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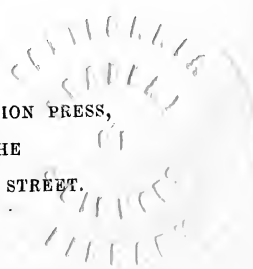
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“It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease.” SIR WM. JONES.

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14th April, 1898.

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JOURNAL  
OF THE  
ASIATIC SOCIETY OF BENGAL.



Vol. LXVI. Part II.—NATURAL SCIENCE.

No. I.—1897.

*Materials for a Flora of the Malayan Peninsula.*—By GEORGE KING,  
LL.D., F.R.S., C.I.E., Superintendent of the Royal Botanic Garden,  
Calcutta.

No. 9.

With the last part of these *Materials* the account of the *Discifloræ* of the Malayan Peninsula was concluded; and in the present part that of the *Calycifloræ* is begun. My progress has (owing to the press of official and of other work) been even slower than I anticipated when I began the publication of these *Materials* now more than seven years ago. I therefore invoked the aid of my excellent friend and colleague Dr. D. Prain, and he, in response to my appeal, generously undertook the elaboration of the important family of *Leguminosæ* which forms so large a portion of the present paper. It is hoped that one more contribution similar in size to the present one will suffice to complete the account of the *Calycifloræ*, and so to bring the whole series about half way towards completion.

Order XXXVII. CONNARACEÆ.

Erect or climbing shrubs or trees. *Leaves* alternate, exstipulate, 1-3-foliolate or unequally-pinnate; leaflets quite entire. *Flowers* in racemes panicles or cymes, regular or subregular, usually bisexual. *Calyx* 5-lobed or -partite, usually persistent, imbricate or valvate. *Petals*

5, usually narrow, free or slightly cohering, very rarely valvate. *Stamens* perigynous or hypogynous, sometimes declinate, 5 or 10, those opposite the petals often shorter and imperfect; filaments often connate at the base. *Disc* 0 or small, annular or incomplete. *Pistils* 5, rarely 1-3 or 6-7, ovoid, hirsute, 1-celled; styles subulate or filiform, stigmas capitellate, simple or 2-lobed; ovules 2, collateral, ascending, orthotropous. *Fruit* usually of 1, rarely 2-3, sessile or stalked, 1- rarely 2-seeded follicles. *Seed* erect, usually arillate, testa thick, usually more or less covered by an arillus which is often very thin; cotyledons fleshy in the exalbuminous, leafy in the albuminous seeds; radicle superior, rarely ventral.—**DISTRIB.** 14 genera, all tropical.

Seeds exalbuminous, arillate.

Pistils solitary.

- |   |                 |
|---|-----------------|
| Leaves pinnate, leaflets 3 to 11; trees or scandent shrubs ... ..   | 1. CONNARUS.    |
| Leaflet solitary, small trees or shrubs, never scandent   | 2. ELLIPANTHUS. |
| Pistils 5 but usually only 1 perfect: leaves pinnate, (leaflet solitary in one species of <i>Rourea</i> ).  |                 |
| Flower-pedicels ebracteolate: follicle curved; lobes of calyx persistent, slightly accrescent, imbricate and forming a cup at the base ... ..       | 3. ROUREA.      |
| Flower-pedicels with persistent bracteoles at their bases, follicle not curved; calyx-lobes persistent, but neither accrescent nor imbricate ... .. | 4. ROUREOPSIS.  |
| Pistils 2 to 5, perfect.  |                 |
| Calyx imbricate; follicles rugose, laminate or tubercled  | 5. AGELEA.      |
| Calyx valvate; follicles neither rugose laminate nor tubercled ... ..   | 6. TENIOCHLENA. |
| Seeds albuminous, pistils 5 to 7, follicles 1 to 3, arillus thin  | 7. CNESTIS.     |

1. \* CONNARUS, Linn.

Trees or (usually scandent) shrubs. *Leaves* unequally pinnate; leaflets 5, rarely 3 or more, quite entire. *Panicles* axillary and terminal, branched. *Flowers* small. *Sepals* 5, deciduous or persistent and clasping the pedicel of the capsule but not accrescent, imbricate. *Petals* 5, linear or slightly dilated upwards. *Stamens* 10, 5 shorter and sometimes without anthers. *Ovary* 1, densely pubescent, style slender, stigma capitellate. *Capsule* oblique, stipitate, inflated, broader upwards; valves glabrous or pubescent within. *Seeds* arillate, testa shining, albumen 0; cotyledons amygdaloid.—**DISTRIB.** Species about 80, all tropical.

Petals minute, much shorter than the sepals ... .. 1. *C. Maingayi*.

Petals longer than the sepals.

Under surfaces of the leaflets and the follicles externally densely rusty-pubescent, upper surfaces of leaflets sparsely pubescent ... .. 2. *C. ferrugineus*.

Under surfaces of leaflets pubescent, upper surfaces and adult follicles externally glabrous ... 3. *C. semidecantrus*.

Both surfaces of the leaflets quite glabrous.

Leaflets ovate-lanceolate or elliptic-lanceolate, acuminate, 2 to 4 in. long.

Follicles sub-cylindric, tapering at the ends, not compressed, minutely sericeous inside ... 4. *C. oligophyllus*.

Follicles compressed, sparsely stellate-hairy inside .. 5. *C. hebephyllus*.

Leaflets broadly ovate with very rounded bases; petals pubescent; follicles 1.5 in. long, pubescent inside ... 6. *C. nicobaricus*.

Leaflets elliptic-oblong or elliptic, 3 to 12 in. long; petals glabrous.

Main nerves of leaves 6 or 7 pairs; follicles 1.25 to 1.4 in. long, sericeous inside .. 7. *C. gibbosus*.

Main nerves of leaves 9 or 10 pairs; follicles 1.5 to 1.75 in. long, sericeous inside ... 8. *C. grandis*.

Main nerves of leaves 5 pairs; follicles 2.5 in. long, pubescent inside ... 9. *C. ellipticus*.

1. *CONNARUS MAINGAYI*, Hook. fil. Fl. Br. Ind. II, 53. A small tree; young branches minutely rusty-tomentose. Leaves 6 to 8 in. long, their rachises densely and minutely tomentose; leaflets 7 to 9, coriaceous, elliptic-oblong, obtusely and shortly acuminate, the base rounded or sub-cuneate, both surfaces distinctly reticulate when dry, the upper glabrous, the lower paler and sparsely adpressed-pubescent, the midrib tomentose; main nerves 7 to 11 pairs, spreading, faint; length 2.25 to 3.25 in., breadth 1 to 1.35 in., petiolules .1 to .15 in. Panicles axillary and terminal, longer than the leaves, densely and minutely rusty-tomentose; the branches short, spicate, with the flowers clustered near the apices. Flowers about .15 in. long, and the same in diameter, on pedicels shorter than themselves. Sepals oblong, laterally inflexed at the apex, hoary-pubescent outside, glabrous inside, connivent. Petals minute, much shorter than the sepals and shorter than the stamens, pale-pubescent in front. Stamens 10; the anthers almost sessile, broadly ovate, glabrous. Pistil solitary, the ovary sericeous like the disc, the style short and stout. Fruit not seen.

Perak; King's Collector, No. 3106.

This is readily distinguished from every *Connarus* described here by its very minute petals. In leaves it approaches *C. oligophyllus*, but is distinguished from that by its pinnate nervation.

2. *CONNARUS FERRUGINEUS*, Jack in Mal. Misc. 2, VII, 37. A sarmentose shrub or powerful woody climber as much as 80 feet long; young branches, petioles, rachises, under-surfaces of leaves and inflorescence densely rusty-tomentose. Leaves 8 to 16 in. long; leaflets 5 to 11, coriaceous, oblong-lanceolate or oblong-oblongeolate, shortly acuminate.

nate, narrowed in the lower fourth to the rounded or sub-cordate base; upper surface rugose and, even when adult, clothed with sparse thin hairs; when old glabrous, the midrib and nerves depressed and tomentose; under-surface rusty-tomentose; main nerves 6 or 7 pairs, oblique, curved, prominent beneath; length 3 to 6 in., breadth 1.25 to 2 in., petiolules .1 to .15 in. *Panicles* terminal, shorter or longer than the leaves; the branches rather short, stout. *Flowers* crowded, .3 in. long, on pedicels much shorter than themselves. *Sepals* oblong-ovate, tomentose outside, glabrous inside. *Petals* linear-oblong, glabrous. *Stamens* 10, alternately long and short; the filaments glabrous. *Ovary* oblong, tomentose, style short. *Follicle* obovoid-oblong, shortly apiculate, tapering to the base, red when ripe, densely rusty-tomentose, 1.75 to 2.25 in. long and .8 to 1.25 in. broad; pericarp woody, densely sericeous inside. *Seed* narrowly oblong, 1 in. long and .6 in. broad, black, shining, with a basal incomplete arillus .5 in. long. Planchon in Linnæa, Vol. XXIII, 429; Hook. fil. Fl. Br. Ind. II, 51. *Tricholobus ferrugineus*, Blume Mus. Bot. Lugd. Bat. I. 237. *Connaraceæ*, Wall. Cat. 8530.

In all the provinces except the Andaman and Nicobar Islands.—  
DISTRIB. Sumatra.

I see no character to separate Blume's genus *Tricholobus* from *Connarus*, and I therefore follow Sir Joseph Hooker in adhering to Jack's name for this plant.

3. *CONNARUS SEMIDECANDRUS*, Jack in Mal. Misc. 2, VII, 39. A sarmentose or often scandent shrub; young branches deciduously puberulous. *Leaves* 6 to 9 in. long, their rachises and the under-surfaces of the leaflets with their petiolules pubescent or puberulous; leaflets 5 to 7, thinly coriaceous, oblong to elliptic-lanceolate, shortly caudate-acuminate, the base cuneate or rounded; upper surface quite glabrous; the lower reticulate, the pubescence often deciduous with age; main nerves 6 or 7 pairs, prominent on the lower surface, spreading but curving upwards, the lower pair very oblique; length 2.5 to 4.5 in., breadth .9 to 2.5 in., petiolules .15 in. *Panicles* axillary and terminal, longer than the leaves, much branched, densely and minutely rusty-tomentose. *Flowers* rather crowded, .2 in. long, on pedicels shorter than themselves. *Sepals* oblong, obtuse, concave, pubescent outside, shorter than the glabrous linear-oblong petals. *Stamens* 10, in two rows, one row very short, the other with its filaments dilated at their bases and as long as the petals. *Pistil* single, shorter than the stamens, the ovary hairy; the style short, stout, pubescent; stigma sub-capitate. *Follicles* falcate, obovoid, compressed, with a short abrupt apical point, narrowed to a stalk at the base, at first rusty-pubescent, afterwards glabrous, obliquely striate, about .75 to .9 in. long and .5 in. broad; pericarp thin, sparsely



sericeous internally. *Seed* with a short basal arillus. Hook. fil. Fl. Br. Ind. II, 52; Kurz For. Flora Burma, II, 326. *Connarus floribundus*, Wall. Cat. 8543 (in part), 8541, B.

In all the provinces except the Nicobars and Andamans.—DISTRIB. Sumatra.

This species is easily distinguished when in fruit by the small size of its follicles. But, while in flower, it is not easy to separate it from *C. gibbosus*, Wall.; the only distinctions that I can find being that, in the latter, the follicles are larger than in this, and that the leaflets are quite glabrous on both surfaces.

4. *CONNARUS OLIGOPHYLLUS*, Wall. ex Planch. in Linnæa, XXIII, 427. Scandent, glabrous except the inflorescence. *Leaves* 6 to 8 in. long; leaflets 3 to 5, coriaceous, elliptic-lanceolate to elliptic-oblong, sub-acute or shortly and bluntly acuminate, the base cuneate or rounded; upper surface shining; the lower paler, dull; main nerves 4 or 5 pairs, ascending (especially the lower 2 pairs), curved, slightly prominent on the lower surface, very faint on the upper; length 2.25 to 4 in., breadth 1 to 2 in., petiolules .25 to .3 in. *Panicles* terminal and longer than the leaves or lateral and shorter, sub-pyramidal, much branched, minutely rusty-pubescent, many-flowered. *Flowers* .35 in. long, sub-sessile or on short pedicels. *Sepals* ovate-lanceolate, acute, much shorter than the oblong obtuse puberulous petals; perfect ovary 1, flask-shaped, puberulous. *Follicle* nearly straight, not compressed, cylindric, tapering to each end, glabrous and vertically striate (when dry) outside, the pericarp coriaceous, minutely sericeous internally, 1.5 to 2 in. long and .75 in. in diam. at the middle. *Seed* shining, black. Hook. fil. Fl. Br. Ind. II, 53. *Connaraceæ*, Wall. Cat. 8542 (in part) and 8539 D. (in part).

Penang; Porter. Perak; Wray, No. 1942. King's Collector, Nos. 5232, 5613, 7804, 8335, 8432. Scortechini, No. 1057. Singapore; Ridley, No. 5904. Malacca; Maingay, Nos. 506, 508/2, 513.

5. *CONNARUS HEBEPHYLLUS*, n. spec. King. A powerful climber; young branches deciduously rusty-pubescent; the bark pale, sparsely lenticellate. *Leaves* 6 to 12 in. long, their rachises glabrous; leaflets coriaceous, ovate-lanceolate, acuminate, the base rounded or slightly cuneate; both surfaces glabrous, dull, the lower pale and faintly reticulate; main nerves 6 or 7 pairs, spreading, curving upwards; length 2 to 4 in., breadth .75 to 1.35 in.; petiolules about .2 in., rugulose, glabrous, pale. *Panicles* terminal and axillary, shorter than the leaves in flower, as long as or longer than them in fruit; the branches short, densely rusty-tomentose. *Flower-buds* obovate, on short pedicels. *Calyx* densely rusty-tomentose outside. *Petals* glabrous. *Stamens* 5 long and 5 minute. *Follicles* when young rusty-tomentose, when ripe

glabrous externally except along the suture, broadly oblong, blunt at both ends, somewhat compressed, obliquely striate, attenuated to a very short grooved pseudo-stalk, rosy-red when ripe, sparsely stellate-hairy inside; length 1.25 in., breadth .85 in.; the pericarp thin, coriaceous, glabrous inside. *Seed* narrowly oblong, blunt, with a short arillus at its base.

Perak; Wray, No. 1858. King's Collector, Nos. 5586, 6517, 7519.

6. *CONNARUS NICOBARICUS*, King n. spec. Scandent, woody, all parts except the inflorescence glabrous; young branches with pale smooth bark. *Leaves* 8 to 10 in. long; leaflets thinly coriaceous, 3 to 5, broadly ovate with a very short blunt apical point, the base broad and rounded; upper surface slightly shining, the lower duller and paler; main nerves 6 or 7 pairs, faint, curving upwards; length of lateral leaflets 2.75 to 4.5 in., breadth 1.5 to 2.75 in.; petiolules about .25 in., the terminal leaflet larger. *Panicles* terminal (probably also axillary), nearly as long as the leaves, rusty-pubescent, the branches sub-erect. *Flowers* crowded near the ends of the branchlets, .35 in. long, on pedicels much shorter than themselves. *Calyx-segments* ovate, tomentose outside, glabrous inside, about one-fourth as long as the corolla. *Petals* linear, pubescent on both surfaces. *Stamens* 10, in two rows, the longer row much shorter than the style and petals; filaments sparsely pubescent, swollen near the base. *Pistil* as long as the petals; the ovary broadly ovoid, tomentose; style sparsely pubescent. *Stigma* sub-capitate. *Follicle* broad, sub-compressed, obtuse, glabrous, faintly striate longitudinally, 1.5 in. long, and nearly 1 in. broad, pubescent inside.

Nicobar Islands; King's Collectors.

Allied to *C. gibbosus*, Wall., but with pubescent petals and larger follicles which are pubescent inside.

7. *CONNARUS GIBBOSUS*, Wall. Cat. 8541 (*in part*). A large semi-scandent shrub; young branches deciduously rusty-puberulous. *Leaves* 6 to 9 in. long, quite glabrous; leaflets 3 to 5, thinly coriaceous, elliptic or elliptic-oblong, very shortly and obtusely acuminate, the base rounded; both surfaces shining, the lower reticulate; main nerves 6 or 7 pairs, spreading but curving upwards, the lower pairs very oblique, slightly prominent on the lower surface; length 3 to 5 in., breadth 1.25 to 2.5 in., petiolules .2 to .3 in. *Panicles* axillary and terminal, shorter than or as long as the leaves, many-branched, rusty-pubescent. *Flowers* rather crowded on the short ultimate branchlets, .25 in. long, on pedicels shorter than themselves. *Sepals* and *petals* as in *C. semidecandrus*. *Stamens* 10, the one row only slightly shorter than the other. *Pistil* longer than the stamens and petals; the ovary ovate-rotund, rusty-tomentose, the style pubescent; stigma sub-capitate. *Follicles*

sub-rhomboidal, compressed, with a short stout apical point, glabrous, obliquely striate; pericarp leathery inside, sericeous, 1·25 to 1·4 in. long, and about 1 in. broad, the stalk ¼ in. long. *Seed* nearly 1 in. long, oblong, blunt at both ends, black, with an arillus obliquely covering its lower half. Hook. fil. Fl. Br. Ind. II, 52; Kurz For. Flora Burma, II, 326.

The Andaman Islands.—DISTRIB. Burma.

This may be distinguished from *C. semidecandrus* by its larger follicles, and larger seeds much more extensively covered by arillus. The inner surface of the pericarp in this is glabrous; in *C. semidecandrus* it is sparsely sericeous.

8. *CONNARUS GRANDIS*, Jack in Mal. Misc. 2, VII, 40. Scandent, all parts except the inflorescence quite glabrous. *Leaves* 9 to 12 in. long, their rachises stout; leaflets 3 to 5, very coriaceous, elliptic-oblong, acute or obtusely acuminate, the base rounded or sub-cuneate; both surfaces, but especially the upper, shining, the lower reticulate when dry; main nerves 9 or 10 pairs, oblique, faint; length 4 to 12 in., breadth 1·5 to 4 in.; petiolules of the lateral leaflets about ½ in., of the terminal ¾ in. *Panicles* often as long as the leaves, terminal or axillary, spreading, with a few spike-like branches, rusty-tomentose. *Flowers* sessile, ¼ in. long. *Sepals* tomentose outside, linear-oblong, obtuse. *Petals* twice as long, linear, dilated upwards, glabrescent. *Filaments* puberulous. *Follicles* obliquely ovoid, sub-rhomboidal, compressed, glabrous, slightly and obliquely rugulose when dry, tapering to a short pseudo-stalk, 1·5 to 1·75 in. long, and about 1 in. broad; pericarp woody, sericeous inside. Planchon in Linnæa, XXIII, 429; Hook. fil. Fl. Br. Ind. II, 53. *C. Wallichii*, Planch. l. c. 426; Kurz For. Flora Burma, I, 328. *Connaracea*, Wall. Cat., 8538 A. B. (*in part*).

In all the provinces except the Nicobars and Andamans.

9. *CONNARUS ELLIPTICUS*, King n. spec. Scandent; young branches deciduously rusty-pubescent, the bark dark and polished. *Leaves* 8 to 15 in. long, everywhere glabrous; leaflets coriaceous, 3 to 5, elliptic-oblong to elliptic, acute or shortly acuminate, the base rounded or sub-cuneate, upper surface very shining when dry; the lower paler, reticulate and less shining; main nerves 5 pairs, oblique, rather prominent beneath; length 4½ to 7 in., breadth 2 to 3 in.; petiolules ½ to ⅔ in., rugulose, pale. *Panicles* axillary and shorter, or terminal and longer than the leaves, minutely rusty-pubescent, the branches obliquely spreading, the ultimate branchlets short. *Flowers* ¼ in. long, on pedicels slightly shorter than themselves. Segments of the *calyx* ovate-lanceolate, acute, rusty-tomentose outside, glabrescent inside, about as long as the pistil and half as long as the linear acute glabrous petals. *Stamens* 5 perfect nearly as long as the petals, and 5 abortive (without

anthers) shorter than the pistil; filaments glabrescent or glabrous, those of the perfect stamens dilated at the base. *Ovary* pubescent, *style* glabrous, *stigma* discoid-capitate. *Follicles* broad, obliquely sub-rhomboid, tapered to the base, the dorsal suture straight and ending in a conical point, the ventral compressed and widely curved, glabrous, red when ripe, 2.5 in. long and 1.5 in. broad; pericarp woody, adpressed-pubescent on its inner surface. *Seed* oblong, flat; the testa black, half covered by a thin basal arillus. *Erythrostigma ellipticum*, Zoll. in Tijdsch. Ned. Ind. XIV, 174.

Singapore; Ridley, No. 1380. Perak; King's Collectors, Nos. 4090, 4943, 5958, 7480, 8435. Wray; Nos. 1831, 2870, 2873; Scortechini, No. 1689. Penang; Curtis.

There is a specimen in the Calcutta Herbarium collected by Kurz in the Buitenzorg garden what exactly agrees with this. That specimen is named *Erythrostigma ellipticum* Zoll.; and it is on the strength of this identification of Kurz's that I have included this synonym here. For Zollinger (who refers the genus *Erythrostigma* to *Anacardiaceæ*) defines his three species (l. c.) *E. ellipticum*, *E. obliquum* and *E. villosum* so briefly and imperfectly, that it is quite impossible, from his descriptions alone, to identify any of them.

## 2. ELLIPANTHUS, Hook. f.

Trees or erect shrubs. *Leaves* with 1 leaflet, quite entire. *Racemes* or *cymes* axillary, short. *Flowers* hermaphrodite or polygamous. *Sepals* 5, not enlarged in fruit, sub-erect, valvate. *Petals* 5, longer than the sepals, oblong-lanceolate, densely pubescent. *Stamens* 10, 5 shorter without anthers; filaments short, subulate, connate at the base. *Ovary* 1, pubescent; style short. *Follicle* stalked, oblique, velvety; valves glabrous within. *Seed* arillate, albumen 0; cotyledons plano-convex.—  
DISTRIB. 12 species; Malayan Peninsula and Islands.

Both surfaces of leaves quite glabrous.

Leaflet narrowly elliptic-oblong, tapering to each end;

follicles 5 in. long ... .. 1. *E. Scortechinii*.

Leaflet elliptic-ovate to elliptic; follicle 1 in. long ... .. 2. *E. calophyllus*.

Under surfaces of leaves hairy.

Leaflet oblong-lanceolate, 2.5 to 3.5 in. long; flowers in short panicles ... .. 3. *E. Curtisii*.

Leaflets ovate- or oblong-elliptic to elliptic, 4 to 6 in. long.

Flowers in racemes, follicle with a pseudo-stalk only 2 in. long ... .. 4. *E. Griffithii*.

Flowers in dense capituloid cymes; follicle gibbous at the base on one side, its pseudo-stalk about 1 in. long .. 5. *E. gibbosus*.

1. ELLIPANTHUS SCORTECHINI, King n. spec. A small tree; young branches with pale cinereous bark, pubescent. *Leaflet* thinly coriaceous, narrowly elliptic-oblong, tapering from the middle to either end, the

apex caudate-acuminate; both surfaces glabrous, the upper shining; the lower dull, minutely reticulate; main nerves 4 pairs, curved, ascending, prominent on the lower surface; length 4·5 to 7 in., breadth 1·25 to 2 in., petiole ·1 to ·15 in. *Cymes* axillary, very short, tawny-tomentose. *Calyx* thick; the lobes deep, ovate, obtuse, cinereous-tomentose. *Petals* slightly longer than the calyx, membranous. *Follicles* cinereous-tomentose, obliquely elliptic, sub-compressed, grooved along the suture, almost straight, the apex rather blunt with an abrupt small apiculus, the base slightly and suddenly contracted into a short stout pseudo-stalk covered by the persistent calyx; length ·5 in., breadth ·3 in.; pericarp thick, glabrous inside. *Seed* oblong with a large hilum and thin arillus.

Perak; Scortechini No. 607.

Gathered only by the late Father Scortechini whose specimens are in fruit, and from whose field notes the foregoing description of the flower has been taken.

2. *ELLIPANTHUS CALOPHYLLUS*, Kurz Andam. Report, Append. B. 6. A small tree; young branches slender, glabrous. *Leaflet* coriaceous, elliptic to elliptic-ovate, sometimes oblong-lanceolate, shortly caudate-acuminate, the base rounded or slightly and abruptly cuneate; both surfaces glabrous; the upper shining when dry; the lower dull, minutely reticulate; main nerves 4 or 5 pairs, spreading, curving upwards, inter-arching freely; length 4·5 to 6·5 in., breadth 2 to 2·25 in.; petiole ·75 to 1 in., the joint near the apex. *Cymes* axillary, shorter than the petioles, minutely tawny-tomentose. *Flowers* ·3 in. long, on pedicels shorter than themselves. *Calyx lobes* broadly ovate, sub-acute, tawny-tomentose outside, less than half as long as the linear-oblong densely velvety obtuse petals. *Stamens* the 5 perfect shorter than the petals and with very pubescent filaments; the 5 abortive much shorter and more slender, anatherous. *Ovary* narrowly ovoid, sericeous. *Style* rather short, stigma sub-capitate. *Follicles* obovoid or ellipsoid, slightly compressed, blunt, rusty-tomentose, 1 in. long; pericarp thick, woody, glabrous within; Kurz Journ. As. Soc. Beng. 1872, Pt. II, 305; For. Flora Burma I, 329; Hook. fil. Fl. Br. Ind. II, 55.

Andaman Islands; Kurz, King's Collectors.

3. *ELLIPANTHUS CURTISH*, King n. spec. A tree; young branches rusty-puberulous, the bark dark. *Leaflet* thinly coriaceous, oblong-lanceolate, tapering to each end, the apex caudate-acuminate; upper surface glabrous, shining; the lower reticulate, sparsely pubescent, the midrib tomentose; main nerves 7 or 8 pairs, curving obliquely upwards, prominent beneath; length 2·5 to 3·5 in., breadth ·8 to 1·5 in., petiole ·3 in., tomentose. *Panicles* axillary, branching from the base, ·5 to ·7 in. long, sericeous. *Flowers* ·2 in. long, on pedicels shorter than themselves. Segments of the *calyx* ovate-lanceolate, thick, tomentose on the outer,

glabrescent on the inner surface, less than half as long as the petals and pistil. *Petals* narrowly oblong, sub-acute, pubescent on the outer, glabrescent on the inner surface. The 5 fertile *stamens* as long as the ovary, glabrous, the anthers broadly ovate, the filaments much dilated at the base, the 5 alternate much smaller and without anthers. *Ovary* oblong, sericeous-tomentose, longer than the stout pubescent style; stigma capitate-discoïd. Fruit unknown.

Penang; Curtis Nos. 1014, 1097.

The nearest ally of this appears to be the imperfectly known *E. Helferi*, Hook. fil. from Tenasserim, of which the type is Helfer's No. 1253; but the leaves of this are much more pubescent on the lower and more shining on the upper surface. The flowers of this are moreover larger.

4. *ELLIPANTHUS GRIFFITHII*, Hook. fil. Fl. Br. Ind. II, 56. A small tree? Young branches slender, rusty-pubescent. *Leaflet* thinly coriaceous, ovate-elliptic, caudate-acuminate, the base abruptly sub-cuneate; upper surface glabrous, shining, the lower sparsely rusty-pubescent, the midrib and nerves almost tomentose; main nerves 9 or 10 pairs, spreading, interarching, prominent beneath; length 4 to 5 in., breadth 1.5 to 2 in., petiole .2 to .25 in. *Racemes* .25 in. long, few-flowered; calyx deeply divided into 5 ovate-lanceolate teeth, adpressed-pubescent. Follicles compressed, much curved, the apex beaked, narrowed at the base to a pseudo-stalk .2 in. long which is embraced by the persistent calyx, rufous tomentose outside, .75 in. long; the pericarp coriaceous, glabrous inside.

Mallacca; Griffith No. 1253.—DISTRIB. Borneo.

5. *ELLIPANTHUS GIBBOSUS*, King n. spec. A small tree; young branches slender, rusty-tomentose. *Leaflet* elliptic or oblong-elliptic, sometimes slightly obovate, shortly and rather abruptly caudate-acuminate, the base cuneate; upper surface quite glabrous; the lower sparsely adpressed-pubescent, the midrib densely so; main nerves 7 or 8 pairs, spreading but curved upwards, prominent on the lower surface when dry; length 4.5 to 6.5 in., breadth 1.75 to 2.75 in., petiole .5 or .6 in. long, tomentose, stout, the joint near the apex. *Flowers* .15 in. long, in dense many-flowered capituloid axillary cymes, sub-sessile. *Calyx-teeth* lanceolate, tawny-tomentose externally, glabrous internally. *Petals* broader than the sepals and sometimes also longer, imbricate, tomentose outside, glabrous inside. *Stamens* 5 or 6 fertile with broadly ovate anthers, and 5 alternate smaller and abortive; the filaments of all united by their expanded bases. *Ovary* villous, style about as long as the stamens, stigma discoïd. *Follicle* narrowly oblong, compressed, the apex produced into a long conical beak; the base gibbous at one side, contracted below the gibbosity into a curved pseudo-stalk about an inch

long, everywhere pale rusty-tomentose; length of follicle and beak equal to that of the pseudo-stalk; pericarp leathery, glabrous inside. *Seed* arillate at the base, testa black.

Perak; very common, Scortechini, Wray, Curtis, King's Collectors.

### 3. ROUREA, AUBL.

Scandent or sarmentose shrubs. *Leaves* unequally pinnate, sometimes with only one leaflet; leaflets subopposite or alternate. *Racemes or panicles* axillary. *Flowers* small; pedicels usually slender. *Sepals* 5, orbicular, imbricate, enlarged and clasping the base of the ripe capsule. *Petals* 5, usually linear-oblong. *Stamens* 10; filaments connate at the base. *Ovaries* 5, 4 usually imperfect; style slender. *Follicle* sessile, curved. *Seed* erect, arillate, exalbuminous.—  
DISTRIB. Tropics; species about 52.

Leaflets not more than 7, petiolulate, glabrous.

Leaves with usually a single leaflet ... .. 1. *R. anomala*.

Leaves with 3 to 9, rarely 11, leaflets; inflorescence ebracteolate, or the bracteoles (if any) fugacious.

Leaflets glaucous on the lower surface ... .. 2. *R. acuminata*.

Leaflets not glaucous on the lower surface.

Leaves 8 to 12 in. long; leaflets elliptic-lanceolate to elliptic, their main nerves 2 to 5 pairs, curving abruptly upwards; flowers .35 in. in diam., in racemes or panicles, flower buds ovoid ... .. 3. *R. commutata*.

Leaves 3 to 7 in. long; leaflets ovate-lanceolate, their main nerves 4 or 5 pairs, faint, spreading; flowers .25 in. in diam.; flower buds ovoid ... .. 4. *R. pulchella*.

Leaves 3.5 to 6 in. long; leaflets 3 rarely 5, broadly ovate or ovate-orbicular with broad rounded bases; their main nerves about 4 pairs, spreading, faint; flower-buds globose ... .. 5. *R. humilis*.

Leaflets very numerous (17 to 40), small, sessile, oblong.

Leaflets shortly and bluntly acuminate, pubescent beneath... 6. *R. rugosa*.

Leaflets bifid at the apex, minutely dotted and sparsely pubescent beneath ... .. 7. *R. parallela*.

Leaflets with obtuse rounded apices.

Lower surface of leaflets rusty-sericeous ... .. 8. *R. fulgens*.

Lower surface of leaflets minutely dotted, reticulate, glabrous ... .. 9. *R. concolor*.

1. ROUREA ANOMALA, King n. spec. A powerful woody perfectly glabrous creeper. *Leaves* either simple or ternate; leaflets coriaceous, ovate-elliptic to broadly ovate, shortly and bluntly caudate-acuminate, the base rounded and usually broad; both surfaces shining and minutely reticulate when dry; main nerves about 6 pairs, curving upwards,

faint; length of the simple leaves and of the terminal leaflet of the ternate leaves 3.25 to 4.5 in., breadth 1.6 to 2.2 in.; petiolules about .2 in., those of the lateral leaflets shorter. *Racemes* slender, shorter than the leaves, in fascicles in the leaf-axils, laxly-flowered. *Flowers* .35 in. long, on slender pedicels of about the same length. *Segments of calyx* ovate-orbicular, sub-oblique, puberulous outside, their edges ciliate, only about one-third of the length of the linear-oblong glabrous petals. *Stamens* much shorter than the petals and than the glabrous pistils. *Follicles* obliquely ovoid, sub-compressed, blunt, yellowish with a red tinge when ripe, 1 in. long. *Seed* with a soft red arillus.

Penang; Curtis No. 504. Perak; King's Collector Nos. 804, 953, 3066, 3866, 4527, 4622, 6755, 8312, 10542, 10863. Wray, No. 3799; Scortechini.

This resembles *R. simplicifolia* Bl. in having both simple and compound leaves; but that is a smaller plant with puberulous inflorescence, and different follicles.

2. *ROUREA ACUMINATA*, Hook. fil. Fl. Br. Ind. II, 48. A powerful woody perfectly glabrous creeper often over 100 feet long; young branches glabrous, often minutely lenticellate. *Leaves* 3 to 9 in. long, the rachis slender; leaflets 5 to 11, thinly coriaceous, oblong, lanceolate or elliptic-oblong, sometimes somewhat obovate, abruptly shortly and bluntly caudate-acuminate, slightly narrowed to the rounded base or with broad minutely cordate base; upper surface shining, the lower dull and glaucous, both minutely reticulate when dry; main nerves about 5 pairs, very faint, spreading; length 1.5 to 2.25 in., breadth .65 to .9 in.; petiolules under .1 in., the terminal one slightly larger. *Racemes* very slender, lax, several from an axil. *Flowers* .3 in. long, on slender pedicels of about the same length. *Sepals* ovate-rotund, about half as long as the narrowly oblong glabrous sepals, glabrous, the edges minutely ciliolate. *Stamens* shorter than the petals and glabrous pistils. *Follicle* narrowly ovate, curved, pointed, .75 in. long, when ripe red tipped with yellow. *Orestis acuminata*, Wall. Cat. 8533.

Singapore; Wallich. Perak; King's Collector Nos. 866, 4271, 6987, 7781, 10599, 10871.

3. *ROUREA COMMUTATA*, Planch. in Linnaea, XXIII, 420. Shrubby, scandent; young branches puberulous becoming glabrous, sometimes minutely lenticellate. *Leaves* 8 to 12 in. long, glabrous; leaflets 3 to 7, thinly coriaceous, sub-opposite, elliptic-lanceolate to elliptic, sub-obtusely caudate-acuminate, the base rounded, both surfaces shining; main nerves 2 to 5 pairs, curved, rather abruptly ascending; length 2.5 to 6 in., breadth 1.35 to 2.25 in.; petiolules .15 to .2 in., the terminal one larger. *Flowers* .35 in. in diam., in glabrous racemes or racemoid panicles much shorter than the leaves and clustered in their axils, pedicels



shorter than the flowers. *Sepals* broadly ovate, blunt, pubescent. *Petals* linear-oblong, broadly ovate. *Stamens* 10, alternately shorter than the filaments, expanded towards the base and united by their edges; ovaries slightly hairy on the inner side, styles glabrous. *Follicles* obliquely ovate-oblong, pointed, coriaceous, glabrous, .75 to 1 in. long. *Seed* ovate, covered by an orange-coloured arillus. Hook. fil. Fl. Br. Ind. II, 47; Kurz For. Flora Burma I, 324. *Cnestis monadelpha*, Roxb. Fl. Ind. II, 454. *Connaracea*, Wall. Cat., 8547, 8548.

Andaman and Nicobar Islands.—DISTRIB. Burma, Chittagong, Sylhet and Assam.

The present species (published in 1850), *R. pulchella*, Blume (1850), and *L. humilis*, Planch. (1850), differ from each other so little that I am not sure that they should not be reduced to one, in which case the species might be named *Rourea monadelpha*, the earliest published name of any of them being *Cnestis monadelpha*, Roxb. (1832).

4. ROUREA PULCHELLA, Planch. in *Linnaea* XXIII, 419. Scandent, woody, quite glabrous. *Leaves* 3 to 7 in. long; leaflets 3 to 7, thinly coriaceous, ovate-lanceolate, obtusely caudate-acuminate, the upper surface very shining, the lower less so, both reticulate; main nerves 4 or 5 pairs, spreading, faint; length 1.5 to 3 in., breadth .75 to 1.6 in.; petioles .15 in., slender. *Racemes* crowded in the axils, shorter than the leaves. *Flowers* .25 in. in diam., the pedicels of the same length, slender. *Sepals* broadly ovate, acute, ciliate, half as long as the petals, linear-oblong. *Pistils* 5, ovaries pilose, styles slender. *Follicle* stout, curved, pointed, glabrous, .6 in. long, red when ripe. Hook. fil. Fl. Br. Ind. II. 48.

Malacca; Griffith, No. 1265. Maingay, No. 501 (Kew Distrib.); Ridley, No. 1449. Singapore, Ridley, Nos. 2028, 3981. Perak; Wray, Nos. 1167, 3774.

5. ROUREA HUMILIS, Blume Mus. Bot. Lugd. Bat. I, 262. Scandent, woody, glabrous. *Leaves* 3.5 to 6 in. long, the rachises slender; leaflets 3 rarely 5, coriaceous, broadly ovate or ovate-orbicular, abruptly and obtusely caudate-acuminate, the base rounded, rarely sub-cuneate, upper surface very shining, the lower less so and more distinctly reticulate; main nerves about 4 pairs, spreading, faint; length 1.5 to 3 in., breadth 1 to 2.25 in. petioles about .2 in., the terminal leaflet the largest. *Racemes* axillary, clustered, slender, few-flowered; the buds sub-globose, on pedicels of about their own length. *Calyx-lobes* sub-orbicular, glabrous. *Stamens* shorter than the calyx, much shorter than the styles. *Follicles* cylindrical, pointed, coriaceous, glabrous, .75 in. long.

Nicobar Islands; Jelinek, No. 140. Kurz. Penang; Curtis, No. 2285. Pahang, Ridley, Nos. 2645, 5121; Singapore. Perak; King's Collector, No. 4677, Scortechini.—DISTRIB. Sumatra, Borneo.

Distinguished chiefly by its broadly ovate coriaceous leaves, very shining on the upper surface and with broad bases.

6. *ROUREA RUGOSA*, Planch. in *Linnaea* XXIII, 422. A stout woody climber; young branches densely cinereous-tomentose. *Leaves* thinly coriaceous, 12 to 15 in. long, the rachises tomentose; leaflets 8 to 15 pairs, sub-sessile, sub-opposite, narrowly oblong or oblong-lanceolate, shortly and bluntly acuminate, rarely acute, the bases rounded or minutely cordate; upper surface glabrous, smooth; the lower reticulate, sparsely pubescent, the midrib tomentose; main nerves 8 or 9 pairs, spreading, interarching very freely, prominent; length 2 to 3.25 in., breadth .6 to 1.25 in. *Panicles* shorter than the leaves, crowded in the leaf-axils, pubescent, many-flowered. *Flowers* about .2 in. long, their pedicels shorter. *Sepals* rotund, pubescent, half as long as the petals. *Follicle* about .75 in. long, pointed, glabrous, striate. *Seed* ovoid, apiculate, about .5 in. long. Hook. fil. Fl. Br. Ind. II, 46. *Connarus-rugosus*, Wall. Cat. 8527.

Singapore; Wallich. Malacca; Griffith, Maingay. Penang; Porter, Curtis. Perak; King's Collector, Wray.

7. *ROUREA PARALLELA*, Planch. in *Linnaea* XXIII, 421. A powerful woody climber, often 150 feet long; young branches cinereous-pubescent. *Leaves* 2 to 6 in. long, their rachises with crisped pubescence; *leaflets* coriaceous, sessile, 10 to 22 pairs, opposite or sub-opposite, oblong, the apex broad, shortly bifid; the base minutely cordate, slightly oblique; upper surface glabrous, shining; the lower with very minute pale dots, sparsely pubescent especially on the midrib; main nerves about 6 pairs, faint; length .5 to .75 in., breadth .25 to .3 in. *Racemes* in axillary clusters, shorter than the leaves; the rachises slender, tomentose. *Flowers* not crowded, .3 in. in diam. and .2 in. long, the pedicels slightly shorter. *Sepals* puberulous, half as long as the petals, broadly oblanceolate, sub-glabrous. *Follicles* when ripe bright red with yellow tips, glabrous, .6 to .7 in. long, pointed. *Seed* elliptic, keeled on one side, .3 in. long. Under *C. similis*, Bl. in Hook. fil. Fl. Br. Ind. II, 50. *Connarus minusoides*, Vahl. ? Wall. Cat. 8526 C.

Penang; Porter; Curtis, No. 473. Malacca; Maingay, No. 498. Perak; King's Collector, Nos. 2580, 4302, 8405, 10119, 10592, 10896; Scortechini. Singapore; Anderson, Ridley. Kedah, Curtis, No. 2629.

Blume's species *R. similis* (Mus. Lugd. Bat. I, 264 (September, 1850), is stated by its author to be very near to this, and indeed Sir Joseph Hooker (Fl. Br. Ind. II, 50) has taken Blume's name in preference to Planchon's. *R. sororia*, Planch. from Borneo must, from the description, be also very near this.

VAR. *major*. Flowers .3 in. long and .35 in. in diam. in lax panicles; leaflets nearly 1 in. long.

Perak; King's Collector, No. 5516.

8. *ROUREA FULGENS*, Planch. in *Linnaea*, XXIII, 423. A woody climber; young branches minutely and deciduously rusty-tomentose. *Leaves* 3 to 5 in. long, the rachis tomentose; leaflets 12 to 24 pairs, thinly coriaceous, oblong, slightly oblique, entire, obtuse, the base rounded or sub-cordate, usually oblique; upper surface glabrous, reticulate, minutely rugulose when dry, the lower rather densely covered with rusty silky pubescence; length .4 to .65 in., breadth .15 to .25 in. *Racemes* axillary, solitary, shorter than the leaves, pubescent, pedicels short. *Flowers* unknown. *Follicles* .75 in. long, much curved. Hook. fil. Fl. Br. Ind. II, 46. *Connarus fulgens*, Wall. Cat. 8524.

Singapore; Wallich; Ridley, Nos. 2027, 4568. Malacca; Maingay, No. 499.

9. *ROUREA CONCOLOR*, Blume Mus. Bot. Lugd. Bat. I, 264. A woody climber; young branches rusty-pubescent. *Leaves* 1 to 4 in. long, the rachises tomentose; leaflets 4 to 16 pairs, thinly coriaceous, sub-sessile, broadly oblong, with very obtuse or truncate apex and broad oblique minutely cordate base; both surfaces glabrous, the upper shining, the lower minutely dotted and boldly reticulate; main nerves about 3 pairs, spreading; length 3.5 to 5 in., breadth 1.5 to 3 in. *Racemes* about as long as the leaves, axillary, slender, rusty-tomentose; pedicels slender, .25 in. long, as long as the flowers. *Sepals* orbicular, only half as long as the oblong petals, stamens as long as the petals. *Follicles* .5 to .75 in. long, pointed. Hook. fil. Fl. Br. Ind. II, 49. *R. parvifolia*, Planch. in *Linnaea*, Vol. XXIII, 420. *Connarus mimusoides*, Wall. (not Vahl.) Cat. 8526 B. *Cnestis mimusoides*, Jack in Mal. Misc. Vol. II, VII, 44.

Singapore; Prince, Ridley, No. 2026, Hullett. Malacca; Griffith, No. 1262 (Kew Distrib.) Perak; King's Collector, No. 4373.—DISTRIB. Sumatra; Forbes, No. 3169. Borneo.

#### 4 ROUREOPSIS, Planch.

Sarmentose or scandent shrubs. *Leaves* unequally-pinnate, leaflets few. *Flowers* in axillary racemes; pedicels slender, bracteolate at the base. *Sepals* oblong, slightly imbricate, somewhat enlarged and spreading, but not clasping the base of the capsule. *Petals* linear-oblong. *Stamens* 10, the alternate longer. *Ovaries* 5, styles slender. *Capsule* linear-oblong, straight. *Seed* ovoid; testa thin, black, arilliform at the base; cotyledons amygdaloid.—DISTRIB. Species 3, all Malayan.

This genus differs from *Rourea* in having straight (not curved) follicles, at the base of which the persistent sepals are free, and also in having bracteoles at the base of the pedicels.

Leaflets puberulous beneath	...	...	...	1. <i>R. pubinervis.</i>
„ quite glabrous	...	...	...	2. <i>R. Scortechinii.</i>

1. *ROUREOPSIS PUBINERVIS*, Planch. in *Linnaea*, XXIII, 424. A woody climber, sometimes as long as 50 feet; young branches with pale striate puberulous bark. *Leaves* 2.5 to 5 in. long, the rachises pubescent; leaflets membranous, 5 to 9, (the terminal one larger than the others), narrowly ovate-elliptic, tapering to each end, the apex abrupt and notched, the base cuneate; upper surface glabrous; the lower paler, puberulous on the midrib and sometimes on the nerves; main nerves 4 or 5, inter-arching, not much more prominent than the intermediate nerves; length of lateral leaflets .7 to 1.7 in., breadth .5 to .75 in. *Racemes* slender, shorter than the leaves, solitary or in fascicles of 2 or 3 in the leaf axils, laxly few-flowered. *Flowers* .35 in. long; their pedicels of about the same length, each with a minute pubescent persistent bracteole at its base. *Sepals* broadly oblong, obtuse, pilose near the apex, about half as long as the linear-oblong sub-acute glabrous petals. *Stamens* shorter than the sepals and pistils; ovaries pubescent. *Follicles* ovate, .5 or .6 in. long, not curved; the persistent calyx-lobes free, erect, about one-third as long as the fruit. Hook. fil. *Fl. Br. Ind.*, II, 50. *Indeterminata*, Wall. Cat. 9050.

Penang; Porter; Curtis, 2332 and 2749. Malacca; Griffith, Maingay No. 500. Perak; very common, Scortechini, King's Collector.—*DISTRIB.* Java.

2. *ROUREOPSIS SCORTECHINII*, King n. sp. A slender sarmentose woody shrub, all parts except the inflorescence glabrous, young branches minutely lenticellate. *Leaves* 6 to 10 in. long, the rachis rather slender; leaflets 7 to 9, sub-opposite, very thinly coriaceous, ovate-lanceolate, tapering from below the middle to the long rather blunt acuminate point, the base cuneate; upper surface shining, the lower rather dull, paler and conspicuously reticulate; main nerves about 4 pairs, faint, the lower very oblique; length 2.25 to 3 in., breadth 1 to 1.25 in., petiolules about .1 in., stout; the lowest leaflets the smallest. *Racemes* slender, axillary, 1 to 2 in. long, laxly-flowered, minutely and sparsely rusty-pubescent. *Flowers* about .25 in. long, on slender pedicels about .2 in. long, each pedicel with a minute rusty-tomentose bracteole at its base. *Calyx-lobes* ovate, obtuse, ciliolate, hairy inside, glabrous outside. *Petals* longer than the calyx, lanceolate, plicate in bud, yellowish. *Filaments* slightly coherent at the base, glabrous. *Pistils* 5, only 1 or 2 fertile. *Fruit* narrowly ovoid, not curved, pointed, coriaceous, glabrous, 1 in. long.

Perak; Scortechini, No. 613. Curtis (elevation 5,000 feet), No. 1998.

Scortechini's specimens have flowers in bud only, and none of them is in fruit. The foregoing description, as respects the flower, is copied from his field note. The fruit is described from what I take to be the same plant collected by Curtis in Perak at an elevation of 5,000 feet and described by him as a small tree.

5. AGELÆA, Soland.

Erect or scandent shrubs. *Leaves* 3-rarely 5-foliolate. *Panicles* or *racemes* axillary. *Calyx* 5-partite, not accrescent nor embracing the fruit, imbricate or subvalvate. *Petals* lanceolate or ligulate, obtuse, free or connate at the middle. *Stamens* 5 or 10. *Disc*  $\frac{1}{2}$ -annular or 0. *Pistils* 2-5. *Follicles* 1-3, sessile or shortly stalked, coriaceous, rugose or lamellate. *Seed* erect, exalbuminous; testa arilliform below the middle. —DISTRIB. 12 species, African and Asiatic.

Main nerves of leaflets 2 or 3 pairs, sub-erect, curving.

All parts more or less pubescent, stamens 5 ... 1. *A. vestita*.

All parts, except the inflorescence, glabrous; stamens 10 ... 2. *A. Wallichii*.

Main nerves of leaflets 7 to 10 pairs, spreading.

Leaflets 3 to 5, all parts more or less pubescent; stamens 5.. 3. *A. pinnata*.

Leaflets never more than 3, adult leaves quite glabrous;

stamens 10 ... 4. *A. Hullettii*.

1. AGELÆA VESTITA, Hook. fil. Fl. Br. Ind. II, 46. A rather slender woody creeper 20 to 80 feet long; young branches at first rusty-tomentose but soon becoming sub-glabrous or glabrous. *Leaflets* membranous, unequal, more or less ovate or elliptic, with rounded base and caudate-acuminate apex; the terminal one the larger, sometimes ovate-rotund to sub-rhomboidal; its petiolule .5 or more in length, swollen at the apex; the lateral leaflets inequilateral, the petiolule only .1 or .2 in. long; upper surface of all sparsely adpressed-pubescent, the midrib and nerves tomentose; lower surface pubescent; main nerves about 3 pairs (one pair sub-marginal), much curved, prominent as are the intermediate nerves and reticulations; length of the lateral leaflets 2.5 to 3 in., breadth 1.25 to 1.75 in., the terminal one larger. *Panicles* extra-arillary, less than 1 in. long, tomentose, with many short branches. *Flowers* under .2 in. long, on slender pedicels. *Calyx* cleft to the very base; the segments unequal, linear, tomentose, shorter than the glabrous yellowish oblanceolate or linear petals. *Stamens* 5, unequal. *Styles* 2 to 5, slender, with a few white hairs. *Follicles* solitary, bright red, rarely in pairs, ovoid, boldly tuberculate or lamellate externally and tomentose, about .6 to .8 in. long, usually with a short curved stout apical beak. *Seed* narrowly sub-obovoid, black, .4 in. long, pale and arilliform near the base. *Cnestis vestita*, Wall. in Herb. Linn. Soc. *Connaracea*, Wall. Cat. 8535. *Heniandrina borneensis*, Hook. f. in Trans. Linn. Soc. xxxiii. 171, t. 28. *Troostwyckia singularis*, Miq. Fl. Ind. Bat. Suppl. 531.

Singapore; Jack, Ridley. Penang; Porter, Curtis. Malacca; Griffith, Maingay. Perak; King's Collector, Scortechini, Johore, Ridley.—DISTRIB. Sumatra, Borneo.

A very common species in Perak. The arillus of the seed is very inconspicuous  
J. II. 3

6304

in dried specimens. The number of the pistils varies from 2 to 5. There are in the Kew Herbarium fruiting specimens of a plant collected by Griffith which exactly resembles this except that its fruits (which are immature) are non-tuberculate and are covered with a dense coating of long silky tawny hairs. The same plant was collected by the Calcutta Garden Collector (No. 6878), but also without flowers. I believe the dense hairiness of the fruit of both gatherings to be due to the irritation caused by the deposit of the eggs of some insect in the young fruit.

2. *AGELEA WALLICHII*, Hook. fil. Fl. Br. Ind. II, 47. A slender woody creeper 20 to 50 feet long, all parts except the inflorescence glabrous. *Leaflets* coriaceous, slightly unequal, ovate-elliptic, with rounded or cuneate bases and short caudate-acuminate apices; the petiole of the terminal leaflet about 1 in. long, thickened near the apex; the petiolules of the lateral leaflets about .25 in. long; both surfaces shining, the lower reticulate; length 3 to 4.5 in.; breadth 1.5 to 2.25 in.; main nerves 2 or 3 pairs, ascending, much curved, one pair submarginal. *Panicles* under 1 in. long, extra-axillary, pubescent. *Flowers* .25 in. in diam., on pedicels longer than themselves. *Calyx* divided for three-fourths of its length into 5 ovate-lanceolate imbricate segments; sparsely pubescent externally, glabrous internally, their edges densely sericeous. *Petals* longer and narrower than the segments of the calyx, glabrous, linear, sub-acute. *Stamens* 10, sub-equal, longer than the styles, much shorter than the petals. *Pistils* 5, very short, stout. *Follicle* usually solitary, bright red when ripe, ovoid, curved, shortly beaked, covered outside with short obtuse tubercles and minutely rusty-tomentose, inside glabrous, .6 in. long. *Seed* oblong, black, its lower half pale and arilliform. *Commaracea*, Wall. Cat., 8544.

Singapore; Wallich. Malacca; Griffith (Kew Distrib.) No. 1275, Maingay, No. 511, Derry, No. 69. Penang; Curtis, Nos. 1633 and 3032. Perak; Wray, No. 48, Scortechini, No. 1730, King's Collector, No. 3735. —DISTRIB. Sumatra, Forbes, No. 2589.

3. *AGELEA PINNATA*, King n. spec. A woody climber 30 to 40 feet long; young branches rusty-puberulous, striate. *Leaflets* 3 to 5, thinly coriaceous, unequal, (the middle the largest), elliptic, broadly and shortly caudate-acuminate, the base rounded or sub-cuneate; upper surface glabrous except the minutely pubescent midrib; lower surface minutely sub-adpressed pubescent, the transverse veins distinct; the midrib tomentose; main nerves 7 to 10 pairs, spreading and curving upwards, prominent on the lower surface, slightly impressed on the upper; length of the terminal leaflet 6 to 8 in., breadth 3 to 3.5 in.; its petiole jointed to the rachis and not longer than those of the lateral slightly smaller leaflets. *Panicles* about 1 in. long, densely crowded in the axils of the leaves, many-flowered, minutely tomentose. *Flowers* .3 in. long, their pedicels half as long. *Calyx* divided to the very base

into 5 linear acuminate reflexed segments, half as long as the petals, tomentose externally. *Petals* linear, much acuminate, glabrous, white inside and purple outside. *Stamens* 5, shorter than the pistils, the anthers sub-globular. *Pistils* 5, the ovaries softly tomentose; the styles spreading, recurved; the stigma bifid. *Fruit* unknown.

Perak; King's Collector, No. 5425.

This differs notably from both the other species of this genus in its leaflets having often 5 instead of 3 leaflets. In the structure of its flowers, however, it agrees perfectly with the diagnosis of the genus. It is more nearly allied to *A. vestita* than to *A. Wallichii*, but it differs from both in the larger number of main nerves in its leaves. Its flowers are moreover larger than those of *A. vestita*, and the petals are differently coloured.

4. *AGELÆA HULLETTII*, King n. spec. A woody creeper 15 to 20 feet long; young branches minutely tomentose. *Leaflets* 3, coriaceous; the terminal slightly the largest, narrowly elliptic-oblong; the lateral pair slightly oblique, all with acute apices and cuneate bases; the petiole of the terminal one from .5 to .75 in. long, jointed; those of the lateral pair .25 in. long; upper surface glabrous and minutely pitted, the lower finely reticulate, when young sub-lepidote and puberulous, when adult glabrous; main nerves 7 or 8 pairs, spreading and curving upwards, prominent on the lower and obsolete on the upper surface; some of the intermediate nearly as distinct; length of the terminal leaflet 6 to 9 in., breadth 2 to 2.5 in., the lateral pair rather smaller. *Panicles* less than 1 in. long, minutely tomentose, crowded in the leaf-axils or from the axils of fallen leaves, many-flowered. *Flowers* .2 in. long and about the same across; their pedicels about .25 in. long. *Calyx* divided for two-thirds of its length into 5 lanceolate segments, tomentose outside, glabrescent inside. *Petals* longer than the sepals, spreading, linear-oblong, glabrous, with a mesial rib, recurved from about the middle. *Stamens* 10, the alternate ones shorter, none of them so long as the pistils. *Ovaries* narrowly oblong, tomentose. *Styles* sub-glabrous, slightly diverging. *Follicles* 1 to 3, bright red when ripe, woody, ovoid, shortly beaked, externally tubercled and minutely rusty-tomentose, inside glabrous, length .5 to .65 in. *Seed* sub-cylindric, compressed, the upper half black, the lower pale and arilliform, .5 in. long.

Singapore; Hullett, No. 841; Ridley, No. 4589. Perak; King's Collector, No. 5729.

This is distinguished from *A. pinnata* by the leaflets being invariably 3 and the stamens being only 5 while, in that species, there are often 5 leaflets and always 10 stamens. This resembles *A. Wallichii* in some respects, but it differs from that species in having larger leaflets more cuneate at the base with acute, not caudate acuminate, apices and with more than twice as many main nerves. The leaflets of the former are moreover quite glabrous at all stages, while in this the lower surface of the young leaflets is puberulous and lepidote.

## NOTE.

*Connarus Diepenhorstii*, Miq. Fl. Ind. Bat. Suppl. 529, (of which a type specimen is in the Calcutta Herbarium) is unmistakably a species of *Agelæa* and should be named *Agelæa Diepenhorstii*. It is allied to *A. Wallichii*, Hook. fil., but has larger leaflets and much longer racemes. To this belong Teysmann's Sumatra specimens from Prianam (Herb. Hort. Bogor., No. 2197), and Forbes's from the Lampongs in Sumatra, Nos. 1313 and 1386.

## 6. TÆNIOCHLÆNA, Hook. f.

A rambling shrub. *Leaves* unequally pinnate, glabrous; leaflets 3, quite entire. *Panicles* axillary, short. *Flowers* hermaphrodite. *Calyx-tube* short, hemispheric; segments 5, enlarged and revolute in fruit, valvate. *Petals* 5, much exceeding the calyx. *Stamens* 10, alternately shorter, nearly free at the base. *Ovaries* 5, sessile; styles short, stigmas discoid. *Follicles* 1-3, ovoid, pubescent; valves glabrous within. *Seed* oblong, arillate; albumen 0, cotyledons plano-convex.

TÆNIOCHLÆNA GRIFFITHII, Hook. fil. in Benth. and Hook. Gen. Pl. I, 434; Fl. Br. Ind. II, 55. Young branches puberulous, and with pale brown lenticels; all parts except the inflorescence quite glabrous. *Leaflets* coriaceous, the terminal largest, elliptic to ovate-elliptic, with sub-acute slightly bifid apices, slightly narrowed to the rounded base, the edges slightly sub-revolute when dry; both surfaces shining, the lower reticulate; main nerves 4 or 5 pairs, the lower pair sub-marginal, all curved upwards, prominent on the lower and depressed on the upper surface; the petiolules of all jointed, .15 in. long; length of the terminal leaflets 5 to 6.5 in., the laterals smaller. *Panicles* (fide Sir J. D. Hooker) "2 to 3 in. long, fascicled, densely pubescent, slender. *Flowers* rotate, .33 in. in diam. *Segments of the calyx* oblong, pubescent, recurved in flower. *Petals* twice as long, linear, dilated upwards, glabrous; filaments short, subulate. *Follicles* 2 or 3, .5 to 1 in. long, obtuse, densely pubescent, valves coriaceous. *Seed* short, slightly compressed, testa black, arillus small."

Malacca; Griffith, Maingay, No. 497.

## 7. CNESTIS, JUSS.

Scandent shrubs or trees. *Leaves* unequally pinnate; leaflets many, quite entire. *Flowers* in racemes, tomentose, rarely paniced, polygamous or dioecious, rotate. *Sepals* 5, valvate or imbricate at the tip, spreading in fruit. *Petals* 5, shorter or longer than the calyx. *Stamens* 10, free. *Ovaries* 5-7, sessile; styles short, stigmas capitellate. *Capsules* 1-3, kidney-shaped, cylindric, curved or waved, pubescent, often villous or clothed with rigid hairs within. *Seed* with a thin arillus, albumen



fleshy, cotyledons thin.—DISTRIB. Tropical Asia and Africa; species about 17.

CNESTIS RAMIFLORA, Griff. Notul. IV, 432. A small tree or a climber, young branches, rachises of leaves, under surfaces of leaflets and inflorescence more or less softly rusty-tomentose. *Leaves* 8 to 15 in. long; leaflets 19 to 31, sub-sessile, narrowly oblong, rarely slightly obovate, obtuse or sub-acute; the base broad, rounded or minutely cordate; upper surface sparsely adpressed-pubescent or glabrescent, the nerves pubescent; main nerves 4 or 5 pairs, spreading, faint; length 1.25 to 3 in., breadth .4 to 1.5 in. *Racemes* much shorter than the leaves, in axillary fascicles. *Female flowers* about .35 in. in diam., the males smaller. *Sepals* narrowly oblong, obtuse, pubescent on both surfaces. *Petals* similar in shape to the sepals but sometimes longer, glabrous. *Stamens* much shorter than the sepals, the filaments glabrous. *Disc* and *Ovaries* 5, tomentose, styles short. *Follicles* 1 to 3 from one flower, sessile, compressed, falcate, widest about the middle, much curved, rugose, rusty-pubescent; the pericarp very thick, woody, lined inside with a dense layer of sericeous tomentum, 1.5 to 1.75 in. long and .8 in. broad. *Seed* broad, compressed, the testa and arillus thin. Kurz Journ. As. Soc. Beng. Vol. XLV, pt. 2, p. 216; For. Flora Burma, I, 329; Hook. fil. Fl. Br. Ind. II, 54. *C. flaminea*, Griff. Notul. VI, 433. *C. platantha*, Griff. l. c. 434; Kurz l. c. *Cnestis foliosus* and *C. igneus*, Planch. MSS. in Herb. Kew. *Connarus foliosus*, Jack in Wall. Cat. 8529. *C. igneus*, Wall. Cat. 8528. *Rourea dasphylla*, Miq. Fl. Ind. Bat. Suppl. 528.

In all the provinces, a common plant.—DISTRIB. Burma, Sumatra, Philippine Islands.

A widely distributed plant and therefore presenting various forms, some of which (as the synonymy shows) have been regarded as species. The form which is most distinct is that which assumes the habit of a small tree; but its flowers and leaves are in no way different from those of the scandent forms. This was, however, kept separate by Kurz under the specific name *C. ramiflora* Griff.; while, for the scandent forms, he kept the name *C. platantha*, Griff.

## ORDER XXXVIII. LEGUMINOSÆ.

(By D. PRAIN.)

Herbs, shrubs or trees. *Leaves* stipulate and usually alternate, pinnate or digitate or simple, often stipellate, sometimes with the rachis ending in a bristle or tendril. *Inflorescence* axillary or leaf-opposed or terminal; usually simply racemose or panicled; bracts and bracteoles usually both present. *Flowers* usually irregular, hermaphrodite, rarely regular or polygamous. *Sepals* 5, combined or free, often unequal, sometimes arranged in two lips. *Petals* 5, rarely fewer by arrest, very

rarely 0, usually free and unequal. *Stamens* normally 10, perigynous or almost hypogynous, rarely fewer by arrest, or indefinite; filaments free or variously combined; anthers 2-celled, dehiscence almost always longitudinal. *Ovary* free, style simple, cylindric, usually declinate; stigma capitate, terminal or oblique; ovules 1—∞ on the ventral suture. *Fruit* usually dry, a pod splitting open along both sutures, sometimes opening only along the ventral suture, sometimes continuous and indehiscent, sometimes separating into one-seeded indehiscent segments. *Seeds* usually exalbuminous; cotyledons foliaceous or amygdaloid, with a straight or an inflexed accumbent radicle.

A very large order with three very natural suborders, including altogether about 8,000 species. Of these suborders the *Papilionaceæ* are cosmopolitan in distribution, the *Cæspiniæ* and the *Mimoseæ* are confined to the tropics and to warm temperate regions.

Petals imbricate :—

Calyx segments united above the level of the disc ;  
the upper petal (standard) exterior (PAPILIONACEÆ):—

Stamens mon- or diadelphous :—

Pods dehiscent along both sutures :—

Leaves even-pinnate the rachis continued as a  
tendrill or bristle .. .. .

I. VICIÆ.

Leaves simple, digitate or odd-pinnate :—

Leaves simple *sessile*, or digitately 3-7-folio-  
late; stamens monadelphous, anthers dimor-  
phous .. .. .

II. GENISTEÆ.

Leaves pinnately 3-foliolate, rarely (*Clitoria*)  
5-7-foliolate or (*Flemingia petiole*) 1-folio-  
late or digitately 3-foliolate and then with  
2-adelphous stamens; when stamens 1-adel-  
phous, the upper filament attached to the  
others at its base .. .. .

III. PHASEOLEÆ.

Leaves 5-∞-foliolate, or if 1-3-foliolate  
(*Tephrosia*) with partially monadelphous sta-  
mens and uniform anthers, or (*Indigofera*)  
with 2-adelphous stamens, apiculate anthers  
and basifixed hairs; when stamens monadel-  
phous the upper stamen free at its base ..

IV. GALEGEÆ.

Pods indehiscent or opening only along lower  
suture; (leaves, except *Arachis*, odd-pinnate):—

Pods not segmented, always quite indehi-  
scent; leaves all odd-pinnate .. .. .

V. DALBERGIEÆ.

Pods breaking into 1-seeded indehiscent seg-  
ments, or if dehiscent (*Desmodium* in part)  
only opening along lower suture; if not seg-  
mented (*Arachis*) with leaves even-pinnate;  
(segment solitary in *Phylacium*) .. .. .

VI. HEDYSARÆÆ.

Stamens free .. .. .

VII. SOPHORÆÆ.

Calyx segments free to the level of the disc (except *Bauhinieæ*); the upper petal interior (*CÆSALPINIÆ*):—

Leaves simple or simply pinnate :—

Anthers basifixed	...	...	...	VIII.	CASSIÆ.
Anthers versatile :—					
Petals 5 :—					
Calyx gamosepalous or valvately partite	...	...	...	IX.	BAUHINIÆ.
Calyx lobes free imbricate	...	...	...	X.	CYNOMETRÆ.
Petals fewer than 5 (? or 1 or 0)	...	...	...	XI.	AMHERSTIÆ.
Leaves 2-pinnate	...	...	...	XII.	CÆSALPINIÆ.

Petals valvate (*MIMOSÆ*):—

Calyx teeth imbricated	...	...	...	XIII.	PARKIÆ.
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Calyx valvate :—

Stamens 5 or 10 :—					
Anthers glandular	...	...	...	XIV.	ADENANTHEREÆ.
Anthers not glandular	...	...	...	XV.	EUMIMOSÆ.
Stamens ∞ :—					
Filaments free	...	...	...	XVI.	ACACIÆ.
Filaments united	...	...	...	XVII.	INGEÆ.

**A. SUBORDER I. PAPILIONACEÆ.** *Calyx segments united beyond the disc. Petals imbricated, the upper external. Radicle inflexed accumbent or, rarely, very short and straight.*

TRIBE I. VICIÆ. Dwarf herbs or climbers. *Leaves* usually even-pinnate, the petiole produced in a spine or tendril, leaflets entire exstipulate; stipules often foliaceous. *Flowers* solitary or racemose. *Stamens* diadelphous (9+1). *Pod* dehiscent.

1. *Abrus*.

TRIBE II. GENISTÆ. Shrubs, sometimes tree-like, or non-climbing herbs. *Leaves* simple or digitately 3-∞-foliolate, rarely 1-foliolate; stipules small, free. *Flowers* in racemes or spikes. *Stamens* monadelphous: anthers almost always 2-morphous. *Pod* dehiscent.

2. *Crotalaria*.

TRIBE III. PHASEOLÆ. Climbing or creeping herbs, rarely erect and shrubby, very rarely trees. *Leaves* pinnately 3-foliolate, rarely 1- or 5-7-foliolate, leaflets entire or lobed, almost always stipellate. Bracts 2 opposite persistent stipular or caducous. *Stamens* monadelphous, but if so the upper filament always free at the base; or diadelphous (9+1) by more or less complete detachment of the upper; anthers uniform very rarely (*Mucuna*) 2-morphous. *Pod* dehiscent.

Leaves gland-dotted beneath	...	...	...	A.	<i>Cajanæ</i> .
Leaves not gland-dotted beneath :—					
Style bearded and bracts very small or deciduous	...	...	...	B.	<i>Euphaseolæ</i> .
Style beardless, or if bearded ( <i>Clitoria</i> ) with bracts persistent :—					
Rachis of inflorescence not swollen at nodes (style bearded in <i>Clitoria</i> )	...	...	...	C.	<i>Glycinæ</i> .

Rachis of inflorescence nodose :—

Upper stamen subconnate with the others and petals  
 subequal ... .. *D. Dioclez.*

Upper stamen free or if subconnate, then petals very  
 unequal :—

Petals very unequal ... .. *E. Erythrineæ.*

Petals of same length ... .. *F. Galacticeæ.*

*Sub-tribe A. Cajaneæ.* Inflorescence racemose, rachis not swollen, or flowers subumbellate or solitary, bracts usually membranous caducous, bracteoles 0; petals of subequal length; upper stamen free; style bearded, stigma terminal; leaves gland-dotted at least beneath; stipels small, sometimes 0.

3. *Flemingia.* Ovules 2; pod turgid, leaves subdigitate or 1-foliolate.
4. *Eriosema.* Ovules 2; pod compressed, leaves pinnately 3-foliolate; funicle terminal on hilum.
5. *Dunbaria.* Ovules 4-∞; pod compressed, not deep-lineate between the seeds.
6. *Atylosia.* Ovules 4-∞; pod compressed, deep-lineate between the strophiolate seeds.
7. *Cajanus.* Ovules 4-∞; pod compressed, deep-lineate between the seeds; strophiole 0.

*Sub-tribe B. Euphaseoleæ.* Inflorescence racemose, rachis nodose, bracts small or caducous; petals equal in length or the keel long-beaked, or spirally twisted; upper stamen free; style longitudinally bearded along the inner face or less often simply pilose round the stigma.

8. *Phaseolus.* Keel spiral.
9. *Vigna.* Keel not spiral; stigma oblique, style not flattened upwards; pods not lineate between seeds.
10. *Pachyrhizus.* Keel not spiral; stigma oblique globose on inner face of style flattened upwards; pod lineate.
11. *Dolichos.* Keel not spiral; stigma terminal; pod not winged.
12. *Psophocarpus.* Keel not spiral; stigma terminal; pod square, winged at the 4 corners.

*Sub-tribe C. Glycineæ.* Inflorescence of axillary fascicles or racemes of solitary or geminate flowers on an unswollen rachis; standard not appendiculate or (in small flowered genera) minutely appendiculate at the base; upper stamen free or united at the base with the rest; style naked (bearded in *Clitoria*).

13. *Clitoria.* Bracts persistent; standard large not spurred; calyx-tube long; style bearded; stamens 10 fertile.
14. *Centrosema.* Bracts persistent; standard large spurred on the back; calyx-tube short; style naked; stamens 10 fertile.
15. *Teramnus.* Bracts small deciduous; standard small; stamens alternate, 5 fertile, 5 sterile.

*Sub-tribe D. Diocleæ.* Inflorescence racemose with rachis swollen at the nodes, bracts small or caducous; calyx usually 4-lobed from union of the two upper teeth, rarely very unequally 2-lipped; petals subequal in length; upper stamen free at the base, connate with the remainder above; style not bearded.

- 16. *Dioclea.* *Calyx campanulate; pod broad much thickened along upper suture.*
- 17. *Pueraria.* *Calyx campanulate; pod linear, flat or narrow.*
- 18. *Canavalia.* *Calyx 2-lipped; with a large upper and small lower lip.*

*Sub-tribe E. Erythrinæ.* Inflorescence usually racemose with rachis nodose, flowers showy with unequal petals—in some genera with very large standard longer than the wings and sometimes than the keel also, in others with standard much exceeded by the large cochleate keel; upper stamen free or united at the base with the remainder; style naked; bracts usually small, deciduous.

- 19. *Mucuna.* *Keel longest, standard shorter than wings; anthers 2-morphous; climbers.*
- 20. *Strongylodon.* *Standard and keel equal and longer than wings; anthers uniform; climbers.*
- 21. *Erythrina.* *Standard longer than keel and wings; anthers uniform; armed trees. Pod sometimes dehiscent only at apex, sterile and indehiscent below.*

*Sub-tribe F. Galactiæ.* Inflorescence racemose with nodose rachis, more rarely amply paniculate; bracts small very deciduous; calyx usually 4-lobed, the two upper teeth connate; petals sub-equal in length; upper stamen free; style not bearded.

- 22. *Spatholobus.* *Pod 1-seeded at the apex only and there partially dehiscent, sterile and indehiscent below.*

TRIBE IV. GALEGEÆ. Herbs never twining, erect shrubs, or less often trees or large woody climbers. *Leaves* odd-, very rarely even-pinnate without the rachis prolonged, leaflets ∞, or rarely 3-1, usually entire. *Stamens* 10, the lower 9 united as far as their middle or further in a sheath split along the upper side or less often closed in the middle, the upper sometimes free from the base, at others connate *by its middle* with the sheath, very rarely wanting; filaments filiform at the tips, anthers versatile uniform, or rarely somewhat dimorphous. *Pod* not segmented, 2-valved or if indehiscent usually small, 1-2-seeded or membranous inflated. *Seeds* rarely strophiolate.

Anthers with connective apiculate or gland-tipped ... .. *A. Indigoferæ.*

Anthers muticous:—

Racemes all axillary or from old nodes ... .. *B. Robiniæ.*

Racemes terminal, or leaf-opposed, or paniculate at the  
ends of branches ... .. C. *Tephrosiææ*.

*Sub-tribe A. Indigoferææ*. Herbs or shrubs, glandular punctate or not, usually hoary canescent, the hairs always fixed in the middle; racemes or spikes axillary; connective of anther produced in a gland or mucro; ovules usually  $\infty$ ; pod 2-valved.

23. *Indigofera*.

*Sub-tribe B. Robiniææ*. Herbs, erect or rarely climbing shrubs, or trees; racemes all axillary or fasciculate on old nodes; upper stamen usually free; anthers muticous; ovules  $\infty$ ; style usually rigid; pod usually 2-valved, flat or only turgid opposite the seeds.

24. *Sesbania*.

*Sub-tribe C. Tephrosiææ*. Herbs, erect or large climbing shrubs, or trees; racemes terminal or leaf-opposed or panicled at the ends of branches, rarely arising from upper axils, or with the lower or all the pedicels geminate or fasciculate in the axils of leaves; anthers muticous; ovules usually  $\infty$ ; style usually rigid; pod 2-valved.

25. *Tephrosia*. *Leaves striate-veined; pod thin, early dehiscent.*

26. *Millettia*. *Leaves reticulate-veined; pod firm, tardily dehiscent.*

TRIBE V. DALBERGIEÆ. Trees or erect or lofty climbing shrubs. *Leaves* pinnately 5- $\infty$ -foliolate, very rarely 3- or 1-foliate, usually exstipellate. *Inflorescence* various, paniculate, fascicled racemose, or cymose. *Stamens* all united in one sheath, entire or split along the upper side, or in two lateral half-sheaths from simultaneous fission along both upper and lower sides, or the upper stamen free the rest connate; anthers usually uniform. *Pod* longer than the calyx, membranous, coriaceous, woody or drupaceous, indehiscent and not segmented.

Leaflets opposite ... .. A. *Lonchocarpeææ*.  
Leaflets alternate ... .. B. *Pterocarpeææ*.

*Sub-tribe A. Lonchocarpeææ*. Leaflets opposite; pod not drupaceous; seeds usually transverse or attached by a lateral hilum, not pendulous.

27. *Pongamia*. *Pod coriaceous, not winged; calyx subtruncate.*

28. *Derris*. *Pod coriaceous or membranous, winged; calyx subtruncate.*

29. *Kunstleria*. *Pod membranous not winged; calyx toothed.*

*Sub-tribe B. Pterocarpeææ*. Leaflets alternate; pod not drupaceous; seeds usually transverse or attached by a lateral hilum, not pendulous.

30. *Dalbergia*. *Anthers small, terminal; pod oblong or linear.*

31. *Pterocarpus*. *Anthers versatile; pod suborbicular.*

TRIBE VI. HEDYSAREÆ. Herbs, undershrubs or shrubs sometimes twining or climbing, rarely trees. *Leaves* odd- or rarely even-pinnate, petiole if produced not cirrhate, leaflets 3-∞, rarely digitately 3-4-foliolate, 1-foliolate or simple. *Stamens* diadelphous, 9 connate in a sheath as high as their middle or higher and split along the upper side, the upper being free, or monadelphous in a sheath split along the upper side, or diadelphous in two equal lateral half-sheaths (split simultaneously along upper and lower sides) or rarely all free; filaments free at their tips, filiform or dilated upwards; anthers uniform versatile, or rarely 2-morphous, the alternate larger subbasifixed. *Pod* indehiscent separating into 1-seeded segments, rarely unsegmented (*Arachis*), or by abortion or organically (*Phylacium*) 1-seeded. *Seeds* rarely strophiolate.

Stamens monadelphous, anthers 2-morphous; leaflets even-pinnate or digitate, exstipellate ... .. *A. Stylosantheæ.*

Stamens diadelphous, anthers uniform; leaflets odd-pinnate or simple.

Leaflets exstipellate, staminal phalanges 5+5 ... .. *B. Aeschynomeneæ.*

Leaflets stipellate, staminal phalanges 9+1 ... .. *C. Desmodiææ.*

*Sub-tribe A. Stylosantheæ.* Herbaceous approaching undershrubs, often viscid; leaves exstipellate, leaflets few; flowers spicate, capitate or rarely subracemose, in terminal spikes, or axillary by suppression of floral branches; bracts 1-foliolate and 2-stipulate, or stipuloid from suppression of the leaf-element; stamens monadelphous; anthers 5 oblong basifixed, 5 alternate shorter versatile.

32. *Arachis.* *Calyx-tube long filiform; leaves even-pinnate; pod not segmented ripening underground.*

33. *Zornia.* *Calyx-tube not elongated; leaves digitately 2-4-foliolate.*

*Sub-tribe B. Aeschynomeneæ.* Herbs, undershrubs or shrubs; leaves pinnate, leaflets ∞, or rarely 1-3, exstipellate; flowers usually in few-fl. axillary racemes, rarely in axillary fascicles or subcymose; keel obtuse or beaked, incurved; wings usually transversely folded; stamens (*in Malayan genera*) connate in two lateral phalanges; style filiform.

34. *Smithia.* *Pod folded within calyx.*

35. *Ormocarpum.* *Pod straight exserted, joints oblong; ovary sessile.*

36. *Aeschynomene.* *Pod straight exserted, joints quadrate or sub-orbicular; ovary stipitate.*

*Sub-tribe C. Desmodiææ.* Herbs, rarely twining, or undershrubs, less often shrubs, very rarely trees; leaves pinnately 3-foliolate or 1-foliolate the distal leaflets 2-stipellate the lateral leaflets opposite, each 1-stipellate, rarely 5-7-foliolate; stipules often striate; flowers in pairs

along the rachis of a raceme, rarely fasciculate or solitary, the racemes terminal or casually at the same time also axillary; standard usually cuneate at the base, wings as long as or longer than keel and usually adherent to its base; upper stamen free or coherent with the rest from the base upwards; pod sometimes (*Phylacium*) 1-jointed, sometimes (*Desmodium* § *Nicholsonia*) opening along the lower suture.

37. *Phylacium*. Ovary 1-ovuled; pod 1-seeded.

38. *Uraria*. Ovary 2- or more-ovuled; pod folded inside calyx; calyx-tube short, teeth long, not accrescent.

39. *Lourea*. Ovary 2- or more-ovuled; pod folded inside calyx; calyx-tube large, teeth small, accrescent in fruit.

40. *Alysicarpus*. Ovary 2- or more-ovuled; pod straight exerted; joints of pod coriaceous as thick as they are long and broad.

41. *Desmodium*. Ovary 2- or more-ovuled; pod straight exerted; joints of pod membranous or, if coriaceous (§ *Dendrolobium*), broader than their thickness, and, if as thick as they are broad, (§ *Scorpiurus*) then much longer than broad.

TRIBE VII. SOPHOREÆ. Trees or tall shrubs, very rarely sub-herbaceous or large climbers. Leaves pinnately 5-∞-foliolate or 1-foliolate. Corolla papilionaceous or almost regular the upper petal outer in bud, the lower ones occasionally absent. Stamens 10, free or very slightly connate at the base. Pod indehiscent unsegmented, or 2-valved. Radicle straight, incurved or inflexed.

42. *Sophora*. Pod moniliform elongated, indehiscent.

43. *Ormosia*. Pod short thickly coriaceous, 2-valved.

**B. SUBORDER II. CÆSALPINIÆ.** Calyx-segments partite to the disc, very rarely (some *Bauhinias*) gamosepalous. Petals imbricated the uppermost internal. Radicle straight or, rarely, slightly oblique. Stamens almost always free.

TRIBE VIII. CASSIÆ. Trees, rarely shrubs or undershrubs. Leaves odd- or even-pinnate. Calyx segments or sepals 5, rarely 4-3, divided to the disc, imbricate or rarely subvalvate. Petals 5 or fewer or 0. Anthers erect, thick, basifixed, dehiscence longitudinal or 2-porose; or rarely dorsifixed and 2-porose. Ovary or stipe free inside calyx-tube. Ovules 2-∞, rarely 1. Seeds albuminous.

44. *Cassia*. Sepals 5, petals 5; stamens 10 or 5, leaves even-pinnate.

45. *Koompassia*. Sepals 5, petals 5; stamens 5; leaves odd-pinnate.

46. *Dialium*. Sepals 5, petals 2 or 1 or 0, stamens 2; leaves odd-pinnate.

TRIBE IX. BAUHINIÆ. Woody tendril-bearing climbers, rarely trees. Leaves simple, entire or 2-lobed; rarely 2-foliolate. Calyx gamo-



sepalous above the disc or valvately partite, the tip 5-toothed or less often 5-lobed with teeth or lobes imbricated. *Petals* 5. *Anthers* versatile. *Ovary* with stalk free or adnate to calyx-tube. *Ovules* 2-∞. *Seeds* albuminous.

47. Bauhinia.

TRIBE X. CYNOMETRÆ. Trees. *Leaves* even-pinnate, 2-∞-foliolate. *Calyx* lobes divided to the disc, imbricate or valvate. *Petals* 5 or fewer or 0. *Anthers* versatile. *Ovary* 1-2-ovuled. *Flowers* usually small.

48. Cynometra.

TRIBE XI. AMHERSTIÆ. Trees. *Leaves* even-, very rarely odd-pinnate, 2-∞-, rarely 1-foliolate. *Calyx* lobes divided to the disc, imbricate, very rarely valvate. *Petals* 5 or fewer or 0. *Anthers* versatile. *Ovary* 3-∞-ovuled, stalk adnate to the disc-bearing tube of calyx.

49. Tamarindus. *Petals* 3 perfect; *stamens* 3 perfect.

50. Sindora. *Petal* 1; *leaves* very coriaceous; *calyx-segments* sub-valvate.

51. Afzelia. *Petal* 1; *leaves* papery; *calyx-segments* much imbricated.

52. Saraca. *Petals* 0; *leaflets* even-pinnate.

53. Crudia, *Petals* 0; *leaflets* alternat odd-pinnate.

TRIBE XII. EUCÆSALPINIÆ. Trees, shrubs or large climbers. *Leaves* all 2-pinnate or, rarely, some leaves simply pinnate others 2-pinnate. *Calyx* lobes divided to the disc. *Petals* usually 5 slightly unequal. *Anthers* versatile. *Ovary* 2-∞-, rarely 1-ovuled, the stalk free in the calyx tube.

54. Peltophorum. *Calyx-lobes* subequal; *pod* winged along both sutures; *stigma* large peltate.

55. Cæsalpinia. *Calyx-lobes* unequal, the lowest large hooded; *pod* wingless.

56. Mezoneuron. *Calyx-lobes* unequal, the lowest large hooded; *pod* winged along upper suture.

57. Pterolobium. *Calyx-lobes* unequal, the lowest large hooded; *pod* samaroid, winged at the apex only.

C. SUBORDER III. MIMOSÆ. *Flowers* regular small. *Calyx* gamosepalous or valvately partite. *Petals* valvate, usually connate below the middle. *Stamens* free or monadelphous.

TRIBE XIII. PARKIÆ. Trees. *Leaves* 2-pinnate. *Calyx* teeth short, imbricate. *Stamens* as many or twice as many as petals.

58. Parkia.

TRIBE XIV. ADENANTHEREÆ. Herbs, climbing shrubs or trees. *Leaves* 2-pinnate. *Calyx* valvate. *Stamens* twice as many, rarely only as many, as the petals. *Anthers* tipped by a stipitate gland.

59. Entada. *Inflorescence* a long spike; woody climbers with very large pods and seeds.
60. Adenanthera. *Inflorescence* a long narrow raceme; trees.
61. Neptunia. *Inflorescence* capitate; aquatic floating or creeping herbs.
62. Xylia. *Inflorescence* capitate; tall trees.

TRIBE XV. EUMIMOSEÆ. Herbs, erect or climbing shrubs, or trees. *Leaves* 2-pinnate. *Flowers* 4-5-merous, rarely 3- or 6-merous. *Calyx* valvate or pappus-like, or 0. *Stamens* twice as many, or only as many, as the petals, free. *Anthers* not gland-tipped; pollen-granules many, distinct.

63. Leucaena. *Pod* opening through the sutures, valves continuous; shrubs or small trees.
64. Mimosa. *Pod* with persistent sutures; valves segmented; shrubs or undershrubs.

TRIBE XVI. ACACIÆ. Trees, shrubs or woody climbers. *Leaves* 2-pinnate. *Flowers* 4-5-merous, rarely 3-merous or 6-merous. *Calyx* valvate, very rarely 0. *Stamens* indefinite, often very numerous, free, or with the inner rows slightly subconnate at the base into a shallow ring; pollen-masses 2-6.

65. Acacia.

TRIBE XVII. INGEÆ. Trees. *Leaves* 2-pinnate sometimes 2-3-geminate, rarely simply pinnate. *Flowers* usually 5-merous. *Calyx* valvate. *Stamens* indefinite often numerous, rarely 10-15, united in a tube at the base or sometimes higher up; anthers small; pollen-masses 2-6.

66. Serianthes. *Pod* septate between the seeds, thick, woody, indehiscent; flowers large; trees.
67. Enterolobium. *Pod* septate between the seeds, spongy or fleshy, indehiscent; flowers small; trees.
68. Calliandra. *Pod* thin, straight with thickened sutures, dehiscing elastically; flowers small; trees or shrubs.
69. Albizzia. *Pod* thin, straight, dehiscent or indehiscent; flowers small; trees or shrubs.
70. Pithecolobium. *Pod* coriaceous, curved, indehiscent or dehiscing through lower suture, or fleshy and dehiscing by both sutures; flowers small; trees.

*SUB-ORDER I. PAPILIONACEÆ.*

Herbs or shrubs (often climbing), rarely trees. Leaves simple or digitately or pinnately compound; usually stipellate rarely even-pinnate. *Inflorescence* various, often racemose. *Flowers* irregular, usually hermaphrodite, rarely regular. *Sepals* 5, united beyond the disc in a campanulate or tubular calyx with a truncate, 5-toothed or 5-lobed limb, or with limb 4-toothed by union of the two upper segments or 2-lipped by similar union of three lower. *Petals* 5 imbricate or rarely spreading, the upper (*standard*) outer, two lateral (*wings*) usually overlapping and free from or attached about the middle to the two lower inner rarely free usually connate below in a curved sheath (*keel*); petals rarely subsimilar and subequal. *Stamens* inserted with the petals on a disc lining the base of the calyx, usually 10 diadelphous in a sheath of 9 connate next keel with 1 free next standard, rarely in 2 lateral sheaths of 5 each; sometimes 9 by abortion of upper filament, or 5 by abortion of alternate stamens; occasionally 10, monadelphous, very rarely 10, free; anthers usually dehiscent longitudinally. *Embryo* with radicle usually inflexed, accumbent. *Albumen* 0 or very scanty.

Stamens mon- or diadelphous:—

Pods dehiscent by both sutures:—

Leaves even-pinnate the petiole ending in a bristle; stamens 9, the tenth abortive ... .. 1. *ABRUS*.

Leaves odd-pinnate or simple, or digitately 3- or more-foliolate:—

Leaves simple or digitately compound; (pods turgid):—

Leaves simple, sessile, or digitately 3-7-foliolate; stamens monadelphous; seeds many ... .. 2. *CROTALARIA*.

Leaves digitately 3-foliolate or, if 1-foliolate, petioled; stamens diadelphous; seeds 2 ... .. 3. *FLEMINGIA*.

Leaves pinnately compound:—

Leaves 3-foliolate (5-7-foliolate in one species of *Clitoria*) (*PHASEOLEÆ* except *Flemingia*):—

Pods dehiscent from end to end:—

Leaves glandular beneath; (pod compressed; stamens 9+1) (*Cajaneæ* except *Flemingia*):—

Ovules 2; the 2 upper calyx-lobes almost free; (stigma small terminal; seed not strophiolate,) funicle attached to end of hilum ... .. 4. *ERIOSEMA*.

Ovules 4 or more; the 2 upper calyx-lobes much connate; funicle centric:—

Climbers; stigma small terminal; seeds strophiolate or sub-strophiolate:—

Pod linear acuminate, hardly depressed between the seeds; funicle expanded but seeds not distinctly strophiolate ... .. 5. *DUNBARIA*.

- Pod oblong obtuse, deeply transversely lineate between the seeds; strophiole large ... .. 6. *ATYLOSIA*.
- Woody undershrubs; stigma dilated, oblique; seeds not strophiolate; (pod acute deeply transversely lineate between the seeds) ... 7. *CAJANUS*.
- Leaves not glandular beneath, (leaflets stipelate; climbing species except *Erythrina*):—
- Style bearded below the stigma; (stamens 9+1) (*Euphaseoleæ* + *Clitoria*):—
- Stigma oblique:—
- Keel spirally twisted .. ... 8. *PHASEOLUS*.
- Keel not spiral:—
- Style filiform ... .. 9. *VIGNA*.
- Style flattened upwards ... .. 10. *PACHYRHIZUS*.
- Stigma terminal:—
- Petals equal in length:—
- Pod flattish, not winged ... .. 11. *DOLICHOS*.
- Pod square, 4-winged ... .. 12. *PSOPHOCARPUS*.
- Petals very unequal, standard large; leaflets sometimes 5-7 ... .. 13. *CLITORIA*.
- Style not bearded below the stigma:—
- Nodes of racemes not swollen (*Glycineæ* except *Clitoria*):—
- Petals very unequal, standard large; stamens 9+1, all fertile ... .. 14. *CENTROSEMA*.
- Petals subequal, all small; stamens monadelphous, 5 fertile, 5 alternate sterile ... 15. *TERAMNUS*.
- Nodes of racemes swollen:—
- Stamens monadelphous; petals equal (*Diocleæ*):—
- Upper lip of calyx not projecting:—
- Pod oblong, turgid, 1-2-seeded ... 16. *DIOCLEA*.
- Pod linear, flat, many-seeded ... 17. *PUERARIA*.
- Upper lip of calyx projecting ... 18. *CANAVALIA*.
- Stamens diadelphous (9+1); petals very unequal (*Erythrineæ*):—
- Anthers dimorphous; keel exceeding wings and standard ... .. 19. *MUCUNA*.
- Anthers uniform:—
- Keel and standard equal, wings very short ... .. 20. *STRONGYLODON*.
- Keel and wings both shorter than standard; *armed trees* ... .. 21. *ERYTHRINA*.
- Pods dehiscent at the seed-bearing apex only, elsewhere seedless and indehiscent:—
- Armed trees, keel and wings shorter than standard 21. *ERYTHRINA*  
§ *HYPAPHORUS*.
- Unarmed climbers; petals equal ... .. 22. *SPATHOLOBUS*.

Leaves pinnately 5-∞-foliolate; (1-foliate in some species of *Tephrosia*):—

Anthers apiculate; hairs centrally fixed; (stamens diadelphous, 9+1) ... .. 23. INDIGOFERA.\*

Anthers obtuse; hairs basifixed:—

Pods transversely septate between the seeds; (stamens diadelphous, 9+1) ... .. 24. SESBANIA.

Pods not septate; (stamens 9+1, the upper often united in the middle to the staminal sheath):—

Leaflets closely parallel-veined; pod thin early dehiscent; *leaves sometimes 1-3-foliolate* ... 25. TEPHROSIA.

Leaflets reticulate-veined; pod thick, tardily dehiscent ... .. 26. MILLETTIA.

Pods indehiscent or, rarely, opening (some *Desmodia*) along the lower suture:—

Pod not segmented; (always indehiscent):—

Leaves odd-pinnate; trees or strong woody climbers:—

Leaflets opposite:—

Stamens monadelphous, the vexillary filament united in the middle to the staminal sheath; pod thickly coriaceous or woody; (calyx truncate):—

Pod wingless ... .. 27. PONGAMIA.

Pod winged ... .. 28. DERRIS.

Stamens quite diadelphous, 9+1:—

Pod winged; calyx truncate ... .. 28. DERRIS

§ AGANOPE.

Pod wingless; calyx toothed ... .. 29. KUNSTLERIA.

Leaflets distinctly alternate:—

Flowers small, pods narrow ... .. 30. DALBERGIA.

Flowers large, pods suborbicular ... .. 31. PTEROCARPUS.

Leaves even-pinnate, the rachis ending in a bristle, *herbs with hypogæal fruits*... .. 32. ARACHIS.

Pod of several (rarely 1) indehiscent 1-seeded segments (in *Desmodium* § *Nicholsonia* dehiscing along the lower suture)

(*HEDYSARÆ* except *Arachis*):—

Leaves exstipellate:—

Stamens monadelphous, anthers dimorphous; leaves digitately 2-4-foliate; (joints of pod muricated) ... 33. ZOENIA.

Stamens diadelphous in 2 bundles of 5 each; anthers uniform; leaves pinnate (*Aeschynomeneæ*); (joints of pod papillose or weakly muricated, rarely smooth):—

Leaves even-pinnate, end-leaflet replaced by a bristle; pod folded together within the calyx ... 34. SMITHIA.

Leaves odd-pinnate; pod straight exerted:—

Calyx 5-toothed; ovary sessile, ovules few, joints of pod oblong ... .. 35. ORMOCARPUM.

\* None of the simple-leaved or subdigitately-leaved species of *Indigofera* are reported from the Malay Peninsula.

- Calyx deeply 2-lipped; ovary stalked, ovules many; joints of pod suborbicular or quadrate ... 36. AESCHYNOMENE.
- Leaves stipellate; (stamens 9+1, anthers uniform):—
- Ovary 1-ovuled; (leaves pinnately 3-foliolate) ... 37. PHYLACIUM.
- Ovary 2- or more-ovuled:—
- Pod folded together within the calyx:—
- Calyx-teeth setaceous, not accrescent ... 38. URARIA.
- Calyx-teeth lanceolate, accrescent ... 39. LOUREA.
- Pod straight exerted:—
- Joints of pod coriaceous about as thick as they are broad and long ... 40. ALYSICARPUS.
- Joints of pod thin, or if coriaceous (§ *Dendrolobium*) much broader than thick, and if as thick as broad (§ *Scorpiurus*) much longer than broad; opening along lower suture in § *Nicholsonia* and in § *Pleurolobium* ... 41. DESMODIUM.
- Stamens free:—
- Stigma terminal, pod long moniliform ... 42. SOPHORA.
- Stigma oblique, pod short turgid ... 43. ORMOSIA.

### 1. ABRUS Linn.

Climbing shrubs. *Leaves* with numerous deciduous leaflets. *Flowers* small, in dense racemes on axillary peduncles or short branches. *Calyx* campanulate, equal; teeth very short. *Corolla* much exerted; standard ovate, acute, adhering below to the staminal tube; wings narrow; keel arcuate. *Stamens* 9, united in a tube slit above, the tenth absent; anthers uniform. *Ovary* subsessile, many-ovuled; style short, incurved, beardless, stigma capitate. *Pod* oblong or linear-oblong, flat or turgid, moderately firm, thinly septate. Species 5; cosmopolitan in the tropics.

- Pod oblong turgid 3-5-seeded ... 1. *A. precatorius*.
- Pod linear flat incurved 8-12-seeded ... 2. *A. pulchellus*.

1. ABRUS PRECATORIUS Linn. Syst. Veg. ed. XII, 472. A copiously branched climber with thin stems and slender glabrous or thinly silky branches. *Leaves* 2-3 in. long; leaflets equally pinnate in 10-20 opposite pairs membranous glabrous above thinly silky beneath, green deciduous, ligulate-oblong .35-.65 in. long, .15-.2 in. wide. *Racemes* many-flowered, crowded, usually shorter than the leaves, rachis usually distinctly thickened in fruit. *Calyx* .1 in. thinly silky. *Corolla* .5 in. pink, or white with pink tinge. *Pod* oblong, turgid, 1-1.5 in. long, .4-.5 in. wide, valves rugose thickened, 3-5-seeded. *Seeds* various, usually bright scarlet with black hilum in wild specimens; sometimes white with black hilum, uniformly white, or uniformly black in cultivated forms. DC. Prodr. II, 381; Roxb. Flor. Ind. III, 258; Wall. Cat., 5818; Miq. Flor. Ind. Bat. I, 158; Bak. in Flor. Brit. Ind. II, 175. *A. minor* Desv. Ann. Sc. Nat. IX, 418. *A. pauciflorus* Desv. Ann. Sc. Nat. IX, 418.

ANDAMANS; very common from the Coco Group to Little Andaman; Barren Island. NICOBARS; common. PENANG; *Wallich! Curtis!* PANGKORE; *Scortechini!* PAHANG; *Ridley!* DISTRIB. Cosmopolitan in the tropics.

2. *ABRUS PULCHELLUS* Wall. Cat. 5819. A copiously branched climber with thin stems and slender glabrous or thinly silky branches. *Leaves* 3-4 in. long; leaflets equally pinnate in 12-16 opposite pairs, membranous glabrous above thinly silky beneath, green deciduous, ligulate oblong .75-1.25 in. long, .25-.35 in. wide. *Racemes* many-flowered, usually lax always long-peduncled, equalling or exceeding the leaves; rachis little thickened in fruit. *Calyx* .1 in. thinly silky. *Corolla* .5 in. pink, or pale blue. *Pod* linear flat incurved 2-2.5 in. long, .5 in. wide, valves smooth thin, 8-12 seeded. Thwaites, Enum. Pl. Zeyl. 91; Bak. in Flor. Brit. Ind. II, 175. *A. lævigatus* E. Mey, Comm. I, 126; Harv. Fl. Cap. II, 263. *A. melanospermus* Hassk. Cat. Bog. 282; Miq. Flor. Ind. Bat. I, 159. *A. acutifolius* Blume MSS. ex Miq. Flor. Ind. Bat. I, 160.

ANDAMANS; Coco Group, *Prain!* Port Blair, common. PERAK; *Kunstler* 1023! *Scortechini* 630! DISTRIB. S. Africa and S.-E. Asia.

## 2. *CROTALARIA* Linn.

Herbs or shrubs with simple or digitately 3-foliolate rarely 5-7-foliolate leaves. *Flowers* often large and showy in terminal or leaf-opposed racemes. *Calyx* with short tube, and with lanceolate or linear teeth free or somewhat connate in two lips. *Corolla* equalling or exceeding the calyx; standard rounded or ovate short-clawed; wings obovate or oblong shorter than standard; keel as long as wings, its petals united, much incurved and beaked. *Stamens* monadelphous in a sheath split dorsally, anthers dimorphous, alternately on short filaments versatile and on longer basifixed. *Ovary* sessile or, rarely, stipitate linear usually many-ovuled; style long, abruptly incurved at the base, bearded above, stigma oblique small. *Pod* sessile or, rarely, supported on a gynophore oblong or linear, straight, turgid or inflated, continuous within, 2-∞-seeded. Species about 250, widespread in tropical and sub-tropical regions.

Leaves simple:—

Stipules decurrent as a persistent wing to the stem ... 1. *C. alata*.

Stipules, if present, not decurrent:—

Pods not longer than the calyx:—

Flowers in elongated racemes, petals blue; stipules

minute ... .. 2. *C. sessiliflora*

Flowers in short few-fl. heads, petals pale yellow;

stipules 0 ... .. 3. *C. chinensis*.

- Pods much longer than the calyx :—
- Pods glabrous, flowers yellow :—
- Stems diffuse, racemes lateral ... .. 4. *C. ferruginea.*
- Stems erect, racemes terminal :—
- Branches stout striated, glabrous or nearly so ;
- leaves stipellate :—
- Leaves obtuse or retuse, bracts and stipules
- small subulate ... .. 5. *C. retusa.*
- Leaves acute, bracts and stipules large acute
- and leafy ... .. 6. *C. sericea.*
- Branches slender terete, densely silky ; leaves
- exstipellate ... .. 7. *C. albida.*
- Pods hirsute, flowers usually blue, racemes lateral
- as well as terminal ... .. 8. *C. verrucosa.*
- Leaves compound :—
- Leaves 3-foliolate :—
- Pods small, obliquely subglobose, very few-seeded
- (hirsute) ... .. 9. *C. uncinella.*
- Pods large, cylindric, many-seeded :—
- Pods hirsute (narrowly cylindric almost sessile) ... 10. *C. incana.*
- Pods glabrous :—
- Pods narrowly cylindric, almost sessile .. 11. *C. Saltiana.*
- Pods oblong, supported on a long gynophore ... 12. *C. laburnifolia.*
- Leaves usually 5-foliolate (at times 3-, 4-, or even 6-7-
- foliolate ... .. 13. *C. quinquefolia.*

1. *CROTALARIA ALATA* Ham. in Roxb. Hort. Beng. 98. A suberect undershrub 1-2 feet high ; stem and leaves below clothed with short silky pubescence. *Leaves* 1-3 in. long, simple, oblong-ovate or obovate, subacute or obtuse, membranous, the stipules with lanceolate-dentate points forming decurrent wings on the stem for nearly the whole length of the nodes. *Racemes* 2-3-fld., on elongated often leafy lateral peduncles ; bracts small, persistent, ovate, acuminate. *Calyx* densely silky, .35 in. long, tube campanulate, bracteolate. *Corolla* pale-yellow hardly exerted. *Pod* distinctly stalked 1.25-1.75 in. long, linear-oblong, glabrous, 30-40-seeded. Don, Prodr. 241 ; Roxb. Flor. Ind. III, 274 ; DC. Prodr. II 124 ; Wall. Cat. 5356 ; Benth. in Hook. Lond. Journ. II, 478 ; Miq. Flor. Ind. Bat. I, 329 ; Bak. in Flor. Brit. Ind. II, 69. *C. sagitticaulis* Wall. Cat. 5357. *C. bialata* Roxb. Flor. Ind. III, 274.

SINGAPORE ; Changi, *Hullett ! Ridley !* DISTRIB. Himalaya ; Indo-China ; Malay Islands.

2. *CROTALARIA SESSILIFLORA* Linn. Sp. Pl. ed. 2, 1004. A rigid erect annual 1-2 feet high, simple or sparingly fastigiately branched, stem and leaves below shortly silky. *Leaves* 2-6 in. long, simple linear or lanceolate narrowed to both ends thickly herbaceous, quite glabrous above, the stipules setaceous very small. *Racemes* 1-8 in. long, 5-20-



fid., terminal; flowers deflexed close-set (occasionally solitary flowers occur also in the axils of the uppermost stem-leaves); bracts long, setaceous, persistent. *Calyx* densely silky with very long hairs, .35-.5 in. long, tube shortly campanulate, teeth all long acute, the upper lanceolate, narrow. *Corolla* blue and white, rarely yellow, glabrous, not exerted. *Pod* sessile .5 in. long, not exerted, oblong, glabrous, 10-15-seeded. DC. Prodr. II, 129; Benth. in Hook. Lond. Journ. II, 565; Miq. Flor. Ind. Bat. I, 338; Bak. in Flor. Brit. Ind. II, 73. *C. anthylloides* Lamk. Encyc. Meth. II, 195; Don, Prodr. 241; Wall. Cat. 5366 A (partly), B, C. *C. salicifolia* Ham. in Don, Prodr. 241 not of Heyne. *C. nepalensis* Link, Enum. II, 228. *C. venusta* Wall. Cat. 5365. *C. brevipes* Champ. in Hook. Kew Journ. IV, 44. *C. eriantha* Sieb. & Zucc. Fl. Jap. 13. *C. Oldhami* Miq. Ann. Mus. Lugd. Bat. III, 42. *C. calycina* Kurz, Journ. As. Soc. Beng. XLV, pt. 2, 147 not of Schrank.

MALAYA PENINSULA; Pahang, *Ridley!* NICOBARS; Kamorta, *Kurz!* DISTRIB. Japan, China, Indo-China, Philippines, Java; Himalayas from Assam westward; Panjab, Central India and Behar.

The specimens collected by Mr. Kurz in Kamorta having yellow flowers were referred by him to *C. calycina*. An examination however shows that they are not *calycina* but *sessiliflora*. A gathering from Java has been issued from Mus. Leyden, also under the name *C. calycina*; this probably indicates that in Java as in the Nicobars, *C. sessiliflora* may have yellow flowers.

3. CROTALARIA CHINENSIS Linn. Sp. Pl. ed. 2, 1003. An annual 1-2 feet high, usually breaking into several stoutish ascending branches from near the base, laxly silky with reddish brown hairs. *Leaves* 1-2 in. long, simple, linear to oblanceolate with rounded base and obtuse or subacute apex, thickly herbaceous laxly silky on both surfaces; stipules 0. *Racemes* densely capitate 3-6-fld., all terminal, bracts and bracteoles linear, persistent. *Calyx* laxly silky, .35-.5 in. long, tube very short, teeth all long acute, the upper lanceolate, lower linear. *Corolla* pale-yellow, glabrous, not exerted. *Pod* sessile .5 in. long, not exerted, oblong, glabrous, 15-20-seeded. DC. Prodr. II, 130; Benth. in Hook. Lond. Journ. II, 566; Miq. Flor. Ind. Bat. I, 339; Bak. in Flor. Brit. Ind. II, 73.

PERAK; Larut river; on rocks in the stream, *Wray!* DISTRIB. China, Indo-China, Philippines; India; Malay Islands.

4. CROTALARIA FERBUGINEA Grah. in Wall. Cat. 5398. A diffuse copiously branching herb with a perennial rootstock, finely silky or shaggy, branches 1.5-2 feet long. *Leaves* very short petioled, herbaceous 1.5-2 in. long, .5-.75 in. across, simple, ovate-oblong obtuse paler beneath; stipules persistent foliaceous deflexed or spreading, .25 in. long; petioles .15 in. long. *Racemes* laxly 2-8-fld. leaf-opposed, 2-4 in. long, bracts linear .2 in. long often deflexed, pedicels very short. *Calyx*

laxly silky with rusty hairs, .5 in. long, tube very short, upper teeth lanceolate lower linear. *Corolla* yellow not exerted. *Pod* shortly stalked 1-1.25 in. long glabrous 20-30-seeded. Benth. in Hook. Lond. Journ. II, 476; Bak. in Flor. Brit. Ind. II, 68. *C. canescens* Wall. Cat. 5415. *C. crassifolia* Ham. in Wall. Cat. 5416. *C. leioloba* Bartl. Ind. Sem. Hort. Goett. 1837; *Linnaea* XII, Litt. 80. *C. pilosissima* Miq. Flor. Ind. Bat. I, 327.

PAHANG; Katepong Pekan, *Ridley!* DISTRIB. India, Indo-China, China; Malay Archipelago.

Mr. Ridley has kindly sent the writer for inspection, from the Singapore Herbarium, the only specimen of this species hitherto collected in the Malay Peninsula. The plant is, however, quite common in Sumatra and Java and may yet be found elsewhere in the Peninsula.

5. *CROTALARIA RETUSA* Linn, Sp. Pl. 715. An erect robust undershrub 3-4 feet high, with stout striated glabrous branches. *Leaves* 1.5-3 in. long, simple, short-petioled, thickly herbaceous, glabrous above puberulous beneath, oblong-oblancoate, obtuse or oftener retuse, rarely subacute at apex, cuneate at base, stipules subulate very small. *Racemes* terminal elongated 6-8 in. long laxly 12-20-fld., bracts and bracteoles subulate, pedicels shorter than calyx. *Calyx* almost glabrous, .35-.5 in., tube short campanulate, half the length of the lanceolate teeth. *Corolla* .8 in. long, much exerted, yellow with purple tinge. *Pod* glabrous linear-oblong, 1-1.5 in., distinctly stalked, 15-20-seeded. DC. Prodr. II, 125; Roxb. Flor. Ind. III, 272; Bot. Reg. t. 253; Bot. Mag. t. 2561; Wall. Cat. 5405; W. & A. Prodr. 187; Miq. Flor. Ind. Bat. I, 330; Bak. in Flor. Brit. Ind. II, 75. *Lupinus cochinchinensis* Lour. Flor. Cochinch. 429; DC. Prodr. II, 410. *Tandale-cotti* Rheede, Hort. Malab. IX, t. 25.

MALAY PENINSULA; Malacca, *Maingay!* *Hervey!* Pahang, *Ridley!* ANDAMANS; Port Blair, very common; having been introduced as a plant of native gardens, it has now run wild throughout the settlement. —DISTRIB. General in the tropics.

6. *CROTALARIA SERICEA* Retz, Obs. V, 26. A robust undershrub 3-4 feet high with stout striated almost glabrous branches. *Leaves* 2-6 in. long, simple, short petioled, thickly herbaceous, glabrous above, finely silky beneath, oblong-oblancoate acute or subacute at apex, cuneate at base; stipules large leafy persistent. *Racemes* terminal elongated 10-12 in. long, laxly 20-50-fld., bracts ovate leafy persistent, pedicels longer than calyx. *Calyx* almost glabrous .5 in. long, tube short campanulate half the length of the lanceolate teeth. *Corolla* .8 in. long, much exerted, yellow with purple tinge. *Pod* glabrous linear-oblong 1-2 in. long, distinctly stalked 20-30-seeded. DC. Prodr. II,

126; Roxb. Fl. Ind. III, 273; Wall. Cat. 5406; W. & A. Prodr. 186; Miq. Flor. Ind. Bat. I, 330; Bak. in Flor. Brit. Ind. II, 75. *C. spectabilis* Roth, Nov. Sp. 341; DC. Prodr. II, 125. *C. macrophylla* Weinm. Syll. II, 26. *C. cuneifolia* Schrank, Syll. II, 78.

MALAY PENINSULA; Malacca, *Griffith*. ANDAMANS; Table Island, *Prain*! DISTRIB. India and Indo-China.

Very like the preceding, but easily distinguished, even in those cases where the foliage is similar, by the large stipules and bracts.

7. CROTALARIA ALBIDA Heyne ex Roth, Nov. Sp. Pl. 333. An undershurb 1-2 feet high with numerous firm slender terete obscurely silky branches. *Leaves* simple linear or oblanceolate obtuse firm shining gland-dotted glabrescent above, thinly silky beneath, 1-2 in. long .2-25 in. wide, petiole .1 in., stipules 0. *Flowers* in terminal, or rarely lateral, laxly 6-20-fl. racemes, 2-4 in. long; bracts linear .05-1 in. long; pedicels .15-.2 in. long slender adpressed-puberulous. *Calyx* turbinate .25 in. long, in fruit .35 in. long, thinly silky; teeth long the 3 lower linear acuminate, the 2 upper broader often subobtuse. *Corolla* pale yellow glabrous .3 in. long. *Pod* glabrous sessile, oblong-cylindric .5-6 in. long, half as long again to twice as long as calyx; seeds 6-12. W. & A. Prodr. 189; Bak. in Flor. Brit. Ind. II, 71. *C. montana* Roxb. Hort. Beng. 54; Flor. Ind. III, 265; W. & A. Prodr. 182. *C. scoparia* Wall. Cat. 5418. *C. parva* Grah. in Wall. Cat. 5402. *C. punctata* Grah. in Wall. Cat. 5401 A, 5401 C. *C. tennis* Wall. Cat. 5403.

SELANGOR; roadsides at Kwala, *Ridley* 7293! DISTRIB. Throughout South Eastern Asia.

A species perhaps only recently introduced to the Malay Peninsula from India; in India and Indo-China the plant is very common in grassy places.

8. CROTALARIA VERRUCOSA Linn. Sp. Pl. 715. A woody herb 2-3 feet high with many angular branches puberulous at first but soon glabrescent. *Leaves* 2-6 in. long, simple short petioled, thin, obscurely downy beneath, ovate, obtuse or occasionally acute at apex, deltoid at base; stipules moderately large leafy semilunate. *Racemes* terminal and lateral, about 6 in. long, rather closely 12-20-fl., bracts linear minute, pedicels about as long as calyx. *Calyx* .3 in. long, obscurely downy, tube short campanulate, half the length of lanceolate teeth. *Corolla* .75 in. long, exserted, usually white and blue, often white, occasionally yellow. *Pods* faintly hirsute, oblong, 1-1.5 in. long, distinctly stalked, 10-15-seeded. DC. Prodr. II, 125; Bot. Mag. t. 3034; Wall. Cat. 5392; W. & A. Prodr. 187; Wight Ic. t. 200; Miq. Flor. Ind. Bat. I, 331 Bak. in Flor. Brit. Ind. II, 77. *C. angulosa* Lamk. Encyc. Meth. II, 197; Roxb. Flor. Ind. III, 273. *C. caerulea* Jacq. Ic. t. 144. *C. acuminata* G. Don., Dict. II, 134.—*Rheede*, Hort. Malab. IX, t. 29.

MALAY PENINSULA; Perak, *Scortechini!* Malacca, *Griffith.* Pahang, *Ridley!*

9. *CROTALARIA UNCINELLA* Lamk. Encyc. Meth. II, 200. An almost stemless undershrub with several subprocumbent slender flexuous spreading branches 1-2 feet long, slightly puberulous. *Leaves* compound 3-foliolate, petioles 1 in. long, leaflets subequal or the terminal slightly the larger, 1-1.5 in. long, .5-.75 in. wide, glabrous above slightly hirsute beneath, elliptic obtuse entire; stipules small, acute, rigid, recurved, glabrous above hirsute beneath. *Racemes* lateral and terminal 2 in. long, 20-25-flid.; flowers close-set, bracts small recurved ovate acuminate. *Calyx* hirsute .15 in. long, teeth lanceolate. *Corolla* .25 in. long, exserted, yellow, glabrous. *Pod* obliquely subglobose, closely adpressed-pubescent, 2-seeded; style sharply hooked. Lamk. Ill. t. 617, f. 2. *C. elliptica* Roxb. Hort. Beng. 54; Flor. Ind. III, 279; Miq. Flor. Ind. Bat. I, 344; Benth. in Hook. Lond. Journ. II, 580; Flor. Hongk. 75; Forbes & Hemsl. Ind. Sinens., I, 151. *C. Vachellii* H. & A. Bot. Beech. Voy. 180; Walp. Rep. I, 588. *Rhynchosia aurea* Ridl. Trans. Linn. Soc., Ser. II, III, 293 not of DC.

MALAY PENINSULA; Pahang, *Ridley!* Malacca, *Derry!* *Goodenough!*  
DISTRIB. China.

First described by Lamarck from specimens received by him from Mauritius; probably the plant had been there introduced; at all events Mr. Baker does not cite it, even as a stranger, in his *Flora of Mauritius*. Afterwards described, independently, by Roxburgh, from specimens reared in the Calcutta garden, and therefore, though issued by Wallich, deliberately excluded from the Indian Flora by Wight and Arnott, who have been in this followed by Baker in the *Flora of British India*. Its discovery in Pahang by Mr. Ridley, in whose list it stands as *Rhynchosia aurea*, and in Malacca where it is apparently quite common, shows that after all it deserves to be included in the Indian Flora.

10. *CROTALARIA INCANA* Linn. Sp. Pl. 716. An erect undershrub 2-4 feet high with robust terete loosely downy branches. *Leaves* compound 3-foliolate petioles 2-3 in. long, leaflets membranous, quickly glabrescent above sparsely hirsute beneath terminal 1.5-2 in. long, larger than lateral all ovate, obtuse at apex and rounded or widely cuneate at base; stipules minute setaceous. *Racemes* terminal and lateral 6-10 in. long, rather closely 12-20-flid., bracts minute. *Calyx* .25 in. long, loosely downy, teeth lanceolate twice as long as the tube. *Corolla* .6 in. long, exserted, yellow, glabrous. *Pod* sessile slightly deflexed and slightly recurved, cylindric 1-1.25 in. long, permanently pubescent with spreading brown silky hairs; 20-30-seeded. DC. Prodr. II, 132; Bot. Reg. t. 377; Miq. Flor. Ind. Bat. I, 347; Bak. in Flor. Brit. Ind. II, 83. *C. Schimperi* A. Rich. Fl. Abyss. I, 151. *C. herbacea* Schweig. in Schrank, Syllog. Ratisb. II, 77.

PENANG; *Curtis!* DISTRIB. Cosmopolitan in the tropics, originally American.

There is one specimen of this in Mr. Curtis' own Herbarium. No other collector has sent it from Malaya.

11. CROTALARIA SALTIANA Andr. Bot. Rep. t. 648. An erect shrub 2-4 feet high with robust smooth or slightly sulcate thinly silky branches. *Leaves* compound, 3-foliolate, petioles 2-3 in. long, leaflets membranous, glabrous above very sparingly silky below, terminal 1.5-2.5 in. long, larger than lateral, all obtuse cuneate at base; stipules minute, deciduous. *Racemes* terminal and occasionally also lateral, usually 1-1.25 feet long, laxly 20-50-fl.; bracts minute. *Calyx* .25 in. long, thinly silky; teeth lanceolate as long as campanulate tube. *Corolla* .6 in. long, exerted, yellow with purple stripes or pure yellow, glabrous. *Pod* sessile deflexed, subrecurved puberulous when young, ultimately glabrous, cylindric, 1.5 in. long, 20-30-seeded. *C. striata* DC. Prodr. II, 131; Miq. Flor. Ind. Bat. I. 346; Bak. in Flor. Brit. Ind. II, 84 (excluding the synonyms *C. Brownei* Bertero and *C. latifolia* Roxb.)

MALAY PENINSULA; Perak, *Wray!* *Scortechini!* Penang, *King!* Malacca, *Maingay!* Singapore, *Kunstler!* Pahang, *Ridley.*

Nearly related to, and at times mistaken for *C. Brownei* Bertero ex DC. in Prodr. II, 130 (*C. lanceolata* Roxb. Hort. Beng. 54 [nomen prius] nec Meyer; *C. latifolia* Roxb. ex Wall. MSS. in Hort. Calcutta) a native of the West Indies, but now occasionally met with as a spontaneous species in India. From *C. Saltiana*, *C. Brownei* differs in having more numerous lateral racemes, with flowers always close-set and racemes never exceeding 6 in., and in having much larger leaflets acute at apex as well as base and more densely silky underneath. The leaves of *C. Saltiana* are like those of the next species; of *C. Brownei* like those of *C. bracteata* and of *Priotropis cytisoides* for both of which species it has, at times, been mistaken.

12. CROTALARIA LABUNIFOLIA Linn. Sp. Pl. 715. An erect shrub 2-4 feet high with long slender rounded glabrous branches. *Leaves* compound, 3-foliolate, petioles 2-3 in. long, leaflets membranous, glabrous on both surfaces, terminal 1-2 in. long, hardly larger than lateral, all subacute or obtuse, cuneate at the base; stipules 0. *Racemes* terminal and lateral 6-12 in. long, few- and very lax-fl.; bracts minute deciduous, pedicels .5 in. long. *Calyx* .3-.4 in. long, glabrous turbinate, teeth lanceolate as long as tube. *Corolla* 1 in. long, much exerted, pure yellow, glabrous, keel much incurved. *Pod* pendulous from a filiform gynophore .75-1 in. long, glabrous, cylindric 1.5-2 in. long, 20-30-seeded. DC. Prodr. II, 130; Roxb. Fl. Ind. III, 275; Wall. Cat. 5424, mostly; W. & A. Prodr. I, 193; Miq. Flor. Ind. Bat. I, 345; Bak. in Flor. Brit. Ind. II, 84. *C. pendula* Bert. in DC. Prodr. II, 130. *C. pedunculosa* Desv. Journ. Bot. III, 76; DC. Prodr. II, 132. *Clavulium pedunculosum* Desv. Ann. Sc. Nat. IX, 407. *Nellia-tandalecotti* Rheede, Hort. Malabar. IX, t. 27.

MALAY PENINSULA; Malacca, *Griffith!* *Maingay!* *Hervey!* **DISTRIB.** India; Malay Archipelago; Philippines.

13. *CROTALARIA QUINQUEFOLIA* LINDL. Sp. Pl. 716. An erect annual 2-4 feet high with straight robust sulcate fastigiate sparingly silky branches. *Leaves* digitate normally 5-foliolate, at times 3-, 4-, or even 6-7-foliolate, petioles 1-3 in. long, leaflets herbaceous, glabrous above, thinly silky beneath, central largest 2-4 in. long, all linear or occasionally narrowly oblanceolate obtuse; stipules linear. *Racemes* terminal, 6-8 in. long, laxly 8-20-flid.; bracts linear as long as pedicels, thinly silky, persistent; lower pedicels as long as calyx, upper short. *Calyx* subglabrous .5 in. long; teeth lanceolate as long as campanulate tube. *Corolla* 1 in. long, glabrous, yellow, white or rarely purplish. *Pod* distinctly stalked subinflated, glabrous, 1.5-2 in. long, .75 in. wide, 30-40-seeded. DC. Prodr. II, 135; Roxb. Flor. Ind. III, 279; Wall. Cat. 5429; W. & A. Prodr. I, 194; Wight Ill, t. 16; Miq. Flor. Ind. Bat. I, 347; Bak. in Flor. Brit. Ind. II, 84. *C. heterophylla* Linn. f. Suppl. 323; DC. Prodr. II, 131.

MALAY PENINSULA; Kedah, *Kunstler!* Singapore, *Hullett!* **DISTRIB.** India; Indo-China; Malay Archipelago; Philippines.

### 3. FLEMINGIA Roxb.

Shrubs, rarely herbs, with leaves digitately 3-foliolate or simple, gland-dotted below. *Inflorescence* various; pedicels very short, not bracteolate. *Calyx-tube* short; teeth narrow, acuminate, the lowest often the longest. *Corolla* little or not at all exerted; petals equal in length; keel obtuse or slightly rostrate. *Stamens* diadelphous; anthers uniform. *Ovary* subsessile, 2-ovuled; style filiform, beardless, stigma capitate. *Pod* oblong, turgid, small, usually two-seeded; seeds not strophiolate, the funicle central. Species about 25; 3 Tropical African, the remainder Asiatic.

Leaves 1-foliolate; flowers in small cymes hidden by large folded persistent bracts and arranged in racemes longer than the leaves ... .. 1. *F. strobilifera*.  
 Leaves 3-foliolate; flowers in simple solitary or fascicled axillary racemes shorter than the petioles, bracts small deciduous ... .. 2. *F. congesta*.

§ *OSTRYDIUM* Desv. Shrubs. *Leaves* simple. *Flowers* in small cymes, each hidden by a large folded persistent bract, closely distichously arranged in copious simple or slightly branched racemes, both in the axils of the leaves and above them.

1. *FLEMINGIA STROBILIFERA* R. Br. in Ait. Hort. Kew. ed. II, IV, 350. An erect shrub 5-10 feet high with slender terete branches velvety towards their tips. *Leaves* 4 in. long, petioles .5 in. long, adpressed

puberulous; leaflets 1, subcoriaceous green glabrescent above thinly silky on the nerves beneath, ovate-acute, base widely rounded or truncate 3·5 in. long, 2 in. wide, lateral nerves 10–12 pairs; stipels obsolete, stipules scarious lanceolate ·3 in. long. *Inflorescence* in terminal racemes or thyrses 3–6 in. long, the slender zigzag rachis rusty-pubescent; bracts erecto-patent, short-petioled, deeply cordate 1 in. long, 1·25 in. wide, membranous, apex shortly cuspidate in all except the very uppermost. *Calyx* ·25 in. finely pilose; teeth lanceolate, exceeding the tube. *Corolla* yellowish or greenish-white ·35 in. long. *Pod* oblong turgid ·35 in. long, finely downy; 2-seeded. DC. Prodr. II, 351; Wall. Cat. 5753; W. & A. Prodr. 243; Wight Ic. t. 267; Miq. Flor. Ind. Bat. I, 161; Bak. in Flor. Brit. Ind. II, 227 (excluding both varieties). *F. abrupta* Wall. Cat. 5755. *Hedysarum strobiliferum* Linn. Sp. Pl. 746; Roxb. Flor. Ind. III, 350. *Zornia strobilifera* Per. Synops. II, 319.

In all the provinces, common. **DISTRIB.** Throughout S.-E. Asia.

§ 2. **FLEMINGIASTRUM** DC. Erect shrubs. *Leaves* digitately 3-foliate. *Flowers* in dense subspicate axillary racemes; bracts linear or lanceolate, caducous.

2. **FLEMINGIA CONGESTA** Roxb. Hort. Beng. 56. An erect woody shrub 4–6 feet high with slender triangular sulcate branches silky towards their tips. *Leaves* 6–9 in. long, petioles 2·5–3·5 in. long, adpressed puberulous margins angled but hardly winged; leaflets 3, subcoriaceous, ovate-acute, terminal cuneate lateral obliquely round at base, green, puberulous above thinly rusty silky especially on the nerves beneath, 3–5 in. long, 1·5–3 in. wide, lateral nerves 5–7 pairs, the lowest pair long, very oblique, arising at junction of midrib and petiolule, stipels obsolete, petiolules ·25 in. long, stipules scarious externally velvety, early caducous ·4 in. long. *Inflorescence* in dense axillary racemes sometimes solitary in the higher, usually fasciculate in the lower axils, 2 in. long, always shorter than petioles; bracts lanceolate ·25 in. long or less, silky externally less rigid than the stipules and like them deciduous. *Calyx* ·35 in. long, densely silky externally, teeth linear-lanceolate the lowest exceeding the others. *Corolla* wings purple standard white striped with pink ·4 in. long. *Pod* oblong ·5 in. long, ·25 in. wide, closely shortly tomentose; seeds 2. Roxb. Fl. Ind. III, 340; DC. Prodr. II, 351; W. & A. Prodr. 241; Wight, Ic. t. 390; Wall. Cat. 5747; Miq. Flor. Ind. Bat. I, 164; Bak. in Flor. Brit. Ind. II, 288, excluding all the varieties. *Crotalaria macrophylla* Willd. Sp. Pl. III, 982. *Rhynchosia crotalarioides* DC Prodr. II, 387.

PENANG; Wallich 5747 F! Pulo Boeting, Curtis 1926! MALACCA; Griffith! PANGKORE, Goodenough! PERAK; Larut, Scortechini 134! Kampong Kota, Wray 3316! **DISTRIB.** India, Indo-China, Java.

All the specimens quoted belong to Roxburgh's true *Flemingia congesta*.

## 4. ERIOSEMA DC.

Shrubs or herbs, mostly suberect, with 1-3-foliolate leaves. *Flowers* racemed or axillary. *Calyx* campanulate; teeth 5, as long as the tube. *Corolla* distinctly exerted; limb of standard roundish, auricled at the base; wings and slightly beaked keel shorter. *Stamens* diadelphous; anthers uniform. *Ovary* sessile, 2-ovuled; style filiform, glabrous, stigma capitate. *Pod* oblong, turgid, 1-2-seeded; seeds oblique, the funiculus attached to the extremity of a linear hilum. Species about 50, mostly Trop. African and American.

ERIOSEMA CHINENSE Vogel. Pl. Meyen. 31. An erect undershrub 1-1.5 feet high, stems slender branching virgately usually near base, densely pubescent one or more from a small tuberous woody rootstock 1.5 in. long, .75 in. across. *Leaves* 1-2 in. long, .3-4 in. across, 1-foliolate very short petioled, linear-oblong to linear-lanceolate, subcoriaceous, greenish with a few adpressed hairs above densely grey-tomentose beneath, the veins rusty brown tomentose; stipules linear scarious 2-nerved persistent .2 in. long, stipels minute. *Flowers* in axils of upper leaves, solitary or geminate subsessile or on a common pedicel, sometimes .5 in. long jointed below flower, bracteoles obsolete. *Calyx* campanulate densely pilose .2 in. long. *Corolla* yellow, drying black, .4 in. long, standard orbicular hairy externally. *Pod* oblong .4 in. long, pubescent with long spreading rufous hairs. Bak. in Flor. Brit. Ind. II, 219. *Crotalaria tuberosa* Ham. in Don. Prodr. 241. *Rhynchosia virgata* Grab. in Wall. Cat. 5503. *R. Grahami* Wall. Cat. 5504. *Pyrrotricha tuberosa* W. & A. Prodr. 238.

PERAK; Wray n. 3804! MALACCA; Griffith. DISTRIB. S.-E. Asia; N. Australia.

## 5. DUNBARIA W. &amp; A.

Woody or herbaceous climbers. *Leaves* 3-foliolate, distinctly gland-dotted beneath; stipellæ rarely present. *Flowers* racemose or axillary. *Calyx* teeth narrow the lowest distinctly exceeding the others. *Corolla* exerted, marcescent or caducous; keel usually not beaked. *Stamens* diadelphous anthers uniform. *Ovary* sessile or stalked, many-ovuled; style inflexed filiform beardless, stigma capitate. *Pod* linear, flat not marked with depressed lines between the substrophiolate seeds. Species about 12, Eastern Asiatic, Japanese and North Australian; only one from our area.

§ RHYNCOLOBIUM. *Corolla* caducous.

DUNBARIA SCORTECHINII Prain. A slender creeper 10-20 feet long with rigid subsulcate grey canescent stem and branches. *Leaves* 4-6 in. long, 3-foliolate; leaflets subtrapezoid, cuspidate acuminate at apex narrowed from below the middle to a rounded base, the lateral pair



obliquely; blueish-green faintly puberulous above, densely grey-canescens beneath 2-2.5 in. long, 1.75-2 in. wide; petiole 1.5-4 in. long, puberulous; petiolules .15 in. long, puberulous; stipels very minute caducous, stipules lanceolate .1 in. long caducous. *Racemes* 2-3 in. long on peduncles 4-6 in. long, overtopping the leaves; pedicels geminate .2 in. long. *Calyx* grey-pubescent with reddish streaks, .3 in. long, tube wide campanulate, lower tooth lanceolate as long as tube and twice as long as lateral deltoid and connate upper pair. *Corolla* .5 in. long, externally dark brown, within pale yellow; keel beaked, standard .6 in. wide, orbicular entire. *Pod* 2.5 in. long, .25 in. wide, linear, pedicel abruptly recurved, closely grey-canescens; 6-8 seeded.

PERAK; in open grassy or bamboo jungles, at Dijong, *Scortechini*, 1841! *Kunstler*, 908! Ulu Bubong, *Kunstler*, 10852!

A species with somewhat the appearance of *Rhynchosia bracteata* but with much more slender stems. It also resembles, but to a less degree, *Atylosia mollis*. Its pods, however, have no depressions between the seeds and this renders it necessary to refer the plant to *Dunbaria*.

#### 6. ATYLOSIA W. & A.

Herbs or shrubs, erect or twining. *Leaves* 3-foliolate, sometimes subdigitate often exstipellate, gland-dotted beneath. *Flowers* axillary or racemed. *Calyx* teeth distinct, longer or shorter than the tube the lowest the longest. *Corolla* more or less exerted, marcescent or caducous; keel not beaked. *Stamens* diadelphous; anthers uniform. *Ovary* sessile; ovules 3 or more; style filiform incurved glabrous, stigma capitate. *Pod* linear or oblong, turgid, marked with horizontal or oblique transverse lines between the seeds which have a conspicuous divided strophiole. Species about 25; from India to Australia and Mauritius.

Petals marcescent, leaflets large pinnately trifoliolate ... 1. *A. crassa*.

Petals deciduous, leaflets small subdigitate ... 2. *A. scarabæoides*.

§ ATYLIA. Petals marcescent, remaining till the pod developes.

1. ATYLOSIA CRASSA Prain. A twining species with firm slender striate shortly-tomentose stems and branches. *Leaves* 3-6 in. long, pinnately 3-foliolate; leaflets subtrapezoid cuspidate-acuminate at apex narrow from beyond the middle to a rounded base, the lateral pair obliquely, dark green and rather densely puberulous especially on the nerves above, densely greenish-brown pubescent and reticulately veined beneath, 2-3 in. long, 1.75-2.25 in. wide; petiole 1.5-2.5 in. long, pubescent; petiolules .15 in. stipels subulate .1 in. long, pubescent, subpersistent, stipules minute caducous. *Racemes* 2-3 in. long, lax short-peduncled, pedicels geminate .3-5 in. long; bracteoles large roundish acute reddish .6 in. long, forming a conspicuous tuft before the racemes expand. *Calyx* .4 in. finely grey-downy lowest tooth lanceolate as long

as the narrowly campanulate tube. *Corolla* yellow, .75 in. long. *Pod* 1-1.25 in. long, .6 in. wide, straight, rounded at both ends closely greenish-brown viscidly puberulous, 3-5-seeded, obliquely transversely depressed between the smallish seeds of which the longer diameter is parallel to the direction of the pod. *Dolichos reticulatus* Ham. in Wall. Cat. 5552 not of Ait. *D. crassus* Grah. in Wall. Cat. 5553. *Dunbaria Horsfieldii* Miq. in Flor. Ind. Bat. I, 179. *Atylosia mollis* Benth. in Pl. Jungh. 243 (excluding syn. *Collæa mollis* Grah.); Bak. in Flor. Brit. Ind. II, 213 (excl. syn. *Collæa mollis* Grah., *Atylosia glandulosa* Dalz., and *Cajanus glandulosus* Dalz. & Gibs.)

ANDAMANS; very common. DISTRIB. India, Indo-China, Malay Archipelago.

The prior name for this species is *Dolichos reticulatus* Ham. but the name *Atylosia reticulata* may not be employed for it owing to there being another *A. reticulata* from Australia based on the *Dolichos reticulatus* Ait. of the *Hortus Kewensis* which was known before our plant. The nearest ally of this species is the purely Himalayan and quite distinct *A. mollis* Bth. (*Collæa mollis* Grah.)

§ CANTHAROSPERMUM. Petals falling before the pod develops.

2. *ATYLOSIA SCARABÆOIDES* Benth. Pl. Jungh. 243. A slender biennial herbaceous twiner with densely grey-downy stems and branches. *Leaves* 1.5-2 in. long, subdigitately 3-foliolate; leaflets obovate-oblong subcoriaceous flexible 1-1.5 in. long, .5-.75 in. wide, obtuse or subacute thinly grey-canescens above, densely pubescent, 3-nerved in lower two-thirds and faintly reticulate-veined beneath; petiole .5 in. long, brownish pubescent; stipels 0, stipules minute caducous. *Racemes* 2-6-fld., on densely pubescent axillary peduncles .3-.4 in. long; pedicels .25 in. long also pubescent. *Calyx* .25 in., densely brownish-grey silky, teeth linear, the lowest twice as long as tube. *Corolla* .4 in. long, keel abruptly incurved at tip. *Pod* straight .75-1 in. long, .25 in. wide, clothed with fine spreading brown silky hairs, with slightly oblique transverse depressed lines between the 4-5-seeds. Miq. Flor. Ind. Bat. I, 173; Bak. in Flor. Brit. Ind. II, 215. *Dolichos scarabæoides* Linn. Sp. Pl. 726. *Cajanus scarabæoides* Thouars ex Grah. in Wall. Cat. 5580. *Rhynchosia scarabæoides* DC. Prodr. II, 387. *R. biflora* DC. Prodr. II. 387. *Cantharospermum pauciflorum* W. & A. Prodr. 255.

MALACCA; *Griffith!* DISTRIB. India, Indo-China, Malaya, China, Mascarene Islands.

## 7. CAJANUS DC.

An erect shrub. *Leaves* 3-foliolate. *Flowers* racemed. *Calyx*-tube campanulate; teeth short. *Corolla* much exserted, its petals equal in length; keel truncate. *Stamens* diadelphous; anthers uniform. *Ovary* sessile, few-ovuled; style long, filiform, much upcurved, stigma capi-

tate. *Pod* linear, straight, narrowed at both ends, 3-5-seeded, torulose with oblique linear depressions between the non-strophiolate seeds. The only species.

CAJANUS INDICUS Spreng. Syst. III, 248. An erect shrub 6-8 feet high with slender grooved grey-silky branchlets. *Leaves* 2-5 in. long; petiole .5-1.5 in. finely fluted densely adpressed hoary; leaflets 3 oblong-lanceolate entire subcoriaceous, terminal 1.75-3 in. long, .5-1.25 in. wide lateral similar but smaller 1.25-1.75 in. long, .35-.75 in. wide, thinly silky above densely shortly silky and indistinctly gland-dotted beneath, nerves 6-9 pairs oblique prominent; stipels minute; stipules lanceolate hoary-canescens externally, .15 in. long. *Inflorescence* in sparse corymbose axillary racemes with peduncles 2 in. long and in a terminal panicle; pedicels downy the lowest .5 in. long, bracteoles obsolete. *Calyx* campanulate .25 in. long, teeth triangular shorter than tube. *Corolla* .6-.75 in., standard yellow, or yellow with red veins, or rarely red. *Pod* 2-3 in. long, .25-.45 in. wide, finely downy, with oblique cross depressions between the 2-6 seeds; armed at tip with thickened base and lower half of style; testa firm from pale to dark brown. W. & A. Prodr. 256; Miq. Flor. Ind. Bat. I, 174; Bak. in Flor. Brit. Ind. II, 217. *C. flavus* DC. Prodr. II, 406. *C. bicolor* DC. Prodr. II, 406; Wall. Cat. 5577. *Cytisus Cajan* Linn. Sp. Pl. 739; Roxb. Flor. Ind. III, 325. *C. pseudo-Cajan* Jacq. Hort. Vindob. t. 119.

ANDAMANS; PERAK; PENANG; MALACCA. **DISTRIB.** Cultivated everywhere in the tropics; probably a native of S.-E. Asia.

### 8. PHASEOLUS Linn.

Twiners, usually herbaceous, with 3-foliolate stipellate leaves. *Flowers* in copious axillary racemes; bracteoles usually conspicuous and persistent. *Calyx* campanulate, the lowest tooth usually longer than the rest and the two uppermost subconnate. *Corolla* much exerted; the keel prolonged into a very long beak which forms a complete spiral. *Stamens* diadelphous; anthers uniform. *Ovary* sessile, many-ovuled; style filiform, twisted round with the keel, conspicuously bearded down the side below the very oblique stigma. *Pod* linear, rarely oblong, subterete or subcompressed, more or less distinctly septate between the seeds. Species about 60, mostly tropical, many widely cultivated, especially in America.

Stipules small basifixed:—

Petals yellow puberulous externally, pods broad subcompressed ... ..

Petals red glabrous, pods narrow subtorulose between seeds 1. *P. lunatus.*  
2. *P. adenanthus.*

Stipules produced below point of insertion (petals yellow, glabrous):—

Pods subcylindric glabrous:—

Stems slender diffuse, racemes subcapitate, leaflets less than half as long as petioles, seeds rounded at ends ... 3. *P. trilobus.*

Stems twining, racemes subspicate, leaflets as long as petioles, seeds subtruncate ... 4. *P. calcaratus.*

Pods slightly compressed, pubescent; (racemes subcapitate, seeds rounded at ends) ... 5. *P. Mungo.*

§ EUPHASEOLUS. Stipules small, basifixed. Pods broad subcompressed.

1. PHASEOLUS LUNATUS Linn. Sp. Pl. 724. A tall twining biennial with stems at first finely downy but soon glabrescent. *Leaves* 6–8 in. long, leaflets 3, pale-green membranous entire rather wide triangular acute, base wide cuneate—of lateral leaflets obliquely, glabrous above minutely sparsely puberulous beneath, 3–4 in. long, 2–2.5 in. wide; petiole 4–6 in. long, and petiolules .2 in. long puberulous; stipels .15 in. long ovate-acute; stipules hardly larger and similar. *Racemes* axillary lax 2–6 in. long peduncles short the lower nodes distant; flowers in fascicles of 2–4, pedicels .35 in. long, bracts minute. *Calyx* .1 in. long minutely 2-bracteolate at the base, puberulous externally teeth wide triangular very short. *Corolla* greenish-yellow .35 in. long puberulous externally. *Pod* decidedly compressed 2–3 in. long, .6–.75 in. wide, .25 in. thick; upper suture recurved, lower widely rounded. DC. Prodr. II, 393; Roxb. Flor. Ind. III, 287; W. & A. Prodr. 244; Miq. Flor. Ind. Bat. I, 194; Bak. in Flor. Brit. Ind. II, 200. *P. vulgaris* Wall. Cat. 5595 not of Linn.

In all the provinces, cultivated.

An American species now widely spread in the old world.

§ LEPTOSPRON Bth. & Hk. f. Stipules medium, basifixed. Pods narrow subcompressed.

2. PHASEOLUS ADENANTHUS G. W. F. Mey. Prim. Flor. Esseq. 239. A spreading glabrescent perennial, with slender rigid stems. *Leaves* 4–6 in. long; leaflets 3 medium to pale green, chartaceous, ovate-acute base cuneate—of lateral leaflets obliquely, nerves on both surfaces at first sparsely puberulous, otherwise glabrous, 2.5–4 in. long, 1.25–2 in. wide; petiole 2.5 in. long channelled above very sparsely hirsute or glabrous, petiolules .2 in. long puberulous; stipels .1 in. ovate adpressed, stipules often reflexed ovate-acute .2 in. long. *Racemes* axillary rather crowded, peduncles 1–4 in. long nodes rather close together; flowers 1–3 from each node, pedicels under .1 in. long, bracts minute. *Calyx* .25 in. long campanulate, teeth deltoid to lanceolate half as long as tube, with 2 ovate bracteoles .1 in. long at its base. *Corolla* pink to purple, showy, 1 in.

long glabrous. *Pod* decidedly compressed 4–6 in. long, .4 in. wide, .2 in. thick upper suture much recurved, subtorulose between the 10–16 brown or red seeds .3 in. long, .25 in. wide, with a small hilum. *Bak.* in *Flor. Brit. Ind.* II, 200. *P. alatus* Roxb. *Hort. Beng.* 54; *Flor. Ind.* III, 288 not of Linn. *P. amarus* Roxb. ex W. & A. *Prodr.* 244. *P. rostratus* Wall. *Pl. As. Rar.* I, 50, t. 63; *Cat.* 5610; W. & A. *Prodr.* 244; Wight, *Ic. t.* 34. *P. truxillensis* H. B. K. *Nov. Gen. & Sp.* VI, 451; *DC. Prodr.* II, 392. *P. senegalensis* Guill. & Perr. *Fl. Seneg.* 217.

ANDAMANS; N. Andaman, *Helper!* S. Andaman, *King's Collector!* Narcondam, growing on the boulders of the higher beach, *Prain!*  
DISTRIB. Cosmopolitan in the tropics.

A very beautiful species not yet reported from the Malay Peninsula proper and not recorded by Prof. Miquel from the Malay Archipelago. It may, however, be found if looked for in the sea-fences of screw-pines along the coasts, this being the habitat chiefly affected by it in the Andaman group.

§ STROPHOSTYLES Bth. & Hk. f. Stipules produced below their point of insertion.

3. PHASEOLUS TRILOBUS Ait. *Hort. Kew.*, ed. I, III, 30. A slender diffuse spreading glabrous or slightly pubescent annual or perennial weed with stems reaching 2–3 feet. *Leaves* 4 in. long; leaflets 3 pale green membranous, 3-lobed or, especially the terminal, at times entire, less often 3-fid to -partite, small suborbicular .75–1 in. in diam. rarely oblong 1.5 in. long by 1 in. wide; petiole long 2–3 in. usually glabrous, petiolules .2 in.; stipels ovate-acute under .1 in.; stipules .25–.5 in. long, ovate-oblong. *Racemes* axillary subcapitate, at ends of erect stoutish peduncles 6–12 in. long, bracts ovate-acute .15–.2 in. long deciduous; pedicels .1 in. *Calyx* campanulate .07–.1 in. yellowish-green, teeth minute deltoid, bracteoles at base lanceolate longer than calyx. *Corolla* yellow .2–.25 in. long glabrous. *Pod* cylindric 1–2 in. long, .15 in. in diam. glabrous straight or slightly recurved, 6–12 seeded. *Roxb.* *Hort. Beng.* 54; *Flor. Ind.* III, 298; *Wall. Cat.* 5588, chiefly; W. & A. *Prodr.* 246; Wight, *Ic. t.* 94; *Miq. Flor. Ind. Bat.* I, 198. *Dolichos trilobus* Linn. *Mantiss.* I, 101; *Burm. Flor. Ind.* 160, t. 50, f. 1; *DC. Prodr.* II, 399. *D. stipulaceus* Lamk, *Encyc. Meth.* II, 300.

ANDAMANS; an introduced weed. DISTRIB. Northern Africa, S.-E. Asia, Malay Archipelago.

An annual crop and a perennial weed throughout its natural area. The perennial form has usually more deeply lobed leaflets; in the annual form lobed and entire leaflets are generally met with in varying proportions on the same plant. Though not as yet recorded from the Malay Peninsula proper, it may be expected to occur there as an introduced weed.

4. PHASEOLUS CALCARATUS Roxb. *Hort. Beng.* 54. A twining annual, or perennial with annual pubescent rarely glabrous stems 6–10 feet long;

rarely suberect with stems 1–2 feet high. *Leaves* usually 4–5 in. long; leaflets 3 membranous sparsely adpressed-pubescent on both surfaces, ovate to lanceolate, acute or shortly acuminate, entire or faintly repand rarely slightly lobed, base of terminal leaflet cuneate of lateral truncate or subauriculately lobed to outer side, 2–4 in. long, 1–2.5 in. wide; petioles 2–4 in. long, pubescent with spreading or slightly reversed hairs, petiolules .15 in. long, pubescent, stipels .15 in. long, glabrous lanceolate, stipules .2–.25 in. long, lanceolate glabrescent. *Racemes* subspicate .75–1.5 in. long, at end of stoutish peduncles 5–8 in. long, pubescent with at first decidedly reflexed hairs; flowers 2–3 together from 6–8 nodes at length .2 in. apart, lower pedicels at length .2 in. long, bracts lanceolate .25 in. long fixed above the base. *Calyx* .15 in. long teeth short deltoid, bracteoles narrowly lanceolate .2 in. long. *Corolla* yellow .5–.75 in. long, glabrous. *Pod* 2.5–3 in. long .2 in. wide, recurved glabrous; *seeds* 10–12 subtruncate at ends with prominent hilum half as long as seed.

VAR. *typica*; stems pubescent. Roxb. Flor. Ind. III, 289; Wall. Cat. 5611; W. & A. Prodr. 245; Bak. in Flor. Brit. Ind. II, 203. *P. hirtus* Wall. Cat. 5593 not of Retz. *P. sublobatus* Wall. Cat. 5598 not of Roxb. *P. pubescens* Blume Cat. Bog. 94; Miq. Flor. Ind. Bat. I, 200.

PERAK; Batu Kuran, common, *Scortechini*! Curtis 2984! ANDAMANS; common, cultivated and as an escape. DISTRIB. S.-E. Asia and Malaya.

VAR. *gracilis*; stems slender, glabrous.

PERAK; Larut, *Scortechini* 1476! Wray 1756! Goping, *Kunstler* 990! Durian, *Kunstler* 1035! 2467! PAHANG; at Pekan, *Ridley* 1124! DISTRIB. Sumatra (*Forbes*).

But for the more slender and glabrous stems there is no character to separate VAR. *gracilis* from *P. calcaratus* which is otherwise a sufficiently variable species. Except that it is described as having subtorulose pods even when old, the writer would have no hesitation in referring *P. luteus* Bl. to VAR. *gracilis*. As a matter of fact the pods of all the varieties of *P. calcaratus* are subtorulose when young, and in Roxburgh's *P. torosus*, which is referable to *P. calcaratus*, they continue so; but, not having seen specimens, the writer does not feel justified in formally reducing Blume's plant, and would leave the matter to be settled by the botanists of the Dutch Indies.

5. PHASEOLUS MUNGO Linn. Mantiss. I, 101. A spreading annual or perennial with slender annual pubescent stems 6–10 feet long, growing in open grassy places (*Kunstler*). *Leaves* 8–10 in. long; leaflets 3 blueish-green membranous ovate-acute, base wide-truncate—of lateral leaflets oblique, sparsely pubescent on both surfaces, 3–5 in. long, 2.5–4 in. wide, petioles 5 in. long sparsely pubescent with spreading hairs,

petiolules .2 in. long densely pubescent, stipels slender subulate .2 in. long, stipules lanceolate sparsely pubescent .3 in. long. *Racemes* dense few-fl. at the end of sparsely pubescent peduncles 4 in. long, bracts lanceolate densely pubescent .3 in. long, pedicels .1 in. *Calyx* .15 in. long puberulous externally, teeth triangular except the lowest lanceolate which is twice as long as the others and half as long as calyx-tube; bracteoles at base as long as bracts but rather narrower. *Corolla* bright yellow .5 in. long glabrous. *Pods* ascending or almost erect, densely clothed with spreading hairs, 1.5–2 in. long, .25 in. wide, compressed, 6–8 seeded. *Seeds* .15 in. long, .1 in. wide, dark brown, flat, oval, hilum one-third as long as seed not very prominent, dissipation between seeds not pronounced. W. & A. Prodr. 245; Wall. Cat. 5889 in part only. *P. radiatus* Roxb. Hort. Beng. 54; Flor. Ind. III, 296; Miq. Flor. Ind. Bat. I, 197 in part, not of Linn. *P. Mungo* VAR. *radiatus* Bak. in Flor. Brit. Ind. II, 203.

PROV. WELLESLEY; at Prye Dock, Curtis 2211! PERAK; at Goping, Kunstler 946! DISTRIB. Wild in S.-E. Asia and also largely cultivated.

Very nearly related to *P. sublobatus* Roxb. (*P. trinervius* Heyne) which differs in having narrower pods, more distinct dissepiments between the much smaller seeds, and a rusty-red pubescence. This is the wild form of the plant cultivated in India as the *mash-kulai* or *urd* crop; though it happens to have been named *P. Mungo* by Linnæus it is quite distinct from the *Mung* plant which has spreading pods with smaller seeds and dark green leaves. The *Mung* is the species named *P. radiatus* by Linnæus.

### 9. VIGNA Savi.

Twining herbs or shrubs with pinnately 3-foliolate stipellate leaves. *Flowers* in copious axillary racemes bracteoles conspicuous. *Calyx* campanulate; teeth short or long, the upper often connate. *Corolla* much exerted; keel truncate or exerted not spirally twisted. *Stamens* diadelphous, anthers uniform. *Ovary* sessile many-ovuled; style long filiform, bearded along the inner face below the oblique stigma. *Pod* linear, subterete, subseptate. Species 40–50, mostly tropical; one widely cultivated.

Keel not prolonged into a beak; pods glabrous:—

- |  |     |     |     |     |                        |
|--|-----|-----|-----|-----|------------------------|
| Stems trailing, pods short few-seeded; a wild sea-coast species                  | ... | ... | ... | ... | 1. <i>V. retusa</i> .  |
| Stems suberect or twining, pods long very many-seeded; a widely cultivated plant | ... | ... | ... | ... | 2. <i>V. Catjang</i> . |
| Keel prolonged into a beak; pods pilose  | ... | ... | ... | ... | 3. <i>V. pilosa</i> .  |

1. VIGNA RETUSA Walp. Rep. I, 778. An extensively spreading perennial trailing sea-coast species with glabrous stems. *Leaves* 3–4 in. long, leaflets 3, pale green, glabrous ovate to obovate thinly fleshy,

entire; apex obtuse or sometimes retuse base cuneate or rounded, 2 in. long, 1.5 in. wide; petiole 1.5 in., glabrous; petiolules .15 in. sparsely hairy, stipels .06 in. recurved lanceolate glabrous, stipules .1 in. lanceolate basifixed. *Racemes* rather densely 12–20-flid. on peduncles 2–6 in. long, nodes 1–2-flid., the lowest .15 in. apart; pedicels slender puberulous .2 in. long, bracts .15 in. long membranous ovate-lanceolate very early deciduous. *Calyx* campanulate faintly puberulous .12 in. long teeth short deltoid. *Corolla* yellow, glabrous, .5 in. long. *Pod* 1.5–2.5 in. long .4 in. wide .25 in. thick, glabrous subtorulose, seeds 4–8. *V. anomala* Walp. Rep. I. 779. *V. lutea* A. Gray in Bot. Wilkes Exped. I, 452; Bak. in Flor. Brit. Ind. II, 205. *Dolichos luteus* Sw. in Prodr. Veg. Ind. Occ. 105; DC. Prodr. II. 398. *Phaseolus obovatus* Grah. in Wall. Cat. 5609.

ANDAMANS and NICOBARS; common on all the coasts from the Coco group and Narcondam south to Katschall and Kamorta. PERAK; *Scortechini!* Ridley 8011! MALACCA; *Griffith!* A cosmopolitan littoral species.

2. VIGNA CATJANG Walp. in Linnæa XIII, 533. A suberect or twining annual with glabrous stems. *Leaves* 4–8 in. long; leaflets 3 membranous pale-green ovate-rhomboid entire or slightly lobed, apex acute base shortly wide-cuneate—of lateral leaflets obliquely, glabrous on both surfaces, 2.5 in. long by 1.75 in. wide or rather larger (VAR. *typica*) to 4 in. long by 3.5 in. or rather less (VAR. *sinensis*); petiole 1.5–4 in. long glabrous, petiolules .15 in. long glabrous or puberulous; stipels ovate obtuse .1 in., stipules .3–4 in. long attached above the base, membranous persistent ovate-lanceolate. *Racemes* subcapitately few-flid. on peduncles usually 1–4 in. long (VAR. *typica*) sometimes 8–12 in. long (VAR. *sinensis*); pedicels short (under .1 in.), bracts membranous, fixed above base, deciduous. *Calyx* glabrous .4 in., teeth deltoid-cuspidate one-third as long as tube. *Corolla* yellow, white, or pinkish .75 in. long. *Pod* 4–24 in. long, .3–4 in. wide, scarcely depressed between the seeds; seeds 12–30 (in much elongated pods the spaces between the seeds are greatly widened). Bak. in Flor. Brit. Ind. II, 205.

VAR. *typica*; suberect, leaves smaller and pods shorter. *V. Catjang* Walp.; Endl. ex Miq. Flor. Ind. Bat. I, 188. *Dolichos Catjang* Linn. Mantiss. 269; DC. Prodr. II, 399; Roxb. Hort. Beng. 55; Flor. Ind. III, 303; Wall. Cat. 5549.

Cultivated in most of the provinces.

VAR. *sinensis*; twining, leaves larger and pods longer. *Vigna sinensis* Endl. ex Hassk. Pl. Jav. Rar. 386; Savi ex Miq. Flor. Ind. Bat. I, 187. *Dolichos sinensis* Linn. Cent. Pl. II, 28; Amoen. Acad. IV, 326; DC. Prodr. II, 399; Roxb. Hort. Beng. 55; Flor. Ind. III, 302;



Wall. Cat. 5550; Bot. Mag. t. 2232; W. & A. Prodr. 250. *D. tranquebaricus* Jacq. Hort. Vidob. III, t. 70; DC. Prodr. II, 400.

Cultivated in most of the provinces.

Widely cultivated in the Eastern Hemisphere; probably a native of S.-E. Asia, but apparently not now known in a truly wild state.

3. *VIGNA PILOSA* Bak. in Flor. Brit. Ind. II, 207. A slender twining perennial with hirsute stems. *Leaves* 5-8 in long, leaflets 3, green, downy to subscribid on both surfaces, entire ovate-acute 3-6 in. long, 1.5-2.5 in. wide, base truncate—of lateral leaflets unequally; petiole 2 in. long, closely downy, petiolules .05 in. only, stipeis subulate minute; stipules 1 in. lanceolate caducous. *Racemes* many-fl'd. 2-3 in. long on peduncles .5-2 in. long, nodes 1-2-fl'd. all close together in flower, at length .15 in. apart, pedicels 1 in. downy, bracts minute. *Calyx* campanulate oblique thinly silky, .3 in. long, lower tooth lanceolate as long as tube one half exceeding the others. *Corolla* purple .75 in. long. *Pod* 4-5 in. long, subcylindric .25 in. in diam., densely hirsute with spreading hairs, septate within between the 8-12 subreniform shining black seeds with truncated ends, .25 in. long .15 in. wide. *Dolichos pilosus* Roxb. Hort. Beng. 55; Flor. Ind. III, 312; DC. Prodr. II, 397; W. & A. Prodr. 249. *Phaseolus difformis* Wall. Cat. 5599.

ANDAMANS; common, *King's Collectors!* *DISTRIB.* India and Indo-China.

#### 10. *PACHYRHIZUS* Rich.

Wide-climbing herbs. *Leaves* pinnately 3-foliolate with stipellate lobed leaflets. *Racemes* long, with tumid nodes and fascicled pedicels; bracts and bracteoles setaceous, caducous. *Calyx* 2-lipped, the limb as long as the tube, the upper lip emarginate, the lower deeply 3-toothed. *Corolla* much exerted, the petals subequal; keel obtuse. *Stamens* diadelphous; anthers uniform. *Ovary* sessile, many-ovuled; style long circinate at the apex, bearded down the inner side below the very oblique stigma. *Pod* large, linear, turgid, deeply depressed between the seeds. Species 2 or 3; the others Mexican and Angolan.

The oldest name for this genus is *Cacara* under which designation it was published by Thouars (*Dict. Sc. Nat.* V, 35) twenty years before Richard's name was issued.

*PACHYRHIZUS ANGULATUS* Rich. ex DC. Prodr. II, 402. A large strong climber with a tuberous root; stems stout, suffruticose, young stems and branches deciduously downy. *Leaves* 8-9 in. long, trifoliolate; leaflets large, membranous glabrous as broad as long base entire deltoid from middle of circumference anterior half deeply or shallowly lobed, 4 in. long, as much across; petiole 5-6 in. long glabrous, petiolules .2 in.

long pubescent; stipels .1 in. subulate, stipules lanceolate puberulous .2 in. long. *Racemes* lax elongated 6–10 in. long on axillary peduncles 12 in. long and upwards, nodes 2–6-fld., lower sometimes 1 in. apart often produced into branches .5 in. long; bracts lanceolate .25 in. long silky. *Calyx* campanulate, teeth triangular, nearly equalling tube, .25 in. long, pedicels .3 in. long, bracteoles setaceous silky shorter than calyx. *Corolla* purple 1 in. long. *Pod* at first adpressed-pubescent, at length almost glabrous 6–9 in. long .5 in. wide, .2 in. thick, deeply depressed along the valves between the 7–12 shining cinnamon-brown flattened seeds .3 in. long, .25 in. wide. Wall. Cat. 5526; W. & A. Prodr. 251; Miq. Flor. Ind. Bat. I, 191; Bak. in Flor. Brit. Ind. II, 207. *P. trilobus* DC. Prodr. II, 402. *Dolichos erosus* Linn. Sp. Pl. 726. *D. bulbosus* Linn. Sp. Pl., Ed. II, 1020; Roxb. Flor. Ind. III, 309. *D. trilobus* Lour. Flor. Cochinch. II, 535. *Cacara erosa* Kuntze Rev. Gen. Pl. I, 165.

Cultivated in most of the provinces. **DISTRIB.** Cosmopolitan in the tropics, probably originally American.

This is known, Mr. Curtis notes, as *Obie Songnang* in the Island of Penang. The large tuberous root, white outside and inside of the appearance and consistence of a turnip, is occasionally, according to Dr. Watt's *Dictionary of Economic Products*, 6–8 feet long and as thick as a man's thigh. It is eaten both cooked and uncooked, is palatable enough but rather insipid. If the rules as to priority of names be rigidly applied this must be known as *Cacara erosa* Kuntze.

## 11. DOLICHOS Linn.

Twining herbs with stipellate 3-foliolate leaves and minute subpersistent bracts bracteoles and stipules. *Flowers* racemose or axillary. *Calyx-tube* campanulate, teeth long or short. *Corolla* much exserted; its petals usually equal in length; keel obtuse or rostrate not spiral. *Stamens* diadelphous; anthers uniform. *Ovary* nearly sessile, many-ovuled; style thickened upwards and bearded down the inner edge or filiform and penicillate round the terminal stigma. *Pod* flat, linear or oblong, recurved. Species about 20, wide-spread in the tropics of both hemispheres.

The only species so far reported from the Malay Peninsula belongs to the group LABLAB, with a style thickened upwards from a narrow base, bearded down the inner edge. This group is treated by Baker as a subgenus, by Taubert as a section, of *Dolichos*. De Candolle, Wight & Arnott, and Kurz consider however, with Savi, that it would be preferable to deal with this as the type of a distinct genus *Lablab*.

DOLICHOS LABLAB Linn. Sp. Pl. 725. A tall subglabrous wide twining perennial or annual with round smooth or slightly downy stems. *Leaves* 4–12 in. long, 3-foliolate; leaflets entire ovate-acute, base cuneate or deltoid, rather pale green, glabrous or slightly pubescent beneath,

2-6 in. long and almost as broad; petiole 2-8 in. long, glabrous; petiolules 2 in. long puberulous; stipels 15 in. long subulate smooth; stipules lanceolate 2 in. long basifixed. *Racemes* lax 6-9 in. long on peduncles 5-8 in. long; pedicels fascicled 15-25 in. long on nodes 5-75 in. apart; bracts early deciduous. *Calyx* 2 in., teeth short deltoid, bracteoles oblong 15-2 in. *Corolla* white or pink 6 in. long. *Pod* 1.5-2 in. long (in one rather unusual form 3 in. long) tipped with the hooked persistent base of the style. Bak. in Flor. Brit. Ind. II, 209.

VAR. *typica*; pods longer, seeds with long axis along the pod. *D. Lablab* Linn. Sp. Pl. 725. *D. lignosus* Roxb. Flor. Ind. III, 305 not of Linn. *Lablab vulgaris* Savi, Diss. 19; DC. Prodr. II, 401; W. & A. Prodr. 250; Miq. Flor. Ind. Bat. I, 189. *D. cultratus* Forsk. Flor. Ægypt. Arab. 134.

PERAK; cultivated, *Scortechini*! ANDAMANS; cultivated, common. Cultivated everywhere in the tropics of the Old World.

VAR. *lignosa*; pods shorter broader at the end, seeds with long axis across the pod. *D. lignosus* Linn. Sp. Pl. 726. *D. Lablab* Roxb. Flor. Ind. III, 307 not of Linn. *D. cultratus* Thunb. Trans. Linn. Soc. II, 320 not of Forsk. *Lablab cultratus* DC. Prodr. II, 402; W. & A. Prodr. 251; Miq. Flor. Ind. Bat. I, 190. *L. microcarpus* DC. Prodr. II, 402; Miq. Flor. Ind. Bat. I, 190.

ANDAMANS; cultivated. Cultivated throughout south-eastern Asia.

In deference to the great authority of Mr. Baker these two very distinct plants are united specifically; they are however so different that they must be treated as at least separate varieties.

## 12. PSOPHOCARPUS Neck.

Twining herbs, with large tuberous roots. *Leaves* 3-foliolate, stipelate; stipules fastened above the base. *Flowers* rather large, lilac. *Calyx* teeth shorter than the tube, the two upper connate. *Corolla* much exserted, the petals equal in length; keel much incurved, but not beaked. *Stamens* monadelphous, the upper free downwards; anthers uniform. *Ovary* substipitate, many-ovuled; style long, much recurved, flattened laterally, densely bearded round the terminal stigma. *Pod* square, with a distinct wing to each angle, distinctly septate between the seeds. Species 3-4, all tropical in the Old World.

PSOPHOCARPUS TETRAGONOLOBUS DC. Prodr. II, 403. A slender annual glabrous twiner with tuberous roots. *Leaves* 5-10 in. long; leaflets 3 ovate, acute or acuminate, base rounded or wide-cuneate, margin entire or slightly wavy, glabrous, green above, paler sometimes slightly glaucescent beneath, 3-6 in. long, 2-6 in. wide; petiole 2-4 in.

glabrous, petiolules .15 in. sparsely hairy along the sides; stipels lanceolate, glabrous .1 in. long, stipules oblanceolate acute towards both ends from the almost median insertion, .3 in. long, glabrous. *Racemes* lax 4–6 fld.; peduncles 2–6 in. long; pedicels geminate .5 in. long, bracts small ovate, .08 in. long. *Calyx* campanulate glabrous oblique; upper connate teeth rounded emarginate, lateral oblong rather exceeding lowest; bracteoles 2 ovate, striate, glabrous, attached slightly above the base .15 in. long twice as large as bracts, half as long as buds. *Corolla* blue or white 1.5 in. long. *Pod* 6–12 in. long, 1.35 in. wide, the wings along the angles membranous .5 in. wide their margins crisped dentate and lacinate; seeds 8–16, rounded. W. & A. Prodr. 252; Hassk. Pl. Jav. Rar. 388 (VAR. *a.* only); Miq. Flor. Ind. Bat. I, 181 (VAR. *a.* only). *Dolichos tetragonolobus* Linn. Syst., Ed. X, 1162; Roxb. Flor. Ind. III, 305 (in part). *D. ovatus* Grah. in Wall. Cat. 5540.—Rumph. Herb. Amb. V. t. 133.

SINGAPORE; *Hullett* n. 75!

Cultivated throughout Southern Indo-China and Malaya.

### 13. CLITORIA Linn.

Scandent or suberect undershrubs, with showy flowers, 3–7-foliolate leaves, stipellate leaflets and persistent membranous small stipules and bracts and large bracteoles. *Calyx* membranous, tubular; teeth deltoid or lanceolate. *Corolla* much exerted; standard spoon-shaped, very large; wings and incurved keel much shorter. *Stamens* monadelphous or diadelphous; anthers uniform. *Ovary* stalked, many-ovuled; style incurved, flattened, bearded along the inner side. *Pod* linear, flattish or turgid. Species 27, in tropics of old and new world, mostly the latter.

Pod flattish, valves not keeled on the face (SUBGEN.

*Ternatea*); stems scandent ... .. 1. *C. Ternatea*.

Pod turgid, with a rib along face of valves (SUBGEN.

*Neurocarpum*); stems suberect ... .. 2. *C. cajanifolia*.

1. CLITORIA TERNATEA Linn. Sp. Pl. 753. A climber with slender terete downy stems. *Leaves* 4 in. long, petiole .75 in., rachis glabrous; leaflets terminal and in 2–3 opposite pairs ovate or oblong obtuse subcoriaceous; 1–2 in. long .75–1 in. wide, stipules small .2 in. long lanceolate, stipels minute linear. *Flowers* axillary solitary pedicels .35–.5 in., bracteoles large roundish obtuse .25–.5 in. long. *Calyx* .5–.75 in.; teeth lanceolate nearly as long as tube. *Corolla* 1.5–2 in. long; standard 1 in. broad, bright blue with an orange centre or (in a commonly cultivated form) white. *Pod* flattish, valves smooth, 2–4 in. long, .35 in. wide, sparsely hirsute; 6–10-seeded. DC. Prodr. II, 233; Bot. Mag. t. 1542; Roxb. Flor. Ind. III, 321; Wall. Cat. 5344; Miq. Flor. Ind. Bat. I, 226; Bak. in Flor. Brit. Ind. II, 208.

ANDAMANS; commonly cultivated. PANGKORE; *Scortechini!* **DISTRIB.**; common throughout the tropics in gardens and as an escape.

2. *CLITORIA CAJANIFOLIA* Benth. in Mart. Flor. Brasil. XV, 121. A suberect undershrub with terete pilose branches. *Leaves* 2-3.5 in. long; petiole .1 in. and rachis adpressed-pilose; leaflets terminal and in 1 lateral pair lanceolate or oblanceolate obtuse subcoriaceous 2-5 in. long, .75-1 in. wide, glabrous above, densely grey-canescens beneath; stipules shortly triangular, pubescent, stipels subulate. *Flowers* axillary usually 2 on a pubescent peduncle 1-1.5 in. long; bracteoles small ovate or lanceolate. *Calyx* .75 in. long, teeth much shorter than tube. *Corolla* 1.5-2 in. long; standard 1.5 in. wide pale-violet with a dull-purple centre. *Pod* turgid, with a rib along face of valves, 1.25 in. long, .35 in. wide quite glabrous, 5-7 seeded. Bak. in Flor. Brit. Ind. II, 209. *Neurocarpum cajanifolium* Presl, Symb. 17, t. 9; Miq. Flor. Ind. Bat. I, 225. *N. retusum* Hassk. Pl. Jav. Rar. 376. *Lotus fluminensis* Vell. Flor. Flum. VII, t. 152.

MALACCA and SINGAPORE, in old clearings, common. **DISTRIB.** A native of Brazil now naturalised in the localities mentioned, in Java, and in Siam.

#### 14. *CENTROSEMA* Benth.

Twining herbs or shrubs; stems with woody base. *Leaves* pinnately 3-foliolate, stipellate; stipules persistent basifixed. *Flowers* very large and showy with persistent bracts and large persistent bracteoles. *Calyx*-teeth short the upper pair connate or obsolete. *Corolla* much exserted; standard orbicular emarginate shortly spurred near base, longer than the falcate obovate wings and the broad incurved slightly shorter keel. *Stamens* usually diadelphous; anthers uniform. *Ovary* subsessile, many-ovuled, style incurved dilated at the apex, stigma terminal beardless. *Pod* subsessile linear flattened, 2-valved, slightly septate between the seeds, both sutures thickened and both valves strongly ridged along the face parallel to the sutures. Species about 25, all American.

Dr. Kuntze states (*Rev. Gen. Pl.* I, 163) that *Bradburya* Raf., reduced in the *Index Kewensis* to *Wistaria*, is in reality this genus, and that Rafinesque's description refers to *Centrosema virginianum* a species widely cultivated in Asia and now quite naturalized in Java though not yet reported as an escape in our area.

*CENTROSEMA PLUMIERI* Benth. in Ann. Wien. Mus. II, 118. A large climber with woody base and twining slender firm glabrous or puberulous branches. *Leaves* 6-10 in. long; leaflets 3 papery dark green glabrous above puberulous on the nerves beneath broadly ovate acute or acuminate 3-6 in. long, 2.5-5 in. across; petioles 3-6 in., glabrous or puberu-

lous; petiolules .15 in. pubescent; stipels .25 in. long, lanceolate; stipules ovate-oblong persistent subscarious .4 in. *Racemes* 2-6-fld., peduncles thick 1-2 in. long, pedicels usually geminate .1-.15 in. long, bracts pubescent orbicular-cucullate as long as pedicels. *Calyx* .25 in. long, oblique wide-campanulate glabrescent, upper tooth very short, lateral wide blunt, lower longer lanceolate, completely hidden by the large persistent coriaceous striate ovate obtuse bracts .6-.75 in. long. *Corolla* large, standard 1.75 in. long, 1.5 in. wide, white, or white with crimson centre, pubescent externally; wings white tipped with violet or rose 1 in. long, .5 in. wide; keel sometimes white, sometimes crimson. *Pod* 6 in. long, .5 in. wide, straight, beaked by the persistent style 1 in. long, both sutures thickened, the lower with narrow longitudinal wings .1 in. remote from the suture; seeds 10-12 oblong or subglobose, hilum oblong-linear. Mart. Flor. Bras. XV, I, 127. *Clitoria Plumieri* Juss. in Pers. Synops. II, 303; Edwards, Bot. Reg. IV, 268. *C. fluminensis* Vell. Flor. Flum. VII, 312, t. 128. *Cruminium giganteum* Desv. Ann. Sc. Nat. Ser. I, IX, 423.

PERAK; at Kampar, *Curtis* 3140! SINGAPORE; *Hullett* 57! 669! no doubt an escape from gardens, as it also is in Sumatra where it has been found growing in forests near Lampar (*Forbes* n. 2599!) A native of South America; cultivated in Asiatic gardens on account of its handsome flowers.

#### 15. TERAMNUS Sw.

Twining herbs, of slender habit. *Calyx-tube* campanulate; teeth distinct, subequal or two upper not so long. *Corolla* little exerted; petals about equal in length; standard not spurred. *Stamens* monadelphous; alternate anthers small, abortive. *Ovary* sessile, many-ovuled; style short, curved, beardless, stigma capitate. *Pod* linear, hooked with the persistent style at the tip, flattish, septate between the seeds. Species 4, belting the world in the tropics.

TERAMNUS LABIALIS Spreng. Syst. III, 235. A wide-spreading climber of slender habit with a few adpressed hairs on the stem. *Leaves* 2.5-4.5 in. long, petiole 1-1.5 in. sparsely adpressed-hirsute; leaflets 3 membranous or subcoriaceous ovate-oblong base rounded apex subacute or at times, especially of lateral pair, obtuse, terminal 1-2.5 in. long 7.5-1.5 in. wide, lateral slightly smaller, green glabrescent above sparsely adpressed-hirsute beneath; stipules minute lanceolate deciduous .15 in. long, stipels subulate .1 in. *Inflorescence* of elongated lax axillary 8-12-fld. racemes 2-3 in. long; pedicels .2 in. solitary below fascicled upwards, bracts narrowly lanceolate .1 in. long, bracteoles close under calyx minute subulate. *Calyx* .15-.2 in. long, 2-labiate, teeth subequal

lanceolate about as long as the narrowly campanulate tube. *Corolla* .25 in. long reddish, standard emarginate, wings overarching the slightly shorter keel. *Pod* glabrous recurved linear 1.5–2 in. long, .2 in. broad, 8–12 seeded. Benth. in Journ. Linn. Soc. VIII, 265; Bak. in Flor. Brit. Ind. II, 184. *Glycine labialis* Linn. fl. Suppl. 325; Roxb. Flor. Ind. III, 318; W. & A. Prodr. 208; Wight, Ic. t. 168; Miq. Flor. Ind. Bat. I, 222. *G. parviflora* DC. Prodr. II, 242; Wall. Cat. 5508 (excl. G., H.) *G. debilis* DC. Prodr. II, 242. *G. pallens* Grah. in Wall. Cat. 5518.

PENANG; Wallich 5518! **DISTRIB.** Throughout the tropics.

**VAR. mollis** Baker (*Teramnus mollis* Benth), should be looked for in the Malay Peninsula, for though it has not yet been reported from our area it occurs in Burma where it has been collected by Wallich and by Kurz, and again in Java where it appears to be commoner than *T. labialis* proper. It is distinguished from *T. labialis* by the presence of spreading hairs on the stem and by the pods being strigosely hirsute with long spreading hairs. Its leaflets also are densely pubescent beneath and its calyx-teeth are shorter than the tube.

## 16. DIOCLEA H. B. K.

Climbing shrubs. *Leaves* pinnately 3-foliolate, stipellate. *Flowers* blue or white, in elongated racemes with thickened nodes; bracts and bracteoles caducous. *Calyx*-tube campanulate, teeth shorter than tube, two upper quite connate. *Corolla* exerted; petals about equal in length; keel incurved but not beaked. *Stamens* monadelphous; the vexillary stamen free below connate with the others in the middle shorter than the rest and with a perfect anther; anthers of keel stamens (in Malay species) alternately perfect and abortive. *Ovary* subsessile hirsute, few-ovuled, style incurved beardless, stigma capitate. *Pod* oblong turgid 1–3-seeded, flattened along the upper suture. Species 17–18, one Indo-Malayan, one extending to Africa and America, the rest tropical American.

Leaflets glabrescent beneath, larger; flowers .75 in. long; calyx

teeth half as long as tube ... .. 1. *D. reflexa*.

Leaflets densely velvety beneath; flowers 1 in. long; calyx teeth

wider one-third the length of tube ... .. 2. *D. javanica*.

1. **DIOCLEA REFLEXA** Hook. f. Niger Flora 306. A strong woody climber 20–30 feet long with rounded black early glabrescent branches. *Leaves* 3-foliolate 9 in. long; leaflets 3, dull green above paler beneath, subcoriaceous when young sparsely hairy on both surfaces but early becoming glabrous above and glabrous except for a few adpressed hairs on the nerves beneath, ovate shortly acuminate with subtruncate base 5 in. long 3 in. across, petiole 4 in. long channelled above sparingly adpressed hirsute; petiolules .25 in. rusty pubescent, stipels .2 in. long, subulate,

stipules lanceolate .25 in. long, deciduous. *Inflorescence* in dense subspicate racemes 6 in. long on axillary peduncles 8–12 in. long with 2–3 widely separated empty bracts; rachis rusty-tomentose, flowers 2–3 together on rounded alternate nodes .2–.25 in. apart; bracts .5 in. long linear reflexed rusty-pubescent early deciduous. *Calyx* campanulate .4 in. long with two small obtuse bracteoles at base; pedicels .15 in. long rusty-puberulous; calyx teeth subequal except the broader truncate upper triangular, half as long as tube. *Corolla* pale-pink .75 in. long, standard-limb orbicular emarginate. *Pods* few, 1–2-seeded; 3–4 in. long, 2 in. wide, .5 in. thick along upper suture, at first sparsely adpressed rusty-silky at length glabrescent; seeds discoid dark brown 1.25 in. in diam. Bak. in Flor. Brit. Ind. II, 196. *Dolichos hexandra* Roxb. Hort. Beng. 55. *D. coriaceus* Grah. in Wall. Cat. 5562.

ANDAMANS; very common, *Helper* 1752! *King's Collectors!* PENANG or SINGAPORE; *Wallich!* PERAK; Larut, *Kunstler* 5718! *DISTRIB.* Silhet; trop. Africa; trop. America.

The vexillary stamen in this and the next species is free at the base though not above; it is rather shorter than the others and bears a perfect anther; the anthers of the 9 stamens that constitute the keel-sheath are alternately perfect and abortive thus giving 5 perfect anthers on the sheath and a sixth perfect anther on the vexillary stamen; hence Roxburgh's excellent specific name.

Dr. Wallich did not obtain this species at Penang and Singapore; his note on the sheet of *Cat.* n. 5562 at Calcutta states that he had forgotten the precise locality but was of opinion that he obtained the specimen either at Penang or at Singapore.

2. *DIOCLEA JAVANICA* Benth. Pl. Jungh. 236. A rather slender woody climber 20–30 feet long with rounded black early glabrescent branches. *Leaves* 3-foliolate 6–7 in. long; leaflets dull green above, coriaceous, beneath densely rusty-velvety, ovate shortly acuminate with subtruncate base 4 in. long 2.25 in. across, petiole 2–3 in. long channelled above, rusty-velvety; petiolules .25 in., velvety, stipels .2 in. long subulate; stipules lanceolate .25 in. long, deciduous. *Inflorescence* in dense subspicate racemes 6 in. long on axillary peduncles 8–12 in. long with 2–3 widely scattered empty bracts; rachis densely velvety, flowers 2–3 together on rounded alternate nodes .2–.25 in. apart; bracts .5 in. long linear reflexed rusty-pubescent early deciduous. *Calyx* campanulate .5 in. long with two small obtuse bracteoles at base; pedicels .15 in. long rusty-puberulous; calyx teeth subequal except the broader truncate upper wide triangular, one-third as long as tube. *Corolla* pale-pink 1 in. long, standard-limb orbicular. *Pods* few usually 1–2-sometimes 3-seeded; 3–5.5 in. long, 2 in. wide, .5 in. thick along upper suture; at first densely rusty-tomentose at length glabrescent; seeds discoid 1.25 in. in diam. Miq. Flor. Ind. Bat. I, 217. *D. Fergusoni* Thwaites Enum. 412.



PERAK; Larut, *Kunstler* 5196! 10320! *Wray* 2000! MALACCA; *Maingay* 520! **DISTRIB.** Ceylon; Chittagong; Java.

Very nearly related to the preceding and perhaps only a form of that species. At the same time the characters by which they are separable are very constant in all the specimens of both that the writer has seen, and from the field-botanist's point of view, at least, it is just as well to follow Mr. Benthams in separating them.

### 17. PUERARIA DC.

Twining shrubs or herbs with stipellate pinnately 3-foliolate leaves; leaflets sometimes palmately lobed. *Flowers* sometimes appearing before leaves, large or small, densely fascicled, in long often compound racemes. *Calyx* teeth long or short the two upper connate. *Corolla* distinctly exerted; standard usually spurred at the base equalling in length the obtuse wings and keel. *Stamens* more or less thoroughly monadelphous; anthers uniform. *Ovary* sessile or nearly so, many-ovuled; style filiform much incurved beardless, stigma capitate. *Pod* linear, flattish. *Species* about 12, mostly Indo-Chinese.

1. PUERARIA PHASEOLOIDES Benth. in *Journ. Linn. Soc.* IX, 125. A slender creeper 20-30 feet long with adpressed-pubescent slender hardly woody stems, and slender twining branches clothed with spreading greyish-brown hairs. *Leaves* contemporaneous with flowers, 6-8 in. long; leaflets 3, membranous dull-green thinly adpressed-hirsute above, dark greenish-grey and densely velvety-tomentose beneath, triangular ovate base wide cuneate—of lateral pair obliquely, apex subobtuse margin entire repand or slightly 3-lobed, sub-3-nerved at base, 3-4 in. long, 2-3 in. wide, petiole 3-4 in., densely clothed with spreading hairs, petioles 2 in. long; stipules small subulate weak 1 in. long, stipules small lanceolate basifixed. *Inflorescence* of long-peduncled axillary racemes of fascicled flowers; peduncle 6-8 in. and rachis puberulous; racemes 4 in. long, fascicles 25-5 in. apart 4-5-fl., pedicels 2 in. puberulous, bracts and bracteoles lanceolate rather rigid clothed with adpressed bristly hairs, the bracteoles subpersistent. *Calyx* campanulate 25 in. long clothed with adpressed bristly hairs, teeth unequal upper broad, and lower lanceolate as long as tube and one-third larger than lateral triangular, all setaceous at tip. *Corolla* pale-blue and white, 6 in. long, standard-limb suborbicular distinctly spurred. *Pods* numerous, at first puberulous, at length glabrescent slightly recurved at the tip, 35 in. long only 2 in. wide. *Seeds* about 16, 15 in. long 1 in. wide, truncate at ends, dark brown, testa dull minutely rugulose. *Bak.* in *Flor. Brit. Ind.* II, 199 (excl. syn. *P. subspicata* Bth.). *Dolichos phaseoloides* Roxb. *Flor. Ind.* III, 316. *D. viridis* Ham. in *Wall. Cat.* 5559. *Neustanthus phaseoloides* Benth. *Pl. Jungh.* 235; *Miq. Flor. Ind. Bat.* I, 219. *Phaseolus decurvus* Grah. in *Wall. Cat.* 5612.

ANDAMANS; at Port Blair, *Prain!* PENANG; *Wallich* 5612! PERAK; Goping, *Kunstler* 1062! 2456! 5117! *Scortechini* 591! 1441! Ipoh, *Curtis* 3151! DISTRIB. S.-E. Asia.

## 18. CANAVALIA DC.

Large twining perennials or biennials with stipellate pinnately 3-foliolate leaves and showy flowers. *Calyx* deeply tubular, limb 2-labiate, the upper lip projecting, entire or emarginate the lower shortly 3-toothed. *Corolla* far exserted; standard large roundish; wings shorter equalling the incurved obtuse keel. *Stamens* monadelphous; anthers uniform. *Ovary* obscurely stalked many-ovuled; style incurved beardless, stigma terminal. *Pod* large linear or oblong, flat or turgid with a longitudinal ridge along each margin of the flattened upper suture. Species 10-12, mostly American.

Pods not turgid, deeply double-channelled along the dorsal suture:—

Pods 1·5-2 in. across; flowers many	...	...	1. <i>C. ensiformis</i> .
Pods ·5-·75 in. across; flowers few	...	...	2. <i>C. lineata</i> .
Pods turgid, almost flat along the dorsal suture; endocarp separating	...	...	3. <i>C. obtusifolia</i> .

1. CANAVALIA ENSIFORMIS DC. Prodr. II, 404. A large biennial or perennial climber with glabrous stems and branches. *Leaves* 3-foliolate 10-12 in. long; leaflets green paler beneath, membranous, when young puberulous, very soon quite glabrous ovate-acute, base rounded—in lateral pair slightly obliquely; 5-6 in. long, 2·5-4 in. wide; petiole 6 in. long glabrous, petiolules ·25 in.; stipels ·15 in. subulate very early deciduous; stipules small triangular ·1 in. long, caducous. *Inflorescence* in lax 12-20-fl. racemes 3-8 in. long on axillary peduncles 4-6 in. long; flowers solitary or geminate from swollen nodes ·3-·5 in. apart, pedicels ·1-·15 in., bracteoles minute ovate caducous. *Calyx* campanulate, sparsely puberulous reticulate-veined ·6 in. long, upper lip oblong emarginate one-third the length of tube. *Corolla* lilac or white 1·5 in. long, limb of standard orbicular emarginate. *Pods* few, long, linear-oblong, slightly curved, dorsal suture strongly 3-keeled and deeply 2-grooved between the keels, 5-20-seeded, in length varying from 6-24 inches, in depth from 1·5-2 in., distance between outer ridges of dorsal suture ·5 in. *Seeds* white, grey or more usually red, 1·25 in. long, ·75 in. wide. *Bak. in Flor. Brit. Ind.* II, 195. *C. gladiata* DC. Prodr. II, 404; *Wall. Cat.* 5531; *W. & A. Prodr.* 253; *Miq. Flor. Ind. Bat.* I, 216. *Dolichos ensiformis* Linn. Sp. Pl. 725. *D. gladius* Jacq. Coll. II, 276; *Roxb. Hort. Beng.* III, 300.

In some of the provinces, cultivated; as it almost universally is throughout the tropics.

The writer follows Mr. Baker in identifying the American *Dolichos gladiatus* (*Canavalia gladiata* DC.) with the Asiatic *Dolichos ensiformis* (*Canavalia ensiformis* DC.)

2. CANAVALIA LINEATA DC. Prodr. II, 404. A glabrous perennial on rocky or sandy sea-coasts. *Leaves* 3-foliolate 8-9 in. long; leaflets pale-green thickly membranous ovate or orbicular, obtuse with or without a short point, or retuse, base cuneate, 2-3 in. long and 2-3 in. across; petiole 3-5 in. long somewhat fleshy, glabrous; petiolules .25 in., stipels .15 in. subulate very early deciduous; stipules small triangular .1 in. long caducous. *Inflorescence* in long-peduncled 4-8-fld. racemes on peduncles 10-16 in. long; flowers solitary or geminate from swollen nodes .3-.5 in. apart, pedicels .1-.15 in. bracteoles minute ovate caducous. *Calyx* campanulate sparsely puberulous reticulate-veined .6 in. long, upper lip oblong subentire one-fourth the length of tube. *Corolla* violet 1 in. long, limb of standard orbicular emarginate. *Pods* few, short, linear-oblong, straight, dorsal suture strongly 3-keeled and deeply 2-grooved between the keels, 4-6-seeded, 3-5 in. long, .75 in. deep; width between outer ridges of dorsal suture .3 in. *Seeds* dark-brown .5 in. long. Somoko-Dusets XIII, t. 20. *Dolichos lineatus* Thunbg. Flor. Japon. 280. *D. obcordatus* Roxb. Flor. Ind. III, 303. *Canavalia obtusifolia* Bak. in Flor. Brit. Ind. II, 196, not of DC; Cleghorn, Madr. Journ. (n. s.) I, t. 4.

PAHANG; Sungei Kelang, Ridley! PENANG; common on sand-banks along the coast, Curtis 1714! SINGAPORE; Hullett 514! DISTRIB. Coasts of India, Indo-China, Malaya, China, Japan, Polynesia, Australia.

3. CANAVALIA OBTUSIFOLIA DC. Prodr. II, 404. A large biennial climber with glabrous stems and branches. *Leaves* 3-foliolate 10-12 in. long; leaflets green, membranous, when young puberulous very soon quite glabrous, ovate-acute to rounded with a shortly acuminate tip, base rounded to subtruncate; 5-6 in. long 3.5-4.5 in. wide; petiole 6 in. long, glabrous; petiolules .25 in.; stipels .15 in. subulate, very early deciduous; stipules small triangular .1 in. long, caducous. *Inflorescence* in lax 12-16-fld. racemes 3-8 in. long, on axillary peduncles 6-12 in. long; flowers solitary or geminate from swollen nodes .3-.5 in. apart, pedicels .1-.15 in., bracteoles minute ovate caducous. *Calyx* campanulate, sparsely puberulous, faintly ridged and not very distinctly reticulate-veined, .5 in. long, upper lip rounded hardly emarginate, scarcely longer than lower and not one-sixth the length of tube. *Corolla* blue and white, 1 in. long, limb of standard orbicular slightly emarginate. *Pods* few, short, turgid, slightly curved, dorsal suture faintly 3-keeled, spaces between keels wide and plane, not grooved, 3-6-seeded, length 3-5 in., depth 1.75-2.25 in., width of dorsal suture between outer keels .75 in. *Seeds* pale umber with gamboge streaks, .75 in. long .5 in. broad,

embedded in the woolly separable endocarp. Miq. Flor. Ind. Bat. I, 215. *C. turgida* Grah. in Wall. Cat. n. 5534 A; Miq. in Flor. Ind. Bat. I, 215. *C. ensiformis* VAR. *turgida* Bak. in Flor. Brit. Ind. II, 196. *Dolichos obtusifolius* Lamk. Encyc. Meth. II, 295. *D. rotundifolius* Vahl, Symb. II, 81; Roxb. Flor. Ind. III, 302.—Rheede Hort. Malab. VIII, t. 43; Pluken. Almag. t. 51, f. 2.

ANDAMANS; Coco Group and Narcondam, *Prain!* Mid. Andaman, *Kurz!* S. Andaman, *Kurz!* *Man!* *King's Collector!* Little Andaman, *Prain!* PERAK; *Scortechini* 1391! *Kunstler* 1123! PANGKORE; *Scortechini* 978! PENANG; *Wallich* 5534! SINGAPORE; Pulo Obin, *Hullett* 330! DISTRIB. Indian, Indo-Chinese and Malayan coasts.

There is no doubt that, in the first place, this is *C. obtusifolia* DC.; that, in the second place, it is not *C. obtusifolia* Bak., in *Flor. Brit. Ind.*; and that, finally, it is specifically distinct from *C. ensiformis* of which the *Flora* makes it a variety. It is however, particularly unfortunate that, while the leaflets of *C. lineata* are almost always "obtuse," those of *C. obtusifolia* rarely are.

### 19. MUCUNA Adans.

Perennials and annuals of wide-twining habit. *Leaves* ample, stipellate, always 3-foliolate, *Flowers* large, showy, usually dark purple, turning quite black when dried. *Calyx-tube* campanulate; two upper teeth quite connate; lowest longer than the middle ones. *Corolla* much exserted; standard not more than half as long as the rostrate keel, which usually a little exceeds the wings. *Stamens* diadelphous; anthers dimorphous, like those of the *Genistææ*. *Ovary* sessile, many-ovuled; style incurved, beardless, stigma capitate. *Pod* very variable in shape and sculpture, usually covered with brittle needle-like irritating bristles. *Species* about 30, spread everywhere in the tropics.

Perennials; pods flat, seeds large flattened, with a hilum extending round the greater part of their periphery (Subgen. ZOOPHTHALMUM):—

Pods with plaits across their faces (§ *Citta*):—

Racemes long lax simple, bracts large boat-shaped; pods with broad wings, over which the plaits do not extend, down the sutures .. .. . 1. *M. imbricata*.

Racemes short corymbose, bracts small; pods with transverse plaits that extend across the usually narrower sutural wings:—

Peduncles naked at base; bracteoles longer than buds; calyx-teeth long; pods one-seeded; margins of transverse plaits simple, and of sutural wings entire 2. *M. monosperma*.

Peduncles bracteate at base; bracteoles shorter than buds; calyx-teeth very short; pods two-seeded; margins of plaits 2-plicate, and of sutural wings incised ... .. 3. *M. bispicata*.

Pods without plaits across their faces (§ *Carpopogon*);  
(wide-winged down both sutures):—

Racemes short corymbose, bracts large boat-shaped ... 4. *M. acuminata*.

Racemes long-peduncled, umbelliform, bracts minute... 5. *M. gigantea*.

Annuals; pods turgid, hooked; seeds small oval with small  
lateral hilum (Subgen. *STIZOLOBIUM*) ... 6. *M. pruriens*.

SUBGEN. 1. *ZOOPHTHALMUM*. Perennial climbers; seeds large more or less flattened, with a long hilum extending round the greater part of the periphery.

§ *CITTA*. Pods plaited across their faces.

1. *MUCUNA IMBRICATA* DC. Prodr. II, 406. A large woody climber with slender glabrescent branches. *Leaves* 9–15 in. long: leaflets 3, membranous, green, glabrous above, glabrous or with a few adpressed hairs beneath, ovate-oblong cuspidate, base rounded—of lateral leaflets obliquely, 5–7 in. long, 3–3.5 in. across, petiole glabrous 4–8 in. long, petiolules .2 in., stipels subulate .15 in.; stipules linear .25 in. long. *Inflorescence* of lax 8–10-fl. axillary racemes, pedicels .35 in. long 1–3 together from swollen nodes towards upper third to fourth of peduncle 5–15 in. long, and in the axils of large boat-shaped deciduous bracts 1.25 in. long 1 in. wide glabrous on both surfaces rounded at apex except the acute or subacute lowest, forming at first a strobilate head. *Calyx* .75 in. long sparsely covered externally with brown deciduous irritating bristles, tube wide-campanulate hardly longer than the wide triangular teeth; flower-buds with a bracteole similar to bracts but much smaller and more early deciduous, at base of calyx. *Corolla* 2–2.25 in. long dull purple or white with purple spots; keel abruptly inflexed at tip standard 1 in. across 1.25 in. long; wings .5 in. wide. *Pod* oblong 4.5–6 in. long 2.25 in. across, wings along the sutures .5 in. wide, plaits .35 in. deep hardly crossing the wings; clothed in all parts with brown deciduous bristles; seeds 2–3. *Bak. in Flor. Brit. Ind. II, 185. Citta nigricans* Lour. Flor. Cochinchin. 557. *Carpopogon imbricatum* Roxb. Hort. Beng. 54. *Stizolobium imbricatum* Kuntze Rev. Gen. Plant. I, 208. *Zoophthalmum nigricans* Prain MSS.

*ANDAMANS*; in the interior forests, common. *DISTRIB.* Himalayas from Kamaon, eastward; and throughout Indo-China.

Most nearly related, amongst Malayan species, to *Stizolobium Junghuhnianum* Kuntze (*Rev. Gen. Plant. I, 208*) from Java, which has very similar bracts. The pods, however, are in that species slightly narrower with rather narrower wings across which the plaits extend more completely. The branches, petioles, leaves and bracts of *M. Junghuhniana* are moreover strigosely hispid and the calyx and pods are more densely bristly. Nearly related also is *M. cyanosperma* K. Schum., from the Moluccas.

2. *MUCUNA MONOSPERMA* DC. Prodr. II, 406. A large woody climber with deciduous rusty down on young branches. *Leaves* 6–9 in. long; leaflets 3 thinly subcoriaceous green glabrous above, when young rather closely rusty-downy beneath, ovate-oblong cuspidate base rounded—of lateral leaflets obliquely, 3–4 in. long 2–2.25 in. across, petiole 3–5 in. long at first rusty, soon glabrescent; petiolules .25 in., stipels subulate .15 in.; stipules linear .2 in. *Inflorescence* corymbose 6–12-flid., axillary, peduncles usually .5–1 in. occasionally elongated 2.5–3 in. long, at first rusty-puberulous as are the pedicels .25–.5 in. long; bracteoles at base of calyx lanceolate .6 in. long, exceeding the buds; bracts small triangular .15 long very early deciduous and leaving small scars at base of pedicels. *Calyx* .4 in. long densely covered with pungent deciduous bristles, tube campanulate twice as long as unequal teeth; upper tooth truncate lateral deltoid lower linear. *Corolla* 1.5 in. long, purple; keel abruptly inflexed at tip, wings .25 in., standard .6 in. long .5 in. wide. *Pod* 2.75 in. long 2.25 in. wide broadly oblong, wings along the dorsal sutures .5 in. wide along ventral .25 in., plaits .3 in. high crossing the wings to their margins; clothed in all parts with brown deciduous bristles; seeds solitary. Wight in Hook. Bot. Misc. II, 346, Suppl. t. 12; W. & A. Prodr. 254; Miq. Flor. Ind. Bat. I, 214; Bak. in Flor. Brit. Ind. II, 185. *M. anguina* Wall. Pl. As. Rar. III, 19 t. 236. *Carpopogon monospermum* Roxb. Hort. Beng. 54; Flor. Ind. III, 283. *C. anguineum* Roxb. Hort. Beng. 54. *Zoophthalmum monospermum* Prain MSS.

ANDAMANS; everywhere very common in the interior jungle.

3. *MUCUNA BIPPLICATA* Teysm. & Binnend. Cat. Hort. Bog. 261. A large woody climber 30–40 feet long with slender glabrous branches. *Leaves* 9–12 in. long; leaflets 3, chartaceous dull green, glabrous on both surfaces ovate-oblong, cuspidate, base rounded—of lateral leaflets obliquely, 6–8 in. long, 5 in. across, petiole glabrous 4–6 in. long, petiolules .25 in., stipels subulate .15 in. long; stipules linear .2 in.; pulvinus swollen puberulous. *Inflorescence* corymbose axillary 2 in. long; peduncle rusty-pubescent arising from an axillary node, its neck surrounded by a number of small triangular acute scaly bracts .15 in. long emitting at once 1–4 3–6-flid. branches 1–5 in. long, main rachis corymbosely branched or simple 15–18-flid., bracts at base of pedicels small triangular immediately deciduous; pedicels .2 in. long; bracteoles at base of calyx .2 in. long, oblong much shorter than buds. *Calyx* greenish-brown densely covered with deciduous pungent bristles, .35 in. long, tube wide-campanulate, teeth extremely short. *Corolla* dark-purple 1.75 in. long; keel abruptly inflexed at tip, wings 1.25 in. long, standard .75 in. wide. *Pod* hardly stipitate 3.5 in. long 1.75 in. wide; plaits oblique very close-set their

edges double with reflexed margins, covered with close pungent brown bristly pubescence; marginal wings lobed between the plaits. *M. atropurpurea* Bak. in Flor. Brit. Ind. II. 186 in part and as to the Malacca plant only. *M. anguina* Scheff. Nat. Tijd. Ned. Ind. XXXII. 413 not of Wall. *Zoophthalmum biplicatum* Prain MSS.

MALACCA; *Maingay*, 590. PENANG; Gapis Pass, *Curtis* 2989! PERAK; Ulu Kewanta, *Scortechini* 925! Sunga Ryah, etc. *Kunstler* 863! 3915! 6805! 8330! *Wray* 3746! DISTRIB. Sumatra (*Forbes* 2649!) Borneo.

There are at Calcutta both flowering and fruiting examples of Teysmann and Binnendyk's original species cultivated in the Buitenzorg garden; these are identical in every detail with this common Sumatra and Malay Peninsula plant. The pods much resemble those of *M. atropurpurea*, to which it comes nearest and with which it has been identified by Mr. Baker. But, besides the double edge to the plaits on the pods, whence the name, the Malayan differs from the Indian species in having larger leaflets, shorter inflorescences, a calyx with an almost truncate mouth and a collar of scaly bracts at the neck of the peduncle similar to but smaller than those that occur at the base of the peduncle in *M. bracteata* of the subgenus *Stizolobium*.

§ CARPOPOGON. Pods not plaited across their faces.

4. MUCUNA ACUMINATA Grah. in Wall. Cat. 5621. A slender creeper 20–30 feet long with sparingly adpressed-puberulous branches. *Leaves* 6–10 in. long; leaflets 3, membranous dull green glabrous above sparingly puberulous especially on the nerves beneath, ovate-oblong rather abruptly acuminate, base rounded or subtruncate—of lateral leaflets obliquely, 2·5–4 in. long 2–3·5 in. wide, petiole glabrous, 4–6 in. long; petiolules ·25 in. adpressed-puberulous; stipels subulate ·15 in. long, stipules linear ·2 in. *Inflorescence* when young in strobilate heads, corymbose, axillary, 2–3 in. long, peduncle grey-pubescent arising from an axillary node, its neck with a collar of small triangular acute scaly bracts ·15 in. long emitting at once 1–4 4–8-fld. usually bifurcate branches; bracts at base of pedicels deciduous large boat-shaped externally finely grey-pubescent, ·75 in. long, ·5 in. wide; pedicels grey-pubescent at length 4–6 in., bracteoles at base of calyx ·3 in. long, deciduous, lanceolate, as long as buds. *Calyx* glossy pale-brown densely covered with deciduous pungent bristles, ·5 in. long, tube wide campanulate twice as long as unequal teeth; upper tooth truncate, lateral wide-deltoid, lower linear longer than the others. *Corolla* 1·75–2 in. long, keel not abruptly inflexed at tip; wings as long as keel and twice as long as the standard ·7 in. wide. *Pod* not quite ripe, 3 in. long, 1·5 in. across, broadly winged down both sutures but not plaited on the faces, copiously clothed especially along the wings with deciduous yellow-brown irritating bristles; seeds 3. *Zoophthalmum acuminatum* Prain MSS.

PENANG; *Wallich* (Cat. n. 5621)! PERAK; Kinta, *Kunstler* 7038! SINGAPORE; Chan Chu Kang, *Ridley* 2075! DISTRIB. Java (*Forbes* n. 493!)

5. *MUCUNA GIGANTEA* DC. Prodr. II, 405. A long very slender climber sometimes reaching 250 feet! with slender glabrous branches. *Leaves* 5–9 in. long; leaflets 3, subcoriaceous dark green, dull, glabrous on both surfaces; oblong cuspidate, base of terminal cuneate of lateral obliquely rounded, 4–5 in. long, 2·5 in wide, petiole glabrous 5 in. long; stipels subulate ·15 in., stipules linear ·2 in. long. *Inflorescence* a pendulous umbelliform corymb terminating a slender glabrous peduncle 4–18 in. long and bearing near its apex usually 3 sometimes 5–7 small projecting puberulous nodes each emitting 3–5 slender readily disarticulating grey-pubescent pedicels ·75 in. long; bracts and bracteoles both minute and very early deciduous. *Calyx* ·5 in. long green with a few pungent bristles, tube rather cylindrical ·5 in. across, teeth all very short the upper wide subtruncate, the other three in bud shortly triangular at length obsolete. *Corolla* sickly greenish-yellow or white 1·25–1·5 in. long, keel not abruptly inflexed at tip; wings 1–1·25 in., standard ·75 in. long ·6 in. wide. *Pod* broadly winged down both sutures faces smooth or with oblique cross ridges but never distinct plaits; 3·5–6 in. long, 2 in. across, clothed with deciduous yellow-brown irritating bristles; seeds 2–4. Wall. Cat. 5619; W. & A. Prodr. 254; Wight in Hook. Bot. Misc. II, 351, Suppl. t. 14; Miq. Flor. Ind. Bat. I, 213; Bak. in Flor. Brit. Ind. II, 186. *M. corymbosa* Grah. in Wall. Cat. 5622. *Dolichos giganteus* Willd. Sp. Pl. III, 1041. *Carpopogon giganteum* Roxb. Hort. Beng. 54; Flor. Ind. III, 286. *Stizolobium giganteum* Kuntze Rev. Gen. Plant. I, 208. *Zoophthalmum giganteum* Prain MSS.

ANDAMANS; Coco Group, *Prain*! Middle Andaman, *Kurz*! South Andaman, *Liebig*! *Kurz*! *Man*! Little Andaman, *Prain*! always close to salt-water creeks or in Mangrove-swamps. Narcondam, near sea beach, *Prain*! PERAK; *Scortechini*! PAHANG; *Ridley* 1227! DISTRIB. A littoral species on Indian, Indo-Chinese, Malayan and Polynesian Coasts.

SUBGEN. 2. STIZOLOBIUM. Annual climbers; seeds ovoid with a small lateral hilum.

6. *MUCUNA PRURIENS* DC. Prodr. II, 405. A slender annual climber with adpressed-pubescent branches at length glabrescent. *Leaves* 6–9 in. long; leaflets 3, membranous ovate-rhomboid, green glabrescent above grey-silky and lustrous beneath, the lateral pair very oblique truncate at base, all 3–5 in. long 2–3 in. wide; petioles 2·5–4·5 in. long, adpressed silky, petiolules ·2 in. long, stipels ·15 in. long subulate, stipules lanceolate ·2 in. long. *Inflorescence* of short-peduncled racemes varying from 1 in. to 1 foot in length and from 3–30-flid., drooping, rachis



finely silky, pedicels short .15–.25 in. usually solitary from lateral projecting nodes; bracts .5 and bracteoles .3 in. lanceolate, grey-silky, lustrous. *Calyx* .4 in. long with a few pungent bristles, tube campanulate hardly as long as the lower lanceolate tooth and equalling the lateral lanceolate and upper triangular tooth. *Corolla* purple 1.25–1.5 in. long; keel slightly incurved, wings nearly as long, standard .6 in. long and about as broad. *Pod* 2–3 in. long .5 in. wide, turgid, ridged longitudinally, recurved in the lower half and abruptly hooked at the tip; clothed with dense, intensely pungent subpersistent bristles at first dark purplish brown at length steel grey to pale rusty-brown; seeds 5–6. Wall. Cat. 5616; Wight in Hook. Bot. Misc. II, Suppl. t. 13.; Bak. in Flor. Brit. Ind. II, 187. *M. prurita* Hook. Bot. Misc. II, 348; W. & A. Prodr. 255; Miq. Flor. Ind. Bat. I, 211. *M. utilis* Wall. ex Wight Ic. t. 280. *Dolichos pruriens* Linn. Syst. Ed. X, 1162. *Stizolobium pruriens* Pers. Synops. II, 299; Kuntze Rev. Gen. Plant. I, 208, *Carpopogon pruriens* Roxb. Hort. Beng. 54; Flor. Ind. III, 283.

ANDAMANS: Great Coco, near N. Andaman, common, *Prairie*! PERAK; Kampong Kota, *Wray* 3326! **DISTRIB.** Throughout the tropics.

## 20. STRONGYLODON Vogel.

Twining herbs, with firm stems and with stipellate 3-foliolate leaves *Flowers* in long lax racemes. *Calyx* campanulate, gibbous; teeth short, obtuse, imbricated. *Corolla* much exerted; standard lanceolate, recurved; wings obtuse, more than a third as long; keel curved, as long as the standard, narrowed into a long beak. *Stamens* diadelphous anthers uniform. *Ovary* stalked, few-ovuled, style filiform beardless; stigma capitate. *Pod* oblong, turgid. *Seeds* as large as a bean, with a hilum running more than half round. Species 3, Polynesian.

STRONGYLODON RUBER Vogel, Linnæa X, 585. An extensive climber with quite glabrous thin hollow but firm stems. *Leaves* 8 in. long, petioles 2 in. long glabrous; leaflets 3, bright green, glabrous on both surfaces membranous shining above, ovate, shortly bluntly cuspidate subequal, 4 in. long 2.5 in. wide, terminal rounded at base with petiolule 1 in., lateral obliquely cuneate at base with short petiolules; 3-nerved at base, central nerve with 2–3 pairs of arching lateral nerves all visible beneath; stipels lanceolate membranous .15 in. long, stipules triangular .25 in. long membranous. *Inflorescence* in copious axillary racemes with peduncles 4–6 in. long of 30–40 1–3 fld. fascicles of pedicellate flowers arising from small produced nodes with obsolete bracts; pedicels slender spreading, .5–.75 in. long. *Calyx* glabrous .3 in. long tubular; teeth very short rounded; 2-bracteolate at base, bracteoles caducous. *Corolla* bright-red 1 in. long, standard lanceolate acute, the short obtuse wings

intimately attached to lamina of narrowly-lanceolate curved keel. *Pod* oblong 3 in. long, obliquely pointed, distinctly stalked, 2 seeded. Walp. Ann. IV, 559; A. Gray, Bot. Amer. Explor. Exped. 446 t. 48; Thwaites Enum. 89; Bak. in Flor. Brit. Ind. II, 191. *Rhynchosia lucida* DC. Prodr. II, 389.

ANDAMANS; common, *Prain! King's Collectors!* DISTRIB. Ceylon; Polynesia.

21. ERYTHRINA Linn.

Trees with prickly branches. *Flowers* large, coral-red, in dense racemes, produced usually before the development of the large constantly 3-foliolate leaves. *Calyx* oblique, spathaceous, finally splitting down to the base or campanulate-bilabiate. *Petals* very unequal; standard always much exserted and considerably exceeding the keel and wings. Upper *stamen* free down nearly to the base or connate with the others half way up the filaments; anthers uniform. *Ovary* stalked, many-ovuled; style incurved, beardless; stigma capitate. *Pod* linear, fertile turgid and torulose throughout, or flat and seedless below. Species 25-30, principally tropical, in both the New World and the Old, and at the Cape.

Pods turgid and seed-bearing throughout their length; stipels replaced by ovate-glands as long as broad; seeds with a very large oval hilum:—

*Calyx* spathaceous, oblique not at all 2-lipped, splitting to the base down the back (§ *Stenotropis*); leaflets membranous subreniform or triangular, green on both surfaces; flowers narrow, standard entire at apex ... 1. *E. indica*.

*Calyx* campanulate, somewhat 2-lipped, not splitting to the base (§ *Micropteryx*); leaflets subcoriaceous ovate-oblong, glaucous beneath; flowers broad, standard emarginate ... .. 2. *E. ovalifolia*.

Pods flat, seedless and indehiscent in their lower half (§ *Hypaphorus*); stipels replaced by oblong glands longer than broad; seeds with a small hilum; (calyx somewhat 2-lipped; leaves membranous ovate-acute, green on both surfaces; flowers narrow, standard entire at tip) ... .. 3. *E. lithosperma*.

SUBGEN. 1. STENOTROPIS Hassk. *Calyx* spathaceous, oblique not at all 2-lipped, finally split to the base down the back. *Pod* turgid and seed-bearing throughout.

1. ERYTHRINA INDICA Lamk Encyc. Meth. II, 391. A tree 60 feet high with thin grey bark, armed with minute conical dark-brown prickles. *Leaves* 8-12 in. long; petioles 4-6 in. long unarmed, when young densely brownish-grey puberulous when full-grown glabrescent

especially in the upper half; leaflets 3, membranous, uniformly bright green, densely brownish-grey puberulous when young when full-grown quite glabrous, terminal subreniform lateral pair slightly oblique triangular, all subcuspidate at apex and subtruncate at base, 4-6 in. long, terminal rather broader than, lateral hardly so broad as long; petiolules .3-.4 in. long; stipels represented by ovate glands .1 in. diam. that remain attached to the rachis on the fall of the leaflets; stipules flaccid lanceolate .4 in. long softly brown-puberulous early caducous. *Inflorescence* of dense racemes 4-6 in. long on stout spreading woody peduncles 3-4 in. long; flowers 1-3 in axils of small triangular puberulous deciduous bracts, pedicels .25 in. long at first brown-puberulous with 2 subulate puberulous deciduous bracteoles .15 in. long at base of calyx. *Buds* narrowly spindle-shaped slightly falcate puberulous. *Calyx* 1-1.25 in. long, soon glabrescent, mouth very oblique splitting to the base down the back the tip with 5 teeth of which 2 or casually 3 are narrowly subulate .2 in. long much exceeding the others. *Corolla* bright-red 2-2.5 in. long, standard 1 in. wide, wings and free keel-petals subequal about .5-.6 in. long. *Ovary* softly grey-puberulous 2 in. long, stalked. *Pod* 6-12 in. long on a stalk .75-1 in. long, black glabrescent distinctly torulose 6-8-seeded, usually the lowest and 1-3 of the uppermost seeds abortive, valves ultimately irregularly shred, hardly distinctly dehiscent; seeds subreniform .6 in. long .4 in. wide testa warm-brown, hilum large oval dark-grey with pale margin. DC. Prodr. II, 412; Roxb. Flor. Ind. III, 249; Wall. Cat. 5963; W. & A. Prodr. 260; Wight, Ic. t. 58; Miq. Flor. Ind. Bat. I, 207; Bak. in Flor. Brit. Ind. II, 188. *E. spathacea* Wall. Cat. 5965, fide Baker. *E. Corallodendrum* Linn. Sp. Pl. 706, in part. *E. cuneata* Grah. in Wall. Cat. 5967, fide Baker.

ANDAMANS; on all the coasts common, *Kurz! Prain!* NICOBARS; common behind the sea beaches, *King's Collectors!* PERAK; *Scortechini!* MALACCA; fide Baker in *Flora of British India*. DISTRIB. Sea-shores of S.-E. Asia, from the Sunderbuns to the Malay Archipelago and Polynesia.

This, as a wild species, is purely littoral; where it occurs inland it has certainly been planted.

Mr. Baker refers here *E. cuneata* Grah. which the writer has not seen; also *E. spathacea* Wall. Cat. 5965. What Wallich's 5965 B. & C. (which were doubtfully identified with 5965 A) may have been, it is difficult to say; they were Himalayan plants and are not at Calcutta. But the Calcutta example of 5965 A is not named *E. spathacea* as in the Lith. Cat., but is named *E. stricta*; the specimen belongs moreover to *E. stricta* and not to *E. indica*.

SUBGEN. 2. MICROPTERYX Walp. *Calyx* campanulate, more or less distinctly 2-lipped, but not splitting down to the base. *Pod* turgid and seed-bearing throughout.

2. *ERYTHRINA OVALIFOLIA* Roxb. Hort. Beng. 53. A tree 30-40 feet high with spreading branches, bark grey, stem 1·5-2 feet diam., armed with thick-based dark-brown prickles. *Leaves* 8-12 in. long; petioles 4-5 in. long sparsely prickly, when young very sparingly puberulous, when full grown quite glabrous; leaflets 3 subcoriaceous deep green above glaucous beneath quite glabrous on both surfaces, terminal ovate or ovate-oblong 4-6 in. long 2·5-3·5 in. across, lateral pair similar but rather smaller, base rounded or wide-cuneate apex obtuse or subacute; petiolules ·25 in. long; stipels represented by ovate persistent glands ·1 in. in diam.; stipules membranous orbicular deciduous ·15 in. across. *Inflorescence* in lax 8-20-fl. racemes 3-6 in. long on stout spreading peduncles 5-8 in. long; flower 1-3 in axils of small broadly ovate deciduous puberulous bracts; pedicels puberulous ·3 in. long with similar but smaller bracteoles at base of calyx. *Buds* narrowly ovate, puberulous. *Calyx* ·5 in. long, ·6 in. wide deeply 2-lobed. *Corolla* 2 in. long dark velvety-brown with deep scarlet tinge, standard 1·5 in. wide emarginate, wings ·75 in., keel-petals coherent 1 in. long. *Ovary* softly grey-puberulous, stalked. *Pod* 6-8 in. long 6-8-seeded on a stalk ·5 in. long, pale-brown puberulous, valves more distinctly dehiscent by the sutures; seeds subreniform ·5 in. long, ·3 in. wide, testa brown, hilum large oval. Roxb. Flor. Ind. III, 254; Wall. Cat. 5961; Wight Ic. t. 247; Benth. Pl. Jungh. 237; Miq. Flor. Ind. Bat. I, 207; Bak. in Flor. Brit. Ind. II. 189. *E. holosericea* Kurz, Journ. As. Soc. Beng. XLII, pt. 2, 69 as to flowers. *Duchassaingia ovalifolia* Walp. in Linnæa XXIII, 742.

PERAK; Kinta, *Kunstler* 7215! MALACCA; *Maingay* 528! DISTRICT. S.-E. Asia, from Assam and Bengal to the Malay Archipelago and Polynesia.

Mr. Kurz's *Erythrina holosericea* (*Corallo dendron holosericeum* O. Kuntze, Rev. Gen. Pl. I, 172) is a spurious species manufactured by combining in one diagnosis a description of the flowers of *E. ovalifolia* and of the leaves of *E. lithosperma*; the *mélange* had been sent to Herb. Calcutta by an officer of the Indian Forest Department under the idea that it came from one tree. The citation of this species by Kuntze (*loc. cit.*) while that author is taking the opportunity to (as the writer thinks) unnecessarily restore an obsolete generic name, might lead to the conclusion that Kuntze had made an effort to verify the validity of the Kurzian species, as to the existence of which Mr. Baker had already expressed a doubt (*Flora of British India* II, 190). It is obvious, however, that Kuntze has done nothing of the kind and it would seem from this citation that the object of much of the *bouleversement* effected by priority-hunting "botanists" is less the restoration of generic names that have been improperly suppressed than a search for opportunities of posing as the authorities for species of whose characters they are ignorant.

In the Herbarium of Mr. Curtis, of the Penang Forest Department, is a solitary

specimen of an *Erythrina* belonging to this section, collected in Langkawi. The flowers are precisely those of *E. suberosa*, a glabrous form of which is common in Burma and Tenasserim; it may, therefore, well belong to that species. But the solitary branchlet is densely prickly whereas it is a feature of both the tomentose Indian and the glabrous Indo-Chinese form of *E. suberosa* to have almost unarmed branchlets. As moreover, Mr. Curtis' specimen is without leaves, the writer cannot on its authority alone, formally include *E. suberosa* among the Malayan species.

SUBGEN. 3. HYPAPHORUS Hassk. *Calyx* campanulate more or less distinctly 2-lipped, but not splitting down to the base. *Pod* flat seedless and indehiscent below, 1-3-seeded towards upper half.

3. *ERYTHRINA LITHOSPERMA* Miq. Flor. Ind. Bat. I, 209 not of Blume. A tree 40-60 feet high with spreading branches, bark white, stem 2 feet in diam., armed with strong prickles. *Leaves* 10-12 in. long; petioles 4-5 in. long with a few prickles or unarmed, when young brownish-grey puberulous soon glabrous; leaflets 3 membranous uniformly bright green densely brownish-grey puberulous when young soon quite glabrous, triangular-ovate cuspidate at apex, terminal wide-cuneate at base 4-6 in. long 3-4 across, lateral pair rounded at base rather smaller; petiolules .3 in. long; stipels represented by oblong glands .15 in. long .1 in. across; stipules deciduous shortly ovate-acute flaccid densely puberulous. *Inflorescence* in short rather dense racemes 3-4 in. long on stout spreading woody peduncles 5-8 in. long, flowers 1-3 in axils of minute ovate-acute bracts; pedicels .2 in. long puberulous, minutely bracteolate at base of calyx. *Buds* puberulous ovate. *Calyx* .3 in. long, softly persistently puberulous, equally 2-lipped. *Corolla* 1.5 in. long, standard oblong obtuse, crimson or crimson with white stripes, wings and keel .5 in. long subequal. *Ovary* compressed faintly puberulous. *Pod* glabrous pale-yellow, 4-8 in. long, 1.25 in. wide in the wing like compressed seedless indehiscent lower half to two-thirds, .6 in wide in the upper 1-3 seeded dehiscent portion; seeds subreniform .75 in. long .4 in. wide, testa almost black, hilum small elliptic pale. Bak. in Flor. Brit. Ind. II, 190. *E. sumatrana* Miq. Flor. Ind. Bat. Suppl. 304; Kurz, As. Soc. Beng. XLII, 2, 70. *E. secundiflora* Hassk. Pl. Jav. Rar. 378; Benth. Pl. Jungh, 237 not of Brotero. *E. holosericea* Kurz, Journ. As. Soc. Beng. XLII, 2, 69 as to leaves.

PENANG; *Wallich!* PERAK; at Kinta, *Kunstler!* at Waterloo, *Curtis* 2982! *Scortechini* (a MSS. description only.) SINGAPORE; *Hullett!* DISTRIB. Indo-China, from the Shan Plateau, to the Malay Archipelago.

Mr. Kurz, as Mr. Baker remarks, has pointed out that the present species is *Erythrina sumatrana* Miq.; authentic examples of *E. sumatrana* in Herb. Calcutta, show that this is the case. But the only difference between *E. sumatrana* Miq. and *E. lithosperma* Bl. (ex Miq. in Flor. Ind. Bat.),—to which Mr. Baker has referred the Indo-Chinese plant that agrees in every respect with the Sumatra and Perak one,—

is in the size of the pods; those of *E. sumatrana* are rather larger than those of *E. lithosperma*. Both species are retained in the *Index Kewensis* but the writer agrees with Mr. Baker in believing that they do not deserve to be treated even as separate varieties. Kurz further states that *E. lithosperma* Blume ex Miq. in Flor. Ind. Bat. is not the same as *E. lithosperma* Bl. Cat. Bogor., which, according to Kurz, was introduced to the Buitenzorg garden from Manritius. Koorders and Valeton, in their valuable Java Herbarium, issue the common wild Java plant which only differs from *E. sumatrana* in having rather smaller pods, under the name *E. lithosperma*; they have however in every case named the plant *E. lithosperma* Miq. not *E. lithosperma* Bl. In their *Bijdragen* II, these authors explain that Blume's "*E. lithosperma*" is only *E. indica*; this being the case the name *E. lithosperma*, but on Miquel's authority, not as that of Blume, is still available for the present species. Here again Kuntze's pretentious *Revisio* fails to assist the serious student; Kuntze claims the authorship of both, as *Corallo dendron lithospermum* and *C. sumatranum* respectively, thus clearly indicating that he has failed to make himself acquainted with the characters of either.

## 22. SPATHOLOBUS Hassk.

Woody climbers, with 3-foliolate stipellate leaves. *Flowers* small or middle-sized, in ample terminal panicles, extending into the axils of the upper leaves, the pedicels densely fasciated at the tumid nodes. *Calyx* campanulate; teeth lanceolate or oblong-deltoid, the upper two connate. *Corolla* distinctly exerted, its petals subequal, the keel obtuse, nearly straight. *Stamens* diadelphous; anthers uniform. *Ovary* sessile or stalked, 2-ovuled; style incurved, beardless, stigma capitate. *Pod* flat, winglike, indehiscent, seedless below; thick, 1-seeded, tardily dehiscent at tip. Species 10, the others Malayan and one Tropical African.

Leaflets not twice as long as broad, the terminal leaflets dissimilar, rhomboid; (leaflets large 3 in. across manifestly pubescent beneath, rachis prolonged beyond attachment of lateral leaflets; flowers blue or purple):—

Leaflets puberulous above, uniformly tomentose beneath; flowers .25 in. long, distinctly pedicelled ... .. 1. *S. ferrugineus*.

Leaflets glabrous above, tomentose only on the nerves beneath; flowers .15 in. long, very shortly pedicelled ... .. 2. *S. gyrocarpus*.

Leaflets at least twice as long as broad, all subsimilar lanceolate or oblanceolate to ovate:—

Leaf-rachis hardly prolonged beyond the insertion of lateral leaflets, leaflets large 3.5 in. across (sparsely pubescent on the nerves beneath) ... .. 3. *S. bracteolatus*.

Leaf-rachis distinctly prolonged beyond the insertion of lateral leaflets, leaflets medium or small not more than 2 in. across:—

Petiolules and leaflets beneath finely adpressed puberulous (stipels manifest flexuous):—

Petiolules twice as long as stipels, flowers pink, branches of panicle lax; leaflets elliptic-acuminate... .. 4. *S. acuminatus*.

Petiolules shorter than stipels, flowers white, branches of panicle strict, leaflets ovate-lanceolate acute 5. *S. dubius*.

Petiolules and leaflets beneath glabrous:—

Leaflets thickly coriaceous (oblong, stipels obscure rigid) flowers purple, calyx densely rusty-pubescent... 6. *S. crassifolius*.

Leaflets chartaceous, flowers white, calyx glabrescent or puberulous:—

Leaflets oblong, stipels obscure rigid, calyx glabrescent, branches of panicle strict ... 7. *S. Maingayi*.

Leaflets oblanceolate, stipels manifest flexuous, calyx finely puberulous, branches of panicle lax ... 8. *S. Ridleyi*.

1. SPATHOLOBUS FERRUGINEUS Benth. Pl. Jungh. 233. A robust woody climber 30–60 feet long with a stem 3–6 in. thick; branchlets densely rusty-tomentose, brown beneath the tomentum, cylindrical. *Leaves* 9 in. long; leaflets 3, coriaceous dull green puberulous above, everywhere rusty-pubescent beneath, terminal ovate apex obtuse base rounded, 5–6 in. long 3 in. across, lateral obliquely elliptic 4·5–5·5 in. long as wide as terminal, lateral nerves 5–7 pairs ascending and midrib prominent beneath, cross-nerves and fine reticulate venation very distinct; petiole 3–4 in. long rusty-pubescent, petiolules ·25 in. also densely rusty; stipels subulate small; stipules broad-based triangular ·25 in. long, very densely rusty, deciduous. *Inflorescence* 8–10 in. long, in lax axillary panicles with stout densely rusty-pubescent somewhat flattened peduncles, branches 4–6 in. long again paniculate the bracts at their bases triangular subpersistent; pedicels distinct ·2 in. long in fascicles of 2–5, bracteoles shorter than buds. *Calyx* densely rusty-pubescent ·2 in. long, teeth deltoid shorter than tube subequal except the rounded slightly emarginate upper. *Corolla* claret-coloured to dark-blue, ·25 in. long, standard oblong deeply notched. *Pod* 3–5 in. long, softly velvety, semi-transparent except at the seed-bearing tip, ·7 in. wide below ·3 in. wide at seed-bearing apex. Miq. Flor. Ind. Bat. I, 204. *Drebbelia ferruginea* Zoll. in Nat. en Geneesk. Arch. III, 79.

PERAK; very common at low elevations, *Wray* 1941! 2008! 2381! 3258! *Scortechini* 213! 1466! *Kunstler* 3566! 6862! 7904! PENANG; Govt. Hill, *King*! *Abrams*! *Curtis*! MALACCA; *Maingay* 530! *Griffith*! *Derry* 1203! *Goodenough* 1437! SINGAPORE; *Hullett* 211! *Ridley* 3609! DISTRIB. Sumatra, Java, Borneo.

From Singapore comes also a form collected twice by Mr. Ridley (n. 5578! n. 6394!) with a close red-silky tomentum beneath. This bears to ordinary *S. ferrugineus* very much the relationship that *Butea sericophylla* Wall. bears to *S. Roxburghii* (*Butea parviflora*) and it has not therefore been here separated as a variety, though it is certainly a very distinct "form" of *S. ferrugineus*. While very near *S. gyrocarpus* this species is quite readily separable by its nearly always rather smaller leaves; its always different tomentum; its always larger flowers with much longer pedicels, and its differently shaped more persistent bracts. The fruits are however,

exceedingly similar; but this is true also of *S. acuminatus*, *S. riparius*, *S. squamiger* and *S. Listeri*, four species that have fruits hardly distinguishable from those of *S. gyrocarpus* and *S. ferrugineus*.

Judging from the field notes of Mr. Kunstler and from a manuscript description written by Father Scortechini, *S. ferrugineus*, though a large climber, rarely if ever attains the dimensions of *S. gyrocarpus*, the next species.

2. *SPATHOLOBUS GYROCARPUS* Benth. Pl. Jungh. 238. A robust woody climber sometimes over 100–150 feet long with a stem 4–6 in. thick; branchlets closely shortly rusty-pubescent, black beneath the tomentum, slightly angular. *Leaves* 12 in. long; leaflets 3 subcoriaceous bright green and glabrous above rusty-pubescent on all veins and nerves beneath, terminal obovate-rhomboid apex rounded with a short point base cuneate, 5–6 in. long, 4.5–5 in. wide, lateral obliquely elliptic 5–6 in. long 3.5–4 in. wide base obliquely rounded apex as in terminal; lateral nerves 6–8 pairs ascending and midrib prominent beneath, cross-nerves and fine reticulate venation very distinct; petiole 4–6 in. rusty puberulous, petiolules .3 in. also rusty; stipels subulate small; stipules broad-based ovate-lanceolate .3 in. long very early deciduous. *Inflorescence* in lax axillary panicles sometimes 12 in. long with stout somewhat flattened rusty-puberulous peduncles, branches 6–8 in. long again paniculate, the bracts at their bases small lanceolate early deciduous; pedicels very short, bracteoles at base of calyx linear shorter than buds early deciduous. *Calyx* grey silky-pubescent .1 in. long, teeth deltoid shorter than the tube subequal except the triangular slightly notched upper. *Corolla* deep-claret to dark-blue, .15 in. long, standard wide-orbicular deeply notched. *Pod* 3–5 in. long 1 in. wide below, seed-bearing tip .3 in. wide, softly velvety, semitransparent except at the seed-bearing apex. Bak. in Flor. Brit. Ind. II, 193; Miq. Flor. Ind. Bat. I, 204. *Butea gyrocarpa* Wall. Cat. 5442.

PERAK; very common at low elevations, *Kunstler* 3181! 7770! 8182! 10390! 10458! PENANG; *Wallich* 5442! *Stoliczka*! **DISTRIB.** Philippines.

This, though common, appears to be hardly so frequent as the last species which it much resembles, especially as regards pods. The tomentum of this species is however, less dense and less red than in *S. ferrugineus* and the flowers are about half the size. This has never been sent to Calcutta from Malacca though *S. ferrugineus* is very plentiful there.

3. *SPATHOLOBUS BRACTEOLATUS* Prain. A slender creeper 15–20 feet long with sparsely rusty-pubescent branches. *Leaves* 10–12 in. long; leaflets 3 ovate-acute or shortly acuminate, the tip slightly mucronate, subcoriaceous glossy bright green on both surfaces very sparsely beset with short rusty adpressed hairs, midrib beneath prominent more densely adpressed-pubescent, lateral nerves ascending 8–9 pairs promi-



ment, cross-nerves distinct, terminal and lateral subequal subsimilar—8–9 in. long, 3·5 in. across; petiole 2–2·5 in. long densely adpressed rusty-pubescent, scarcely prolonged beyond attachment of lateral leaflets, petiolules ·3 in. long also densely rusty; stipels short subulate, stipules ·25 in. long, deciduous, membranous, densely rusty, lanceolate; leaves towards ends of branches sometimes 1-foliolate. *Inflorescence* in terminal and axillary panicles 1·5–2 ft. long, branches 3–4 in. long again paniculate, with smaller sometimes 1-foliolate leaves at their bases, or bractless; pedicels very short, bracteoles at base of calyx lanceolate ·2–2·5 in. long, longer than buds, early deciduous. *Calyx* pale-brown pubescent, ·15 in. long, lower teeth sublinear central longer than lateral all shorter than calyx tube, upper lip triangular notched at apex. *Corolla* shortly exerted small, colour not noted, standard orbicular-oblong slightly retuse. *Pod* not seen.

PERAK; in dense jungle on Gunong Batu Pateh, at 3000–4000 feet, *Kunstler* n. 8079!

This in externals more resembles *S. Roxburghii* than it does any other Malayan species, and may possibly be the plant from Penang, noted by Mr. Baker as having been confused by Dr. Wallich with *S. gyrocarpus* under *Cat.* n. 5442; at Calcutta, however, all the specimens of *Cat.* n. 5442 are genuine *S. gyrocarpus*. The present plant was not identified with any species at Kew and in any case it is certainly not a form of *S. Roxburghii*; it differs in having smaller flowers; narrower, relatively longer bracteoles, and much longer stipules—the latter in *S. Roxburghii* are triangular and though wider at the base are only ·15 in. long. The stipels on the other hand are small and obscure and the most striking difference between this plant and *S. Roxburghii*, or indeed between it and any other species of *Spatholobus* is that the rachis of the leaf is so shortly prolonged beyond the attachment of the lateral pair of leaflets that the leaf is at times subdigitately 3-foliolate.

4. SPATHOLOBUS ACUMINATUS Benth. Pl. Jungh. 238. A robust climber with branches at first minutely downy soon glabrescent. *Leaves* 8–10 in. long; leaflets 3, all oblong-cuspidate rounded at the base, 4–6 in. long, 1·5–2 in. across, subcoriaceous, pale green on both surfaces glabrous above, under the lens very minutely and sparsely puberulous beneath, midrib prominent beneath very sparsely shortly puberulous, lateral nerves 8–10 pairs spreading very slender, fine reticulations distinct but not prominent; petiole 2–4 in. long glabrescent, petiolules ·2 in. adpressed puberulous; stipels short subulate, stipules ovate-lanceolate ·25 in. long ·15 in. wide, very early deciduous. *Inflorescence* in short axillary panicles 6–8 in. long, branches 1·5–2 in. long again paniculate; pedicels slender usually 2–3 together ·2 in. long. *Calyx* puberulous ·15 in. long, teeth oblong obtuse half as long as tube the upper slightly emarginate. *Corolla* ·4 in. long, bright red (*vide* Baker), standard orbicular emarginate. *Pod* 3–5 in. long, softly velvety, semi-transparent except at seed bearing tip, ·7 in. wide below ·3 in. wide at tip. Miq.

Flor. Ind. Bat. I, 204; Bak. in Flor. Brit. Ind. II, 194. *Sapindacea* Wall. Cat. 8082. *Butea acuminata* Wall. Cat. 5443.

PENANG; Wallich 8082! ANDAMANS; common, *King's Collectors!*  
DISTRIB. Martaban.

The solitary Malayan specimen at Calcutta that appears referable to this species is one issued by Dr. Wallich as *Sapindacea* sp. (Cat. n. 8082); this specimen is not dealt with in the *Flora of British India*. So far as it goes it agrees better with Dr. Wallich's Martaban specimens of *S. acuminatus* (Cat. n. 5443) than it does with any Malayan species of *Spatholobus*, to which genus it manifestly belongs; the specimen is, however, only in very young flower. No one has met with it in Penang since Dr. Wallich collected it.

Mr. Baker's description of *S. acuminatus* does not apply to Dr. Wallich's *Butea acuminata* in so far as the lengths of the panicles and of the pedicels are concerned. His description would apply to Wall. Cat. 5907 (*Pongamia rosea* Grah.) which Mr. Baker also includes here; *Pongamia rosea* certainly is a *Spatholobus* but is a species very distinct from *S. acuminatus*. There are not at Calcutta examples of Wall. Cat. 5908 or Wall. Cat. 9054; both are here excluded because Mr. Baker expresses a doubt regarding both. The first may indeed prove to be the same as *Spatholobus riparius* Prain; of the second nothing can be said because, in the *Flora of British India*, it is referred not only to *S. acuminatus*, but also to *Derris thyrsiflora*.

The Andamans specimens are absolutely identical with Wallich's original specimens (Cat. 5443) from Martaban.

5. *SPATHOLOBUS DUBIUS* Prain. A large climber 100–150 feet long, stem 6–8 in. diam. with round adpressed-puberulous branches. *Leaves* 6–8 in. long; leaflets 3 ovate-acuminate base rounded the tip slightly mucronate, coriaceous glossy bright green, glabrescent above adpressed-puberulous beneath, lateral nerves ascending 8–9 pairs prominent beneath, cross-nerves distinct; terminal 2–6 in. long 1.5–3 in. wide, lateral subsimilar rather smaller; petioles 1.5 in. long puberulous, petiolules .15 in. pubescent; stipels subulate .15–.2 in. long, stipules lanceolate .2 in. deciduous; leaves towards ends of branches sometimes 1-foliolate. *Inflorescence* in terminal and axillary spreading panicles the former sometimes 8 in. the latter 4 in. long, sometimes 2–3 from same axil. *Bracts* lanceolate persistent adpressed-pubescent .15 in. long equalling the pubescent solitary or fasciculate pedicels; bracteoles minute. *Calyx* adpressed-pubescent, .12 in., campanulate, teeth short triangular except the 2-fid upper. *Corolla* .25 in. long, pure white, standard orbicular retuse. *Pod* not seen.

PERAK; Gunong Bubu, 800–1200 feet, *Kunstler* 7585! PENANG; Govt. Hill, *Curtis* 2970!

A very distinct species apparently nearest to *S. littoralis* Hassk. from which it differs in having the lower lip of calyx toothed and the leaves uniformly puberulous beneath. The shortness of its petiolules, which are equalled and often exceeded in length by the subulate stipels, renders the species easily distinguishable.

6. *SPATHOLOBUS CRASSIFOLIUS* Benth. Pl. Jungh. 238. Apparently

a strong climber, branches at first rusty-pubescent at length glabrescent. *Leaves* 8–10 in. long, all oblong-cuspidate, cuneate at the base, 4–6 in. long 1·5–2 in. wide, thickly rigidly coriaceous, dark green and quite glabrous on both surfaces midrib prominent beneath glabrous, lateral nerves 6–7 pairs and secondary nervation very slightly raised; petiole 2–4 in. long glabrous, petiolules ·2 in. glabrescent; stipels short subulate often obscure, stipules lanceolate ·2 in. long very early deciduous. *Inflorescence* of short axillary panicles 8–9 in. long, branches about 2 in. long, again paniculate, peduncles rusty-pubescent with a few ovate-acute deciduous leaf-scales at their base; pedicels very short, rusty-pubescent. *Calyx* densely rusty-velvety, ·1 in. long, teeth all deltoid shorter than the tube. *Corolla* ·2 in. long, dark-purple, limb of standard much broader than deep, deeply emarginate at apex subcordate at junction with claw. *Pod* not seen; when immature with a stalk (*vide* Baker.) Bak. in Flor. Brit. Ind. II, 194. *Pongamia*? *crassifolia* Grah. in Wall. Cat. 5913.

PENANG; *Wallich!* DISTRIB. Silhet.

This is very distinct by reason of its leaves and (from Mr. Baker's description) on account of its stipitate pod. Dr. Wallich's original specimens from Silhet and Penang seem undoubtedly examples of one species; strangely, it has not been sent again to Calcutta from either locality.

7. *SPATHOLOBUS MAINGAYI* Prain. A large climber with glabrous branches. *Leaves* 4–5 in. long; leaflets 3 ovate-acute base rounded tip slightly mucronulate, thickly coriaceous glabrous on both surfaces, lateral nerves ascending 5–6 pairs slightly prominent beneath cross-nervation distinct but not prominent; terminal 3 in. long 1·75 in. wide; lateral rather smaller; petiole 2 in. glabrous, petiolules ·25 in. quite glabrous; stipels subulate ·1 in. long, stipules ovate ·1 in. long, deciduous. *Inflorescence* in terminal and axillary panicles 6–8 in. long. *Bracts* minute subulate persistent puberulous, as are the rachis and pedicels shorter than calyx; bracteoles very minute. *Calyx* adpressed-puberulous ·12 in. long, campanulate, teeth all short rounded. *Corolla* white ·25 in. long, the standard orbicular deeply emarginate. *Ovary* hirsute 2-ovuled.

MALACCA; *Maingay* 611! PERAK; *Kunstler* 3535! 4652! 6906! 10428! *Scortechini* 206! 1537! SINGAPORE; *Ridley!*

This evidently quite common species has never yet been reported in fruit. It appears from a note in Herb. Calcutta that Mr. Kurz had supposed it might be the same as *S. macropterus* Miq.; the flowers, however, differ slightly and, in their venation, the leaves of the two species differ markedly. Father Scortechini on the other hand thought when he collected it that this might be *Derris* (*Aganope*) *macrophylla*, a reasonable supposition in the absence of fruit since the flowers of *Spatholobus* are very like the flowers of *Aganope* and since the obscurity, and indeed at times apparently total absence, of stipels from the leaves of this species leads to their being

easily overlooked. There are, however, very few specimens without stipels on *some* of their leaves and the writer has therefore followed Mr. Kurz in referring the plant to *Spatholobus*. The matter cannot, however, be conclusively settled till pods are obtained and examined. The only other species with equally obscure stipels is *S. crassifolius*, of which, however, Mr. Baker has seen immature fruit.

8. *SPATHOLOBUS RIDLEYI* Prain. A climber with glabrous slightly-angled branches. *Leaves* 6 in. long; leaflets 3 subequal oblanceolate apex acuminate tip mucronulate base cuneate, papery quite glabrous on both surfaces, 3–3·5 in. long 1–1·25 in. wide; petiole glabrous 1·5 in. long, petiolules glabrous ·2 in. long; stipels small rigid subulate, often very obscure; stipules lanceolate ·25 in. long subrigid parallel-veined. *Inflorescence* in axillary racemes 3 in. long 1 in. wide, bracts and bracteoles minute deciduous. *Calyx* ·12 in. campanulate adpressed-pubescent, upper tooth truncate the others rounded half as long as tube, pedicels ·2 in. long, adpressed-puberulous. *Corolla* ·25 in., white, standard orbicular, limb slightly auriculate, apex retuse. *Pod* 4 in. long, 1 in. wide below, seed-bearing tip ·4 in. across; sparsely puberulous, reticulate-veined, semitransparent except at apex.

SINGAPORE; *Ridley* 6401!

A very distinct species though nearest to *S. macropterus* Miq.

### 23. INDIGOFERA Linn.

Herbs or shrubs more or less densely clothed with adpressed hairs, with (in Malayan species) compound odd-pinnate leaves. *Flowers* small in copious axillary racemes. *Calyx* minute campanulate; teeth 5, subequal or the lower longest. *Corolla* caducous, standard obovate; keel straight, not beaked, laterally spurred near base. *Stamens* diadelphous, anthers uniform apiculate. *Ovary* sessile many-ovuled; style short incurved, stigma capitate penicillate. *Pod* linear-cylindric several-seeded. Species about 250; in all tropical regions and in temperate South Africa.

The genus is hardly a Malayan one; the above definition applies, as to foliage, only to the species that occur in the Malay Peninsula.

Herbaceous; stems densely pubescent; pod short straight pubescent ... .. 1. *I. hirsuta*.

Shrubby; stems faintly hoary; pod glabrous:—

Calyx deeply cleft, about half as long as corolla; pods reflexed:—

Leaflets ovate-acute; racemes dense, pods short much recurved ... .. 2. *I. Anil*.

Leaflets obovate-obtuse; racemes lax, pods longer straight or only slightly recurved at the tip ... .. 3. *I. tinctoria*.

Calyx shortly toothed, hardly  $\frac{1}{2}$  as long as corolla; pods ascending ... .. 4. *I. galegioides*.

1. *INDIGOFERA HIRSUTA* Linn. Sp. Pl. 751. An annual or biennial suberect herb 1-3 or 4 feet high; stem densely covered with soft short spreading grey or brown pubescence. *Leaves* 2-5 in. long, short-petioled; leaflets terminal and in 2-5 opposite pairs, obovate 1-2 in. long, membranous greyish-green above, glaucous beneath, densely coated with adpressed hairs; stipules setaceous, plumose. *Racemes* 2-6 in. long, short-peduncled, very dense-fl. *Calyx* densely pubescent, .15 in. long; teeth setaceous plumose; tube very short. *Corolla* .2 in. long, little exserted, purple or red. *Pod* .5-.7 in long, straight, densely covered with spreading grey pubescence, 6-8 seeded. DC. Prodr. II, 228; Roxb. Flor. Ind. III, 376; Jacq. Ic. I, 569; Wall. Cat. 5450; Hook. Comp. Bot. Mag. t. 24; W. & A. Prodr. I, 204; Miq. Flor. Ind. Bat. I. 304; Bak. in Flor. Brit. Ind. II, 98. *I. ferruginea* Schum. & Thonn. Pl. Guin. 370.

PAHANG; *Ridley!* PENANG; *Curtis!* MALACCA; *Ridley!* SINGAPORE; *Hullett!* **DISTRIB.** Tropics generally.

2. *INDIGOFERA ANIL* Linn. Mantiss. 272. A shrub 4-6 feet high with twiggy woody thinly silvery branches. *Leaves* 2-3 in. long, petioles .5-1 in.; leaflets terminal and in 5-8 opposite pairs, ovate-acute .5-1 in. long, membranous, green; stipules subulate. *Racemes* 1-2 in. long, dense-fl., nearly sessile. *Calyx* .04 in. silvery, teeth acute as long as tube. *Corolla* purple .15-.2 in., distinctly exserted. *Pods* .4-.6 in. long .1 in. thick glabrescent retro-falcate 4-6-seeded. Miq. Flor. Ind. Bat. I, 307. Bak. in Flor. Brit. Ind. II, 99. *I. tinctoria* var. *Anil* Kurz Journ. As. Soc. XLV, pt. 2, 269 excl. all syn.

ANDAMANS; Port Blair, not uncommon. A native of America but not uncommon in cultivation and as an introduced escape or weed in the Old World. This is apparently much commoner in Indo-China than it is in India; it is frequently mistaken for *Indigofera coerulea* Roxb. which however appears to be exclusively an Indian plant.

3. *INDIGOFERA TINCTORIA* Linn. Sp. Pl. 751. A shrub 4-6 feet high with twiggy woody thinly silvery branches. *Leaves* 1-2 in. long, petioles .5-1 in.; leaflets terminal and in 4-6 opposite pairs, obovate-oblong, .5-1 in. long membranous, green; stipules subulate. *Racemes* 2-4 in. long, lax-fl. nearly sessile. *Calyx* .04 in., silvery, teeth acute as long as tube. *Corolla* reddish-yellow .15-.2 in., distinctly exserted. *Pods* .7-1 in. long .1 in thick, glabrescent straight, or slightly recurved towards tip, 8-12-seeded. DC. Prodr. II, 224 (*var. a.* only); Roxb. Flor. Ind. III, 379; Wall. Cat. 5474; W. & A. Prodr. I, 202; Wight, Icon. t. 365; Miq. Flor. Ind. Bat. I, 306; Bak. in Flor. Brit. Ind. II, 99. *I. indica* Lamk. Encyc. Meth. III, 245. *I. sumatrana* Gært. Fruct. II, 317, t. 148.

PENANG; cultivated, *Curtis!* MALACCA; *Griffith!* PANGKORE; *Scortechini!* PAHANG; "growing near Sultan's tomb," *Ridley!* SINGAPORE;

*Ridley!* A native apparently of the Old World; often cultivated and occasionally occurring as an escape.

4. INDIGOFERA GALEGIOIDES DC. Prodr. II, 225. A tall shrub, reaching 8 feet high, with twiggy woody branches at first adpressed-pubescent at length glabrescent. *Leaves* distinctly petioled, 8–12 in. long; petioles .5–2 in.; leaflets terminal and in 6–12 lateral pairs, oblong obtuse, of varying size generally .5 in. long by .3 in. across but sometimes 1–2 in. long, membranous, green above glaucescent beneath very obscurely adpressed hirsute; stipules distinct, stipels minute. *Racemes* 2–3 in. long, short-peduncled, very dense-fl'd. *Calyx* .04 in. long, hoary, teeth very short, deltoid. *Corolla* pale-red .4–.5 in., finely canescent externally. *Pods* glabrous 2.5–3 in. long, cylindric, straight, beaked, 15–18-seeded. Miq. Flor. Ind. Bat. I, 310; Bak. in Flor. Brit. Ind. II, 100. *I. uncinata* Roxb. Fl. Ind. III, 382; Wall. Cat. 5472. *I. Finlaysoniana* Wall. Cat. 5488.

MALAY PENINSULA; Perak; *Kunstler*, 316! Malacca, *Griffith!* Langkawi, *Curtis*, 2865! DISTRIB. Ceylon; Indo-China; S. China; Philippines; Malay Archipelago.

Very easily distinguished from other species by the fact that its pods instead of spreading or being reflexed, are fastigiate grouped with their apices pointing in the direction of the apex of the peduncle. It is often planted for ornament and is perhaps not really native in Malaya.

#### 24. SESBANIA Pers.

Soft-wooded shrubs or trees with long, very narrow abruptly \*pinnate leaves with very numerous deciduous linear-oblong obtuse mucronate leaflets. *Flowers* in axillary racemes. *Calyx* campanulate shallowly 2-lobed or 5-toothed. *Corolla* much exserted; petals all with long claws; standard broad keel straight and obtuse or subrostrate and recurved. *Stamens* 2-adelphous; anthers uniform. *Ovary* stipitate, linear, many-ovuled; style filiform, incurved glabrous; stigma capitate. *Pod* very long and narrow, dehiscent; septate between the very many seeds. Species about 40, cosmopolitan in the tropics.

Flowers small, bud straight (§ *Eusesbania*); annual shrubs:—

Pod twisted pendulous; stems thick pith-like; flowers .75

in long ... .. 1. *S. paludosa*.

Pod not twisted usually ascending; stems woody very

slender; flowers .4 in. long ... .. 2. *S. cannabina*.

Flowers large, bud falcately recurved (§ *Agati*); a tree ... 3. *S. grandiflora*.

1. SESBANIA PALUDOSA Roxb. Hort. Beng. 56 (*sub Aeschynomene*). A large tree-like herb with annual stems reaching 12 feet in height,

\* By an unfortunate oversight this character is not made prominent in the Keys to the tribes and genera, p. 22 and p. 33.

2 in. in diam. full of white soft pith, quite unarmed as are the leaf rachises. *Leaves* 4–12 in. long, sessile, leaflets 10–30 pairs dark-green sparingly hirsute above. *Racemes* drooping 8–12-fld., 4–5 in. long equaling or slightly exceeding the leaves in whose axils they arise. *Flowers* yellow the standard externally dotted with small purple spots .75 in. long. *Pods* 10–12 in. long flexible with strong not indented sutures always pendulous and always twisted. *S. grandiflora* Miq. Flor. Ind. Bat. I, 238, not of Pers. *S. cochinchinensis* Kurz Journ. As. Soc. Beng. XLV, 2, 271, not of DC. *S. punctata* Benth. MSS. in Herb. Kew, not of DC. *S. aculeata* var. *paludosa* Bak. in Flor. Brit. Ind. II, 115 (in part only and excluding the syn. *Aeschynomene uliginosa*). *Aeschynomene paludosa* Roxb. Hort. Beng. 56; Flor. Ind. III, 333, not *S. paludosa* Jacq.

KEDAH; open marshy ground near rice-fields, *Kunstler* 1712!  
DISTRIB. Bengal; Burma; China; Java.

Roxburgh, who knew the Bengal *Sesbanias* well, has left of most of them, under the name of *Aeschynomene*, unmistakable descriptions and figures which subsequent Indian botanists have for some reason treated with little consideration. A careful examination of living plants shows, however, that Roxburgh's treatment of the forms is probably accurate, and his views of the limitation of the species are certainly preferable to any that have since been proposed.

The present species is the familiar *Kathiola* (as opposed to the true *Sola* which is *Aeschynomene aspera*), so common in marshes throughout the Gangetic Delta.

Though recognised as distinct by Prof. Miquel, that author unfortunately has used a specific name that is pre-occupied in the genus. Mr. Kurz thought it might be *Coronilla cochinchinensis* Lour. but that species has erect torulose pods and the identification is therefore impossible. Mr. Bentham has suggested its being *Sesbania punctata* but the pods and the stem structure forbid this identification also. As *Sesbania paludosa* Jacq. is not this species but is Roxburgh's *Aeschynomene uliginosa* it seems best to conserve Roxburgh's specific epithet *paludosa* for the very distinct plant to which he originally applied it.

Dr. Kuntze (*Rev. Gen. Plant.* I, 181) would reduce this to *Sesbania ægyptiaca*! an excellent instance of the unscientific use of the imagination.

2. *SESBANIA CANNABINA* Pers. Synops. II, 316. A tall and slender unarmed woody herb, stems reaching 20 feet in height without exceeding .5 in. in diam. at base. *Leaves* 2–3 in. long, sessile; leaflets 8–20 pairs, glabrous, very dark green. *Racemes* short (under 1 in.) but distinctly peduncled, 2–4-fld.; flowers yellow, the standard externally closely purple-streaked, .4 in. long. *Pods* very often solitary rarely more than 2, spreading or pendulous rarely erect, 4–8 in. long; sutures stout straight, valves not depressed between the seeds. DC. Prodr. II, 265; Miq. Flor. Ind. Bat. II, 286, excluding syn. *S. cannabina* W. & A. *S. affinis* Schrad. in DC. Prodr. II, 265. *S. polyphylla* Miq. Flor. Ind. Bat. II, 288. *S. aculeata* var. *cannabina* Bak. in Flor. Brit. Ind. II, 115. *Aeschynomene cannabina* Retz. Obs. V, 26; Roxb. Flor. Ind. III, 335.

TONGKAK; *Curtis' Collector* 2861! DISTRIB. Lower Bengal, commonly cultivated; Lower Burma; Java.

This species has, like the last, been much misunderstood. It is the familiar *Dunchi* plant of Bengal, where it is widely cultivated; to a slight extent on account of its fibre which, being more resistant to water than other kinds is employed in making fishing nets and lines; to a greater extent for its long lithe stems that are used as the wattles of which are constructed the walls of the houses in which *Piper Betle* is grown in Bengal. Probably this is an introduced plant in Malay countries.

3. *SESBANIA GRANDIFLORA* Pers. Synops. II, 316. A soft-wooded tree 20-30 feet high and 8-10 in. in diam. at base, with virgate terete branches. *Leaves* 6-12 in. long, leaflets 16-30 pairs, linear-oblong glabrous, pale-green. *Racemes* short (1 in. long), 2-4-flid., but distinctly peduncled; flowers white or pink. *Calyx* .8 in. deep, glabrous, shallowly 2-lobed. *Corolla* 3-3.5 in. long. *Pods* up to 20 in. long, falcate or straight, firm, sutures thick straight, valves slightly depressed between the seeds. Bak. in Flor. Brit. Ind. II, 115. *Agati grandiflora* Desv. Journ. Bot. I, 120, t. 4; Miq. Flor. Ind. Bat. I, 289.

PERAK; Thaipeng, *Scortechini* 525! SINGAPORE; *Kunstler* 1147! *Hullett* 819! DISTRIB. Mascarene Islands to N. Australia, usually planted.

The *Agati* tree, which is very doubtfully native either in India or Malaya, is often grown as a support for Pepper-vines in Southern India. In Northern India it is chiefly planted for the sake of its showy flowers.

## 25. TEPHROSIA Pers.

Herbs or undershrubs with compound odd-pinnate or, rarely, simple leaves; the leaflets opposite, subcoriaceous. *Flowers* in terminal and leaf-opposed racemes. *Calyx* campanulate with distinct subequal teeth. *Corolla* much exerted, petals clawed, standard suborbicular; keel incurved, not beaked. *Stamens* diadelphous, anthers uniform, obtuse. *Ovary* sessile, linear, many-ovuled; style much incurved, flattened or filiform, silky or glabrous; stigma capitate often penicillate. *Pod* linear flattened, many-seeded, 2-valved, continuous or obscurely septate between the seeds. Species about 100, in all tropical regions.

The above definition applies only to the species of the Malay Peninsula.

An undershrub; calyx-teeth short, deltoid ... .. 1. *T. candida*.

Herbs; calyx-teeth narrow cuspidate as long as the tube:—

Pods glabrescent ... .. 2. *T. purpurea*.

Pods clothed with persistent brownish silky hairs ... 3. *T. Hookeriana*.

1. *TEPHROSIA CANDIDA* DC. Prodr. II, 249. A low shrub, 4-6 feet high, with slender woody grooved branches clothed with brown or grey



persistent velvety pubescence. *Leaves* short-petioled 6–9 in. long; leaflets terminal and in 9–12 opposite pairs, ligulate, acute, 1.5–2 in. long, green and glabrous above, grey and thinly silky beneath; stipules setaceous, ascending. *Racemes* copious, terminal and lateral, 6–9 in. long, lower flowers fasciculate; pedicels .25–.4 in., silky. *Calyx* densely silky, .2–.25 in. long, teeth much shorter than tube. *Corolla* .75–1 in., rose or white, standard densely silky. *Pods* 3–4 in. long, 10–15-seeded, slightly recurved, clothed with adpressed brown silky hairs; style silky, flattened. Wall. Cat. 5627; W. & A. Prodr. 210; Bak. in Flor. Brit. Ind., II, 111. *Robinia candida* Roxb. Flor. Ind. III, 327. *Kiesera sericea* Reinw. in Miq. Flor. Ind. Bat. I, 291. *Xiphocarpus candidus* Hassk. Pl. Rar. Jav. 336.

SINGAPORE; *Anderson!* *Hullett!* **DISTRIB.** Himalayas, Western Indo-China, Malay Archipelago.

2. *TEPHROSIA PURPUREA* Pers. Synops. 329. A copiously branched suberect herbaceous perennial with slender firm terete glabrescent stems. *Leaves* short-petioled 3–6 in. long; leaflets terminal and in 6–10 opposite pairs, narrowly oblanceolate obtuse, .5 in. long, green and glabrescent above, glaucous and obscurely silky beneath; stipules subreflexed. *Racemes* copious all lateral, 3–6 in. long, lax-flid.; lower flowers fasciculate; pedicels .1–.2 in., bracteoles minute. *Calyx* densely silky .1–.15 in. long; teeth linear as long as tube. *Corolla* .25–.3 in. long, red, standard thinly silky. *Pods* 1.5–2 in. long, 6–8-seeded, slightly recurved, glabrescent; style glabrescent; stigma penicillate. DC. Prodr. II, 251; Wall. Cat. 5638; W. & A. Prodr. 213; Miq. Flor. Ind. Bat. I, 296; Bak. in Flor. Brit. Ind., II, 112. *Galega purpurea* Linn. Sp. Pl. ed. II, 1063; Roxb. Flor. Ind. III, 386.

MALACCA; *Griffith!* PENANG; *Curtis!* PAHANG; *Ridley!* SELANGOR; roadsides, *Ridley* 7291! **DISTRIB.** S.-E. Asia.

The form found in the Malay Peninsula is the typical plant described by Linnaeus and by Roxburgh as *Galega purpurea*. Mr. Ridley has noted on his Selangor specimens:—“*Indigofera*, introduced by Tamils, now established.”

3. *TEPHROSIA HOOKERIANA* W. & A. Prodr. 212; **VAR.** *amoena* Prain. A slightly-branched erect herbaceous perennial with firm terete finely downy branches. *Leaves* short-petioled 4–8 in. long; leaflets terminal and in 6–9 opposite pairs narrowly oblanceolate, truncate, 1 in. long, green and glabrous above, grey and thinly silky beneath; stipules linear erect. *Racemes* copious all lateral, 6–9 in. long, lax-flid.; pedicels .1 in. long; bracteoles minute. *Calyx* densely silky .15–.2 in. long; teeth setaceous rather longer than tube. *Corolla* .35–.5 in. long, red, standard thinly silky. *Pods* 2–2.5 in. long, 8–10-seeded, slightly recurved, densely clothed with persistent brownish silky hairs; style flattened

glabrescent; stigma penicillate. *Tephrosia amœna* Wall. in Hort. Calcutt. not of Eckl.

PENANG; *Curtis!* MALACCA; *Maingay!* *Derry!* DISTRIB. N. India.

This differs from Wight and Arnott's *T. Hookeriana* (*T. colutea* Wight in Wall. Cat. 5647 not of Pers.) in having leaflets almost twice as long and glabrous above; in true *T. Hookeriana* the leaflets are pubescent above as well as beneath. As Hamilton in *Trans. Linn. Soc.* XIII, 546 gives the alternative name *Tephrosia hirta* to the *Galega hirta* cited under this species by Mr. Baker, it must follow, if Mr. Baker's identification be correct, that the name *T. hirta* Ham. should be cited for the species. Dr. Hamilton's diagnosis, however, is of a plant with "falcate" pods in "dense" racemes, two characters which exclude *T. hirta* from this species and which point to its being a form of *T. villosa*.

There is little doubt that in a critical review of the genus the Malayan and North Indian plant should be looked on as specifically distinct from the true *T. Hookeriana* of Southern India; but as an African *T. amœna* Eckl. has already been published, Dr. Wallich's MSS. name is not available. The species might, however, be known as *Tephrosia subamœna*. The *Tephrosia amœna* "Pers." cited by Mr. Baker does not exist.

## 26. MILLETTIA W. & A.

Trees, shrubs or large woody climbers with odd-pinnate, rarely 1-foliolate leaves; the leaflets opposite and usually large, generally stipellate. *Flowers* large and showy in axillary solitary or fascicled racemes and in terminal panicles, the florets single or in fascicles along the rachis. *Calyx* cup-shaped lobed or slightly toothed; teeth 5 or the 2 upper connate or absent. *Corolla* much exserted, petals long-clawed; standard broad spreading or reflexed, auricled or not at the base; wings free or only cohering at the tip, oblong sickle-shaped; keel incurved obtuse. *Stamens* monadelphous or diadelphous, the vexillary filament being united at the base or as far as the middle with the others, or being quite free; anthers uniform, filaments filiform. *Ovary* linear sessile or shortly stalked surrounded at base by an annular disc-like sheath; ovules rather numerous; style filiform incurved glabrous, stigma capitate. *Pod* linear, lanceolate or oblong, usually compressed and flat, occasionally turgid; thickly coriaceous or woody; late or hardly dehiscent. Species about 60; especially prevalent in Indo-China and Malaya.

The genus *Millettia* is retained here because its species are familiar to residents in the east under this name. But, as Baron von Mueller has shown, there is no room for a genus *Millettia* apart from *Wistaria*. The name *Wistaria* unfortunately, though it has come into common use among horticulturists, is not the one that was originally given to the genus. The oldest name, as pointed out by Dr. O. Kuntze, is *Phaseoloides* and this, in a modified form, that author proposes to employ. Adjectives are not, however, advisable as generic names and the name *Kraunhia* which, as Sir Joseph Hooker and Mr. Jackson point out, is the earliest unobjectionable name, appears to be that which, when the two genera are united, must be employed for their species.

Inflorescences in axillary or terminal racemes or panicles; leaves scattered along the branches :—

Standard not auricled at the base of the lamina (§ *Eumillettia*), or auricles only represented by callosities :—

Leaves *lustrous beneath with thin lepidote silky pubescence*; (pods turgid silky; leaves exstipellate) ...

1. *M. sericea.*

Leaves *opaque beneath, glabrous when mature, or silky only on the nerves beneath* (*M. Hemsleyana*); (pods woody) :—

Pods turgid rugose; leaves rigidly coriaceous; racemes densely thyrsoid; flowers dark-red or purple: (leaves without stipels) :—

Bracts large suborbicular, *young racemes strobilate*; standard silky externally; pods pubescent ...

2. *M. eriantha.*

Bracts small ovate early deciduous; standard glabrous externally; pods glabrous ...

3. *M. atropurpurea.*

Pods flat smooth (lenticelled in *M. glaucescens*); leaves membranous (subcoriaceous in *M. cœrulea*); racemes lax; flowers white, pink or blue :—

Leaflets without stipels, membranous; racemes distinctly peduncled; pods glabrous (*standard 2-callose*) :—

Standard glabrous externally :—

Pods lenticelled, the sutures slightly winged; leaflets subglaucous quite glabrous beneath ...

4. *M. glaucescens.*

Pods not lenticelled the sutures thickened but not winged; leaflets pubescent on midrib and nerves beneath ...

5. *M. Hemsleyana.*

Standard silky externally; (pods not lenticelled, sutures not winged; leaflets glabrous beneath) ...

6. *M. decipiens.*

Leaflets stipellate, subcoriaceous; racemes very close and short peduncled; pods pubescent externally; (leaves glabrous beneath; flowers blue) ...

7. *M. cœrulea.*

Standard auricled at base of lamina (§ *Otosema*); (leaves subcoriaceous opaque beneath, pods pubescent) :—

Pods very wide turgid; leaflets small many obtuse; flowers pink, or white with pink tinge; panicles wide short :—

Leaflets densely velvety beneath; pod obpyriform, longitudinally channelled, pubescence short, pale-purple brown ...

8. *M. Maingayi.*

Leaflets glabrescent beneath; pod oval, not channelled, pubescence long, dark-brown ...

9. *M. oocarpa.*

Pods flat; leaflets large few caudate-acuminate; flowers pure white :—

Leaflets 5-7, rarely 3; pods soft brown-velvety ...

10. *M. albiflora.*

Leaflets *solitary*; pods pale yellowish-velvety ...

11. *M. unifoliata.*

Flowers *solitary along leafless stem* on conical processes in axils of leaf-scars; leaves *tufted at top of slender stems* ...

12. *M. cauliflora.*

1. *MILLETIA SERICEA* W. & A. Prodr. 263. A large woody climber 80–100 feet long, in dense forest; in the open a low spreading shrub 8–25 feet high; stems 3–6 in. diam.; branches striate shortly finely pubescent. *Leaves* 8–12 in. long, leaflets terminal and in 3–4 opposite petiolulate pairs, without stipels; obovate to elliptic-oblong, entire, apex bluntly cuspidate, base rounded or cuneate, 3–5 in. long 1·5–3 in. wide; coriaceous, deep-green and glabrous above glossy and silvery-grey or light-brown from a minute scale-like pubescence beneath; petiolules .2 in. long. *Racemes* axillary nearly as long as the leaves, slightly pubescent, the nodes not produced, each with the scars of 7–8 flowers. *Flowers* on pedicels .15 in. long bracteolate under the calyx. *Calyx* wide-tubular, limb truncate .15 in. deep, dark-brown silky externally. *Corolla* .5 in. diam., standard orbicular long-clawed, whitish pink or blue internally, brown-silky externally, wings clawed, purple or pink with white stripes. *Vexillary filament* hardly cohering at base with the remaining stamens. *Ovary* pubescent, style glabrous. *Pod* 3–7 in. long 1 in. across, densely brown-tomentose with a rusty shining velvety tomentum, turgid when ripe. *Seeds* 1–3, rarely 4, testa dark-brown smooth; 1 in. long, .75 in. diam. Miq. Flor. Ind. Bat. I, 153; Bak. in Flor. Brit. Ind. II, 104. *Pongamia sericea* Vent. Hort. Malmals. sub. t. 28; DC. Prodr. II, 416. *Phaseolodes sericeum* Kuntze Rev. I, 201.

VAR. *typica*; leaflets silvery beneath; sutures of young pods distinctly thickened; seeds 1–2, rarely 3.

PERAK; common; *Scortechini!* *Kunstler!* *Wray!* DISTRIB. Sumatra (*Teysmann!* *Forbes* 3103A!); Java (*Kurz!*)

A small-leaved form of *M. sericea* is reported from Penang (*Curtis* n. 844!); *Lobb* n. 310 in Herb. Kew, not seen by the writer, is noted by Mr. Hemsley as identical with it; and the same plant is also at Kew from Singapore, as it is at Calcutta from Perak (*Kunstler* n. 401! *Wray* n. 2364!). But the Perak specimens have in some cases leaflets of the ordinary size on the same twig with the small leaflets; the flowers of this form are exactly like those of *M. sericea* and the Penang plant is therefore not even separable as a variety.

VAR. *malaccensis*; leaflets brownish underneath; sutures of young pods hardly thickened; pods longer seeds 3–4.

MALACCA; *Griffith* 1764! *Maingay* 518! *Goodenough* 1706!

A distinct local form but perhaps hardly a good variety.

2. *MILLETIA ERIANTHA* Benth. Pl. Jungh. 250. A rather slender woody climber 50–80 feet long with only the youngest twigs silky. *Leaves* 8–11 in. long, rachis glabrous, leaflets terminal and in 2, rarely 3, opposite pairs, petiolulate without stipels; obovate-oblong or elliptic shortly cuspidate 2–4 in. long, 1·25–2·5 in. across, rigidly coriaceous pale green and glabrous on both surfaces; petiolules .25 in. *Racemes* copious, at first short dense 1–1·5 in. long and strobilate with large

suborbicular cuspidate densely silky bracts, ultimately thyrsoïd 6 in. long; the bracts deciduous .3 in. in diam.; pedicels .15 in. long. *Calyx* wide-campanulate .4 in. long, externally uniformly pubescent with brownish silky hairs; the teeth triangular two-thirds as long as tube. *Corolla* dark-red within, the standard externally densely glossy-brown silky nearly 1 in. long. *Pod* turgid, 3 in. long 1.75 in. across, 1-seeded; woody, rugose, clothed with pale brown hairs; slightly beaked. Miq. Flor. Ind. Bat. I, 155; Bak. in Flor. Brit. Ind. II, 108.

PERAK; common, *Wray! Scortechini! Kunstler!* MALACCA; very common, *Griffith! Maingay! Derry! Goodenough!* SINGAPORE; *Ridley* 6396! 6663! PAHANG; *Ridley* 2644!

3. *MILLETIA ATROPURPUREA* Benth. Pl. Jungh. 249. An erect tree 30–80 feet high 3–4 feet in girth; branches and thick branchlets grey but glabrous. *Leaves* 15–18 in. long, leaflets terminal and in 3–4 opposite pairs petiolulate without stipels; narrow-oblong, base rounded or rarely cuneate apex obtuse or shortly cuspidate, 4–6 in. long 1.5–2 in. across, rigidly coriaceous green and glabrous on both surfaces, upper surface shining; petiolules .25 in. *Racemes* copious in a dense terminal thyrsoïd hoary-tomentose panicle 6–8 in. across; bracts small ovate deciduous, .1 in. in diam.; pedicels .2 in. long, rusty-pubescent thickening in fruit. *Calyx* .25 in., campanulate, teeth small the two upper truncate the others acute, thinly silky externally. *Corolla* dark-purple, standard 1 in. long ovate-obtuse, glabrous externally. *Vexillary stamen* free; ovary pubescent. *Pod* turgid, 3 in. long 2 in. across, 1–2 seeded; woody subrugose quite glabrous; slightly beaked. Miq. Flor. Ind. Bat. I, 157; Bak. in Flor. Brit. Ind. II, 108. *Pongamia atropurpurea* Wall. Cat. 5910; Pl. As. Rar. I, t. 78.

PERAK; *Scortechini* 193! 273! *Kunstler* 8012! PENANG; *Wallich* 5910! MALACCA; common. SINGAPORE; *Hullett* 60! DISTRIB. Tenasserim; Sumatra.

4. *MILLETIA GLAUDESCENS* Kurz in Journ. As. Soc. Beng. XLII, 2. 67. A large tree with glabrous branches the smaller ones slightly angled. *Leaves* 8–9 in. long; rachis glabrous; leaflets terminal and in 4–5 opposite petiolulate pairs; lowest pair broadly ovate the rest obovate-oblong all acuminate, 3.5–5 in. long 1.25–1.75 wide; membranous, bright green above glaucescent beneath, glabrous from an early stage on both surfaces; petiolules .2 in. *Racemes* axillary slender 6 in. long, at first puberulous as are the capillary solitary, paired, or fascicled pedicels, .2 in. long. *Calyx* wide shallow-tubular, slightly pubescent, obscurely toothed, .15 in. deep. *Corolla* .4 in. long, standard orbicular glabrous externally, 2-callose at base, steel-blue (*vide* Kurz); wings clawed. *Vexillary filament* cohering half way up staminal

sheath. *Ovary* pubescent style glabrous. *Pod* 5–6 in. long, 1 in. wide, thickish, woody, usually tubercled rarely reticulated on the faces, quite glabrous; both sutures thickened and expanded into narrow wings. *Bak.* in *Flor. Brit. Ind.* II, 107.

PERAK; Kapayong Kurta, *Wray* 168! *Scortechini* (specimens with reticulated but not tubercled pods)!

By its pods this species is most nearly allied to *M. tetraptera* Kurz, but it has very different leaves which resemble those of *M. pubinervis* and *M. Hemsleyana* except in being glabrous. It agrees with these two species also as regards structure of flowers though not as regards pods. As regards leaves it likewise much resembles *M. decipiens* and *M. dehiscens*; in these species, however, not only are the pods without wings along the thickened sutures but the standard is silky externally.

5. *MILLETTIA HEMSLEYANA* Prain. An erect bushy tree 20–40 ft. high, stem 10–15 in. in diam.; branches puberulous when young. *Leaves* 6–8 in. long, rachis pubescent, leaflets terminal and in 3–4 opposite petiolulate pairs, without stipels; lowest pair broadly ovate the rest elliptic-obovate all obtusely acuminate, 2–3·5 in. long, 1·25–1·5 in. wide; membranous bright green glabrous from an early stage above subglaucous and pubescent beneath with scattered flexuous spreading hairs which quickly disappear except from the midrib and main lateral nerves; petiolules ·2 in., stipules large, ·25 in., deciduous. *Racemes* axillary, slender simple, 2·5–4 in. long, at first puberulous as are the capillary, solitary or fascicled pedicels, ·25 in. long, subtended by lanceolate deciduous bracts ·2 in. long. *Calyx* wide shallow-tubular, slightly pubescent, obscurely toothed, ·15 in deep, red, or green with a reddish tinge. *Corolla* ·4 in. long, standard orbicular 2-callose at base glabrous externally, white or faintly tinged with pink, wings clawed. *Vexillary filament* cohering nearly half way up staminal sheath. *Ovary* pubescent, style glabrous. *Pod* 3·5–4 in. long ·5 in. wide, thin, quite glabrous, sutures slightly thickened not winged. *Kraunhia Hemsleyana* Prain MSS.

PERAK; *Wray* 3310! 3608!

*Millettia Hemsleyana* is very closely related to *M. pubinervis* Kurz, a Tenasserim species; it has however rather narrower leaflets and differs especially in having large stipules and bracts. To *M. glaucescens* it is also closely related, but it differs in having pods that are neither winged along the sutures nor lenticelled along the valves. Both in pods and in foliage it likewise closely resembles *M. decipiens* but that species differs in having a pubescent standard.

6. *MILLETTIA DECIPIENS* Prain. An erect wide-spreading tree 40–60 feet high, stems 2–3 feet in diam.; branches all glabrous the smaller slightly angled. *Leaves* 8–9 in. long; rachis glabrous; leaflets terminal and in 4–5 opposite petiolulate pairs; lowest pair broadly ovate the rest elliptic-obovate all acuminate 2–3·5 in. long 1·25–1·5 in. wide;

membranous rather dark green on both surfaces glabrous from an early stage on both surfaces except for occasionally a few scattered hairs on the midrib beneath; petiolules .2 in. *Racemes* axillary slender simple 6–8 in. long, at first puberulous as are the capillary solitary or fascicled pedicels, .2 in long. *Calyx* wide shallow-tubular, slightly pubescent, obscurely toothed, .15 in. deep. *Corolla* .4 in. long, standard orbicular, densely silky externally, 2-callose at base, pink, or white with a pink tinge, wings clawed. *Vexillary filament* cohering half way up staminal sheath. *Ovary* pubescent, style glabrous; ovules 4. *Pod* 4–5 in. long, nearly 1 in. across, glabrous, sutures not thickened. *Kraunhia decipiens* Prain MSS.

PERAK; Ulu Slim, 400 feet, *Kunstler* 10718! Kwala Dipong, *Scortechini* 1749! Plass river, *Wray* 548! PAHANG; Kwala Tahan, *Ridley* 2591!

The flowers of this species so much resemble those of *Pongamia glabra* that, with flowering examples, only careful dissection to ascertain the number of ovules satisfactorily distinguishes the two. Another species extremely nearly related to this is *Millettia dehiscens* (*Pongamia dehiscens* Koord. & Val. *Bijdr.* II. 96) a Java tree with the same silky standard, but with the ovary 5- or more-ovuled; its leaves are like those of *M. glaucescens*, its pods like those of *M. ovalifolia*.

7. *MILLETIA COERULEA* Bak. in *Flor. Brit. Ind.* II, 107. A woody climber with glabrous branches. *Leaflets* terminal and in 3 petiolulate pairs, stipellate; obovate-oblong cuspidate 4–6 in. long; subcoriaceous, glabrous on both sides from an early stage; petiolules .15 in. long. *Racemes* short-peduncled, close, axillary. *Flowers* short-pedicelled, densely fascicled. *Calyx* campanulate .1 in., faintly silky, nearly truncate. *Corolla* three times the calyx, the standard densely white-anescent on the back. *Stamens* monadelphous. *Pod* large flat rather woody, linear-oblong 7–8 in. long, 1.5–1.75 in. wide, recurved, late in dehiscing, clothed with dense short persistent brown-velvety pubescence. *Pongamia coerulea* Grah. in *Wall. Cat.* 5894.

MALACCA; *Griffith.* *DISTRIB.* Burma.

The above description is taken from the *Flora of British India*, there being no specimen at Calcutta either of the Burmese or of the Malacca types of Mr. Baker's species. The specimens here that accord best with the description are some from Penang (*Curtis* n. 2459); they are in fruit only and may prove to belong to *M. coerulea*. The plant is noted, however, as a "tree;" the specimens have 5-foliolate leaves and the leaflets resemble those of *M. albiflora*, of which it may equally well be a variety.

8. *MILLETIA MAINGAYI* Bak. in *Flor. Brit. Ind.* II, 110. A creeper over 100 feet long; young branches pale brown-pubescent. *Leaves* 8–10 in. long, leaflets terminal and in 5–8 opposite pairs, shortly petioluled stipellate; oblong, base rounded, apex rounded or subacute, 1.5–2 in. long 1 in. across, coriaceous, light green and glabrous above, velvety

underneath as is the leaf-rachis; petiolules  $\cdot 2$  in., stipels setaceous, persistent. *Racemes* in small axillary panicles one-third as long as leaves,  $2\cdot 5$  in. long,  $1\cdot 5$  in. across; rachis and pedicels rusty-pubescent, as are the linear deciduous bracts  $\cdot 1$  in. long; pedicels  $\cdot 1$  in. *Calyx*  $\cdot 2$  in. campanulate, externally rusty-pubescent, teeth wide-triangular half as long as tube. *Corolla* white tinged with pink,  $\cdot 5$  in. long, standard orbicular, auriculate at base of lamina, slightly emarginate and slightly puberulous externally. *Pod* oblong or obpyriform, woody indehiscent (*vide* Baker), rounded at both ends,  $6$  in. long  $3\cdot 5$  in. wide, turgid, shortly pale rusty-brown velvety, the surface traversed by deep longitudinal grooves.

SINGAPORE; cultivated, *Maingay*; *Ridley*! SELANGORE; in dense jungle at 800–1200 feet elev., *Kunstler* 8759!

A remarkable species, originally described by Mr. Baker from a fruiting specimen. To the kindness of Mr. Ridley, the Calcutta Herbarium owes the possession of excellent flowering and fruiting examples of the plant; from these the above description has been drawn up. Mr. Kunstler's plant from Selangore is unfortunately only in flower; it agrees however in every detail with the flowering specimens sent from the Singapore garden by Mr. Ridley.

The only near ally of *M. Maingayi* is the next species from which it differs in having larger pods that, according to Mr. Baker, do not dehisce and in having leaflets densely tomentose beneath.

9. *MILLETTIA OOCARPA* Prain. A large creeper, young branches glabrous. *Leaves* 6–8 in. long, leaflets terminal and in 4–6 opposite pairs, shortly petiolulate stipellate; oblong, rounded at both ends, 2–3 in. long, 1– $1\cdot 5$  in. across, the terminal considerably exceeding the others, subcoriaceous light green and glabrous above, whitish and very sparsely adpressed-puberulous, finely reticulately veined beneath; leaf-rachis puberulous as are the petiolules  $\cdot 2$  in. long; stipels setaceous persistent. *Racemes* in small axillary panicles one-half as long as leaves,  $2\cdot 5$  in. long,  $1\cdot 5$  in. across; rachis and pedicels slightly puberulous as are the linear deciduous bracts  $\cdot 1$  in. long; pedicels  $\cdot 1$  in. *Calyx*  $\cdot 2$  in. long, campanulate, externally grey-puberulous, teeth short obscure. *Corolla* white tinged with pink,  $\cdot 5$  in. long, standard orbicular, auriculate at base of lamina, entire, uniformly sparsely puberulous externally. *Stamens* diadelphous, vexillary filament free. *Ovary* 2-ovuled, pubescent. *Pod* oval, woody, dehiscent, rounded at both ends,  $3\cdot 5$  in. long,  $1\cdot 75$  in. in diam., turgid, densely dark brown-velvety, the surface smooth. *Kraunkhia oocarpa* Prain MSS.

PERAK; Batu Togoh, 250 feet, *Wray* 2141! *Scortechini* 429!

Very nearly related to *Millettia Maingayi* of which it has exactly the flowers. Its pods however are smaller, densely covered with darker and much longer hairs, and are distinctly dehiscent. In shape and size they resemble the egg of a domestic fowl. The leaflets too differ in not being velvety beneath, and the leaves are shorter.

10. *MILLETTIA ALBIFLORA* Prain. A handsome spreading tree some-



times 80–100 feet high (*Kunstler*), usually 30–50 feet, trunk 2–3 feet in diam., branches glabrous. *Leaves* a foot long, leaflets terminal and in 2–3 more rarely 1, opposite pairs, shortly petiolulate without stipels, elliptic-lanceolate entire apex caudate base cuneate, 5–10 in. long, 1·5–2·5 in. across, lowest pair rather smaller, thickly membranous shining above dull beneath, with 6–9 pairs of ascending rather prominent lateral nerves and a very prominent midrib, quite glabrous on both surfaces, petiolules ·2 in. long. *Racemes* in very long narrow axillary panicles towards ends of branches, 1–1·5 feet long, 2·5 in. across; individual racemes subfastigiata 4–6 in. long with 10–12 solitary short-pedicelled flowers; pedicels ·15 in. long, rusty-puberulous as are the peduncles and main-rachis. *Calyx* ·25 in. long, rusty-puberulous, tube campanulate rather longer than the triangular teeth, the two upper teeth connate emarginate. *Corolla* pure white ·75 in. long, standard orbicular 2-auriculate at base of lamina, externally glabrous. *Vexillary filament* extending half way up the sheath or at length free on one side only, or on both. *Ovary* puberulous. *Pod* linear 7–13 in. long, 1·5–2 in. wide, straight flat rather woody, uniformly soft brown-velvety. *Kraunkhia albiflora* Prain MSS.

PERAK; Goping, *Scortechini* 1948! Ulu Salama, *Kunstler* 729! 1288! 4467! 5833! 5993! 6077! Larut, *Kunstler* 5357! 6709! 6842! Thaipeng, *Wray* 1864! Kota, *Wray* 1943! *Ridley* 7981! 8004! PAHANG; Tahan, *Ridley* 2641!

A very fine species apparently extremely common in Perak. Mr. *Kunstler* notes that it is usually found near river-courses or in wet low ground.

11. *MILLETTIA UNIFOLIATA* Prain. A handsome spreading tree 30–40 feet high, trunk 1 foot in diam., branches glabrous. *Leaves* consisting of a solitary terminal leaflet, petiolulate without stipels, obovate-oblong or lanceolate entire, apex acute rarely caudate, base cuneate, thickly membranous shining above dull beneath, with a prominent midrib and 6–9 pairs of ascending lateral nerves not much more prominent than the distinct secondary reticulations; glabrous on both surfaces; petiolule ·25 in. long directly articulate with branch. *Racemes* in very slender axillary panicles shorter than the leaflets, 3–4 in. long ·25–·35 in. across; individual racemes short 3–5-fl. separated from each other by intervals 1 in. long; peduncles and pedicles glabrous. *Calyx* ·2 in. long, externally glabrous, campanulate 2-bracteolate at base, bracteoles ovate-lanceolate minute, teeth shorter than tube hirsute within. *Corolla* pure white ·75 in. long, standard orbicular 2-auriculate at base of lamina, externally glabrous. *Stamens* monadelphous in a sheath split along the vexillary side. *Ovary* puberulous. *Pod* linear 6 in. long 1 in. across, flat, rather woody, tapering to both ends, finely pale yellowish-velvety externally. *Kraunkhia unifoliata* Prain MSS.

PERAK; Pangkore Island, *Curtis* 1615! *Scortechini* 1023! *Tupia*, *Wray* 2836! *Blanja*, *Scortechini* 124! 1711! *Larut*, *Kunstler* 4251! *Goping*, *Kunstler* 4492! 8210!

Very closely related to *Millettia albiflora* of which it has much the flowers and also much the fruits. It differs however from all other hitherto known *Millettias* in having 1-foliolate leaves. The pods are never so large as in *M. albiflora* and the inflorescence is very different in appearance owing to its being smaller and more slender.

12. MILLETTIA CAULIFLORA Prain. A small slender unbranched gregarious shrub 6–8 feet high, stems hardly .5 in. in diam., with black lenticelled bark, bearing a terminal tuft of leaves and having small nodular flower-bearing projections in the axils of leaf-scars along the stem. *Leaves* 1–1.5 feet long, stipules subulate, .3 in. long, caducous; rachis tawny-pubescent as are the petiolules and the setaceous persistent stipels; leaflets thinly membranous glabrous on both surfaces, lateral nerves in 5–7 ascending pairs impressed above very prominent like the midrib beneath; lowest pair 2 in. long 1.25 in. across, terminal and upper pairs 6 in. long 2 in. wide. *Calyx* .2 in., glabrescent. *Corolla* (only withered specimens seen) apparently pink, standard apparently auricled. *Pod* solitary, at intervals along the stem, 3–3.5 in. long, .6 in. wide, narrowed towards base, slightly recurved, rigidly coriaceous early dehiscent, externally grey silky-tomentose; seeds 2. *Kraunhia cauliflora* Prain MSS.

PERAK; *Larut*, *Kunstler* 2555!

A very distinct species with leaves much like those of the African *Millettia macrophylla* Hook. f., but with fewer lateral nerves. It differs from all other known species in having solitary fruits (and apparently solitary flowers) in the axils of old leaf-scars along the stem. The standard seems to be auricled, but whether the stamens are monadelphous or diadelphous cannot yet be said.

## 27. PONGAMIA Vent.

A tree. *Leaves* odd-pinnate, leaflets opposite, ex-stipellate. *Flowers* racemed. *Calyx* campanulate, nearly truncate. *Corolla* much exserted; standard broad, silky; keel obtuse the petals cohering at their tip. *Stamens* monadelphous, the upper filament free low down; anthers oblong, versatile. *Ovary* sessile, 2-ovuled; style incurved, glabrous, stigma capitate. *Pod* woody, somewhat turgid, oblong, indehiscent, not winged nor thickened at the sutures. A single species, on all coasts from the Mascarene Islands to Malaya, North Australia, and Western Polynesia.

PONGAMIA GLABRA Vent. *Jard. Malm.* t. 28. A fairly-large tree 40–60 feet high, with spreading glabrous branches; bark greyish-green soft, wood pale-yellow when cut, darkening on exposure; stem reaching 2–3

feet in. diam. *Leaves* 8–10 in. long, pale-green, leaflets usually 5–7, more rarely 7–9, oblong or ovate, rarely ovate-lanceolate, acute, base cuneate or deltoid; subequal, 3–7 in. long, 1–3·5 in. wide, subcoriaceous, glabrous on both surfaces or, rarely, slightly puberulous on the nerves beneath, lateral nerves about 8 pairs rather prominent beneath as is the midrib, rachis about 5 in. long glabrous as are the petiolules ·25 in. long. *Flowers* in rather short axillary racemes 4–6 in. long with peduncles 1–1·5 in. long, usually simple; nodes tumid bearing 2–4 subequal filiform pedicels, rachis and pedicels sparsely puberulous, pedicels ·25–35 in. long, bracteolate at base and 2-bracteolate towards apex. *Calyx* wide-campanulate ·12 in. deep, ·15 in. wide, mouth truncated. *Corolla* ·35–·5 in. long, white with violet or pinkish flush, standard orbicular, silky on the back, subcordate and 2-auriculate at the base. *Stamens* monadelphous. *Ovary* finely pubescent, ovules 2, rarely 1. *Pod* turgid woody glabrous, 1·5–2 in. long, ·8–1·25 in. wide, ·25 in. thick, brownish-green with a short decurved point; seeds 1, very rarely 2, testa white, marbled with slightly raised brownish lines radiating irregularly from the hilum, ·7 in. long, ·5 in. wide.

*VAR. typica*; leaflets usually 5, occasionally 7, oblong or ovate 2·5–3·5 in. wide, quite glabrous beneath; racemes always solitary simple, pedicels ·35 in. long, their bracteoles only sub-opposed and situated slightly above the middle. *Pongamia glabra* Vent.: DC. Prodr. II, 416; Wall. Cat. 5878; W. & A. Prodr. 262; Wight, Ic. t. 59; Bedd. Flor. Sylvat. t. 177; Miq. Flor. Ind. Bat. I, 147; Bak. in Flor. Brit. Ind. II, 240. *Pongamia grandifolia* Zoll. & Mor. Syst. Verzeichn. 3; Miq. Flor. Ind. Bat. I, 147. *Pongamia mitis* Kurz, Journ. As. Soc. Beng. XLV, 2. 128. *Robinia mitis* Linn. Sp. Pl. ed. II, 1044. *Galedupa indica* Lamk Encyc. Meth. II, 594 (excl. syn. *Caju galedupa* Rumph.); Roxb. Flor. Ind. III, 239. *Dalbergia arborea* Willd. Sp. Pl. III, 901. *Galedupa arborea* Roxb. Hort. Beng. 53.—Rheede Hort. Malab. VI, t. 3; Rumph. Herb. Amb. III, t. 117; Lamk III. t. 603.

In all the provinces, very abundant on the banks of every tidal river and along the margins of all Mangrove-swamps.—*DISTRIB.*; of the genus; often planted in inland districts.

*VAR. xerocarpa*; leaflets 7–9, very rarely 5, lanceolate 1–1·35 in. wide, usually sparsely puberulous on the midrib and main veins beneath, racemes occasionally 2–3 in same axil and sometimes sparingly branched, the pedicels ·25 in. long with the bracteoles opposed and situated close under the calyx; ovules sometimes solitary. *Pongamia xerocarpa* Hassk. Retz. ed. nov. 208. *Malaparius flavus* Miq. Flor. Ind. Bat. I, 1082 in addend., hardly *Malaparius* Rumphius.

PAHANG; *Ridley* 1362! KEDAH; *Kunstler* 1740! PERAK; Trang,

*Kunstler* 1420! 5625! MALACCA; *Derry* 939! DISTRIB. Ceylon (Thwaites C. P. 1489); Java; Sumatra.

*Pongamia glabra* is the well-known littoral species known in Southern India generally as *Pangam*, in Northern India as *Karanj*, in Burma as *Thin-win* and in Malaya as *Malapari*. Throughout India it is very generally planted, both as a timber tree, and for the sake of the oil obtained from its seeds; it does not seem to be planted in the Malayan provinces.

The typical variety appears in two somewhat distinct forms that pass, however, into each other by all kinds of intermediates. These are:—

(a) a form with medium-sized leaflets and flowers (the original *P. glabra*) which is spread throughout the area occupied by the species; also

(β) a form with decidedly larger leaflets and flowers (the form named *P. grandifolia* Zoll. & Mor.) which extends from north to south along the coasts of Chittagong, Arracan, the Andamans, Nicobars, Sumatra and Java, apparently without extending westward to the Sundribuns and India or eastward to Tenasserim and the Malay Peninsula.

VAR. *xerocarpa*, though only separable by characters that individually are trivial, nevertheless looks remarkably different from the type; it resembles far more the two species known as *Millettia decipiens*, and *Millettia dehiscens*. Indeed, with flowers alone, only a careful examination of the ovary, 4- or more-ovuled in the *Millettias*, 1- or 2-ovuled in the *Pongamia*, ensures accurate determination. The fruits of the *Millettias* are, however, dehiscent and therefore unlike those of *Pongamia*.

Roxburgh used for this genus Lamarck's name *Galedupa*, first applied in 1786. Lamarck's use of the name depended on his belief that *Caju galedupa* Rumphius (*Herb. Amboin.* II, t. 13) was this tree. As figured, however, *Caju galedupa* has equally-pinnate leaves, dehiscent pods and arillate seeds; *Pongamia glabra* has unequally-pinnate leaves, indehiscent pods, no arillus and a very small hilum. Moreover Rumphius describes and figures *Pongamia glabra* (*Herb. Amboin.* III, 117) under its Malay name *Malapari*. That Lamarck had detected his mistake is clear from his having abandoned the name *Galedupa* in 1797 (*Illustr.* t. 603) in favour of *Pungamia*—taken from Adanson's name *Pongam* of 1768. This last Ventenat amended to *Pongamia* in 1803, and in that form has become familiar a name which, even were *Galedupa* accurately applicable, is much anterior to *Galedupa*. The point would not indeed call for discussion but for the fact that quite recently Taubert in the authoritative *Natürlichen Pflanzenfamilien* has re-adopted Roxburgh's usage. Kuntze, not satisfied even with this amount of change, desires to use the word *Caju(m)*; that is, he desires to use precisely the synonym which cannot be applied to the plant described by Lamarck, as the name of the plant to which Lamarck's definition belongs.

Loureiro, overlooking both Rumphius' description of the pods and his figure showing its leaflets as opposite, referred *Malapari* to *Pterocarpus*; he has been followed in this by most subsequent botanists except Miquel, who, having seen specimens of *Malapari* collected in Sumatra by Teysmann, removed the plant from *Pterocarpus* and established it as a genus. Bentham (*Gen. Plant.* I, 465) expresses a doubt as to Teysmann's *Malapari* being conspecific with Rumphius' one. Everything, however, is in favour of the belief (unfortunately the Sumatra plant is unrepresented in *Herb. Calcutta*) that Teysmann's '*Malapari*' is *Pongamia glabra*, just as Rumphius' '*Malapari*' and the '*Malapari*' recently collected by Derry in Malacca, are *Pongamia glabra*. But it must be noted that while Rumphius' '*Malapari*' appears

to be typical *Pongmia glabra*, Derry's 'Malapari' is var. *zerocarpa*, and so apparently, judging by Miquel's description, is Teysmann's.

28. DERRIS Lour.

Climbers, rarely erect trees. *Leaves* odd-pinnate, with usually exstipellate leaflets. *Flowers* copious, usually fascicled, showy, in axillary or terminal racemes or panicles. *Calyx* campanulate, nearly truncate. *Corolla* much exerted, standard broad; keel obtuse, the petals cohering slightly. *Stamens* usually monadelphous, the upper one free in § *Aganope*; anthers versatile. *Ovary* sessile, few-ovuled; style incurved, filiform, stigma capitate. *Pod* rigid, thin, flat, indehiscent, oblong if one-seeded, strap-shaped if few-seeded, with a distinct wing down the upper or both sutures. **DISTRIB.** Species about 40, belting the world in the tropics.

Standard not callose at the base:—

Vexillary stamen free throughout; flowers single in ample thyrsoid panicles with nodes neither tumid nor produced into stalks (§ *Aganope*):—

Pod winged only along the upper suture, and sinuate between the seeds; corolla over  $\frac{1}{2}$  in. long ... 1. *D. sinuata*.

Pod winged down both sutures, not sinuate between the seeds; corolla under  $\frac{1}{2}$  in. long:—

Buds and flowers distinctly pedicelled, bracteoles shorter than buds ... 2. *D. Wallichii*.

Buds and flowers sessile, bracteoles exceeding the buds ... 3. *D. thyrsoiflora*.

Vexillary stamen united with the others at least in the centre of tube; flowers fascicled on tumid nodes that are sometimes produced into stalks:—

Pods winged only along upper suture:—

Pod narrow, pointed at both ends, several-seeded (§ *Brachypterum*):—

Climbers, leaflets 9–19 medium, acute; flowers in long lax panicles exceeding the leaves ... 4. *D. scandens*.

Trees, leaflets 25–39 small, rounded; flowers in dense panicles shorter than the leaves ... 5. *D. dalbergioides*.

Pod suborbicular or shortly broadly-oblong, obtuse, few-seeded (§ *Euderris*):—

Leaflets glabrous, not exceeding 5 in. long, exstipellate; pods glabrous ... 6. *D. uliginosa*.

Leaflets pubescent beneath, often 6–8 in. long, stipellate; pods pubescent ... 7. *D. elegans*.

Pod winged along both sutures [unknown in *D. affinis* and *D. floribunda*] (§ *Dipteroderris*):—

Rachis and branches of panicle densely silky; pod silky; (leaves faintly-veined) ... 8. *D. andamanica*.

Rachis and branches of panicle glabrous or sparsely puberulous; pod (where known) glabrous:—

Flowers white in laxly-branching panicles:—

Leaves with 10 pairs of prominent spreading secondary nerves; ovules 4 ... 9. *D. affinis*.

Leaves with 4-5 pairs of ascending faint secondary nerves; ovules 2-3 ... 10. *D. floribunda*.

Flowers pink in fastigately-branching panicles (leaves with numerous spreading but not prominent secondary nerves; ovules 2; pod glabrous) ... 11. *D. amœna*.

Standard 2-callose at base (§ *Paraderris*):—

Leaf and petals pubescent ... 12. *D. elliptica*.

Leaves and petals glabrous ... 13. *D. malaccensis*.

§ 1. AGANOPE. Robust climbers with large leaflets; flowers usually rather small in ample thyrsoid panicles, the nodes not produced into stalks; upper stamen quite free from the others down to the base; base of vexillum without callosities; pod winged down one or both sutures.

1. *DERRIS SINUATA* Thwaites Enum. Pl. Zeylan. 93. A strong climber with dark-brown glabrous branches. *Leaves* 10-16 in. long; leaflets dark-green 5-7, coriaceous ovate- to ovate-oblong or elliptic, shortly cuspidate or subobtusate base rounded or widely deltoid, 4-5 in. long, 2-3 in. wide, glabrous on both surfaces, lateral nerves 5-7 pairs spreading hardly visible, rachis 6-12 in. long glabrous as are the petioles .25 in. long. *Flowers* in ample thyrsoid terminal, or terminal and axillary panicles 8-16 in. long, branches 1.5-3 in. long at intervals of .5-1 in. their nodes not tumid nor produced into stalks, pedicels .1 in. long (in fruit lengthening to .25-.3 in.), stout, arranged usually in subopposite pairs .2-.25 in. apart, occasionally all scattered, rachis and its branches glabrescent, pedicels adpressed rusty-puberulous, with small deciduous bract at base and 2 very minute triangular deciduous bracteoles close to calyx. *Calyx* wide-campanulate thinly silky .2 in. long, with ripe fruit .25 in. in diam. circumscissile at base. *Corolla* .6 in., standard erect orbicular .5 in. wide, with ecallose cordate base. *Stamens* 2-adelphous, the vexillary filament free from the rest to the base. *Ovary* pubescent, ovules 5-7. *Pod* strap-shaped, coriaceous, distinctly reticulated, 2.5-8 in. long, 1.5 in. wide, upper suture narrowly winged, wing never exceeding .1 in. in breadth, usually much less and sometimes barely perceptible, always more or less sinuate between the 1-5 seeds. Benth. Journ. Linn. Soc. IV, Suppl. 113; Bak. in Flor. Brit. Ind. II, 246. *Pongamia sinuata* Wall. Cat. 5911. *Pongamia grandifolia* Grah. in Wall. Cat. 5882, not of Zoll. & Mor.

PERAK; on banks of tidal rivers, *Kunstler* 179! *Scortechini*! MALACCA; river banks, *Griffith* 1773! *Maingay* 551! DISTRIB. Ceylon; Sundribuns: Coasts of Indo-China and the Malay Archipelago.

2. DERRIS WALLICHII Prain. A strong climber with glabrous brownish lenticular branches. *Leaves* 8–12 in. long, leaflets pale-green, 5–9, subcoriaceous oblong-lanceolate acute, base rounded, 4–5 in. long 1·5–2 in. wide, glabrous on both surfaces, lateral nerves ascending 8–9 pairs prominent beneath, rachis 4–8 in. long glabrous as are the petioles 25 in. long. *Flowers* in ample thyrsoid terminal and axillary panicles 8–16 in. long, their branches 5–1·5 in. long at intervals of 25–5 in., their nodes not tumid nor produced into stalks, pedicels 2–25 in. long arranged in subopposite pairs at intervals of 2–3 in., rachis and its branches thinly-silky as are the pedicels and calyx, bracts at base of pedicels ovate, much shorter than buds, lateral pair of bracteoles at their apices very minute. *Calyx* tubular at length campanulate, mouth truncate, 12 in. long, 15 in. wide. *Corolla* 3 in. long, standard erect orbicular with cordate ecallose base. *Stamens* 2-adelphous, the vexillary filament quite free. *Ovary* pubescent, ovules 4. *Pod* broadly strap-shaped, thin, flat, glabrous, finely veined, 1·5–4·5 in. long, 1·5 in. wide 1–2-seeded, not sinuate between the seeds; distinctly winged down both margins. *Pterocarpus floribundus* Wall. Cat. 5846. *Derris thyrsoiflora* Prain MSS. in Herb. Calcutta (as to Andamans specimens) hardly of Bentham.

ANDAMANS; *King's Collectors!* DISTRIB. Silhet, Cachar and Khasia.

The Andaman specimens here described have leaves very like those of *D. thyrsoiflora* but they have rather more nerves and are not quite so thick. The long pedicels, however, make it very easy to distinguish the two, while the fruits of *D. Wallichii* are broader than those of *D. thyrsoiflora*. In distributing specimens from the Calcutta Herbarium those from the Andamans were unfortunately issued under the name *D. thyrsoiflora*.

3. DERRIS THYRSIFLORA Benth. in Journ. Linn. Soc. IV, Suppl. 114. A large rambling bush or small tree with spreading branches, 15 to 20 feet high, or a robust climber reaching 60–80 feet in length, in either case with a stem 6–8 in. in diam. with glabrous lenticelled branches. *Leaves* 8–15 in. long, leaflets dark-green, 5–9, coriaceous oblong to oblong-lanceolate usually acute sometimes rounded at apex, base rounded or cuneate, 4–6 in. long, 1·5–2·5 in. wide, glabrous on both surfaces, lateral nerves ascending 5–7 pairs rather prominent beneath, rachis 4–10 in. long, glabrous as are the petioles 25 in. long. *Flowers* in ample thyrsoid terminal and axillary panicles 8–24 in. long, their branches 5–2 in. long at intervals of 25–5 in., their nodes not tumid nor produced into stalks, pedicels in fruit under 1 in. in flower hardly perceptible, arranged usually in close-set subopposite pairs, rachis and its branches thinly silky as is the sessile calyx with linear deciduous basal bracteole as long as bud and with two very minute lateral bracteoles. *Calyx* tubular, at length campanulate, mouth truncate, 12 in. long, 15 in. wide, green-

ish white. *Corolla* white, .3 in. long, standard erect orbicular .35 in. wide, with ecallose cordate base. *Stamens* 2-adelphous, the vexillary filament free from the rest to the base, the free portion of all the filaments slightly puberulous. *Ovary* pubescent; ovules 4. *Pod* strap-shaped, thin, flat, glabrous finely-veined, 1.5-3.5 in. long, 1-1.25 in. wide, distinctly winged along both sutures, wings subequal .2-.25 in. wide, not sinuate between the 1-3 (very rarely 4) seeds. Bak. in Flor. Brit. Ind. II, 246 (excl. syn. *Amerimum obovatum* and *Pongamia* Wall. Cat. 9054). *Derris pyrrothyrsa* Miq. Flor. Ind. Bat. Suppl. 297. *Aganope floribunda* Miq. Flor. Ind. Bat. I, 151. *Millettia thyrsiflora* Benth. Pl. Jungh. 249.

NICOBAR; Kamorta, Kurz! KEDAH; Yau, Ridley 5224! PENANG; Curtis 248! MALACCA; Griffith 1776! Maingay 552! Derry 94! 1030! PERAK; Scortechini, 907! 1176! 1342! 1533! 1639! 2073! Wray, 1985! 2513! 2770! 3068! Kunstler 3630! 6419! 7638! 7757! 7919! 10062! 10395! 10850! PAHANG; Ridley 2456! 2458! SINGAPORE; Anderson! Kurz! Hullett! DISTRIB. Sumatra, Java.

This species is very distinct from *D. sinuata* by reason of its much smaller, more numerous, and more closely set florets, which are as nearly as possible sessile; also on account of its very different pods which are shorter, much thinner, not sinuate between the seeds and are distinctly winged down both sutures. It is much more closely related to the last species from which it can be most easily distinguished by the absence of pedicels.

The synonym *Amerimum obovatum* is excluded because that plant is the same as *Pongamia obovata* Grah., reduced, with justice, to *Derris cuneifolia*. And the synonym *Pongamia* Wall. Cat. 9054 is also excluded, at least as a temporary measure, because Mr. Baker, in another passage, has referred it to *Spatholobus acuminatus*.

There are at Calcutta authentic examples, named by Dr. Miquel himself, both of *Aganope floribunda* Miq. and of *Derris pyrrothyrsa* Miq.; these are specimens of the same species, from Java and Sumatra respectively; they agree exactly with our specimens from the Malay Peninsula.

The variation in habit depends on whether the species is growing in open places or in dense forest.

§ 2. BRACHYPTERUM. Trees or climbers with comparatively small leaflets; flowers medium fasciculate on tumid nodes in axillary panicles: stamens monadelphous; base of vexillum without callosities; pod thin strap-shaped, narrow, pointed at both ends, winged only along the upper suture.

4. DERRIS SCANDENS Benth. in. Journ. Linn. Soc. IV, Suppl. 103. A very large climber often exceeding 100 feet in length with branchlets at first obscurely grey downy; stems as thick as a man's wrist with very irregularly excentric annual rings. *Leaves* 4-6 in. long, dark green; leaflets 9-19, rigidly subcoriaceous obovate-oblong to oblong, acute rarely obtuse at apex, cuneate less often rounded at base, 2 in long, .75 in. wide, polished and glabrous above, obscurely adpressed



grey-pubescent, dull beneath; rachis 2·5–4 in. long, grooved above, glabrous as are the petiolules ·2 in. long. *Flowers* in very long copious short-peduncled axillary racemes, sometimes 15–18 in. in length, with distant tumid nodes sometimes produced into short branches each bearing a cluster of unequal slender pedicels ·15–·25 in. long, the various flowers from one node expanding successively, rachis and pedicels finely adpressed-pubescent, the pedicels 2-bracteolate under the calyx, the bracteoles ovate minute. *Calyx* ·12 in. long, thinly silky, wide-campulate, teeth obscure. *Corolla* white to pale-rose, ·35 in. long. *Stamens* monadelphous. *Ovary* finely puberulous; ovules 6–8. *Pod* 1–3 in. long, 4–5 in. wide, narrowed to both ends, narrowly winged along the upper suture, 1–4 seeded, uniformly finely adpressed grey-silky, somewhat turgid against the seeds. Bak. in *Flor. Brit. Ind.* II, 240. *Dalbergia scandens* Roxb. *Cor. Pl.* II, t. 192; DC. *Prodr.* II, 417; Wall. *Cat.* 5857; Roxb. *Flor. Ind.* III, 232; W. & A. *Prodr.* 264; Wight,  *Ic.* t. 275. *Dalbergia timorensis* DC. *Prodr.* II, 417. *Pongamia coriacea* Grah. in Wall. *Cat.* 5905. *Brachypterum scandens* Benth. in *Ann. Wien. Mus.* II, 101; Miq. *Flor. Ind. Bat.* I, 138. *Brachypterum timorense* Benth. in *Miq. Pl. Jungh.* 253; *Miq. Flor. Ind. Bat.* I, 138.

ANDAMANS; very common everywhere. NICOBARS: plentiful. PENANG; *Curtis* 979! PAHANG: *Ridley* 2639! *DISTRIB.* South-Eastern Asia to North Australia, general.

Mr. Baker has described the pod as glabrous; it never becomes quite glabrous even when ripe. Though the name *Derris scandens* is most generally used for this species, it has to be pointed out that, so soon as *Deguelia* is recognised to be the best generic name, this species will have to be known as *Deguelia timorensis* Taub. (*Natür. Pflanzenfam.* III, 3. 345) because *Deguelia scandens* is the original name for the American plant at present known as *Derris guianensis* Bth. The genus was published under the name *Deguelia* before it was published under the name *Derris*.

5. *DERRIS DALBERGIOIDES* Bak. in *Flor. Brit. Ind.* II, 241. A spreading tree 30–40 feet high; branchlets silky-pubescent. *Leaves* 6–8 in. long by 1·5–2 in. wide, leaflets 25–39, linear rounded-obtuse at both ends slightly oblique at the base the apex slightly emarginate, 1 in. long, ·35 in. wide, firmly papery, adpressed pubescent on both sides, dark-green above paler beneath, lateral nerves 7–8 pairs, indistinct, rachis 5–6 in. long and petiolules ·1–·15 in. rusty-pubescent. *Flowers* in copious short-peduncled axillary racemes 3–6 in. long very rarely exceeding the leaves, about ·65–·75 in. wide with crowded tumid nodes each bearing a dense cluster of unequal short pedicels ·1 in. long or less, the various florets of a node expanding successively, rachis and pedicels brown silky-pubescent, the pedicels 2-bracteolate under the calyx, the bracteoles linear ·08 in. long. *Calyx* ·15 in. long, densely brown-silky, shortly but distinctly toothed, the teeth deltoid the lower subequal, the

two upper somewhat united. *Corolla* rose-purple, .45 in. long, standard oblong, base cordate 2-glandular. *Stamens* monadelphous. *Ovary* densely pubescent, ovules 5-8. *Pod* 1-5-seeded narrowed to both ends 1-2.5 in. long, winged along the upper suture.

PERAK; very common, *Scortechini* 1995! *Ridley* 3024! *Kunstler* 3039! 5805! PATANI; *Machado* 5812! MALACCA; *Maingay* 603! *Derry*, 138! 488! *Goodenough* 1829! DISTRIB. Tenasserim and Martaban.

None of the large suites of specimens sent to Calcutta has fruit; Mr. Baker describes the pod as exactly like that of *D. robusta*; he however describes *D. robusta* as having a glabrous pod which is never the case. Further Mr. Baker has described the leaflets of this species as 'glabrous' and on this account Father Scortechini has proposed for the Perak plant the name *D. dalbergioides* var. *dasyphylla*, to be distinguished by its pubescent leaflets from Mr. Baker's plant. The leaves of the original specimens collected by Parish and Maingay have, however, leaflets pubescent on both surfaces exactly as in the Perak plant.

§ 3. EUDERRIS. Robust climbers with medium to large leaflets; flowers rather large fasciculate on tumid or produced nodes in axillary panicles; stamens monadelphous; base of vexillum without callosities; pod thin, broadly oblong or suborbicular, obtuse, winged only along the upper suture.

6. DERRIS ULIGINOSA Benth. Pl. Jungh. 252. A widely spreading shrubby climber sometimes 40 feet long, with glabrous branches; stems 2-3 in. in diam. *Leaves* 5-8 in. long, leaflets usually 5, but very often 3, casually solitary, the terminal exceeding the others, rigidly subcoriaceous, ovate, acuminate or caudate-acuminate, base always rounded, 3-5 in. long, 1.5-2.5 in. wide, polished above quite glabrous on both surfaces, lateral nerves 7-8 pairs, very faint, looping at their ends some way within margin, bright green above paler beneath, rachis 2-5 in. long, channelled above and glabrous as are the petiolules .25 in. long, secondary nerves indistinct. *Flowers* in rather short showy axillary racemes, 3-5 in. long, with nodes produced into short stalks each bearing one or several subequal pedicels the flowers of a fascicle opening subsimultaneously, rachis and pedicels glabrous, the node-stalks .15 in., the pedicels proper as long, bracteolate at base and again 2-bracteolate a little below the calyx. *Calyx* .15 in. long, subglabrous except the shortly ciliate subtruncate margin, rather wide-campanulate. *Corolla* delicate rose-pink, .4 in. long, standard orbicular base subcordate eglandular. *Stamens* monadelphous. *Ovary* finely puberulous, ovules 5-7. *Pod* obliquely rounded-oblong 1-5 in. long, 1.75 in. across, glabrous, pale straw-colour when ripe, thin, flat, distinctly reticulately-veined; seed solitary, yellowish-brown, much compressed, 1 in. long almost as broad. Benth. in Journ. Linn. Soc. IV, Suppl. 107; Miq. Flor. Ind. Bat. I, 141; Bak. in Flor. Brit. Ind. II, 241. *Robinia uliginosa* Roxb.

ex Willd. Sp. Pl. III, 1133. *Galedupa uliginosa* Roxb. Hort. Beng. 53; Fl. Ind. III, 243. *Pongamia uliginosa* DC. Prodr. II, 416; Wall. Cat. 5879 (excl. E.); W. & A. Prodr. 262. *Pterocarpus uliginosus* Roxb. ex G. Don. Gen. Syst. II, 377.

In all the provinces, on the sea-coasts and on muddy tidal-river banks, common. **DISTRIB.** Sea-shores from Eastern Africa and the Mascarene Islands to Malaya and Western Polynesia.

Mr. Bentham would refer here *Derris Forsteniana* Bl. (*Miq. Flor. Ind. Bat.* I, 144); this hardly seems probable owing to Miquel's description of the leaves as having 3 pairs of leaflets. Mr. Baker would also refer here *Dalbergia heterophylla* Willd. (*Sp. Pl.* III, 901), but this again is very improbable for *D. heterophylla* has, according to the original description, obtuse leaves, which *Derris uliginosa* never has; as, also, racemes longer than the leaves, which those of *D. uliginosa* never are.

7. **DERRIS ELEGANS** Benth. Pl. Jungh. I, 252. A rather slender creeper sometimes 60 feet long, with brown pubescent branchlets. *Leaves* 8–12 in. long, dark-green, leaflets 5 (very rarely 3 or 7) the terminal exceeding the others, rigidly subcoriaceous, from oblong to lanceolate, base always somewhat rounded, 3–8 in. long, 1·5–4 in. wide, glabrous above, when young rusty-pubescent (sometimes persistently so) beneath, rachis rusty-pubescent 4 in. long, petiolules glabrescent 2 in. long with rigid subulate stipels 1 in. long, lateral veins 6–8 pairs prominent like midrib beneath. *Flowers* in solitary or fascicled axillary racemes 2–3 in. long, always much shorter than the leaves, nodes bracteate tumid but not produced into stalks, each bearing one or several subequal pedicels, rachis and pedicels rather densely villous with spreading rusty pubescence, the pedicels filiform 35 in. long with 2 linear bracteoles a little below the calyx. *Calyx* 15 in. long, black purple, sparsely pubescent, margin subtruncate. *Corolla* pure-white with pink tips, 4–5 in. long, standard orbicular-oblong tapering at base eglandular. *Stamens* monadelphous. *Ovary* softly villous, ovules 2–4. *Pod* obliquely rounded-oblong or oblong 1·5 (rarely 2·5 in.) long, 1 in. wide, thin, flat, distinctly reticulated, covered throughout with a fine sparse pubescence; seeds 1, rarely 2, much compressed 75 in. in diam.

**VAR. typica**; leaflets ovate to lanceolate, acute, becoming at length subglabrous beneath, flowers 5 in. long. *Derris elegans* Benth. Pl. Jungh. I, 252; Journ. Linn. Soc. IV, Suppl. 109; Bak. in Flor. Brit. Ind. II, 242. *Pongamia elegans* Grah. in Wall. Cat. 5883. *Pongamia floribunda* Grah. in Wall. Cat. 5884. *Leguminosa* Wall. Cat. 7540.

**ANDAMANS**; *King's Collectors*! PERAK; *Kunstler* 1419! 3911! **DISTRIB.** Tenasserim and Martaban; Sumatra (*Forbes*!)

**VAR. vestita**; leaflets oblong-acuminate to ovate-acute, densely persistently rusty-velvety beneath, flowers rather smaller 4 in. long. *D. vestita* Bak. in Flor. Brit. Ind. II, 242.

MALACCA; *Maingay* 608! PERAK; *Scortechini* 1758! *Kunstler* 2775! 4014! 5583! 7398! DISTRIB.; Tenasserim.

The only differences between the two plants are in the points noted; their fruits are identical. The species is evidently closely related to *D. uliginosa* and has very similar pods; these however are always rather narrower in proportion to their length and further differ in occasionally being 2-seeded. But the inflorescence differs in the two in that the nodes of *D. elegans* are not produced; and the leaves differ markedly from those of *D. uliginosa* in shape, and as to pubescence. The most striking peculiarity of *D. elegans* is however the presence of stipels, a feature most unusual in *Derris*, but equally manifest in both varieties.

§ 4. DIPTERODERRIS. Robust climbers with large leaflets, flowers medium on tumid or produced nodes in terminal and axillary panicles; stamens monadelphous, base of vexillum without callosities; pod winged down both sutures.

8. DERRIS ANDAMANICA Prain. A strong climber with fulvous or tawny-pubescent branches. *Leaves* 10–16 in. long; leaflets pale-green 7–9 (rarely 5) coriaceous, oblong or elliptic shortly cuspidate, base rounded, 5–6 in. long 2–3 in. wide, glabrous on both surfaces, lateral nerves 8–10 pairs spreading faint below not visible above except in young leaves, secondary veining fine, rachis 6–12 in. long glabrous as are the petiolules .25 in. *Flowers* in ample terminal and axillary panicles, the branches rather numerous ascending 5–8 in. long, nodes tumid or produced into short stalks sometimes .75–1 in. long, bearing several unequal filiform pedicels either clustered at their tips or scattered throughout their extent, rachis and branches pale tawny-pubescent, pedicels puberulous .2–3 in. long exceeding the calyx, bracteate at their base and 2-bracteolate under the calyx. *Calyx* wide-campanulate .12 in. long, densely silky, green, margin subentire. *Corolla* white .6 in. long, standard orbicular, base ecallose shallow-cordate. *Stamens* monadelphous. *Ovary* finely pubescent; ovules 4. *Pod* finely tawny-silky, thin, strap-shaped, 3–4 in. long, 1 in. wide, winged subequally along both sutures, wings .12 in. wide; seeds 1–3. *Derris sinuata* Prain in Journ. As. Soc. Beng. LX, 2, 311 not of Benth.

ANDAMANS; from Coco Group southwards; common on the coasts. NICOBARS; common.

This fine species has not, so far, been collected outside the limits of the Andamans and Nicobars. Originally referred in the Calcutta Herbarium to *Derris sinuata*, recent and fuller suites of specimens now show that its nearest alliance is with the South Indian *D. eualata* Bedd., but it has longer pedicels and smaller bracteoles than has that species, and has a silky pod.

9. DERRIS AFFINIS Benth. Pl. Jungh. 252. A climber with pale-brown lenticular glabrous branches. *Leaves* 6 in. long, pale-green, leaflets 5 subequal, firmly chartaceous, ovate-acute base rounded, 2.5 in.

long, 1·25 in. wide, glabrous on both surfaces, lateral nerves 10 pairs prominent on both sides running almost to margin of blade, rachis 3·5 in., glabrous as are the petiolules ·2 in. long. *Flowers* in lax axillary panicles 6–8 in. long, sparingly branched, branches 2·5 in. long or less, spreading, nodes tumid but not produced into stalks, bearing one or more unequal filiform pedicels, rachis and pedicels sparsely adpressed-puberulous, the pedicels ·2 in. long rather longer than the calyx, bracteate at their base, 2-bracteolate close under the calyx. *Calyx* campanulate ·12 in. long, subglabrous, purplish, margin sinuate-toothed, *Corolla* apparently white, ·35 in. long, standard orbicular ecallose. *Stamens* monadelphous. *Ovary* sparsely hairy; ovules about 4. *Derris uliginosa* VAR. *Loureirii* Benth. in Journ. Linn. Soc. IV, Suppl. 108 in part. *Pongamia uliginosa* Wall. Cat. 5879 (E only) not of DC.

PENANG; *Wallich!*

Nearly related to *D. marginata* Bth. from which it differs mainly in having shorter pedicels 2-bracteolate close under the calyx, and in having rather smaller leaflets with more numerous nerves. It seems also very nearly related to the next species from which it differs in its shorter panicles and its leaflets with more numerous and more prominent nerves. It is besides nearly related to *D. amœna* but differs in having thinner leaves, and laxer panicles with spreading not fastigiate branches.

10. *DERRIS FLORIBUNDA* Benth. Journ. Linn. Soc. IV, Suppl. 105. A stout rambling shrub with glabrous whitish branches. *Leaves* 4–5 in. long, leaflets 3–5, pale-green, thinly coriaceous, broadly elliptic-oblong, base rounded, apex shortly and obtusely acuminate, 2–2·5 in. long 1–1·5 in. wide, glabrous on both surfaces, lateral nerves 4 pairs very faint beneath not visible above, rachis 3–4 in. long, glabrous as are the petiolules ·25 in. long. *Flowers* in long lax axillary panicles sometimes 15–18 in. long, sparingly branched, the branches 4–6 in. long, spreading, nodes distant tumid, sometimes produced into stalks bearing 2–6 unequal filiform pedicels, rachis and pedicels sparsely spreading-puberulous, the pedicels ·4 in. long, 2-bracteolate at base of calyx. *Calyx* campanulate ·12 in. long, purple-brown, margin crenate. *Corolla* white, ·3 in. long, standard orbicular ecallose with a green spot above the long claw. *Stamens* monadelphous. *Ovary* sparsely puberulous, ovules 2–3. *Bra-chypterum floribundum* Miq. Flor. Ind. Bat. I, 139.

PERAK; Larut, *Scortechini* 2180! DISTRIB. JAVA.

The Perak specimens have pedicels rather more glabrous than the Java ones; otherwise they agree very closely. Miquel refers the plant doubtfully to *Bra-chypterum*; to the writer it seems as if its affinities were rather with *Dipteroderris*; unfortunately the pod is still unknown. The Perak plant is 2-ovuled, the Java one 3-ovuled, in all the flowers examined by the writer.

11. *DERRIS AMœNA* Benth. Pl. Jungh. 252. A large glabrous climber reaching 50 feet, with black branches. *Leaves* 6–8 in. long,

leaflets bright-green, 7 (sometimes 9, rarely 5), rigidly subcoriaceous to coriaceous, ovate-oblong cuspidate, base rounded to cuneate, 2–4 in. long, 1–2 in. wide, glabrous on both surfaces, lateral nerves numerous parallel spreading indistinct beneath visible above, rachis 4–6 in., glabrous as are the petiolules .25 in. long. *Flowers* in rather dense, fastigiately branched, axillary panicles 6–9 in. long, lower branches almost equalling main-rachis, nodes rather close often produced in short stalks bearing usually 3 unequal filiform pedicels, rachis and pedicels glabrous, the pedicels .25 in. long, 2-bracteolate a short distance below calyx. *Calyx* campanulate .12 in., glabrescent, mouth sinuately-toothed. *Corolla* pink (*Ridley*) or purple (*Kunstler*), .3 in. long, standard orbicular ecallose. *Stamens* monadelphous. *Ovary* sparsely puberulous; ovules usually 2. *Pod* thin glabrous ligulate-oblong flexible finely veined, 3–4 in. long, 1–1.5 in. wide, upper wing .25 in. wide, lower narrow; seeds usually 2, sometimes solitary.

VAR. *typica*; leaves rigidly subcoriaceous green beneath. *D. amœna* Benth. Journ. Linn. Soc. IV, Suppl. 110; Bak. in Flor. Brit. Ind. II. 245. *Pongamia amœna* Wall. Cat. 5912.

PERAK; *Kunstler* 1381! *Scortechini* 1736! MALACCA; *Maingay!*  
DISTRIB. Tenasserim.

VAR. *Maingayana*; leaves coriaceous glaucous beneath. *Derris Maingayana* Bak. in Flor. Brit. Ind. II, 245.

MALACCA; *Derry!* SINGAPORE; *Maingay!* *Hullett!* *Ridley* 6402!

It seems impossible, now that large suites of specimens have been sent from Malacca by Mr. Derry, to treat these two plants as more than varieties of one species. Mr. Derry gives two local names for his plant, '*Aker-tuba-tuba*' and '*Aker-pakidah*.'

§ 5. PARADERRIS. Robust climbers with large leaflets, flowers large on usually produced nodes in axillary panicles; stamens monadelphous; base of vexillum with two callosities extending along the claw; pod winged down the upper suture.

12. DERRIS ELLIPTICA Benth. Journ. Linn. Soc. IV, Suppl. 111. A large climbing shrub 20–30 feet long with black warted branches and rusty-pubescent young shoots. *Leaves* 9–15 in. long, dull greyish-green, leaflets 9–13 subequal, at first membranous, with age subcoriaceous, oblong to oblanceolate-oblong cuspidate, 3–6 in. long, 1–1.3 in. wide, pubescent beneath, at first puberulous at length glabrous above, rachis 6–9 in. long, rusty-pubescent faintly grooved above, petiolules .2 in. long rusty-pubescent, lateral veins 8–10 pairs prominent beneath as is the midrib. *Flowers* in copious lax axillary racemes 9–10 in. long, never exceeding the leaves, nodes produced into distinct stalks .3–1.3 in. long, each bearing one or more (usually 3) subequal pedicels, rachis and

pedicels densely rusty-tomentose the pedicels slender .25 in. long, bracteolate at their bases and 2-bracteolate under the calyx. *Calyx* .25 in., densely rusty-pubescent, wide-campanulate the mouth sinuately subtruncate. *Corolla* from pure white (*Scortechini*) to white with pink tinge (*Kunstler*) or dull pink (*Wray*), .65 in. long, standard densely silky on the back, orbicular with rounded 2-callose base. *Stamens* monadelphous. *Ovary* vilious, ovules usually 4 (sometimes 3, rarely 5). *Pod* oblong to lanceolate, 1-4-seeded, 1.5-3.5 in. long, .75 in. wide, distinctly winged along upper, faintly along lower suture. Bak. in Flor. Brit. Ind. II, 243. *Galedupa elliptica* Roxb. Hort. Beng. 53; Flor. Ind. III, 242. *Pongamia elliptica* Wall. Pl. As. Rar. III, 20, t. 237; Cat. 5881; Wight, Ic. t. 420; Miq. Flor. Ind. Bat. I, 148. *Pongamia dubia* Grah. in Wall. Cat. 5899. *Pongamia volubilis* Zoll. & Mor. Syst. Verzeichn. 3; Miq. Flor. Ind. Bat. I, 148. *Millettia pachycarpa* Bak. in Flor. Brit. Ind. II, 106 in part (*as to the Malacca locality*).

MALACCA; *Griffith! Maingay!* PERAK; *Scortechini* 1738! *Wray* 1678! 1695! 3323! *Kunstler* 1431! **DISTRIB.** Northwards through Tenasserim to Chittagong; southwards through Sumatra to Java.

Mr. Wray gives '*Aker-tuba*' as the Malay name of this species. It has a true *Derris* pod but differs markedly from the other species by its standard silky on the outside. When they are only in flower and the leaves of both are still young it is very difficult without careful examination to distinguish this species from *Millettia pachycarpa*. This is Zollinger's *Pongamia volubilis* of which there are authentic specimens at Calcutta; it is also said by Mr. Benthams to be the same as *P. Horsfieldii* Miq. and *P. hypoleuca* Miq.; neither of these is represented in *Herb. Calcutta*.

13. **DERRIS MALACCENSIS** Prain. A rather slender creeper 30-50 feet long with glabrous branches. *Leaves* 9-15 in. long, bright-green, leaflets 5-7 (rarely 9), subequal, subcoriaceous, elliptic, base rounded apex caudate-acuminate, 4-6 in. long 2-2.5 in. wide, the caudate tip .35-.6 in. long, glabrous on both surfaces, rachis 6-8 in. long, glabrous hardly grooved above, petiolules .25 in. glabrous, lateral veins about 5 pairs indistinct. *Flowers* in solitary axillary racemes 4-6 in. long always much shorter than the leaves, nodes produced in stalks .15-.2 in. long each bearing one or several subequal pedicels, rachis and pedicels glabrescent, the pedicels filiform .25 in. long bracteolate at base and with 2 small lanceolate bracteoles very near base of calyx. *Calyx* .15 in. long reddish, wide-campanulate, glabrous except the ciliate slightly sinuate margin. *Corolla* white or yellow tinged with pink, .65 in. long, standard orbicular truncate or subcordate at the 2-callose base. *Stamens* monadelphous. *Ovary* densely rusty-pubescent; ovules 4-5. *Pod* oblong winged or not, glabrous, 1-4-seeded, 2-3 in. long.

**VAR. *typica***; pod 1.5 in. wide, winged along the upper suture, sometimes along both. *Derris cuneifolia* **VAR. *malaccensis*** Benth. Journ. Linn. Soc. IV, Suppl. 112.

PERAK; Larut, Goping, etc. *Kunstler* 4028! 4149! 4504! 8551!  
*Scortechini* 110! MALACCA; *Griffith* 1774! SINGAPORE; *Ridley*! DISTRIB.  
 Tenasserim; Borneo.

VAR. ? *aptera*; pod 1 in. wide, wingless; leaflets with lateral veins  
 stronger beneath.

MALACCA; *Maingay* 613! PERAK; *Kunstler* 4518! 6428!

VAR. ? *millettioides*; pod and leaflets as in VAR. ? *aptera* but the  
 former usually longer and ultimately dehiscent (as in *Millettia*) along  
 both sutures.

PERAK; Ulu Bubong, *Kunstler* 10696!

The plant here described as *Derris malaccensis* is extremely closely related to  
*D. cuneifolia* of which indeed it was treated by Mr. Benthams as a variety. Its  
 leaves differ mainly in having fewer but larger leaflets with long caudate-acuminate  
 tips; the flowers, too, are considerably larger and of a somewhat different colour:  
 the pods of *D. malaccensis* are also much larger than those of *D. cuneifolia*. It  
 must also, from the description of that plant, be very nearly allied to *D. montana*  
 Benth. (*Pl. Jungh.* 253) a Java species not represented in *Herb. Calcutta*. The  
 foliage of the two is evidently almost identical but the flowers are a little larger in  
*D. montana*, being .75 in. long. *D. malaccensis* is thus evidently intermediate be-  
 tween *D. cuneifolia* and *D. montana* as regards its petals; it is likewise intermediate  
 as regards ovary. Mr. Benthams ascribes two ovules to *D. cuneifolia* and this is  
 almost always the case; in one or two flowers, however, three ovules have been  
 found; Mr. Baker indeed says that the pod of *D. cuneifolia* may be 3-seeded,—this  
 no *Calcutta* specimen shows. To *D. montana* Mr. Benthams ascribes "about 8  
 ovules;" *D. malaccensis* has had, in almost every flower examined, 4 ovules and in  
 some pods it has 4 seeds; one or two ovaries with 5 ovules have been met with,  
 but never more than 5 have been seen.

The plants named VAR. ? *aptera* and VAR. ? *millettioides* are placed here merely  
 for convenience of reference. They are both reported in fruit only, and as they  
 have almost exactly the leaves of *Derris malaccensis* it seems better for the present  
 to refer to them under that species. As regards VAR. ? *aptera* indeed this is the  
 more essential since two gatherings from Perak (*Wray* 2025! *Kunstler* 3190!), and  
 one from Penang (*Curtis* 2735!) have pods intermediate between those of VAR. ?  
*aptera* and those of *D. malaccensis*. The pods of VAR. ? *aptera* are, however,  
 obviously those of a *Pongamia* rather than those of a *Derris*, if *Pongamia* be  
 really entitled to a separate generic position, which the writer hardly believes.  
 The distinguishing character is a quite artificial and, as these very plants show, a  
 somewhat inadequate one.

The existence of VAR. ? *millettioides* raises an even more troublesome question,  
 the relationship of *Millettia* to *Derris*. The arrangement adopted in the *Genera*  
*Plantarum*, the *Histoire des Plantes* and the *Natürlichen Pflanzenfamilien* places  
*Derris* and *Pongamia* among the *Dalbergiæ* and *Millettia* among the *Galegæ*. This  
 then, considering the great authority of the authors who have sanctioned it, must  
 be accepted as the most natural arrangement possible. That a more *inconveni-*  
*ent* one could hardly be devised has, however, been the experience of most field  
 botanists and of most authors who have had to deal with the species belonging to the  
 genera. For these genera are so closely allied that they only differ, and that merely



'on paper,' in the "tardy dehiscence" of the pod in *Millettia*, its "indehiscence" in *Pongamia* and *Derris*. As a matter of fact Mr. Benthams has placed in *Derris* a species (*D. microptera*) the pods of which dehisce, while Mr. Kurz has placed in *Millettia* a species (*M. monticola*) that has the pods of a *Derris*. No taxonomist, however able, can venture in the absence of fruit to do more than suggest to which of the three genera a particular species should be referred. A fourth genus to which similar remarks apply is *Lonchocarpus*; this only differs from species of *Derris* that have thin pods, exactly as *Pongamia* differs from species of *Derris* that have turgid pods, in having sutures without wings. It is, moreover, a suspicious fact that Koorders and Valetton (*Bijdr.* II.) find the same difficulty in separating *Pongamia* from *Millettia*.

In the works of Roxburgh and of Wight and Arnott, also in Benthams account of the *Leguminosæ* in *Plant. Junghuhn.*, *Millettia* was not divorced from *Derris* and its allies; Miquel and Kurz, too, continued to place the genera side by side. And certainly if they have adopted the less natural method of arrangement, it cannot be denied that, in so doing, these authors have retained a much more convenient one.

## 29. KUNSTLERIA Prain.

Woody climbers with unequally pinnately 1-7-foliolate exstipellate leaves; stipules small, deciduous. *Flowers* rather small in ample terminal thyrsoid panicles extending into the axils of the upper leaves; pedicels solitary, nodes not tumid. *Calyx* campanulate, teeth lanceolate the two upper connate. *Corolla* distinctly exerted; standard ovate entire; keel boat-shaped the petals slightly cohering. *Stamens* diadelphous the upper one quite free from the other 9 and adnate at base to standard claw; anthers versatile uniform on alternately short and long free filaments. *Ovary* sessile, few-ovuled; style incurved filiform, stigma capitate. *Pod* thin, flat strap-shaped membranaceous or coriaceous, indehiscent, style terminal, sutures not winged. *Seeds* 1-3, much compressed, oblong; radicle inflexed. Species 5, Malayan.

This interesting genus possesses the habit of *Spatholobus* with the calyx and almost the corolla and stamens of that genus. It differs, however, in having its flowers solitary in place of fascicled on tumid nodes; in having exstipellate leaflets varying in number in different species from 1-7; and in having the pod quite indehiscent with the seeds centrally not terminally situated, in this last character being indistinguishable from *Lonchocarpus*. From *Lonchocarpus* however *Kunstleria* differs in having the flowers unfascicled, in having the calyx toothed, and in having the stamens diadelphous. As regards inflorescence *Kunstleria* agrees exactly with *Derris* § *Aganope* and agrees moreover with that group of species in having the vexillary stamen free. But here again *Kunstleria* differs in having a wingless pod and a toothed calyx, and in having the free stamen adnate to the standard claw. With the calyx of *Spatholobus* then, we have associated in *Kunstleria* the inflorescence of *Aganope* and the pod of *Lonchocarpus*.

The genus is dedicated to the memory of Herr H. H. Kunstler, one of the most enthusiastic, as he was one of the most painstaking and faithful of the collectors who have laid down their lives in the cause of science in the tropics.

Leaflets solitary, with petiolules attached slightly within margin of lamina :—

Leaflets and petioles glabrous on both surfaces ...	...	1a. <i>K. Curtisii</i> .
Leaflets and petioles subscabridly pubescent ...	...	1b. <i>K. Curtisii</i> VAR. <i>laziflora</i> .

Leaflets several, with petiolules attached to margin of lamina :—

Leaves 3-foliolate, (leaflets and petioles glabrous ; pods narrower than in the other species of which pods are known) ... 2. *K. Kingii*.

Leaves 5-foliolate :—

Leaflets thickly coriaceous, densely ferruginous underneath 3. *K. Forbesii*.

Leaflets chartaceous, glabrous on both surfaces... 4. *K. Ridleyi*.

Leaves 7-foliolate, (leaflets and petioles subscabridly pubescent) 5. *K. Derryi*.

1. *KUNSTLERIA CURTISII* Prain. A shrubby climber with slender branches ; bark brownish lenticular. *Leaves* 5–8 in. long, leaflet 1, ovate-lanceolate 4–6·5 in. long, 2·5 in. wide, apex acute base rounded, lateral nerves ascending 4–5 pairs rather prominent as is the midrib beneath, margin entire ; rigidly chartaceous, pale-green ; petiole ·75–1·5 in. long, petiolule ·25 in. subpeltately attached. *Flowers* in copious terminal and axillary panicles 8–12 in. long, 5–8 in. across, rachis and branches rusty-pubescent ; pedicels pubescent ·08 in. long. *Calyx* campanulate densely pubescent, ·15 in. long, teeth triangular except the upper broadly deltoid bifid at tip half as long as tube. *Corolla* apparently purple, ·25 in. long, standard ovate-oblong. *Pod* thin flat densely rusty-pubescent, 5 in. long 1 in. wide, 2–3 seeded.

VAR. *typica* ; leaves above and petioles glabrous, leaves beneath and petiolules sparsely adpressed-pubescent with whitish hairs ; rachis and branches of panicles sparsely rusty-pubescent ; pods distinctly reticulated.

PENANG ; at Tulloh Bahang, *Curtis* 3019!

VAR. *laziflora* ; leaves on both surfaces subscabridly, petioles and petiolules densely softly pubescent with rusty tomentum, as are the rachis and branches of the laxer more spreading panicles ; pods more densely velvety not visibly reticulated.

PANGKORE ; Tulloh Sera, *Curtis* 1632!

The calyx and corolla, so far as the limited material goes, are not distinguishable in these two plants. The measurements of pod given are taken from fruits of the typical variety ; the pods of the other are much smaller but are apparently not so far advanced. When fuller material of these two plants is available it may be necessary to consider them specifically distinct ; on the other hand their leaves, but for the different pubescence, are quite similar and it may prove unnecessary to separate them even as varieties.

2. *KUNSTLERIA KINGII* Prain. A very extensive climber over 100 feet long, with slender branches ; bark brown lenticular. *Leaves* 5–8 in. long, leaflets 3 ovate-lanceolate 4–6 in. long, 1·5–2 in. wide, apex acute,

base of lateral leaflets rounded, of central rather the larger shortly cuneate, lateral nerves ascending 5-6 pairs rather prominent as is the midrib beneath, margin entire; firmly chartaceous pale-green glabrous on both surfaces, petiole glabrous 1.5-2.5 in. long, petiolules glabrous .2 in. marginally attached. *Flowers* in copious terminal and axillary panicles 8-12 in. long, 5-8 in. across, rachis and branches rusty-pubescent; pedicels pubescent .08 in. long. *Calyx* campanulate densely pubescent .15 in. long, teeth triangular except the upper broadly deltoid bifid at tip almost as long as tube. *Corolla* dark-purple, .25 in. long, standard oblong. *Pod* thin flat densely brown-pubescent and distinctly reticulated, 2-4 in. long, .6 in wide, 1-2 seeded, seeds oblong 1.25 in. long, .5 in. wide, cotyledons thin and leaf-like, testa very dark brown.

PERAK; Larut, *Kunstler* 3830! 6870! 6935!

Among the many specimens sent by Mr *Kunstler* only one has a leaf with a solitary leaflet, all the other leaves are 3-foliolate. The individual leaflets are extremely like those of typical *K. Curtisii* and only differ in not being slightly peltate and in being hardly so thick; the pods however are very different.

3. *KUNSTLERIA FORBESII* Prain. A small shrubby climber 6-10 feet long, with densely rusty-pubescent branches. *Leaves* 8-10 in. long, leaflets 5 elliptic, 3.5-5 in. long, 2-2.5 in. wide, terminal rather exceeding the others, bases of all rounded, apex rounded shortly abruptly acuminate, lateral nerves spreading, 6-9 pairs, rather prominent as is the midrib beneath, margin entire; rigidly coriaceous dark-green subscabrid above densely rusty velvety beneath, petiole rusty-puberulous 3.5 in. long, petiolules .25 in. densely rusty-pubescent. *Flowers* in rather strict terminal and axillary panicles 12-18 in. long 5-6 in. wide, rachis and branches densely rusty-velvety, as are the very short pedicels and lanceolate bracts .1 in. long. *Calyx* campanulate, densely rusty-velvety, .15 in. long, teeth lanceolate except the triangular slightly bifid upper almost as long as tube. *Corolla* deep lake-red, .25 in. long, standard oblong. *Pod* not seen.

PERAK; Salama, *Kunstler* 3094! *DISTRIB.* Sumatra (*Forbes* 3241!).

4. *KUNSTLERIA RIDLEYI* Prain. A climber with slender puberulous branches. *Leaves* 6-8 in. long, leaflets 5 elliptic, 2-3.5 in. long, 1.25-2 in. wide, terminal considerably larger than the others, bases of all narrowly truncate, apex tapering to a finally somewhat abrupt blunt point, lateral nerves ascending, 5-6 pairs, rather prominent as is the midrib beneath; margin entire, firmly chartaceous pale-green glabrous on both surfaces, petiole sparsely pubescent 2-3 in. long, petiolules rusty-pubescent, .2 in. long, marginally attached. *Flowers* in rather strict terminal and axillary panicles 12-18 in. long, 4-5 in. across, rachis and branches sparsely rusty-pubescent; pedicels very short, and subulate bracts .08 in.

long, densely rusty. *Calyx* campanulate densely rusty, .15 in. long, teeth triangular except the broadly deltoid slightly bifid upper, rather more than half as long as tube. *Corolla* .25 in. long, standard broadly ovate. *Pod* thin flat densely rusty-pubescent and distinctly reticulated, 6 in. long 1.25 in. wide.

SINGAPORE; *Ridley*, 6395!

A very distinct species, in inflorescence most resembling *K. Forbesii* but with leaves of the consistence and appearance of those of *K. Kingii*, though with 5 leaflets in place of 3. The pod however is very different from that of *K. Kingii*, and resembles that of *K. Curtisii*, the chief difference being that the meshes of the reticulations on the valves are much opener in *K. Ridleyi* than in *K. Curtisii*.

5. *KUNSTLERIA DERRYI* Prain. A climber with densely pale-rusty pubescent branches. *Leaves* 6–8 in. long, leaflets 7, ovate-lanceolate, 1–3 in. long .75–1.5 in. wide, terminal with deltoid base considerably exceeding the lateral with rounded bases, all with cuneate apex, lateral nerves ascending 6–7 pairs, rather prominent as is the midrib beneath, margin entire; rigidly chartaceous pale-green subscabridly pubescent on the nerves above, uniformly subscabrid beneath as are the petioles 2.5–3 in., and the marginally attached petiolules .2 in. long. *Flowers* in rather strict terminal and axillary panicles 12–15 in. long 2–3 in. wide, rachis and branches softly pale-rusty as are the very short pedicels and the very small lanceolate bracts. *Calyx* campanulate, densely rusty-pubescent, .15 in. long, teeth triangular, upper rather broader, notched, half as long as tube. *Corolla* dark-purple .25 in. long, standard oblong. *Pod* not seen.

MALACCA; Machap Tebung Road, *Derry* 1006!

Leaves and branches with exactly the pubescence of *K. Curtisii* var. *lawiflora* but with 7 leaflets instead of a solitary leaflet and with marginally, not subpeltately attached petiolules.

### 30. *DALBERGIA* Linn. fl.

Trees or climbing shrubs. *Leaves* with alternate subcoriaceous leaflets. *Flowers* copious, small, in terminal or lateral panicles. *Calyx* campanulate; teeth 5, distinct, usually short. *Corolla* exerted; standard broad; keel obtuse, with its petals only joined at the tip. *Stamens* 9–10, monadelphous, the sheath split above, or diadelphous, the sheath split also down the keel; anthers minute, basifixed, with the cells back to back, and the slit mostly short and apical. *Ovary* stalked, few-ovuled; style short, incurved, glabrous, stigma capitate. *Pod* oblong or strap-shaped, usually thin and flat, 1–4-seeded, indehiscent, not thickened or winged at the sutures. Species 60–70, cosmopolitan in the tropics.

Stamens in two lateral phalanges of 5 filaments each, pod thin and flattened except opposite the seeds (§ *Dalbergaria*) 1. *D. volubilis*.

Stamens monadelphous:—

Pod thin and flattened except opposite the seed (§ *Sissoa*) [unknown in *D. Hullettii*]:—

Flowers contemporaneous with the leaves; climbing species:—

Standard narrow, claws of petals shorter than calyx tube:—

Pod very short-stalked; flowers .25 in. long in panicles of congested corymbs (leaflets 1 in. or more in length) ... .. 2. *D. confertiflora*.

Pod distinctly stalked; flowers minute (.15-.2 in.) in lax corymbose cymes:—

Leaflets .6-1.5 in. long; corymbs mostly terminal; ovary puberulous ... .. 3. *D. Junghuhnii*.

Leaflets .2-4 in. long; corymbs smaller axillary and terminal; ovary glabrous ... .. 4. *D. subsympathetica*.

Standard orbicular, claws of petals as long as calyx-tube:—

Leaflets rather numerous, membranous, not cuspidate:—

Leaflets 13-17, 1.5-2 in. long, oblong obtuse or subacute; racemes large spreading; calyx and leaves densely pubescent... .. 5. *D. velutina*.

Leaflets 25-41, .6-.75 in. long, rhomboid retuse; racemes small congested; calyx and leaves thinly pubescent ... .. 6. *D. tamarindifolia*.

Leaflets few (1-5), large (2-4 in. long), firm, abruptly cuspidate ... .. 7. *D. pseudo-sissoo*.

Flowers preceding the leaves; a small tree, (claws of petals as long as calyx-tube) ... .. 8. *D. Hullettii*.

Pod uniformly thickened throughout the valves, the upper suture falcate at least when young (§ *Selenobium*):—

Pods flattened, reticulated, always 1-seeded, (upper suture recurved when ripe):—

Leaflets usually 5, small (under 1 in. long), obovate-oblong obtuse; flowers many in congested panicles 9. *D. torta*.

Leaflets usually 3, large (3-3.5 in. long), ovate-lanceolate acute; flowers few in short spikes ... 10. *D. menoëides*.

Pods turgid, smooth, often 2-seeded:—

Upper suture recurved when ripe, pod puberulous; leaflets acuminate, large (4-6 in. long), prominently veined and when young densely pubescent beneath, thickly coriaceous ... .. 11. *D. Kunstleri*.

Upper suture convex like lower when ripe, pod glabrous; leaflets glabrous obtuse slightly emarginate, smaller (2-3.5 in. long), not prominently veined beneath, thinly coriaceous ... .. 12. *D. parviflora*.

§ 1. DALBERGARIA. *Pod* thin and flattened except opposite the seeds. *Stamens* diadelphous in two lateral phalanges of 5 filaments each.

1. DALBERGIA VOLUBILIS Roxb. Cor. Pl. II, 48 t. 191. A large woody climber, 40–60 feet high, with twining glabrescent branches here and there thickened and twisted into spiral hooks. *Leaves* 4–5 in. long, leaflets 11–13 obovate, or ovate-oblong rounded, obtuse or slightly retuse faintly mucronulate at apex, dark-green above paler beneath, glabrous on both surfaces, .75–1 in. long .5–.75 in. across; rachis 3–4 in. long and petiolules .15 in. long, quite glabrous. *Flowers* in copious terminal and axillary panicles 8–12 in. long with glabrous peduncles and with numerous horizontal or decurved puberulous branches 1–3 in. long bearing corymbose cymes, ultimate corymbs densely congested; bracts at base of branches of panicle small ovate subpersistent; pedicels slender puberulous, lower .2 in. long upper very short with a small lanceolate persistent bracteole at base and two small ovate ones embracing the lower fifth of calyx-tube. *Calyx* campanulate, densely puberulous .1 in. long, teeth lanceolate lowest exceeding the others. *Corolla* pale-blue .25 in. long, standard broadly orbicular emarginate, reflexed at junction of blade and claw. *Stamens* 10, in two lateral groups of 5 each. *Pod* distinctly stalked, linear-oblong obtuse membranous, 2–3 in. long, 1 in. wide; 1–2-seeded. Hort. Beng. 53; Fl. Ind. III, 231; DC. Prodr. II, 417; Wall. Cat. 5874; W. & A. Prodr. 265; Benth. in Journ. Linn. Soc. IV, Suppl. 46; Bak. in Flor. Brit. Ind. II, 235.

ANDAMANS; very common. DISTRIB. Throughout India and Indo-China.

By an oversight this is described in the *F. B. I.* as having ebracteate pedicels; in reality each pedicel has three persistent bracteoles, one at its base, two at its apex.

§ 2. SISSOA. *Pod* thin and flattened except opposite the seeds. *Stamens* monadelphous.

2. DALBERGIA CONFERTIFLORA Benth. Pl. Jungh. 255. A large climber with sparsely puberulous, soon glabrescent branches. *Leaves* 4–6 in. long, leaflets firm 11–15, oblong obtuse or retuse, green and glabrous above paler and sparsely puberulous beneath, 1–1.5 in. long, .5–.75 in. wide; rachis 3–4 in. long, glabrous as are the petiolules .2 in. long. *Flowers* rather small in ample terminal and axillary panicles, 3–5 in. long, of corymbosely or subcapitately crowded cymes; peduncle and branches rather densely pubescent; bracts puberulous minute ovate deciduous; solitary bracteoles at base of pedicels also ovate deciduous; pair at base of calyx ovate-lanceolate persistent embracing lower fifth of calyx-tube. *Calyx* .15 in. long, pubescent, rather narrowly tubular, teeth short obtuse, one-third as long as tube except the lower lanceolate half as long

as tube. *Corolla* white .25 in. long, claws of petals short. *Stamens* 9 monadelphous. *Pod* thin glabrous, 2–3 in. long .75–1 in. wide, 1–3-seeded, stalk very short. Benth. Journ. Linn. Soc. IV, Suppl. 41; Bak. in Flor. Brit. Ind. II, 233.

ANDAMANS; very common. DISTRIB. Eastern Himalaya, Assam, Chittagong, Pegu.

A very distinct species; the description of the pod given in the *Flora of British India* is apparently taken from another species.

3. *DALBERGIA JUNGHUHNII* Benth. Pl. Jungh. 254. A shrubby climber 15–30 feet long, with twining glabrous branches, here and there twisted and thickened into spiral hooks. *Leaves* 4–5 in. long, leaflets 7–15, oblong or elliptic, rounded at both ends faintly emarginate at the apex, green and glabrous above, glaucescent and glabrous or faintly puberulous beneath, .6–1.5 in. long .35–.75 in. wide; rachis 2.5–4 in. long, petiolules .15 in. long. *Flowers* minute, secund in an ample terminal and in smaller axillary paniculate cymes 2 in. wide and as long as the leaves, peduncle branches and pedicels pubescent; bracts minute caducous; bracteoles all persistent, one at base of short pedicel lanceolate acuminate very minute, two at base of calyx ovate-obtuse embracing the lower third of calyx-tube. *Calyx* .08 in. campanulate, teeth short obtuse one-third as long as tube, except the lower acute half as long as tube. *Corolla* white, .15 in. long, claws of petals short. *Stamens* 9 monadelphous. *Ovary* pubescent. *Pod* thin membranous greenish, glabrous, 2.5–3 in. long, 1–1.3 in. wide, 1-seeded, slightly cuneate at base and distinctly stalked.

VAR. *typica*; leaflets usually 7–9, oblong, glabrous or only faintly puberulous beneath. *D. Junghuhnii* Benth. Journ. Linn. Soc. IV, Suppl. 33; Miq. Flor. Ind. Bat. I, 129; Bak. in Flor. Brit. Ind. II, 233.

PENANG; 500 feet, *Curtis!* MALACCA; *Maingay* 547! 547/2! *Good-enough!* *Derry!* SINGAPORE; *Hullett* 141! *Ridley!* DISTRIB. Sumatra, Java.

VAR. *Scortechinii* Prain; leaflets 11–15 elliptic, beneath more closely puberulous especially on midrib.

PENANG; Ayer Etam, *Curtis* 1437! MALACCA; Bijong, *Scortechinii* 1830! *Maingay* 549! SINGAPORE; Bukit Timah, *Ridley* 6406! DISTRIB. Borneo.

These two plants differ in no way as regards flowers; the leaves however differ considerably in appearance and it may ultimately be found that the second variety—of which the fruit is as yet unknown—should be known as a distinct species, *Dalbergia Scortechinii*. The original specimens on which Mr. Bentham founded the species were collected by Junghuhn in Sumatra and by Griffith in Malacca; the writer has not seen either. Mr. Bentham describes the ovary as glabrous in his

specimens, it is hairy in all the specimens above cited where there are flowers. The most nearly related species are *D. subsympathetica*, which has much smaller leaflets with rather larger flowers in more numerous less ample cymes; and *D. sympathetica* which also has rather larger flowers and smaller leaflets. In *D. sympathetica* however the leaflets are more numerous and the pod though similar is more shortly stalked.

Mr. Bentham, who had not seen fruit of this when he wrote, suggested that this might prove to be the same as *D. parviflora* Roxb. One objection to this suggestion is the very small number of leaflets described by Roxburgh; a still more fatal objection, however, is in the pod; this Roxburgh describes as falcate,—an indication that *D. parviflora* should be sought for in § *Selenolobium* rather than in § *Sissoa*.

4. DALBERGIA SUBSYMPATHETICA Prain. A tall climber 60–80 feet long, less often a scandent shrub or small tree 15–30 feet high, with twining puberulous branches. *Leaves* 1·5–3 in. long, leaflets 9–15 oblong, apex truncate or emarginate base wide-cuneate or rounded, green and glabrous above, paler and pubescent with long adpressed hairs beneath, ·25–·4 in. long, ·2–·3 in. wide; rachis 1–2·5 in. long, densely puberulous, as are the petiolules ·1 in. long. *Flowers* minute secund, in small axillary paniculate cymes, ·75–1 in. across, as long as the leaves, peduncle ·5–·7 in., branches and pedicels pubescent; bracts minute caducous; bracteoles all persistent, one at base of short pedicel lanceolate, acuminate, very minute, two at base of calyx ovate-obtuse embracing lower fourth of calyx-tube. *Calyx* ·1 in. campanulate, teeth short obtuse one-third as long as tube, except the lower acute half as long as tube. *Corolla* white, ·2 in. long, claws of petals short. *Stamens* 9, monadelphous. *Ovary* glabrous except along anterior suture. *Pod* thin, membranous greenish glabrous, 2·5 in. long, 1 in. wide, 1-seeded; slightly cuneate at base and distinctly stalked.

PENANG; *Curtis* 1492! PERAK; *Scortechini* 201! 1071! *Wray* 2086! 3205! *Kunstler* 2354! 3562! 4978! 5182!

Very near *D. Junghuhnii* and just possibly only a variety of that species; it is however easily distinguished by its much smaller leaflets and its smaller, more numerous cymes of rather larger but still very minute flowers.

5. DALBERGIA VELUTINA Benth. Pl. Jungh. 255. A long climber with rusty densely pubescent branches. *Leaves* 6–8 in. long, leaflets 13–17, oblong obtuse or subacute membranous, 1·5–2 in. long, ·6–·8 in. wide, dark-green glabrescent to puberulous above, rusty-puberulous to pubescent beneath, stipules large densely pubescent, rachis 5–6 in. long puberulous or pubescent, as are the petiolules ·1 in. long. *Flowers* in somewhat dense axillary panicles, with corymbose branches, 4 in. long 2·5 in. wide, the peduncles branches and pedicels densely pubescent, bracts rather large ovate and bracteoles narrowly lanceolate persistent pubescent; the pair at base of calyx half as long as pedicel one-third as



long as calyx-tube. *Calyx* .15 in. long, pubescent, campanulate, teeth acute upper shorter than lanceolate lower. *Corolla* white or pink, .25 in. long, claws of petals as long as calyx-tube. *Stamens* 9 monadelphous. *Pod* thin obtuse brownish, short-stalked, 1-seeded, 2-3 in. long, .6-.7 in. wide.

VAR. *typica*; leaves beneath, leaf-rachis, linear-lanceolate stipules, peduncles and bracts pale rusty-velvety. *D. velutina* Benth. Journ. Linn. Soc. IV, Suppl. 43; Bak. in Flor. Brit. Ind. II, 233. \**D. stipulata* Wall. Cat. 5868.

MALACCA; *Maingay!* DISTRIB. Burma, Assam.

VAR. *Maingayi* Prain; leaves puberulous glaucescent beneath; leaf-rachis, ovate-acuminate stipules, peduncles and bracts very darkly rusty-puberulous.

MALACCA; *Maingay* 612! SINGAPORE; *Ridley!* DISTRIB. Tenasserim (*Griffith* 1798); Malay Archipelago.

The only pods of true *D. velutina* at Calcutta are still unripe; the description of the fruit is therefore taken from Mr. Baker's account: to Mr. Bentham the fruit was unknown.

Of var. *Maingayi* which, as a note made in Herb. Kew indicates, is at Kew treated as a "less hairy variety" of *D. velutina*, the writer has seen no fruit. Not improbably it may be found ultimately necessary to treat it as a distinct species to be known as *D. Maingayi*.

6. DALBERGIA TAMARINDIFOLIA Roxb. Hort. Beng. 53. A shrubby climber, 15-40 feet high with densely pubescent young branches. *Leaves* 5-6 in. long, leaflets 25-41, thinly pubescent on both surfaces rather paler beneath, crowded, trapezoid-oblong, .6-.75 in. long, .3 in. wide, moderately firm, caducous; rachis densely puberulous 4.5-5.5 in. long, petiolules very short; stipules lanceolate densely puberulous .2 in. long. *Flowers* with the leaves, in congested sessile axillary panicles with corymbose branches .5-2 in. long, .5-1 in. wide, peduncles, branches and pedicels densely puberulous, bracts rather large ovate and bracteoles persistent puberulous; pedicels as long as calyx with solitary bracteole as base and two rather large ovate close under calyx, the lower fourth of which they embrace. *Calyx* campanulate, glabrescent (in Malayan specimens), pale greenish-yellow, .15 in. long, teeth short obtuse. *Corolla* white .35 in. long, claws of petals as long as calyx-tube. *Stamens* usually 9, rarely 10, monadelphous. *Ovary* glabrous; ovules 2-3. *Pod* thin greenish, drying bright-brown, glabrous, long-stalked, strap-shaped, subacute; 1-3-seeded; not veined nor thickened opposite the seeds, 1.5-3 in. long, .4-.5 wide. Roxb. Flor. Ind. III, 233 (in part only); Wight, Icones, t. 242 (excluding fig. of fruit); Wall. Cat. 5870; Benth. in Journ. Linn. Soc. IV, Suppl. 44; Miq. Flor. Ind. Bat. I, 131; Bak. in Flor. Brit. Ind. II, 234. *D. rufa* Grah. in Wall. Cat. 5864.

*D. multijuga* Grah. in Wall. Cat. 5865. *D. livida* Wall. Cat. 5866.  
*D. Blumei* Hassk. Pl. Jav. Rar. 400.

ANDAMANS; very common everywhere in the main group; Barren Island, *Prain!* LANGKAWI; *Curtis* 2625! PERAK; *Scortechini* 68! *Wray* 2387! *Kunstler* 3346! 5963! 6481! 8667! PENANG; *Wallich* 5665! MALACCA; *Maingay* 602! *Derry* 1167! *DISTRIB.* Himalayas from Nepal eastward; Indo-China; Malay Archipelago.

All the Perak and Malacca specimens agree exactly with *D. multijuga* Grah., and that in turn does not differ even as a variety from *D. rufa* Grah., with the type of which *Curtis'* Langkawi specimens and the Andaman form exactly coincide. These two forms differ from the Upper Burma and Himalayan plant in having fewer-fl., laxer panicles, with a glabrescent instead of a downy calyx. The pods are, however, identical in both. It has been usual to quote Roxburgh without qualification as the authority for this species, in spite of the fact that he has described as belonging to it, the fruit that belongs to *D. Millettii*. And it has been also usual to cite *Derris pinnata* Lour. as this plant, overlooking the fact that *Derris pinnata* has glabrous leaflets and, presumably, only monospermous pods. The writer has not seen Loureiro's original specimens; his description of *D. pinnata*, however, certainly applies more aptly to *D. Millettii* than it does to *D. tamarindifolia*, which moreover does not appear to have such a root as Loureiro describes. In any case until specimens can be produced, *D. pinnata* should be treated as indeterminate.

7. DALBERGIA PSEUDO-SISSOO Miq. Flor. Ind. Bat. I, 128. A shrubby climber 15–25 feet long with twining, glabrous branches. *Leaves* glabrous medium-green, 6 in. long, leaflets firm 1–5, oblong slightly narrowed from beyond the middle to the cuneate or rounded base, widely rounded and abruptly cuspidate at apex, 2–4 in. long 1–2 in. wide, rachis 2–3 in., petiolules .25 in. long. *Flowers* in lax axillary panicles with subcorymbose branches, 2.5–3.5 in. long and almost as broad, the branches finely grey-downy; pedicels .15 in. long with slender subulate bracteoles under the calyx. *Calyx* campanulate .2 in. long, externally puberulous, teeth widely triangular obtuse much shorter than the tube. *Corolla* .35 in. long, petals creamy-white with pink tips their claws as long as the calyx. *Stamens* 9 monadelphous. *Ovary* long-stalked, densely pubescent 1-, or often 2-ovuled, style slender incurved. *Pod* brownish, strap-shaped, obtuse, 3–4 in. long, .5–.65 in. wide, seed solitary. *D. Championii* Thw. Enum Pl. Zeyl. 95; Benth. in Journ. Linn. Soc. IV, Suppl. 39; Bak. in Flor. Brit. Ind. II, 231. *D. Sissoo* Miq. Flor. Ind. Bat. I, 128 not of Roxb.

PERAK; Larut, *Kunstler* 3177! 3340! 3579! 4964! 6565! *Scortechini* 1348! *Wray* 2098! 2965! PENANG; Government Hill, *Curtis!* SINGAPORE; Bukit Mandai and elsewhere, *Hullett!* *Ridley!* *DISTRIB.* Ceylon; Malay Islands.

The doubt that has hung over the identity of this species has at length been

cleared up through the kindness of Dr. J. V. Suringar. Both Mr. Bentham and Mr. Baker have suggested that it may be the same as *D. pseudo-sissoo* Miq. and in response to a request made by Dr. King that some Malayan specimens from Calcutta, which are undoubtedly conspecific with the Ceylon plant, might be compared with the Miquelian types at Leiden, Dr. Suringar has not only made the necessary comparisons but has sent to Calcutta examples of some of the authentic specimens and very careful drawings of others. These leave no doubt whatever as to the identity of the two plants named *D. pseudo-sissoo* and *D. Championii*. One curious feature has been noticed in this examination by Dr. Suringar and by the writer. In Ceylon (as Mr. Bentham found) and in Penang the ovaries appear to be always 1-ovuled; in Perak, Singapore and Borneo they are oftener 2-ovuled than 1-ovuled in the proportion of 7 to 3; in Java they are nearly always 2-ovuled, nine ovaries having 2 ovules for one ovary with 1 ovule. A still more interesting discovery made by Dr. Suringar is that *D. Sissoo* Miq. is not *D. Sissoo*. Roxb. (this no one who considers what the native habitat of *D. Sissoo* is, will be surprised to learn), but that it is (what was hardly to be expected) Dr. Miquel's own *D. pseudo-sissoo*. Dr. Suringar, in confirmation of his discovery, has sent to Calcutta an authentic specimen of *D. Sissoo* Miq. in Herb. Leiden (not of Roxb.). This then explains the "unfortunate selection" of name that Mr. Bentham very justly comments upon. Dr. Suringar, sharing Mr. Bentham's feeling, suggests that in view of this extraordinary confusion it would be better to drop Miquel's name altogether; and the writer would very gladly have adopted the suggestion and continued to use Dr. Thwaites' name *D. Championii*, had the dictates of common-sense been of any weight in modern nomenclature. But unfortunately there is now no doubt that the plant named *D. pseudo-sissoo* by Miquel is the same as that named *D. Championii* by Thwaites; it cannot be gainsaid that so far as it goes, the description of *D. pseudo-sissoo* applies to the species; and it is clear that the name *D. pseudo-sissoo* has nine years' priority over the name *D. Championii*. This being so, Miquel's name may just as well be given precedence now, seeing that one or other of the bibliographers who pose as botanists would make the alteration so soon as this note appears, in spite of the fact that Miquel did not recognise his own species when he saw it.

8. *DALBERGIA HULLETTII* Prain. A small tree with blackish rugose rusty-puberulous thickish branchlets, without leaves at time of flowering. *Flowers* in short, clustered racemes, 1-1.5 in. long, springing from tufts of triangular rusty-pubescent small bracts in axils of old leaves; lowest pedicels longer than the rest, slender, .3 in. long, rusty-pubescent as are the peduncles; bracteoles at base of pedicels solitary ovate-lanceolate .1 in. long persistent, the pair below calyx subulate very small. *Calyx* campanulate, densely rusty-tomentose .15 in. long, teeth half as long as tube, acute. *Corolla* .3 in. long, claws of petals as long as calyx-tube. *Stamens* 9, rarely 10, monadelphous. *Ovary* with densely pubescent stalk; ovule solitary. *Pod* unknown.

SINGAPORE; *Hullett* 626!

A very distinct species, only once reported. It is nearest to a Bornean tree apparently as yet undescribed (*Haviland* n. 2894); the only difference between the flowers of the two is that in the Bornean plant the ovary is densely woolly; in this the ovary is quite glabrous though its stalk is pubescent. The Bornean plant has

leaves with solitary or trifoliolate leaflets; when trifoliolate the lateral leaflets are subopposite. It thus approaches most nearly to *D. pseudo-sisoo* which also has flowers similar to those of *D. Hullettii* and of Haviland's species from Borneo.

§ 3. SELENOLOBIUM. *Pod* thickened throughout upper suture, recurved at least while young.

9. DALBERGIA TORTA Grah. in Wall. Cat. 5873. An unarmed littoral climber with twining glabrescent branches often twisted into spiral hooks. *Leaves* 3 in. long, leaflets 5 (very rarely 7 or 3), obovate-oblong obtuse sometimes emarginate, dark-green and glabrous above paler and sparingly adpressed-puberulous beneath, .6-.8 in. long, .4-.6 in. wide; rachis 2 in. long glabrous as are the petiolules .1 in. long. *Flowers* in sessile congested axillary panicles, 1-2 in. long, with very slightly puberulous branches, bracts small ovate-lanceolate persistent; pedicels very short with a small ovate-lanceolate bracteole at the base and with two larger ovate bracteoles under the calyx embracing lower third of its tube. *Calyx* glabrescent, wide-campanulate, .15 in. long, teeth short, wide-triangular, obtuse. *Corolla* white, .25 in. long, claws of petals as long as calyx-tube. *Stamens* 10 monadelphous. *Pod* brown flat glabrous, .9 in. long, .5 in. wide, upper suture recurved, rather thick-walled throughout, 1-seeded; stalk as long as calyx. *D. monosperma* Dalz. in Hook. Journ. Bot. II, 36; Benth. in Journ. Linn. Soc. IV, Suppl. 48; Miq. Flor. Ind. Bat. I, 132; Bak. in Flor. Brit. Ind. II, 237.

ANDAMANS: very common on all the coasts of the main group; Narcondam, *Prain!* PENANG; *Wallich* 5873! *Curtis* 220! LANGKAWI; *Curtis* 2868! PERAK; coast at Matong, *Scortechini* 1099! *Wray* 2502! MALACCA; at Tanjong Kling, *Ridley* 3312! SINGAPORE; growing in salt water, *Kunstler* 66! Krangi, *Ridley* 5576! *T. Anderson!* *Kurz!* DISTRIB. Western coasts of India; Sundribuns; Burma; Borneo; New Guinea; China.

A purely littoral species. The citation of *Wall. Cat.* 5879 by Dr. Miquel and Mr. Baker for this species is due to their having copied the statement from Mr. Bentham. By an uncorrected printer's error Mr. Bentham is made in the description to quote this number, though in the notice of localities the number 5873 is correctly given.

10. DALBERGIA MENOEIDES Prain. An unarmed climber with glabrous, twining, hooked branches. *Leaves* 5 in. long, leaflets 3, ovate lanceolate tapering to both ends, dark-green and glabrous above, paler and sparsely adpressed-puberulous beneath, 3-3.5 in. long, 1-1.5 in. wide; rachis 1.5 in. long, glabrous, petiolules .08 in. puberulous. *Flowers* very few, sessile, clustered at tips of short puberulous axillary peduncles .15-.25 in. long, each with two ovate bracteoles embracing lower fourth of calyx-tube. *Calyx* campanulate, externally sparingly

puberulous .15 in. long, teeth short subequal obtuse. *Corolla* .35 in. long, claws of petals as long as calyx-tube. *Stamens* 10 monadelphous. *Ovary* glabrous, ovule solitary. *Pod* greenish, semilunar, flat, glabrous, firm, reticulated throughout, upper suture recurved, 1.5 in. long, .75 in. wide; 1-seeded; tip acute, stalk rather longer than calyx.

PERAK; Krian, *Scortechini* 1392!

A very distinct species with leaflets somewhat resembling those of *D. pseudo-sissoo*.

11. *DALBERGIA KUNSTLERI* Prain. An extensive climber 40–150 feet long with stem 3–6 in. in diam. and pubescent young branches. *Leaves* 10–12 in. long, leaflets 7–9, the lateral ones subopposed, dark-green quite glabrous above, dark-grey when young densely pubescent when old sparsely puberulous beneath, rigidly coriaceous, elliptic-acuminate, 4–6 in. long, 2 in. wide, with very prominent midrib and 8–9 pairs of spreading lateral veins beneath, secondary venation also distinct, rachis 8 in. long, petiolules .3 in. long at first densely pubescent ultimately glabrescent. *Flowers* in axillary panicles 4–6 in. long with spreading rusty-puberulous branches, bracts and bracteoles deciduous, pedicels under .1 in. *Calyx* .15 in., teeth lanceolate except the upper, the lowest twice as long as the tube. *Corolla* dark-blue, .35 in. long, standard orbicular emarginate. *Stamens* monadelphous. *Ovary* pubescent. *Pod* finely puberulous, rigid, much thickened throughout, 1–2-seeded, 1.5–2.5 in. long, .9 in. wide, .3 in. thick, short-stalked, dark-brown to almost black when ripe, with grey lines alongside the sutures.

PERAK; Goping, *Kunstler* 4736! Kinta, *Kunstler* 7067!

A very fine species nearest to *D. reniformis*; it differs in being a climber whereas that species is a tree; in having blue flowers whereas that species has them white; in having larger and thicker leaves and larger pods. The pod is quite indehiscent but as the seed matures the epicarp cracks alongside both sutures so that, when quite ripe, the pod, as *Kunstler* remarks in a field note, shows a "grey seam" due to the exposure of the mesocarp along two lines parallel to each suture. Sometimes the pod consists of but one reniform segment with a solitary seed; usually however there are two segments though the seed inside the distal segment rarely develops; when this happens the epicarp does not give way, and there is then no "grey seam" along the suture.

12. *DALBERGIA PARVIFLORA* Roxb. Hort. Beng. 98. A strong climber 30–80 feet long with glabrous branches. *Leaves* 6–8 in. long, leaflets 5–9, ovate-lanceolate with obtuse slightly emarginate tips, light-green quite glabrous on both surfaces, finely reticulately veined beneath, 2–3.5 in. long .75–1.5 in. wide; rachis 2–3 in. and petiolules .15 in. long, glabrous. *Flowers* very small in axillary and terminal panicles of congested dichotomous cymes with puberulous branches; bracts rounded ciliate deciduous; bracteoles at base of very short pedicels rounded persistent,

the pair at base of calyx oblong ciliate embracing lower half of tube. *Calyx* .08 in., campanulate, teeth obtuse upper two connate, lower three subequal all as long as tube. *Corolla* white, .15 in. long, claws of petals short. *Stamens* 10, monadelphous. *Ovary* glabrous. *Pod* turgid 1-3-seeded; .75-2 in. long, .6 in. wide, when young falcate along upper, when ripe convex along both sutures, when 2- or 3-seeded torulose between the seeds. Flor. Ind. III, 225; Miq. Flor. Ind. Bat. I, 132; Benth. Journ. Linn. Soc. IV, Suppl. 33. *D. Cumingiana* Benth. Pl. Jungh. 255; Journ. Linn. Soc. IV, Suppl. 32; Miq. Flor. Ind. Bat. I, 129. *D. Zollingeriana* Miq. Flor. Ind. Bat. I, 130. *Drepanocarpus Cumingii* Kurz, Journ. As. Soc. Beng. XLV, pt. 2. 282.

ANDAMANS; *Helper* 1808! DINDINGS; *Curtis*! PAHANG; *Ridley* 1374! 2639! PERAK; Matang Jambu, *Wray* 2525! Goping, *Kunstler* 1423! 5973! 6151! *Scortechini*! DISTRIB. Malay Archipelago.

Regarding this plant Mr. Hemsley has noted:—"This agrees with Kew specimens of *D. reniformis* Roxb." This species, however, is a climber whereas *D. reniformis* is a tree; Roxburgh's *D. reniformis* has moreover much larger flowers and, as in *D. Kunstleri*, the fruits of *D. reniformis* remain falcate along the upper suture even when ripe.

That this is *D. parviflora* Roxb. hardly admits of a doubt. Mr. Bentham and Mr. Baker have, indeed, suggested that *D. parviflora* may be the same as *D. Junghuhnii*; in spite of the very great authority of these authors this suggestion must be abandoned as untenable. The number and, still more, shape of the leaflets make the identification impossible; moreover, Roxburgh's account of the pod shows that his species *must* be, as Miquel admits, a *Selenobium* and not as Bentham and Baker suppose, a *Sissoa*. Roxburgh's description is meagre in the extreme; but since *D. Cumingiana* provides a species that exhibits *all* the characters of *D. parviflora* and as no other Malayan species of *Dalbergia* hitherto found does so, it seems imperative to use Roxburgh's name for the species.

A more interesting question regarding this plant is, however, its supposed identity with Rumphius' *Locca lignum* (*Herb. Amboin.* V. 17. t. 13). So far as Calcutta specimens go the only authority for the belief is the existence of a specimen from Halmahera (*Teysmann* n. 5668) on which Mr. Teysmann has written "Kayoe lakka" and another from Tarabangie, Lampongs, Sumatra (*Hort. Bogor* n. 444) also collected by Mr. Teysmann and also marked "Kayoe lakka." It is remarkable that our other Sumatra specimens, collected on the R. Rawas by Dr. H. O. Forbes (*Forbes* n. 3216), have no note to this effect, and just as remarkable that collectors so careful as Mr. Ridley, Fr. Scortechini, Herr Kunstler and Mr. Wray, who have sent us numerous specimens of the same species, should have made no note regarding it. Their silence renders the matter doubtful, and appears to afford good ground for Dr. Kuntze's refusal (*Rev. Gen. Plant.* I, 158) to accept the identification proposed by Teysmann and adopted by Hasskarl (*Neue Schluessel zu Rumph.* p. 90). As Kuntze justly remarks, the meagre account of the flower given by Rumphius does not fit the present species since Rumphius says it has two petals, and though the general habit agrees that alone hardly suffices for identification. The calyx of the only open flower in the figure quite accords with the calyx

of our plant and the fruit also quite agrees. But the uppermost branchlets are shown as curved and twisted like those of *D. torta* while those lower down are figured as passing into spines like those of *D. spinosa*, two species that, though they belong to the same section of *Dalbergia*, are nevertheless very different from *D. parviflora*. None of our very numerous specimens show either hooks or spines, nor have any of the field-notes that accompany the specimens a reference to spines on the stem.

In the Herbarium of the Penang Forest Department, kindly lent by Mr. Curtis, there is however a specimen from Lumot in the Dindings, to which the native name "Kayu Laha" is attached along with the further note, "climber; wood valuable, used as incense." This specimen, from a widely remote locality, thus bears a note made without reference to the controversy that has arisen regarding *Kayoe lakka* but that entirely confirms the notes of Mr. Teysmann, who was, it may be remarked, one of the most careful collectors that has ever worked in Malaya. The existence of this specimen therefore re-opens the whole question, which may be commended to Malayan field-botanists as one worthy of attention and solution. To judge from Rumphius' account there were, in his time, three if not four species included under the name *Caju Lacca* and of one, at least, of these he says that it had *no* spines, only thickened nodes instead. It seems quite certain that *D. parviflora* must have been one of the four. But whether his figure is meant to represent it or has been made to include some of the characters of the others as well, can only be known when all four are completely understood.

### 31. PTEROCARPUS Linn.

Erect trees. *Leaves* with alternate coriaceous exstipellate leaflets. *Flowers* yellowish, in copious paniced racemes; bracts and bracteoles minute, caducous; pedicels distinctly articulated at the apex. *Calyx* turbinate, curved before expansion, the teeth short. *Petals* exserted, with long claws; standard and wings crisped; keel obtuse, the petals scarcely or not at all coherent. *Staminal* sheath slit both above and below, or above only; the upper stamen often nearly or quite free; anthers versatile. *Ovary* stalked, 2-ovuled; style incurved, stigma terminal. *Pod* orbicular, rarely other than 1-seeded, with a broad rigid wing, the point turned down to opposite the base or near it. Species about 15; cosmopolitan in the Tropics.

Leaflets finely veined throughout, pedicels slender longer than the calyx, beak of pod distinctly raised beyond the outer base ... .. 1. *P. indicus*.

Leaflets with 5-7 pairs of distinctly raised veins beneath, pedicels stoutish shorter than the calyx, beak of pod hardly raised beyond the outer base ... .. 2. *P. dalbergioides*.

1. PTEROCARPUS INDICUS Willd. Sp. Pl. III, 904. A tree 30-40 feet high with widely spreading branches drooping at the end. *Leaves* 8-10 in. long, leaflets 5-9 moderately firm, 2-4 in. long 1.5-2 in. wide, the terminal rather larger than the others, the rachis usually faintly prolonged, all ovate with rounded rarely deltoid base and rounded

abruptly acuminate apex, glabrous on both surfaces, dark-green, margins entire but distinctly undulate, uniformly finely veined throughout, stipules lanceolate .5 in. long early caducous, petiolules .25 in., glabrous as is the leaf-rachis. *Flowers* in copious terminal and axillary panicles, rachis and pedicels glabrescent, pedicels .3 in. long, very slender, with 2 linear caducous bracteoles .1 in. long, half as long as bud, at apex. *Calyx* .25 in. long, finely brown-silky, teeth rounded the two uppermost exceeding the others. *Corolla* yellow, .6 in. long, standard .5 in. across. *Pod* orbicular, with stalk .3 in. long, 1.75–2.25 in. in diameter, uniformly sparsely adpressed-pubescent with silky hairs, rather distinctly anastomotically 2–3-veined opposite the seed, the style usually a considerable distance (65°–100°) above the base, pointing outwards at right angles to the stalk. Roxb. Hort. Beng. 53; DC. Prodr. II, 419; Roxb. Flor. Ind. III, 238; Benth. in Journ. Linn. Soc. IV, Suppl. 77 (in part only); Miq. Flor. Ind. Bat. I, 135; Bak. in Flor. Brit. Ind. II, 238 (in part only). *P. Draco* Lamk. Ill. t. 602, f. 2, *b* (not *a*). *P. dalbergioides* Wall. Cat. 5843 (letter G only) not of Roxb. *P. Zollingeri* Miq. Flor. Ind. Bat. I, 136. *P. obtusatus* Miq. Flor. Ind. Bat. I, 136. *P. saxatilis* Bl. MSS. in Hort. Bogor. *Lingoum saxatile* Rumph. Herb. Amboin. II, t. 70.

PENANG; Wallich 5843 G! MALACCA; Griffith! Maingay 550! PERAK; Kunstler 1513! 8713! Scortechini 503! Wray 2003! 2280! DISTRIB. Northwards throughout Tenasserim to Martaban; southwards to Sumatra and Java.

A fine tree often confused with the next species from which it is, however, very distinct in foliage and somewhat different in habit.

2. *PTEROCARPUS DALBERGIOIDES* Roxb. Hort. Beng. 53. A tree 60–80 feet high with ascending branches, spreading at the end. *Leaves* 8–10 in. long, leaflets 5–9, firm, 2–4 in. long 1–1.5 in. wide the terminal rather larger than the others, ovate-lanceolate with deltoid rarely rounded base and gradually narrowing to apex, glabrous on both surfaces, pale-green, margins entire hardly undulate, with 5–7 pairs of distinctly raised veins beneath, stipules lanceolate .5 in. long, early caducous, petiolules .15 in. long glabrous as is the leaf-rachis. *Flowers* in copious terminal and axillary panicles, rachis and pedicels finely brown-pubescent, pedicels .2 in. long stoutish with 2 very shortly ovate caducous bracteoles under .05 in. long, less than  $\frac{1}{2}$  as long as bud, at apex. *Calyx* .25 in. long, densely brown silky, teeth rounded the two uppermost exceeding the others. *Corolla* yellow .4 in. long, standard .35 in. across. *Pod* orbicular, with stalk .6 in. long, 2–2.25 in. in diameter, uniformly very finely puberulous and not veined opposite the seed, the style usually a short distance (40°–50°) above the base, pointing slightly downwards. DC. Prodr. II, 418; Roxb. Flor. Ind. III, 236; W. & A. Prodr. 267



Wall. Cat. 5843 (excluding G and, according to W. & A., also excluding D). *P. indicus* Benth. in Journ. Linn. Soc. IV, Suppl. 77, in part; Bedd. Fl. Sylvat. t. 23; Bak. in Flor. Brit. Ind. II, 238 in part, not of Willd.

ANDAMANS; common.

This tree is usually treated as a form of the preceding species, and it has been the fashion to say that the two are not distinguishable by 'botanical' characters. As they grow it would be very hard to mistake them, and when have been carefully examined it becomes difficult to realize that, even in the herbarium, they should ever have been confounded.

### 32. ARACHIS Linn.

Annual herbs. *Leaves* abruptly pinnate, leaflets few; stipules elongated adnate to the petiole. *Calyx* long-tubular simulating a pedicel, 2-lipped; the upper lip 4-toothed the lower long slender. *Corolla* resupinate. *Stamens* (sometimes only 9) united in a tube inserted with the petals on calyx limb; staminal tube grooved on vexillary side but not split; anthers dimorphic alternately on short filaments versatile and on longer subbasifixed. *Ovary* at first short-stalked, at base of calyx-tube, the stalk soon elongating; style filiform, bearded above; stigma minute. *Pod* long-stalked ovate-oblong, obtuse at both ends, gibbous, torulose, reticulated, coriaceous, indehiscent, 2-4-seeded. *Seeds* fleshy, oily. Species 7; six in Brazil, 1 widely cultivated in the tropics.

ARACHIS HYPOGÆA Linn. Sp. Pl. 741. An annual diffuse herb, stems grooved and angled 6-20 in. high, often much branched near base; stems and branches clothed with longish spreading hairs. *Leaf-rachis* pubescent 2-4 in. long; leaflets exstipellate in 2 opposite pairs, ovate-oblong obtuse with rounded base, 1-1.5 in. long, .6-1 in. wide, green and glabrous above, pale and sparsely clothed with spreading hairs beneath; stipules narrow lanceolate 1 in. long, .15 in. wide, upper half free. *Flowers* 2-7, in leaf-axils along the stem. *Calyx*-lips .25 in. long, the lower linear the upper .15 in. wide. *Corolla* .4 in. long, pale-yellow or white; standard suborbicular, glabrous, keel beaked. *Pod* carried underground by the elongating pedicel, where it ripens; 1-1.25 in. long, .5 in. across; 2-3-seeded. DC. Prodr. II, 474; Miq. Flor. Ind. Bat. I, 218.

SINGAPORE; cultivated, *Anderson*! PENANG; cultivated, *Curtis*!

The "Ground-Nut," commonly cultivated in India and Malaya, probably originally introduced into the old world from Brazil.

### 33. ZORNIA Gmel.

Annuals, with large geminate coriaceous bracts and dotted leaflets in 1-2 opposite pairs. *Flowers* in lax racemes. *Calyx* minute; upper

teeth short, connate; lowest shorter than the two middle ones. *Corolla* much exerted; standard broad; keel incurved, acute. *Stamens* monadelphous; anthers dimorphous. *Ovary* sessile, many-ovuled; style filiform, incurved, stigma minute capitate. *Pod* of several small round flattened finely muricated 1-seeded indehiscent joints. Species 10, all but two American.

ZORNIA DIPHYLLA Pers. Synops. II, 518. A diffuse annual with slender zigzag wiry branches reaching 11–15 in. in length, glabrous or sparingly puberulous. *Leaf-rachis* .25 in. long, puberulous, channelled above; leaflets in one terminal pair, oblong or lanceolate (lanceolate in Malayan specimens), .5 in. long, .12 in. wide, glabrous, conspicuously dotted; stipules lanceolate with a long spur. *Racemes* laxly 3–12-fl., 1–3 in. long; bracts also dotted, ovate-acute, almost concealing flowers and fruits. *Calyx* minute. *Corolla* slightly exerted. *Pods* 1–6-jointed; joints .08 in. long, pubescent, and irregularly sprinkled with harsh prickles. Benth. in Mart. Flor. Bras. XV, 80, t, 21, 22; Bak. in Flor. Brit. Ind. II, 147. *Zornia angustifolia* Smith in Rees Cyclop. n. 1; DC. Prodr. II, 316; Wall. Cat. 5660; Miq. Flor. Ind. Bat. I, 278. *Z. dictyocarpa* DC. Prodr. II, 327. *Z. gibbosa* Span. Linnæa XV, 191. *Z. graminea* Span. Linnæa XV, 192. *Hedysarum diphylllum* Linn. Sp. Pl. 747; Roxb. Flor. Ind. III, 353.

SINGAPORE; Changi, *Ridley* 4672! DISTRIB. Cosmopolitan in the tropics.

#### 34. SMITHIA Ait.

Herbs or undershrubs. *Leaflets* many small sensitive, opposite, leaf-rachis ending in a bristle; stipules scarious with large auricles. *Flowers* racemose or axillary. *Calyx* deeply 2-lipped, the lips usually entire. *Corolla* exerted; standard orbicular; keel incurved obtuse. *Stamens* in two bundles of 5 each; anthers uniform. *Ovary* linear, many-ovuled; style incurved, filiform, stigma minute capitate. *Pod* of many or few small flattened or turgid joints, folded together inside the calyx. Species 20–30, throughout tropics of the Eastern Hemisphere.

SMITHIA SENSITIVA Ait. Hort. Kew. ed. I, III, 496. A diffuse spreading annual with slender glabrous much branched stems 1–3 feet long, only .12 in. thick at base. *Leaf-rachis* .5–1 in. long sparsely beset with long whitish bristles; leaflets 3–10 pairs, .25–.4 in. long, oblong obtuse, sparsely bristly on the almost straight margins and on the mid-rib beneath. *Racemes* simple 1–6-fl., in axils of upper leaves on peduncles .3 in. long, pedicels slender bracteolate .15 in. long or less, ascending; bracteoles small ovate-acute scarious. *Calyx* .25–.3 in. long, lips subequal, entire, acute, with a few scattered subadpressed pale-yellow

bristles. *Corolla* yellow, glabrous, 4 in. long. *Pod* 4-6-jointed; faces densely papillose. DC. Prodr. II, 325; Roxb. Hort. Beng, 56; Flor. Ind. III, 342; Salisb. Paradis. t. 92; Miq. Flor. Ind. Bat. I, 272; Bak. in Flor. Brit. Ind. 148. *S. abyssinica* Hochst. in Schimp. Pl. Abyssin.

ANDAMANS; a common weed throughout the settlement at Port Blair. NICOBARS; Kamorta, *Kurz!* DISTRIB. Africa; S.-E. Asia.

Not seen from the other provinces; probably a recent introduction from India. From Java comes a very closely allied plant (*S. javanica* Miq.) which differs mainly in having no bristles on the calyx; this may be no more than a form of the Indian and African *S. sensitiva*: all the specimens reported are, however, very uniform.

### 35. ORMOCARPUM Beauv.

Shrubs. *Leaves* with odd-pinnate exstipellate leaflets and persistent striated stipules and bracts. *Flowers* in lax racemes. *Calyx*-tube campanulate; 2 upper teeth deltoid; 3 lower lanceolate. *Standard* broad; keel much incurved, not at all beaked. *Stamens* in two bundles of 5 each; anthers uniform. *Ovary* linear, few-ovuled; style filiform, inflexed, stigma minute terminal. *Pod* of a few indehiscent turgid linear or oblong joints, the lower seedless, the faces rugose, naked or muricated with weak gland-tipped prickles. Species 6, spread all round the world in the tropics.

ORMOCARPUM GLABRUM Teysm. & Binnend. Nat. Tijd. Ned. Ind. XXVII, 56. A small tree 12-14 feet high, with smooth angular branches; epidermis desquamating. *Leaves* 6 in. long, leaflets 1 in. long, 4 in. wide, terminal and 8-9 alternate lateral elliptic obtuse mucronate, glabrous, glaucescent beneath; rachis subtrigonus, glabrous, thickened at base; stipules subulate erect. *Racemes* corymbose, on short peduncles 12 in. long; individual flowers on slender pedicels 5 in. long, 2-bracteolate above the middle. *Calyx* 25 in. long, green, campanulate, unequally 5-toothed, glabrous externally; teeth oblong, acute. *Corolla* much exserted, yellow, purple-veined; standard suborbicular retuse. *Ovary* long-stipitate, glabrous. *Pod* 6-7-jointed, ultimately becoming blackish, 5-6 in. long; individual joints 75-1 in. long, externally marked with 6-8 longitudinal more or less parallel ridges.

ANDAMANS; very common in thickets near Port Blair; no doubt introduced. DISTRIB. Malay Archipelago.

This has the general habit of the common Indian *O. senoides*, of which it is perhaps only a cultivated form; its pods, however, are much longer and are never muricated. The original description, it should be noted, was made from specimens cultivated at Buitenzorg.

### 36. ÆSCHYNOMENE Linn.

Erect herbs or undershrubs. *Leaves* with very numerous close

sensitive odd-pinnate small linear leaflets. *Flowers* in sparse racemes. *Calyx* deeply 2-lipped, the lips faintly toothed. *Corolla* fugacious; standard orbicular; keel not beaked. *Stamens* in two bundles of 5 each; anthers uniform. *Ovary* stalked, linear, many-ovuled; style fliform, incurved, stigma terminal. *Pod* linear, with a stalk longer than the calyx, and 4–8 flattened 1-seeded separating joints. Species about 30, spread everywhere in the tropics.

Stems woody, slender, much-branched; calyx and corolla small  
glabrous; pods narrow, smooth ... .. 1. *Æ. indica*.  
Stems pith-like, stout, little-branched; calyx and large corolla  
hispid; pods broad, warted ... .. 2. *Æ. aspera*.

1. *ÆSCHYNOMENE INDICA* Linn. Sp. Pl. 713. A slender, much branched annual undershrub, stems 1–3 feet high under .15 in. in diam. at base; everywhere glabrous, pale-green; branches slender twiggy terete. *Leaf-rachis* 2–3 in. long; leaflets close, terminal and in 20–30 opposite pairs, linear, obtuse, 1-nerved, .2 in. long; stipules lanceolate, .3 in. long, membranous, deciduous, with a large auricle. *Racemes* axillary 1–4-fld.; peduncles 1 in. and pedicels .3 in., usually viscid; bracteoles small subulate glandular. *Calyx* .2 in., glabrous, teeth unequal the two upper subconnate, persistent, withering. *Corolla* pale-yellow, tinged with pink or orange, .45 in. long, glabrous, fugacious, standard orbicular emarginate. *Stigma* capitate. *Pod* 1–1.5 in. long, straight or at times slightly curved, upper suture even, lower indented between the 8–10 separating smooth or faintly papillose joints .12–.15 in. broad. DC. Prodr. II, 320; Miq. Flor. Ind. Bat. I, 274; Bak. in Flor. Brit. Ind. II, 151. *Æ. pumila* Linn. Sp. Pl. ed. II, 1061; DC. Prodr. II, 321. *Æ. aspera* Wall. Cat. 5666 not of Linn. *Æ. diffusa* Willd. Sp. Pl. III, 1164; DC. Prodr. II, 321; Wall. Cat. 5565. *Æ. viscidula* Willd. Enum. 776. *Æ. Roxburghii* Spreng. Syst. III, 322. *Smithia aspera* Roxb. Hort. Beng. 56; Flor. Ind. III, 343. *Hedysarum Neli-Tali* Roxb. Hort. Beng. 57; Flor. Ind. III, 365.

ANDAMANS; Port Mouat, plentiful. PROV. WELLESLEY; *Ridley* 8009!  
DISTRIB. Tropics generally.

2. *ÆSCHYNOMENE ASPERA* Linn. Sp. Pl. 713. A tall erect swamp-shrub reaching 10–12 feet in height, stems 3 in. or more in diam., externally glabrous, internally full of soft white pith; branches few or none. *Leaf-rachis* 3–6 in. long; leaflets terminal and in 30–50 opposite pairs, linear, obtuse, 1-nerved, .5 in. long; stipules lanceolate .5 in. long, auricled, deciduous. *Racemes* axillary corymbosely 2–4-fld.; peduncles 1 in. and pedicels .4 in. clothed with spreading bristles; bracteoles small ovate deciduous. *Calyx* .4 in., hispidly hairy, unequally 5-toothed, the two upper teeth subconnate. *Corolla* .75 in. yellow, fugacious, standard orbicular. *Pod* 2–2.5 in. long, .3 in. across, often indented on

both the echinulate sutures, always along the lower, between the 4-8 separating joints which are usually ochinulate on the face, rarely smooth. DC. Prodr. II, 320; Miq. Flor. Ind. Bat. I, 275; Bak. in Flor. Brit. Ind. II, 152. *Æ. indica* Wall. Cat. 5667 not of Linn. *Æ. trachyloba* Miq. Flor. Ind. Bat. I, 276. *Æ. indica* var. *aspera* Hassk. Pl. Jav. Rar. 340. *Hedysarum lagenarium* Roxb. Hort. Beng. 57; Flor. Ind. III, 365.

MALACCA; *Griffith!* DISTRIB. Tropical S.-E. Asia and Tropical Africa.

This is the well-known "Sola" plant, the pith of which is used in making sun-hats, fishermen's floats and other articles where great lightness is desirable. Doubtless it is an introduced plant in Malacca.

### 37. PHYLACIUM Benn.

Climbing herbs. *Leaves* 3-foliolate; stipules persistent small linear or lanceolate, leaflets stipellate. *Flowers* in axillary racemes shortly pedicelled, 2-bracteolate near the calyx, completely enveloped, as ultimately is the legume, in a large boat-shaped membranous accrescent bract. *Calyx* tubular, sub-2-labiate, 4-toothed. *Standard* ovate, apex retuse base 2-auriculate; wings oblong, long-spurred, spurs incurved clasped by the auricles of the standard; keel straight obtuse shortly spurred. *Siamens* diadelphous, posterior filament adnate to base of standard-claw. *Ovary* short-stalked, its base surrounded by a shallow disc; ovule solitary; style inflexed. *Pod* short-stalked ovate-rotund, acute. Species 2, the present and another which is Indo-Chinese.

PHYLACIUM BRACTEOSUM Benn. Pl. Jav. Rar. 159 t. 33. A slender climber 20-30 feet long, young parts and leaves beneath sparingly adpressed-hirsute. *Leaves* pinnately 3-foliolate; leaflets ovate-oblong base rounded apex obtuse, thinly herbaceous, green on both surfaces, glabrous above, sparingly hirsute beneath, 2-3 in. long, 1.5 in. wide; petioles glabrescent 1.5 in. long, stipules and stipels linear, persistent. *Racemes* axillary 2-10 together, 1.5-2 in. long, shorter than the leaves, flowers fasciculate few. *Bracts* pale-green, 1-1.5 in. long, externally glabrous, sparing hirsute within. *Calyx* .15 in. long, externally sparingly hirsute, upper lip entire ovate, lower 3-lobed, lobes lanceolate the central rather the larger, none overlapping. *Corolla* .3 in. long, white with a pink tinge, glabrous. *Pod* .25 in. long, compressed, sparing hirsute, reticulate. Benth. Pl. Jungh. I, 231; Miq. Flor. Ind. Bat. I, 228.

PERAK; near Gunong Pondo, in open jungle, 200-300 feet elev., *Kunstler* 8367! DISTRIB. Sumatra and Java to the Philippines.

### 38. URARIA Desv.

Suffruticose perennials. *Leaves* stipellate, with 1 to 9 leaflets. *Flowers* very numerous, minute, racemose. *Calyx*-tube very short; two

upper teeth short; three lower usually elongated, setaceous. *Standard* broad; wings adhering to the obtuse keel. *Stamens* diadelphous; anthers uniform. *Ovary* sessile or short-stalked, few-ovuled; style inflexed filiform, stigma terminal. *Pod* of 2-6 small turgid 1-seeded indehiscent joints, often placed face to face. Species 15, S.-E. Asiatic.

Stems erect, heads long cylindrical; upper leaves 5-9-foliolate, leaflets much longer than broad:—

Leaflets narrowly lanceolate, clouded above, pedicels clothed with short bristles, joints of pod polished glabrous ... 1. *U. picta*.

Leaflets oblong, green above, pedicels clothed with long bristles, joints of pod dull puberulous ... 2. *U. crinita*.

Stems trailing heads short oblong; leaves 1-foliolate and 3-foliolate intermixed, leaflets not much longer than broad ... 3. *U. lagopoides*.

1. *URARIA PICTA* Desv. Journ. Bot. I, 123 t. 5 f. 19. An erect little-branched suffruticose perennial 3-6 feet high, with stout finely downy stems .5 in. or more in diam. at base. *Leaves* 10-12 in. long, rachis finely downy; leaflets terminal and in 2-4 opposite pairs, linear-lanceolate, rigidly subcoriaceous, glabrous clouded with white above, finely reticulate veined and minutely pubescent beneath, 4-8 in. long .3-6 in. wide; petiole 2-2.5 in. long, stipules lanceolate long-acuminate from a broad base .5 in. long with parallel veins, stipels subulate .2 in. long; the lowest leaves simple or 3-foliolate, round or oblong. *Racemes* in dense cylindrical heads 6-12 in. long, .65-.75 in. broad; bracts brown scarioso deciduous, upper lanceolate lower ovate-acuminate; pedicels .25-.35 in. long, covered with short bristles, abruptly incurved at the tip after flowering. *Calyx* .2 in. long. *Corolla* purple, exserted, .3 in. long. *Pod* glabrous, pale lead-coloured, joints 3-6, smooth polished, .13 in. long .1 in. wide, compressed. DC. Prodr. II, 324; Wall. Cat. 5674; Miq. Flor. Ind. Bat. I, 267; Bak. in Flor. Brit. Ind. II, 155. *U. linearis* Hassk. Pl. Jav. Rar. 349. *Hedysarum pictum* Jacq. Ic. t. 567; Roxb. Hort. Beng. 57. *Doodia picta* Roxb. Flor. Ind. III, 368.

PERAK; *Scortechini*! PROV. WELLESLEY; *Ridley* 6958! NICOBARS; Kamorta, *Kurz*! DISTRIB. India; Indo-China; Malay Islands.

2. *URARIA CRINITA* Desv. Journ. Bot. I, 123. An erect little-branched perennial 3-8 feet high, with stout finely downy stems .75 in. or more in diam. at base. *Leaves* 8-15 in. long, rachis sparingly puberulous, leaflets terminal and in 2-3 opposite pairs, ovate-oblong acute, subcoriaceous, glabrous, green above, finely reticulate-veined and minutely tomentose beneath, 3-4 in. long, 1-1.5 in. wide, base rounded; petiole 3-4 in. long, stipules lanceolate acuminate .6 in. long, puberulous; stipels lanceolate .15 in. long; the lowest leaves simple or trifoliolate, ovate or subcordate. *Racemes* in dense cylindrical heads 8-18 in. long, 1-1.5 in. broad; bracts scarioso deciduous ovate-acuminate, ciliate;

pedicels 45-65 in. long, covered with long spreading bristles, abruptly incurved at the tip after flowering. *Calyx* .2 in. long, teeth sparingly plumose. *Corolla* pale-purple, .3 in. long. *Pod* puberulous, joints 4-6, black, dull, .13 in. long, .1 in. wide, compressed. DC. Prodr. II, 324; Wall. Cat. 5675; Miq. Flor. Ind. Bat. I, 268; Bak. in Flor. Brit. Ind. II, 155. *U. comosa* DC. Prodr. II, 324. *U. picta* Wight, Ic t. 411, not of Desv. *Hedysarum crinitum* Linn. Mant. I, 102; Burm. Flor. Ind. 169 t. 56; Roxb. Hort. Beng. 57. *Doodia crinita* Roxb. Flor. Ind. III, 369.

PAHANG; Renchong, etc. *Ridley!* PERAK; Thaipeng, *Scortechini* 71! Sunga Ryah, *Kunstler* 1011! MALACCA; *Maingay* 527! SINGAPORE; *Hullett* 49! *Ridley* 8110! DISTRIB. India, Indo-China, China, Malay Islands.

3. URARIA LAGOPOIDES DC. Prodr. II, 324. A tufted woody perennial with slender trailing pubescent much branched stems 1-3 feet long. *Leaves* 1.5-2 in., rachis pubescent; leaflets solitary, or a terminal and one pair of opposite leaflets, oblong rhomboid or rounded, base rounded truncate or at times cordate, thickly membranous, green glabrous above, finely reticulate-veined, pubescent beneath, 1-2 in. long .75-1 in. wide; lateral pair of leaflets when present always much smaller than terminal; petiole .5-.75 in.; stipules lanceolate .2 in.; stipels subulate small. *Racemes* in short dense simple oblong heads, 1-2.5 in. long, .8 in. wide; bracts subpersistent distinctly ciliated, .3 in. long; pedicels densely crinite, .15 in. long. *Calyx* .12 in., lower teeth setaceous, densely plumose. *Corolla* pale-purple, .2 in. long. *Pods* glabrous, joints thick, reticulate, .15 in. long, .08 in. wide, compressed. Miq. Flor. Ind. Bat. I, 268; Bak. in Flor. Brit. Ind. 156. *U. retusa* Wall. Cat. 5680. *Hedysarum lagopodioides* Linn. Sp. Pl. 1198. *H. lagopoides* Burm. Fl. Ind. 68, t. 53, f. 2. *Lespedeza lagopoides* Pers. Synops. II, 303. *Doodia lagopodioides* Roxb. Flor. Ind. III, 366.

PAHANG; *Ridley* 2594! PERAK; *Scortechini* 13! PROV. WELLESLEY; *Ridley* 8010! ANDAMANS; *King's Collectors!* DISTRIB. India; Indo-China; China; Malay Islands.

### 39. LOUREA Neck.

Herbs. *Leaves* membranous, stipellate, 1-3-foliolate. *Flowers* in terminal simple or paniced racemes. *Calyx* membranous, accrescent, the lanceolate teeth as long as the campanulate tube. *Corolla* equalling or exceeding the calyx; standard broad; keel obtuse. *Stamens* diadelphous; anthers uniform. *Ovary* few-ovuled; style filiform, inflexed, stigma capitate. *Pod* of about 4 small distinct 1-seeded smooth veined joints, included in the calyx. Species 4; all originally East Indian.

LOUREA VESPERTILIONIS Desv. Journ. Bot. I. 122, t. 5 f. 18. An erect slender herb, sparingly subfastigiately branched; branches towards their tips finely downy with hooked hairs. *Leaf-rachis* .5–1 in., leaflets usually 1 terminal, rarely 3; rigidly subcoriaceous, green usually clouded with white, the terminal one 2–3 in. broad, .3–.5 in. long with two linear or lanceolate spreading or slightly ascending 2–3-nerved halves, apex of each lobe broadly emarginate bristle-tipped; lateral leaflets, when present, much smaller, obliquely obversely deltoid. *Racemes* simple or slightly paniced; 3–6 in. long; pedicels pubescent, shorter than calyx, the lower geminate. *Calyx* membranous campanulate; in fruit .25–.35 in. long, sparsely pubescent with spreading hairs; teeth as long as tube, wide-triangular with a strong central nerve and widely reticulate-veined, as is the tube, with slightly weaker secondary nerves. *Corolla* not longer than calyx. *Pod* included, 4–5-jointed. DC. Prodr. II, 323; Wall. Cat. 5671; Miq. Flor. Ind. Bat. I, 264; Bak. in Flor. Brit. Ind. II, 154. *Hedysarum Vespertilionis* Linn. fil. Suppl. 331; Roxb. Hort. Beng. 57; Flor. Ind. III, 352.

MALAYAN PENINSULA; exact locality not given, *Sir W. Norris!*  
DISTRIB. Now cosmopolitan in the tropics, but often only planted.

#### 40. ALYSICARPUS Neck.

Diffuse annuals or biennials. *Leaves* simple, rarely 3-foliolate, stipellate, subcoriaceous. *Flowers* in copious axillary racemes. *Calyx* glumaceous; teeth deep, often imbricated, the two upper often connate. *Corolla* not exerted; standard broad; keel obtuse, adhering to the wings. *Stamens* diadelphous; anthers uniform. *Ovary* nearly or quite sessile, many-ovuled; style incurved, stigma capitate. *Pod* terete or turgid, composed of several indehiscent 1-seeded joints. Species about 15; weeds, everywhere in the tropics of the old world.

ALYSICARPUS VAGINALIS DC.; Miq. Flor. Ind. Bat. I, 231. A robust ascending herb, stems 1–3 feet long (VAR. *typica*); or a dwarf diffuse herb with very slender stems and branches spreading 8–12 in. (VAR. *nummularifolia*); the branchlets slightly downy. *Leaves* always 1-foliolate, petioles .3 in. long, slender, glabrous, stipules subscarios parallel-veined ovate-acute half as long as petioles; leaflets glabrous cordate at base, lowest lanceolate 1.5–2 in. long, .5 in. broad acute, with upper oblong obtuse 1–1.5 in. long and 1 in. wide (in one series of forms); or lowest oblong .75 in. long subacute, the upper .5 in. long ovate-obtuse all .3 in. wide (in a second series of forms). *Racemes* 8–12-fl. lax-fl. 1–3 in. long (VAR. *typica*) or congested under 1 in. long (VAR. *nummularifolia*); pedicels shorter than calyx. *Calyx* .12 in. glabrescent, teeth linear-setaceous longer than tube. *Corolla* pale-yellow tinged with



pink, small, included. *Pod* terete, reticulate-veined, .5–.75 in. long, .08 in. wide; joints 6–8, half as long again as broad; faintly pubescent, slightly thickened at the ends. Bak. in Flor. Brit. Ind. II, 158.

VAR. *typica*. Stems stouter ascending, lower leaves usually lanceolate and upper oblong; occasionally lower leaves oblong and upper ovate, racemes lax. DC. Prodr. II, 353; W. & A. Prodr. 233. *A. diversifolius* Wall. Cat. 5772. *A. Harnieri* Schweinf. Rel. Kotsch. 24 t. 19. *Hedysarum vaginale* Linn. Sp. Pl. 746; Roxb. Hort. Beng. 56; Flor. Ind. III, 345.

PANGKORE; *Scortechini* 1461! MALACCA; on Pulo Besai, *Maingay* 516! SINGAPORE; Changi, *Ridley* 1080!

VAR. *nummularifolia* Miq. *loc. cit.*; Bak. *loc. cit.* Stems slender diffusely spreading, lower leaves always oblong, upper ovate, racemes dense. *A. nummularifolius* DC. Prodr. II, 353; Wall. Cat. 5767; W. & A. Prodr. 133. *A. varius* Wall. Cat. 5768. *Hedysarum nummularifolium* Linn. Sp. Pl. 746. *H. varium* Roth. Nov. Sp. 35 t. *H. cylindricum* Poir. Encyc. Meth. Suppl. V, 400. *Hegetschweilera pulchella* Regel, Bot. Zeit. I, 47.

ANDAMANS; Gt. Coco Isd. *Prain*! Port Blair, *King*! PERAK; *Scortechini*! *Ridley* 8008! PENANG; Water-fall, *Curtis* 1892! 1893! MALACCA; *King*! *Hervey*! SINGAPORE; on Pulo Obin, *Kunstler* 4!

The writer has followed Miquel and Baker in uniting these two plants which Linnæus, De Candolle, Wallich and Wight have endeavoured to keep distinct. The difficulty that has arisen in distinguishing them, has been due to the fact that *A. vaginalis*, though always diagnosed as having lower leaves lanceolate and upper leaves oblong, in reality very often has the lower oblong and the upper ovate as in *A. nummularifolius*. The true distinguishing characters are the spreading habit and condensed racemes of the variety, the ascending stems and lax racemes of the typical plant. The description and the varietal diagnoses now given may, it is hoped, prevent a recurrence of the difficulty that has hitherto been experienced in differentiating the two.

#### 41. DESMODIUM Desv.

Herbs or shrubs. *Leaves* 1- or 3-foliolate, stipellate. *Flowers* small usually in copious often dense racemes. *Calyx* campanulate; teeth longer or shorter than the tube the two upper often subconnate. *Corolla* exerted; standard broad; wings more or less adherent to the usually obtuse keel. Upper *stamen* entirely or partially free from the other united 9. *Ovary* sessile or stipitate, few- or many-ovuled; style incurved, stigma minute capitate. *Pod* usually composed of several 1-seeded indehiscent joints, the faces compressed, the upper suture rarely finally splitting open, the joints usually separating. Species about 150; cosmopolitan in tropical and subtropical countries, a few in temperate N. America and temperate S. Africa.

Pod distinctly divided into several separating one-seeded joints:—

Leaves 3-foliolate:—

Small trailing herbs with 1-3 axillary flowers (1.

*Sagotia*):—

- |  |        |    |                          |
|--|--------|----|--------------------------|
| Pedicels hardly exceeding the petioles; leaflets obovate-cuneate, truncate or emarginate | ...    | 1. | <i>D. triflorum.</i>     |
| Pedicels distinctly longer than petioles; leaflets oblong rounded at apex                | ... .. | 2. | <i>D. heterophyllum.</i> |

Undershrubs or shrubs with woody branches:—

Bracts large, 2-foliolate, persistent (2. *Phyllodium*).. 3. *D. pulchellum.*

Bracts small, simple, deciduous:—

Flowers in dense short-peduncled axillary umbels

(3. *Dendrolobium*):—

Leaflets smooth, veins beneath indistinct; pods glabrous ... .. 4. *D. umbellatum.*

Leaflets rugose, reticulate-veined beneath; pods strigose ... .. 5. *D. rugosum.*

Flowers in more or less elongated racemes:—

Lowest joint of pod distinctly stalked, *constrictions between joints reaching from lower almost to upper suture* (4a. *Eudesmodium* § *Podocarpium*) .. ... 6. *D. laxum.*

Lowest joint of pod sessile:—

Joints of pod not manifestly longer than broad:—

Joints of pod indehiscent, leaflets large acuminate (4b. *Eudesmodium* § *Dollinera*).. 7. *D. megaphyllum.*

Joints of pod opening along lower suture, leaflets small (4c. *Eudesmodium* § *Nicholsonia*):—

Leaflets obovate-cuneate silvery beneath; pedicels always ultimately reflexed; stems prostrate .. ... 8. *D. capitatum.*

Leaflets obovate-cuneate or obovate-acute, not silvery beneath; pedicels erect or ascending; stems erect ... 9. *D. polycarpum.*

Joints of pod 4 times as long as broad (4d.

*Eudesmodium* § *Scorpiurus*) ... 10. *D. laxiflorum.*

Leaves 1-foliolate:—

Petioles not winged:—

Joints of pod 4 times as long as broad (4d.

*Eudesmodium* § *Scorpiurus*) ... 11. *D. ormocarpoides.*

Joints of pod not manifestly longer than broad

(4e *Eudesmodium* § *Heteroloma*):—

Racemes lax, pods glabrescent ... .. 12. *D. gangeticum.*

Racemes dense, pods densely pubescent .. 13. *D. virgatum.*

Petioles broadly winged (5. *Pteroloma*):—

Pods thin, densely strigose ... .. 14. *D. triquetrum.*

Pods coriaceous, quite glabrous ... .. 15. *D. auriculatum*.  
 Pods indistinctly jointed, not separating into segments  
 but dehiscing in a continuous line along the ventral  
 suture (6. *Pleurolobium*) ... .. 16. *D. gyroides*.

SUBGEN. 1. SAGOTIA Walp. Trailing *herbs*, with small 3-foliolate stipellate leaves. *Flowers* in sparse lax racemes or 1-2 in the axils of the leaves; bracts deciduous and pods distinctly jointed.

1. DESMODIUM TRIFLORUM DC. Prodr. II, 334. A small trailing herb with very slender diffusely branching stems 6-18 in. long; branches sparsely hirsute with fine spreading hairs. *Leaves* .5 in. long, 3-foliolate; petiole .2 in. long; leaflets membranous obovate-cuneate, apex truncate or emarginate, terminal .25 in. long .2 in. across, lateral .2 in. long .15 in. across, glabrous above sparsely adpressed-hirsute beneath; stipels minute subulate, stipules persistent lanceolate .15 in. long. *Inflorescence* of 1-3-fld. axillary fascicles; pedicels .25 in., bracteoles minute. *Calyx* pubescent with longish white hairs .1-1.5 in. long; teeth setaceous longer than narrowly campanulate tube. *Corolla* pink or occasionally white .2 in. long. *Pod* .4-6 in. long, .15 in. wide; joints 3-5, reticulately veined and finely puberulous; upper suture straight, lower distinctly indented between the joints. Wall. Cat. 5734 (except part of F.); Benth. in Mart. Flor. Bras. XV, 95, t. 26; Miq. Flor. Ind. Bat. I, 238; Bak. in Flor. Brit. Ind. II, 173. *D. triflorum* VAR. *minus* W. & A. Prodr. 229; Wight Ic. t. 292. *D. heterophyllum* Wall. Cat. 5701 C. *Hedysarum triflorum* Linn. Sp. Pl. 749; Roxb. Hort. Beng. 57; Flor. Ind. III, 353. *H. stipulaceum* Burm. Flor. Ind. t. 54, f. 2. *Nicholsonia reptans* Meissn. in Linnaea XXI, 260. *Sagotia triflora* Walp. & Duch. in Linnaea XXIII, 738.

ANDAMANS; Port Blair, Kurz! Prain! Great Coco Island (specns. all white-fld.) Prain! MALACCA; Maingay 522! PROV. WELLESLEY; King! PENANG; Wallich 5734 I! DISTRIB. Cosmopolitan in the tropics.

An extremely common species in India, not so common in Indo-China; very rare, perhaps only a recently introduced weed, in Malaya.

2. DESMODIUM HETEROPHYLLUM DC. Prodr. II, 334. A trailing herb with slender diffusely branching stems 2-2.5 feet long; branches densely hirsute with spreading hairs. *Leaves* 1-1.5 in. long, 3-foliolate, petiole .5 in. long; leaflets membranous oblong or obovate-oblong apex rounded or subacute, terminal .5-1 in. long, .3-.5 in. wide, lateral similar .25-.5 in. long .2-.25 in. wide, glabrous above, hairy beneath; stipels minute subulate, stipules persistent lanceolate .15 in. long. *Inflorescence* of solitary or geminate axillary flowers and, towards ends of branches, of a few axillary lax few-fld. racemes; pedicels .5-8 in. long, sparsely pubescent with rusty spreading hairs; bracts .2 in. long, ovate-lanceolate, deciduous, bracteoles minute. *Calyx* .15 in. densely hirsute,

teeth setaceous, longer than narrowly campanulate tube. *Corolla* pale-purple, .25 in. long. *Pod* .5–.75 in. long, .18 in. wide; joints 4–5, reticulate, glabrescent except the lower suture, dehiscent; upper suture straight lower distinctly indented between the joints. Wall. Cat. 5701, letters A. B. D.; Miq. Flor. Ind. Bat. I, 238; Bak. in Flor. Brit. Ind. II, 173. *D. cæspitosum* DC. Prodr. II, 333. *D. triflorum* Wall. Cat. 5734, letter F. in part. *D. triflorum* VAR. *majus* W. & A. Prodr. 229; Wight, Ic. t. 291. *Hedysarum heterophyllum* Willd. Sp. Pl. III, 1201. *H. reptans* Roxb. Hort. Beng. 57; Flor. Ind. III, 354. *Dicerma repens* Grah. in Wall. Cat. 5740.

In all the provinces, very common. DISTRIB. Throughout tropical S.-E. Asia.

Though very like the preceding this is quite easily distinguished by its thicker stems, larger and differently shaped leaflets, much longer pedicels and rather broader pods, the joints of which usually dehisce along the lower suture.

The distribution in India and Malaya of these two species, is reversed. In India this is quite a rare plant, *D. triflorum* being common everywhere; in Malaya, on the other hand, *D. triflorum* is very rare while *D. heterophyllum* is extremely common and is apparently the representative of the other.

SUBGEN. 2. PHYLLODIUM Desv. *Shrubs* with woody branches and 3-foliolate leaves. *Flowers* umbellate, the umbels in long continuous rows, each hidden by a pair of persistent bracts.

3. DESMODIUM PULCHELLUM Benth. ex Bak. in Flor. Brit. Ind. II, 162. A small shrub 4–5 feet high with slender terete finely grey-downy branches. *Leaves* 5–6 in. long, 3-foliolate, petiole .25–.4 in., channelled above, downy; leaflets coriaceous green subrugose above, finely downy beneath, narrow-ovate to ovate-lanceolate subacute, terminal 3–4 in. long 1.5 wide, on petiolules .6 in. long; lateral pair much smaller, 1.25 in. long, .75 in. wide, petiolules .15 in. long; lateral nerves 10–12 pairs, very oblique distinctly raised beneath, secondary reticulate cross-venation visible; stipels subulate as long as petiolules, stipules .25 in. long subscariosus closely parallel-veined, subpersistent. *Inflorescence* axillary or terminal, 3–10 in. long, in racemes of solitary flowers, fascicles, or small subumbellate corymbs, in the axils of 12–40 compound foliar bracts; *bracts* 2-foliolate, their stipules .2 in. and petiole .15 in. long, leaflets opposite subobliquely orbicular .5 in. across, glabrous externally, finely downy internally, on very short stipellate petiolules, their terminal leaflet reduced to a bristle .2–.25 in. long; fascicles or close-set corymbs 2–6-fld.; pedicels slightly unequal, .08–.10 in., downy. *Calyx* .1 in. puberulous, teeth lanceolate shorter than tube. *Corolla* .25 in. yellow. *Pod* .2–.3 in. long indented on both sutures slightly puberulous; joints 2, less often solitary, very rarely 3, .1 in. long, .12 in. broad. *Hedysarum pulchellum* Linn. Sp. Pl. 747; Roxb. Flor. Ind. III, 361.

*Zornia pulchella* Pers. Synops. II, 318. *Dicerna pulchellum* DC. Prodr. II, 339; Wall. Cat. 5737; Wight, Ic. t. 418. *Phyllodium pulchellum* Desv. Journ. Bot. III, 123, t. 5, f. 24; Benth. Pl. Jungh. 217; Miq. Flor. Ind. Bat. I, 260.

MALACCA; *Griffith*. PAHANG; *Ridley* 2596! JOHORE; *Kunstler* 376! PERAK; *Scortechini*!

SUBGEN. 3. DENDROLOBIUM W. & A. *Shrubs* with woody branches and 3-foliolate leaves. *Flowers* in dense short-peduncled or sessile axillary umbels, bracts minute deciduous.

4. DESMODIUM UMBELLATUM DC. Prodr. II, 325. A littoral shrub 5–15 feet high with densely downy terete young branches. *Leaves* 5–7 in. long, 3-foliolate, petiole 1 in. long, channelled above, rusty-puberulous; leaflets subcoriaceous, green glabrous above, paler and thinly canescent underneath, ovate-oblong obtuse or rarely acute or subacute, terminal 3–3.5 in. long, 2–2.5 in. wide on a petiolule .5 in. long, the lateral pair similar but smaller 2–2.5 in. long, 1.25–1.75 in. wide on petiolules .2 in. long; lateral nerves 6–8 pairs hardly raised beneath; stipels very small, subulate, half as long as petiolules; stipules large .3 in. long, subscarios, closely parallel-veined, caducous with the unfolding of leaf next above which they cover in bud. *Inflorescence* axillary, with peduncles .35 in. long, in 6–12-fld. corymbs simulating umbels; pedicels short .15 in. or less, elongating in fruit to .25 in., unequal, very close-set. *Calyx* with a broad scarious deciduous bracteole, .1 in. long .07 in. wide, at its base, densely silky externally, .15 in. long, teeth lanceolate, as long as tube. *Corolla* .5 in. long, white. *Pod* 1.5–2 in. long, joints 4, very rarely 5, .3 in. long, .25 in. wide, sparsely silky when young, glabrous when ripe, thick and coriaceous almost turgid. W. & A. Prodr. 224; Wall. Cat. 5687; Bak. in Flor. Brit. Ind. II, 161. *Dendrolobium umbellatum* Benth. Pl. Jungh. 218; Miq. Flor. Ind. Bat. I, 262. *Hedysarum umbellatum* Linn. Sp. Pl. 747. *H. arboreum* Roxb. Flor. Ind. III, 360.

In all the provinces, common on the coasts. **DISTRIB.** On all coasts from the Mascarene Islands to Polynesia.

A curious variety of this species, with branches, leaves beneath, and ripe pods softly silky, is *var. hirsutum* DC. It is known only from specimens cultivated in Hort. Calcutta (*Wall. Cat.* n. 5687/D) and in Hort. Bogor.—the Buitenzorg specimens being marked "*E horto Calcuttensi recepta*." The original habitat of this variety is unknown.

*D. umbellatum* has been said to occur in Upper Burma; this is a mistake caused by Dr. Wallich having issued (as 5687/β) a totally different species under the same name. No one has ever sent specimens of *D. umbellatum* to Calcutta except from sea-coasts and the shores of tidal rivers.

5. DESMODIUM RUGOSUM Prain. A large gregarious shrub with  
J. II. 18

rusty-puberulous angular young branches. *Leaves* 5–7 in. long, 3-foliolate, petiole 1 in. long, channelled above, rusty-puberulous; leaflets coriaceous rugose, puberulous on the midrib and nerves above, densely rusty-puberulous beneath on the midrib lateral nerves and secondary veins; obovate-acute, terminal 4 in. long 2·5 in. wide, on a petiolule ·5 in. long; lateral pair oblong-acute base obliquely rounded, 3·5 in. long 1·75–2 in. wide, on petiolules ·15 in. long; lateral nerves 10–12 pairs very prominent beneath as is the close reticulate secondary venation; stipels subulate, ·12 in., nearly as long as petiolules; stipules subscariosus caducous. *Inflorescence* axillary, with peduncles ·25 in. long, in 3–6-fld. corymbs simulating umbels but with the rachis produced for ·3 in. or more in the centre and marked by numerous close-set scars left by fallen pedicels; pedicels that persist ·2 in. long, elongating slightly in fruit. *Calyx* with a broad scariosus deciduous bracteole ·1 in. long at its base, pubescent externally, ·2 in. long, teeth longer than tube. *Corolla* ·5 in. long, white. *Pod* 1·5 in. long, joints 4, ·3 in. long ·25 in. wide, densely adpressed-pubescent with coarse rusty hairs, thick, coriaceous, almost turgid.

KEDAH; Langkawi, *Curtis* 2550! **DISTRIB.** Tenasserim.

Very nearly related to the preceding species but with quite different foliage and pods. Very nearly related also to *D. Wallichii* (*D. umbellatum* Wall. Cat. n. 5687 letter B only) from Upper Burma, but with larger pods, and coarser, more rugose acute leaves than in that species; indeed, *D. Wallichii* with the inflorescence of *D. rugosum* has foliage more resembling that of *D. umbellatum*. The stipules of *D. Wallichii* do not fall immediately after the unfolding of the leaf next above, as in the case of *D. umbellatum* and *D. rugosum*.

*Desmodium* (*Dendrolobium*) *Cephalotes* Wall. is stated by Dr. Miquel to occur in Java. No Malayan specimens of the species, which is very common throughout India and Indo-China, have yet reached Calcutta. Its presence, however, would not be surprising and the species should be looked for by collectors in the Malay Peninsula.

**SUBGEN. 4. EUDESMODIUM.** Erect *herbs* or *undershrubs* with large 1–3-foliolate leaves. *Flowers* often 2 or several from a node in long racemes simple or paniced, bracts deciduous and pods distinctly jointed.

§ **PODOCARPIUM** Bth. Joints of pod indehiscent, longer than broad, the lowest one distinctly stalked, constrictions reaching from lower nearly to straight upper suture.

6. **DESMODIUM LAXUM** DC. Prodr. II, 336. A bush 2–4 feet high with angular erect finely-puberulous branches. *Leaves* 5–8 in. long, 3-foliolate, petiole 1–2·5 in., channelled above, finely sparsely puberulous; leaflets membranous, green and glabrous above, paler and sparsely hirsute on the nerves beneath, terminal narrow ovate, 4–6 in. long 1·5–2 in. wide, narrowed gradually to apex, cuneate at base on a petiolule ·75 in.

long, lateral nerves 3 pairs the lowest much stronger than the rest and very oblique; side leaflets similar but smaller, 3-4 in. long 1-1.5 in. wide, with slightly oblique bases; stipels subulate .2 in. long; stipules linear-lanceolate .5 in. long, persistent. *Inflorescence* in rather narrow terminal and axillary racemes, the former sometimes paniculate, 12-20 in. long, composed of as many distant solitary flowers or few-fl. fascicles, bracts minute linear; pedicels puberulous slender .2 in., ultimately spreading .4 in. long. *Calyx* very small .08 in. long, tubular, slightly pubescent, teeth deltoid very short. *Corolla* pink, .25 in. long. *Pod* 1-3 in. long, the lowest joint on a stalk .3 in. long, joints few indehiscent .5 in. long, .2 in. wide, the constrictions nearly reaching the upper suture, cut obliquely from opposite the point to the base. *D. Gardneri* Bth. Pl. Jungh. 226; Miq. Flor. Ind. Bat. I, 255; Bak. in Flor. Brit. Ind. II, 165. *D. podocarpum* Miq. Ann. Mus. Lugd. Bat. III, 46 not of DC.

PERAK; on Ulu Batang Padang, *Wray* 1608! DISTRIB. India; Himalayas; Indo-China; China; Malay Archipelago.

§ DOLLINERA Endl. Joints of pod indehiscent, hardly longer than broad, upper suture straight or slightly indented; calyx teeth not exceeding tube.

7. *DESMODIUM MEGAPHYLLUM* Zoll. Nat. en Geneesk. Arch. III, 58. A straggling shrub 8 feet high with slightly grooved, blackish branches, with a sparse short tomentum. *Leaves* 7-9 in. long, 3-foliolate, petiole 2-2.5 in., channelled above, sparsely tomentose; leaflets subcoriaceous, green sparsely puberulous above, grey thickly softly woolly beneath; rhomboid ovate-acuminate terminal cuneate at base, 4-6 in. long, 2.5-3.5 in. wide, on petiolule 1-1.5 in. long; lateral pair similar but smaller 3-4 in. long, 1.5-2.5 in. wide with obliquely rounded base; lateral nerves 5-6 pairs very oblique; stipels linear .25 in. long; stipules subscariosus .15 in. long, lanceolate. *Inflorescence* longer than the leaves, in axillary and terminal racemes, the latter sometimes panicked, 8-10 in. long, of 25-30 few-fl. fascicles; pedicels slender .4 in. long, bracts .5 in. long, subscariosus, lanceolate, bracteoles minute subulate. *Calyx* campanulate .15 in. long, teeth triangular as long as tube. *Corolla* pale-violet, .3 in. long. *Pod* dull-crimson, 2-2.25 in., 6-8-jointed, joints .25 in. long .2 in. wide, indehiscent, slightly puberulous, finely reticulate-veined, slightly indented on the lower suture. Miq. Flor. Ind. Bat. I, 245, excluding synonyms.

PERAK; upper part of Batang Padang Valley, at 2,000 feet, *Wray* 1441! DISTRIB. Java, Tenasserim.

§ NICHOLSONIA DC. Joints of pod dehiscent along lower suture, not longer than broad; upper suture straight, lower slightly indented.

8. *DESMODIUM CAPITATUM* DC. Prodr. II, 336. A prostrate under-

shrub with elongated woody rounded branches, hoary-tomentose towards their tips, sometimes reaching 6 feet in length. *Leaves* 2-2.5 in. long, 3-foliolate, petiole .6 in. long slightly grooved and glabrescent above, adpressed-tomentose beneath; leaflets subcoriaceous, green glabrescent above, densely white-silky pubescent beneath; obovate-cuneate apex rounded, terminal 1.25 in. long, 1 in. across, lateral similar but smaller .75 in. long, .5 in. across, lateral nerves about 8 pairs slightly visible beneath; stipels subulate .1 in. long, stipules linear .25 in. long. *Inflorescence* of dense axillary and terminal subsessile racemes 1-2 in. long; pedicels .2-.25 in., abruptly reflexed in fruit; bracts small ovate-cuspidate ciliate, bracteoles minute. *Calyx* .1 in., glabrescent, teeth setaceous longer than tube. *Corolla* purplish-red, .2 in. long. *Pods* faintly puberulous, .5-.75 in. long .15 in. wide; joints 6-8, dehiscent along lower indented suture. Miq. Flor. Ind. Bat. I, 241; Bak. in Flor. Brit. Ind. II, 170. *D. obovatum* Wall. Cat. 5722 B. *D. polycarpum* W. & A. Prodr. 227, in part. *Hedysarum capitatum* Burm. Fl. Ind. 167, t. 64, f. 1. *H. conicum* Poir. Encyc. Meth. VI, 419. *Pseudarthria capitata* Hassk. Pl. Jav. Rar. 390.

PERAK; Durian, S. Batang, *Kunstler* 361! Thaipeng, *Scortechini*!  
PAHANG; Palan Tawa, *Ridley* 2598a!

9. DESMIDIUM POLYCARPUM DC. Prodr. II, 334. An erect or sub-erect undershrub or shrub 2-5 feet high with woody angular slender branches shortly tomentose towards their tips. *Leaves* 2-4 in. long, 3-foliolate, petiole .6-1 in. long, slightly grooved glabrous above, sparsely adpressed-pubescent beneath; leaflets subcoriaceous, pale-green glabrous above, thinly adpressed-hirsute beneath, usually obovate-cuneate apex round, sometimes ovate-acute (*D. ovalifolium* Wall.), 1.25-3 in. long 1-1.5 in. across, lateral similar but smaller, .75-1.25 in. long .5-.75 in. across, lateral nerves about 6 pairs indistinct; stipels subulate .2 in. long, stipules linear .3 in. long. *Inflorescence* of dense axillary and terminal subsessile racemes 1-4 in. long; pedicels .2 in. long ascending; bracts ovate-cuspidate ciliate .25 in. long, bracteoles minute. *Calyx* .1 in., glabrescent, teeth setaceous longer than tube. *Corolla* pinkish-purple, .2 in. long. *Pods* usually faintly or (*D. ovalifolium*) densely ciliate, .5-.75 in. long .15 in. wide; joints 6-8, dehiscent along lower indented suture. W. & A. Prodr. 227; Wight Ic. t. 406; Miq. Flor. Ind. Bat. I, 242; Bak. in Flor. Brit. Ind. II, 171. *D. angulatum* Wall. Cat. 5727 in part, not of DC. *D. siliquosum* DC. Prodr. II, 336. *D. heterocarpum* DC. Prodr. II, 337. *D. retusum* G. Don, Gen. Syst. II, 297. *D. gyroides* Hassk. Pl. Jav. Rar. 362, not of DC. *D. Buergeri* Miq. Ann. Mus. Lugd. Bat. III, 45. *D. nervosum* Vogel, Pl. Meyen, 28. *D. patens* Wight Ic. t. 407. *Hedysarum polycarpum* Lamk. III. t. 628.



*H. siliquosum* Burm. Fl. Ind. 169, t. 55, fig. 2. *H. heterocarpon* Linn Sp. Pl. 747. *H. purpureum* Roxb. Hort. Beng. 57; Fl. Ind. III, 358. *H. retusum* Don Prodr. 243. *H. patens* Roxb. Fl. Ind. III, 362.

VAR. *typica*; leaves obovate-cuneate rounded at apex; pods faintly puberulous.

In all the provinces, extremely common. DISTRIB. East Africa, India, Malaya, Indo-China, China, Polynesia.

VAR. *ovalifolia*; leaves ovate-acute base rounded or truncate; leaflets beneath sometimes softly silky; pods pubescent with spreading hairs. *D. ovalifolium* Wall. Cat. n. 5730.

PENANG; *Wallich!* PERAK; Goping, *Kunstler* 1007! DISTRIB. Sumatra (*Forbes* n. 1256!)

There are several more or less distinct forms of *D. polycarpum* most of which are readily recognisable, though all are connected with each other and with typical *D. polycarpum* by means of many intermediates. The form here defined as var. *ovalifolia* has no intermediates, however, and so far as material hitherto collected goes, might even be treated as a separate species. But its habit and its flowers are so exactly those of *D. polycarpum* that it seems better to consider the differences of leaves and fruit as merely varietal.

§ SCORPIURUS Bth. Joints of pod indehiscent much longer than broad constricted along both sutures.

10. DESMODIUM LAXIFLORUM DC. Prodr. II, 335. An erect under-shrub 2-5 feet high with woody slender obtusely angled stems, at first densely clothed with short hairs at length glabrescent. *Leaves* 6-20 in. long, 3-foliolate, petiole 1.5-2.5 in., pubescent with adpressed hairs, grooved above; leaflets membranous or subcoriaceous, green and glabrous above, sparsely adpressed-hirsute beneath, terminal ovate-acute base rounded or cuneate, 4-6 in. long 1.5-3 in. across with petiolule 1 in. long, lateral nerves prominent beneath 7-10 pairs; lateral leaflets similar but smaller 1.5-2.5 in. long, 1-1.5 in. wide, base obliquely rounded, petiolule very short; stipels subulate .2 in. long; stipules ovate long-acuminate, .3 in. long. *Inflorescence* in axillary and terminal racemes 6-10 in. long, of 12-20 distant solitary flowers or few-fl. fascicles; bracts and bracteoles minute linear or setaceous; rachis puberulous with adpressed hairs as are the ultimately patent pedicels .2-.25 in. long. *Calyx* .1 in., pubescent, tube campanulate, teeth lanceolate as long as tube. *Corolla* white, .2 in. long. *Pod* 1-1.75 in. long, pendulous, .1 in. wide, joints .3 in. long, indehiscent, hardly constricted at the sutures and not ribbed, closely beset with short hooked hairs. Miq. Flor. Ind. Bat. I, 251; Bak. in Flor. Brit. Ind. II, 164. *D. bicolor* Wall. Cat. 5719. *D. elongatum* Wall. Cat. 5715. *D. leptostachyum* Wall. Cat. 5697 B. *D. sulcatum* Wall. Cat. 5736. *D. recurvatum* Grah. in Wall. Cat. 5717; W. & A. Prodr. 226; Wight Ic. t. 374. *D. diffu-*

142 G. King—*Materials for a Flora of the Malayan Peninsula.* [No. 1, *sum* DC. Prodr. II, 335, non 336. *Hedysarum recurvatum* Roxb. Hort. Beng. 57; Fl. Ind. III, 358; Wight, Ic. t. 409. *H. diffusum* Roxb. Fl. Ind. III, 357, not of Willd. *H. Roxburghii* Spreng. Syst. App. 292. *H. Rottleri* Spreng. Syst. III, 320.

ANDAMANS; Great Coco, *Prain!* NICOBARS; Kondil, *Kurz!* DISTRIB. Throughout India, Indo-China and Malaya.

11. DESMIDIUM ORMOCARPOIDES DC. Prodr. II, 327. An erect undershrub 2-5 feet high with woody slender obtusely angled stems, at first densely clothed with short hairs at length glabrescent. *Leaves* 5-7 in. long, 1-foliolate, petiole .75 in. long, pubescent with spreading hairs, channelled above; leaflet subcoriaceous, green and glabrous above, sparsely pubescent to closely silky beneath, ovate-acute, base rounded or truncate, 4-6 in. long 1.5-2.25 in. wide, lateral nerves 6-8 pairs visible beneath; stipels subulate, .2 in. long; stipules ovate long-acuminate scarious, .3 in. long, subsistent. *Inflorescence* in terminal or rarely axillary racemes 6-10 in. long, of 12-20 distant solitary flowers or few-fl. fascicles; bracts and bracteoles minute linear or setaceous; rachis puberulous with rusty tomentum as are the ultimately patent pedicels .25-.35 in. long. *Calyx* .1 in. pubescent, tube campanulate, teeth short deltoid. *Corolla* white, .2 in. long. *Pod* 3-4 in. long, pendulous, .15 in. wide; joints 6-8, .6 in. long, indehiscent, constricted at both sutures, longitudinally ribbed, closely beset with short hooked hairs. Miq. Flor. Ind. Bat. I, 249; Bak. in Flor. Brit. Ind. II, 164. *Hedysarum adhaerens* Poir. in Lamk. Encyc. Meth. V, 15 not of Vahl. *H. ormocarpoïdes* Desv. ex DC. Prodr. II, 327. Rumph. Herb. Amboin. VI, t. 66.

VAR. *velutina*; leaves softly silky beneath. *D. zonatum* Miq. Flor. Ind. Bat. I, 250.

ANDAMANS; common in the interior of the Islands. SELANGOR; *Ridley* 7295! PAHANG; Kwala Tembeling, *Ridley* 2605! DISTRIB. Java.

The typical form of this species has leaves very sparsely hairy beneath; it occurs in Java (*vide* De Candolle), and is common in India from Ceylon and the Pulney Mts. northwards to Assam.

§ HETEROLOMA Bth. Joints of pod indehiscent, hardly longer than broad; upper suture straight or slightly indented; calyx-teeth exceeding tube.

12. DESMIDIUM GANGETICUM DC. Prodr. II, 327. A slender undershrub 1-4 feet high with woody obtusely angled glabrescent stems and angled adpressed-puberulous branches. *Leaves* 4-6 in. long, 1-foliolate, petiole .75 in. long channelled and with a few adpressed hairs above; membranous or rarely subcoriaceous, green and glabrous above, a little paler adpressed-puberulous beneath; ovate-acute, base rounded or truncate, 3-5.5 in. long 1-2 in. wide, lateral nerves 8-9 pairs slightly

visible on both surfaces, cross-nervation slightly visible beneath; stipels subulate .2 in. long; stipules linear subpersistent .25 in. long. *Inflorescence* in copious ascending terminal and axillary racemes 6–12 in. long, of 30–40 rather close-set few-fl. fascicles; bracts and bracteoles minute setaceous; rachis adpressed-puberulous as are the fastigiate pedicels .2–.25 in. *Calyx* finely pubescent, .08 in., teeth lanceolate longer than campanulate tube. *Corolla* white, .15 in. long. *Pod* subfalcate, .5–.75 in. long, .1 in. across, 6–8-jointed, indented on upper suture, joints indehiscent slightly longer than broad, minutely puberulous with hooked hairs. Wall. Cat. 5689; Miq. Flor. Ind. Bat. I, 247; W. & A. Prodr. 225; Wight, Ic. 271; Bak. in Flor. Brit. Ind. II, 168. *D. latifolium* Wight, Ic. t. 272 not t. 270. *Hedysarum gangeticum* Linn. Sp. Pl. 746; Roxb. Flor. Ind. III, 349. *H. collinum* Roxb. Flor. Ind. III, 349. PENANG; Pinara Bukit, Curtis 2771! NICOBARS; Teressa, etc., *Jelinek* 233! *King's Collectors*!

13. *DESMODIUM VIRGATUM* Zoll. Nat. en Geneesk. Arch. III, 58. A slender undershrub 1–4 feet high with angled adpressed-pubescent stems and branches. *Leaves* 4–6 in. long, 1-foliolate, petiole .25 in. long channelled above, densely rusty-tomentose; membranous or subcoriaceous, pale-green glabrous above, adpressed-puberulous beneath; ovate-acute, base rounded or truncate, margin slightly sinuate, 3–5 in. long 1–2 in. wide, lateral nerves 8–9 pairs slightly visible on both surfaces; stipels subulate .2 in. long; stipules short triangular, .15 in. long. *Inflorescence* in copious ascending terminal and axillary racemes 3–8 in. long, of 20–30 close-set few-fl. fascicles; bracts and bracteoles minute setaceous, rachis densely rusty-tomentose; pedicels very short, .08 in., glabrescent. *Calyx* glabrescent, .08 in., teeth lanceolate longer than campanulate tube. *Corolla* pale-pink, .2 in. long. *Pod* subfalcate, .5–.75 in. long, .1 in. across, 6–8-jointed, indented on upper suture, joints indehiscent as long as broad, densely clothed with short hooked hairs. Zoll., Flora (1847) 697. *D. latifolium* var. *virgatum* Miq. Flor. Ind. Bat. I, 247. *D. gangeticum* var. *acuminatum* Miq. Flor. Ind. Bat. I, 248. *D. latifolium* Bak. in Flor. Brit. Ind. II, 168, in part, hardly of DC.

PERAK; Batu Kuran, *Scortechini* 1594! **DISTRIB.** Chittagong, Burma, Java.

This has the habit and foliage of *D. gangeticum*, but in flowers and especially in fruits, it more resembles *D. latifolium* to which indeed Miquel and Baker have referred it.

SUBGEN. 5. *PTEROLOMA* Desv. *Shrubs* with 1-foliolate leaves and winged petioles. *Flowers* racemose, bracts minute and keel acute.

14. *DESMODIUM TRIQUETRUM* DC. Prodr. II, 326. A shrub with

grooved triangular glabrescent branches. *Leaves* 5–6 in. long, 1-foliolate; petiole 1 in. long .3 in. wide, with broad leafy reticulate-veined wings; blade 4–5 in. long .75–1 in. wide, narrowly oblong-lanceolate with rounded or subcordate base and acute apex, green and glabrous on both surfaces, lateral nerves 15–20 pairs and secondary cross reticulate venation distinct on both surfaces especially beneath; stipules very large, .5–.75 in. long .2 in. wide, subscarios, closely parallel-veined persistent, stipels small adnate to upper margin of petiolar wing. *Inflorescence* in narrow axillary and terminal racemes 6–10 in. long, of solitary or fascicled flowers in the axils of 20–40 simple scarious bracts resembling foliar stipules with similar but much smaller stipulets at their base; pedicels ascending .2–.3 in. long. *Calyx* .15 in. long, very sparsely hairy, bracteolate at base, bracteoles narrow scarious linear; tube campanulate, teeth unequal, upper deltoid lower linear. *Corolla* purple, .3 in. long. *Pod* 1–2 in. long, joints 6–8, thin, .2 in. long, .25 in. wide, densely persistently strigose with subadpressed greyish-brown hairs. Bak. in Flor. Brit. Ind. II, 163 in part only, the synonyms *D. alatum*, *D. auriculatum* and *D. pseudo-triquetrum* excluded. *Hedysarum triquetrum* Linn. Sp. Pl. 746. *H. alatum* Roxb. Flor. Ind. III, 348. *Pteroloma triquetrum* Benth. Pl. Jungh. 220; Miq. Flor. Ind. Bat. I, 258 excluding the synonyms *Desmodium pseudo-triquetrum* and *D. alatum*.

ANDAMANS; common in the interior of the Islands. PERAK; *Kunstler* 1074! *Scortechini*! DISTRIB. India and Indo-China.

This species is very easily recognised by its hairy pods. Some difficulty is at times found in separating flowering specimens of this from flowering specimens of the next species; the two are however quite distinct. Equally distinct are two other species, *D. alatum* and *D. pseudo-triquetrum*, quite justly differentiated by De Candolle but merged in *D. triquetrum* by Miquel, who has been followed in the *Flora of Brit. Ind.*

15. *DESMODIUM AURICULATUM* DC. Prodr. II, 326. A littoral shrub with grooved triangular glabrescent branches. *Leaves* 4–5 in. long, 1-foliolate, petiole 1 in. long .3 in. wide, with broad leafy reticulate-veined wings; blade 3–4 in. long 1–1.5 in. wide, oblong or ovate-acute with truncate or cordate base and acute apex, green and glabrous on both surfaces, lateral nerves 10–12 pairs and secondary cross reticulate venation distinct on both surfaces, especially beneath; stipules large .5 in. long .2 in. wide, subscarios, closely parallel-veined, persistent, stipels adnate to tip of petiolar wing. *Inflorescence* in axillary and terminal racemes 5–8 in. long, of solitary or fascicled flowers in the axils of 12–20 simple scarious bracts; pedicels ascending, .3 in. long. *Calyx* .15 in. long, sparsely hairy, base bracteolate; tube campanulate shorter than the unequal teeth. *Corolla* purple, .3 in. long. *Pod* 1–2 in. long,

joints 6–8 stoutish coriaceous, .25 in. long .3 in. wide, quite glabrous, polished. *D. triquetrum* Bak. in Flor. Brit. Ind. II, 163 in part, not of DC. *Pteroloma auriculatum* Miq. Flor. Ind. Bat. I, 258.

ANDAMANS; coasts of Great Coco, *Prain!* of South Andaman, *Playfair!* *Kurz!* *Prain!* DISTRIB. Indo-China; Malay Archipelago.

Though common in Tenasserim where it has been collected by Wallich (n. 5788 M!) and Helfer (n. 1648!) as well as in Mergui where it has been obtained by Griffith (n. 568!) and Proudlock (n. 14!), this is not present in Calcutta from any locality within the Straits Settlements. It is rather more closely related to *Desmodium alatum*, which has broader pods, than to the preceding species, but it is equally distinct from both. It appears to be an almost exclusively littoral form; there are however two inland gatherings at Calcutta, both from Silhet and both collected by Mr. Clarke (n. 14352! and n. 42702!).

It should be noted that *Hedysarum alatum* Roxb. is not the species described by De Candolle as *Desmodium alatum*; Roxburgh's *H. alatum* is exactly equivalent to Linnaeus' *H. triquetrum*. Roxburgh's *H. triquetrum* on the other hand is not Linnaeus' plant but is *Desmodium pseudo-triquetrum* DC., a species confined to Northern India, the lower Himalayan slopes, and the mountains of Assam. *D. alatum* DC., the plant with broad pods described in the *Prodromus*, occurs in Khasia, Cachar and Chittagong without appearing in India proper or in Burma and the Malay Peninsula; it recurs, however, in Java. The present species, *D. auriculatum*, has not been found in Java but is met with again in Timor.

SUBGEN. 6. PLEUROLOBIUM DC. Erect *undershrubs*, with large leaves. *Flowers* racemose; *Pods* indistinctly jointed, dehiscing in a continuous line along the ventral suture.

16. DESMODIUM GYROIDES DC. Prodr. II, 316. A shrub about 10 feet high with terete sparsely pubescent branches. *Leaves* 2.5–3 in. long 3- or often only 1-foliolate, petiole .75 in. long, slender glabrescent; leaflets membranous, oblong or ovate-oblong obtuse, pale-green glabrous above, very thinly adpressed-pubescent beneath, 1.75–2 in. long, 1–1.25 in. wide, lateral nerves 6–8 pairs visible beneath; lateral leaflets if present similar but much smaller, .5 in. long, .4 in. wide. *Inflorescence* in dense axillary and terminal at first strobilate racemes, with large imbricating scarious soon deciduous ovate-acute bracts, .25 in. long .2 in. wide, pedicels finely-pubescent at length patent, .25 in. long. *Ocalyx* .1 in., wide-campanulate, teeth triangular half as long as tube. *Corolla* .35 in. long, .2 in. across, purple. *Pod* 1–1.5 in. long, .2 in. wide, falcate; joints 6–10, dehiscing along the lower slightly indented suture but not separating from each other, copiously pubescent with a felted rusty tomentum. Wall. Cat. 5728; W. & A. Prodr. 227; Miq. Flor. Ind. Bat. I, 243; Bak. in Flor. Brit. Ind. II, 175. *D. pseudogyroides* Miq. Flor. Ind. Bat. I, 244. *Hedysarum gyroides* Roxb. Hort. Beng. 57. *Codariocalyx gyroides* Hassk. Flor. (1842) Beiblatt. II, 49. *C. conicus* Hassk. in Walp. Rep. I, 744. *Pseudarthria polycarpa* Hassk. Pl. Jav. Rar. 393.

PERAK; Kinta river, *Kunstler* 765! **DISTRIB.** India, Indo-China, Malaya.

## 42. SOPHORA Linn.

Trees or shrubs. *Leaves* odd-pinnate. *Flowers* showy, yellow or white or violet-purple, racemed or paniced. *Calyx* oblique subgibbous broadly campanulate; teeth deltoid very short. *Corolla* much exerted, standard broad; petals equal in length all with long claws; keel obtuse. *Stamens* free or only obscurely connate at the very base; anthers uniform versatile. *Ovary* stalked, many-ovuled; style incurved, stigma capitate. *Pod* moniliform, sublignose or membranous usually indehiscent, the joints turgid and usually terete. Species about 25; widespread in tropical and subtropical regions, a few temperate or alpine.

The above definition applies to the section *Eusophora*, to which the only Malayan species belongs.

SOPHORA TOMENTOSA Linn. Sp. Pl. 373. An evergreen littoral shrub or small tree sometimes reaching 20 feet in height, with all parts at first softly and shortly tomentose. *Leaves* 6–12 in. long, leaflets 10–17 terminal and in subopposite pairs or often along proximal half of rachis distinctly alternate, elliptic to oval-obtuse 1–1.5 in. long, .5–.75 in. wide, thinly coriaceous, with age glabrescent above, persistently softly pubescent beneath, petiolules very short densely pubescent as is the rachis. *Flowers* in terminal racemes 6 in. long on softly tomentose pedicels, .3 in. long, with deciduous subulate basal bracteoles, .15 in. long. *Calyx* obliquely truncate, .35 in. long, obsolete toothed, externally softly pubescent. *Corolla* yellow, glabrous, .65 in. long; standard orbicular veined. *Stamens* almost free to the base, the vexillary filament quite free, the filaments of the other 9 very shortly connate round base of pubescent 10–12-ovuled ovary. *Pod* moniliform 6–8-seeded, 4–6 in. long, the oblong hoary joints separated by stipes as long as themselves. DC. Prodr. II, 95; Wall. Cat. 5333; Roxb. Flor. Ind. II, 316; W. & A. Prodr. 179; Miq. Flor. Ind. Bat. I, 124; Bak. in Flor. Brit. Ind. II, 249. *S. glabra* Hassk. Cat. Hort. Bog. 285; Miq. Flor. Ind. Bat. I, 125 (*vide* Baker).

KEDAH; Langkawi, *Curtis*! **DINDINGS**; on coast, *Scortechini*! *Curtis*! PERAK; Larut, *Ridley*! PULO CONDOR; on the coast, *Finlayson*! **ANDAMANS**; very common on all the coasts. **DISTRIB.** On most tropical sea-coasts.

## 43. ORMOSIA Jacks.

Erect trees or, one species, climbing. *Leaves* odd-pinnate. *Flowers* usually in dense terminal racemes. *Calyx* campanulate, deeply 5-cleft,

the two upper teeth usually distinctly subconnate into an upper lip. *Corolla* slightly exserted, petals subequal in length, all short-clawed; standard orbicular sometimes emarginate; keel petals free, and wings oblong, obtuse. *Stamens* free or only faintly subconnate at the very base, much incurved and exserted when the flower expands; anthers oblong, versatile. *Ovary* subsessile; style long, filiform, circinate at the tip with an oblique stigma on the inner face. *Pod* thickly fleshy or woody, or thinly woody, turgid 2-valved continuous within, the sutures without wings. *Seeds* bright red, with or without arillus. Species about 25, cosmopolitan in the tropics.

Climber; (leaves quite glabrous beneath) ... .. 1. *O. scandens.*

Trees:—

Seeds large with a black adnate basal aril; (leaves minutely sparsely pubescent underneath):—

Panicles fastigiate, flowers white, pedicels stout; pods 3 in. wide, seed 1 in. long ... .. 2. *O. macrodisca.*

Panicles lax, flowers yellow, pedicels slender; pods 1·25 in. wide, seed 75 in. long ... .. 3. *O. gracilis.*

Seeds small without any aril:—

Leaves quite glabrous beneath; (pod 6 in. broad, 4 in. thick, valves thinly woody) ... .. 4. *O. nitida.*

Leaves pubescent beneath:—

Leaflets distinctly petiolulate; pedicels shorter than calyx; pod with thinly woody valves 6 in. broad, 4 in. thick:—

Leaflets (9–13) small (not exceeding 2·5 in.) shortly acuminate (dark green thinly pubescent beneath)... 5. *O. parviflora.*

Leaflets larger (4 in long) acute or subobtus:—

Leaflets thinly pubescent beneath, pale-green, 7–9; branches thin; panicles lax, bracts small; pubescence grey ... .. 6. *O. sumatrana.*

Leaflets densely pubescent beneath, dark-green, 11–13; branches very thick; panicles fastigiate, bracts conspicuous; pubescence rusty ... 7. *O. microsperma.*

Leaflets sessile; pedicels almost equalling calyx; pod with thickly woody valves 1·35 in. wide, 1 in. thick ... 8. *O. venosa.*

1. *ORMOSIA SCANDENS* Prain. A large climber over 100 feet long with stem 6–8 in. in diam.; branches glabrous. *Leaves* 12–15 in. long; leaflets 5–7, ovate-oblong or the terminal slightly obovate, coriaceous, bright-green, quite glabrous on both surfaces, apex shortly acuminate base rounded, 6–9 in. long, 2·5–3 in. across; secondary nerves 13–18, fine ultimate reticulations rather distinct beneath. *Racemes* in ample terminal panicles, 12 in. long 6 in. across, with pale-tawny shortly puberulous rachis and branches, pedicels 2 in. long, pale-tawny silky, shorter than the calyx, with a minute deciduous basal and 2 subulate

apical persistent bracteoles, .08 in. long, close under calyx. *Calyx* .25 in. long, finely grey-silky, three lower teeth deltoid as long as calyx-tube, two upper subconnate into a shortly bifid upper lip. *Corolla* .35 in. long, white with a reddish tinge, standard .25 in. across. *Stamens* quite free, incurved, exserted. *Ovary* with line of hairs along upper suture, elsewhere glabrous, ovate; style slightly contorted; ovules 3. *Pod* unknown.

PERAK; Larut, *Kunstler* 3560!

A very distinct species differing from the rest in its scandent habit. Mr. *Kunstler* speaks of it as rare.

2. *ORMOSIA MACRODISCA* Bak. in *Flor. Brit. Ind.* II, 253. A large tree with very thick grey glabrous branches. *Leaves* 8–10 in. long, leaflets 7–9, oblong, very thick and rigid in texture, pale grey-green on both surfaces, quite glabrous above, with a very sparse adpressed pubescence of short hairs beneath, apex acute, base broadly rounded to cuneate, 3–5 in. long, 1.25–2 in. broad, secondary veins 7–9 pairs, faintly prominent beneath. *Racemes* crowded in terminal fastigate panicles, 6 in. long, 3 in. wide, with brown-silky puberulous rachis and branches, pedicels .1–.15 in., brown-silky, shorter than calyx, with a minute basal and 2 minute apical persistent bracteoles close under calyx. *Calyx* .3 in. long, finely brown-silky, three lower teeth two-thirds, two upper teeth one-third as long as tube, all teeth oblong-obtuse. *Corolla* .5 in. long, white; standard .4 in. across. *Stamens* quite free, incurved, exserted. *Ovary* glabrous, obliquely oblong, ovules 3. *Pod* hard thick irregularly orbicular, 3 in. across .75 in. thick, at first flattened, at length turgid opposite the usually solitary seed. *Seed* oblong, 1 in. long, .7 in. wide, bright scarlet, with an adnate, black, pitted aril, .2 in. deep, embracing its base.

MALACCA; *Maingay* 600! SINGAPORE; *Ridley* 2103!

3. *ORMOSIA GRACILIS* Prain. A slender tree with very thin pale-brown glabrous branches. *Leaves* 5–8 in. long, leaflets 7–9, ovate-lanceolate, chartaceous, pale grey-green on both surfaces, quite glabrous above, with a very sparse adpressed pubescence of short hairs beneath, apex caudate-acuminate, base cuneate, 2.5–3 in. long, 1 in. across, secondary veins 8–9 pairs, very faint beneath not visible above. *Racemes* in lax terminal panicles, 5 in. across, with slender branches 6 in. long, faintly adpressed grey-silky as is the rachis, pedicels grey-silky, .15 in. long, very slender, rather shorter than calyx, with lanceolate basal bract, .08 in. long, and 2 very minute triangular apical bracteoles at base of calyx. *Calyx* .25 in. long, finely silky, pale-green, teeth ovate-lanceolate, longer than calyx-tube except the two upper. *Corolla* pale-yellow, .35 in. long; standard .25 in. across. *Stamens* quite free, much



incurved, exserted. *Ovary* puberulous, ovate-lanceolate; ovules 2. *Pod* hard, thick, irregularly oblong-ovate, with a short stalk and slightly excentric acute point, 1.5 in. long, 1.25 in. wide, externally covered with a pale bluish bloom; inside white. *Seed* usually solitary, oblong, .75 in. long, .6 in. wide, somewhat compressed, bright scarlet, with an adnate, black, smooth aril, .15 in. deep, embracing its base.

PERAK; Larut, *Scortechini* 324! *Kunstler* 4234! *Wray* 2979!

A very fine species; near to *O. macrodisca*, but with a smaller pod and seed as well as with smaller leaflets; the seed too has the black arillar portion unpitted. It resembles *O. glauca* as to leaves though its leaflets are not quite so large; it has however larger seeds than *O. glauca* has, and the seeds have a black hilum; the seeds of *O. glauca* are all scarlet.

4. *ORMOSIA NITIDA* Prain. A tree 30–50 feet high, stem 2 feet in circumference, with stout rusty-brown glabrescent branches. *Leaves* 5–7 in. long, leaflets 7, obovate or elliptic, base rounded, apex broadly rounded and abruptly shortly cuspidate, very rigidly coriaceous, dark glossy-green quite glabrous on both surfaces, terminal 2.5–4 in. long, 1.3–2 in. wide, rather exceeding the others, secondary nerves very slender, 12–15 pairs. *Racemes* in fastigiate terminal panicles, 6–8 in. long, 5–6 in. across, rachis and branches faintly puberulous, pedicels puberulous, .15 in. long, shorter than calyx, bracts and bracteoles deciduous. *Calyx* .2 in. long, rather densely tawny-silky, teeth deltoid, the 3 lower as long as tube the two upper subconnate into a 2-fid upper lip. *Corolla* unknown. *Pod* irregularly oblong, 1 in. long .75 in. across, the valves thinly woody, rigid, quite glabrous and black externally, brown and not suberous within, with a short stalk equalling the calyx-tube. *Seed* oval, usually if not always solitary, cinnabar-red, .35 in. long .3 in. wide, without arillus.

PERAK; Goping, in open jungle, local, *Kunstler* 6082!

This very distinct species has unfortunately only been reported in fruit. Its pods are very like those of *O. microsperma* or *O. parvifolia* but appear to have been glabrous from the beginning. They differ, moreover, very markedly in being shortly stipitate; the leaflets too, are of different shape and firmer texture, besides being quite glabrous on both surfaces.

5. *ORMOSIA PARVIFOLIA* Bak. in *Flor. Brit. Ind.* II, 253. A fairly large tree with slender persistently brown-velvety branches. *Leaves* 6–8 in. long, leaflets 9–13, oblong, coriaceous, green, glossy above, thinly hairy beneath, apex shortly acuminate, base rounded, the terminal rather larger than the others, 2–2.5 in. long, .6–.7 in. wide, secondary nerves fine and hardly raised beneath, 8–9 pairs. *Racemes* in fastigiate terminal panicles with rather short branches, 3–4 in. long, 2.5 in. wide, with densely brown-velvety rachis and branches, pedicels brown-velvety, very short, each with an ovate-lanceolate basal bract and with 2 ovate

bracteoles under the calyx. *Calyx* .2 in. long, densely brown-silky, the teeth triangular, the three lower as long as the calyx-tube the two upper rather shorter. *Corolla* apparently white, .35 in. long, standard .25 in. across. *Stamens* quite free, incurved, exerted. *Ovary* ovate, densely silky, ovules 3. *Pod* orbicular, 1-seeded, or oblong and lineate between the seeds if 2-3-seeded, shortly stipitate, valves thin, rigid, at first densely silky soon glabrescent and black externally, reddish-brown inside. *Seeds* ovoid, .3 in. long, .25 in. wide, cinnabar-red, without arillus. *Macrotropis bancana* Miq. Flor. Ind. Bat. Suppl. 295.

MALACCA; *Griffith* 1765! *Maingay* 614! *Goodenough* 1443! SINGAPORE; *Ridley* 5929! 8096! PAHANG; *Ridley* 1267! 5013! DISTRIB. Banka (*Teysmann* 3405!); Borneo (*Haviland* 57!)

There is an authentic example of *Macrotropis? bancana* Miq. at Calcutta; it belongs undoubtedly to this species.

6. ORMOSIA SUMATRANA Prain. A large tree with tomentose rather slender ultimately glabrescent branches. *Leaves* 8-10 in. long, leaflets 7-9 (very rarely 5), ovate or ovate-elliptic or obovate, obtusely apiculate or subacuminate, base rounded, coriaceous, pale-green, glabrous somewhat glossy above, hirsute but at length glabrescent beneath as are the rachis and petiolules, 2-4 in. long 1-1.75 in. wide, the terminal exceeding the others, nerves 8-10 pairs, spreading rather prominent beneath. *Racemes* in lax terminal panicles, 6-8 in. long and almost as wide, with pubescent rachis and branches; pedicels .1 in. long, shorter than the calyx, bracts .1 in. long, oblong, very deciduous as are the similar bracteoles at base of pedicels, the two bracteoles under the calyx sub-persistent, lanceolate, .08 in. long. *Calyx* .2 in., externally tawny-pubescent, three lower teeth ovate-lanceolate shorter than tube, the two upper subconnate in a 2-lobed upper lip. *Corolla* pinkish-white with lilac-purple markings, .35 in. long, standard orbicular emarginate, .3 in. wide. *Stamens* quite exerted, incurved. *Ovary* densely puberulous, almost always 3-ovuled. *Pod* irregularly orbicular if 1-seeded, 1 in. across, oblong and 1.7 in. long if 2-seeded, lineate between the seeds, the valves thinly woody, rigid, black and glabrescent externally. *Seed* ovoid .4 in. long, .35 in. wide, cinnabar-red without arillus. *Macrotropis sumatrana* Miq. For. Ind. Bat. Suppl. 294.

MALACCA; *Brisu*, *Holmberg* 735! DISTRIB. Sumatra (*Teysmann* 3618! *Forbes* 2592! 2648!)

Though very closely related to the next species, this is nevertheless easily distinguished by its different leaves and tomentum, its lax panicles, its smaller flowers, and its larger seeds.

The Malacca plant here referred to *O. sumatrana* has been only once collected; it has inflorescence and flowers exactly as in *O. sumatrana* but it has not yet been sent in fruit. While therefore we know that it differs from *O. microsperma* and from *O. venosa* it is not absolutely certain that it exactly agrees with *O. sumatrana*.

7. *ORMOSIA MICROSPERMA* Bak. in Flor. Brit. Ind. II, 253. A tree 40 to 60 feet high with thick, densely brown-velvety branches. *Leaves* 8–10 in. long, leaflets 11–13, oblong or obovate, acute or subobtusely, base broadly rounded, rigidly coriaceous, dark-green, glabrous rather glossy above, densely persistently shortly brown-pubescent beneath as are the rachis and petiolules, 2·5–4 in. long 1·5–2 in. wide, secondary nerves 7–9 pairs, slightly raised beneath. *Racemes* in ample terminal fastigate panicles, 8 in. long, 6 in. across, with densely velvety rachis and branches; pedicels ·07–12 in. long, much shorter than the calyx, bracts ovate-lanceolate, densely velvety, persistent, ·25 in. long, bracteoles at base of pedicels similar but smaller (·12 in. long), two bracteoles close under calyx ·1 in. long, oblong. *Calyx* ·25 in. long, externally densely velvety, 3 lower teeth as long as calyx 2 upper rather shorter. *Corolla* white, ·45 in. long, standard ·35 in. wide. *Stamens* quite free, exerted, incurved. *Ovary* densely velvety, 3–4-ovuled. *Pod* ·6 in. across, irregularly orbicular if 1-seeded, oblong and 1–1·2 in. long if 2-seeded, lineate between the seeds, the valves thinly woody, rigid, glabrescent or persistently velvety. *Seed* ovoid ·3 in. long, ·25 in. wide, cinnabar-red, without arillus.

VAR. *typica*; pedicels very short, pods when ripe glabrescent. *O. coarctata* Kurz, Journ. As. Soc. Beng. XLII, 2. 71 hardly of Jackson.

MALACCA; Griffith 1759! Maingay 532! Derry 1090! PERAK; near Ulu Selangor, Kunstler 8767!

VAR. *Ridleyi*; pedicels distinct, pods more persistently pubescent. SINGAPORE; Selitar, Ridley, 5574!

The specimens collected by Dr. Griffith have been named by Mr. Bentham "*Ormosia coarctata*? Jacks." and those collected by Dr. Maingay have been definitely issued as *Ormosia coarctata*; Mr. Kurz too, has accepted this determination. Mr. Baker however finds that the identification of Griffith's and Maingay's Malacca plant with *O. coarctata* Jackson (*Trans. Linn. Soc. X, t. 25*; a plant from Guiana) cannot be sustained.

*Ormosia microsperma* is nearly related to *O. sumatrana* (*Macrotropis sumatrana* Miq.) and is also closely related to *Chænolobium septemjugum* Miq. and *C. decemjugum* Miq. (*Flor. Ind. Bat. Suppl.* 302). Mr. Kurz reduces the genus *Chænolobium* to *Ormosia* (*Journ. As. Soc. Beng. XLII, 2. 71*); in this he is certainly right. He, however, further considers that both plants are but forms of the same species and that moreover they are both referable to *O. microsperma*. So far as the material that was at Kurz' disposal goes this appears to the writer to be a premature conclusion, and it seems better for the present to keep Miquel's plants specifically apart.

Mr. Ridley's plant from Singapore differs very considerably from the Perak and Malacca one. The pods are described as hairy in the field note; they are so in the specimens themselves, but those at Calcutta are not quite ripe. If the pods prove to be quite persistently velvety it will probably be necessary to treat the plant as a distinct species to be named *O. Ridleyi*.

8. *ORMOSIA VENOSA* Bak. in Flor. Brit. Ind. II, 254. A tall tree, with branches densely persistently velvety-pubescent. *Leaves* 4–6 in. long, leaflets 7, obovate-oblong, obtuse or subobtuse, base cuneate nearly sessile on the rachis, rigidly coriaceous, greyish-green glabrous but dull above, densely persistently tomentose beneath, 3–4 in. long 1.5–2 in. across, terminal exceeding the rest, secondary nerves 10–12, distinctly raised beneath, rachis densely velvety. *Racemes* terminal crowded, with rather slender branches, 3–4 in. long and about as wide, rachis and branches densely velvety; pedicels .2 in. long, nearly equalling the calyx, bracts .15 in. long, lanceolate, persistent, bracteoles at base of pedicels .1 in. long, 2 bracteoles under calyx minute but subpersistent. *Calyx* .25 in. long, densely velvety, teeth triangular, three lower as long as tube, two upper subconnate. *Corolla* .35 in. long, apparently white, standard .3 in. across. *Stamens* incurved, exerted. *Ovary* velvety. *Pod* obtuse or subacute, orbicular or oblong, obtuse or subacute, 1.5 in. long, 1.35 in. across, .1 in. thick, the valves very thickly woody, black and glabrous externally. *Seeds* usually solitary, ovoid, .5 in. long, .4 in. wide, crimson-red, without arillus.

MALACCA; *Maingay* 533!

A very distinct species.

#### SUBORDER II. *CESALPINIÆ*.

Trees or shrubs, very rarely herbs. *Leaves* pinnate or 2-pinnate leaflets 1–∞-paired, rarely simple or 1-foliolate, stipels usually 0, if present very minute. *Inflorescence* racemose, rarely cymose, very rarely spicate; axillary, lateral, or in terminal panicles. *Flowers* irregular or very rarely regular, 5-, less often 4-merous. *Sepals* 5, or 4 from fusion of the upper two, divided to the summit of the disc that lines the short or long calyx-tube, imbricate or rarely valvate, or very rarely united in a toothed or lobed limb. *Petals* 5, or fewer by abortion, the upper innermost in bud, the others variously imbricate. *Stamens* 10, or fewer by abortion, very rarely indefinite, free or rarely some or all more or less connate; anthers various. *Ovary* free or united by its stipe to the disc-bearing calyx-tube. *Seeds* various, albumen copious, scanty, or 0. *Radicle* straight or slightly oblique, hidden between cotyledons, or shortly exerted.

Leaves simply pinnate or (*Bauhinia*) 1-foliolate:—

Anthers basifixed:—

Leaves even-pinnate; (petals 5) ... .. 44. CASSIA.

Leaves odd-pinnate; leaflets alternate:—

Petals 5; stamens 5; pod flat, winged throughout its circumference, indehiscent ... .. 45. KOOMPASSIA.

- Petals 2 or 0; stamens 2; pod turgid subglobose, wingless, dehiscent ... 46. DIALIUM.
- Anthers versatile :—
- Corolla complete, *i.e.*, with 5 petals; sepals 5; (stamens free) :—
- Seeds with albumen; leaves 1-foliolate 2-lobed, rarely entire, rarely by fission 2-foliolate ... 47. BAUHINIA.
- Seeds without albumen; leaves even-pinnate, 2-3- (rarely 1-) jugate ... 48. CYNOMETRA.
- Corolla incomplete, *i.e.*, with fewer than 5 petals; sepals 4 :—
- Petals present; sepals green; (leaflets even-pinnate) :—
- Petals 3; stamens 3 monadelphous ... 49. TAMARINDUS.
- Petal solitary :—
- Calyx-lobes subvalvate; stamens monadelphous 9, all or only 2 perfect, *funiculus of seed thick arillate* ... 50. SINDORA.
- Calyx-lobes much imbricated; stamens free 3 ... 51. APZELIA.
- Petals 0; sepals coloured :—
- Leaflets even-pinnate; stamens 3-8 ... 52. SARACA.
- Leaflets alternate; stamens 8-10 ... 53. CRUDIA.
- Leaves 2-pinnate; (anthers versatile) :—
- Calyx segments subequal; *stigma peltate* ... 54. PELTOPHORUM.
- Calyx segments manifestly unequal, the lowest lobe cucullate larger than the rest :—
- Pod wingless ... 55. CÆSALPINIA.
- Pod winged :—
- Wing extending all along the upper suture ... 56. MEZONEURON.
- Wing apical, (pod samaroid) ... 57. PTEROLOBIUM.

44. CASSIA Linn.

Erect shrubs or trees, rarely herbs. *Leaves* simple, abruptly pinnate. *Flowers* usually large and showy, in axillary racemes and terminal panicles. *Calyx*-tube very short; sepals broad or narrow, imbricated. *Petals* 5, imbricated, subequal, usually broad. *Stamens* normally 10, but rarely all perfect, 3-5 being often reduced to stamodia or altogether absent; anthers mostly but not invariably basifixed, dehiscing by terminal pores or with the slit more or less continued longitudinally. *Ovary* sessile or stalked, many-ovuled; style incurved, stigma terminal. *Pod* very variable, terete or flat, usually septate, the albuminous seeds flattened, sometimes parallel with the valves, sometimes with the septa, dry, dehiscent or indehiscent. Species 340, spread everywhere in the tropics, a few extra-tropical.

Trees shrubs or stout herbs with large leaflets and with obtuse sepals:—

Stamens 10, all fertile:—

Lowest 2-3 stamens larger than the rest, pods terete indehiscent (§ *Fistula*):—

Flowers pink, in dense corymbs, bracts large persistent:—

Leaflets acute, corymbs from old nodes below leaves, sepals green, petals acute ... .. 1. *C. nodosa.*

Leaflets obtuse, corymbs among leaves, sepals brown to purple, petals obtuse ... .. 2. *C. javanica.*

Flowers yellow, in lax racemes, bracts small deciduous ... .. 3. *C. Fistula.*

Lowest stamens not exceeding the rest, pods flat, dehiscent (§ *Psilorhegma*) ... .. 4. *C. glauca.*

Stamens 7 only fertile; the 3 upper reduced to staminodes (§ *Senna*); pods dehiscent, usually more or less compressed):—

Leaves with glands on the common rachis:—

Glands between the bases of two opposed leaflets; leaflets obtuse, pods with oblique dissepiments; seeds rhombohedral:—

Glands between each of the two lower pairs of leaflets; pedicels short, pods subquadrangle ... 5. *C. Tora.*

Gland between lowest pair of leaflets only; pedicels long, pods subterete ... .. 6. *C. obtusifolia.*

Glands far below leaflets and near base of petiole; leaflets acute, pods with transverse dissepiments; seeds ovate, compressed:—

Calyx, leaves and pods densely tomentose; flowers in subsessile axillary pairs ... 7. *C. hirsuta.*

Calyx, leaves and pods glabrous; flowers in axillary corymbs:—

Leaflets 3-5 pairs; pods flattened ... 8. *C. occidentalis.*

Leaflets 8-12 pairs; pods turgid ... 9. *C. Sophera.*

Leaves with rachis channelled above, barred transversely between the leaflets but without glands:—

Shrubs with flowers in strobilate subspicate racemes; pods winged along the valves; leaflets reaching 6 in. ... .. 10. *C. alata.*

Trees with flowers in panicles of corymbs; pods not winged; leaflets not exceeding 2.5 in.:—

Stipules large persistent; pod thin-valved flexible, with narrow sutures ... .. 11. *C. timoriensis.*

Stipules small deciduous; pod with coriaceous rigid valves, sutures thickened ... .. 12. *C. siamea.*

Slender herbs or undershrubs with very small leaflets and with acute sepals (§ *Chamaecrista*):—

Leaflets linear minute (.15 in. long); pedicels 1 in.

bracteolate above middle; pod 20–25-seeded; stamens all fertile alternately short and long ... 13. *C. mimosoides*.  
 Leaflets oblong (.4 in. long, .15 in. wide); pedicels .3 in. bracteolate below middle; pod 8–16-seeded; stamens unequal 1–3 upper often sterile ... 14. *C. Leschenaultiana*.

§ 1. FISTULA DC *Sepals* obtuse, stamens all antheriferous, the 2–3 lowest larger than the rest and with longer filaments. *Pods* indehiscent, stipitate, very long, terete with thin brittle ligneous dissepiments between the numerous seeds which are embedded in suberous wad-like discs between the partitions.

I. CASSIA NODOSA Ham. in Roxb. Hort. Beng. 31. A tree 40–50 feet high, stem 10–15 inches across, branches spreading, branchlets black glabrous except for the slightly downy tips. *Leaves* equally pinnate 9–10 in. long; leaflets chartaceous 6–12 pairs, opposite, oblong, base rounded, apex shortly acuminate, 2–2.5 in. long, 1–1.25 in. wide, bright green, glabrous and shining above, dull and slightly pubescent, especially on the nerves, beneath; lateral nerves spreading 12–16 pairs, slender but visible beneath, petiolules .15 in. long, puberulous as is the leaf-rachis. *Flowers* in corymbs 2–3 in. long, from old nodes along the branches, peduncles solitary or 2–4 together, puberulous simple very rarely branched, 1 in. long, bracts ovate-lanceolate persistent, puberulous, .25 in. long, pedicels puberulous the lower 1.5 in. long. *Calyx* 5-partite to the base, lobes subequal green, ovate-obtuse, hoary. *Petals* 5, subequal, carnation to white with a flush of pink, .6–.7 in. long, .25 in. wide ovate-acute, distinctly clawed. *Stamens* 10, all antheriferous, the 3 lowest with longer nodose filaments and larger anthers than the others. *Pod* terete, rather distinctly annulated, .5 in. in diam., 1.5–2 feet long, glossy black with thin brittle ligneous transverse dissepiments between the 60–90 seeds each of which is embedded in a suberous disc .5 in. across .2 in. thick. *Seeds* broadly ovate smooth slightly shining, .35 in. long, .3 in. across, .2 in. thick, testa pale warm-brown. Wall. Cat. 5331; Roxb. Flor. Ind. III, 336; Wight, Ic. t. 410; Bak. in Flor. Brit. Ind. II, 261.

ANDAMANS; *King's Collectors!* MALACCA; *Griffith!* *Maingay* 596! Bukit Tampin, *Goodenough* 1912! BRISU, *Derry* 537! Sadanan Reserve, *Derry* 588! Seladan, *Goodenough* 125! PENANG; Waterfall, *Curtis* 1576! PERAK; Chanderiang, *Kunstler* 5722! near Ulu Kerling, *Kunstler* 8732! Goping, *Kunstler* 4364! *Scortechini* 1934! PAHANG; Makang, *Ridley* 1359! DISTRIB. Indo-China, from Sylhet and Chittagong southwards and eastwards; Sumatra (*Forbes* 1748! 2669!); Borneo (*Haviland!*)

The Malay names given for this are *Siboosok* (*Goodenough* 1912); *Busok-busok* (*Derry* 537); and *S'busu* (*Goodenough* 125; *Derry* 588). This name it shares with

*C. javanica*. It seems that this species does not occur in Java, where *C. javanica* is its representative.

2. *CASSIA JAVANICA* Linn. Sp. Pl. 379. A tree 30–40 feet high, branches spreading; branchlets black glabrous except for the slightly downy tips. *Leaves* equally pinnate 9–15 in. long; leaflets chartaceous 8–20 pairs, opposite, oblong, base rounded, apex obtuse, 1·5–2 in. long, ·75–9 in. wide, bright-green, glabrescent and slightly shining above, dull and uniformly puberulous beneath, lateral nerves rather oblique 10–12 pairs, slender but visible beneath, petiolules ·15 in. long, puberulous as is the leaf-rachis. *Flowers* in corymbs 6–10 in. long, terminal and from leaf-axils, sometimes paniculately branched, peduncles solitary, often with 1–2 small foliage leaves with 2–4 pairs of leaflets, puberulous, 4–6 in. long, bracts ovate-lanceolate ·4–·5 in. long, persistent, puberulous, pedicels puberulous the lowest 1·5 in. long. *Calyx* 5-partite to the base, lobes subequal crimson to purple-brown, ovate-obtuse, hoary. *Petals* 5 subequal, rose-pink, ·8–1 in. long, ·35 in. wide, broadly spathulate obtuse, distinctly clawed. *Stamens* 10 all antheriferous, the 3 lowest with nodose larger filaments and larger anthers. *Pod* terete, not very distinctly annulated, ·75 in. in diam., 1·25–1·5 feet long, glossy black, with thin brittle ligneous transverse dissepiments between the 50–75 seeds each of which is embedded in a suberous disc ·75 in. across ·2 in. thick. *Seeds* broadly ovate, smooth slightly shining, ·35 in. long, ·3 in. across, ·2 in. thick, testa pale warm-brown. DC. Prodr. II, 490; Wall. Cat. 5309; Benth. Pl. Jungh. 259; Miq. Flor. Ind. Bat. I, 90; Bak. in Flor. Brit. Ind. II, 267; Koord. & Val. Bijdr. II, 8. *C. Bacillus* Gaertn. Fruct. I, 313; Roxb. Hort. Beng. 31; Flor. Ind. II, 337; Wight, Ic. 252. Rumph. Herb. Amboin. II, 82, t. 22.

PERAK; Thaipeng, Wray 4020! DISTRIB. Sumatra (*Forbes* 1275!); Java.

Mr. Wray is the only collector who has sent this very distinct species to Calcutta from the Malay Peninsula. The Malay name of this Mr. Wray gives as *Sibusu*, a circumstance that causes no surprise when it is considered how very closely related this species and *C. nodosa* undoubtedly are.

3. *CASSIA FISTULA* Linn. Sp. Pl. 377. A tree 20–40 feet high with spreading branches and glabrous branchlets. *Leaves* equally pinnate 8–16 in. long; leaflets coriaceous 4–6 pairs, developing successively, opposite, ovate, tapering from below the middle to a narrow point, base wide-cuneate, 2–6 in. long, 1·5–3·5 in. wide, bright-green, glabrous shining above, dull and paler beneath when young clothed with a close but very caducous silvery pubescence; lateral nerves obliquely spreading 10–20 pairs, slender but visible above somewhat prominent beneath, petiolules ·2 in. long stoutish, glabrous as is the leaf-rachis. *Flowers* in



long lax racemes 12-20 in. long, bracts minute caducous, pedicels glabrous 1.5-2 in. long. *Calyx* 5-partite to the base, segments broadly spatulate .25 in. long, finely puberulous. *Petals* 5 subequal, obovate shortly clawed, .8-1 in. long, .6-.7 in. wide. *Stamens* 10 all antheriferous, the 3 lowest with larger and thicker but not nodose filaments, and with larger anthers. *Pod* terete, .9-1 in. thick, not at all annulated, 1-2 feet long, dull black with thin brittle ligneous transverse dissepiments between the 50-90 seeds each of which is embedded in a suberous disc .8-9 in. across, .2 in. thick. *Seeds* broadly ovate smooth shining, .35 in. long, .3 in. across, .2 in. thick, testa pale warm-brown. DC. Prodr. II, 488; Roxb. Hort. Beng. 31; Fl. Ind. II, 333; Wall. Cat. 5302; W. & A. Prodr. 285; Miq. Flor. Ind. Bat. I, 89; Bak. in Flor. Brit. Ind. II, 261; Koord. & Val. Bijdr. II, 11. *C. rhombifolia* Roxb. Hort. Beng. 31; Flor. Ind. II, 334; Wight Ic. t. 269.

MALACCA; *fide* Baker in *Flor. Brit. Ind.* ANDAMANS; planted, common.

This is the well-known *Amaltás* or "Indian Laburnum" undoubtedly a native of India but, not in the writer's opinion, entitled to be considered an indigenous tree in Malaya; indeed none of the Malayan botanists have sent specimens to Calcutta. Mr. Baker however alludes to specimens at Kew from Malacca; possibly it is planted in the other provinces also. In the Andamans it only occurs as a planted tree.

§ 2. PSILORHEGMA Vogel. *Sepals* obtuse, stamens all antheriferous, anthers all subequal. *Pods* compressed, dehiscent, the dissepiments between the seeds membranous.

4. CASSIA GLAUCA Lamk Encyc. Meth. I, 647. A small tree 15-20 feet high with glabrous terete branches; stem 4-6 in. in diam. *Leaves* equally pinnate 6-9 in. long; leaflets 4-6 pairs opposite, membranous or subcoriaceous, pale-green glabrous above, very glaucous and sparsely adpressed-puberulous or glabrous beneath, ovate-acute, base cuneate, 2-4 in. long, 1-2 in. wide, lateral nerves 10-12 pairs indistinct, petiolules .15 in. long, puberulous as is the rachis which is faintly channelled above and furnished with long conical glands between each of the 2-3 lowest pairs of leaflets; stipules falcate narrowly lanceolate .35 in. long, caducous. *Flowers* in axillary corymbs 4 in. long, 2.5 in. across, the peduncles 2 in. long; lower pedicels 1.25 in. long, spreading, solitary in the axils of small elliptic caducous bracts glabrous as are the peduncles. *Calyx* 5-partite to the base, segments very unequal, pale-yellow, glabrous, all orbicular, the outer .2, the others .3 in. across. *Petals* 5 subequal, spreading, broadly ovate-obtuse shortly clawed, 1 in. long, .75 in. across, pale-primose with faint greenish-yellow veins. *Stamens* 10 subequal. *Pod* straight flat very thin, dehiscent, linear, tapering to both ends, flexible, dull, slightly compressed between the seeds, valves thinly coriaceous, 6-8 in. long, .5-.7 in. wide, with a stalk

·5–·6 in. long. *Seeds* biseriate, 20–30, oval, ·25 in. long, ·15 in. wide, very thin, testa dark-brown shining. DC. Prodr. II, 495; Wall. Cat. 5312; W. & A. Prodr. 289; Bedd. Flor. Sylvat. 91; Miq. Flor. Ind. Bat. I, 96; Bak. in Flor. Brit. Ind. II, 265. *C. swattensis* Burm. Flor. Ind. 97. *C. arborescens* Vahl. Symb. III, 56; Roxb. Hort. Beng. 31. *Senna arborescens* Roxb. Flor. Ind. II, 345.

PENANG; *Kunstler* 1473! *Curtis*! MALACCA; cultivated, *Maingay* 595! PERAK; *Simpang*, *Wray* 2051! DISTRIB. S.-E. Asia generally, but often, perhaps usually cultivated.

§ 3. SENNA Bth. & Hk. f. *Sepals* obtuse, perfect stamens 7, the 3 uppermost reduced to staminodes, the remainder subequal or the lowest 2–3 with longer filaments and larger anthers than the rest. *Pods* compressed, rarely subterete, usually dehiscent, the dissepiments between the seeds membranous.

5. CASSIA TORA Linn. Sp. Pl. 376. An annual fœtid herb or undershrub 2–3 feet high. *Leaves* equally pinnate, distinctly petioled, 3–4 in. long; leaflets 3 pairs opposite, membranous, glaucous, obovate-oblong, uppermost leaflets 2 in. long 1 in. wide, lowest pair 1–1·25 in. long ·75 in. wide, apex equally acute, base slightly obliquely rounded, glabrous or puberulous on both surfaces, lateral nerves 8–10 pairs, oblique straight rather pronounced beneath, petiolules ·1 in. long, puberulous as is the rachis which is deeply grooved above and furnished with a long conical gland between each of the two lowest pairs of leaflets; stipules linear ·75 in. long, caducous. *Flowers* usually in sessile pairs in axils of the leaves the upper crowded, their common peduncle even in fruit not exceeding ·15 in., usually shorter, the pedicels even in fruit not exceeding ·35 in. *Calyx* 5-partite to base, segments green ovate-acute glabrous spreading, ·2 in. long. *Petals* 5 subequal, spreading, pale-yellow, ·3 in. long, ·2 in. wide, oblong-obtuse, the standard retuse. *Stamens* 7 (the 3 upper replaced by staminodes) subequal, anthers brown. *Pod* 6–8 in. long, ·15 in. wide, nearly tetragonous, obliquely septate, the valves puberulous membranous not reticulated, sutures broad. *Seeds* 25–30, rhombohedral, long axis in direction of pod, ·15 in. long, ·1 in. thick, brown, shining. Linn. Sp. Pl. ed. II. 538 (excl. syn. *Roy. Lugd.* and excl. var.  $\beta$ .); DC. Prodr. II, 493; Roxb. Hort. Beng. 31; Collad. Hist. Cass. 96; Wall. Cat. 5316; W. & A. Prodr. 290 excl. var.  $\beta$ .; Miq. Flor. Ind. Bat. I, 90, excl. var.  $\beta$ .; Bak. in Flor. Brit. Ind. II, 263 in part only. *C. Tagera* Lamk. Encyc. Meth. I, 643 not of Linn. *C. fatida* Salisb. Prodr. 326. *C. gallinaria* Collad. Hist. 96. *C. obtusifolia* Linn. Sp. Pl. ed. II, 539 as to all the citations except *Sloane, Hist. Jamaica*, but not as to the plant; Lour. Flor. Coch. Chin. 323; Miq. Flor. Ind. Bat. I, 95 excl.

VAR.  $\beta$ . *Senna Tora* Roxb. Flor. Ind. II, 340. Rumph. Herb. Amboin. V, t. 97, f. 3; Rheede, Hort. Malab. II, t. 53.

ANDAMANS; very common throughout the Settlement. PERAK; Kwala Dipong, *Scortechini* 1750! DISTRIB. A wide-spread weed in S.-E. Asia.

This is sometimes spoken of as cosmopolitan in the tropics and possibly it has now become introduced in the New World. But if so, it is not common there and the writer has never seen an American specimen.

6. *CASSIA OBTUSIFOLIA* Linn. Sp. Pl. 377. An annual bland herb or undershrub 2-7 feet high. *Leaves* equally pinnate, distinctly petioled 3-4 in. long; leaflets 3 pairs opposite, membranous, green, obovate-oblong, uppermost leaflets 2 in. long, 1 in. wide, lowest pair 1-1.25 in. long, .75 in. wide, apex broadly equally deltoid, base slightly obliquely rounded, glabrous or puberulous on both surfaces, lateral nerves 8-10 pairs, oblique straight faint on both surfaces, petiolules under .1 in. puberulous as is the rachis which is deeply grooved above and is furnished with a long conical gland between the lowest pair of leaflets; stipules linear .75 in. long, caducous. *Flowers* usually in subsessile pairs in axils of the leaves the upper crowded, their common peduncle even in fruit not exceeding .15 in. usually shorter, the pedicels even in flower 1-1.25 in. long. *Calyx* 5-partite to the base, segments green ovate-acute glabrous, spreading, .25 in. long. *Petals* 5 subequal, spreading, bright-yellow, .5 in. long, .35 in. wide, oblong-obtuse, the standard truncate. *Stamens* 7 (the 3 upper replaced by staminodes) subequal, anthers brown. *Pod* 8-10 in. long, .2 in. wide, sub-terete, obliquely septate, the valves glabrous, membranous, distinctly transversely reticulated, sutures broad. *Seeds* 30-35, rhombohedral, .2 in. long, .15 in. thick, brown shining. Linn. Sp. Pl. ed. II, 539 as to the plant but excl. the ref. to *Dillenius* and to *Rumphius*; DC. Prodr. II, 493; Collad. Hist. Cass. 95. *C. toroides* Roxb. Hort. Beng. 31. *C. humilis* Collad. Hist. Cass. 96. *C. Tora* VAR.  $\beta$ . Linn. Sp. Pl. 376. *C. Tora* VAR.  $\beta$ . W. & A. Prodr. 291 excl. references to *Rheede* and to *Lamarck*; Miq. Flor. Ind. Bat. I, 95. *C. Tora* Bak. in Flor. Ind. Bat. II, 263 in part, not of Linn. *C. obtusifolia* VAR.  $\beta$ . Miq. Flor. Ind. Bat. I, 96, not VAR. *a*. *Senna toroides* Roxb. Fl. Ind. II, 340.

SINGAPORE; common, *Hullett* 102! *Kunstler* 124! DISTRIB. Native in Tropical America; now introduced and, here and there, fairly common in South-Eastern Asia.

Dr. Roxburgh was at some pains to point out how different this species is from *C. Tora*. The confusion of identification originated with Linnæus himself and has been perpetuated owing to the fondness that many authors have for books and names as compared with plants and facts.

7. *CASSIA HIRSUTA* Linn. Sp. Pl. 378. A diffuse tomentose under-

shrub 2-5 feet high usually of annual duration. *Leaves* equally pinnate 4-8 in. long; leaflets 3-6 (rarely 2) pairs, opposite, membranous, green, fœtid, ovate-acuminate with cuneate base, rather densely pilose on both surfaces, 1.5-3.5 in. long, 1-1.5 in. wide, lateral nerves about 6 pairs straight ascending, petiolules very short pilose as is the leaf-rachis which has a single large gland 2 in. above its base; stipules subulate membranous .35 in. long. *Flowers* usually in subsessile pairs in axils of leaves, the upper crowded, their common peduncle even in fruit not exceeding .15 in., pedicels in fruit .5 in. long, erect, rigid, pilose. *Calyx* 5-partite to base, segments pale, ovate-subacute, pilose externally, .25 in. long. *Petals* 5, subequal, spreading, bright-yellow, .45 in. long, .25 in. wide ovate-oblong obtuse. *Stamens* 7 (the 3 upper replaced by staminodes) the 3 lower longer and with larger anthers than the two lateral pairs; anthers brown. *Pod* slightly falcate, 6-8 in. long, .25 in. wide, subterete, faintly transversely septate, the valves densely villous, papery, very faintly reticulated and faintly depressed between the seeds, sutures broad. *Seeds* 90-120, ovate, small, dull-brown, .15 in. long, .1 in. wide, .07 in. thick. DC. Prodr. II, 497; Bak. in Flor. Brit. Ind. II, 263. *C. tomentosa* Wall. Cat. 5304 not of Linn.

SINGAPORE; very common, *Anderson* 44! *Hullett* 75! *Kunstler* 317!

DISTRIB. An American weed now naturalised in many parts of S.-E. Asia.

8. *CASSIA OCCIDENTALIS* Linn. Sp. Pl. 377. A diffuse subglabrous undershrub 2-5 feet high usually of annual duration. *Leaves* equally pinnate 6-8 in. long; leaflets 3-5 pairs opposite, membranous, glaucous, fœtid, ovate-oblong with rounded base, tapering to an acuminate tip, glabrous above, glabrous or finely pubescent beneath, 1-3 in. long, .5-1.25 in. wide; lateral nerves 6-10 pairs spreading, petiolules very short glabrous as is the leaf-rachis which has a single large globose gland at its base. *Flowers* in axillary short-peduncled few-fl. corymbs arranged in a terminal panicle, bracts white with pink tinge, thin, ovate-acuminate, caducous, .5 in. long; pedicels .15-.2 in. long, sparsely puberulous, spreading, in fruit reaching .5 in. long, ascending, rigid. *Calyx* 5-partite to base, segments white faintly tinged with pink, glabrous, membranous, obtuse, .3 in. long. *Petals* 5 subequal, yellow very faintly veined with orange, .5 in. long, .3 in. wide, ovate-obtuse. *Stamens* 7, (the 3 upper replaced by staminodes) the 3 lower longer and with larger anthers than the two lateral pairs; anthers brown. *Pod* slightly falcate, compressed, transversely septate, sutures rigid, valves depressed between the 20-30 seeds, 4-5 in. long, .35 in. wide, .2 in. thick. *Seeds* broadly ovate, small, pale-brown, .2 in. long, .15 in. across, .1 in. thick. DC. Prodr. II, 497; Roxb. Hort. Beng. 31; Bot. Reg. t. 83; W. & A. Prodr. 290; Miq.

Flor. Ind. Bat. I, 94; Bak. in Flor. Brit. Ind. II, 262. *C. fœtida* Pers. Synops. I, 457. *C. Sophera* Wall. Cat. 5317 L. not of Linn. *Senna occidentalis* Roxb. Flor. Ind. II, 343.

In all the PROVINCES, a very common weed of waste places. **DISTRIB.** Cosmopolitan in the tropics but in all probability derived originally from America and only introduced in the Old World.

Mr. Baker describes the flowers as pale lilac; this they appear never to be in South-Eastern Asia.

9. **CASSIA SOPHERA** Linn. Sp. Pl. 379. A diffuse sub-glabrous shrub 8–10 feet high, annual or subperennial. *Leaves* equally pinnate 8–10 in. long; leaflets 8–12 pairs opposite, membranous, glaucous, lanceolate with cuneate base, apex acuminate, glabrous, 2–3 in. long .5–.75 in. wide; lateral veins 10–12 pairs spreading; petiolules very short glabrous as is the leaf-rachis which has a single large conical gland .2–.25 in. above its base. *Flowers* in axillary distinctly peduncled few-fl. corymbs, bracts green ovate-acute minute caducous, .15 in. long, pedicels .25 in. long sparsely puberulous spreading; in fruit reaching .5 in. long ascending rigid. *Calyx* 5-partite to base, segments green glabrous firmly membranous obtuse .25 in. long. *Petals* 5 subequal, yellow, hardly at all veined, .5 in. long, .3 in. wide, ovate-obtuse. *Stamens* 7 (the 3 upper replaced by staminodes) the 3 lower longer and with larger anthers than the two lateral pairs, (sometimes one of these also reduced to a staminode). *Pod* slightly falcate, turgid, transversely septate, sutures slender, valves not depressed between the 30–40 small seeds, 3–4 in. long, .35 in. wide, .2 in. thick. *Seeds* broadly ovate rather dark-brown, .24 in. long, .15 in. across, .1 in. thick. DC. Prodr. II, 492; Roxb. Hort. Beng. 31; Wall. Cat. 5317 partly; W. & A. Prodr. 287; Miq. Flor. Ind. Bat. I, 92; Bak. in Flor. Brit. Ind. II, 262. *C. esculenta* Roxb. Hort. Beng. 31. *C. chinensis* Jacq. Ic. t. 73. *C. frutescens* Mill. Dict. n. 2. *C. coromandeliana* Jacq. Fragm. 67, t. 100. *Senna Sophera* Roxb. Fl. Ind. II, 347. *S. esculenta* Roxb. Fl. Ind. II, 346. Rumph. Herb. Amboin. V, 283, t. 97, f. 1.

ANDAMANS; much less common than *C. occidentalis*. PENANG; *vide* Baker. **DISTRIB.** Originally American, now cosmopolitan in the tropics.

This species has not been sent by any Malayan botanist to the Calcutta Herbarium. Its presence in Penang is however mentioned by Mr. Baker; the collector's name is not given. It was not Dr. Wallich; Wallich's Malayan "*C. Sophera*" (Cat. 5317 L.) is all *C. occidentalis*. It is strange that though this species appears to have been earlier of introduction to—at all events to have been longer known—in S.-E. Asia, it is now, though almost equally wide-spread, much less "common" than the more recently introduced *C. occidentalis*.

10. **CASSIA ALATA** Linn. Sp. Pl. 378. A shrub 5–8 feet high with very thick finely downy branches; stem often 4–5 in. thick, scarred

with cicatrices of fallen leaves and marked by the persistent rather rigid stipules. *Leaves* equally pinnate 1-2 feet long; leaflets 8-14 pairs opposite, rigidly chartaceous, green, linear-oblong to oblong, obtuse or emarginate, apiculate, base obliquely rounded or truncate, glabrous on both surfaces or sometimes obscurely downy beneath, gradually increasing in size from base upwards, 2-6 in. long, 1-2.5 in. wide, lateral nerves 10-15 pairs ascending curved towards extremities, distinct above and very prominent beneath, secondary venation beneath distinct; petiolules very short glabrous as is the leaf-rachis, which is deeply channelled above with firm yellow borders and with transverse ridges occasionally slightly apiculate in the middle between each pair of leaflets, but with no true gland; stipules .25 in. long, auriculate, rigid, pointed, persistent. *Flowers* in peduncled subspicate racemes, 6-18 in. long, at first enveloped in large membranous strobilate yellow caducous bracts .75 in. long, .6 in. wide, ovate, subacate or obtuse; pedicels .15 in. (in fruit .25 in.) long, very finely puberulous as is the thick rachis. *Calyx* 5-partite to base, segments spatulate obtuse, 1 in. long, .6 in. wide, yellow, membranous, glabrous. *Petals* 5 subequal, bright yellow veined with orange, ovate-orbicular shortly clawed, 1.25 in. long, .75 in. wide. *Stamens* 7 (the 3 upper reduced to staminodes) the 3 lowest with long filaments and two of these with very large anthers; the two lateral pairs with short filaments and small anthers. *Pod* straight rigid divaricately spreading glabrous dehiscent, 6 in. long .8 in. wide, sutures narrow, valves with a crenulated chartaceous wing .35 in. wide running from end to end. *Seeds* 50-60 flattened, triangular, the sides straight with acute point at hilum, the base somewhat rounded, .25 in. long, .2 in. wide, .1 in. thick, testa smooth shining brown. DC. Prodr. II, 492; Roxb. Hort. Beng. 31; Wall. Cat. 5301; W. & A. Prodr. 287; Wight, Ic. t. 253; Miq. Flor. Ind. Bat. I, 93; Bak. in Flor. Brit. Ind. II, 264. *C. bracteata* Linn. f. Suppl. 232; DC. Prodr. II, 492. *C. herpetica* Jacq. Obs. II, 24, t. 45, f. 2. *Senna alata* Roxb. Flor. Ind. II, 349.

ANDAMANS; common, *King!* *Prain!* PERAK; *Scortechini!* MALACCA; *Griffith!* DISTRIB. Cosmopolitan in the tropics.

11. CASSIA TIMORIENSIS DC. Prodr. II, 499. A shrub or small tree 6-30 feet high, with virgate pubescent branches. *Leaves* equally pinnate, 1-1.5 feet long; leaflets 16-24 pairs, opposite, membranous, pale-green, glabrescent to densely pubescent above, sparsely pubescent to softly densely tomentose beneath, lanceolate-oblong with a fine point at the rounded apex and with obliquely rounded base, 1-1.75 in. long, .35-.65 in. wide, lateral nerves 8-10 pairs inconspicuous, petiolules .07 in. long, pubescent as is the rachis which is channelled above and trans-

versely barred between the leaflets; stipules lanceolate to auriculate foliaceous persistent, usually larger in the region of the inflorescence, .25 in. long. *Flowers* in a large erect terminal panicle extending into the axils of the upper leaves, 1-1.25 feet long, 6 in. across, composed of alternate corymbs 2-3 in. long, 1.5 in. across; lower pedicels 1 in. long, solitary in axils of small deciduous bracts, rusty- or yellow-pubescent as are the branches and main-rachis. *Calyx* 5-partite to base, segments distinctly unequal, oblong-obtuse, densely pubescent outside, the larger .3 in. the smaller .2 in. long. *Petals* 5 oblong, .6 in. long, .3 in. wide, bright-yellow faintly veined with orange. *Stamens* 7 (the 3 upper reduced to staminodes) the 3 lower with longer filaments but not much larger anthers than the two lateral pairs. *Pod* straight, flat, very thin, deliscent, linear, slightly tapering to both ends, glossy and flexible, valves thinly coriaceous, 5-6 in. long, .5 in. wide, with a stalk .3 in. long. *Seeds* biseriate, 16-20, oval-obtuse .25 in. long, .2 in. across, very thin, testa dark brown, shining, with a dull paler vertical central patch.

VAR. *typica*; leaflets glabrescent above, sparsely pubescent beneath, stipules of the upper leaves narrower. *C. timoriensis* Miq. Flor. Ind. Bat. I, 99; Bak. in Flor. Brit. Ind. II, 265; Koord. & Val. Bijdr. II, 13.

KEDAH; Coah Langkawi, *Curtis* 2094! DISTRIB. India; Indo-China; Malay Archipelago.

VAR. *xanthocoma* Miq.; leaflets pubescent above, densely golden-tomentose beneath, stipules of the upper leaves very broad. *C. palmata* Wall. Cat. 5306 A. *C. xanthocoma* Miq. Analect. Ind. I, 10. *C. timoriensis* VAR. *xanthocoma* Miq. Flor. Ind. Bat. I, 99. *C. timoriensis* VAR. *chrysocoma* Koord. & Val. Bijdr. II, 14.

PERAK; Kwala Dipong, growing near limestone, *Kunstler* 8255! *Scortechini* 1751! Goping, *Kunstler* 689! Ulu Bubong, *Kunstler* 10087! DISTRIB. Tenasserim, Malay Archipelago.

The two varieties are very easily distinguished but they do not differ at all in essentials. The Bornean specimens of *C. xanthocoma* first received by Miquel were without fruit; on seeing pods that author himself very justly reduced his species, as a variety, to *C. timoriensis*.

12. CASSIA SIAMEA Lamk Encyc. Meth. I, 648. A tree 30-50 feet high with smooth bark and spreading branches; stem 12-18 in. in diam. *Leaves* equally pinnate, 6-12 in. long; leaflets 4-16 pairs, opposite, subcoriaceous, rather dark-green shining above, dull and paler beneath, oblong-obtuse or retuse minutely mucronate, base rounded, 1.25-2.5 in. long, .5-.9 in. wide, lateral nerves 10-12 pairs obscure above fine but distinct beneath, petiolules distinct .1 in. long, glabrous as is the rachis which is channelled and is transversely barred between the leaflets above but is without glands; stipules minute subulate caducous.

*Flowers* in large erect terminal panicles extending into the axils of the upper leaves, 8–16 in. long, 6–8 in. across, composed of alternate crowded corymbs 3–4 in. long, 2 in. across; lower pedicels 1 in. long solitary in axils of small lanceolate bracts 2 in. long, grey-pubescent as are the branches and main rachis. *Calyx* 5-partite to base, segments distinctly unequal, ovate-obtuse, greenish-yellow, downy externally, the larger .35 in. the smaller .2 in. long. *Petals* 5 suborbicular, .75 in. long, .6 in. wide, except the upper obcordate .6 in. long, .5 in. wide, all rather pale uniform-yellow. *Stamens* 7 (the 3 upper reduced to staminodes) the 3 lower with much larger anthers and longer filaments than the 2 lateral pairs. *Pod* nearly straight, flat, thin, slightly swollen opposite the seeds, sutures faintly thickened, valves thickly coriaceous, sparsely puberulous, 6–9 in. long, .5 in. wide, with a distinct stalk .5 in. long. *Seeds* biseriate 20–30, oval, .3 in. long, .25 in. across, very thin, testa dark-brown, shining. Bak. in *Flor. Brit. Ind.* II, 264. *C. florida* Vahl. *Symb.* III, 57; DC. *Prodr.* II, 499; W. & A. *Prodr.* 288; Bedd. *Fl. Sylv.* t. 179; Miq. *Flor. Ind. Bat.* I, 98. *C. sumatranu* Roxb. *Hort. Beng.* 31; DC. *Prodr.* II, 506; Wall. *Cat.* 5305. *Senna sumatranu* Roxb. *Flor. Ind.* II, 347.

PERAK; near Ulu Selangor, *Kunstler* 8668! Blanja, *Wray* 147! MALACCA; Brisu, *Holmberg* 869! PAHANG; Pulo Rumpit, *Ridley* 2648! DISTRIB. India, Indo-China, Malay Archipelago.

Mr. Wray gives the local name of this in Perak as *Pako Nemong* and notes that the wood is strong and tough. Mr. Holmberg gives the name in Malacca as *Juhl*.

§ 4. CHAMÆCRISTA DC. *Sepals* narrow; stamens 5 or 10 all perfect equal, or with the uppermost one smaller than the others and sometimes replaced by a staminode. *Pod* dehiscent small strap-shaped, flat, the seeds compressed parallel with the more or less oblique valves.

13. CASSIA MIMOSOIDES Linn. *Sp. Pl.* 379. A low diffuse perennial, suberect or spreading, simple or much branched, glabrous or pubescent, sometimes suffrutescent 2–3 feet high; stem terete. *Leaves* 3–4 in. long, equally pinnate; leaflets 40–60 pairs, linear with a distinct oblique mucro, .1–.15 in. long, glabrous on both surfaces, rachis puberulous with a small sessile gland on the petiole below the lowest pair of leaflets, stipules finely subulate, straight, .2 in. long. *Flowers* axillary, solitary or 2–3 together, pedicels unequal, ultimately 1 in. long, bracteolate above the middle; buds pointed narrow. *Calyx* 5-partite to base, segments unequal linear-lanceolate to oblong-acute, .25–.3 in. long. *Petals* 5 subequal, elliptic or orbicular, shortly clawed, obtuse, .35 in. long. *Stamens* 10 perfect, alternately longer and shorter. *Pod* 2 in. long, .2 in. across, linear, flattish. *Seeds* 20–25, obliquely rhomboid, compressed, testa dark-brown, shining. DC. *Prodr.* II, 503;



Miq. Flor. Ind. Bat. I, 101; Bak. in Flor. Brit. Ind. II, 266. *C. augustissima* Lamk. Encyc. Meth. I, 650; DC. Prodr. II, 505; W. & A. Prodr. 292. *C. sensitiva* Roxb. Hort. Beng. 32. *C. tenella* Roxb. Hort. Beng. 31. *Senna sensitiva* Roxb. Flor. Ind. II, 353. *S. tenella* Roxb. Flor. Ind. II, 354.

PROV. WELLESLEY; Tasek Selangor, *Ridley* 6995! PENANG; Government Hill, *Curtis* 2507! DISTRIB. Throughout South-Eastern Asia.

14. CASSIA LESCHENAUTIANA DC. Mem. Soc. Hist. Nat. Gen. II, 2, 132. A suberect perennial, rather softly pubescent, 2-3 feet high, stems terete. *Leaves* equally pinnate 1-2 in. long, leaflets 16-24 pairs, narrowly oblong with a distinct oblique mucro and 4-6 strong very oblique secondary nerves, glabrous or puberulous, .4-.6 in. long, .1-.15 in. across; rachis pubescent, with a large sessile gland on the petiole below the lowest pair of leaflets, stipules lanceolate straight .35 in. long. *Flowers* axillary, solitary or 2-3 together, pedicels unequal, ultimately .25-.35 in. long, bracteolate not far above the base, buds pointed. *Calyx* 5-partite to base, segments unequal linear-lanceolate to oblong-acute, .35 in. long. *Petals* 5 subequal, elliptic or orbicular, shortly clawed, obtuse, .4-.6 in. long. *Stamens* 10 or 9 or 7 (all perfect or with the uppermost, or the three uppermost, reduced to staminodes), the 2-3 lowest often rather larger than the lateral ones. *Pod* 1-1.5 in long, .2 in. across, linear, flattish. *Seeds* 8-16, obliquely rhomboid, compressed, testa brown shining. DC. Prodr. II, 504. *C. Wallichiana* DC. Prodr. II, 505; W. & A. Prodr. 292. *C. mimosoides* VAR. *Wallichiana* Bak. in Flor. Brit. Ind. II, 266.

PENANG; Government Hill, *Curtis* 829! SINGAPORE; *Hullett* 663! DISTRIB. India; Himalayas; Indo-China.

This is reduced to *C. mimosoides* by Mr. Baker but it seems better in the meantime to keep the two plants apart. They are certainly, as Mr. Baker indicates, very closely related, but they do not much resemble each other and are not easily confounded.

#### 45. KOOMPASSIA Maingay.

Very tall erect trees. *Leaves* odd-pinnate with alternate leaflets. *Flowers* copious small, obscure, in ample terminal panicles; bracts small deciduous. *Calyx*-tube very short conical, or none; sepals 5, lanceolate, subequal, very slightly imbricated. *Petals* 5 subequal, their margins not meeting. *Stamens* 5, filaments short or very short, anthers equal basifixed, dehiscing by two apical pores. *Ovary* sessile, subglobose or slightly elongated, 1-ovuled; style short acute, stigma small, terminal. *Pod* oblong, compressed, winged throughout its circumference, narrowed and somewhat twisted at the base, indehiscent. *Seed* solitary situated

near the middle of the pod; compressed, exalbuminous; cotyledons leafy, radicle short straight. Species 4, Malayan.

Leaflets green beneath; panicles rusty-pubescent; petals exceeding sepals and stamens; anthers short broad; ovary subglobose, rusty-pubescent ... .. 1. *K. malaccensis.*

Leaflets glaucescent beneath, much smaller; panicles grey, puberulous; petals much shorter than sepals and stamens; anthers long narrow; ovary compressed, very nearly glabrous ... .. 2. *K. parvifolia.*

1. *KOOMPASSIA MALACCENSIS* Maingay ex Benth. in Hook. Icon. Pl. XII, 58. t. 1164. A tree 80–100 feet high, with stem 3–4 feet in diameter; branches closely rusty-pubescent at length glabrescent. *Leaves* alternate odd-pinnate, 5–8 in. long, rachis rusty-pubescent; leaflets 7–9 alternate, ovate-lanceolate or oblong, acuminate, apex obtuse slightly emarginate, base rounded, 2–3 in. long, .8–1.25 in. wide, coriaceous, dark-green glabrous and shining above, rather paler, dull and sparsely adpressed rusty-puberulous beneath; lateral nerves 10–12 pairs, faintly visible above, distinct beneath and connected by a fine reticulate secondary venation; petiolules rusty-pubescent .25 in. long. *Panicles* terminal and extending into the axils of the uppermost leaves 5 in. long, 3–4 in. across; branches 2 in long, pedicels .2 in. long; all parts densely rusty-pubescent. *Calyx*-tube obsolete; sepals 5 slightly imbricate ovate-acute, .12 in. long, densely rusty externally. *Petals* 5, oblong, obtuse, white, .15 in. long, slightly exceeding the sepals, two and a half times as long as stamens. *Stamens* 5, filaments very short glabrous; anthers slightly incurved twice as long as broad, widely triangular. *Ovary* subglobose, densely rusty-pubescent, 1-ovuled; style short. *Pod* oblong, compressed, 4–5 in. long, 1.25–1.5 in. wide, reticulately wide-veined opposite the solitary seed. *Seed* 1.5 in. long, .65 in. wide, cotyledons foliaceous; cordately 5-nerved at base, nerves conspicuous. Taubert in Engl. Natürlich. Pflanzenfam. III, 3. 156.

PERAK; Larut, *Kunstler* 7692! Thaipeng, *Wray* 2388! near Blangie, *Scortechini* 1712! MALACCA; Merlimau, Selandar, Sungei Udang, etc.; *Maingay* 557 (*vide* Bentham); 604! *Derry* 51! *Holmberg* 880! *Good-enough* 1416! SINGAPORE; Selitan, etc.; *Ridley* 4567! 6403! *Cantley* (*vide* Taubert). PENANG; T. Bahang, *Curtis* 432! DINDINGS; Lumot, *Curtis*! *DISTRIB.* Sumatra (River Rawas, *Forbes*!).

This is the fine tree which the Malays know as *Kumpass*. Another species from Borneo (*K. Beccariana* Taubert,—founded on Beccari n. 2690) is evidently closely related; there are no specimens of the species at Calcutta. The description and drawing of the anthers in the original account of the genus are somewhat inaccurate.

2. *KOOMPASSIA PARVIFOLIA* Prain. A tree 80–100 feet high, branchlets glabrous or only puberulous at the tips. *Leaves* alternate odd-

pinnate, 3–4 in. long, rachis grey-silky; leaflets 9–11 alternate, elliptic-lanceolate, apex obtuse slightly emarginate, base widely cuneate, 1–1.25 in. long, .25–.35 in. wide, chartaceous, medium-green, glabrous and shining above, glaucescent and sparsely silky-pubescent beneath; lateral nerves 4–5 pairs, quite invisible above and very faint beneath; petioles grey-silky, .2 in. long. *Panicles* terminal, 5 in. long, 2.5–3 in. across, branches 1.5 in. long, pedicels .15 in. long slightly thickened under the calyx; all parts closely grey-silky. *Calyx*-tube short conical; sepals 5 slightly imbricate, ovate-lanceolate, margins of the inner slightly narrower, recurved, all .15 in. long and silky-puberulous externally. *Petals* 5, elliptic, white, one-third as long as sepals, half as long as stamens. *Stamens* 5, filaments very short glabrous; anthers distinctly incurved, four to five times as long as broad, narrow-lanceolate. *Ovary* compressed glabrous except for a few hairs at the base, 1-ovuled; style short. *Pod* not seen.

PERAK; Goping, *Scortechini* 1996!

This fine tree is known to the Malays as *Tualang*; its timber is largely used for building purposes. In this respect it resembles the preceding species as well as another famous timber-tree from Borneo the *Tapan* (*Koompassia excelsa* Taub. = *Abauria excelsa* Beccari).

From Signor Beccari's description of *Tapan* it is evidently a tree of much more gigantic proportions than the *Tualang*. Its foliage is probably similar for its leaflets are described as being of about the same size; the number of leaflets to a leaf Beccari does not state. But the flowers are very different for in *Tapan* the petals are hardly shorter than the sepals and are about the same length as the stamens, while the anthers are shorter than the filaments; in *Tualang* the petals are very small and the anthers are exceedingly long as compared with the filaments.

#### 46. DIALIUM Linn.

Erect unarmed trees. *Leaves* odd-pinnate with more or less distinctly alternate leaflets. *Flowers* copious small obscure in ample terminal panicles. *Calyx*-tube very short; free segments lanceolate or ovate lanceolate, subequal, much imbricated, deciduous. *Petals* 0 (in all Malayan species). *Stamens* 2, erect, included; anthers attached near the base, dehiscence longitudinal. *Ovary* sessile, 2-ovuled; style filiform stigma terminal. *Pod* firm, dry, indehiscent, oblong, 1-seeded; endocarp pulpy. *Seed* albuminous, embryo foliaceous, radicle straight. Species about 15, cosmopolitan in the tropics, chiefly however in S.-E. Asia.

Leaves quite glabrous on both surfaces:—

Pods large, (firm), 1.5 in. long, strongly umbonate at

apex ... .. 1. *D. Kunstleri*.

Pods smaller, not exceeding 1 in. in length, obtuse or only faintly apiculate:—

Pods fragile not velvety; leaflets thinly coriaceous:—

Pedicels as long as calyx, panicles laxly spreading 2. *D. patens*.

Pedicels shorter than calyx, panicles erect:—

Leaflets lanceolate alternate; seeds subquadrate longitudinally striate ... 3. *D. indum*.

Leaflets elliptic opposite; seeds orbicular reticulate ... 4. *D. laurinum*.

Pods firm, velvety; leaflets rigidly coriaceous ... 5. *D. Maingayi*.

Leaves more or less pubescent beneath:—

Leaflets large, 5-7:—

Leaflets opposite or nearly so, very faintly puberulous beneath; sepals pubescent within ... 6. *D. ambiguum*.

Leaflets conspicuously alternate, thickly covered beneath with golden-brown pubescence; sepals pubescent within ... 7. *D. platysepalum*.

Leaflets small, 9-15:—

Leaflets 9-11, conspicuously alternate, thickly covered beneath with golden-brown pubescence; sepals glabrous within ... 8. *D. Wallichii*.

Leaflets 13-15, opposite, rusty tomentose beneath; sepals puberulous within ... 9. *D. Kingii*.

1. *DIALIUM KUNSTLERI* Prain. A tree 100-130 feet high with spreading branches, stem 2-3 feet thick; branchlets slender, pale, rugose glabrous. *Leaves* alternate, odd-pinnate, 5-6 in. long; leaflets 5, rarely 3, alternate or subopposite, ovate-lanceolate, narrowly acuminate, apex entire, base cuneate, 4-5 in. long, 1.25-1.5 in. wide, coriaceous, rather dark-green shining above, dull and pale green beneath, glabrous on both surfaces; lateral nerves ascending 5-6 pairs hardly visible above, faint beneath and with there a very faint reticulate intermediate secondary venation; petiolules stout, very short, .1 in. long, glabrous. *Panicles* terminal and axillary 4 in. long, 3 in. wide; branches 2 in. long, glabrous, pedicels (in fruit) .2 in. long. *Calyx* and *stamens* not seen. *Pod* subspherical, hardly compressed, obliquely prominently umbonate at the tip, firm, 1.5 in. long, 1.35 in. across; glabrous, very faintly verrucose, black. *Seed* solitary subrotund, smooth, dark-brown, dull, .6 in. long, .5 in. wide, .2 in. thick.

PERAK; Goping, 500-800 feet, *Kunstler* 4415!

This very fine species, easily distinguished from all the others by its much larger pods with very pronounced umbonate apex, has been but once reported and then, unfortunately, without flowers. It is perhaps most nearly related to *D. indum* from which, however, besides differing as to fruits it is also distinguished by its thicker and fewer leaflets. No native name has been given for the species.

2. *DIALIUM PATENS* Bak. in Flor. Brit. Ind. II, 270. A tree 60–80 feet high with a rather slender stem 10–20 in. thick; branchlets slender smooth pale-brown glabrous. *Leaves* alternate, odd-pinnate, 5–6 in. long; leaflets 3–5, opposite or subopposite, oblong to elliptic, rather abruptly cuspidately narrowed to an obtuse entire apex, base rounded, 3–5 in. long, 1·5–2·25 in. wide, subcoriaceous, bright-green and shining above, paler and dull beneath, glabrous on both surfaces; lateral nerves 8–10 pairs spreading, fine but distinct on both surfaces as is the reticulate intermediate secondary venation; petiolules stout, glabrous, ·25 in. long. *Panicles* terminal and axillary, 6–8 in. long, 4–5 in. wide, rachis and branches slender and flexuous, glabrous; pedicels glabrous spreading or cernuous, ·2–·25 in. long. *Calyx* ·15 in. long, ovoid-oblong in bud, tube obsolete, segments 5, white and almost petaloid, subequal, much imbricated, ovate-oblong obtuse, finely grey-pubescent on both surfaces, the two upper segments sometimes faintly connate. *Petals* 0. *Stamens* 2, filaments short slender, connective puberulous, anthers oblong basifixed. *Ovary* silky, narrowly-ovate, sessile, tapering upwards to the slender incurved style; ovules 2. *Pod* ovoid, slightly compressed, apex not apiculate, fragile, black, thinly grey-pubescent, ·5 in. long ·35 in. across, ·3 in. thick. *Seed* solitary, nearly regularly oblong in shape with rounded angles, ·3 in. long, ·25 in. across, ·15 in. thick, dark-maroon in colour, only slightly shining, neither striate nor reticulate.

PERAK; Larut, at low elevations, *Kunstler* 5551! 5577! MALACCA; *Griffith* 1846 (K. D.)! *Maingay* 537! **DISTRIB.** Borneo.

“*Maingay* 537” forms, with “*Griffith* 1846,” the basis of this species. The description here given of pod and seed is drawn up entirely from an example of “*Maingay* 537.” The discrepancy between the description in the *F. B. I.* and the actual fruit of the species the writer is unable to explain.

3. *DIALIUM INDUM* Linn. Mantiss. 24. A tree 60–70 feet high with spreading branches; branchlets slender, rugose, grey-puberulous. *Leaves* alternate, odd-pinnate, 6–8 in. long; leaflets 5–9, alternate or subopposite ovate-oblong to ovate-lanceolate, narrowly acuminate apex entire, base cuneate, 3–4 in. long, 1–1·5 in. wide, chartaceous, dark-green slightly glossy above, dull and rather paler beneath, glabrous on both surfaces; lateral nerves 8–10 pairs, faint above more pronounced beneath and with there a distinct reticulate intermediate secondary venation; petiolules glabrous ·2 in. long. *Panicles* terminal and axillary, 4 in. long, 3 in. wide; branches from ·25–2 in. long, faintly silky-puberulous as are the pedicels ·1 in. long, usually in clusters of 3, with caducous basal bracts. *Calyx* ·15 in. long, obtuse-oblong in bud, tube obsolete, segments 5 subequal much imbricate ovate-oblong obtuse, grey-puberulous on both surfaces. *Petals* 0. *Stamens* 2, opposite the two

upper calyx segments, filaments very short slender, anthers large oblong, basifixed, dehiscing longitudinally. *Ovary* silky, ovate, sessile, tapering upwards somewhat abruptly into a slender incurved style; ovules 2. *Pod* suborbicular, .9 in. wide, slightly compressed, shortly apiculate, fragile, finely puberulous with minute silky hairs but not velvety. *Seed* solitary, obovate-quadrate, brown, finely longitudinally striate, shining, .5 in. long, .4 in. wide, .15 in. thick. Linn. Mantiss. 511; Benn. Pl. Jav. Rar. 136, t. 30; Miq. Flor. Ind. Bat. I, 79; Koord. & Val. Bijdr. II, 20. *D. javanicum* Burm. Fl. Ind. 12. *Carandje* Bontius, Hist. Ind. Or. 93; Rumph. Herb. Amboin. II, 93, footnote. *Tamarindus monococcus minor*, etc. Plunk. Mantiss. 177; Amalth. 198, t. 144, f. 4.

PAHANG; Pijaie, Pahang river, *Ridley* 2607! PENANG; Ayer Etam, *Curtis*!

This is the *Kranji* of the Malays in Java according to Bontius, Rumphius, Miquel and Koorders. Mr. *Ridley's* specimens have no native name and as there is no indication that they are from a planted tree it may be reasonably supposed that the species is indigenous in Pahang. The specimens sent by Mr. *Curtis* are noted as being from "Ayer Etam in Miller's compound;" this remark, taken in conjunction with the fact that two native names "*Kranji borong* or *Kranji padie*" are given as alternatives, seems to point to the species being an introduced one in Penang. The name *Kranji borong* is sometimes applied in Malacca to the quite dissimilar species *D. platysepalum*.

The fruits are eaten for the sake of the pulp that forms the endocarp of the pod. In the *Indian Forester* for October 1896, it is stated that *Kranji* is one of the valuable timbers of the Straits Settlements. The scientific name cited in the notice is *D. indicum*; there is no species of that name. Perhaps the present species is intended; there is however nothing to show whether the tree referred to be this or some of the other species of *Dialium*.

4. *DIALIUM LAURINUM* Bak. in Flor. Brit. Ind. II, 269. A large tree with slender ringose dark-brown rusty-puberulous branchlets. *Leaves* alternate, odd-pinnate, 7-8 in. long; leaflets 7, rarely 5, subopposite, elliptic rather suddenly narrowed to a broad subobtuse or emarginate apex, base broadly rounded, 4-5 in. long, 1.75-2 in. wide, rigidly coriaceous, dark-green on both surfaces, glossy above, dull beneath, glabrous on both sides, secondary nerves 8-9 pairs oblique but not curved, faint above, rather prominent beneath and with there a distinct reticulate intermediate secondary venation; petiolules stout, glabrous, .3-.4 in. long. *Panicles* terminal and axillary, 4 in. long, 3 in. wide, branches from .5 to 2 in. long, rusty-pubescent, pedicels .1 in. long, usually in clusters of 3, silky. *Calyx* .15 in. long, ovoid-oblong in bud, tube subobsolete, segments 5 subequal much imbricate, oblong-lanceolate, densely grey-velvety on both surfaces. *Petals* 0. *Stamens* 2 opposite the upper calyx-segments, filaments very short, slender; anthers oblong.

*Ovary* silky, ovate, subsessile, style slender incurved, ovules 2. *Pod* almost orbicular, 1 in. across not apiculate, black, thinly coated with short grey-pubescent, the thin epicarp extremely fragile. *Seed* solitary, almost exactly orbicular, .5 in. across, .2 in. thick, reddish-brown, shining and smooth with fine rather wide-meshed reticulations on the surface. Ridley, *Trans Linn. Soc. n. s. III*, 294.

MALACCA; Ayer Panas, etc.; *Maingay* 539 (K.D.)! *Goodenough* 1321! SINGAPORE; Krangi, *Ridley* 6437! PAHANG; Pigang, near Pekan, *Ridley*.

A very distinct species, easily recognised by its almost orbicular seed. Mr. Goodenough notes that this is known in Malacca as *Krangi papan*; he however quotes the same name as applied to a form of *D. platysepalum*. There are no Pahang specimens at Calcutta; the locality is cited from Mr. Ridley's paper on the Pahang flora.

5. *DIALIUM MAINGAYI* Bak. in *Flor. Brit. Ind.* II, 269. A large tree with spreading branches; branchlets slender lenticelled dark-brown, glabrous. *Leaves* alternate odd-pinnate, 4-5 in. long; leaflets 9, rarely 7, subopposite elliptic-oblong narrowed cuspidately to an obtuse or subacute entire apex, base rounded, 2-2.5 in. long, .75-1 in. wide, coriaceous, very dark-green shining above, dull and paler green beneath, glabrous on both surfaces; lateral nerves 4-5 pairs not visible above, faint and not raised beneath, scarcely more conspicuous than the very faint intermediate reticulate secondary venation; petiolules slender .2 in. long, glabrous. *Panicles* terminal, 4-5 in. long, 3 in. wide, branches 2 in. long, erecto-patent rusty-puberulous; pedicels .15 in. long, 2-3 together, rusty-puberulous. *Calyx* .25 in. long, ovoid in bud, tube very short campanulate, segments 5, or occasionally only 4, much imbricate, broadly ovate-obtuse, shortly brown-velvety silky on both surfaces. *Petals* 0. *Stamens* 2 opposite the two upper calyx-segments, filaments thick nearly as long as the anther, the connective beset with short brown hairs. *Ovary* black-velvety, ovate, shortly stipitate, style incurved glabrous; ovules 2. *Pod* widely obovoid, apex not apiculate, firm, .9 in. long, .8 in. wide, hardly at all compressed, densely persistently deep-olive velvety. *Seed* solitary, obovate-quadrate, finely longitudinally striate, shining, .45 in. long, .35 in. wide, .15 in. thick.

PERAK; Goping, *Scortichini* 2052! Upper Perak, 1000 feet, *Wray* 3407! 3767! PENANG; Tulloh Bahang, *Curtis* 440! 3031! MALACCA; Selandaun, *Goodenough* 1533! SINGAPORE; *Maingay* 538 K. D. (Herb. Propri. 1398 A.)!

The seeds of this species are hardly distinguishable except in colour from those of *D. indum*, the fruits and the foliage are however extremely different. Curtis gives *Krangi* as the native name of this species in Penang; in Malacca the tree is said by Goodenough to bear the alternative names *Kranji ambot* and *Kranji*

*s'Kellat.* The latter epithet is however also applied in Malacca to a form of the very different species *D. platysepalum*. No native name is cited with the Perak specimens or with the Singapore ones.

6. *DIALIUM AMBIGUUM* Prain. A tree 40–50 feet high, stem 5–8 in. in diam.; branchlets very verrucosely lenticelled, glabrous, blackish. *Leaves* alternate, odd-pinnate, 8–9 in. long; leaflets 7, opposite or rarely subopposite, oblong, rather abruptly shortly caudate-acuminate apex obtuse entire, base rounded, 4–5 in. long 1.5–1.75 in. wide, very rigidly coriaceous, bright-green, glossy and glabrous above, dull and faintly puberulous under the lens beneath; leaf-rachis glabrous; lateral nerves 9–11 pairs, fine, only visible beneath, forming distinct intra-marginal loops and with a fine intermediate reticulate secondary venation; petiolules glabrous .2 in. long. *Panicles* terminal and axillary, deltoid, slightly spreading, 5–8 in. long, 4–8 in. wide, branches 2–4 in. long very sparsely puberulous with grey-silky hairs as is the main rachis; pedicels usually in clusters of 3, .15 in. long. *Calyx* .15 in. long, ovoid in bud, tube obsolete, segments 5, subequal, much imbricate, broadly triangular subacute, reflexed after flower opens; densely brown-velvety on both surfaces. *Petals* 0. *Stamens* 2, opposite the two upper calyx-segments; filaments thick and fleshy one-third as long as anther. *Ovary* light green-silky, ovate, quite sessile, tapering gradually into the glabrous style; ovules 2. *Pod* and seed unknown.

PERAK; Gopong, 500–800 feet, *Kunstler* 6142! MALACCA; Bukit Sadanen, *Derry* 510 (partly; only the specimens termed "*Kranji*")!

This tree is evidently very closely allied to *D. platysepalum* and may ultimately prove to be but a form of that variable species; if so, however, it is an exceedingly distinct variety, readily recognised owing to the differences in its ovary, in its pubescence, and in the arrangement of its leaflets. No native name is given for the Perak specimens; those from Malacca that appear to belong to the same species are simply termed *Kranji*.

7. *DIALIUM PLATYSEPALUM* Bak. in *Flor. Brit. Ind.* II, 270. A tree 40–50 feet high; branchlets brown, closely-puberulous, sparsely lenticelled. *Leaves* alternate, odd-pinnate, 5–9 in. long; leaflets 5–7, usually conspicuously alternate, or rarely subopposite, elliptic or oblong to ovate-lanceolate, rather abruptly shortly caudate-acuminate apex obtuse entire, base rounded or cuneate, 3–5 in. long, 1–2 in. wide, very rigidly coriaceous, dark-green glossy and glabrous above, densely shortly yellowish-brown silky beneath; leaf-rachis finely puberulous; lateral nerves 9–11 pairs, fine, only visible beneath, forming distinct intra-marginal loops and with a fine intermediate secondary reticulate venation; petiolules puberulous .25 in. long. *Panicles* terminal and axillary, deltoid, close or slightly spreading, 5–8 in. long, 4–7 in. wide, branches 2–3 in. long, erecto-patent, finely brown-silky as is the main-



rachis; pedicels usually in clusters of 3, .15 in. long. *Calyx* .2 in. long, ovoid in bud, tube rather distinct campanulate, segments 5, subequal, much imbricate, broadly triangular-obtuse, coriaceous, reflexed after flower opens, densely brown-velvety on both surfaces. *Petals* 0. *Stamens* 2, opposite the two upper calyx-segments; filaments thick and fleshy one-third to one-half as long as anther. *Ovary* black-velvety, ovate, shortly stipitate, gradually tapering upwards into the puberulous incurved style; ovules 2. *Pod* obovoid or orbicular, apex not apiculate, firm, spherical or slightly compressed, 1 in. long, .6-.8 in. across, .5-.7 in. thick; persistently brown-velvety. *Seed* solitary, orbicular, widely oblong or subrhomboid, pale-brown in fresh, darker in old specimens, finely longitudinally striate, .45 in. long, .35 in. wide, .2 in. thick.

VAR. *typica*; leaves usually ovate-lanceolate, cuneate less often rounded at the base; filaments half as long as anthers; pods orbicular very little compressed. *D. platysepalum* var. *typica* Bak. loc. cit.

PERAK; Larut, Wray 4019! MALACCA; Griffith 1847! Maingay 536! Sungei Udang, Holmberg 821! Bukit Sadanen, Derry 510 (partly; only the specimens termed "*Sepan*")! Merliman, Derry 89! Ayer Panas, Goodenough 1693! JOHORE; Machap, Goodenough 2000!

VAR. *papan*; leaves elliptic, rounded rarely cuneate at the base; filaments only one-third as long as anthers; pods orbicular very distinctly compressed.

MALACCA; Ayer Panas, Holmberg 814! Derry 1225! Goodenough 1553!

VAR. *burong*; leaves oblong, rounded at base; pods clavately obovoid.

MALACCA; Selandan, Holmberg 855!

The tree here described as var. *typica* is also the typical variety of *D. platysepalum* as described by Mr. Baker. For reasons given under that plant, the present writer has found it necessary to treat Mr. Baker's var. *Wallichii* as a distinct species.

No native name is given for the specimens of *D. platysepalum* collected by Griffith, Maingay, and Wray. Holmberg gives its Malay name as merely '*Koran*'; Derry for his n. 510 collected in 1890 (which, by the way, is quite different from his n. 510 collected in 1892) gives the name *Sepan*. For his n. 89 however Derry gives the name *Krangi s' Kellat*; the same name is used by Goodenough for his n. 1693. As explained under that species, Goodenough also uses this name, with the name *Krangi ambot* as an alternative one, for *D. Maingayi*; and it is true that though the flowers of *D. Maingayi* are quite different from those of *D. platysepalum*, their fruits are exceedingly alike and fruiting specimens of the two are only to be easily distinguished by the absence of pubescence from the leaves of *D. Maingayi*, the presence of a close golden-brown pubescence on the under-surface of those of *D. platysepalum*. Goodenough gives no native name for the Johore examples, which are quite like those from Perak and Malacca.

Whether the other two "varieties" here described are really separable as such, or whether, perhaps, they may not even prove to be distinct species, it is not, from the material at the writer's disposal, at present possible to decide. But field-botanists in the Peninsula should be able to settle the point satisfactorily for themselves.

VAR. *papan*, so named because each of the three gatherings has been noted as bearing the Malay name *Kranji papan*, differs from the type only in the characters noted. Its facies, owing to its broadly elliptic leaves and its conspicuously compressed pods, is somewhat distinct, and it is rather noteworthy that all three gatherings have received the same native name, a name too that has been applied to no other form.

VAR. *burong*, so named because it has been said by Holmberg to be termed *Kranji burong* by the Malays, has a still more distinctive facies owing to its pods being clavate, and because the pubescence on the under surface of its leaves is of a darker, somewhat brownish tint. Its leaflets too are in shape exactly like those of *D. ambiguum*. Still it does not seem possible to treat it as representing the fruit of *D. ambiguum* because in that tree the leaflets are almost exactly opposite and are very faintly puberulous beneath, in this they are conspicuously alternate and densely pubescent beneath. Its flowers have not been sent. The name *Kranji burong*, it should be noted, is used in Penang as an alternative one with *Kranji padie*, for *D. indum*.

8. *DIALIUM WALLICHII* Prain. A tree, branchlets brown, closely pubescent, slightly rugose, not leucicelled. *Leaves* alternate 7-8 in. long; leaflets 9-11, very conspicuously alternate, oblong-lanceolate, acuminate, apex acute, base cuneate, 2-2.25 in. long, .6-.8 in. wide, coriaceous, bright-green glabrous above, densely shortly yellowish-brown-silky beneath; leaf-rachis softly pubescent; lateral nerves about 15 pairs, only visible beneath and there hardly more distinct than the faint intermediate secondary venation; petiolules pubescent .1 in. long. *Panicles* terminal and axillary, 6-8 in. long, 3-4 in. wide, branches 2-3 in. long, ascending, rather flexuous, softly pubescent as is the main rachis; pedicels .1 in. long. *Calyx* .2 in. long, ovoid in bud, tube distinct, segments 5, subequal, much imbricate, broadly triangular-obtuse, thinly coriaceous, reflexed after flower opens, densely greenish-velvety outside, inside white, glabrous. *Petals* 0. *Stamens* 2, opposite upper calyx-segments; filaments very thick less than one-fourth the length of anther, connective uniformly softly pubescent. *Ovary* brown-silky, distinctly stipitate, tapering into the slender, incurved, puberulous style; ovules 2. *Pod* obovoid 1 in. long, .75 in. across, purplish-velvety. *Seed* solitary, subquadrate, indented near the micropyle; .4 in. long, .3 in. across, .15 in. thick, finely longitudinally striate. *D. platysepalum* VAR. *Wallichii* Bak. in Flor. Brit. Ind. II, 270. *Connaraceae* Wall. Cat. 8534.

MALACCA; *Maingay* 540! SINGAPORE; *Wallich* 8534! *Ridley*!

This very distinct species agrees with *D. platysepalum*, of which Mr. Baker has

made it a variety, in having the same golden-brown pubescence on the under surface of its leaflets. But the smaller size of these leaflets; the shortness of the petiolules; the great difference in sepals, glabrous within in *D. Wallichii*, velvety within in *D. platysepalum*; and the equally marked differences in the fruit and the seed have led the present writer to treat it as a species apart.

9. *DIALIUM KINGII* Prain. A tree with spreading branches 100–150 feet high, stem 3–4 ft. in diameter; branchlets brown closely pubescent, slightly rugose, not lenticelled. *Leaves* alternate 8–9 in. long; leaflets 13–15, opposite except the terminal one, oblong-lanceolate, apex abruptly cuneate or rounded with an obtuse or retuse tip, base cuneate or rounded, 2–2.5 in. long, .6–.8 in. wide, very rigidly coriaceous, deep-green glabrous and shining above, rusty-pubescent beneath, leaf-rachis glabrous; lateral nerves about 10 pairs rather distinct, secondary intermediate venation faint; petiolules glabrous .1 in. long. *Panicles* terminal and axillary, deltoid, 6–8 in. long, 8–10 in. across, branches 3–4 in., erecto-patent, densely dark-brown velvety as is the main rachis; pedicels usually in clusters of 3, .25 in. long. *Calyx* .25 in. long, ovoid in bud, tube obsolete, segments 5, subequal, much imbricate, broadly ovate-obtuse, reflexed after flower opens; externally densely brown-velvety, inside waxy-white closely pubescent. *Petals* 0. *Stamens* 2 opposite upper calyx-segments, filaments very thick and fleshy, one-third as long as the bright-yellow anther; connective uniformly softly pubescent. *Ovary* densely brown-velvety, sessile, tapering abruptly into the incurved puberulous style; ovules 2. *Pod* irregularly spherical, .9 in. long, .75 in. across, velvety-black. *Seed* solitary, subquadrate, warm-brown, faintly longitudinally striate, .4 in. long, .5 in. wide, .2 in. thick.

PERAK; Gopong district, in hilly localities from 300–1000 feet, *Kunstler* 4627! 8187!

No Malay name has been sent for this tree which is one of the most distinct and is perhaps the finest of the Peninsular species of *Dialium*. Its nearest ally is evidently *D. Wallichii* from which however its opposite leaflets, rusty-pubescent beneath, and its larger flowers at once distinguished it.

#### 47. BAUHINIA Linn.

Unarmed erect trees, or climbers with circinate tendrils. *Leaves* simple usually more or less deeply cleft from the tip, rarely entire or fully divided into two leaflets. *Flowers* usually showy sometimes small, in copious simple or paniced often corymbose racemes. *Calyx*-tube with a disc produced to the top, sometimes long and cylindric, sometimes short and turbinate or campanulate, limb entire and spathaceous or cleft into 2 or 5 teeth, very rarely campanulate truncate. *Petals* 5 subequal usually with a distinct claw. *Stamens* 10; or reduced to 5

or 3 or 1, if fewer than 10 with or without sterile filaments; filaments free filiform; anthers versatile dehiscent longitudinally. *Ovary* stalked, many-ovuled; style long or short, stigma small or large and peltate, subterminal or oblique. *Pod* linear or oblong, flat, continuous within, dehiscent or indehiscent. *Seeds* albuminous, funiculus usually broadly triangular. Species 150, spread throughout the tropics.

Fertile stamens 10, (flowers large showy):—

Leaflets distinct; calyx with a produced tube and a 5-cleft limb (§ *LYSIPHYLLUM*); a very extensive cirrhose climber ... .. 1. *B. diphylla*.

Leaflets connate; calyx with a short tube and a spathaceous limb (§ *PAULETIA*); shrubs:—

Lobes of leaves rounded; flowers yellow the upper petal with a central purple blotch; pod puberulous, not ribbed along upper suture ... .. 2. *B. tomentosa*.

Lobes of leaves subacute; flowers pure white; pod glabrous ribbed along each side of upper suture ... 3. *B. acuminata*.

Fertile stamens 3:—

Calyx-tube produced (§ *PHANERA*):—

Buds narrowly clavate, the calyx-tube passing gradually into the limb; tendrils 0; (flowers large showy):—

Erect; leaves glabrous above; calyx-limb spathaceous; pods glabrous ... .. 4. *B. purpurea*.

Climbing; leaves puberulous above; calyx-limb dividing into equal segments; pods pubescent ... 5. *B. mollissima*.

Buds widely clavate, with a rather abrupt transition from tube to limb; tendrils circinate more or less plentiful:—

Buds club-shaped—calyx-tube slightly ampullæformly dilated downwards, limb in bud obovate; anthers much longer than broad; (leaves of two connate leaflets with rounded or subacute apices):—

Petals glabrous except on midrib and claw externally; (flowers long-pedicelled in pyramidal terminal corymbs):—

Stipules persistent; style glabrous ... .. 6. *B. albo-lutea*.

Stipules deciduous; style densely pubescent ... 7. *B. semibifida*.

Petals uniformly densely pubescent externally:—

Petals much longer than calyx-lobes:—

Flowers long-pedicelled in pyramidal lateral and terminal corymbs; leaves pubescent, (stipules large persistent orbicular) ... 8. *B. Hullettii*.

Flowers short-pedicelled in dense terminal corymbs; leaves glabrous:—

Stipules large persistent orbicular ... 9. *B. Griffithiana*.

Stipules small deciduous ... .. 10. *B. ferruginea*.

Petals not longer than calyx-lobes; (leaves pubescent; corymbs terminal dense, flowers very shortly pedicelled) ... .. 11. *B. Ridleyi*.

Buds clove-shaped—calyx-tube cylindric, limb in bud ovate or orbicular; anthers shortly oblong:—

Leaves of two connate leaflets with rounded apices; (calyx-tube considerably longer than limb) ... 12. *B. glauca*.

Leaves entire or divided at the tip (in young plants of some species casually split to the base) into two narrow acute or acuminate lobes:—

Calyx-tube much longer than the limb; (leaves usually entire, less often divided at the tip, flowers in dense terminal corymbs):—

Leaves 5-7-nerved, adpressed-pubescent beneath; calyx rusty-downy; pod pubescent ... 13. *B. cornifolia*.

Leaves 7-9-nerved, glabrous beneath; calyx sparsely puberulous; pod glabrous ... 14. *B. bidentata*.

Calyx-tube not exceeding the limb:—

Inflorescence lax, the lower flowers not at all deciduous; leaves thick firm:—

Flowers in racemes, the lower pedicels not sensibly longer than those above:—

Racemes long, many-fld; leaves all entire, glabrous beneath ... 15. *B. lucida*.

Racemes short, few-fld; leaves rather deeply bifid, densely pubescent beneath ... 16. *B. Scortechinii*.

Flowers in corymbs, the lower pedicels manifestly longer than those next above:—

Leaves deeply cordate often subpeltate, not much longer than broad, sometimes 2-fld at tip, petiole 1 in. long ... 17. *B. Kingii*.

Leaves shallow-cordate, twice as long as broad, all entire, petiole 5 in. long ... 18. *B. Finlaysonianana*.

Inflorescence dense, most of the lower pedicels deciduous leaving the rachis below as a longish nodose peduncle; leaves thin flexible:—

Leaves entire or rarely slightly emarginate at tip, 5-nerved; calyx glabrous; (pod glabrous) ... 19. *B. Wrayi*.

Leaves divided at apex (only a few in region of inflorescence entire), nerves more than 5; calyx-pubescent:—

Leaves as broad as long, nerves 9-11, apical sinus wide deltoid; calyx rusty-pubescent; pod large pubescent ... 20. *B. integrifolia*.

Leaves longer than broad, nerves 7-9, apical sinus narrow; calyx grey-silky; pod small glabrous; flowers small ... 21. *B. glabrifolia*.

Calyx-tube very short (§ *Lasiobema*); (flowers small, in long narrow many-fld. racemes):—

Calyx-limb 5-partite; petals white; pods small glabrous; leaves flexible, divided at apex:—

Pod short, 2-seeded ... 22. *B. anguina*.

Pod longer, 3-5-seeded ... .. 23. *B. Curtisii*.  
 Calyx-limb entire; petals red; pods large densely pubescent (3-5-seeded); leaves rigid, entire ... .. 24. *B. strychnoidea*.

§ 1. *LYSIPHYLLUM* Benth. Fertile *stamens* 10. *Calyx* with a long tube and 5-cleft limb. *Pod* broad indehiscent. Leaflets distinct.

1. *BAUHINIA DIPHYLLO* Ham. in Syme, Embassy 476 c. Ic. (1800). A very extensive glabrous twining species with circinate tendrils, sometimes spreading 200-300 feet or further. *Leaves* cordate at base; leaflets always quite free, each 5-6-nerved, flexible, rounded at both ends, wider below, 3 in. long, 2 in. across, pale-green glabrous on both surfaces; petiole glabrous .75-1.25 in. long, slightly thickened at both ends. *Flowers* very large, in lax terminal racemes 8-12 in. long, pedicels glabrous ascending 1.5-2 in. long, bracts small ovate squamous; buds 2 in. long fusiform. *Calyx* thickly coriaceous, green, glabrous, limb cut to base into 5 lanceolate equal reflexed segments 1.2 in. long, tube .8 in. long very slightly infundibuliform. *Petals* lanceolate erect, clawed, equal, as long as calyx-lobes, .4 in. wide, white, faintly veined. *Stamens* 10, all fertile, equal, anthers linear, filaments as long as petals, glabrous. *Ovary* glabrous very long-stalked, style .5 in. long, somewhat incurved. *Pod* very large, thin and flat, 10-16 in. long, 3 in. wide, stipe 2 in. long, rather finely transversely veined. *Seeds* 30-40 in a row along the middle of the pod, oval, somewhat compressed, .5 in. long, .3 in. across, .2 in. thick, testa pale-brown shining. Wall. Cat. 5784; Bak. in Flor. Brit. Ind. II, 278. *Bauhinia Buchanani* Desv. Ann. Sc. Nat., ser. I, IX, 430. *Phanera diphylla* Benth. Pl. Jungh. 264.

MALACCA; Griffith (sive Baker). DISTRIB. Burma; S. India.

This species is extremely plentiful in Burma but has never been sent to Calcutta from Malaya. It is inserted on the authority of Mr. Baker in the *Flora of British India* II, 278.

§ 2. *PAULETIA* Cav. Fertile *stamens* 10. *Calyx* with very short tube and spathaceous limb. *Pod* narrow dehiscent. Erect shrubs with large showy flowers and connate leaflets.

2. *BAUHINIA TOMENTOSA* Linn. Sp. Pl. 375. An erect shrub with downy zig-zag rounded branches. *Leaves* truncate at base, flexible, rather broader than long, 2-2.5 in. wide, 7-9-nerved, cut three-sevenths down into two rounded obtuse or faintly acute lobes, shining glabrous above, closely pubescent beneath; petiole pubescent, slightly grooved above, thickened at both ends, .5 in. long. *Flowers* in short-peduncled leaf-opposed 2-fld. (rarely 1- or 3-fld.) peduncles .4-1.2 in. long, pedicels erect .2 in. long, 2-bracteolate, bracts linear .25 in. long; buds narrowly ovate-acute, .7 in. long, the tip very shortly subulately 5-lobed. *Calyx* green, finely closely pubescent, splitting spathaceously to the base of

the .5 in.-long limb, tube .2 in. long, distinctly infundibuliform. *Petals* obovate-spathulate, 1.75 in. long, .8 in. wide, yellow, the upper with a purple central blotch. *Stamens* 10, all fertile, subequal, anthers linear, filaments hirsute in lower half. *Ovary* distinctly stalked, densely tomentose, style .5–.7 in. long, straight. *Pod* 4–5 in. long, .5–.7 in. across, compressed, at length dehiscent, when ripe only faintly puberulous, not ribbed along upper suture; stipe .2–.25 in. long. *Seeds* 10–16, oblong, flattened, .25 in. long, .2 in. across, testa dark-brown shining. Roxb. Hort. Beng. 31; DC. Prodr. II, 514; Roxb. Flor. Ind. II, 323; Wall. Cat. 5790 A—E; Bot. Mag. t. 5560; W. & A. Prodr. 295; Miq. Flor. Ind. Bat. I, 75; Bedd. Flor. Sylv. 92; Bak. in Flor. Brit. Ind. II, 275. *B. speciosa* Roxb. in Wall. Cat. 5791 not of Vogel.

PENANG; fide *Baker*. ANDAMANS; *King's Collectors!* DISTRIB. S.-E.-Asia; Trop. Africa.

There are no Malayan specimens at Calcutta; the plant in the Andamans is, if not cultivated, probably introduced.

3. *BAUHINIA ACUMINATA* Linn. Sp. Pl. 376. A small erect shrub with obscurely downy zig-zag angular branches. *Leaves* slightly cordate, flexible, rather longer than broad, 3–6 in. wide, 9–11-nerved, cut one-third down into two triangular subobtuse or acute lobes, shining glabrous above, glaucescent hairy (sometimes at length glabrescent) beneath; petiole puberulous grooved above, thickened at both ends, 1–1.5 in. long. *Flowers* in leaf-opposed few-fl. corymbs, peduncle .5 in. long, pedicels erect the lowest .4 in. long, 2-bracteolate, bracts linear or subulate .15 in. long; buds lanceolate acuminate 1.5 in. long, the tip very shortly subulately 5-lobed. *Calyx* green, glabrous or faintly puberulous, splitting spathaceously to the base of the 1.25 in.-long parallel-veined limb, tube .25 in. long, very slightly infundibuliform. *Petals* oblong, pure white, glabrous, 1.75 in. long, 1 in. wide. *Stamens* 10, all fertile, subequal, anthers linear, filaments hirsute in lower third. *Ovary* long-stalked glabrous, style .5 in. long, curved. *Pod* 4–5 in. long, .6–.7 in. broad, firm, glabrous, compressed, at length dehiscent, strongly ribbed along each side of the upper suture, stipe .5 in. long. *Seeds* 10–15, ovate, flattened, .3 in. long, .2 in. wide. DC. Prodr. II, 513; Roxb. Hort. Beng. 31; Flor. Ind. II, 324; Wall. Cat. 5794; W. & A. Prodr. 295; Miq. Flor. Ind. Bat. I, 74; Bak. in Flor. Brit. Ind. II, 276. *B. candida* Ait. Hort. Kew. II, 49; DC. Prodr. II, 513 not of Roxb. *B. purpurea* Wall. Cat. 5797 (D only) not of Linn.

ANDAMANS; very common, *King's Collectors!* PERAK; *Kunstler* 413! 2386! 8283! *Scortechini* 1812! MALACCA; *Hervey!* etc. DISTRIB. China, India, Indo-China, Malay Archipelago.

§ 3. *PHANERA* Lour. Fertile *stamens* usually 3, sometimes 4–5.

*Calyx*-tube usually more or less produced; limb 5-cleft or, very rarely, spathaceous. Erect or scandent; flowers variable in size.

4. *BAUHINEA PURPUREA* Linn. Sp. Pl. 375. An erect tree 20–30 feet high, with moderately stout glabrescent branches and without tendrils. *Leaves* roundish, base shallowly cordate, apex divided one-third to one-half down, sinus wideish, lobes rounded obtuse or subacute; rigidly subcoriaceous, 4–6 in. long and broad, medium-green, glabrous above, paler and glabrous or faintly puberulous beneath; nerves 9–11; petiole 1·5 in. glabrous; stipules small membranous, triangular, 1 in. long, deciduous. *Flowers* in terminal and axillary short-peduncled few-fl. corymbs, 2–4 in. long; lower pedicels 25–5 in. long, puberulous as is the rachis, bracts minute deltoid, deciduous; buds clavate 1·5 in. long, tapering uniformly from the blunt apex to the base. *Calyx* tawny-downy, limb 9 in. long, splitting into 2 coriaceous valves slightly divided at the apex into 5 short teeth, tube slightly dilated upwards 6 in. long. *Petals* 5, oblanceolate acute with long claw, white to purple, 1·75 in. long, 5 in. wide. *Stamens* 3–4 fertile, anthers linear-oblong, filaments white, as long as the petals. *Ovary* very long-stalked, puberulous, ovules 16–20, style stoutish 4 in. long, stigma rather large oblique peltate. *Pod* glabrous 8–12 in. long, 8–1 in. across, tardily dehiscing, valves firm woody flat, rather pointed at both ends, stipe 1 in. long. *Seeds* 12–16, compressed, orbicular, 5 in. in diam. testa brown. Roxb. Hort. Beng. 31; Ham. in Trans. Linn. Soc. XIII, 497; Wall. Cat. 5797 in part; Roxb. Flor. Ind. II, 320; W. & A. Prodr. 296; Bedd. Flor. Sylv. 92; Bak. in Flor. Brit. Ind. II, 284. *B. triandra* Roxb. Hort. Beng. 31; Wall. Cat. 5799; Roxb. Fl. Ind. II, 320. *B. coromandeliana* DC. Prodr. II, 515. *Phanera purpurea* Benth. Pl. Jungh. 262; Miq. Flor. Ind. Bat. I, 60.

SINGAPORE; *Hullett* 218! perhaps planted. *DISTRIB.* India; Indo-China; China.

5. *BAUHINIA MOLLISSIMA* Wall. Cat. 5782 (1830). A rather slender climber, usually small but sometimes reaching 60–80 feet in length, branches slender persistently rusty-tomentose; apparently always without tendrils. *Leaves* roundish, base cordate, apex divided one-third down, sinus wide, lobes obtuse; rigidly subcoriaceous, 4–6 in. long, rarely a little narrower than broad, bright-green; above persistently puberulous along the nerves, elsewhere densely papillose and velvety to the touch but ultimately not hairy, beneath thinly persistently rusty-pubescent; nerves 11–13; petiole 1·25–1·5 in., rusty-pubescent. *Flowers* in leaf-opposed racemes, peduncle subterete 5–2·5 in. long, compressed towards tip, densely rusty-tomentose, lower flowers usually deciduous, bracts persistent ovate-acute under 1 in. long, pubescent externally,



glabrous within; pedicels .25 in. long, rusty-tomentose, 2-bracteolate near the apex; buds narrowly clavate 2-2.5 in. long, the narrowly fusiform upper part rather shorter than the narrow slightly infundibuliform base. *Calyx* densely tawny- to rusty-tomentose limb splitting into reflexed equal linear-lanceolate lobes 1-1.25 in. long, tube 1-1.25 in. long. *Petals* 5, narrowly oblanceolate, the four lower 2 in. long, .3 in. wide, reddish-brown with a central yellow streak, the upper 2.25 in. long, .5 in. wide, bright-red with a central branching yellow line, all narrowed into a long claw and pubescent externally. *Stamens* 3 fertile, anthers linear-oblong, filaments yellowish, uniform, glabrous. *Ovary* densely tawny-pubescent, stalk .5 in. long, tomentose as is the style .7 in. long, stigma small peltate; ovules 4-6. *Pod* pubescent, 4 in. long, 1 in. wide, tapering to both ends, stipe .5 in. long. *Seeds* 1-2, compressed, orbicular, about .4 in. in diam. *B. elongata* Korth. Nat. Verh. Gesch. 89 t. 24 (1839); Bak. in Flor. Brit. Ind. II, 281. *B. purpurea* Zoll. & Mor. Syst. Verzeichn. 1; Nat. en Geneesk. Arch. III, 69, not of Linn. *Phanera elongata* Benth. Pl. Jungh 262; Miq. Flor. Ind. Bat. I, 61. *B. Pottsi* G. Don, Gen. Syst. II, 462.

PERAK; *Scortechini*! *Kunstler* 1024! 2461! 5165! KEDAH; at Yau, *Ridley* 5206! PENANG; *Porter* (Wall. Cat. 5782)! MALACCA; *Mainyag* 542/2! DISTRIB. Northwards to Tenasserim; southwards to the Malay Archipelago.

The name given by Korthals being of considerably later date than that employed by Wallich, Dr. Wallich's name is here adopted. Korthals' figure conveys a rather inaccurate idea of the colour of the flower, the true nature of which is given from a full field-note made by Mr. Kunstler.

6. BAUHINIA ALBO-LUTEA Prain. A slender shrubby climber with slender rusty-pubescent branches, tendrils few circinate glabrous. *Leaves* roundish, base cordate, apex divided one-third down, sinus narrow apiculate, lobes usually subacute; rigidly subcoriaceous, 2.5-4 in. long, often rather broader than long, dark-green; glabrous above, persistently puberulous, rarely closely pubescent, beneath; nerves 11-13; petiole 1.5-2.5 in., sparsely puberulous; stipules oblong-obtuse, .2 in. long persistent. *Flowers* in few-flowered lax pyramidal terminal racemes, 3-4 in. long, 3 in. across, pedicels rusty-puberulous erectopatent the lower 1.5-1.75 in. long, bracts lanceolate .2 in. long, bracteoles subulate .15 in., deciduous; buds club-shaped, .9 in. long, the obovoid upper part exceeding the ampullæform base. *Calyx* rusty-puberulous, limb splitting into reflexed lanceolate segments .5 in. long, .1 in. wide, tube .4 in. long, slightly dilated towards base. *Petals* cream-coloured, 5 subequal, oblanceolate subacute distinctly clawed, 1.25 in. long, .3 in. wide, glabrous within, and glabrous externally except on the claw and

along the lower third of the midrib. *Stamens* 3 fertile, anthers linear-oblong, filaments uniform 1.5 in. long. *Ovary* distinctly stalked, rusty-pubescent, style slender glabrous, .8 in. long, stigma oblique peltate. *Pod* thin oblong with black glabrous woody valves. *Seeds* 2 (*vide* Miquel). *Bauhinia ferruginea* Kurz Journ. As. Soc. Beng. XLV. 2. 128 (Enum. Pl. Nicobars); loc. cit. 289 (Burm. Flora) not of Roxb. *Phanera albo-lutea* Miq. Flor. Ind. Bat. I, 1079.

NICOBARS; Great Nicobar, *Jelinek* 241! DISTRIB. Indo-China; Sumatra.

It is rather strange that this species should occur in Burma, the Nicobars and Sumatra and not have as yet been gathered in the Malay Peninsula. It is nearer to *B. semibifida* than to *B. ferruginea*, with which Mr. Kurz has placed it, both on account of its long pedicels and because of its almost glabrous petals, but it differs very markedly as regards bracts and stipules as well as in its ovary which has a glabrous style. Its nearest allies are, however, the Indian *B. nervosa* which differs in having pubescent petals, and the Sumatran *B. stipularis* Korth., which differs in having petals with cordate instead of cuneate bases.

7. BAUHINIA SEMIBIFIDA Roxb. Hort. Beng. 31. A very strong climber often exceeding 30 feet in length, with stems 4-6 in. thick; branchlets stoutish brightly rusty-silky, tendrils glabrous few, thick, woody, circinate. *Leaves* roundish, base cordate, apex divided one-third to one-half down, sinus narrow apiculate, lobes round or subacute; rigidly subcoriaceous, 2-3 in. long, sometimes a little narrower than broad, light-green and glabrous above, beneath with reddish rather densely rusty nerves, elsewhere sparsely adpressed-rusty silky; nerves 9-11; petiole 1-1.5 in., sparsely rusty-silky, stipules broadly ovate, falcate, .15 in. long, very deciduous. *Flowers* in pyramidal terminal racemes 4-10 in. long, 3 in. across, pedicels erecto-patent, rusty-pubescent, 1-1.5 in. long, bracts .2 in. long, lanceolate, deciduous; buds club-shaped .9-1.2 in. long, the obovoid upper part exceeding the ampullæform base. *Calyx* densely rusty-pubescent, limb splitting into reflexed lanceolate segments .5-.7 in. long, .15 in. wide, tube dilated slightly towards base, .4-.5 in. long. *Petals* 5 subequal, oblanceolate obtuse, shortly clawed, .8-1 in. long, .35 in. wide, dull, white, glabrous except on the claw and along the base of the midrib externally where there is a faint rusty pubescence. *Stamens* 3 fertile, anthers linear-oblong, filaments white, uniform, shorter than the petals. *Ovary* distinctly stalked densely rusty-silky, ovules 6-8, style thick silky stout, .4 in. long; stigma large oblique peltate. *Pod* thin oblong, with black glabrous woody valves, 4 in. long, 1.25 in. wide, stipe .35 in. long. *Seeds* 4-6, flattened, orbicular, .5 in. in diam. Wall. Pl. As. Rar. t. 253; Cat. 5783; Roxb. Flor. Ind. II, 330; Wight Ic. t. 263; Bak. in Flor. Brit. Ind. II, 280. *Phanera semibifida* Benth. Pl. Jungh. 263; Miq. Flor.

Ind. Bat. I, 61. *Bauhinia ferruginea* VAR. *excelsa* Bak. in Flor. Brit. Ind. II, 283; not *Phanera excelsa* Bl. *Phanera sumatrana* Miq. Flor. Ind. Bat. I, 1078.

MALACCA; Griffith 1868; Mount Ophir, Lobb! SINGAPORE; Lobb! Maingay 542/3! Schomburgk 60! Hullett 55! 146! Kunstler 1251! Ridley! DISTRIB. Sumatra; Borneo.

This is very near indeed to *B. ferruginea*, but is easily distinguished by the pubescence on the outside of the petals being limited to a line on the centre near the base. *Phanera excelsa* Bl., from Borneo, reduced by Korthals to *Bauhinia ferruginea* is a quite distinct species, recently again reported by Hullett (n. 246). The Malacca specimen collected by Griffith which Mr. Baker refers to *B. ferruginea* VAR. *excelsa* is not at Calcutta, but Maingay 542/3 referred at Kew to the same variety is, at Calcutta, exactly the same as typical *B. sumatrana* Miq. and is therefore only a large form of *B. semibijida*. Another Maingayan sheet (n. 542/2, referred also to *B. ferruginea* VAR. *excelsa*) is, at Calcutta, the quite different *B. mollissima* Wall. (*B. elongata* Korth.).

8. BAUHINIA HULLETTII Prain. A strong shrubby climber reaching 20 feet in length, branchlets stoutish pubescent, tendrils few circinate pubescent. *Leaves* roundish, base cordate; apex divided one-third down, sinus narrow apiculate, lobes round; rigidly subcoriaceous, 2·5–4 in. long, rather longer than broad, dark-green sparsely pubescent above, paler and closely adpressed-pubescent beneath; nerves 9–11; petiole 1–1·5 in., densely pubescent; stipules orbicular hirsute foliaceous, 5 in. in diam., persistent. *Flowers* in lax few-fl. lateral leaf-opposed racemes, 3–6 in. long, 3 in. across, pedicels erecto-patent densely rusty-tomentose, 1·25–1·5 in. long, bracts lanceolate 25 in. long as are the linear bracteoles 15 in. long; buds club-shaped, 7–9 in. long, the obovoid upper part exceeding the ampullæform base. *Calyx* pubescent, rose-red as are the pedicels, limb splitting into reflexed lanceolate segments 4–5 in. long, 1 in. wide, tube slightly dilated towards base, 3–4 in. long. *Petals* rose-pink, 5 subequal, oblanceolate-obtuse, long-clawed, 1·25 in. long, 4 in. wide, far exserted, glabrous within, very densely tomentose externally. *Stamens* 3 fertile, anthers linear-oblong, filaments uniform pink, 2 in. long. *Ovary* distinctly stalked, densely silky, style thick tomentose stout, 1·2 in. long, stigma large oblique peltate. *Pod* unknown.

PENANG; Curtis 784! J. Scott! Kunstler 1347! PERAK; Wray 177! MALACCA; Holmberg 775!

Very near *B. Griffithiana* but differs in having the stipules, though similar, very much smaller; in having the leaves pubescent instead of glabrous; in having long-pedicelled lax-flowered lateral corymbs instead of short-pedicelled dense-flowered terminal ones, and in having the flowers red or pink.

9. BAUHINIA GRIFFITHIANA Prain. A very strong shrubby climber reaching 20 feet in length, branchlets stout glabrous, tendrils few cir-

cinate, glabrous. *Leaves* roundish, base cordate, apex divided one-third down, sinus narrow apiculate, lobes round; rigidly subcoriaceous, 2·5–4 in. long, about as long as broad, dark-green shining above, paler beneath, quite glabrous on both surfaces; nerves 9–11; petiole 1–1·5 in. glabrous; stipules orbicular foliaceous, .75 in. in diam., persistent. *Flowers* in pyramidal terminal racemes 3·5–6 in. long, 3 in. across, pedicels spreading, rusty-pubescent, .4 in. long, bracts ovate .3 in. long, .25 in. wide, subsistent as are the two similar subequal bracteoles; buds club-shaped 1 in. long, the broadly obovoid upper part exceeding the ampullæform base. *Calyx* rusty-puberulous, limb splitting into reflexed lanceolate segments .6 in. long, .15 in. wide, tube slightly dilated towards base .4 in. long. *Petals* bright-yellow, 5 subequal, oblanceolate obtuse, shortly clawed, 1·25–1·5 in. long, .4–.5 in. wide, glabrous within, densely tomentose externally. *Stamens* 3 fertile, anthers linear-oblong, filaments red, dilated in the middle, 2 in. long. *Ovary* distinctly stalked, densely silky; ovules 6–8; style thick silky, stout, .6 in. long, stigma large oblique peltate. *Pod* thin, oblong, with black glabrous woody valves, 5 in. long, 1·5 in. wide, stipe .35 in. long. *Seeds* 4–6, flattened, ovate, .5 in. long, .35 in. across. *Bauhinia ferruginea* var. *Griffithiana* Bak. in Flor. Brit. Ind. II, 283. *Phanera Griffithiana* Benth. Pl. Jungh. 263; Miq. Flor. Ind. Bat. I, 65.

MALACCA; *Griffith* 1867! *Maingay* 542! *Hervey*! *Derry* 188! *Holmberg* 775! PERAK; *Scortechini* 298! PAHANG; *Ridley* 2606!

This agrees in foliage with *B. ferruginea* with which Mr. Baker has united it, and it has the same pubescence on the outside of the petals. But it differs considerably in flower and very markedly in the nature of its bracts and of its large persistent stipules and Mr. Bentham seems to the writer to have been undoubtedly justified in treating it as specifically distinct. It is in reality more nearly allied to *B. Hullettii* which has however pink flowers and pubescent leaves, and has the long-pedicelled flowers of *B. semibipida* and *B. albo-lutea*, than it is to the species in which Mr. Baker includes it.

10. BAUHINIA FERRUGINEA Roxb. Hort. Beng. 90. A very strong shrubby climber sometimes exceeding 20 feet, branchlets stoutish soon glabrescent, tendrils few circinate glabrous. *Leaves* roundish, base cordate, apex divided one-third down, sinus narrow apiculate, lobes round; rigidly subcoriaceous, 2·5–4 in. long, always about as broad as long, dark-green, shining and glabrous above, paler and glabrous beneath; nerves 9–11; petiole 1–1·5 in., glabrous; stipules broadly ovate, falcate, .15 in. long, very deciduous. *Flowers* in pyramidal terminal racemes 3·5–6 in. long, 3 in. across, pedicels spreading, rusty-pubescent, .4 in. long, bracts .2 in. long, lanceolate, deciduous; buds club-shaped 1 in. long, the broadly obovoid upper part exceeding the ampullæform base. *Calyx* rusty-puberulous, limb splitting into reflexed lanceolate segments .6 in. long,

·15 in. wide, tube slightly dilated towards base, ·4 in. long. *Petals* pale greenish-yellow, 5 subequal, oblanceolate-obtuse, shortly clawed, 1–1·25 in. long, ·35 in. wide, glabrous within, densely tomentose externally. *Stamens* 3 fertile, anthers linear-oblong, filaments pink, uniform, 2 in. long. *Ovary* distinctly stalked, densely silky; ovules 6–8; style thick, silky, stout, ·6 in. long, stigma large oblique peltate. *Pod* thin, oblong, with black glabrous woody valves, 8 in. long, 2 in. wide, stipe ·5 in. long. *Seeds* 4–6, flattened, broadly ovate, ·5 in. long, ·4 in. across. Wall. Cat. 5776; Roxb. Flor. Ind. II, 331; Bak. in Flor. Brit. Ind. II, 283 excl. both the varieties and the syn. of Korthals and G. Don. *Phanera ferruginea* Benth. Pl. Jungh. 262; Miq. Flor. Ind. Bat. I, 62.

PERAK; Wray 622! 1258! *Scortechini* 67! *Kunstler* 2508! 3492! 6173! PENANG; Porter (Wall. Cat. 5776)! *Curtis* 211!

This is very near to *B. semibifida* Roxb. but is at once distinguished by its petals being externally uniformly pubescent.

*Bauhinia ferruginea* Korth., referred by Mr. Baker to Roxburgh's plant, is an exceedingly distinct species. Korthal's plant is, in fact, the basis of *Phanera excelsa* Miq., which Mr. Baker elsewhere separates (as to citation) as a variety of *B. ferruginea*. The plant described as var. *excelsa* by Mr. Baker is, however, still another species (*B. sumatrana* Miq., which is only a form of *B. semibifida*). *B. Pottsii* G. Don, also referred here by Mr. Baker, has a tomentose pod and therefore cannot possibly be the present species. Don's plant is doubtless *B. mollissima* Wall. which is the only tomentose-fruited species at all nearly related to the present one.

11. *BAUHINIA RIDLEYI* Prain. A very strong shrubby climber reaching 20 feet in length, branches stoutish, thinly but persistently rusty-silky, tendrils few circinate persistently silky. *Leaves* roundish, base cordate, apex divided one-third down, sinus narrow apiculate, lobes usually subacute; rigidly subcoriaceous, 2·5–4 in. long, sometimes a little longer than broad, dark-green strigose above, densely adpressed-pubescent beneath; nerves 9–11; petiole ·75–1 in., densely rusty-pubescent; stipules ovate-lanceolate, falcate, ·15 in. long, very deciduous. *Flowers* in densely congested terminal corymbs 2 in. long and broad, pedicels densely silky ·3 in. long, spreading, bracts and bracteoles equal orbicular, persistent, densely tomentose, ·25 in. long; buds club-shaped ·7 in. long, the obovoid upper part exceeding the ampullæform base. *Calyx* densely softly rusty-pubescent, limb splitting into reflexed lanceolate segments ·4 in. long, ·1 in. wide, tube ·3 in. long, slightly dilated towards base. *Petals* pure-white, 5 subequal, oblong-obtuse, hardly clawed, not exerted, glabrous within, densely tomentose externally, ·4–5 in. long, ·2 in. wide. *Stamens* 3 fertile, anthers crimson, linear-oblong, filaments ·75 in. long, uniform, red. *Ovary* shortly stalked, densely tomentose, style thick, tomentose, stout, ·5 in. long, stigma large oblique peltate. *Pod* unknown.

PERAK; *Scortechini* 140! 519! *Kunstler* 1096! PENANG; *Ridley*! *Curtis* 1291! JOHORE; *King and Hullett*!

Very nearly related to *B. ferruginea*, *B. Hullettii*, *B. Griffithiana*, and like these species with petals densely pubescent outside; it is, however, easily recognised by its dense corymbs and by its short petals, not at all exerted.

12. *BAUHINIA GLAUCA* Wall. Cat. 5785. A spreading climber with glabrous slender branchlets; tendrils numerous circinate rusty-puberulous. *Leaves* cordate at base, bifid to the middle with obtuse lobes and a narrow sinus; firm, thinly coriaceous, rather broader than long, 2-3 in. across, glabrous above, thinly persistently adpressed rusty-pubescent especially on the nerves beneath; nerves 9-11; petiole .75-1.25 in. long, stipules linear-subulate .2 in. long. *Flowers* in copious, dense, peduncled or very rarely sessile, leaf-opposed and terminal corymbs, the peduncles sparsely rusty often 1-2 in. long, lower pedicels .5-.75 in. long sparsely rusty, bracts and bracteoles linear-subulate, .15-.2 in. long; buds clove-shaped .65 in. long, the ovoid head one-half shorter than the ridged cylindric base. *Calyx* glabrous, limb splitting into subequal ovate-acute lobes .25 in. long, tube .4 in. long, puberulous within. *Petals* 5 subequal, cream-coloured, oblong very long-clawed, wavy at the margin, .75 in. long, sparsely pubescent externally. *Stamens* 3 fertile, anthers short-oblong, filaments white uniform glabrous, .9 in. long, exceeding the petals, declinate. *Ovary* glabrous with a distinct slender stalk and a stoutish style, .15 in. long, slightly incurved; stigma small; ovules about 20. *Pod* thin glabrous, flat, 6-8 in. long, 1.5-2.5 in. across, stipe .25-.3 in. long. *Seeds* 15-20 in a line down the centre of the pod, much compressed, oval, .5 in. long, .3 in. wide. Bak. in *Flor. Brit. Ind.* II, 282. *Phanera glauca* Benth. Pl. Jungh. 265; Miq. *Flor. Ind. Bat.* I, 68, t. 2 A.

PERAK; *Scortechini* 219! *Wray* 3332! PENANG; *vide* Baker. DISTRIBUTION: Indo-China; China; Malayan Archipelago.

The pods are like those of *B. diphylla* but smaller and with shorter stipe. Its nearest allies are the Chinese *B. corymbosa* with similar but smaller leaves and with similar flowers but with narrow pods, and the Assam *B. tenuiflora* with similar pods but with less deeply bifid leaves and with a much longer calyx-tube. Mr. Baker has seen a variety from Singapore with smaller leaves (VAR. *parvifolia*); this has not yet been sent to Calcutta.

13. *BAUHINIA CORNIFOLIA* Bak. in *Flor. Brit. Ind.* II, 278. A very large slender creeper 100-150 feet long, stems 2-3 in. in diam., branches slender, thinly rusty-downy, tendrils few circinate downy. *Leaves* very slightly cordate at base, narrowed gradually to an obtuse or subacute entire or rarely bifid point, half as long again as broad, 2.5-3.5 in. long, 1.5-2.5 in. across, rather rigidly subcoriaceous, dark-green and glabrous above, thinly adpressed brown-silky beneath; 7- (rarely 5-) nerved; petiole 1 in. long, puberulous, slightly thickened at both ends. *Flowers*

in dense terminal corymbs, 4 in. long and broad; pedicels rusty, erecto-patent, the lower 1.75 in. long, bracts very small deciduous; buds clove-shaped, the cylindric base much longer than the spherical apiculate upper portion. *Calyx* rusty-downy, limb splitting into 5 subequal ovate shortly acuminate lobes .25 in. long, .2 in. across; tube cylindric .6-.7 in. long. *Petals* 5 subequal, deep orange-yellow at length becoming brick-red, oblanceolate-oblong very shortly clawed, .8 in. long, .5 in. wide, externally sparsely rusty-pubescent. *Stamens* 3 fertile, anthers shortly oblong, filaments much shorter than petals. *Ovary* densely rusty-downy, shortly stalked, style .2 in. long; stigma large peltate. *Pod* oblong woody, 4 in. long, 2 in. wide, externally finely adpressed rusty-pubescent; stipe .15-.2 in. long. *Seeds* about 4, much compressed, dark-brown, 1 in. long, .7 in. across.

PENANG; *Griffith*; *Kurz!* *Hullett* 123! *Curtis* 488! MALACCA; *Maingày* 545! PERAK; *Kunstler* 6261!

Very closely related to *B. bidentata* but differing in having larger flowers, pubescent pods, and leaves slightly downy beneath. The character derived from the leaf-apex, which appeared reliable when Mr. Baker's account of the Indian *Bauhinias* was published 20 years ago, is now proved, by the large suites of specimens sent to Herb. Calcutta during recent years, to fall within the limits of both of these species.

14. BAUHINIA BIDENTATA Jack, Malay. Misc. II, 7, 76. A very large strong creeper over 150 feet long, or sometimes, when growing apart, shrubby or even tree-like (*Kunstler*, *Hullett*), branches slender glabrescent, tendrils few circinate quite glabrous. *Leaves* very slightly cordate at base, sometimes truncate, narrowed gradually to an obtuse or sub-acute bifid or entire point, half as long again as broad, 2.5-5 in. long, 1.5-3.5 in. across, rather rigidly subcoriaceous, dark-green shining above, pale beneath, glabrous on both surfaces; 7-9-nerved; petiole 1 in. long, glabrous, slightly thickened at both ends. *Flowers* in dense terminal corymbs 3 in. long and broad; pedicels finely pubescent, erecto-patent, the lower 1.5 in. long, bracts ultimately deciduous, ovate-acute, .15 in. long; buds clove-shaped, the cylindric base much longer than the spherical acute but not apiculate upper portion. *Calyx* puberulous, limb splitting into subequal ovate-acute lobes .3 in. long, .2 in. across; tube cylindric striate 1 in. long. *Petals* subequal, deep orange-yellow at length becoming scarlet, oblong, spreading, shortly clawed, .6 in. long, .35 in. wide, externally sparsely rusty-pubescent. *Stamens* 3 fertile, anthers shortly oblong, filaments short hirsute. *Ovary* sparsely pubescent, distinctly stalked, style .2 in. long, stigma large peltate. *Pod* oblong woody, 4.5 in. long, 1.5 in. wide, externally quite glabrous, stipe .25 in. long. *Seeds* 4-5, much compressed, .5 in. long, .35 in. wide. Hook. Comp. Bot. Mag. I, 223; Wall. Cat. 5778; Bak. in Flor. Brit.

Ind. II, 279. *Phanera bidentata* Benth. Pl. Jungh. 263; Miq. Flor. Ind. Bat. I, 64.

PERAK; *Scortechini* 93! 248! *Wray* 1628! *Kunstler* 803! 1000! 3130! 3183! 3528! 4797! 6533! PENANG; *Porter* (Wall. Cat. 5778)! *Hullett* 181! *Kunstler* 1300! *Curtis* 136! SELANGOR; *Ridley* 318! JOHORE; *King! Hullett* 833! DISTRIB. Sumatra (*Forbes!*); Philippines.

Nearest to *B. cornifolia* Bak.

15. *BAUHINIA LUCIDA* Wall. Cat. 5779 A. A large creeper more than 100 feet long, with stoutish glabrous branches; tendrils long circinate glabrous. *Leaves* usually distinctly cordate at the base, tapering from below the middle to an ultimately abruptly shortly acuminate point; rather longer than broad, 3–5 in. long, 2–2.5 in. wide, rigidly subcoriaceous, bright-green shining above, glabrous on both surfaces, 5-(rarely 7-) nerved; petiole 3–4 in. long, glabrous. *Flowers* in lax long-peduncled copious paniculate racemes, terminal and extending into the axils of the upper leaves, 4–6 in. long, 2 in. across; pedicels rusty-puberulous, erecto-patent, subequal throughout the raceme, rarely exceeding .75 in. long, bracts lanceolate, deciduous, .2 in. long, bracteoles 2 subpersistent, subopposite, subulate, .15 in. long, near base of calyx-tube; bud clove-shaped, the subcylindric base as long as the obovoid blunt upper portion. *Calyx* closely rusty-tomentose, limb splitting into subequal ovate-obtuse lobes .25 in. long, .2 in. across; tube subcylindric .25 in. long. *Petals* subequal, bright-yellow, ovate-oblong, long-clawed, .8 in. long, .5 in. across, externally rusty-pubescent. *Stamens* 3 fertile, anthers shortly oblong. *Ovary* glabrous except on sutures near the base, stalk distinct pubescent; style .15 in. long, glabrous, stigma large peltate. *Pod* narrowly oblong, woody, 3.5 in. long, 1 in. wide, narrowing towards the base, valves glabrous; stipe .25 in. long, rusty-pubescent. *Seeds* 4–6, irregularly orbicular, compressed, .4 in. across. *Bauhinia emarginata* Bak. in Flor. Brit. Ind. II, 278 not of Mill. and hardly of Jack. *Phanera lucida* Benth. Pl. Jungh. 262.

PENANG; *Porter* (Wall. Cat. 5779)! PERAK; *Wray* 2127! *Scortechini* 66! 1534! *Kunstler* 3434! 3902! 6659!

Mr. Bentham and Mr. Baker both refer to this species *B. emarginata* Jack, from Sumatra. But Jack's plant has, by the original description, corymbose racemes with long pedicelled flowers and has tomentose ovaries. It is therefore quite clear that it cannot be the same as *B. lucida* Wall. In any case the use of the name '*emarginata*' is to be deprecated, seeing that it was applied to a Mexican species (*B. emarginata* Mill. *Dict.*, ed. VIII, 5) before Jack's name was published.

16. *BAUHINIA SCORTECHINI* Prain. A large climber with slender branches, glabrous except at the rusty-puberulous tips, tendrils long circinate puberulous. *Leaves* one and a half times as long as broad,



very shallowly cordate or truncate at base, from which they taper gradually to the junction of upper and middle third thence more abruptly to a bifid tip; 3·5–4 in. long, 2–2·5 in. wide, rigidly coriaceous, dark-green and shining above, uniformly densely rusty-tomentose beneath; nerves 9, rarely 7; sinus ·75 in. deep, very narrow; petiole 1·5 in. long, glabrous, thickened at both ends. *Flowers* in lax, few-fld., terminal short racemes under 2 in. long; pedicels and rachis rusty-pubescent, the former erecto-patent, subequal throughout, the lowest not exceeding ·5 in.; bracts lanceolate subsistent ·15 in. long, bracteoles 2 subsistent subopposite subulate, ·15 in. long; bud ·5 in. long, clove-shaped, the cylindric base as long as the spherical upper portion. *Calyx* closely rusty-tomentose, limb splitting into subequal ovate lobes; tube cylindric ·25 in. long. *Petals* subequal ovate, externally densely rusty-tomentose (fully opened flowers not seen). *Stamens* 3 sometimes 4 fertile, anthers short oblong, filaments hirsute. *Ovary* rusty-pubescent, stalk and style distinct, the latter glabrous; stigma large peltate. *Pod* not seen.

PERAK; *Scortechini* 698!

This species is evidently very closely related to *B. lucida* with which it agrees altogether in inflorescence and largely in shape of leaf. It differs however in having the leaves densely tomentose beneath and in having them all deeply bifid at the tip. The colour of the flower has not been noted by Father Scortechini, but the petals, in the dried state, are exactly like those of the numerous species that are noted as having orange-yellow flowers which redden with age, and are unlike those petals that are noted as white. Owing to the absence of fully opened flowers the dimensions of petals and the lengths of stipe and style cannot be given.

17. *BAUHINIA KINGII* Prain. A small climber with slender zig-zag glabrous branches, tendrils circinate glabrous, often much thickened. *Leaves* deeply cordate often slightly subpeltate at base, narrowed gradually from the rounded basal lobes to an ultimately shortly acuminate emarginate or often deeply bifid rarely entire apex, rather longer than broad, 3·5–4 in. long, 2·5–3 in. wide, rigidly coriaceous, medium-green, glabrous and shining above, pale and puberulous along the nerves, very sparsely adpressed-pubescent elsewhere beneath; very uniformly 5-nerved, the nerves much branched outwards; petiole 1 in. long, glabrous. *Flowers* in lax, lateral axillary and terminal corymbs, 3 in. long, 2·5 in. broad, sometimes forming large loose leafless or leafy zig-zag panicles 6 in. across and at times 1–1·5 ft. long; pedicels very sparsely puberulous, spreading, the lowest 1·25 in. long; bracts at base ·2 in. long, lanceolate; bracteoles near apex ·1 in. long subulate, both deciduous; bud clove-shaped, ·5 in. long, the narrowly-infundibuliform base as long as the subglobose apiculate upper part. *Calyx* closely rusty-pubescent, limb splitting into subequal ovate, very shortly acuminate lobes ·25 in. long, ·2 in. across; tube narrow-infundibuliform,

·25 in. long, ·15 in. in diam. at apex. *Petals* subequal, bright-red (*Wray*), oblanceolate-obtuse, long-clawed, ·8 in. long, ·25 in. wide, externally rusty-pubescent. *Stamens* 3 fertile, anthers shortly oblong, filaments hirsute. *Ovary* rusty-pubescent along sutures, long-stalked; style long, curved, puberulous, ·25 in. long, stigma large peltate. *Pod* small, quite glabrous; woody, narrowly ovate, tapering to both ends, 2 in. long, ·8 in. across; stipe ·2 in. long, pubescent. *Seeds* 1 or 2, ovate, compressed, ·3 in. long, ·2 in. across.

PERAK; *Scortechini* 320! on Gunong Batu Pateh, at 4500 feet, *Wray* 392! SELANGOR; Bukit Etam, *Kellsall* 2001! DISTRIB. Borneo?

This is an exceedingly distinct species, more nearly approaching *B. Finlaysoniana* than any of the other Peninsular species, but amply distinct in the shape and colour of its flowers, the smaller size of its pods, the pubescence on its leaves beneath; also in the shape of the leaves and the type of nervation. Beccari n. 835, from Borneo, of which however there are only 2 leaves and one flower at Calcutta, appears to be the same.

18. *BAUHINIA FINLAYSONIANA* Grah. in Wall. Cat. 5801. A large climber, over 100 feet long, branches slender glabrous, tendrils few circinate glabrous. *Leaves* slightly cordate at base, oblong, narrowed rather suddenly from above the middle to an obtuse or emarginate or acute point; about twice as long as broad, 3–5 in. long, 1·5–2·5 in. across, rigidly coriaceous, medium-green, glabrous on both surfaces, 5- (rarely 3-) nerved; petiole ·3–4 in. long, glabrous. *Flowers* in rather lax, terminal corymbs 3–4 in. long, 2–3 in. across; pedicels closely rusty-pubescent, erecto-patent, the lowest 1 in. long; bracts lanceolate, ·15 in. long, deciduous; buds clove-shaped, the subcylindric base rather shorter than the ovoid-acute upper portion. *Calyx* densely rusty-tomentose, limb splitting into subequal ovate-acute lobes ·25 in. long, ·2 in. across; tube subcylindric, ·2 in. long. *Petals* subequal, creamy-white or pale yellow, orbicular, distinctly clawed, ·6 in. long, ·5 in. across, externally rusty-pubescent. *Stamens* 3 fertile, anthers shortly oblong. *Ovary* densely pubescent along sutures and on the distinct stalk, style short (·15 in.), glabrous, stigma large peltate. *Pod* (not quite ripe) linear-oblong, woody, 2 in. long, ·6 in. wide. *Seeds* 4–6. Bak. in Flor. Brit. Ind. II, 278. *Phanera Finlaysoniana* Benth. Pl. Jungh. 262.

PENANG; foot of Government hill, *Curtis* 295! PERAK; *Scortechini* 247! 1463! *Kunstler* 3589! *Wray* 2300! DISTRIB. Siam (*Finlayson*).

Mr. Benthham describes this as having almost glabrous petals; this is not the case in the Peninsular specimens. Both Mr. Benthham and Dr. Miquel doubt whether it be more than a form of *B. lucida*; it is, however, extremely distinct from that species and is much more nearly related to *B. Kockiana* Korth. (*Verh. Nat. Geschied.* 87, t. 10), which differs mainly in usually having 3-nerved leaves and in always having rather longer pedicels and a much longer calyx-tube. Dr. Finlayson's

specimens are said by Mr. Benthams to be from the Malay Archipelago, by Mr. Baker to be from the Peninsula; we know, however, from Dr. Wallich's correspondence that the majority of Finlayson's specimens, more particularly those without any definite locality, came from Siam.

19. *BAUHINIA WRAYI* Prain. A shrubby creeper 15–30 feet long, with slender glabrous branches and circinate glabrous tendrils. *Leaves* flexible, truncate very rarely cordate at the base, tapering from about the middle to an acute entire, very rarely an obtuse emarginate apex, rather longer than broad, 2–3 in. long, 1·25–1·75 in. across, medium-green, glabrous above, glaucescent glabrous or faintly puberulous only on the nerves beneath; very uniformly 5-nerved; petiole slender, glabrous, ·5–·6 in. long. *Flowers* in dense close-fld. terminal and axillary racemes, 2·5–4 in. long, the lower flowers deciduous except the few that become fertilised, the remaining terminal portion corymbose 2·5 in. long and broad; pedicels very slender, thickening in fruit, 1·35 in. long, sparsely rusty as is the slightly nodose main-rachis, bracts subulate ·2 in. long, very deciduous; bud clove-shaped, only ·2 in. long, the spherical minutely apiculate upper part in diameter equalling the length of the slender cylindrical base. *Calyx* glabrous, tube ·15 in. long, limb splitting into 5 spatulate subequal lobes ·15 in. long. *Petals* pale greenish-yellow, or white at length pinkish, broadly oblanceolate, long-clawed, ·6 in. long, ·2 in. across, margins slightly wavy, sparsely pubescent externally. *Stamens* 3 fertile, anthers shortly oblong. *Ovary* small, 3–4 ovuled, distinctly stalked, quite glabrous throughout, style ·15 in. long, stigma small peltate. *Pod* obovate to oblong-obtuse, tapering to base, thin, woody, stipe ·2 in. long, 2–3 in. long, 1 in. across, quite glabrous. *Seeds* 1–2, rarely 3, very much compressed, broadly ovate, ·5 in. long; ·4 in. across, testa dark-brown, dull.

PERAK; *Kunstler* 2238! 2466! 4049! 5243! *Scortechini* 1652! *Wray* 1934! 2782! SELANGOR; *Kunstler* 8758!

Very distinct from any other Peninsular species, and by its inflorescence (in which it most resembles *B. integrifolia* among the *Phaneras*) connecting *Phanera* with *Lasiobema*, its small flowers approaching those of the latter section. It is extremely nearly allied to a Bornean species (represented by *Mottley* n. 376 and *Haviland* n. 95) which differs in having deeply cordate leaves, in having quite glabrous pedicels, and in having the petals, though similarly crenulate, larger and almost glabrous. It is just possible that the Borneo plant may be the lost *B. cordifolia* Roxb.

20. *BAUHINIA INTEGRIFOLIA* Roxb. Hort. Beng. 90. A large climber over 100 feet long, branches slender rusty-puberulous, tendrils circinate rusty. *Leaves* usually deeply cordate, always about as long as broad, mostly 4–6 in. across and with a deltoid apical sinus ·4–·6 in. deep; the leaves in the region of inflorescences usually small 1·25 in. long, 1 in. across, not infrequently entire; the leaves on young root-shoots

or seedlings paler and larger often 8 in. across, much broader than long with an obtuse-angled sinus reaching nearly halfway down and with divergent deltoid lobes 3-4 in. long; thinly subcoriaceous, bright-green, glabrous and shining above, at times brownish underneath especially on the nerves which are sometimes rusty-pubescent; nerves 11, very rarely 9; petiole glabrous cylindrical thickened at both ends, usually 1.75-2.25 in. long, upper petioles in inflorescence .25-.5 in. only; petioles of young shoots and seedlings sometimes exceeding 4 in. *Flowers* in terminal leafy panicles a foot long, the individual racemes dense close-fld., 3-6 in. long, the lower flowers deciduous except the few that are fertilised, the remaining terminal portion corymbose 3 in. long and broad; pedicels very slender, thickening in fruit, 1.5 in. long, spreading, rusty-pubescent as is the nodose main-rachis; bracts very short, ovate-acute, sometimes persisting; bud clove-shaped, .35 in. long, the cylindrical base slightly shorter than the ovate upper part. *Calyx* rusty-pubescent, tube .15 in. long, limb splitting into 5 subequal ovate-acute lobes .2 in. long. *Petals* 5 subequal, bright-yellow passing with age to orange and brick-red, broadly obovate, long-clawed, .7 in. long, .3 in. wide, margins slightly wavy, very densely rusty-pubescent externally. *Stamens* 3 fertile, anthers shortly oblong. *Ovary* 4-6-ovuled, densely pubescent, shortly stalked, style very long, .6 in., glabrous, stigma small peltate. *Pod* oblong, flat, woody, 7-8 in. long, 2.5 in. across, externally pubescent, stipe .15 in. long only. *Seeds* 3-5, very much compressed, broadly ovate, .9 in. long .7 in. across, margin deeply notched at micropyle; funicle flat triangular .5 in. long, .5 in. broad at base, narrowing obliquely to the hilum. Wall. Cat. 5780; Roxb. Flor. Ind. II, 331; Bak. in. Flor. Brit. Ind. II, 279. *Phanera integrifolia* Benth. Pl. Jungh. 263; Miq. Flor. Ind. Bat. I, 64 and Suppl. 286.

PAHANG; *Ridley* 1360! 5023! PENANG; *Wallich* 5780 B! *Curtis* 300! 500! 501! PROV. WELLESLEY; *Kunstler* 1608! PERAK; *Scortechini* 98! 515! 1174! *Kunstler* 819! 964! 3585! 3947! 4897! 5538! *Wray* 46! MALACCA; *Maingay* 541! 544! *Hullett* 89! *Hervey!* *Derry* 6! 76! 484! 1118! *Holmberg* 850! 866! *Goodenough* 1276! 1672! DISTRIB. Sumatra.

Like *B. Wrayi* this species serves to connect *Phanera* with *Lasiobema*. In Perak, Mr. Wray informs us, the Malay name of this species is *Dadau*; he says that string and rope are made from the inner bark. Dr. Jack, on the other hand limits the name *Dadaub*, in Sumatra, to his *B. emarginata*. In Malacca there appears to be some dubiety as to the Malay name of the species, the following being those noted:—*Akar Katop-Katop* (*Derry*, 1118; *Holmberg*, 866; *Goodenough*, 1276): *Akar t'pak kuda merah* (*Goodenough*, 1672): *Sarau* (*Holmberg*, 850): *Panga Sarau* (*Derry*, 484).

21. *BAUHINIA GLABRIFOLIA* Bak. in *Flor. Brit. Ind.* II, 281. A slender climber 50–80 feet long, stem 1·5 in. in diam., branchlets slender at first grey-silky, tendrils few short, circinate, woody, sparsely silky. *Leaves* truncate or shallowly cordate, very rarely deep-cordate at base, gradually tapering to an acute point, towards apex of twigs entire, lower down cleft at tip, with narrow sinus extending one-sixth to one-fourth down and with narrow acute lobes; the leaves of young plants and root-shoots bifid to the very base; rather longer than broad, 4–6 in. long, 3–4·5 in. wide, light-green, shining, quite glabrous above, when young pubescent on the nerves at length glabrous beneath; nerves 9 more rarely 7, in the quite 2-fid. leaves 3 or 4 to each lobe; petiole 1·25–2 in., glabrous. *Flowers* in terminal panicles, 8 in. long, 4 in. wide, of numerous dense short-peduncled many-flowered corymbs 2 in. long, 1·25 in. wide, pedicels erecto-patent 35–5 in. long, loosely grey-silky, bracts at bases of corymb-peduncles 2, stipellar, ovate-acute, 1·5 in. long, silky beneath, glabrous above, at base of pedicels solitary, lanceolate, persistent, 2 in. long, bracteoles about middle of pedicels 2, subopposed, subulate, 1·5 in. long; buds clove-shaped, the spherical subapiculate upper part longer than the narrowly cylindrical base. *Calyx* rather laxly grey-silky, limb splitting into spreading subequal ovate lobes with inturred tips, 2·5 in. long, tube 1·5 in. long. *Petals* small white, obovate, clawed, 3 in. long, densely grey-silky outside. *Stamens* 3 fertile, anthers very shortly oblong, filaments white slender glabrous, 5 in. long. *Ovary* densely silky especially along sutures, distinctly stalked, style glabrous slender, 2 in. long, stigma small. *Pod* (young) with silky sutures and glabrous valves; stipe 2·5 in. long. *Bauhinia diptera* Blume ex Miq. *Anal. Ind.* I, 12. *B. piperifolia* Kurz, *Journ. As. Soc. Beng.* XLV, 2, 288 not of Roxb. *B. anguina* Kurz, *Journ. As. Soc. Beng.* XLV, 2, 288 not of Roxb. *Phanera diptera* Miq. *Flor. Ind. Bat.* I, 70.

PERAK; *Scortechini* 316! 1512 (spp. with distinct leaflets = *B. diptera* Bl.)! *Kunstler* 4311! 4511! 6170! *Wray* 3960! PENANG; *Curtis* 801! 1541! *DISTRIB.* Tenasserim; Pegu; Borneo.

This is extremely nearly related to *Bauhinia piperifolia* Roxb. (*Phanera glabrifolia* Benth.) and has, indeed, been united with Roxburgh's species both by Mr. Kurz and by Mr. Baker. It is however very easily distinguished by its stipelliform main-bracts, not present in *B. piperifolia*; its much longer persistent bracts at base of pedicels; its pedicels less than half as long, with a spreading, not adpressed, tomentum; and its densely woolly ovaries, those of *B. piperifolia* being quite glabrous.

The oldest name is *Bauhinia diptera* Bl. but as the term is applicable only to young leafy root-shoots or to seedling plants and is quite inappropriate when used in connection with flowering branches of adult plants, it seems much better to neglect it. When Mr. Baker's name is used, however, it has to be recollected

that it is merely the name which one employs, and that this can be done only because Baker has referred to his *B. glabrifolia* some Tenasserim specimens collected by Helfer that differ specifically from the plant he describes; both the diagnosis and the cited synonyms of the *Flora of British India* must be altogether excluded.

§ 4. LASIOBEMA Korth. Fertile *stamens* 3. *Calyx* with very short tube and equally 5-partite or entire truncate limb. *Pod* dehiscent or (*B. anguina*) indehiscent. Slender climbers with long narrow racemes of very small flowers.

22. BAUHINIA ANGUINA Roxb. Hort. Beng. 31. A woody climber with slender glabrous branchlets and circinate tendrils. *Leaves* ovate, base cordate, apex of upper leaves often entire, of the others very variably shallowly to deeply 2-fid, sometimes on young plants and root-shoots quite divided to the base with more or less divergent and more or less acuminate lobes; membranous, 2·5–5 in. long, 2–3 in. wide, bright-green, shining, glabrous on both surfaces; nerves 5–7; petiole 1 in. long, glabrous. *Flowers* very small in many-fld. racemes arranged in terminal panicles often extending into axils of upper leaves, 6 in. long, as much across, individual racemes 2–4 in. long, 5 in. across, pedicels spreading, equal, 15 in. long, very slender, faintly puberulous as is the main-rachis, bracts minute linear; buds small spherical, 07 in. in diam. *Calyx* faintly puberulous, tube campanulate very short, lobes ovate 07 in. long, spreading. *Petals* oblanceolate, 12 in. long, puberulous externally, white. *Stamens* 3 fertile, filaments 1 in. long. *Ovary* distinctly stalked, glabrous, style slender 1 in. long, stigma minute. *Pod* thin flat oblong, glabrous, indehiscent, 1·5–2 in. long, 1 in. across. *Seeds* oblong, 6 in. long, 35 in. wide, only slightly compressed, long diameter in long axis of pod. Cor. Pl. III, t. 285; DC. Prodr. II, 516; Wall. Cat. 5773; Roxb. Flor. Ind. II, 328; W. & A. Prodr. 298; Bak. in Flor. Brit. Ind. II, 284. *B. scandens* Linn. Sp. Pl. I, 374 (as to Rheede's Malabar, not as to Rumphius' Malayan plant.) *Lasiobema anguinum* Korth. ex Miq. Flor. Ind. Bat. I, 71.

MALAYAN PENINSULA; *vide* Baker in *Flora of British India*. **DISTRIB.** India; Indo-China; Malay Archipelago.

Mr. Baker notes this as being from the Eastern Peninsula; no specimens have been sent to Calcutta as yet. Dr. Miquel claims it also as a native of the Malay Archipelago; from this region likewise, no specimens have as yet been sent here; all those at Calcutta from the Archipelago belong to *Lasiobema Horsfieldii* Miq. This latter form Mr. Baker has reduced to *B. anguina* and the writer agrees with Baker in believing that the two plants are not specifically separable. At the same time he considers it better to treat *L. Horsfieldii* as varietally distinct, on account of its much smaller pods which are only 1–1·25 in. long, and 5–6 in. wide: Dr. Watt too has, in Herb. Calcutta, proposed for the plant the name *B. anguina* var. *Horsfieldii* Watt MSS. The point is here dwelt on because of the possibility that, when *B. anguina* is again collected in the Peninsula, it may prove to be this Sumatra and

JAVA VAR. *Horsfieldii*, and not the typical, larger fruited Indian variety, that is characteristic of the region.

23. *BAUHINIA CURTISII* Prain. A woody climber with slender very faintly puberulous branchlets. *Leaves* ovate-oblong, base rounded, apex divided at the tip into two short diverging deltoid lobes, sinus wide rectangular, a few of the smallest uppermost leaves entire at apex; membranous, 2.5-4 in. long, 2-2.5 in. wide, bright-green glabrous on both surfaces; nerves 5-7; petiole 1.25 in. long, glabrous. *Flowers* very small in terminal, simple, many-fl'd. racemes or panicles that extend into axils of upper leaves, 4 in. long and as much across, individual racemes 3 in. long, 1 in. across, pedicels spreading, equal, .5 in. long, very slender, faintly puberulous as is the main rachis, bracts minute linear; buds small ovate-acute, .15 in. long. *Calyx* puberulous externally, tube campanulate very short, lobes ovate-lanceolate spreading, .15 in. long. *Petals* spathulate, glabrous, .25 in. long, clawed, white. *Stamens* 3 fertile, filaments .35 in. long. *Ovary* shortly stalked, glabrous, style slender, .15 in. long, stigma minute. *Pod* thin flat, black, somewhat flexible, slightly recurved, quite glabrous, 2.5 in. long, .75 in. wide, stipe .07 in. long. *Seeds* 3-5, not seen quite ripe.

KEDAH; Langkawi, Trutow, *Curtis* 1682! near the lake, *Curtis* 2619!

Very nearly related to *B. Championii* Benth., from S. China and the Eastern Himalaya, which has similar but rather larger pods. The present species, however, has longer pedicels, smaller buds, shorter calyx-lobes, a shorter stipe to the ovary and pod. The ovary here is also quite glabrous as are the leaves beneath; in *B. Championii* the ovary is somewhat silky, the leaves adpressed pubescent beneath. It is easily distinguished from *B. anguina* by the longer pods and pedicels. Mr. Curtis' specimens have no tendrils.

24. *BAUHINIA STRYCHNOIDEA* Prain. A slender climber 60-80 feet long with stems only 1 in. in diam., branches slender glabrous, tendrils few very small circinate glabrous. *Leaves* ovate-acute, base cuneate or rarely rounded, apex entire; rigidly subcoriaceous, 3-3.5 in. long, 1.5-2 in. wide, bright-green glabrous, polished above, dull beneath; nerves 5, the outer pair very slender the inner almost as strong as the laterally branching midrib with whose base they are usually more or less confluent; petiole .75 in., glabrous. *Flowers* small, in many-fl'd. racemes arranged in terminal panicles extending into axils of upper leaves, 8-12 in. long, 4-6 in. across, individual racemes 6-10 in. long, 2 in. wide, pedicels spreading, equal, .75 in. long, very slender, glabrous as is the main rachis, bracts minute linear; buds small, obovoid, .2 in. long, *Calyx* glabrous, tube campanulate very short, limb wide-campanulate .2 in. long and as much across, the entire margin truncate with 5 minute projections representing calyx tips. *Petals* spathulate, quite glabrous externally,

slightly puberulous within along midrib, the upper rather longer sub-acute, the others obtuse .35 in. long, light-red, spreading. *Stamens* 3 fertile, filaments .3 in. long. *Ovary* very shortly stalked, densely pubescent, style .2 in. long, stigma large peltate. *Pod* thin flat densely velvety, 3-5 in. long, 2 in. across, valves woody; stipe very short. *Seeds* 3-5, ovate, dark-brown, 1 in. long, .6 in. across.

PERRAK; *Kunstler* 5914! 7054! *Scortechini*! SELANGOR; Kwala Lampir, "top of the cave," *Kelsall* 1971!

A very remarkable species at once distinguished from any of the other Malayan ones by its leaves, which have the nervation of a *Strychnos*; and from all the hitherto known species by its truncate entire calyx. It might on this account be perhaps treated as the type of a new section. As regards fruit it might be placed in the section *Phanera*; as regards its other characters it agrees better with *Lasiobema* in which it is now placed.

## 48. CYNOMETRA Linn.

Erect unarmed trees. *Leaves* with few coriaceous odd-pinnate leaflets. *Flowers* copious, minute, in axillary corymbs or racemes. *Calyx* with a very short tube and subbasal disc; divisions 4-5, oblong, imbricated. *Petals* 5, oblanceolate, equal, not exerted. *Stamens* 10, or in *C. polyandra* indefinite, filaments erect, free, filiform, exerted; anthers small, oblong, versatile, dehiscent longitudinally. *Ovary* sessile or short-stalked, 2-ovuled; style filiform, stigma capitate. *Pod* turgid, oblique-oblong, with very thick indehiscent, usually rugose, tough, somewhat fleshy valves. *Seed* exalbuminous, central, filling up the cavity. **DISTRIB.** Species 20, spread everywhere in the tropics.

*Stamens* 10 (§ *Eucynometra*); leaf-rachis glabrous:—

Flowers on stem and thick branches in racemes with a produced axis; pedicels glabrous; (leaves 1-jugate) ... 1. *C. cauliflora*.

Flowers among the leaves in racemes or corymbs without a produced axis; pedicels puberulous:—

Corymbs laxly umbelliform, bracts small very deciduous; pods rugose; leaves 1-2-jugate ... 2. *C. ramiflora*.

[Leaves 1-jugate ... SUBSP. *genuina*;

Leaves 2-jugate ... SUBSP. *bijuga*;

End-leaflets acute much exceeding basal pair ... VAR. *heterophylla*,

End-leaflets obtuse hardly exceeding basal pair ... VAR. *mimosoides*.]

Racemes dense subspicate, bracts subsistent; pod smooth; leaves 3-jugate ... 3. *C. inaequalifolia*.

*Stamens* 40-60 (§ *Pseudocynometra*); leaf-rachis puberulous; (flowers in axillary corymbs; pedicels puberulous) ... 4. *C. polyandra*.

[Pod smooth ... VAR. *typica*;



Pod very rugose, leaflets considerably larger ... .. VAR. ? *Kurzii.*]

§ 1. EUCYNOMETRA. Stamens 10.

1. CYNOMETRA CAULIFLORA Linn. Sp. Pl. 382. A shrub or small tree 8–16 feet high. *Leaves* even-pinnate, leaflets 1-jugate with petiole under .2 in. long or occasionally with one of the leaflets abortive, dimidiate-oblong to subfalcate-oblong, subsessile, 2–3 in. long, .75–1.5 in. wide, base cuneate, apex acute or subacute slightly notched, subcoriaceous, dark-green, glabrous on both surfaces, slightly shining above, lateral nerves few ascending not very prominent beneath, not visible above. *Flowers* in small elongated sessile racemes, .5–2 in. long, occasionally reduced to very short 2–3-fl. stalklets or to single flowers, clustered, rarely solitary, on rugose nodes on the stem, the bracts small concave-ovate, persistent, .05 in. long, glabrous, pedicels .2 in. long, slender glabrous, with small concave-ovate basal bracteoles, .05 in. long. *Calyx*-tube very short, lobes 5, lanceolate, white, .15 in. long. *Petals* linear, .15 in. long, white or pink. *Stamens* 10, filaments .2 in. long, slender, glabrous. *Ovary* glabrescent, shortly stipitate, oblique; ovules 2. *Pod* thick and fleshy, oblong to irregularly globose, apiculate, glabrous, 1–2 in. long, edible. DC. Prodr. II, 509; Roxb. Hort. Beng. 32; Wall. Cat. 5816 A, B; W. & A. Prodr. 293; Miq. Flor. Ind. Bat. I, 77; Bak. in Flor. Brit. Ind. II, 268.

MALACCA; *vide* Baker. DISTRIB. Cultivated occasionally in India and in our area; generally in the Malay Archipelago.

2. CYNOMETRA RAMIFLORA Linn. Sp. Pl. 382. A medium-sized, spreading, sea-coast tree, 20–30 feet high. *Leaves* even-pinnate; leaflets 1-jugate with petiole under .2 in. long, or 2-jugate with rachis 1.25–2 in. long, the lowest pair always slightly, often much, smaller than the terminal, obliquely obovate-oblong to subfalcate-oblong, subsessile, 1–5 in. long, .25–2.5 in. wide, base obliquely cuneate, apex obtuse or shortly bluntly acuminate, coriaceous, dark-green, glabrous on both surfaces, shining above, lateral nerves numerous, spreading, rather distinct. *Flowers* in small subumbellate corymbs on small branches above the axils of fallen leaves, .3–.6 in. long, the bracts small ovate, the outer .15–.2 in. in diam., very deciduous, pedicels .3–.5 in. long, very slender, finely puberulous, with small lanceolate basal bracteoles. *Calyx*-tube very short, lobes 5, ovate-lanceolate, white, .12 in. long. *Petals* white, linear-lanceolate, .15 in. long, much narrower than sepals. *Stamens* 10; filaments slender, .25 in. long, glabrous; anthers versatile. *Ovary* densely pubescent, subsessile, very oblique; ovules 2. *Pod* fleshy, strongly wrinkled, irregularly oblong or ovoid with a thick terminal fleshy tip, .5 in. long, .4 in. broad and nearly as thick. *Seed* oblong, .4 in. long, .3

in. wide, .2 in. thick. Lamk. Encyc. Meth. II, 240; DC. Prodr. II, 509; Bak. in Flor. Brit. Ind. II, 267.

SUBSP. *genuina*; leaves 1-jugate, leaflets subfalcate-oblong, shortly bluntly acuminate. *C. ramiflora* Miq. Flor. Ind. Bat. I, 78. *C. ramiflora* VAR. *a* W. & A. Prodr. 293.—Rumph. Herb. Amboin. I, t. 63; Lamk. III. t. 331 f. 2.

Not reported from our area. DISTRIB. Java, *Horsfield* 146 (erroneously distributed as *C. bijuga*)! Ceram, *Teysmann* 1961 (erroneously distributed as *C. cauliflora*)! Amboina, *Rumphius* (icon.)! *Teysmann* 5528!

SUBSP. *bijuga*; leaves 2-jugate. *C. bijuga* Spanoghe, *Linnaea* XV, 201 (1841), name only.

*a*. VAR. *heterophylla* Thw. Enum. Pl. Zeyl. 97; terminal pair of leaflets acute or shortly acuminate, larger than the basal pair. *C. bijuga* Miq. Flor. Ind. Bat. I, 78. *C. ramiflora* Bedd. Fl. Sylvat. t. 315, not of Linn. *C. polyandra* Miq. Anal. Bot. Ind. I, 11, not of Roxb.

ANDAMANS; Coco Group, rare, *Prairie*! S. Andaman coast, very rare, *King*! *King's Collector*! PERAK; Matong, on the coast, *Wray* 2503! JOHORE; Skudai River, *Hullett and King*! SINGAPORE; Sungei Jurong, *Ridley* 5891! DISTRIB. Ceylon, (*Walker*)! Sumatra, (*Forbes*)! Java, Timor, Borneo.

*β*. VAR. *mimosoides* Bak. in Flor. Brit. Ind. II, 267; terminal pair of leaflets obtuse, emarginate or retuse, hardly larger than the basal pair; leaflets much smaller than in VAR. *a*. *C. mimosoides* Wall. Cat. 5817 (1830). *C. ramiflora* VAR. *β*. W. and A. Prodr. 293. Rheedee, Hort. Malab. IV, t. 31; Lamk, III. t. 331, f. 1? (seems to show 1-jugate leaflets only).

ANDAMANS; very common in every tidal and beach forest. DISTRIB. Malabar, *Rheedee* (icon.)! Ceylon, *Wallich* (*Cat.* n. 5816 C in part; mixed with cultivated examples of *C. polyandra* from Madras and erroneously distributed as *C. cauliflora*)! Sundribuans; Arracan; Martaban and Tenasserim.

The three plants here included in *C. ramiflora* have been somewhat misunderstood by Linnæus and indeed by most subsequent botanists. That the plant of Rumphius, here treated as SUBSP. *genuina*, will have to be kept apart from the other two as a distinct species in any careful monograph of the genus seems to admit of little question. Though mentioned in many works as Indian, no one has ever sent Indian specimens to Calcutta; the only authors who have actually seen specimens that were not from the Malay Archipelago are Wight and Arnott, Thwaites, and Trimen; the specimens mentioned by these writers in every case came from Ceylon not from India. No one has ever sent it from the Malay Peninsula.

It is tolerably certain that the two plants which form what is here termed

SUBSP. *bijuga* are not specifically separable, for some examples from the Andamans seem intermediate between the two. There are, however, no specimens that serve to link either of the forms with the 1-jugate SUBSP. *genuina*, and it will always be necessary to keep them apart as distinct—they are certainly very easily distinguishable—varieties.

VAR. *heterophylla* is also said to be Indian; it is, however, only found in Indian gardens, though it does appear to be wild on the coasts of Ceylon. That VAR. *mimosoides* occurs in India seems likely from its having been figured by Rheede, though no one has ever collected it in Malabar again. It is, however, quite common in the Sundribuns at the northern end of the Bay of Bengal and extends from that area down the eastern side of the Bay as far as Tenasserim and the Andamans; it has never been reported from the Malay Peninsula or Archipelago, where VAR. *heterophylla* (*C. bijuga* Miq.) is the representative form. And just as the two forms grow side by side in the beach forests of the Andamans, so they both occur on the coasts of Ceylon, for a plant from Trincomalee issued by Wallich under 5816/C is the same thing as his own *C. mimosoides* from the coasts of Burma. Wight and Arnott, too, say that they also have seen specimens from Ceylon which are the same as Rheede's Malabar plant; there is no doubt that Rheede's plant is Wallich's *C. mimosoides*.

In the event of SUBSP. *bijuga* being treated as a "species" of which *heterophylla* and *mimosoides* are only varieties, it must be noted that the name to be employed, from the point of view of priority, should be Wallich's, which is a decade anterior to Spanoghe's. But the adoption of Wallich's name will afford an excellent example of the disadvantage of the modern craze that insists on a rigid adherence to the laws of priority, Spanoghe's name being so much the more suitable of the two.

3. CYNOMETRA INÆQUALIFOLIA A. Gray, Bot. U. S. Expl. Exped. 473. A lofty tree 150–200 feet high; leafy shoots at first enveloped in imbricating bracts. *Leaves* even-pinnate, rachis glabrous 2–3 in. long; leaflets 3-jugate, elliptic-oblong, base obliquely cuneate, inner side with the lower third to two-thirds of margin straight, narrower than outer with uniformly curved outline, apex subacuminate; rigidly coriaceous, dark-green, glabrous and smooth on both surfaces, shining above, lateral nerves 8–9 pairs very faint and hardly distinguishable from the secondary reticulations; sessile, 2–3 in. long, 1–1.25 in. wide, the lowest the smallest. *Flowers* in subcapitately congested axillary racemes 1–1.5 in. long, 1 in. wide, the closely imbricating bracts hard, striate, scarious, broadly ovate, .25 in. across, pedicels puberulous, .25–.3 in. long, with two oblong membranous basal bracteoles .15 in. long. *Calyx*-tube very short, lobes 5, narrowly obovate, imbricate, ascending, .2 in. long, white. *Petals* 5, oblanceolate, white, .2 in. long, a little narrower than sepals. *Stamens* 10, filaments slender, .4 in. long, glabrous, anthers versatile. *Ovary* densely pubescent, shortly stipitate, very oblique; ovules 2. *Pod* obovoid, thickly woody, obliquely obovoid, 2–2.25 in. long, 1.5 in. wide, .75 in. thick. *Seed* solitary, irregularly oval-oblong, 1.6 in. long, 1 in. broad, .5 in. thick. Bak. in Flor. Brit. Ind. II, 267.

MALACCA; *Maingay* 589! *Derry* 893! PROV. WELLESLEY; Tasek Gelugur, *Ridley* 6981! PERAK; *Scortechini* 2190! at Goping, *Kunstler* 6022! 6066!

§ 2. PSEUDOCYNOMETRA. Stamens 40-60.

4 CYNOMETRA POLYANDRA Roxb. Hort. Beng. 32. A large tree, the leafy shoots at first enveloped in imbricating bracts, the basal ones scarious 3 in. in diam., the inner membranous and reaching 2 in. long, 1 in. across. *Leaves* even-pinnate, rachis puberulous 3-7 in. long; leaflets 3-jugate, elliptic-obovate or oblong, base obliquely cuneate, inner side with the lower half of margin straight, narrower than outer with uniformly curved margin, apex subacuminate, subcoriaceous, dark-green above, paler beneath, glabrous and smooth on both surfaces, hardly shining, lateral nerves 7-8 pairs more prominent beneath than the secondary reticulations, sessile, 2-5.5 in. long, 1-2.5 in. across, the lowest the smallest. *Flowers* in sessile axillary corymbs 2 in. long, 1.5 in. wide, the closely imbricating bracts hard striate scarious, broadly ovate, .3 in. across, soon deciduous, pedicels pubescent, .6-1 in. long with 2 very deciduous basal bracteoles. *Calyx*-tube very short, lobes 4, narrow-obovate, imbricate, reflexed, .4 in. long, white. *Petals* 5, lanceolate, .4 in. long, narrower than sepals, white. *Stamens* 40-60, filaments slender, .5 in. long, glabrous, anthers versatile. *Ovary* densely pubescent, subsessile, very oblique; ovules 1-2. *Pod* oblique, oblong, woody, 2-2.5 in. long, 1.25-1.5 in. wide, smooth or rugose. *Seed* solitary, irregularly oblong, 1.5 in. long, 1 in. wide, .5 in. thick.

VAR. *typica*; pod smooth. *C. polyandra* Roxb. Hort. Beng. 32; Pl. Coromand. III, t. 286; Flor. Ind. II, 372; DC. Prodr. II, 509; Wall. Cat. 5815; W. & A. Prodr. 294.

PENANG and MALACCA; *vide* Baker. DISTRIB. Khasia, Silhet.

VAR. ? *Kurzii*; pod very rugose, leaflets rather larger. *C. cauliflora* Wall. Cat. 5816 E.

PENANG; *Jack* (Wall. Cat. 5816 E)! *Kurz!* on Govt. Hill, "Apl. 1890" and "May 1893" *Curtis!* PERAK; *Scortechini!*

There are no specimens of *C. polyandra* proper from Penang or Malacca in Herb. Calcutta. The specimens of "VAR. ? *Kurzii*," which may possibly prove, when fully represented, to be a distinct species, has been obtained in fruit by Kurz alone; all the other specimens are in leaf only; its flowers are, so far, unknown.

#### 49. TAMARINDUS Linn.

A spineless tree. *Leaves* abruptly pinnate. *Flowers* in racemes. *Calyx*-tube turbinate; disc produced above its base; teeth lanceolate much imbricated, the two lowest connate. *Petals* only the three upper developed, the two lateral ovate, the upper hooded, the two lower

reduced to scales. *Stamens* monadelphous, only 3 developed, the others reduced to mere bristles at the top of the sheath; anthers oblong, versatile, dehiscing longitudinally. *Ovary* many-ovuled, with a stalk adnate to the calyx-tube; style filiform, stigma capitate. *Pod* linear-oblong, many-seeded, with a thin crustaceous epicarp and thick pulpy mesocarp. *Seeds* exalbuminous. One species, now planted everywhere in the tropics.

TAMARINDUS INDICA Linn. Sp. Pl. 34. A large unarmed tree with spreading branches, 40–60 feet high, stem 2–3 feet in diam., the young branchlets at first puberulous, elsewhere quite glabrous. *Leaves* even-pinnate, 2·5–6 in. long, leaflets 10–20 pairs rather close, oblong-obtuse, 3·5–1·25 in. long, 2–3 in. across, glabrous on both surfaces, medium-green above, paler sometimes glaucescent beneath; coriaceous, subsessile, reticulate-veined; stipules linear, early caducous. *Flowers* in simple or paniced terminal or lateral racemes 2–4 in. long, bracts concave, caducous, 2·5–3 in. long, obovate-elliptic, pedicels articulated under the base of calyx, slender, 2·5 in. long, glabrous; bracteoles small with puberulous margins. *Calyx* 5 in. long, faintly puberulous, tube narrowly turbinate, 2 in.; limb 4-partite, segments subequal, 3 in. long, 2 in. wide, ovate-acute, entire, much imbricated, membranous. *Petals* 3, an upper and two lateral, yellowish with pink stripes, obovate-oblong, subequal, 4 in. long, slightly exceeding calyx-limb, 2·5 in. across, slightly narrowed to a short claw; the two lower petals replaced by small scales. *Stamens* 3 fertile, anterior, connate nearly half their length, alternating with rudimentary bristle-like staminodia; anthers oblong, versatile. *Ovary* stipitate, style rather short equalling the stamens; stigma terminal, obtuse, slightly thickened; ovules 8–10 or more. *Pod* linear-oblong, nearly straight, thickened, subcompressed; 3–8 in. long, 1 in. wide, 4 in. thick; outer layer of pericarp thin, crustaceous, scurfy; middle layer pulpy, acid, traversed by fibres. *Seeds* 3–10, obovate-elliptic, compressed, 6 in. long, 4 in. wide, 2 in. thick; testa thick shining, sides areolate. DC. Prodr. II, 488; Roxb. Flor. Ind. III, 215; Wall. Cat. 5824; W. & A. Prodr. 285; Miq. Flor. Ind. Bat. I, 82; Bak. in Flor. Brit. Ind. II, 273; Oliver, Flor. Trop. Africa, III, 307. *T. occidentalis* Gaertn. Fruct. II, 310, t. 146; DC. Prodr. II, 488. *T. umbrosa* Salisb. Prodr. 323. *T. officinalis* Hook. Bot. Mag. t. 4563.

ANDAMANS; Great Coco Island, introduced by the sea, not planted, Prain! KEDAH; “growing wild at the top of limestone hills,” *Kunstler* 1728! SELANGOR; “in dense old jungle,” *Kunstler* 8613! **DISTRIB.** Planted throughout the tropics; believed by Oliver to be truly indige-  
nous in Africa.

#### 50. SINDORA Miq.

Unarmed lofty trees. *Leaves* abruptly pinnate; leaflets few rigidly  
J. II. 26

coriaceous. *Flowers* small, paniced. *Calyx* with a very short tube and basal disc; segments 4, valvate or very slightly imbricated. *Petal* 1, the size and shape of the upper calyx-segment. *Stamens* 10, the upper free and without anther, the others declinate shortly monadelphous, hirsute, unequal, the two nearest the free staminode always fertile, rather larger than the rest which are alternately short and long and may casually have sterile anthers or none; anthers oblong, versatile, dehiscent longitudinally. *Ovary* 2-5-ovuled, short-stalked, pubescent; style long, filiform, circinate, stigma small terminal capitate. *Pod* more or less oblique, broadly rounded-oblong, dehiscent, the valves flat, hard and woody, armed or not all over the face with straight, conical, firm prickles. *Seeds* usually 2, rarely 3-5, with a hard shining testa and resting on the cupshaped apex of a thick obconic arillate funiculus. Species 9; eight Malayan, one Cambodian.

The earliest publication of any species of this genus was in Rumphius, *Herb. Amboin.* II, t. 13. It thus forms, by citation, a part of the genus *Galedupa* Lamk. (*Encyc. Meth.* II, 594 [1786]); it is not, however, covered by the description of *Galedupa indica* given by Lamarck; that description applies only to the *Pongam* of Rheede (*Hort. Malab.* VI, t. 3), now known as *Pongamia glabra* Vent. As this latter name is validly established—Rheede's genus having been published by Adanson as *Pongam*, before it was mistaken by Lamarck for *Galedupa*—it may be one day found necessary to restore Lamarck's name *Galedupa indica* and restrict it to Rumphius' *Caju Galedupa*. In any case *Galedupa* is the generic name first applied to, and therefore, by the modern canons, the one that should be used for what is at once *Sindora* Miq., *Echinocalyx* Benth., and *Grandiera* Lefevre. The writer, be it understood, is of those who consider our modern priority-hunting to be frequently unwise; this consideration will probably be shared by sober-minded students who, after reading what is said here and what has been already said under *Pongamia*, may take the trouble to examine the treatment that adepts in the art are prepared to accord the names now under discussion.

The genus is not a member of the tribe *Cynometreæ* but of the *Amherstieæ*, where it has to be placed close to the genera *Pahudia* Miq. and *Afzelia* Linn. *Pahudia* is in fact almost exactly intermediate between *Sindora* and *Afzelia* since it combines the thinner leaves and the much imbricated sepals of the latter, with almost the pod and exactly the seeds of the former. The stamens in both *Pahudia* and *Sindora* are similarly united in a sheath, but there is the curious difference that the two nearest the fissure are abortive and represented by bristles on the tube in *Pahudia*, whereas in *Sindora* these are fully developed and in some of the species are at times the only fertile stamens present.

Pods armed on the face with strong straight prickles (unknown in *S. velutina*); leaves puberulous or pubescent beneath:—

Pods subequally rounded at base, style and beak at opposite ends of its long axis; rachis of raceme straight with spirally-set bracts and flowers:—

Stipules large foliaceous; calyx-lobes with a few spines outside in their upper third ... .. 1. *S. Wallichiana*.

Stipules inconspicuous; calyx-lobes rather densely spinescent outside in their upper two-thirds ... 2. *S. Echinocalyx*.

Pods obliquely rounded at base, beak projecting laterally at right angles to direction of stalk (unknown in *S. velutina*); rachis of raceme zig-zag with subdistichously-set bracts and flowers:—

Leaflets 3-jugate, puberulous beneath; calyx-lobes slightly spinescent in their upper third outside ... 3. *S. intermedia*.

Leaflets 5-6-jugate, densely pubescent beneath; calyx-lobes not spinescent ... 4. *S. velutina*.

Pods unarmed; leaves glabrous beneath; (pod subequally rounded at base, calyx-lobes not spinescent) ... 5. *S. coriacea*.

1. *SINDORA WALLICHIANA* Benth. A large tree with slightly rusty-pubescent branchlets. *Leaves* equally pinnate with puberulous rachis 4-6 in. long, stipules very large foliaceous semi-lunar sub-intrapetiolar, 6 in. long, acute at apex, rounded auriculate at base, pubescent on both sides; leaflets 3-jugate, oblong, apex round or acute, base round or cuneate, 1.5-3.25 in. long, 1 in. wide, the lowest pair slightly the smallest, very coriaceous, shining glabrous above, dull uniformly pubescent beneath, nerves numerous close horizontal slightly irregular, faint beneath not visible above, petiolules .2 in. long, puberulous. *Flowers* in axillary and terminal lax panicles 6-8 in. long, 5-6 in. wide, individual racemes 3-4 in. long with straight pubescent rachis, flowers spirally arranged, bracts broadly ovate-obtuse, .4 in. long, densely pubescent beneath, sparsely puberulous above, pedicels .35 in. long, with two ovate-lanceolate bracteoles, .2 in. long, at the apex; buds oblong densely pubescent, .4 in. long. *Calyx*-tube short, lobes 4, thick, .25 in. long, densely strigose within, ovate-acute, valvate, sparingly spinescent externally in the upper third. *Petal* 1, as long as the calyx-lobes, inside densely hairy. *Staminal*-sheath and filaments declinate pubescent. *Ovary* very hirsute, style twisted, stigma capitate. *Pod* broadly oblong, subequally rounded at base so that the short stout straight beak projects in the direction of the long axis, 3 in. long, 2 in. across; valves dehiscent, puberulous, woody, uniformly armed on the outside with strong straight conical spines .15 in. long. *Seeds* usually 2, with arillate funicle. *Sindora Wallichii* Benth. in Hook. Icon. Plant. t. 1018 not t. 1017; Bak. in Flor. Brit. Ind. II, 268 in part, excl. syn. *Echinocalyx* Bth. and both VARS. *Guilandina Wallichiana* Grah. in Wall. Cat. 5805. *Galedupa Wallichiana* Prain MSS.

SINGAPORE; *Wallich* 5805! *Kurz!* *T. Anderson* 41! MALACCA; *Griffith!*

The Griffithian specimens referred to were given by Dr. Griffith to Dr. McClelland; from his collection they passed into the Calcutta Herbarium under Griffith's original name "*Cassia* sp." They were afterwards examined by Dr. T.

Thomson, who referred them to the genus *Schotia* which is much nearer their real position. They are very distinct, by reason of their less spiny calyx-lobes and their large foliaceous stipules, from another Griffithian gathering from Malacca, first issued from Kew as n. 1848 under the name "*Dialium?* sp." and subsequently made by Mr. Bentham the type of his genus *Echinocalyx*. When afterwards referring Griffith n. 1848 and Wallich n. 5805 to one species, Mr. Bentham, who apparently had only Wallich's specimens at his disposal, did not know that the Singapore plant has large foliaceous stipules.

2. *SINDORA ECHINOCALYX* Prain. A large tree with glabrescent branchlets. *Leaves* equally pinnate with puberulous rachis 2–3 in. long, stipules small; leaflets 3-jugate oblong, apex round or slightly acute, base round or slightly cuneate, 1.25–2 in. long, .75–1 in. wide, the lowest pair slightly the smallest, very coriaceous, shining glabrous above, dull minutely puberulous beneath especially on the midrib, nerves numerous close horizontal slightly irregular, faint beneath not visible above, petioles .15 in. long, puberulous. *Flowers* in axillary and terminal lax panicles 4–5 in. long, 2.5–3 in. wide, individual racemes 1.25–1.5 in. long, with straight puberulous rachis, flowers spirally disposed, bracts ovate-obtuse .25 in. long, glabrescent above, puberulous beneath, pedicels .25 in. long, puberulous, with two oblanceolate bracteoles, .2 in. long, at the apex; buds oblong, puberulous, .3 in. long. *Calyx*-tube short, lobes 4 thick, .2 in. long, pubescent inside, ovate-acute, valvate, rather densely uniformly spinescent externally in the upper two-thirds. *Petal* 1, pubescent internally. *Staminal*-sheath and filaments declinate, hairy. *Ovary* very hirsute, style curved, stigma capitate. *Pod* broadly oblong, subequally rounded at base so that the slender straight beak projects in the direction of the long axis, 2.25 in. long, 1.5 in. across; valves dehiscent, puberulous, thinly woody, uniformly armed on the outside with strong straight conical spines .15 in. long. *Seeds* 2, funicle arillate. *Sindora Wallichii* Benth. in Hook. Icon. Plant. t. 1017, not t. 1018 and not *Guilandina Wallichiana* Grah. *S. Wallichii* var. *ovalifolia* Maingay MSS. *Echinocalyx* Benth. in Benth. & Hook. f. Gen. Pl. 1, 584. *Gale-dupa Echinocalyx* Prain MSS.

MALACCA; Griffith 1848! Maingay 562/1!

Nearest to *S. Wallichiana* but easily distinguished by its less pubescent leaves, different stipules, and smaller flowers with more spinescent calyx.

3. *SINDORA INTERMEDIA* Baker. A large tree, over 100 feet high, with slightly rusty-tomentose branches. *Leaves* equally pinnate, with puberulous rachis 4–6 in. long, stipules small; leaflets 3-jugate, oblong, apex round or slightly acute, base round or slightly cuneate, 1.5–2.5 in. long, 1 in. wide, the lowest pair slightly the smallest, very coriaceous, shining glabrous above, dull minutely puberulous beneath especially on the midrib, nerves numerous close horizontal slightly irregular, not very



conspicuous beneath, not visible above, petiolules  $\cdot 15$  in. long, puberulous. *Flowers* strongly scented, in axillary and terminal dense panicles, 4–6 in. long, 2.5–3 in. wide, individual racemes 2 in. long with suberect zig-zag rusty-tomentose rachis, flowers subdistichous, bracts ovate-acute  $\cdot 3$  in. long, densely puberulous beneath, sparsely so above; pedicels  $\cdot 35$  in. long rusty-tomentose, with two ovate-lanceolate bracteoles,  $\cdot 2$  in. long, at the apex; buds oblong densely pubescent,  $\cdot 4$  in. long. *Calyx*-tube short, lobes 4, thick,  $\cdot 25$  in. long, very densely strigose on the inside, ovate-acute, valvate, sparingly spinescent externally in the upper third. *Petal* 1, reddish, as long as the calyx-lobes, densely hairy. *Staminal*-sheath and filaments declinate, red with rusty hairs; perfect anthers 9. *Ovary* very hirsute, style twisted, stigma capitate. *Pod* wide-oblong, obliquely rounded at base so that the small recurved beak projects laterally at right angles to direction of stalk, 2 in. long, 2.5–3.5 in. across; valves dehiscent, puberulous, woody, uniformly armed on the outside with strong straight conical spines  $\cdot 2$  in. long. *Seeds* usually 2, rarely 3–5, with hard black shining testa, oblong, horizontal,  $\cdot 5$  in. long,  $\cdot 75$  in. across, resting on a basal, arillus-like, thick obconic funiculus about  $\cdot 75$  in. long. *Sindora Wallichii* var *intermedia* Bak. in Flor. Brit. Ind. II, 268. *S. Wallichii* Scortechini MSS. not of Benth. *Galedupa intermedia* Prain MSS.

PANGKORE; Gunong Tungal, Curtis 1630! *Scortechini* 1064!  
MALACCA; Maingay 562! PERAK; *Scortechini*!

This is at once distinguished by its transverse pods from both of the species placed under *S. Wallichiana* by Mr. Bentham. Mr. Curtis gives the Malay name of this in Pangkor as "*Sapetir*."

Two other species with similarly oblique pods are *S. sumatrana* Miq. and *S. cochinchinensis* Baill.; it is just possible that *S. velutina* Bak. may prove to share the character and to belong to the same group.

4. *SINDORA VELUTINA* Bak. in Flor. Brit. Ind. II, 269. A large tree with densely tawny-tomentose branches. *Leaves* equally pinnate with sparsely pubescent rachis 5–7 in. long, stipules not seen; leaflets 5–6-jugate, oblong, apex subacute or acute, base round or slightly cuneate, 2.5–3.5 in. long, 1–1.75 in. wide, the lowest pair rather the smallest, very coriaceous, shining glabrous above, dull densely uniformly softly pubescent beneath, nerves numerous close horizontal slightly irregular, very faint beneath, not visible above, petiolules  $\cdot 1$  in., densely pubescent. *Flowers* in axillary and terminal lax racemes 5–7 in. long, 3 in. wide; individual racemes 2 in. long, with zig-zag densely tawny-pubescent spreading rachis, flowers subdistichous, bracts ovate-acute,  $\cdot 3$  in. long, densely tawny-tomentose, pedicels  $\cdot 15$  in. long, densely tomentose as are the two lanceolate bracteoles; buds oblong, densely pubescent,  $\cdot 4$  in. long. *Calyx*-tube short, lobes 4, thick,  $\cdot 25$  in. long, densely hairy

within, ovate-acute, valvate, without spines externally. *Petal* 1, as long as calyx-lobes, densely hairy. *Staminal-sheath* and filaments declinate hairy. *Ovary* very hirsute, oblique; style twisted, stigma capitate. *Pod* not yet known. *Galedupa velutina* Prain MSS.

MALACCA; Maingay 607!

Of this very distinct species the only specimens hitherto collected are Maingay's. One of these has been very kindly placed at Dr. King's disposal, for purposes of description, by the Director of the Royal Gardens, Kew. There is no doubt as to its affinity being greatest, as Mr. Baker has already indicated, with *S. intermedia*, and though it is as yet impossible to say if the pod is marked by the presence or absence of spines, it is very probable, from the obliquity of the ovary, that it has a transverse pod like *S. intermedia* and *S. sumatrana*.

5. *SINDORA CORIACEA* Prain. A large tree with glabrous branches. *Leaves* equally pinnate with glabrous rachis 5-6 in. long, stipules small; leaflets 4-jugate, oblong, apex rounded or subacute, base round or slightly cuneate, 2-3 in. long, 1.25-1.5 in. wide, the lowest pair rather the smallest, very coriaceous, shining glabrous above, dull glabrous beneath, nerves numerous close horizontal slightly irregular, very faint, petiolules .15 in. glabrous. *Flowers* in axillary and terminal lax panicles 8-10 in. long, 4 in. wide; individual racemes 2 in. long, with straight, thinly rusty-puberulous, spreading rachis; flowers spirally disposed, bracts and bracteoles not seen, pedicels thinly rusty, .2 in., buds oblong, thinly rusty, .25 in. long. *Calyx-tube* short, lobes 4, thick, .2 in. long, very faintly imbricated; spineless externally. *Petal* 1. *Staminal-sheath* and filaments hairy. *Pod* broadly oblong, subequally rounded at base so that the strong slightly recurved beak, .3 in. long, continues the direction of the stalk, tip subobliquely cuneate, tapering abruptly on the dorsal, slightly rounded on the ventral suture, 3 in. long, 2.25 in. across; valves dehiscent, glabrous, woody, unarmed. *Seeds* 2-3, funicle thick arillate. *Afzelia? coriacea* Bak. in *Flor. Brit. Ind.* II, 275. *Intsia coriacea* Maingay MSS. *Galedupa coriacea* Prain MSS.

MALACCA; Chaban, Maingay 566! Ridley 2328! PENANG; Tulloh Bahang, Curtis 430!

This fine tree is said by Mr. Ridley to be the "*Sapetir*" of Malacca; this name, it will be noticed, is used in Pangkor for the nearly allied but quite distinct *S. intermedia*. Mr. Curtis says it is known in Penang as "*Mirbau*;" the "*Mirbau*" of the Mainland, it will be observed, is *Afzelia palembanica*.

Of the specimens referred to, the writer has only seen leaves of Maingay's, and only fruits of Curtis' and of Ridley's gatherings. The description of the flowers is therefore constructed from the characters stated and implied in the brief description of the *Flora of British India*. The number of stamens mentioned by Maingay, still more their monadelphous nature, makes it certain that the plant can be no *Afzelia* and goes to indicate that it is a species of *Sindora*; the fruiting specimens sent by Mr. Curtis and Mr. Ridley show that this is really the case.

The leaflets of this species are exactly like those of *S. sumatrana* but the pods differ in being much larger, and in being neither transversely twisted nor armed. The pods both in shape and in the absence of spines resemble those of *S. Galedupa* (*Galedupa indica* Lamk. Encyc. Meth. II, 594, as to syn. *Caju Galedupa* Rumph. Herb. Amboin. II, 59, t. 13) and only differ in being a good deal larger. The two may indeed ultimately prove to be forms of one species.

## 51. AFZELIA Smith.

Erect unarmed trees. *Leaves* abruptly pinnate, with few pairs of opposite leaflets. *Flowers* in copious terminal panicles. *Calyx* with the disc produced to the top of the elongated tube; sepals 4, much imbricated, slightly unequal. *Petal* only one developed, orbicular with a distinct claw, the others absent or rudimentary. *Stamens* 3 perfect, filaments long, pilose; anthers minute, oblong, opening longitudinally. *Pod* large oblong flattish, sublignose, subindehiscent. *Seeds* exalbuminous. Species 10–12; tropics of Old World.

Leaflets 4, rarely 2:—

Pedicels and calyx glabrous	...	...	...	1. <i>A. retusa</i> .
Pedicels and calyx puberulous	...	...	...	2. <i>A. bijuga</i> .

Leaflets 8, rarely 10 or 6; (pedicels and calyx pubescent) ... 3. *A. palembanica*.

1. AFZELIA RETUSA Kurz, Journ. As. Soc. Beng. XLIII, 2, 73. A small tree 15–20 feet high, stem 6–8 in. in diam. *Leaves* even-pinnate, 3–6 in. long; leaflets 2- (very rarely only 1-) paired, sometimes only subopposite, subcoriaceous, glabrous on both surfaces, oblong, base rounded, apex obtuse, emarginate or retuse, 2–4 in. long, 1·5–2 in. wide, nerves numerous fine spreading reticulate, petiolules distinct, 1·5 in. long, glabrous as is the rachis. *Flowers* in numerous terminal simple rarely slightly branched few-flowered glabrous racemes 2·5–3 in. long; pedicels stout glabrous, 5 in. long, bracteoles ovate-oblong, glabrous, 2 in. long, very early caducous as are the similar bracts. *Calyx* quite glabrous, tube slightly dilated upwards, 5 in. long, somewhat exceeding limb with 4 subequal oblong spreading lobes 35 in. long, 25 in. wide. *Petal* 7 in. long, limb 6 in. wide, 4 in. deep with rounded waved apex and wide-cuneate entire base, white or pinkish, claw very slender 3 in. long; pubescent along claw and midrib externally. *Stamens* 3 fertile, filaments 1·25 in., sparsely pubescent, pink. *Ovary* stalked, pubescent on lower suture, soon glabrous, style glabrous slender, 1·5 in. long. *Pod* 5–6 in. long, 2 in. wide, oblong, rigid, curved, coriaceous. *Seeds* orbicular, 1 in. in diam., 25 in. thick. Bak. in Flor. Brit. Ind. II, 274.

ANDAMANS; very common on all the coasts. PERAK; Wray 2491! PANGKORE; *Scortechini* 975! MALACCA; *Griffith* 1855! SINGAPORE; *Ridley* 4675! 6006! **DISTRIB.** Gangetic Delta.

Very nearly related to *A. bijuga* and perhaps only a variety of that species.

Mr. Baker attributes to this, just as Mr. Kurz does to *A. bijuga*, the occasional presence of 3 pairs of leaflets; none of the numerous specimens at Calcutta have more than two pairs of leaflets.

2. *AFZELIA BIJUGA* A. Gray, Bot. Amer. Explor. Exped. 467, t. 51. An erect tree reaching 50 feet in height, 1-1.5 feet in diam. *Leaves* even-pinnate, 3-6 in. long; leaflets 2-(very rarely only 1-) paired sometimes only subopposite, subcoriaceous, glabrous on both surfaces, oblong, base slightly oblique wide-cuneate or rounded, apex obtuse or bluntish acuminate emarginate, 2-4 in. long, 1.5-2 in. wide, nerves numerous fine spreading reticulate, petiolules distinct .15 in. long, glabrous as is the rachis. *Flowers* in leaf-opposed or terminal corymbose pubescent panicles 6 in. long, 4 in. wide, the individual racemes 1.5-2 in. long; pedicels slender puberulous .6 in. long, jointed, 2-bracteolate under the calyx, bracteoles oblong puberulous .1 in. long, bracts oblong .1 in. long caducous. *Calyx* puberulous, tube cylindric .3 in. long, rather shorter than limb with 4 subequal oblong spreading lobes .35 in. long, .25 in. wide. *Petal* .6 in. long, limb .5 in. wide, .35 in. deep, with rounded waved apex and wide cuneate entire base, white or pink, claw very slender, .25 in. long; pubescent along claw and midrib externally. *Stamens* 3 fertile, filaments 1.25 in., sparsely pubescent, pink. *Ovary* stalked, pubescent on both sutures, exserted, style glabrous slender, 1.5 in. long. *Pod* 6-8 in. long, 2.5 in. wide, oblong, rigid, thickly coriaceous. *Seeds* orbicular 1 in. across, .25 in. thick. Bak. in Flor. Brit. Ind. II, 274. *Intsia amboinensis* Thouars Gen. Nov. Madag. 22; DC. Prodr. II, 509; Miq. Flor. Ind. Bat. I, 80, all in part: Miq. Flor. Ind. Bat. Suppl. 288. *Baryxylum rufum* Lour. Fl. Coch. Chin. 266 in part. *Macrobium bijugum* Colebr. in Trans. Linn. Soc. XII, 359, t. 17. *Outea bijuga* DC. Prodr. II, 511; Wall. Cat. 5823. *Metrosideros amboinensis* Rumph. Herb. Amboin. III, 21 (in part) t. 10. *Jonesia triandra* Roxb. Flor. Ind. II, 220.

ANDAMANS; very common in all the coast forests, *Kurz! Prain! King's Collectors!* NICOBARS; Kamorta, *Kurz!* SINGAPORE; *Wallich* (Cat. n. 5823 B)! *Ridley!* *DISTRIB.* All coasts from Eastern Polynesia to the Mascarene Islands.

In Mr. Kurz's description of this species occurs the statement that the leaflets may be at times in 3 pairs, and the same variation is indicated in Rumphius' figure quoted above. But the writer finds, as Mr. Baker does, that this species has not more than 4 leaflets. Mr. Kurz's statement is due to his having treated Andamans specimens of *Afzelia palembanica* as representing a form of *A. bijuga*.

The synonym *Intsia amboinensis* only applies to this species in the sense in which it is used by Miquel in his *Suppl.*: there is an authentic example of the Sumatra plant so named by Miquel in the Calcutta Herbarium; it is a specimen of *Afzelia bijuga*. The earlier use of the name must be neglected, since it has been made to cover Rumphius' description. For, while it is clear that that des-

cription includes this sea-coast species, it also includes one, if not more than one, inland species of far greater dimensions than this littoral tree ever attains.

Roxburgh's *Jonesia triandra* is not a *Saraca* but is this species.

3. *AFZELIA PALEMBANICA* Bak. in Flor. Brit. Ind. II, 275. A tall erect tree 100–150 feet high, stem 2–3 feet in diam. *Leaves* even-pinnate 6–8 in. long; leaflets usually 4- (very rarely only 3-, more often 5-) paired, sometimes only subopposite, subcoriaceous, glabrous on both surfaces, oblong, base slightly oblique, rounded or subcordate, apex obtuse or bluntish-acuminate emarginate, 2–4 in. long, 1.5–2 in. wide, nerves numerous fine spreading reticulate, petiolules distinct .15 in. long, glabrous as is the rachis. *Flowers* in leaf-opposed or terminal corymbose pubescent panicles of few-flowered racemes, 3.5 in. long, 2.5 in. across, the individual racemes 1 in. long; pedicels slender, pubescent, .15–.2 in. long, jointed 2-bracteolate under the calyx, bracteoles ovate, pubescent, .2 in. long, bracts small ovate, .15 in. long, caducous. *Calyx* downy, tube cylindrical .2 in. long, shorter than limb with 4 subequal oblong spreading lobes .25 in. long, .2 in. wide. *Petal* .35 in. long, limb oblong .25 in. long, .2 in. wide, margin uniform, claw .1 in. long, glabrous. *Stamens* 3 fertile, filaments .75 in., sparsely pubescent, dark-claret coloured, two sterile filaments at base of petal. *Ovary* stalked, pubescent, exserted; style glabrous, slender, .75 in. long. *Pod* 10–12 in. long, 3.5 in. wide, oblong, almost woody. *Seeds* wide-oblong, 1.25 in. long, 1 in. wide, .3 in. thick. *A. bijuga* Kurz, For. Flor. Brit. Burm. I, 412 not of Gray.

ANDAMANS; South Point, *Kurz!* PERAK; *Wray! Kunstler 4433!* 7387! *Scortechini 1839!* MALACCA; *Griffith! Maingay 565!* *Cantley 1670!* *Holmberg 776!* DISTRIB. Siam (*Teysmann!*).

This is, according to Maingay, "the best Malacca timber tree;" according to Scortechini it affords "the best timber in the Peninsula." The Malay name, according to Scortechini, is *Mirbau* in Perak; Holmberg gives this as the Malacca name also. In Penang however, according to Curtis, the name *Mirbau* is used for *Sindora coriacea*.

While this species is *Azelia palembanica* Bak., it certainly is not *Intsia palembanica* Miq., of which one of the original types is in Herb. Calcutta. That tree, as Miquel says, has ovate-lanceolate leaflets (3 in. long by 1.25 in. wide, tapering to an acute point), it has also large ovate persistent bracts, .3 in. across. It does not seem necessary to alter the name in this place, but in a monograph of *Azelia* it will be necessary to term the Peninsular species *Azelia Bakeri*.

Mr. Baker has pointed out incidentally an omission in Mr. Kurz's *Forest Flora of Brit. Burma*: Kurz himself collected this species in the Andamans; strangely no one has met with it there again. He has, however, united it with *A. bijuga* and it is this union that explains Mr. Kurz's double error of attributing to *A. bijuga* pods a foot long and leaves with more than 4 leaflets.

## 52. SARACA Linn.

Erect trees. *Leaves* abruptly pinnate, leaflets glabrous rigid subcoriaceous or coriaceous, in bud minutely stipellate, stipels very rarely persistent, stipules large intrapetiolar scarious completely united, rarely foliaceous partially free. *Flowers* in dense sessile paniculate rarely simple corymbs on old nodes, or rarely axillary, with subpetaloid coloured persistent or rarely deciduous bracts and bracteoles. *Calyx* petaloid, limb 4-cleft lobes imbricate subequal, tube cylindric crowned by a lobed disc. *Corolla* 0. *Stamens* 2–8, exserted, with long filiform filaments and oblong versatile anthers opening longitudinally. *Ovary* many-ovuled, with a stalk attached to and produced beyond the disc, in most of the flowers rudimentary; style long filiform, stigma minute suboblique capitate. *Pod* flat dehiscent, rigidly coriaceous. *Seeds* exalbuminous. Species 16 or more; all South-Eastern Asiatic.

Leaves quite glabrous; stipules small at length scarious quite united along their inner margins; stipels vanishing; flowers yellow, at length becoming reddish, in paniculate corymbs:—

Bracts and bracteoles very deciduous, large where known; (pedicels glabrous):—

Leaflets 7-jugate, petiolules  $\frac{1}{4}$  in. long; calyx-lobes shorter than tube, bracts and bracteoles very large:—

Corymbs subsessile, dense, subsimple; pods over 3 in. broad; (calyx-lobes more than half as long as tube; stamens 4) ... .. 1. *S. thaipingensis.*

Corymbs in lax long-peduncled panicles; pods 2 in. broad:—

Calyx-lobes one-third as long as tube; stamens 4; pod beakless ... .. 2. *S. declinata.*

Calyx-lobes half as long as tube; stamens 7–8; pod beaked ... .. 3. *S. cauliflora.*

Leaflets 2–3-jugate, petiolules  $\frac{1}{25}$  in. long; calyx-lobes as long as tube; (corymbs in lax long-peduncled panicles; pods 1.5 in. broad; bracts and bracteoles unknown; stamens apparently 7) ... .. 4. *S. Kunstleri.*

Bracts and bracteoles persistent, small; (petiolules not exceeding  $\frac{1}{2}$  in.):—

Stamens 7–8; (pedicels glabrous):—

Leaflets 4–6-jugate, coriaceous; bracteoles amplexicaul, ascending ... .. 5. *S. indica.*

Leaflets 1–2-jugate, subcoriaceous; bracteoles not amplexicaul, spreading ... .. 6. *S. bijuga.*

Stamens 3–4:—

Pedicels glabrous; ovary glabrous (leaflets 4–7-jugate) ... .. 7. *S. macroptera.*

Pedicels puberulous; ovary pubescent:—

Leaflets 4–7-jugate, corymbs short ... .. 8. *S. palembanica.*

Leaflets 2-4-jugate, corymbs long ... .. 9. *S. triandra*.

Leaves with rachis, petiolules and nerves beneath pubescent; stipules large foliaceous, united only in lower third; stipels persistent, flowers white in simple corymbs; (stamens 2) ... 10. *S. latistipulata*.

1. *SARACA THAIPINGENSIS* Cantley MSS. in Herb. Kew. A tree 50-80 feet high, with rather slender stem 6-15 in. in diam. *Leaves* with rachis 16-30 in. long; leaflets membranous, strongly veined, 6-8-paired, oblong-lanceolate, apex acuminate, base slightly obliquely wide-cuneate, 12-16 in. long, 4-5 in. wide, secondary nerves about 12 pairs, dark-green, dull and glabrous on both surfaces; petiolules stout .4 in. long, stipels caducous; stipules coriaceous at length scarious, usually soon deciduous, the two united throughout into a convolute sheath for the subsequent bud, when laid open narrowly oblong, 1 in. long, .4 in. across, parallel-nerved and emarginate at the apex. *Flowers* in dense simple corymbs from old nodes on thick branches and stems, 3 in. long and 3-4 in. across; peduncles and pedicels glabrous, stout; bracts large oblanceolate-obtuse, lowest 1.5 in. long, .3 in. wide, tapering from near the apex to the narrow-cuneate base, decreasing upwards; bracteoles 2 oblanceolate, deciduous, .5 in. long, pedicels below bracteoles .3 in. long. *Calyx* yellow at length becoming red, tube .8 in. long, less than twice as long as limb of 4 oblong sepals, .5 in. long. *Petals* 0. *Stamens* 4 with a rudimentary filament, the filaments slender throughout; anthers nearly twice as long as broad; filaments twice as long as sepals. *Ovary* stalked, puberulous along sutures, elsewhere glabrous, usually rudimentary; style declinate. *Pod* purple when young, shining dark-red when ripe, 15-18 in. long, 3.25 in. wide, linear-oblong, considerably curved, much compressed, stipe under .25 in. long, apex beakless, straight on lower, rounded on upper suture at the blunt apex, more rounded on upper than on lower suture at the oblique base.

PERAK; Thaiping, Cantley 36! Tupai, Wray 2448! Larut, *Scortechini!* Kunstler 2249! 2768! Goping, Kunstler 4248! 6088! MALACCA; Ulu Chembong, Derry 999! Bukit Tampin, Goodenough 1875 A!

Mr. Derry gives the local name of this as "*Talan*;" Mr. Goodenough notes it as "*Gapis*:" consult also the note under *S. cauliflora*.

2. *SARACA DECLINATA* Miq. Flor. Ind. Bat. I, 84. A tree 20-60 feet high with rather slender stem 6-15 in. in diam. *Leaves* with rachis 12-24 in. long; leaflets thinly subcoriaceous, strongly veined, 6-8-paired, oblong-lanceolate, apex acuminate, base slightly obliquely wide-cuneate, 9-12 in. long, 3-4 in. wide, secondary nerves about 12 pairs, dark-green shining above, dull beneath, glabrous on both surfaces; petiolules thick .4 in. long, stipels caducous; stipules coriaceous at length scarious, usually soon deciduous, the two united throughout into a convolute sheath for the subsequent bud, when laid open .75 in. long, .3 in. wide,

parallel-nerved. *Flowers* in panicles of corymbs from leaf axils and from old nodes on branches and stems, 1 foot long, sometimes nearly as broad, individual corymbs 4–6 in. long, peduncles and pedicels glabrous, stout, bracts very large ovate-acuminate, 2 in. long, .7 in. wide, tapering from the middle to both ends, decreasing upwards: bracteoles 2, elliptic, deciduous, .5 in. long, pedicels below bracteoles .5 in. long. *Calyx* bright yellow, tube 1 in. long, cylindric, slender, slightly curved, thrice as long as limb of 4 obovate obtuse-sepals. *Petals* 0. *Stamens* 4 with a rudimentary filament, the filaments slender throughout and inserted in the retiring angles of a 5-lobed disc; anthers nearly twice as long as broad; filaments thrice as long as sepals. *Ovary* stalked, puberulous along sutures elsewhere glabrous, most often rudimentary; style declinate. *Pod* black, 12 in. long, 2.75 in. wide, linear-oblong, quite straight, compressed, stipe under .25 in. long, base equally cuneate and apex equally acute to the beakless tip. *Jonesia declinata* Jack, Malay. Miscell. II, 7. 74; Walp. Rep. I, 844.

PAHANG; Tembeling, *Ridley* 2587! PERAK; Kwala Kearing, *Wray* 544! *Scortechini* 1747! Larut, *Kunstler* 2729! 3961! 5393! SELANGOR; Kwala Lampar, *Curtis*! MALACCA; Nyalas, *Goodenough* 1720! *DISTRIB.*; Sumatra, Java.

This species is said by Mr. Goodenough to be "*Gapis Kognet*" or "*Talam Kognet*," the same names as he cites for *S. cauliflora*; see note under that species.

3. *SARACA CAULIFLORA* Bak. in *Flor. Brit. Ind.* II, 272. A tree 20–60 feet high, with rather slender stem 6–15 in. in diam. *Leaves* with rachis 12–16 in. long; leaflets rigidly subcoriaceous, strongly veined, 5–6-paired, oblong-lanceolate, apex acuminate, base slightly obliquely wide-cuneate, 9–12 in. long, 3–4 in. wide, secondary nerves about 12 pairs, dark-green shining above, dull beneath, glabrous on both surfaces; petiolules stout .4 in. long, stipels caducous; stipules coriaceous at length scarious usually soon deciduous, the two united throughout into a convolute sheath for the subsequent bud, when laid open .75 in. long, .3 in. wide, parallel-nerved. *Flowers* in panicles of corymbs from old nodes on branches and stems, 6 in. long and as much across, individual corymbs 3 in. long, peduncles and pedicels glabrous stout; bracts very large, obovate-acute, deciduous, lowest 2 in. long, .6 in. wide, tapering from above the middle to a cuneate base, decreasing upwards; bracteoles 2, lanceolate, deciduous, .5 in. long, pedicels below bracteoles .5 in. long. *Calyx* yellow, tube 1 in. long, twice as long as limb of 4 oblong sepals. *Petals* 0. *Stamens* 7–8 with a rudimentary filament and two acute angular projections on the disc; the filaments alternately slender throughout and widened towards the base; anthers nearly twice as long as broad; filaments twice as long as sepals. *Ovary* stalked, puberulous



along sutures elsewhere glabrous, usually rudimentary; style declinate. Pod black, 12–15 in. long, 2.25 in. wide, linear-oblong, somewhat curved, compressed, stipe .3 in. long, base cuneate towards upper suture, apex acute tapering towards lower suture which is prolonged into a stout beak 1 in. long.

MALACCA; Griffith, Maingay, Derry! Goodenough! PERAK; Scortechini!

The local name of this species is said by Mr. Goodenough to be "*Gapis Kog-net*" or "*Talan-Kognet*;" Mr. Derry notes it as "*Bunga Talan?*"

How far the characters are valid that separate this species and *S. thaipingensis* from *S. declinata* is, in the writer's opinion, a very doubtful matter. The chief diagnostic character, in the case of *S. cauliflora*, is the presence of 7 stamens and the writer has accordingly placed in Mr. Baker's species only those specimens where 7 or 8 stamens occur. These however consist of but two gatherings, one from Malacca and one from Perak; for, as it happens, neither Maingay's nor Griffith's specimens that form the original types of the species are represented at Calcutta. The pods described were collected by Goodenough in Malacca and are placed here because they certainly differ from the pods that are known to belong to the tree described as *S. declinata* and from those that belong to *S. thaipingensis*. But young pods of *S. declinata* from Java are rather more like those here supposed to belong to *S. cauliflora* than like those of the Peninsular *S. declinata* and a careful field study of the forms by Malayan botanists is urgently called for. The species which Mr. Cantley has named *S. thaipingensis* has usually been distributed as *S. cauliflora* and it is, as a matter of fact, of the three here described, the one that best accords with Mr. Baker's account of the leaves and of the corymbs of his *S. cauliflora*. But *S. thaipingensis* appears never to have more than 4 stamens and therefore can hardly be Baker's plant. If it can only be shown that the characters to be derived from the stamens and the pods are at all variable it may be possible to reduce both Mr. Baker's and Mr. Cantley's plants to *S. declinata*.

4. *SARACA KUNSTLERI* Prain. A tree 20–40 feet high, stem 3–5 in. in diam., branchlets zigzag glabrous. Leaves even-pinnate, rachis 5–10 in. long, glabrous; leaflets petiolulate large, 2–3-jugate, diminishing downwards, ovate-acuminate, base cuneate, distal 8–10 in. long, 3.5–4 in. wide, basal if 2 pairs and central if 3 pairs 4–5 in. long, 2.25–2.5 in. wide, basal if 3 pairs 3.5–4 in. long, 2–2.25 in. wide; all chartaceous, dark-green above, rather paler beneath, glabrous on both surfaces, main-nerves ascending, 6–9 pairs, more prominent beneath as is the midrib and the fine secondary reticulation; petiolules .25 in. long. Flowers in terminal long-peduncled paniculate corymbs, the peduncles 8–12 in. long, glabrous as are the branches 1–2 in. long, and the pedicels. Calyx-tube and pedicels, especially the latter, very short, together only .4–.5 in. long; bracts not seen; calyx-lobes ovate-oblong .2 in. long, glabrous. Corolla 0. Filaments 7, anthers not seen. Pod falcate 4–6 in. long, 1.5 in. wide, glabrous. Seeds 5–6, transversely ovate, .5 in. long, .7 in. across, .25 in. thick, testa black, smooth, shining, crustaceous.

PERAK; Gunong Batu Pateh, 1500-2000 feet, *Kunstler* 8048 1

A very distinct species, apparently nearest *S. Lobbiana* Bak.; unfortunately good flowers are not yet available for description.

5. *SARACA INDICA* Linn. Mant. I, 98. A low wide-spreading tree 20-30 feet high, stem 2 feet thick, branches glabrous. *Leaves* with rachis 7-8 in. long, rachis glabrous, leaflets subcoriaceous 5, less often 6 rarely 4 pairs, oblong-lanceolate apex obtuse or acute, base rounded or cuneate slightly oblique, 6-9 in. long, 2-3 in. wide, margins faintly undulate, dark-green shining above, dull and paler beneath, both sides quite glabrous; petiolules short .2 in. long very stout, stipels deciduous; stipules small at first coriaceous, green, at length scarious, brown, the two united completely from base to apex into a convolute sheath for the subsequent bud, when laid open ovate-oblong .4 in. long, .25 in. wide, parallel-nerved and minutely laciniate at the wide tip. *Flowers* in dense corymbs 3-4 in. in diam., axillary; peduncles and pedicels reddish, glabrous, rather stout, basal bracts ovate-subacute with ciliate margins, bracteoles 2 subopposed persistent ascending oblong-spathulate subacute amplexicaul, .15 in. long, pedicels below bracteoles .3-.5 in. long. *Calyx* bright-orange becoming at length red, tube .5-.6 in. long, cylindric, about twice as long as limb of 4 obovate-oblong sepals. *Petals* 0. *Stamens* 7 or 8 with 2 rudimentary filaments, all filaments slightly widened and slightly connate at base, reddish, anthers nearly twice as long as broad, purple; filaments thrice as long as sepals. *Ovary* stalked, puberulous along the sutures elsewhere glabrous, 8-12-ovuled, in most flowers rudimentary and then quite glabrous; style filiform declinate nearly as long as filaments. *Pod* black, 4-10 in. long, 1.7 in. wide, linear-oblong, compressed, valves strongly wide-reticulate; stipe .25 in. long. *Seeds* 4-8, oblong, compressed, 1.5 in. long. *Miq. Flor. Ind. Bat. I*, 83; *Bedd. Fl. Sylv. t. 57*; *Bak. in Flor. Brit. Ind. II*, 271. *S. arborescens* *Burm. Fl. Ind. 85, t. 25, f. 2*. *Jonesia Asoca* *Roxb. As. Res. IV*, 355; *Fl. Ind. II*, 218; *DC. Prodr. II*, 487; *Wall. Cat.* 5822; *W. & A. Prodr.* 284; *Wight Ic. t. 206*; *Bot. Mag. t. 3018*. *J. pinnata* *Willd. Sp. Pl. II*, 287.

MALACCA; *vide* Baker in *Flora of Brit. India*. Probably planted; the species has never been sent to Calcutta by any Malayan botanist.

6. *SARACA BIJUGA* Prain. A tree with spreading branches 20-30 feet high, stem 6 in. to 2 feet thick; branches glabrous. *Leaves* with rachis 1 in. long, leaflets thinly subcoriaceous 2-, or not infrequently 1-jugate, oblong-lanceolate, apex gradually narrowed in the upper third to a sharp point, bases of terminal pair very oblique, rounded on lower cuneate on upper margin, of lower pair rounded or subcordate on both sides, 4-10 in. long, 1-2.75 in. wide, margins faintly undulate, dark-green

and shining above, dull and paler beneath, both sides quite glabrous; petiolules very short under  $\cdot 1$  in., stout, stipels deciduous; stipules small coriaceous at length scarious, completely united from base to apex, narrowly ovate-oblong  $\cdot 6$  in. long,  $\cdot 2$  in. wide, tip subacute. *Flowers* in dense corymbs 4–5 in. in diam., axillary, peduncles and pedicels reddish, glabrous, slender, basal bracts ovate-subacute with ciliolate margins, bracteoles 2 subopposed persistent spreading, ovate-obtuse not amplexicaul,  $\cdot 15$  in. long, pedicels below bracteoles  $\cdot 15$ – $\cdot 2$  in. long. *Calyx* orange becoming at length light-red, tube  $\cdot 25$  in. long, cylindric, hardly longer than the limb of 4 ovate-obtuse sepals. *Petals* 0. *Stamens* 7 or 8, all filaments slightly widened and faintly connate at base, dark claret-coloured; anthers not much longer than broad; filaments thrice as long as sepals. *Ovary* stalked, very sparsely puberulous along sutures, in most flowers rudimentary and then quite glabrous. *Pod* reddish-yellow, smooth, polished, faintly reticulate, 6–8 in. long,  $2\cdot 35$  in. across; stipe  $\cdot 2$  in. long. *Seeds* 4–6.

PERAK; Larut; in open jungle generally near running streams, *Kunstler* 2749! 2382! 4059! Kinta, near limestone hills, *Kunstler* 7221! Larut, *Scortechini* 1503! Batu Togoh, *Wray* 2152!

This is the nearest of the native Malayan species to the common Indian *Saraca indica*; it is however very distinct on account of its 2-jugate leaves, its smaller flowers with spreading bracteoles and its very different pods. Elsewhere the writer has indicated the possibility of this proving ultimately to be only a variety of the not very fully described Javanese *S. minor* Miq. But from Miquel's account of that plant this must be at least an exceedingly distinct variety.

7. *SARACA MACROPTERA* Miq. Flor. Ind. Bat. I, 1080. A tree 30–40 feet high, stem 4–6 in. in diam. *Leaves* with rachis 4–15 in. long; leaflets rigidly subcoriaceous 4–7-paired, oblong-lanceolate, apex gradually narrowed to an acuminate tip, base slightly unequally rounded, 5–12 in. long,  $1\cdot 5$ – $3\cdot 5$  in. wide, secondary nerves about 12 pairs, curving forward, prominent beneath, bright-green shining above, paler dull beneath; petiolules  $\cdot 15$  in. long, glabrous as is the rachis, stipels caducous; stipules completely united in a scarious bud-sheath  $\cdot 5$  in. long. *Flowers* in densely fascicled corymbs in leaf axils and on old nodes, 1 in. long,  $1\cdot 5$  in. across; peduncles and pedicels quite glabrous very slender, the latter  $\cdot 25$ – $\cdot 3$  in. long below the two ovate-oblong spreading persistent bracteoles  $\cdot 15$  in. long; bracts ovate-acute  $\cdot 1$  in. long. *Calyx* bright-yellow, tube slender cylindric  $\cdot 25$  in. long, exceeding the limb of 4 oblong sepals  $\cdot 2$  in. long. *Petals* 0. *Stamens* 3–4, twice as long as sepals, filaments slender and inserted on the crenately lobed disc; anthers short oblong. *Ovary* stalked glabrous. *Pod* not seen.

PERAK; Larut, in low wet ground, *Kunstler* 5511! **DISTRIB.** Sumatra, Borneo.

This is extremely closely related to *S. palembanica* but is readily distinguished by its glabrous peduncles and pedicels, and its glabrous ovary. The solitary Perak gathering differs from the original Sumatran specimens (n. 863 *Hort. Bogor*) in having much smaller flowers, but is not otherwise distinguishable. It may, on the whole, be better, however, to treat the Peninsular plant as a distinct variety, *var. parviflora*; unless it should be found that the two differ markedly in fruit they can hardly be looked upon as distinct species: as yet, the fruit is unknown in either plant.

8. *SARACA PALEMBANICA* Miq. ex Bak. in *Flor. Brit. Ind.* II, 272. A tree with spreading branches, 30–40 feet high, stem 8–10 in. in diam. *Leaves* with rachis 8 in. long; leaflets rigidly subcoriaceous 4–7 paired, oblong, apex obtuse shortly abruptly acuminate, base slightly unequally rounded, 5–14 in. long, 2.5–4.5 in. wide, secondary nerves about 12 pairs, curving forward, prominent beneath, dark-green above, paler beneath, rather dull; petiolules .15 in. long, glabrous as is the rachis, stipels caducous; stipules completely united in a scarious bud-sheath .5 in. long. *Flowers* in densely fascicled corymbs on old nodes, 2 in. long nearly as much across; peduncles and pedicels pubescent, slender, the latter .5 in. long below the two ovate-oblong spreading persistent bracteoles .2 in. long; bracts ovate-subacute .2 in. long. *Calyx* orange-yellow, tube slender cylindrical .35 in. long, exceeding the limb of 4 oblong sepals .25 in. long. *Petals* 0. *Stamens* 4, at times only 3, two and a half times as long as sepals, filaments slender and inserted in the retiring angles of a crenately lobed fleshy ring, deep-purple as are the shortly oblong anthers. *Ovary* stalked, densely hairy, in most flowers rudimentary and then subglabrous. *Pod* not seen. *Jonesia* (*Saraca*) *palembanica* Miq. *Flor. Ind. Bat. Suppl.* 291.

PENANG; Kulang Ulu, *Curtis* 647! PANGKORE; Dindings river, *Curtis* 1386! MALACCA; *Maingay!* DINDINGS TERRITORY; "in wet low lands," *Bryant!* PERAK; Larut, "in low wet ground," *Kunstler* 6372! *Scortechini* 138! *DISTRIB.* Sumatra.

This is very near *S. macroptera* Miq. but differs in having rather smaller flowers, with pubescent peduncles and pedicels, and more densely clustered corymbs. Miquel describes the ovary as glabrous, but it is densely pubescent except in the case of the abortive ovaries which occur, however, in the vast majority of the flowers. Though its leaves very much resemble those of *S. macroptera*, it is less closely allied to that species than it is to *S. triandra*, a species which is much more common in the Malay Peninsula than either of the others.

9. *SARACA TRIANDRA* Bak. in *Flor. Brit. Ind.* II, 272. A slender tree 15–30 feet high, stem 4–8 in. in diam. *Leaves* with rachis 1.5–3 in. long; leaflets thinly subcoriaceous, 2–3-, very rarely 4-paired, oblanceolate-oblong, obtuse with or without an abrupt acumen, or subacute, tapering from beyond the middle to a cuneate base, lower pair very rarely rounded at base, and narrowed towards apex; 5–12 in. long, 2–6 in. wide, secondary nerves about 12 pairs, the lowest pair distinctly

marginal to half-way up, the others curving forward prominent beneath; dark-green shining above, dull beneath, glabrous on both surfaces; petiolules .15 in. long, glabrous as is the rachis, stipels caducous; stipules completely united in a scarious bud-sheath .5 in. long. *Flowers* in lax fascicled corymbs in leaf-axils and on old nodes, 5-8 in. long and broad; peduncles and pedicels slender pubescent, the latter .75 in. long below the two ovate-oblong spreading persistent bracteoles .25 in long; bracts ovate subacute .2 in. long. *Calyx* yellow becoming pink or red, tube slender cylindric, .25 in. long, about as long as limb of 4 oblong sepals. *Petals* 0. *Stamens* 3-4, two and a half to three times as long as sepals, filaments slender, inserted on a crenated fleshy ring, purplish as are the anthers. *Ovary* long-stalked, densely pubescent, mostly rudimentary. *Pod* oblong, very obliquely rounded at base on lower suture, obliquely obtuse at apex with lower suture projecting as a beak .25 in. long; 4-6 in. long, 1.5-1.75 in. wide, much compressed, valves brown when ripe, uniformly finely puberulous. *Seeds* 3-4.

MALACCA; *Griffith!* *Miller!* *Hervey!* *Goodenough* 1463! 1478! *Maingay* 563! PERAK; in dry rocky places, *Kunstler* 2138! 2757! 344! 3797! 3886! 3912! 3957! 4507! 4517! 5563! 7912! 8516! 8561! *Ridley* 3026! 3099! *Wray* 41! *Scortechini* 1143! 1675! PENANG; Government Hill, *Curtis* 165! DINDINGS; at Rajah Hitam, *Bryant!* DISTRIB.; Sumatra, (Moera Enim; *Teysmann* 3638!)

Mr. Goodenough gives the native name of this as "*Talan*." The species is remarkably closely related to *S. palembanica* and differs only by its larger laxer corymbs and its fewer leaflets, and further investigation on the part of field-botanists in Malaya may demonstrate that Mr. Baker's species is only a form assumed in dry localities by the tree that was previously described by Miquel as *Jonesia palembanica*. Both the synonyms of the *Flora of British India* should be deleted, for *Jonesia triandra* Roxb. is *Azalia bijuga*, while *J. scandens* Roxb. is, by Roxburgh's definition, clearly not this species and probably not a *Saraca* at all.

10. SARACA LATISTIPULATA Prain. A small tree with slender leafy pubescent branches. *Leaves* 8 in. long, rachis puberulous, leaflets rigidly coriaceous, 6 pairs, ovate-lanceolate, apex acuminate, base slightly obliquely rounded, 4.5-6 in. long, 1.5 in. across, dark-green, dull glabrous above, pubescent on the midrib beneath and puberulous along the margins, petiolules short, .15 in. long, pubescent, stipels small subulate persistent pubescent; stipules large foliaceous each with a strong midrib, ovate-acute, auriculate at base on their outer free margin, connate between petiole and branch for one-third their length on the inner margin, from .5-1.5 in. long, .25-1 in. wide, usually slightly unequal. *Flowers* in very few-flowered cymes, sometimes reduced to single pedicels, clustered on rugose woody nodes along thick old branches, under .75 in. long; with ovate-lanceolate persistent basal bracts and two sub-

opposite amplexicaul triangular persistent erect bracteoles midway between bract and calyx-tube, pedicels and bracteoles puberulous. *Calyx* white, tube cylindrical .15 in. long, shorter than limb of 4 narrow-oblong sepals, pubescent along margin at tip. *Petals* 0. *Stamens* 2 with a rudimentary filament between them, opposite to and involved by the inmost calyx segment; filaments widened at base and subconnate, pink; anthers nearly twice as long as broad, filaments twice as long as sepals. *Ovary* pubescent. *Pod* oblong, obliquely obtuse at apex with a rather pronounced beak, obliquely rounded at base, 2 in. long, .1 in. across.

PERAK; Dindings, Lumut, *Ridley* 3089! 8006!

A very remarkable species, easily distinguished from all those hitherto known by its large foliaceous stipules, and its stipellate leaves with pubescent rachis. It has been obtained twice, both times in the same locality, and on both occasions by Mr. Ridley.

### 53. CRUDIA Schreb.

Shrubs or trees. *Leaves* odd-pinnate or spuriously even-pinnate by the approximation of the penultimate to the terminal leaflet, the leaf-rachis sometimes prolonged beyond the ultimate leaflet, the remaining leaflets usually conspicuously alternate rarely occasionally subopposed; stipules interpetiolar, stipels 0. *Flowers* in racemes either terminating, or simple or in clusters at the bases of, the glabrous or pubescent new leafy shoots. *Calyx*-tube very short, with a short disc, segments 4 oblong, imbricated, persistent, reflexed in flower. *Petals* 0. *Stamens* 10 (or 8–9) exerted, filaments free filiform, anthers oblong, versatile, dehiscing longitudinally. *Ovary* pubescent, few-ovuled; with distinct short glabrous stalk and filiform incurved glabrous style; stigma terminal capitate, small. *Pod* with 2 rigidly coriaceous subcompressed valves. *Seeds* few, often only 1, exalbuminous. Species, one each Indian and African; nine or ten American; about twelve Malayan.

The oldest names for this genus, according to the *Index Kewensis*, are *Aplatoa* Aubl. and *Touchiroa* Aubl. As the first name was based on the flowers of one species of this genus with the fruit of a *Pterocarpus*, it cannot possibly be used. There seems nothing against the employment of the second name which was given to a species of the group with few leaflets to the leaf-rachis — the group to which *C. bantamensis*, *C. gracilis* and *C. Wrayi*, among Malayan species, belong.

Leaflets more than 3 (§ *Crudia*):—

Leaflets coriaceous, very long caudate-acuminate, rachis prolonged beyond the last of the oblanceolate, all conspicuously alternate leaflets; (innovations and petioles densely rusty-tomentose) ... .. 1. *C. caudata*.

Leaflets papery, acute or shortly acuminate, rachis not prolonged beyond the two terminal, often spuriously opposite leaflets:—

Innovations and petioles pubescent, leaflets uniformly puberulous or pubescent beneath; racemes rather lax; petiolules and pedicels rather long:—

- |  |    |                         |
|--|----|-------------------------|
| Leaflets 11–13, lanceolate, pubescence tawny, pod densely rusty-pubescent ... .. | 2. | <i>C. Scortechinii.</i> |
| Leaflets 7–9, obovate to oblong, pubescence grey, pod tawny-puberulous... ..     | 3. | <i>C. Curtisii.</i>     |

[Leaflets puberulous beneath; apex shortly acuminate ... .. VAR. *typica* ;  
 Leaflets densely pubescent beneath; apex acute ... .. VAR. ? *Wallichii.*]

Innovations and petioles glabrous; racemes rather dense; petiolules and pedicels rather short:—

- |   |    |                     |
|---|----|---------------------|
| Leaflets 7–8, glaucous, glabrous on the nerves, elsewhere uniformly puberulous beneath ... .. | 4. | <i>C. glauca.</i>   |
| Leaflets 5 (rarely 3), pale-green, quite glabrous beneath ... ..                              | 5. | <i>C. speciosa.</i> |

Leaflets 3 or by abortion fewer (§ *Touchiroa*):—

- |   |    |                     |
|---|----|---------------------|
| Leaflets small oblanceolate, racemes dense with puberulous rachis and pedicelled flowers ... .. | 6. | <i>C. Wrayi.</i>    |
| Leaflets large ovate-oblong, racemes sparse with glabrous rachis and sessile flowers ... ..     | 7. | <i>C. gracilis.</i> |

1. *CRUDIA CAUDATA* Prain. A small tree with slender at length glabrescent branches, and densely rusty-tomentose new shoots. *Leaves* odd-pinnate, rachis 1.5–2 in. long, petiole articulate, the interpetiolar stipules united by their inner margins at the base only, elsewhere free, lanceolate, densely rusty-pubescent on their petiolar, glabrous on their axillary aspect; leaflets 5–7, petiolules .1 in long, densely rusty-tomentose as is the rachis, which is prolonged beyond the last leaflet into a subulate process; alternate, oblanceolate, base rounded in lower, deltoid in upper leaflets, apex prolonged into a .75 in. long, narrow-caudate tip, 2.5–4 in. long, 1 in. across, rigidly coriaceous, dark-green glabrous and shining above, dull and densely rusty-pubescent on the nerves beneath, lateral nerves 6–7 pairs slightly ascending, looped within the margin, secondary venation prominent beneath, all nerves obscure above. *Flowers* in narrow racemes at the bases of new leafy shoots, with round densely rusty-tomentose rachis, pedicels rather stout, under .25 in. long, densely rusty with a subulate bracteole close under calyx; buds oblong .2 in. long. *Calyx*-tube very short, lobes 4, imbricate, reflexed in flower, densely rusty outside, quite glabrous within. *Stamens* not seen. *Ovary* stipitate, densely rusty-velvety, 1-ovuled, stalk glabrous as long as calyx-tube. *Pod* (young) linear-oblong, obliquely rounded at base,

apex obtuse apiculate, compressed, 2 in. long, .75 in. across, valves densely, shortly, subscabridly rusty-pubescent. *Seed* 1. *Touchiroa caudata* Prain MSS.

JOHORE; Tanjong Kupang, *Ridley* 6399! *DISTRIB.* Borneo.

A remarkably distinct species, though recalling in some respects the description given by Hasskarl of *C. orientalis* (*Cat. Hort. Bog.* 288). Hasskarl's species has, however, more numerous leaflets which are only rusty-pubescent on their margins; it has also larger, 2-seeded pods.

2. *CRUDIA SCORTECHINII* Prain. A tree 80–90 feet high, young branches tawny-pubescent. *Leaves* odd-pinnate, rachis 6–8 in. long, petiole articulate on an auricled node with an interpetiolar entire stipule, leaflets 11–13, with petiolules .2 in. long, sparsely tawny-pubescent as is the rachis, alternate, lanceolate, base slightly unequally rounded, apex acuminate, 2–3 in. long, 1 in. wide, papery, green and glabrous above, paler and pubescent with short sparse tawny hairs beneath, lateral nerves spreading, 12–16 pairs, not much stronger than the fine secondary venation. *Flowers* in narrow racemes at the ends and bases of new leafy shoots, 3–6 in. long, with angular tawny-pubescent rachis; pedicels slender at length .4 in. long, tawny-puberulous, many of the lower caducous, minutely bracteolate about the middle; buds oblong .2 in. long. *Calyx*-tube very short lined by a disc, lobes 4, imbricate in bud reflexed in flower, sparsely pubescent on both surfaces. *Petals* 0. *Stamens* 9, filaments glabrous, free, alternately short and long, anthers broadly ovate, versatile. *Ovary* stipitate, densely tawny-villous, 1- or 2-ovuled; stalk glabrous as long as calyx-tube, style glabrous incurved. *Pod* oblong, obliquely rounded at both ends, densely rusty-tomentose, rugulose, 2.5 in. long, 1.5 in. across, flat. *Seed* 1, funiculus elongated. *Touchiroa Scortechinii* Prain MSS.

PERAK; Goping, *Scortechini* 2129!

A very distinct species.

3. *CRUDIA CURTISII* Prain. A tall tree 80–150 feet high with spreading crown and densely grey-pubescent branchlets; stem 2–3 feet in diam. *Leaves* odd-pinnate, rachis 3–4 in. long, petiole articulate on an auricled node with an interpetiolar 2-lobed stipule, leaflets 7–9, with petiolules .25 in. long, closely puberulous as is the rachis, alternate, obovate to oblong, base slightly obliquely rounded or cuneate, apex rounded or tapering to an at length bluntly caudate tip, 2–3.5 in. long, 1–1.5 in. wide, membranous, green and glabrous above, paler and uniformly sparsely puberulous beneath, lateral nerves ascending prominently looped within margin, secondary venation indistinct. *Flowers* in rather lax narrow racemes at the ends and bases of new leafy shoots, 4–6 in. long, with angular densely grey-pubescent rachis; pedicels very



slender, at length  $\cdot 6$  in long, grey-puberulous, with a caducous subulate bracteole about the middle; buds oblong  $\cdot 15$  in long. *Calyx*-tube very short, lobes 4, imbricate, reflexed in flower, sparsely pubescent externally, glabrous within. *Petals* 0. *Stamens* 10, filaments glabrous, free, alternately long and short, anthers broadly oblong, versatile. *Ovary* stipitate densely grey-downy, 1- or 2-ovuled, stalk glabrous longer than calyx-tube, style glabrous incurved. *Pod* oblong, obliquely rounded at base, subequally rounded and apiculate at tip, rusty-puberulous, rather distinctly reticulate, 3 in. long, 2 in. wide,  $\cdot 5$  in. thick, valves very firmly coriaceous. *Seed* 1, oblong,  $1\cdot 25$  in. long,  $1\cdot 2$  in. wide,  $\cdot 35$  in. thick. *Touchiroa Curtisii* Prain MSS.

PENANG; Govt. Hill, 1200 feet elev., *Curtis* 3007! MALACCA; Bukit Sadanau, *Derry* 1164! PERAK; Larut, *Kunsler* 7467! Thaiping, *Kunstler* 8514! Kinta, *Kunstler* 4753!

VAR. ? *Wallichii* Prain; leaf-rachis and leaflets beneath densely softly velvety; leaflets acute, not cuspidate or caudate at the tip. *Leguminosa* Wall. Cat. 5983. *Ignota* Wall. Cat. 8089. *Touchiroa Wallichii* Prain MSS.

PENANG; *Porter* (Wall. Cat 5983)! *Wallich* (Cat. 8089)!

This fine tree is, according to Mr. Derry, known in Malacca as '*Kumpas ruman*.' Though very nearly related to *C. glauca* it seems to be quite distinct and is easily separated by its longer petiolules; pubescent leaf-rachis, rachis of inflorescence and young leafy shoots; also by its rather smaller leaflets and pods. It is likewise very closely related to *C. speciosa* but it has longer pedicels and a less dense inflorescence than that species, which moreover has the leaflets quite glabrous.

The plant here tentatively referred to the species as VAR. ? *Wallichii* occurs twice in the Wallichian Herbarium, on both occasions without flowers or fruits. It has never been obtained again and it is just possible that when it is re-discovered it will prove a distinct species, *C. Wallichii*.

4. *CRUDIA GLAUCA* Prain. A tree 50–70 feet high, with spreading glabrous branches; stem  $1\cdot 5$ – $2\cdot 5$  feet in diam. *Leaves* odd- (or sometimes even-) pinnate, rachis 2– $2\cdot 5$  in. long, petiole articulate on an auricled node with an interpetiolar 2-lobed stipule, leaflets 7–8, with petiolules  $\cdot 15$  in. long, quite glabrous as is the rachis, alternate or occasionally subopposite, oblanceolate-oblong, base slightly obliquely rounded, apex rounded and at length abruptly obtusely cuspidate,  $2\cdot 5$ –4 in. long,  $1\cdot 25$ – $1\cdot 75$  in. wide, thinly papery, dark-green and quite glabrous above, very glaucous glabrous on the nerves elsewhere finely adpressed-puberulous beneath, lateral nerves ascending, prominently looped one-third their length within the margin, secondary venation indistinct. *Flowers* in dense narrow racemes at the bases of new leafy shoots, 3–5 in. long, with angular glabrous rachis. *Calyx* not seen. *Pod* oblong tapering subequally at base to a stipe  $\cdot 25$  in. long, and at apex to a

short acute beak, closely tawny-puberulous, rather distinctly reticulate, 4 in. long, 2 in. wide, '6 in. thick; valves very firmly coriaceous. *Seed* 1, oblong, 1.5 in. long, 1.2 in. across, '4 in. thick. *Touchiroa glauca* Prain MSS.

PERAK; Goping, *Kunstler* 8175!

This is very nearly related to *C. Curtisii* but differs markedly in having leaflets very glaucous beneath, the leaflets being also rather larger and the petiolules shorter; in having the leaf-rachis, petiolules, and nerves beneath glabrous; and in having, as is shown by the scars on the rachis of the infrutescence, much more densely flowered racemes; the pods also are larger than in *C. Curtisii*. Flowers have not yet been sent. Of all the Malayan species, this is the one that most nearly approaches the Ceylon *C. zeylanica*.

5. *CRUDIA SPECIOSA* Prain. A handsome tree with slender pendulous glabrous branches and glabrescent new shoots. *Leaves* odd-pinnate, rachis 2-3 in. long, petiole articulate on an auriculate node, with an interpetiolar 2-lobed stipule, leaflets 5 (rarely 3), with petiolules '15 in. long, glabrous as is the rachis; alternate, oblong, base unequally rounded or truncate, apex abruptly tapering to a short acutely caudate tip, 2-2.5 in. long, 1-1.5 in. wide, papery, dark-green above, paler beneath, quite glabrous or both surfaces, lateral nerves spreading slender, looped within margin, hardly more prominent than secondary venation. *Flowers* in rather dense narrow racemes at the ends of new leafy shoots, 6-10 in. long with round glabrescent rachis; pedicels spreading, very slender, quite glabrous, '35 in. long, with a minute bracteole below the middle; buds oblong, '25 in. long. *Calyx*-tube very short, lobes 4, imbricate, reflexed in flower, very sparsely puberulous externally, glabrous within. *Petals* 0. *Stamens* 10, filaments glabrous, free, alternately short and long, anthers broadly oblong, versatile. *Ovary* stipitate, densely pubescent, 1- or 2-ovuled; stalk as long as calyx-tube, glabrous, style glabrous incurved. *Pod* not seen. *Touchiroa speciosa* Prain MSS.

PUNGAH; "a very handsome tree with dark-green leaves and slender pendulous branches; growing in the Rajah's Garden," *Curtis* 2955! Nearest to *C. Curtisii* and *C. glauca* but evidently quite distinct from both.

6. *CRUDIA WRAYI* Prain. A small tree with slender glabrous branches. *Leaves* odd-pinnate, rachis 1 in. long, petiole articulate on an auriculate node, the interpetiolar lanceolate stipules united at their very base only, glabrous as are the leaf-rachis and the petiolules, '15 in. long; leaflets 3, alternate, oblanceolate, base cuneate, apex acute or rounded and shortly abruptly acuminate, 1.5-2.5 in. long, '5-1 in. wide, thinly papery, pale yellowish-green, glabrous on both surfaces, lateral nerves spreading, 7-8 pairs, slender, looped within margin, secondary nervation fine but distinct. *Flowers* in narrow dense racemes at the ends and

bases of new leafy shoots, 4–8 in. long, with angular puberulous rachis; pedicels slender .2 in. long, puberulous, bracteolate in the middle; buds oblong, .15 in. long. *Calyx*-tube very short, lobes 4, imbricate in bud, spreading in flower, faintly puberulous outside, glabrous within. *Petals* 0. *Stamens* 8–9, alternately long and short, anthers broadly ovate, versatile. *Ovary* shortly stipitate, densely pubescent, 1- or 2-ovuled; stalk glabrous equalling calyx-tube, style glabrous incurved. *Pod* unknown. *Touchiroa Wrayi* Prain MSS.

PERAK; Larut, at Sungei on the plains, *Wray* 2874!

This is a member of the group of species forming the original genus *Touchiroa*, to which *C. bantamensis* and *C. gracilis*, among Malayan species, also belong. But *C. Wrayi* is easily distinguished from both the species mentioned by its very small leaflets and its much longer pedicels; the flowers, except for having longer stalks, are extremely like those of *C. bantamensis*.

7. *CRUDIA GRACILIS* Prain. A slender shrub 6–8 feet high, young branches glabrous. *Leaves* odd-pinnate, rachis .75–1 in. long, petiole articulate on a small node, with interpetiolar glabrous lanceolate stipules united only at their very bases, leaflets 3 (or occasionally 2 from abortion of one lateral leaflet), with stout petiolules .25 in. long, glabrous as is the rachis; alternate, ovate-oblong to oblong-lanceolate, base cuneate or slightly unequally rounded, apex shortly caudate-acuminate, 4.5–6 in. long, 2–3 in. across, firmly papery, pale yellowish-green, glabrous on both surfaces, lateral nerves ascending, about 6 pairs, distinct, secondary venation somewhat distinct beneath. *Flowers* in very narrow sparse spikes at the ends of new leafy shoots, 10–12 in. long with angular quite glabrous rachis; sessile, minutely bracteolate below the calyx; buds oblong, .15 in. long. *Calyx*-tube very short, lobes 4, imbricate in bud, spreading in flower, quite glabrous on both surfaces. *Petals* 0. *Stamens* 8–9, filaments glabrous, free, alternately short and long, anthers broadly ovate, versatile. *Ovary* shortly stipitate, densely pubescent, 1- or 2-ovuled; stalk glabrous, shorter than calyx-tube, style glabrous incurved. *Pod* unknown. *Touchiroa gracilis* Prain MSS.

PERAK; Thaiping, in low wet ground in dense forest, rare, *Kunstler* 8468!

This is extremely closely related to *Touchiroa bantamensis* Hassk. which has also 3- (or by abortion 2-) foliolate leaves, but has larger leaflets, puberulous rachis and sepals, and distinct though very short pedicels.

#### 54. PELTOPHORUM Vogel.

Tall unarmed trees. *Leaves* abruptly bipinnate. *Flowers* showy, yellow or white, in axillary and in paniced terminal racemes. *Calyx* with the disc confined to the base, teeth subequal, very deeply cut, imbricate. *Petals* oblong or roundish, imbricated, spreading. *Stamens*

10, free, declinate; filaments with a dense tuft of hairs at the base; anthers uniform, linear-oblong. *Ovary* sessile, free, few-ovuled; style long filiform incurved, stigma large peltate. *Pod* oblong, flat, thin, hard, indehiscent, with a firm broad wing on each suture. Species 7–8; cosmopolitan in the tropics.

Flowering pedicels not exceeding the calyx ... 1. *P. ferrugineum*.  
Flowering pedicels 3–4 times as long as calyx ... 2. *P. dasyrachis*

1. *PELTOPHORUM FERRUGINEUM* Benth. Flor. Austral. II 279. A tall tree 70–80 feet high; branchlets covered with a thin rusty tomentum. *Leaves* 6–12 in. long, petiole 1–1.5 in., sparingly rusty-pubescent; pinnæ 16–20, distal 4–6 in. long, progressively shortening towards proximal, 3–4 in.; leaflets close, ligulate-oblong, sessile, base unequal, apex obtuse, .5–.75 in. long, .35 in. wide, subcoriaceous, puberulous above, faintly rusty-pubescent beneath. *Racemes* in a large terminal panicle 12 in. long, 8–9 in. across, branches 4–6 in. long, bracts linear under 1 in. long, very caducous, bud .35 in. in diam., pedicels .15–.25 in. long, rachis, branches and pedicels densely rusty-pubescent. *Calyx* partite to .15 in. from base, lobes subequal, ovate-lanceolate, .25 in. long, densely rusty-pubescent externally. *Corolla* 1.25 in. wide, petals .8 in. long, yellow, the thickened base densely rusty-hairy on both sides, the blade more or less glabrous but the margin ciliate with rusty hairs. *Stamens* 10, free, filaments equal, pubescent at the base. *Ovary* densely villous, style very sparingly pubescent throughout, the stigma peltate. *Pod* 2–4 in. long, 1 in. across, narrowed to both ends, rigid, glabrous, closely longitudinally veined outside. Bak. in Flor. Brit. Ind. II, 257. *Poinciana Roxburghii* G. Don, Gen. Syst. II, 433. *Cæsalpinia inermis* Roxb. Flor. Ind. II, 367. *C. ferruginea* Dene, Nouv. Ann. Mus. II, 462; Miq. Flor. Ind. Bat. I, 111. *C. arborea* Zoll. Nat. en Geneesk. Arch. III, 65; Miq. Flor. Ind. Bat. I, 112.

ANDAMANS; *Kurz!* NICOBARS; *Jelinek* 240! *Heinig!* KEDAH; Langkawi, *Curtis* 370! MALACCA; *Griffith* 1903! *Hervey* 2078! SINGAPORE; *Ridley* 265! JOHORE; *Ridley* 3977! *DISTRIB.* Borneo (*Hullett!*); Java; Timor.

2. *PELTOPHORUM DASYRACHIS* *Kurz* ex Bak. in Flor. Brit. Ind. II, 257. A tall tree 70–80 feet high; branchlets covered with a fulvous tomentum. *Leaves* 6–15 in. long, petiole 1–1.5 in. long, tomentose; pinnæ 14–18, distal 4–5 in. long, shortening progressively towards proximal 2–2.5 in.; leaflets close, ligulate-oblong, sessile, base unequal, apex rounded, .5–.75 in. long, .35 in. wide, subcoriaceous, puberulous above, slightly rusty-pubescent beneath. *Racemes* 6–9 in. long, 3 in. across, pedicels patent 1–1.5 in. long, bracts lanceolate, .5 in. long, subpersistent; bud .35 in. in diam.; rachis, pedicels and bracts rusty-pubescent. *Calyx* partite to .15 in. from base, lobes equal, ovate-lanceolate, .25 in. long,

densely rusty-velvety externally. *Corolla* 1·5 in. across, petals 1 in. long, oblong, yellow, the thickened base very densely hairy on both sides, the blade glabrous. *Stamens* 10, free, filaments equal, pubescent at the base. *Ovary* densely villous, style sparsely pubescent throughout, the stigma large peltate glabrous. *Pod* 4–5 in. long, 1·25–1·4 in. across, rigid, 1–5-seeded, narrowed at both ends, faintly puberulous and not veined externally. *Cæsalpinia Finlaysonianana* Grab. in Wall. Cat. 5971. *C. dasyrachis* Miq. Flor. Ind. Bat. Suppl. 292.

PERAK ; Goping, *Scortechini*, 1994 ! Trang, *Kunstler* 1394 ! 8172 ! MALACCA ; common, *Griffith* ! Maingay 560 ! *Holmberg* 884 ! *Derry* 1049 ! **DISTRIB.** Sumatra.

The native name in Malacca is “*Batai*” or “*Kayu Batai*.”

There is a third species of *Peltophorum* in Sumatra (*P. grande*), a very tall tree with white flowers tinged with pink.

### 55. CÆSALPINIA Linn.

Robust erect trees, shrubs, or woody prickly climbers. *Leaves* large, abruptly bipinnate. *Flowers* showy, yellow, in copious axillary racemes. *Calyx* deeply cleft, with the disc confined to its base, the lobes imbricated, the lowest the largest, cucullate. *Petals* spreading, usually orbicular with a distinct claw, the uppermost smaller than the others. *Stamens* 10, free, declinate ; anthers oblong, uniform, versatile. *Ovary* sessile or subsessile, few-ovuled ; style filiform, sometimes clubbed at the tip, stigma terminal. *Pod* oblong or ligulate, thin and flat, or thicker and subturgid, indehiscent or dehiscent, smooth or (in **SUBGEN.** *Guilandina*) armed all over with wiry spines. Species about 40, widely spread in the tropics of both hemispheres.

Pod armed with abundant wiry prickles ; petals narrow  
(**GUILANDINA**) :—

Leaves stipulate, leaflets small, bracts squarrose ... 1. *C. Bonducella*.

Leaves without stipules, leaflets larger, bracts ascending ... 2. *C. Bonduc*.

Pod unarmed, petals broad :—

Pod dry, thin-valved with narrow sutures (**EUCÆSALPINIA**) :—

Leaflets few, coriaceous, large ; pods short, seeds solitary or rarely 2 (§ *Nugaria*) ... 3. *C. Nuga*.

Leaflets many, membranous or subcoriaceous, small ; pods longer than broad, seeds 5–8 :—

Stamens long, far-exserted ; petals long-clawed (§ *Cæsalpinaria*)... 4. *C. pulcherrima*.

Stamens short, little-exserted ; petals short-clawed (§ *Sappania*) :—

Petals orbicular, flowers 75 in. across :—

Stipules 0, petals subequal, pod wingless broadly blunt-pointed with recurved beak ... 5. *C. Sappan*.

- Stipules large, upper petal smaller than the others,  
pod narrowly winged along ventral suture, ob-  
liquely round-pointed with straight beak ... 6. *C. sepiaria*.  
Petals oblong (subequal), flowers only .3 in. across,  
(pod wingless, broadly blunt-pointed with straight  
beak) ... .. 7. *C. parviflora*.  
Pod somewhat fleshy, thick-valved with wide sutures  
(CINCLIDOCARPUS):—

- Leaflets oblong; racemes lax, pedicels much exceeding  
calyx ... .. 8. *C. digyna*.  
Leaflets ligulate, racemes denser, pedicels hardly exceed-  
ing calyx ... .. 9. *C. tortuosa*.

SUBGEN. 1. GUILANDINA Bak. *Pod* dry, armed on the face with abundant wiry prickles; *petals* narrow.

1. CÆSALPINIA BONDUCELLA Fleming, *Asiat. Research.* XI, 159. A climber, often very extensive, with finely grey-downy branches armed with many small hard falcate yellow prickles. *Leaves* 1 to 2 feet long, with a pair of reduced pinnæ (or compound stipules) at their base; pinnæ 12–16, 2–3 in. long, slightly lengthening upwards, leaflets 12–18, membranous, rather pale-green, ovate or elliptic, base slightly unequally rounded, apex cuneate or rounded mucronulate, .5–1 in. long, .3–.6 in. wide, glabrous above, slightly puberulous beneath, more closely on the margins, petiolules very short; lobes of compound stipules sub-orbicular. *Racemes* terminal and slightly supra-axillary, simple or paniced, dense at top, laxer downwards, 6–10 in. long; pedicels .2 in. (in fruit .3 in.) long, with squarrose reflexed lanceolate deciduous bracts .25–.3 in. long, finely brown-downy as are the pedicels and main-rachis. *Calyx* .25–.3 in. long, closely downy. *Petals* oblanceolate, little exerted, yellow except the broader shorter ovate-acute upper with reddish base. *Stamens* densely grey-silky, declinate. *Pod* short-stalked, oblong, 2–3 in. long, 1.75 in. wide, densely strongly aculeate externally. *Seeds* usually 2, oblong, lead coloured, .5 in. across. Roxb. *Flor. Ind.* II, 357; Bak. in *Flor. Brit. Ind.* II, 254. *Guilandina Bonducella* Linn. *Sp. Pl.* 381; Wall. *Cat.* 5803. *G. Bonduc* W. & A. *Prodr.* 280 in part; Miq. *Flor. Ind. Bat.* I, 113 in part.

ANDAMANS; common on the coasts. PENANG; Curtis 99! DISTRIB. Cosmopolitan in the tropics.

2. CÆSALPINIA BONDUC Roxb. *Hort. Beng.* 32. A large shrubby creeper often very extensive, with sparingly pubescent branches armed with rather strong falcate brown prickles. *Leaves* 1–2 feet long, without stipules; pinnæ 8–16, 5–8 in. long, slightly lengthening upwards, leaflets 12–14, papery, ovate, base subequally rounded, apex cuneate mucronate, 1.5–2 in. long, .75–1 in. wide, dark-green shining glabrous above, rather closely puberulous beneath, petiolules .08 in. long. *Racemes*

terminal and supra-axillary simple or paniced, rather lax throughout, 6–12 in. long; pedicels .2 (in fruit .3) in. long, with membranous lanceolate deciduous bracts .2 in. long, finely brown-pubescent as are the pedicels and main-rachis. *Calyx* .2–.25 in. long, closely downy, light-green, tinged with pink. *Petals* oblanceolate, little exserted, yellow. *Stamens* silky, declinate. *Pod* rather distinctly stipitate, oblong, 5 in. long, 2.5 in. wide, sparsely strongly aculeate externally. *Seeds* usually 4, oblong, .5 in. across. Roxb. Flor. Ind. II, 362; Bak. in Flor. Brit. Ind. II, 255. *Guilandina Bonduc* Linn. Sp. Pl. 381; DC. Prodr. II, 480; Wall. Cat. 5806; W. & A. Prodr. 280 in part; Miq. Flor. Ind. Bat. I, 113 in part.

NICOBARS; *King's Collector!* PENANG; *Wallich* 5806! PAHANG; *Ridley* 2650! PERAK; *Scortechini* 1062! *Kunstler* 7147! *Wray* 3089! DISTRIB. Cosmopolitan in the tropics.

SUBGEN. 2. EUCÆSALPINIA. *Pod* dry, unarmed, valves thin; petals broad.

§ 1. NUGARIA DC. *Leaflets* few coriaceous shining; *petals* short-clawed; *stamens* not far exserted; *seeds* 1, rarely 2.

3. CÆSALPINIA NUGA Ait. Hort. Kew. III, 32. A very extensive littoral climber, with glabrous green branches armed with very strong, short, hard, dark, hooked prickles. *Leaves* 6–12 in. long, pinnæ 6–8, rather remote, subequal, 2–3 in. long, leaflets 4 or (oftener) 6, rigidly coriaceous, dark-green and shining above, ovate, acute or very rarely obtuse, base slightly unequally rounded or sometimes cuneate, 1–2.5 in. long, .5–1 in. wide, quite glabrous on both surfaces; petiolules .15 in. long. *Racemes* in a terminal panicle extending into the axils of the uppermost leaves, 10–15 in. long, 6–8 in. across, individual racemes 2.5–3 in. long; pedicels .3 (in fruit .5) in. long, with small ovate-lanceolate deciduous bracts .1 in. long. *Calyx* .25–.3 in. long, leathery, quite glabrous. *Corolla* .5 in. across, fragrant, petals yellow, orbicular except the rather smaller ovate-acute upper blotched with red. *Stamens* densely woolly at base, declinate. *Pod* 2 in. long, 1.35 in wide, oblong, beaked, hard, slightly turgid, indehiscent. *Seed* solitary, black, 1 in. long, .75 in. wide. DC. Prodr. II, 481; Miq. Flor. Ind. Bat. I, 108; Bak. in Flor. Brit. Ind. II, 255. *Cæsalpinia paniculata* Desf. Cat. ed. 2, 210; Roxb. Hort. Beng. 32; DC. Prodr. II, 481; Roxb. Flor. Ind. II, 364; W. & A. Prodr. 281; Wight, Ic. t. 36. *C. sumatrana* Wall. Cat. 5831 B, C, not of Roxb. *C. bijuga* Wall. Cat. 5833, not of Sw. *C. scandens* Kœnig in Roth, Nov. Sp. 289; DC. Prodr. II, 482; Wall. Cat. 5829. *Guilandina Nuga* Linn. Sp. Pl. ed. II, 545. *Nuga sylvarum* Rumph. Herb. Amboin. V, t 50.

ANDAMANS; very common on all the coasts and near muddy creeks.

NICOBAR; common. KEDAH; Pulo Langkawi, *Curtis* 2618! 2867! PERAK; *Scortechini* 1096! *Kunstler* 1029! MALACCA; *Griffith* 1898! PAHANG; *Ridley* 1377! DISTRIB. Coasts of S.-E. Asia, North Australia and Western Polynesia.

The nearest ally of this species is not any plant known as a *Cæsalpinia*, but a species from China known as *Mezoneuron sinense*.

§ 2. CÆSALPINARIA Bth. & Hk. f. *Leaflets* small, numerous, membranous; *petals* very long-clawed; *stamens* very far exerted; *seeds* 6-8.

4. CÆSALPINIA PULCHERRIMA Sw. Obs. 166. A shrub with glabrous unarmed or very sparsely and weakly prickly branches. *Leaves* 4-6 in. long, pinnæ 12-16, 2-4 in. long, the proximal and distal rather shorter than those between, leaflets 16-24, distinctly petiolulate, close, membranous, elliptic-oblong, apex obtuse, base slightly oblique, cuneate on upper rounded on lower side, .5-.7 in. long, .35-.45 in. wide, dark-green, glabrous on both surfaces. *Racemes* terminal and axillary, simple or very sparingly branched, 8-12 in. long, at length subcorymbose, 4-6 in. wide, pedicels ascending, the lowest reaching 3-4 in. in length; bracts subulate .2 in. long, very early caducous. *Calyx* .6 in. long, quite glabrous, leathery, the lower segment very large and deeply cucullate, .4 in. wide. *Corolla* spreading, 1.5 in. across, all petals long-clawed, the lower four .75 in. long, yellow or red, lamina orbicular with crisped margin, .5 in. in diam., the upper smaller. *Stamens* far-exserted, red, glabrous, 1.75 in. long. *Pod* thin, flat, ligulate, glabrous, nearly straight, 2-3 in. long, .6 in. wide; seeds 6-8, broadly oval, compressed, brown, .4 in. long, .3 in. wide. Benth. Pl. Jungh. 258; Miq. Flor. Ind. Bat. I, 111; Bak. in Flor. Brit. Ind. II, 255. *Poinciana pulcherrima* Linn. Sp. Pl. 380; DC. Prodr. II, 484; Bot. Mag. t. 995; Wall. Cat. 5813; Roxb. Flor. Ind. II, 355; W. & A. Prodr. 282. Rheede, Hort. Malab. VI, t. 1; Rumph. Herb. Amboin. II, t. 20.

A garden or hedge plant in most of our provinces.

The native country of this species is uncertain, but apparently it is not anywhere truly wild in S.-E. Asia. The other species of the section are American, so that this one has perhaps also been originally derived from the Western Hemisphere.

§ 3. SAPPANIA DC. *Leaflets* many, membranous, small; *petals* short-clawed; *stamens* not far exerted; *seeds* 3-6.

5. CÆSALPINIA SAPPAN Linn. Sp. Pl. 381. A tree 20-30 feet high with thorny stem 6-10 in. in diam.; branches rusty-pubescent with few small prickles. *Leaves* 8-15 in. long, pinnæ 16-24, 4-6 in. long; leaflets 20-36, close, membranous or chartaceous, oblong, very oblique, sessile, attached at lower corner, apex obtuse or slightly retuse, .5-.75 in. long, .35 in. wide, glabrous above, slightly puberulous on the nerves



beneath. *Racemes* in a terminal panicle extending into the axils of the uppermost leaves, 12–16 in. long, 8 in. across, individual racemes 4–6 in. long; pedicels .5–.6 in. long, bracts lanceolate .3 in. long, very deciduous. *Calyx* .4 in. long, leathery, glabrous. *Corolla* .75 in. across, petals bright-yellow, the upper with a pinkish basal patch, all orbicular subequal. *Stamens* waxy-white, densely woolly at base, declinate. *Ovary* grey-velvety. *Pod* 3–4 in. long, 1.5–2 in. wide, subcompressed, polished, indehiscent, with a hard recurved short beak at upper angle of obtuse apex. Roxb. Cor. Pl. I, 17, t. 16; Hort. Beng. 32; DC. Prodr. II, 482; Wall. Cat. 5838; Roxb. Flor. Ind. II, 357; W. & A. Prodr. 281; Miq. Anal. Ind. I, 9; Flor. Ind. Bat. I, 108; Bedd. Flor. Sylvat. 90; Anal. Gen. t. 13, f. 1; Bak. in Flor. Brit. Ind. II, 255. *Biancæa Sappan* Todaro, Hort. Bot. Panorm. 3. *Lignum Sappan* Rumph. Herb. Amboin. IV, t. 21.

PERAK; open jungle at foot of hills, Ulu Bubong, *Kunstler* 10567! PAHANG; Pulo Changei, *Ridley* 2590! DISTRIB. India, Indo-China; Malay Archipelago.

6. *CÆSALPINIA SEPIARIA* Roxb. Hort. Beng. 32. A moderate climber with stout woody stem and somewhat densely grey- or brown-pubescent branches armed with strong sharp prickles. *Leaves* stipulate, 9–15 in. long; pinnæ 12–20, 2–3 in. long, subequal, leaflets 16–24, very shortly petiolulate, close, membranous, oblong, apex obtuse, base rounded on both sides, slightly oblique on upper, .5–.8 in. long, rather pale-green glabrous above, glaucous and slightly pubescent beneath; stipules very obliquely ovate with crisped margins, long-acuminate apex, and with projecting auriculate lower angle of base, .5 in. long, .3 in. wide, soon deciduous. *Racemes* terminal and axillary all simple, drooping, 6–12 in. long, 2–2.5 in. across, pedicels erecto-patent, .75 in. long, bracts large ovate-lanceolate caducous, .4 in. long, densely pubescent. *Calyx* .5 in. long, densely pubescent. *Corolla* spreading, .75 in. across, petals bright yellow, all orbicular, .5 in. across except the upper only .25 in. in diam. *Stamens* little exerted, declinate, greenish-white, densely woolly in the lower half. *Pod* indehiscent, linear-oblong, 3–5 in. long, 1.2 in. across, subligulate, glabrous, slightly recurved and slightly turgid, rather strongly reticulate-veined especially in the half next lower suture; upper suture dilated into a narrow wing; faces slightly depressed between the 6–8 mottled seeds, .4 in. long, .3 in. wide. Wall. Cat. 5834; Roxb. Flor. Ind. II, 360; W. & A. Prodr. 282; Wight, Ic. 37; Miq. Flor. Ind. Bat. I, 109; Bak. in Flor. Brit. Ind. II, 256. *C. ferox* Hassk. Pl. Jav. Rar. 400. *C. japonica* Sieb. & Zucc. Fl. Jap. 9. *C. crista* Thunb. Flor. Jap. 179, not of Linn. *Reichardia decapetala* Roth. Nov. Sp. 9; DC. Prodr. II, 484. *Biancæa scandens* Todaro, Hort. Bot. Panorm. 4, t. 1.

PENANG; Govt. Hill, 2500 feet, *Curtis*, 385! DISTRIB. Eastern and South-Eastern Asia, introduced in America.

7. *CÆSALPINIA PARVIFLORA* Prain. A small tree or, at times, a climber, with stem 8–12 in. in diam. and with rusty-pubescent branches sparingly armed with small prickles. *Leaves* stipulate 8–10 in. long, pinnæ 18–24, 2–3 in. long; leaflets 30–36, close, firmly subcoriaceous, oblong, sessile, attached sub-centrally but with the lower corner subauriculately produced, apex obtuse or rounded, .35–.5 in. long; .2–.25 in. wide in VAR. *typica*, .75 in. long, .35 in. wide (or rarely even larger) in VAR. ? *stipularis*, dark-green glabrous and shining above, dull beneath and glabrous in VAR. *typica*, sparsely puberulous on the midrib in VAR. ? *stipularis*; stipules lanceolate or oblong .45–.75 in. long. *Racemes* in an ample terminal again branching panicle extending into the axils of the upper leaves, 2–3 feet long, 12–15 in. across, primary branches 5–8 in. long, final individual racemes 3 in. long; pedicels .25 in. long, slender, densely puberulous as are the main-rachis and branches of panicle; bracts linear or lanceolate, .2–.25 in. long, deciduous. *Calyx* .25 in. long, thinly coriaceous, puberulous. *Corolla* .3 in. across, petals greenish-yellow, oblong, subequal, hardly exerted. *Stamens* green, densely woolly at base. *Ovary* sparsely pubescent. *Pod* of VAR. *typica* 1 in. long, .5 in. wide, with a recurved beak at upper angle of obtuse apex; seeds (young) oval, 4, .25 in. long.

VAR. *typica*; leaflets not exceeding .5 in. in length, glabrous beneath; stipules lanceolate, .45 in. long, .2 in. wide, margin entire; bracts linear, .2 in. long, hardly equalling the pedicels.

PERAK; at low elevations, *Kunstler* 3499! 7584! *Wray* 1909!

VAR. ? *stipularis*; leaflets .75 in length or longer, the midrib beneath puberulous; foliaceous stipules broadly ovate-oblong, .75 in. long, .35 in. wide, continued in the leafless portion of the more diffusely branching and more densely puberulous inflorescence, their margins often incised; bracts lanceolate, .25 in. long, equalling the pedicels.

PERAK; Larut, in the plains, *Wray* 3983! 3991! 4261!

The foliage of the typical variety of this species is very like that of *C. cinclidocarpa* Miq. or *C. tortuosa* Roxb. but the remarkably small flowers and the different fruit (which is exactly like a miniature *C. Sappan* pod) abundantly distinguish it from all other Indo-Malayan species.

The pod of VAR. ? *stipularis* is not yet known and it may ultimately be necessary to separate it specifically from *C. parviflora*. But its flowers, except that the calyx is somewhat more puberulous, are exactly as in *C. parviflora*, and though VAR. ? *stipularis* has a somewhat different facies on account of its larger leaflets and especially its much longer foliaceous subsistent stipules, it seems better in the meantime to treat it tentatively as no more than a variety of *C. parviflora*. *Wray* notes that VAR. *typica* is a "small tree;" *Kunstler* states on one occasion that it is

a tree 30–40 feet high, on another that it is a climber 100–150 feet long. Of all three gatherings of var. ? *stipularis* it is noted that the plant is a climber.

SUBGEN. 3. CINCLIDOCARPUS Bak. *Pod* rather fleshy, indehiscent, naked on the faces, with thickened sutures. *Petals* broad.

8. CÆSALPINIA DIGYNA Rottl. ex Willd. Nov. Act. Nat. Cur. IV, 198 t. 3. A climber with glabrous or slightly downy branches armed with scattered prickles. *Leaves* 6–9 in. long, pinnæ 8–9, 1·5–2·5 in. long increasing upwards, leaflets 16–20, close, membranous, oblong, obtuse, sessile, base subequally rounded, ·35–·45 in. long, ·25 in. wide, medium-green and glabrous above, greyish and obscurely downy beneath; stipules subulate, membranous, very early deciduous. *Racemes* simple axillary, 8–12 in. long, 3 in. wide, pedicels distant slender horizontal or slightly deflexed, 1 in. long, glabrous as is the main-rachis. *Calyx* leathery, quite glabrous, ·3 in. long. *Corolla* spreading, ·75 in. across, petals orbicular, ·3 in. in diam., subequal, yellow except the upper slightly streaked with red. *Stamens* little exerted, filaments greenish-white, densely woolly in the lower half, declinate. *Pod* rather fleshy, indehiscent, oblong, glabrous, with much thickened sutures, 1·5–2 in. long, 1 in. across, turgid, torulose; seeds 2–4, black, ovoid, ·5 in. long, ·4 in. wide. DC. Prodr. II, 482; Wall. Cat. 5839; W. & A. Prodr. 281; Bak. in Flor. Brit. Ind. II, 256. *C. oleosperma* Roxb. Hort. Beng. 32; Fl. Ind. II, 356. *C. flavicans* Grah. in Wall. Cat. 5825. *C. gracilis* Miq. Flor. Ind. Bat. I, 110. *Pterolobium lacerans* Wall. Cat. 5841 letters F, H, and I; not of R. Br.

MALACCA; *Griffith*! PENANG; *Curtis* 448! TONGKAH; *Curtis*' *Collector* 2862! DISTRIB. India, Indo-China, Malay Archipelago.

9. CÆSALPINIA TORTUOSA Roxb. Hort. Beng. 32. A stout subscandent straggling shrub, with slightly downy spreading branches armed with very strong prickles. *Leaves* 12–18 in. long, pinnæ 30–40, 2·5–4 in. long, the proximal and distal rather shorter than those between, leaflets 40–60, sessile, close, rigidly subcoriaceous, narrowly ligulate, apex obtuse or rounded, base obliquely cuneate, ·25–·3 in. long, ·1 in. wide, dark-green, glabrous on both surfaces, shining above. *Racemes* axillary, simple, erect, 15–18 in. long, 1·5 in. across, pedicels spreading, ·5 in. long, slender, glabrous as is the stout rachis, bracts very small caducous. *Calyx* ·5 in. long, leathery, quite glabrous, the lower segment very deeply cucullate, ·35 in. wide. *Corolla* spreading, ·75 in. across, petals bright-yellow with red streaks near base, all orbicular clawed, ·5 in. across except the upper only ·25 in. in diam. *Stamens* little-exserted, declinate, green, densely woolly in lower half. *Pod* oblong, twisted, indehiscent, glabrous, with much thickened sutures, 2–3 in. long, 1 in. across, turgid, torulose; seeds 2–5, hard, smooth, dark-brown,

·4 in. across. Wall. Cat. 5827, A, B, and C.; Roxb. Flor. Ind. II, 365; Miq. Flor. Ind. Bat. I, 109; Bak. in Flor. Brit. Ind. II, 257.

PENANG; Penara Bukit, 700 feet, *Curtis* 1027! **DISTRIB.** Sumatra, Tenasserim.

Very nearly related to *C. cinclidocarpa* Miq. which differs by its branching inflorescence and its pubescent calyx; also to *C. acanthobotrya* Miq. which has shorter, more laxly-flowered racemes and broader leaflets. Mr. Kurz indeed has in Herb. Calcutta proposed to treat *C. acanthobotrya* as a variety (VAR. *latifolia*) of *C. tortuosa* but the examination of an authentic example of Dr. Miquel's plant leads the writer to believe that it is better, at least at present, to consider it specifically distinct.

#### 56. MEZONEURON Desf.

Robust woody prickly climbers. *Leaves* abruptly bipinnate. *Flowers* in ample paniced racemes. *Calyx* very oblique, usually deeply cleft, with a basal or intertubal disc, the lobes imbricated, the lowest largest covering the others in bud like a hood. *Petals* spreading, obovate-spathulate, subequal or the upper smallest. *Stamens* free, declinate, usually exserted; anthers oblong, uniform. *Ovary* sessile or shortly stipitate, declinate, few- or many-ovuled; style filiform, stigma small, capitate, the margin often fringed. *Pod* large, thin, oblong, flat, indehiscent, with a broad wing down the upper suture; seeds compressed, orbicular, cotyledons flat, radicle straight. **Species** about 15; all in the tropics of Eastern Hemisphere.

Calyx deeply cleft, with a wide short tube and a basal disc, the anterior lobe deeply cucullate (*Eumezoneuron*):—

Leaflets opposite, large; pods 1-seeded ... .. 1. *M. cucullatum*.

Leaflets alternate, medium to small; pods several seeded:—

Leaflets beneath and calyx externally puberulous ... 2. *M. hymenocarpum*.

Leaflets beneath and calyx externally glabrous:—

Pedicels puberulous, jointed near base of calyx; leaflets cuneate at apex ... .. 3. *M. Kunstleri*.

Pedicels glabrous, jointed considerably below base of calyx; leaflets obtuse ... .. 4. *M. andamanicum*.

Calyx shallowly cleft, with a narrow long tube and a disc extending above the base, anterior lobe shallowly hooded (*Tubicalyx*); (leaflets alternate) ... .. 5. *M. sumatranum*.

**SUBGEN. 1. EUMEZONEURON;** calyx deeply cleft, disc basal; lower lobe deeply cucullate.

1. MEZONEURON CUCULLATUM W. & A. Prodr. 233. A large climber, branches glabrous armed with small dark short recurved prickles. *Leaves* 6–12 in. long, pinnæ 4–10, 6–8 in. long; leaflets 8–10, opposite, rigidly subcoriaceous, ovate-acute, base wide-cuneate slightly unequal, 2–4 in. long, 1·25–1·75 in. wide, glabrous on both surfaces, dark-green

above, paler beneath, secondary veins 4-5 pairs and intermediate reticulations faint; petiolules .2 in. long. *Inflorescence* a terminal or axillary panicle of simple or occasionally branched racemes, 1-1.5 feet long, with terete glabrous main-rachis; single racemes 4-8 in. long; pedicels close-set, slender, .3 in. long, jointed a little above the middle. *Calyx* yellow, quite glabrous, leathery, anterior sepal cucullate, obtuse, .25 in. long, the rest orbicular, tube shallow. *Corolla* .45 in. across, pale-green, standard 2-lobed, shorter but wider than the other subequal orbicular. *Stamens* far exerted, puberulous at base, declinate, unequal. *Ovary* declinate, 1-2-ovuled. *Pod* thin, 3-3.5 in. long, 1.25 in. wide (including wing .3 in. wide), faintly reticulated; seeds usually solitary, very rarely 2.

ANDAMANS; common. *DISTRIB.* Eastern Himalaya, India, Indo-China.

2. *MEZONEURON HYMENOCARPUM* W. & A. Prodr. I, 283. A large climber, branches finely puberulous, with a few scattered recurved brown prickles. *Leaves* 1-1.5 feet long, pinnæ 1-10, 3-4 in. long, leaflets 10-14, alternate or subopposite, rigidly subcoriaceous, obovate, apex obtuse or rounded, base cuneate unequal, .5-1 in. long, .25-.6 in. wide, puberulous above, puberulous to densely pubescent beneath, secondary veins 5-6 pairs very faint; petiolules .15 in. long. *Inflorescence* a large terminal thyrsoid panicle of unbranched racemes extending into the axils of the uppermost leaves, 2 feet long, 8-10 in. wide, the single racemes 6-8 in. long, puberulous as are the main-rachis and slender pedicels, .35-.5 in. long, jointed .15 in. under base of calyx. *Calyx* densely puberulous, leathery, anterior sepal cucullate subacute, .25 in. long, the others orbicular. *Corolla* .5 in. across, yellow, petals ovate-orbicular, upper small. *Stamens* far exerted, hirsute at base, declinate, unequal. *Ovary* declinate, about 5-ovuled; stigma slightly fringed. *Pod* thin, 4 in. long, when ripe 1 in. wide (including posterior wing .25-.3 in. wide), faintly wide-reticulated, 5-seeded. *Cæsalpinia hymenocarpa* Wall. Cat. 5832. *Mezoneuron pubescens* Bak. in Flor. Brit. Ind. II, 259 not of Desf.

ANDAMANS; very plentiful near Port Blair, *King's Collectors!* *DISTRIB.* Burma; Ceylon.

Resembles *M. andamanicum* but is easily distinguished by its leaves and its calyx being pubescent; by its pedicels being shorter; and by its pods being smaller and not so distinctly reticulated.

3. *MEZONEURON KUNSTLERI* Prain. A large climber, branches glabrous, with a few brown scattered recurved prickles. *Leaves* 6-8 in. long, pinnæ 4-6, 4-5 in. long, leaflets 6-8, alternate, subcoriaceous, ovate, cuneate at apex and base, almost equally decurrent on the short petiolule,

·5–1·25 in. long, ·35–·75 in. wide, glabrous on both surfaces, dark-green above, glaucescent beneath, secondary veins few, faint, widely reticulated; petiolules ·15 in. long. *Inflorescence* a large terminal thyrsoid panicle of unbranched racemes 1·5–2 feet long, 8–9 in. wide, the single racemes 8–10 in. long, faintly puberulous as in the main-rachis; pedicels slender ·35–·45 in. long, distinctly puberulous, jointed ·2 in. under base of calyx. *Calyx* quite glabrous, leathery, anterior sepal deeply cucullate obtuse, ·25 in. long, the rest orbicular, all gland-dotted as is the shallow tube. *Corolla* ·5 in. across, bright-yellow, petals ovate-orbicular, upper smaller than the others. *Stamens* far exserted, hirsute at base, declinate, unequal. *Ovary* declinate, about 5-ovuled; stigma slightly fringed. *Pod* only seen very young; wing half as wide as body of pod.

PERAK; Sungah Ryah, *Kunstler* 895!

A species very near *M. andamanicum*, with which it agrees in number, size, and disposition of leaflets, and which it closely resembles in flowers. The different shape of the leaflets, however, and especially the much shorter distance between the joint in the pedicel and the base of the calyx, with the much shorter puberulous pedicels, mark it as abundantly distinct. The wing, too, of the very young pod is in *M. Kunstleri* almost twice as wide as the wing in the corresponding stage of the pod in *M. andamanicum*.

4. *MEZONEURON ANDAMANICUM* Prain, Journ. As. Soc. Beng. LXI, 2, 131. A large climber, branches glabrous with a few scattered prickles. *Leaves* 1–1·5 feet long, pinnæ 4–10, 5–7 in. long, leaflets 8–10, alternate, rigidly subcoriaceous, obovate, slightly retuse, base cuneate slightly unequally decurrent on the short petiolule, ·5–1·5 in. long, ·35–1 in. wide, glabrous on both surfaces, dark-green above, pale beneath, secondary veins few faint widely reticulated; petiolules ·15 in. long. *Inflorescence* a large terminal thyrsoid panicle of unbranched racemes extending into the axils of the uppermost leaves, 2–2·5 feet long, 1 foot wide, the single racemes 10–12 in. long, quite glabrous as are the main-rachis and the slender pedicels ·5–·75 in. long, jointed ·3 in. under base of calyx. *Calyx* quite glabrous, leathery, anterior sepal deeply cucullate obtuse, ·25 in. long, the rest orbicular all reticulate-veined and yellow gland-dotted as is the shallow tube. *Corolla* ·5 in. across, rather pale-yellow, petals ovate-orbicular, the upper smaller than the others with a thickened claw prolonged into a ligular ciliate ridge, the rest with claw hirsute internally and with lamina red-blotched at base and pink-veined. *Stamens* far exserted, hirsute at base, declinate, 2-seriate, free, unequal. *Ovary* declinate, ovules about 6; stigma slightly fringed. *Pod* thin, 5 in. long, when ripe 1–1·5 in. wide (including posterior wing ·25–·35 in. wide), finely wide-reticulated, distantly 3–5-seeded.

ANDAMANS; very common near Port Blair, *Prain! Man! King's Collector!*

SURGEN. 2. TUBICALYX Miq. Flor. Ind. Bat. I, 1081. *Calyx* shallowly cleft, the disc extending above the base, lower lobe shallow-cucullate.

5. MEZONEURON SUMATRANUM W. & A. Prodr. I, 283. A large climber, branches glabrous, armed with a few dark short recurved prickles. *Leaves* 1-1.5 feet long, pinnæ 6-10, 8-12 in. long, leaflets 6-8, alternate, rigidly subcoriaceous, obovate-oblong, emarginate and apiculate, base rounded very slightly unequal, 1.5-2.5 in. long, 1.25-1.75 in. wide, glabrous on both surfaces, dark-green above, paler beneath, secondary veins rather prominently closely reticulate beneath; petiolules .2 in. long. *Inflorescence* a terminal or axillary panicle of simple or occasionally branched racemes 1.5-2 feet long, with terete thick glabrous main rachis, single racemes 5-6 in. long; pedicels close-set slender, .25 long, curved. *Calyx* quite glabrous, leathery, anterior sepal orbicular .25 in. long, twice as large as the others, tube compressed .5 in. long. *Corolla* .35 in. wide, .5 in. long, of 5 subequal petals, oblong, narrowed to the base, the standard reddish the other petals yellowish. *Stamens* hardly exerted, declinate, glabrous, unequal. *Ovary* declinate stipitate glabrous, 3-4-ovuled, stigma glabrous. *Pod* thin, 3-4 in. long, 1.35 in. wide (including posterior wing .25 in. wide), finely wide-reticulate, distantly 3-4-seeded. Miq. Flor. Ind. Bat. I, 105 and I, 1081; Bak. in Flor. Brit. Ind. II, 259. *Cæsalpinia sumatrana* Roxb. Hort. Beng. 32; Flor. Ind. II, 336; Wall. Cat. 5831A only.

MALACCA; *Griffith!* *Maingay* 534! PERAK; Thaipeng, *Scortechini* 67! Kwala, *Scortechini* 1766! Simpat, *Ridley* 3083! DINDINGS; Lumot, *Ridley & Curtis!* SINGAPORE; near Krangi, *Ridley* 2105! 6026!

The great difference in the appearance of the calyx no doubt justifies Dr. Miquel's proposal to treat this plant as the type of a distinct subgenus of *Mezoneuron*.

### 57. PTEROLOBIUM R. Br.

Robust woody prickly climbers. *Leaves* abruptly bipinnate. *Flowers* in paniced racemes. *Calyx* deeply cleft, with the disc near the base, the lobes imbricated, the lowest longer and more hooded than the others. *Petals* spreading, oblong and clawed equalling the calyx. *Stamens* 10, free, declinate, little exerted; anthers oblong versatile. *Ovary* sessile, 1-ovuled; style filiform, stigma small terminal. *Pod* indehiscent, samaroid with a large horny oblique terminal wing. Species 7; one African, one Australian, two Chinese, three South-East Asiatic.

Racemes with thin angular glabrous rachis, laxly 20-30-

fld., pedicels longer than calyx ... .. 1. *P. macropterum*.

Racemes with stout terete puberulous rachis, densely

150-200-fld., pedicels not longer than calyx ... .. 2. *P. densiflorum*.

1. PTEROLOBIUM MACROPTERUM Kurz, Journ. As. Soc. Beng. XLII, 2. 71. A large climber, young branches sparsely pubescent, all parts

sparingly armed with small prickles. *Leaves* 6–9 in. long; pinnæ 14–16, 2–2.5 in. long with puberulous rachis; leaflets 14–20, elliptic-oblong, apex rounded or obtuse, base unequal, abruptly rounded on upper, narrow-cuneate on lower side, .45 in. long, .25 in. wide, chartaceous, dark-green above, paler beneath, glabrous on both surfaces. *Racemes* lax, in spreading terminal and axillary panicles with glabrous slender angular rachis and branches, 8 in. long, 4 in. across, individual racemes 3–4 in. long, 20–30-fl.; pedicels glabrous slender spreading, .4–.6 in. long. *Calyx* glabrous, thinly coriaceous, lowest sepal .25 in. long. *Corolla* white, .25 in. long. *Pod* 2.5–2.75 in. long, glabrous; seed-bearing base turgid reticulate, .75 in. long, .5 in. wide, wing .7–.8 in. wide, the upper margin straight or slightly recurved thickened, the lower thin irregularly sinuately convex, the apex rounded. *Pterolobium lacerans* Miq. Flor. Ind. Bat. I, 106 not of R. Br., nor of Wall., nor of Wight. *P. indicum* var. *macropterum* Bak. in Flor. Brit. Ind. II, 259.

ANDAMANS; very common. DISTRIB. JAVA; Burma.

This species is not so closely related to *P. lacerans* R. Br., with which Dr. Miquel has identified it, as it is to *P. indicum* A. Rich. (*P. lacerans* Wall.; W. & A.; Wight, Ic.) of which Mr. Baker treats it as a variety. *P. macropterum* has however quite glabrous flower branches, very different leaflets, and fewer and smaller prickles; while it agrees with *P. indicum* in length of pedicels and in style of inflorescence, it has very different pods with a much larger wing.

2. *PTEROLOBIUM DENSIFLORUM* Prain. A large climber, young branches pubescent, all parts very strongly armed with large recurved prickles. *Leaves* 4–8 in. long, pinnæ 8–16, 3 in. long, with puberulous rachis; leaflets 14–16, rather narrow-oblong, apex obtuse or retuse, base unequal abruptly rounded on both sides, .6 in. long, .25 in. wide, sub-coriaceous, dark-green, glabrous on both surfaces. *Racemes* dense in fastigiate terminal panicles with stout subterete puberulous rachis and branches; 1.5 feet long, 1 foot across, individual racemes 150–200-fl., 6–8 in. long; pedicels puberulous slender spreading, .25 in. long. *Calyx* sparsely puberulous, thinly coriaceous, lowest sepal .3 in. long. *Corolla* yellow, .3 in. long. *Pod* 2 in. long, glabrous; seed-bearing base turgid, reticulate, .6 in. long, .5 in. wide, wing .5–.7 in. wide, the upper margin straight thickened, the lower thin irregularly sinuately convex, the apex narrowly rounded. *P. microphyllum* Kurz, Journ. As. Soc. Beng. XLII, 2, 71 not of Miq. *P. indicum* var. *microphyllum* Bak. in Flor. Brit. Ind. II, 259 in part, and excl. the plant of Miquel.

PENANG; Government Hill, 2500 feet, *Curtis* 3093! MALACCA; *Maingay* 535!

*Maingay's* plant here cited is the same as that of *Curtis* both as regards flowers and fruits. The description of the leaflets is taken from the Penang plant, the Malacca one at Calcutta having only bare rachises. The Malacca plant is the type



of *P. microphyllum* Kurz; that it cannot possibly be the true *P. microphyllum* Miq. is obvious from the fact that Miquel's plant has linear leaflets smaller than those of his *P. laceras*—which is the *P. macropterum* of this work—arranged in from 20–22 pairs on 14–16 pairs of pinnæ, whereas *P. densiflorum* has oblong leaflets larger than those of *P. macropterum*, arranged in from only 7–8 pairs on 4–8 pairs of pinnæ. Mr. Kurz's misidentification no doubt arose from the fact that he had not seen the leaves of Maingay's plant. In style of inflorescence *P. densiflorum* most resembles the Chinese *P. punctatum* Hemsl., but that plant has less dense and less numerous flowered racemes, and has very different leaves.

*SUBORDER III. MIMOSEÆ.*

Trees, shrubs or very rarely herbs. *Leaves* 2-pinnate, very rarely simply pinnate. *Flowers* small, rarely elongated, tubular, sessile in globose heads or cylindric spikes, rarely shortly pedicelled and in globose umbels or slender racemes; bracts small narrow often dilated at the tips, substrobilately imbricate in bud usually deciduous during flowering; bracteoles very rare; perianth regular often in 5-merous, sometimes 4-merous, rarely 3-merous or 6-merous whorls. *Sepals* valvate (except in *Parkieæ*), rarely free, usually connate in a 5-toothed to 5-lobed tube, sometimes 0; disc-tube 0. *Petals* as many as sepals, valvate, free or connate in a lobed tube, hypogynous or obscurely perigynous. *Stamens* as many, or twice or thrice as many, as petals, or indefinite, free or monadelphous, or adnate to base of corolla tube, usually exerted; anthers small, versatile, dehiscing longitudinally. *Ovary* free at base of calyx. *Seeds* usually ovate or orbicular, compressed, with basilar hilum; rarely thick globose or ovoid; testa hard, albumen 0, or scanty; cotyledous flat; radicle straight, shortly exerted or included; funiculus often expanded in a small fleshy arillus.

Anthers gland-tipped; (stamens 5–10):—

Calyx-teeth short, imbricated (*Parkieæ*); filaments usually either connate or adnate at base; (inflorescence capitate; heads very large; trees) ... .. 58. PARKIA.

Calyx valvate (*Adenanthereæ*); filaments free:—

Inflorescence elongated; (species all woody):—

Flowers sessile; great climbers with opposite leaflets and huge pods and seeds ... .. 59. ENTADA.

Flowers short-stalked; trees with alternate leaflets and narrow contorted pods ... .. 60. ADENANTHERA.

Inflorescence capitate; heads small:—

Small aquatic or subaquatic herbs with small thin pods opening early by upper suture; seeds small ... 61. NEPTUNIA.

Lofty trees with large thick woody pods, late in dehiscing, opening by both sutures; seeds large ... 62. XYLIA.

Anthers not gland-tipped; (calyx valvate, rarely 0):—

Filaments free:—

Stamens definite, as many, or twice as many as petals

(*Eumimoseæ*); (inflorescence capitate in Malayan species); shrubs or under-shrubs with thin coriaceous pods:—

Pods straight with continuous valves, dehiscing through sutures ... .. 63. LEUCENA.

Pods slightly curved with usually segmented valves and with always indehiscent persistent sutures ... 64. MIMOSA.

Stamens indefinite often very numerous (*Acaciæ*); inflorescence spicate or capitate ... .. 66. ACACIA.

Filaments more or less connate (*Ingeæ*); (stamens usually indefinite, rarely only 2-3-times as many as petals):—

Pods (indehiscent) septate between the seeds:—

Flowers large; petals adnate below to the staminal tube, otherwise free; pod woody turgid, sutures not thickened ... .. 66. SERIANTHES.

Flowers small; petals connate below in a tube; pod spongy or fleshy hardly turgid, the sutures thickened 67. ENTEROLOBIUM.

Pods not septate between the seeds:—

Pods straight with thin valves:—

Sutures thickened; valves elastically revolvately dehiscent from apex to base ... .. 68. CALLIANDRA.

Sutures thin, pods indehiscent or if dehiscent the dehiscence not elastic ... .. 69. ALBIZZIA.

Pods twisted with coriaceous valves, or if almost straight (*P. bubalinum*) with fleshy valves, (sutures thin) ... .. 70. PITHECOLOBIUM.

#### 58. PARKIA R. Br.

Tall, unarmed trees. *Leaves* bipinnate with usually very numerous leaflets. *Flowers* in dense long-peduncled heads, each subtended by a coriaceous persistent ligulate bract with a spoon-shaped tip. *Calyx* tubular, shortly 5-cleft, lobes imbricate. *Corolla* tubular, cleft half-way down, the segments subvalvate. *Stamens* 10, exerted, the filiform filaments united in the lower part with each other and with the corollatube; anthers narrow, gland-tipped, the pollen cohering in irregular masses. *Ovary* stalked, many-ovuled; style filiform, stigma minute capitate. *Pod* large, flat, strap-shaped, coriaceous, finally dehiscing. Species about 10, cosmopolitan in the tropics, mostly American.

Petioles with two glands; heads subspherical (leaflets very narrow, acute, in 60-100 pairs) ... .. 1. *P. biglandulosa*.

Petioles with one gland only; heads turbinate or clavate:—

Leaflets subfalcate, acute, in 40-80 pairs ... .. 2. *P. Roxburghii*.

Leaflets straight, obtuse or retuse in 20-35 pairs ... .. 3. *P. speciosa*.

1. *PARKIA BIGLANDULOSA* W. & A. Prodr. 279. A lofty tree. *Leaves* 2-pinnate, main-rachis downy 12-15 in. long; pinnae 20-40 pairs subalternate, secondary rachises also downy about 3 in. long; leaflets

small straight narrow linear-ligulate close-set, 60–100 pairs, with obliquely truncate bases and acute apices, strongly 1-nerved, pubescent along the margins, .2 in. long, .05 in. across, petiolar part of main rachis 1–1.5 in. long, with 2 collateral glands at the top of its swollen base, and with 3–9 solitary glands between the bases of as many pairs of pinnæ toward the apex of the rachis. *Flowers* in dense subspherical heads 1.5 in. in diam., peduncle 4–9 in. long. *Calyx* tubular, shortly 5-cleft, .3 in. long, teeth pilose, elsewhere glabrous. *Corolla* tubular, segments subvalvate. *Stamens* 10, exerted, the filaments connate below and adnate at base to corolla tube; anthers narrow. *Pod* (including stipe 2 in. long) 14–15 in. long, 1.5 in. wide, .35 in. thick, black, at first downy, ultimately quite glabrous. *Seeds* 10–12, oval, .75 in. long, .5 in. wide, .25 in. thick, dark-brown, smooth with a central ovate-lanceolate pale-brown rugose area. Bak. in Flor. Brit. Ind. II. 289. *Mimosa pedunculata* Roxb. Fl. Ind. II, 551.

MALAY PENINSULA; *vide* Baker.

Mr. Baker says that this comes from the Malay Peninsula, and on his authority the statement is here repeated. No botanist has, however, hitherto sent it from the Malay Peninsula; the locality given by Roxburgh is not Malaya, but “the islands to the eastward of the Bay of Bengal;” by this Roxburgh indicates the Andamans and Nicobars. Still, no one has gathered it there in recent years, and the precise habitat must for the present be left doubtful. The specimens at Calcutta are (1) Wight’s n. 559, the type of the species, cult. in the Missionary Garden; (2) Specimens from Madras Agri.-Hort. Society’s Garden collected by Dr. Claghorn; (3) Specimens of Roxburgh’s plant from the Calcutta Botanic Garden where the tree still grows—these last are exactly like Wight n. 559 and show that the doubts expressed by Wight and Arnott as to the identity of their plant with Roxburgh’s *Mimosa pedunculata* are unfounded; (4) Specimens, no doubt from cultivated examples, sent from Assam by Masters and by Jenkins. This is the only *Parkia* at all generally cultivated in Bengal; the next species, which is also grown, is comparatively uncommon.

*P. biglandulosa* should then be carefully looked for in the Nicobars and Andamans, and particularly in N. Andaman; it is highly improbable that it will be found, in a wild state, either in Indo-China or in Malaya.

2. *PARKIA ROXBURGHII* G. Don, Gen. Syst. II, 397. An erect tree 40–60 feet high, stem about 2 feet in diam., young branches pubescent. *Leaves* 2-pinnate, main-rachis puberulous or glabrescent, 12–24 in. long; pinnæ 20–30 pairs, opposite; secondary rachises glabrescent 3–6 in. long; leaflets small, falcately curved forwards, linear-lanceolate, close-set, 40–80 pairs, subequally truncate at base, apex acute, strongly 1-nerved, puberulous along the margins, .3 in. long, .1 in. wide, petiolar part of main-rachis 2–3 in. long with 1 solitary gland below the lower pair of pinnæ and with 3–5 solitary glands between the bases of as many pairs of pinnæ towards apex of rachis. *Flowers* in dense turbi-

nate heads, 1.5 in. long, 1 in. in diam., peduncle 10–16 in. long. *Calyx* tubular, shortly 5-cleft, .25 in. long, teeth pilose, elsewhere glabrous. *Corolla* tubular, pale-yellow, segments subvalvate. *Stamens* 10, exserted, the filaments connate below and adnate to corolla-tube; anthers narrow. *Pod* (including stipe 3–7 in. long) 15–20 in. long, 1.5 in. wide, .3 in. thick, black, glabrous. *Seeds* 12–20, oval, .5 in. long, .35 in. wide, .2 in. thick, dark-brown and smooth throughout. *Bak. Flor. Brit. Ind.* II, 289. *P. Brunonis* Grah. in Wall. Cat. 5288. *P. africana* Miq. *Flor. Ind. Bat.* I, 52 not of R. Br. *P. biglobosa* Benth. in Hook. *Journ.* IV, 328; *Miq. Flor. Ind. Bat. Suppl.* 283; *Koord. & Val. Bijdr.* I, 276. *P. intermedia* Hassk. *Cat. Hort. Bog.* 289; *Pl. Jav. Rar.* 414. *Mimosa biglobosa* Roxb. *Flor. Brit. Ind.* II, 551 not of Jacq.

SINGAPORE; cultivated, *Ridley* 6928! MALACCA; Panchor, *Goodenough* 1748! *DISTRIB.* Wild in Silhet, Cachar and Chittagong; cultivated sparingly in Indo-China and Malaya.

Mr. Goodenough gives the native name as “*Kada-ong* ;” the seeds, he notes, are used as peppermint. This species is said by Koorders and Valetton to be wild in Java; the species cultivated by the Javanese is not, however, the present one, but the next, *P. speciosa* Hassk. And it should be noted besides that the wild tree in Java is not *exactly* the tree that is wild in Silhet, Cachar and Chittagong but is the form that Hasskarl proposed to treat as a distinct species under the name *P. intermedia*. Mr. Ridley’s specimens, from the Singapore Gardens, are precisely like those from Cachar and Chittagong (true *P. Roxburghii*); Mr. Goodenough’s, on the other hand, are absolutely identical with those from Java (true *P. intermedia*). Before definitely deciding that *P. intermedia* and *P. Roxburghii* are the same species, the writer would wish to study the former in the living state; it is often a rash thing to reduce to another, from herbarium material alone, species founded by so competent a botanist as Hasskarl; so far as our Calcutta specimens go, the evidence is altogether in favour of these two trees being quite distinct.

3. *PARKIA SPECIOSA* Hassk. *Flora XXV.* Beibl. 55. A large tree with spreading branches, 80–100 feet high, stem 2–3 feet in diam., young branches glabrescent. *Leaves* 2-pinnate, main-rachis pubescent, 8–10 in. long; pinnæ 10–16 pairs, subalternate, secondary rachises puberulous, 3 in. long; leaflets small almost straight, linear, close-set, 20–35 pairs, subequally truncate at base, obtuse or retuse at apex, .25 in. long, .1 in. wide, with strong median and 3–4 pairs of distinct secondary nerves beneath, margins with only a few scattered hairs; petiolar part of main-rachis 1–1.5 in. long, with 1 solitary gland midway between base and lowest pair of leaflets and with 2–6 solitary glands between the bases of as many pairs of pinnæ towards apex of rachis. *Flowers* in dense narrowly clavate heads, 2 in. long, .75 in. in diam., peduncles slender 16–20 in. long. *Calyx* tubular, shortly 5-cleft, .25 in. long, teeth pilose, elsewhere glabrous. *Corolla* tubular, white, segments subvalvate. *Stamens* 10, exserted, the filaments connate below and adnate to corolla-tube; anthers

narrow. *Pod* (including stalk 2-5 in. long) 18-20 in. long, 2-2.5 in. wide, .3 in. thick, black, glabrous. *Seeds* 12-18, oblong-oval, .9 in. long, .6 in. wide, .25 in. thick, dark-brown and smooth throughout. Hassk. Cat. Hort. Bog. 289; Pl. Jav. Rar. 414; Miq. Flor. Ind. Bat. I, 53. *P. macrocarpa* Miq. Flor. Ind. Bat. Suppl. 284. *Acacia graveolens* Jack, Mal. Misc. II, 78. The PETE or PETHEK.

PENANG; on the coast, cultivated, *Curtis!* PROV. WELLESLEY; *Kunstler* 1657! PERAK; Thaiping, *Scortechini* 504! Larut, in dense jungle from 500-2000 feet elev., local, *Kunstler* 5300! DISTRIB. Sumatra; Java, (cult. *Hasskarl!*).

It would appear that this is the only species of *Parkia* truly wild in our area. It has been identified by Father Scortechini with *P. macrocarpa* Miq., from Sumatra, of which there is no authentic specimen at Calcutta; it certainly accords admirably with Miquel's description. There is at Calcutta an authentic example of Hasskarl's *P. speciosa*; it proves that the present species is no other than Hasskarl's plant, and as Hasskarl's name has nearly twenty years' priority it is here adopted. In the *Index Kewensis* it is suggested that both *P. intermedia* and *P. speciosa* may be forms of *P. Roxburghii*. To judge by Hasskarl's description this may be true of *P. intermedia*; as regards *P. speciosa* the suggestion is obviously an impossible one.

While however, Hasskarl's name *P. speciosa* is long anterior to Miquel's, it does not conserve the oldest specific name. This tree is, as Hasskarl expressly admits, (*Neuer Schluess.* 50) the *Pete* of Rumphius (*Herb. Amb.* III, 51); it is equally the *Petek* of Jack, to which Jack has given the name *Acacia graveolens*. The writer does not propose, in the modern manner, to suggest that *P. speciosa* should therefore be known as *Parkia graveolens*, though doubtless there are those who will seize the opportunity of applying this name and of posing as authorities for the species.

It is strange that though evidently wild so near as in Sumatra and in the Malay Peninsula, this species is only cultivated in Java, and that there, according to Koorders and Valetton, its native country is unknown. These authors indeed (*Bijdr.* I, 268) suggest that it is a native of British India. It certainly is not a native of India proper; it is not even cultivated there. Our Indian species are, *P. Roxburghii* (*P. biglobosa*), wild in Silhet, Cachar and Chittagong; *P. leiophylla*, wild in Pegu; and *P. insignis*, wild in Martaban. We in India also experience a difficulty like that experienced by our Dutch colleagues, since there is a species *P. biglandulosa*, cultivated in India from Madras to Assam, of whose natural habitat we are somewhat uncertain.

#### 59. ENTADA Adans.

Woody unarmed climbers, with tendrils. *Leaves* bipinnate. *Flowers* in long narrow spikes, minute, yellowish, polygamous. *Calyx* minute, campauulate, equally 5-toothed. *Corolla* oblong in bud, the 5 long equal narrow lobes falcate in expansion. *Stamens* 10, free, shortly exerted, filaments filiform; anthers crowned with a gland. *Ovary* subsessile, many-ovuled; style filiform, stigma concave terminal. *Pod* flat, woody, very large, composed of many discoid one-seeded joints,

the endocarp persisting round the large compressed orbicular seeds. Species 10, the others Trop. African and American.

*ENTADA SCANDENS* Benth. in Hook. Journ. Bot. IV. 332. A very large slender creeper; branches woody terete glabrous. *Leaves* with petiole 2-4 in. long, the rachis as long or longer ending usually in a tendril; pinnæ usually 4 with stalks 1.5-2.5 in. long, leaflets oblong or obovate, obtuse or acute, 1-2 in. long, .6-1.25 in. wide, glabrous, dark-green, rigidly coriaceous, shining above; petiolules .1 in. *Inflorescence* of peduncled spikes, 6-10 in. long, usually paniced from the nodes of old leafless branches, sometimes simple from the axils of the leaves. *Flowers* .1-1.5 in. long, sessile or very shortly pedicellate. *Calyx* green, 5-toothed, teeth valvate. *Corolla* yellow. *Pod* 1-3 feet long, 3-4 in. wide, 1.5 in. thick, slightly curved, sutures very thick indented between seeds, valves woody depressed sublineate between the seeds, with a tendency to segmentation. *Seeds* 5-15, oblong, somewhat flattened, 2 in. long, 2.25 in. wide, 1.25 in. thick, testa very dark-brown, thick tough polished, slightly oily. Braud. For. Flor. 167; Bak. in Flor. Brit. Ind. II, 287. *E. Pursætha* DC. Prodr. II, 425; Wall. Cat. 5294; W. & A. Prodr. 267; Miq. Flor. Ind. Bat. I, 45; Scheff. in Nat. Tijds. Ned. Ind. XXXII. 412 t. 16, t. 18A. *E. monostachya* DC. Prodr. II, 425; Wall. Cat. 5293. *E. Rheedei* Spreng. Syst. II, 325. *E. Parrana* Spreng. Syst. II, 325. *E. Rumphii* Scheff. Nat. Tijds. Ned. Ind. XXXII, 412 t. 17, t. 18B. *Mimosa scandens* Linn. Sp. Pl. ed. II. 1501; Roxb. Flor. Ind. 554. Rumph. Herb. Amboin. V. 5. t. 4; Rheede, Hort. Malab. VIII. t. 32, 33, 34; IX, t. 77.

ANDAMANS; very common on the coasts. NICOBARS: *Kurz!* COCO GROUP; *Prain!* NARCONDAM; *Prain!* PENANG; *Porter* (Wall. Cat. 5293)! *Curtis* 115! MALACCA; *Hervey!* *Derry!* PERAK; *Scortechini* 769! *Kunstler* 1018! 6228! *Wray* 1676! 1715! 2866! *DISTRIB.* Tropics generally.

Rather variable as to number and size of leaflets; both the forms figured by Scheffer occur in our area. That which he terms *E. Rumphii* is much the commoner in the Malay Peninsula: from the Andamans and Nicobars only the form *E. Pursætha* is reported.

#### 60. ADENANTHERA Linn.

Erect trees without spines or tendrils. *Leaves* ample, bipinnate. *Flowers* minute, in narrow spike-like racemes, hermaphrodite, usually pentamerous. *Calyx* campanulate, equally toothed. *Petals* valvate, equal, lanceolate, cohering only at the very base. *Stamens* 10, free, equalling the corolla; anthers tipped with a gland. *Ovary* sessile, many-ovuled; style filiform, stigma minute capitate. *Pod* strap-shaped, torulose, falcate, the coriaceous valves much twisted after they separate.

*Seeds* small, bright-coloured. Species 4, spread through tropics of Old World.

Leaflets obtuse glabrous beneath; pinnæ 8-12 ... 1. *A. pavonina*.  
 Leaflets acute puberulous beneath; pinnæ 6-8 ... 2. *A. bicolor*.

1. *ADENANTHERA PAVONINA* Linn. Sp. Pl. 384. A small unarmed tree 20-50 feet high. *Leaves* with a petiole 2-4 in. long, rachis prolonged 6-10 in. not produced beyond last pair of pinnæ; pinnæ 8-12 opposite, 3-6 in. long with stalk .5-.75 in. long; leaflets alternate 10-16, ovate or oblong, base wide-cuneate, apex obtuse, papery, .5-1.5 in. long, .3-.75 in. wide, dark-green above, pale glaucous beneath, glabrous on both surfaces; petiolule .15 in. long. *Inflorescence* of narrow short-peduncled racemes 2-6 in. long, axillary or paniced at the ends of branches. *Flowers* small, .15 in. long, on slender pedicels also .15 in. long. *Calyx* green, lobes very small. *Corolla* pale-yellow, the petals equal, valvate, narrow-lanceolate, free except at the base, glabrous. *Stamens* 10, free, hardly exerted, anthers tipped by a gland. *Pod* flat, 6-9 in. long, .6 in. wide, .3 in. thick, contorted when ripe. *Seeds* 10-15, lenticular, .35 in. in diam., .25 in. thick, with a smooth, shining, usually uniformly red testa. DC. Prodr. II, 446; Roxb. Flor. Ind. II, 370; Wall. Cat. 5300; W. & A. Prodr. 271; Wight, III. t. 80; Bedd. Fl. Sylvat. t. 46; Miq. Flor. Ind. Bat. I, 46; Bak. in Flor. Brit. Ind. II, 287.

ANDAMANS; very common. PERAK; Thaiping, *Scortechini* 80! Inatang Jambu, *Wray* 2515! KEDAH; Langkawi, *Curtis*! TONGKAH; *Curtis*' Collector 3091! MALACCA; *Griffith*! DISTRIB. Widespread in South-Eastern Asia.

2. *ADENANTHERA BICOLOR* Moon, Cat. Pl. Ceyl. 34. A small slender unarmed tree 20-30 feet high. *Leaves* with a petiole 1.5-2.5 in. long, rachis prolonged 3-5 in., not produced beyond last pair of pinnæ; pinnæ 6-8 opposite, 2.5-4 in. long with stalk .3 in. long; leaflets alternate 8-10, ovate or elliptic, base rounded, apex acute, rigidly subcoriaceous, .75-1.5 in. long, .5-.75 in. wide, bright-green glabrous above, pale-glaucous adpressed-puberulous beneath; petiolule .15 in. long. *Inflorescence* of narrow short-peduncled racemes 3-5 in. long, axillary or paniced at the ends of branches. *Flowers* small, .15 in. long, on slender pedicels also .15 in. long. *Calyx* green, lobes very small. *Corolla* white, the petals equal, valvate, elliptic-lanceolate, free except at the very base, glabrous. *Stamens* 10, free, distinctly shortly exerted, anthers tipped by a stipitate gland. *Ovary* glabrous reddish. *Pod* flat, 4-6 in. long, .6 in. wide, .3 in. thick, contorted when ripe. *Seeds* 8-10, lenticular, .35 in. in diam., .25 in. thick, with a smooth shining red, or black and red testa. Thwaites Enum. Pl. Zeyl. 98; Bedd. Flor. Sylvat. 94; Bak. in Flor. Brit. Ind. II, 287.

PENANG; Waterfall, *Curtis* 2840! *King*! PERAK; Larut, *Kunstler* 3991! *Scortechini* 197! 1849! Assam Kumbong *Wray* 2124! PANKORE; *Scortechini* 1073! SINGAPORE; Bukit Timah, *Hullett* 880! Bukit Mandai, *Ridley* 3636 A! MALACCA; *Miller*! *Griffith*! *Maingay* 591! *Derry* 522!

The seeds are not always black and red but are sometimes concolorous red just as is usual in *A. pavonina*. The nearest ally of this species is one obtained in Borneo by Mr. Hullett. This Mr. Hullett notes as "a good-sized tree," from Sarawak (*Hullett* 292); Mr. Brace in the Calcutta Herbarium has named it *A. borneensis* Brace. The diagnosis between the two species may be given as follows:—

Pinnæ 3-4 pairs; leaflets 8-10, acute at apex, always under 2 in. long, 1·5 times as long as broad, pale-green above, glaucous and puberulous beneath; flowers not longer than pedicels ... .. 1. *A. bicolor*.

Pinnæ 2 pairs; leaflets 4-5, acuminate at apex, usually over 2 in. long, twice as long as broad, dark-green above, glabrous and not glaucous beneath; flowers twice as long as pedicels... 2. *A. borneensis*.

The flowers of *A. borneensis* are considerably larger than those of *A. bicolor*.

Dr. Griffith has noted that the Malay name of *A. bicolor* in Malacca is "*Bunah Saga*;" Mr. Derry gives it as "*Saga*."

#### 61. NEPTUNIA Lour.

Herbs without prickles. *Leaves* bipinnate, with persistent stipules and numerous small strap-shaped sensitive membranous leaflets. *Flowers* minute, dimorphous, in dense heads on axillary peduncles, polygamous, those of the lower part of the head bearing only protruded flattened staminodia. *Calyx* minute, campanulate, 5-toothed. *Petals* 5, strap-shaped, connate near the base. *Stamens* of the perfect flowers exerted; anthers gland-crested. *Ovary* stalked, many-ovuled; style filiform, stigma club-shaped. *Pod* coriaceous, flattened, ligulate or oblong, 2-valved. Species 8; cosmopolitan in the tropics.

NEPTUNIA OLERACEA Lour. Fl. Cochinch. 654. An unarmed herb with annual wide-creeping softish swollen stems, rarely emitting sub-erect branches, rooting copiously at the leaf and flower-bearing nodes. *Leaves* 2-pinnate, rachis (including petiole 1·5 in.) 2·5-3 in. long, glabrous; pinnæ 4-6, 2-3 in. long, with stalk ·3 in. long; leaflets 8-15-jugate, narrow-oblong, obtuse, glabrous, ·35-·5 in. long, ·2 in. wide. *Peduncles* ascending 3-12 in. long, glabrous; flowers minute, in dense heads ·5-·75 in. long, ·5 in. across, the lower replaced by numerous ligulate yellow staminodes ·25-·3 in. long, bracts small ovate subobtuse. *Corolla* ·05 in. long. *Pod* oblong, oblique, ·5-1 in. long, ·35 in. wide, beaked, dry, dehiscing early by the upper suture. *Seeds* 6-9, transverse, narrow-oval, somewhat pointed towards hilum, obtuse at opposite end, ·2 in. long, ·12 in. wide, ·1 in. thick, testa brown, polished. Benth. in Hook. Journ. IV, 354; Miq. Flor. Ind. Bat. I, 50; Bak. in. Flor. Brit. Ind.



II, 285. *Mimosa natans* Roxb. Cor. Pl. t. 119; Hort. Beng. 40; Fl. Ind. 553. *Desmanthus natans* Willd. Sp. Pl. IV, 1044; DC. Prodr. II, 444; Wall. Cat. 5295; W. & A. Prodr. 270. *D. lacustris* DC. Prodr. II, 444. *D. stolonifer* DC. Prodr. II, 444.

PENANG; Bagian Jumal, *Curtis!* PROV. WELLESLEY; Butterworth, *King!*

### 62. XYLIA Benth.

Tall unarmed tree. *Leaves* bipinnate. *Flowers* in round heads, mostly perfect. *Calyx* tubular, 5-toothed at the tip. *Petals* 5, valvate, slightly united at the base, little longer than the calyx. *Stamens* 10, free, exserted; anthers gland-crested in an early stage. *Ovary* sessile, many-ovuled; style filiform, stigma minute terminal. *Pod* large, woody, oblong-falcate, finally dehiscing, flat, septate between the oblong compressed seeds.—A single species.

XYLIA DOLABRIFORMIS Benth. in Hook. Journ. Bot. IV, 417. A tree 80–100 feet high, unarmed. *Leaves* 2-pinnate; pinnæ two, terminal on a rachis or petiole 1–2 in. long; leaflets 2–4 pairs, diminishing downward and with below the last pair on the outside a small unopposed leaflet; rachis of pinnæ 3–4 in. long with a gland on the upper side between the bases of each pair of leaflets; terminal leaflets 3–6 in. long, 1.25–2.5 in. wide, lowest pair 1.25–1.5 in. long; all oblong with acute apex and rounded base, subcoriaceous, glabrous on both surfaces; petiolule .1 in. long. *Inflorescence* of very dense globose heads .5–.75 in. in diam.; peduncles puberulous 3 in. long, slender, thickening in fruit, crowded on short puberulous branchlets developed with the young leaves. *Calyx* tubular .2 in. long; teeth 5, valvate. *Corolla* cream-coloured, .25 in. long, petals slightly cuneate at base, valvate, lanceolate. *Stamens* 10, filaments free, exserted, .5 in. long, young anthers very minutely gland-crested. *Ovary* sessile, many-ovuled. *Pods* large woody, oblong-falcate, flat, ultimately dehiscent, 4–6 in. long, 1–2.5 in. wide, .35 in. thick, septate between the seeds. *Seeds* 6–10, broadly ovate, much compressed, .65 in. long, .5 in. wide, .1 in. thick; testa brown, shining, smooth. Bedd. Fl. Sylvat. t. 186; Miq. Flor. Ind. Bat. I, 42; Bak. in Flor. Brit. Ind. II, 286. *Mimosa xylocarpa* Roxb. Cor. Pl. t. 100; Hort. Beng. 40; Fl. Ind. II, 543. *Inga xylocarpa* DC. Prodr. II, 439; Wall. Cat. 5277; W. & A. Prodr. 269. *I. lignosa* Grah. in Wall. Cat. 5278. *I. dolabriformis* Grah. in Wall. Cat. 5279.

SINGAPORE; Wallich 5279. DISTRIB. India, Indo-China, Philippines.

### 63. LEUCENA Benth.

Unarmed erect trees. *Leaves* bipinnate. *Flowers* sessile, in dense globose heads, 5-merous, usually perfect. *Calyx* cylindrical-campanulate

shortly-toothed. *Petals* valvate, free. *Stamens* 10, free, much exerted; anthers not gland-crested. *Ovary* stalked, many-ovuled; style filiform. stigma minute terminal. *Pod* flat, coriaceous, strap-shaped, dehiscent, Species 8, mostly American.

*LEUCÆNA GLAUCA* Benth. in Hook. Journ. Bot. IV, 416. A low erect tree or large shrub, 6–20 feet high, without spines. *Leaves* 2-pinnate 4–6 in. long, petiole about 2–3 in.; pinnæ 4–8-jugate, 2–3 in. long, stalk .35 in. long; leaflets 10–15 pairs, linear-oblong, apex acute, base slightly obliquely cuneate, glaucous, membranous, caducous, finely downy, .4–.5 in. long, .1–.15 in. wide. *Inflorescence* of very dense globose heads, .5–.75 in. in diam.; peduncles often geminate 1–1.25 in. long, slender, in fruit often about 2 in. long and slightly thickened. *Flowers* 5-merous, usually all perfect. *Calyx* cylindric-campanulate, teeth short valvate. *Corolla* white, .15 in. long, petals free, valvate. *Stamens* 10, exerted, .25 in. long, anthers without glands. *Ovary* stalked, many-ovuled, softly sparsely pubescent; style filiform, stigma small terminal. *Pod* straight, flat, coriaceous, ligulate, dehiscent; 5–6 in. long, .4–.5 in. wide; stalk .25–.5 in. long. *Seeds* 15–20, transverse, narrow-ovate, compressed, apex obtuse, base cuneate, .3 in. long, .15 in. wide, under .1 in. thick, testa brown, shining. Miq. Flor. Ind. Bat. I, 41; Bak. in Flor. Brit. Ind. II, 290. *Acacia frondosa* Willd. Sp. Pl. IV, 1076; DC. Prodr. II, 468; W. & A. Prodr. 276. *A. glauca* Willd. Sp. Pl. IV, 1075; DC. Prodr. II, 467. *A. biceps* Willd. Sp. Pl. IV, 1075; DC. Prodr. II, 467. *A. leucocephala* Link. Enum. II, 444; DC. Prodr. II, 467.

KEDAH; in open jungle, *Kunstler* 1703! PERAK; Lime-stone Hill, Gapis, *Scortechini* 912! SELANGOR; on hilly ground, *Kunstler* 1130! PAHANG; Pulo Tawai, *Ridley* 2642! PENANG; Water-fall, etc. *Curtis* 49! SINGAPORE; *Maingay* 583! DISTRIB. Now cosmopolitan in the tropics but probably originally American.

#### 64. MIMOSA Linn.

Shrubs or herbs, with or without prickles. *Leaves* (in the Malayan species) bipinnate; leaflets small, sensitive, ligulate, caducous. *Flowers* minute, in dense globose heads, polygamous, (in the Indian species) mostly tetramerous. *Calyx* campanulate, shortly toothed. *Petals* connate towards the base. *Stamens* as many as, or twice the number of, the petals, much exerted, filaments filiform, free; anthers not gland-crested. *Ovary* stalked, many-ovuled; style filiform, stigma minute terminal. *Pod* flat, membranous, made up of 1-seeded joints that separate, when mature, from the sutures. Species 230, mostly confined to Trop. America.

*Stamens* 4; rachis of leaf bristly, stem bristly and prickly,  
leaves digitately divided, sutures of pod prickly ... .. *I. M. pudica.*;

Stamens 8-10; rachis of leaf smooth, stem prickly not bristly,  
leaves pinnately divided, sutures of pod not prickly ... .. 2. *M. sepiaria*.

1. *MIMOSA PUDICA* Linn. Sp. Pl. 518. A diffusely spreading undershrub rarely over 2 feet high, with stems and branchlets sparsely prickly and copiously beset with deflexed bristles. *Leaves* very sensitive, with usually 4 digitate pinnæ, sessile at the end of a petiole 2 in. or more long, beset with spreading bristles; stipules lanceolate .35 in. long, striate, subscarious, with margins beset with spreading bristles; pinnæ 2.5-3.5 in. long, the rachis beset with ascending bristles; leaflets 12-20 pairs, glabrous above, sparsely adpressed-bristly beneath, subcoriaceous, narrow-oblong, obliquely acute at apex of upper angle, obliquely rounded at lower side of sub-5-nerved base, main-nerve branching slightly upwards, .35 in. long, .15 in. wide; sessile. *Inflorescence* capitate, the heads usually in pairs from axils all along the branches, .35 in. in diam.; peduncles very slender .75-1 in. long, beset with spreading prickles. *Calyx* campanulate, teeth short valvate. *Corolla* pink, .1 in. long, petals connate below valvate above. *Stamens* 4, much exserted, filaments .3 in. long, filiform, free, anthers without glands. *Ovary* stalked; style filiform, stigma very small terminal. *Pods* flat, slightly recurved, membranous, .6-1 in. long, .2 in. across, made up of 3-5 1-seeded joints that fall away when mature from the persistent armed sutures, which are clothed with weak spreading yellowish-white bristles .15-.2 in. long. DC. Prodr. II, 426; Roxb. Hort. Beng. 41; Wall. Cat. 5292; Roxb. Flor. Ind. II, 564; Miq. Flor. Ind. Bat. I, 43; Bak. in Flor. Brit. Ind. II, 291. The SENSITIVE PLANT.

ANDAMANS; extremely common throughout the settlement. PENANG; overspreading the whole coast-line, *Curtis* 1237! SINGAPORE; *T. Anderson* 32! *Maingay* 584! DISTRIB. Throughout S.-E. Asia, probably originally introduced from America.

This, having been introduced into the settlement at Port Blair in the Andamans, has there spread so much as to have become extremely troublesome; a large labour force has to be constantly told off to try and keep it in check; its complete eradication is apparently hopeless.

2. *MIMOSA SEPIARIA* Benth. in Hook. Journ. Bot. IV, 395. A woody shrub with puberulous branchlets soon glabrescent, sparingly armed with strong compressed slightly recurved prickles. *Leaves* 2-pinnate, rachis slightly downy 2 in. long (the petiolar part .75 in long); pinnæ 6-8-jugate, 1.5 in. long, subsessile, upper side pubescent; leaflets 12-20-jugate, rigidly coriaceous, narrow-ligulate, caducous, .25-.35 in. long, .1-.15 in. wide, subacute at apex, obliquely truncate at lower side of sub-5-nerved sessile base, main-nerve branching considerably upwards. *Inflorescence* capitate, the heads .25 in. in diam., arranged in

ample patent terminal panicles with puberulous main-rachis and compound puberulous lower branches; the whole 6–8 in. long, 4–6 in. wide, peduncles of individual heads .5–.75 in. long. *Calyx* campanulate, teeth short, valvate. *Corolla* .05 in. long. *Stamens* 8–10, filaments free, .1 in. long. *Ovary* stalked; style filiform, stigma small terminal. *Pod* with a slender stalk .2 in. long, flat, almost straight, membranous, 1.5–2 in. long, .25 in. wide, made up of 6–8 glossy, finely reticulated 1-seeded joints that fall away when mature from the persistent unarmed sutures. Bak. in Flor. Brit. Ind. II, 291. *M. nigrescens* Maingay MSS.

SINGAPORE; *Maingay* 582! *Anderson* 34! *Kurz*! *King*! **DISTRIB.** Occurs also in China and in Borneo, but no doubt is an introduction from America; it is only found near clearings.

## 65. ACACIA Willd.

Spinose or prickly shrubs or trees, erect or climbing. *Leaves* bipinnate, with minute leaflets. *Flowers* in globose heads or cylindrical spikes, hermaphrodite or polygamous, usually pentamerous. *Calyx* campanulate or funnel-shaped, shortly toothed. *Petals* exserted, united in the lower half. *Stamens* free, indefinite, much exserted; anthers minute, not gland-crested. *Ovary* stalked or sessile, many-ovuled; style filiform, stigma minute capitate. *Pod* ligulate or oblong, not jointed, usually compressed and dry, dehiscent or indehiscent, rarely turgid or subcylindrical, sutures straight or wavy, not thickened. Species 430; the leafy groups cosmopolitan in the tropics, the great phyllodineous series, which comprises two-thirds of the genus, almost restricted to Australia. None of the species with spicate inflorescence occur within our area.

- Erect shrubs or small trees, with stipular spines, bracteate pedicels and cylindric pods ... .. 1. *A. Farnesiana*.  
 Climbing shrubs, with non-spinescent stipules, and with prickly branches; pedicels naked; pods flat:—  
 Flower heads .4 in. across; leaflets narrow oblong ... .. 2. *A. pseudo-Intsia*.  
 Flower heads .2 in. across; leaflets linear ... .. 3. *A. pennata*.

1. ACACIA FARNESIANA Willd. Sp. Pl. IV, 1083. A shrub or low tree with slender zig-zag branches marked with grey dots. *Leaves* 2-pinnate; rachis downy 1–1.5 in. long with a minute petiolar gland; pinnæ 8–16, 1–1.5 in. long; leaflets 10–20 pairs, green, subglabrous, rigidly coriaceous, linear-oblong, .25 in. long, .05 in. wide; stipules spinescent seldom over .25–.35 in. long on the branchlets, persisting and on old branches sometimes over 1 in. long, polished, white, straight. *Flowers* in rounded heads .35 in. in diam., fragrant, bright yellow; peduncles crowded on axillary nodes, slender, puberulous, .75–1 in. long, with a ring of small bracts at or near the apex. *Calyx* campanulate, minute.

*Corolla* .05 in. long, teeth short obtuse. *Pod* thick cylindrical glabrous, 2–3 in. long, .5 in. thick, dull-brown marked with fine horizontal striæ; mesocarp pulpy enclosing the biseriate seeds. *Seeds* 12–18, ovate, .3 in. long, .2 in. wide, .15 in. thick, smooth, dull-brown with faint lateral areola. DC. Prodr. II, 461; Wall. Cat. 5264. A–F; Bedd. Flor. Sylvat. t. 52; Miq. Flor. Ind. Bat. I, 7; Bak. in Flor. Brit. Ind. II, 292. *Mimosa Farnesiana* Linn. Sp. Pl. 521; Roxb. Hort. Beng. 40; Flor. Ind. II, 557. *Vachellia Farnesiuna* W. & A. Prodr. 272; Wight, Ic. t. 300. *Acacia indica* Desv. Journ. Bot. I, 69; DC. Prodr. II, 462. *Farnesia odora* Gaspar. Desc. Nuov. Gen. Legum. (1838) *with plate.*

Planted in some of the provinces:—ANDAMANS; Kurz! PENANG; Porter (Wall. Cat. 5264F)! PAHANG; Katapong, Ridley 1246! DISTRIB. Cosmopolitan (perhaps usually planted) in the tropics.

2. ACACIA PSEUDO-INTSIA Miq. Flor. Ind. Bat. I, 12. A large scandent shrub 12–20 feet high, the branches and branchlets armed with many small sharp recurved glossy dark-coloured prickles; young branches blackish, puberulous or glabrescent. *Leaves* 2-pinnate, rachis 8 in. long, puberulous or glabrescent, strongly armed with recurved prickles beneath, petiolar portion 2.5 in. long with a large projecting gland close to base on its upper surface; pinnæ 8–12-pairs, 2.5–3.5 in. long, the upper 2–4 pairs with glands between their bases; leaflets 30–35 pairs, sessile, linear-oblong, obtuse, .4 in. long, .15 in. wide, rigidly subcoriaceous, glabrous above, adpressed-puberulous or glabrous beneath. *Flowers* in rounded heads, .4 in. in diam., yellow, peduncles .5–.75 in. long, slender, puberulous, naked, in clusters of 2–4, rarely solitary along a panicle extending 10–12 in. beyond the leaves; bracts large, ovate-acute or acuminate, .2–.25 in. long. *Calyx* puberulous, .07 in. long. *Corolla* .1 in. long. *Pod* not seen.

VAR. *typica*; bracts puberulous, pedicels .5 in. long, leaflets adpressed-puberulous beneath.

SINGAPORE; Changhi, Hullett 835! Ridley 3631! Bukit Timah, Ridley 6177! DISTRIB. Sumatra, Java.

VAR. *ambigua* Prain; bracts glabrous, pedicels .75 in. long, leaflets quite glabrous beneath.

ANDAMANS; very common, King's Collectors!

In externals the Singapore plant much resembles *A. caesia* W. & A., the Andamans one at the same time resembling *A. Intsia* Willd. except in having the leaflets crowded. Closer examination shows, however, that the natural alliance of the species is rather with the group of forms aggregated under the name *A. pennata*; the large bracts, in particular, make all further comparison with the group to which *A. Intsia* belongs an impossibility.

Its nearest ally is a species from Northern Indo-China described by Kurz under the name *A. pruinescens* from which this differs in having broader leaflets, in

having no bloom on the young branches, and particularly in having the large petiolar gland very near the base of the petiole; the corresponding gland in *A. pruinescens* is about an inch above the base. The two species *A. pseudo-Intsia* and *A. pruinescens* taken together form a group that is almost exactly intermediate between the *A. Intsia* and the *A. pennata* groups.

3. *ACACIA PENNATA* Willd.; Bak. in Flor. Brit. Ind. II, 297. A large scandent bush or strong creeper, sometimes extending for 50–60 feet, branches and branchlets armed with many small sharp slightly recurved glossy brown or blackish prickles, young twigs faintly pubescent or glabrous. *Leaves* 2-pinnate; the rachis 6 in. long, glabrous or puberulous, prickly beneath or unarmed, petiolar portion .75–1 in. long with a projecting large or small gland .4–.5 in. above the base; pinnæ 20–40 pairs, 1.25–2 in. long, the upper pairs with glands between their bases; leaflets 35–40 pairs, sessile, linear, .2–.35 in. long, under .05 in. wide, firm, glabrous. *Flowers* in rounded heads .2 in. in diam., white or pale-yellow, peduncles .5–.7 in. long, slender, puberulous, naked, in clusters of from 4–8 along a panicle extending 12–15 in. beyond the leaves; bracts small linear, .1 in. long. *Calyx* glabrous, .05 in. long, campanulate. *Corolla* .07 in. long. *Pod* linear-oblong, acute or acuminate at both ends, 4–6 in. long, .75–1 in. wide, flat, very thin, with a stalk under .2 in. long, the sutures slightly thickened. *Seeds* flat, ovate, .4 in. long, .2 in. wide, under .1 in. thick, faintly areolate, dull-brown, smooth.

*VAR. arrophula* Bak. in Flor. Brit. Ind. II, 298; leaf-rachis almost glabrous, prickly beneath, peduncles 4–6-nate; petiolar gland large, inter-pinnular glands 2–3. *A. arrophula* Don. Prodr. Flor. Nep. 247?

ANDAMANS; very common. *DISTRIB.* India, Indo-China.

*VAR. pluricapitata* Bak. in Flor. Brit. Ind. II, 298; leaf-rachis puberulous, not prickly, peduncles 6–8-nate; petiolar gland small, inter-pinnular glands 10–12. *A. pluricapitata* Steud. Nomencl. ed. II, 1, 7; Benth. Hook. Lond. Journ. I, 516; Pl. Jungh. I, 267. *A. polycephala* Grah. in Wall. Cat. 5255 not of DC.

PENANG; *Porter* (Wall. Cat. 5255)! MALACCA; *Griffith!* *Maingay* 585! *Derry* 166! *Holmberg* 838! *Hervey!* PERAK; *Scortechini!* *Kunstler* 482! 3332! 4876! 5504! 10300! *DISTRIB.* Malay Archipelago.

Following the *Flora of British India* these two very distinct plants are here treated as varieties of *Acacia pennata*. That *A. pluricapitata* is deserving of specific rank seems almost certain, and it is probably equally certain that the plant here termed *VAR. arrophula* should also be separated specifically from *A. pennata*. The point can only be satisfactorily settled in a monographic revision of the Indian *Acacias*; pending the preparation of such a revision it seems better to deal with the forms as they have been dealt with by Mr. Baker. The true *A. pennata* of Willdenow is unknown from our area.

66. *SERIANTHES* Benth.

Unarmed trees. *Leaves* 2-pinnate. *Flowers* racemose, very large, 5-merous, mostly hermaphrodite. *Calyx* deeply campanulate, deeply toothed. *Petals* adnate to the base of the staminal column, free above. *Stamens* monadelphous, very numerous; anthers minute. *Ovary* sessile, many-ovuled; style filiform, stigma minute capitate. *Pod* large oblong, almost woody, somewhat turgid, indehiscent, septate between the seeds. Species 2, one in Malaya, one in Polynesia.

*SERIANTHES GRANDIFLORA* Benth. in Hook. Lond. Journ. Bot. III, 225. A large unarmed tree with rusty-puberulous young branches. *Leaves* evenly 2-pinnate, rachis puberulous 7-9 in. long, with a large sessile gland .25 in. above base and with small glands between the bases of each pair of pinnæ; pinnæ 3-8-jugate, 3-4 in. long, puberulous; leaflets 6-12 pairs, obliquely oblong, subfalcate, obtuse, base obliquely truncate, .5-1 in. long, .3-.6 in. wide, rigidly subcoriaceous, glossy-green above, paler dull reticulate-veined beneath, glabrous on both surfaces. *Flowers* few, in axillary corymbose panicles 4-6 in. long, main-rachis puberulous, peduncular portion 2 in. long, the branches puberulous .5-.7 in. long, each 2-4-fl'd; pedicels densely tomentose .2 in. long; buds oblong or globose, .35 in. across. *Calyx* wide-campanulate, .5 in. long, .35 in. wide with triangular teeth one-third the length of tube, uniformly densely felted externally. *Corolla* yellowish-white, 1.5 in. long, the segments densely woolly externally, glabrous within. *Filaments* over 500, 2.5 in. long. *Pod* turgid, 6 in. long, 2.25 in. wide, .75 in. thick, epicarp thin brittle, endocarp woody; sutures thin, valves septate and slightly depressed between the seeds. *Seeds* 6-8, narrowly ovate, the long axis across the pod, .75 in. long, .3 in. across, .15 in. thick, testa dark-brown, smooth but hardly shining, seed faintly areolate. Miq. Flor. Ind. Bat. I, 40; Bak. in. Flor. Brit. Ind. II, 301. *Inga Finlaysoniana* Wall. Cat. 5284. *I. grandiflora* Wall. Cat. 5285. *I. ventricosa* Grah. in Wall. Cat. 5266 in part.

SINGAPORE; *Wallich!* *Finlayson.* MALACCA; *Griffith!* *Maingay* 580!  
DISTRIB. Malay Archipelago.

67. *ENTEROLOBIUM* Mart.

Erect unarmed trees. *Leaves* bipinnate. *Flowers* in globose heads, 5-merous, usually hermaphrodite. *Calyx* campanulate or subcampanulate, shortly toothed. *Corolla* subinfundibuliform, the petals connate to the middle. *Stamens* monadelphous much exerted; anthers small not gland-crested. *Ovary* sessile many-ovuled; style filiform, stigma minute capitate. *Pod* strap-shaped straight or curved, indehiscent, mesocarp spongy at length hardening, or pulpy and soft, endocarp firm

forming continuous septa between the seeds; the sutures thickened. Species 5 or 6, all American; one introduced and now becoming spontaneous in S.-E. Asia.

*ENTEROLOBIUM SAMAN* Prain. A large spreading tree 40–60 feet high, stem 3 feet or more thick, branches pubescent. *Leaves* evenly 2-pinnate, rachis 4–6 in. long, pubescent, basal gland none but with glands between the bases of each pair of pinnæ, single in the upper, paired in the lower half of the rachis; pinnæ 4–6-jugate, 2–3 in. long, rachises pubescent with glands between each pair of leaflets; leaflets decreasing downwards, 6–8-jugate in the upper, 3–5-jugate in the lower pinnæ, ovate-oblong rigidly coriaceous, glabrous above, densely pubescent beneath, apex obtuse, base obliquely truncate, main-nerve diagonal, terminal 1.5 in. long, .8 in. wide; stipules small lanceolate, densely pubescent, deciduous. *Flowers* in dense heads 1.25 in. across, on pubescent pedicels 2.5 in. long, solitary or 2–3 together in the axils of the upper leaves, each with a lanceolate pubescent bract .15 in. long and a slender puberulous pedicel .05 in. long. *Calyx* infundibuliform, densely pubescent externally, .15 in. long, teeth wide-triangular, short. *Corolla* pinkish, infundibuliform, .3 in. long, tube puberulous outside, teeth ovate, externally pubescent, half as long as tube. *Filaments* pink, 1.25 in. long, connate at base in a tube one-third as long as that of corolla. *Pod* straight, 6–7 in. long, .6 in. wide, .35 in. thick, valves slightly depressed between the seeds, sutures thickened, epicarp thinly crustaceous, mesocarp pulpy, endocarp firmly crustaceous and forming continuous septa between the seeds. *Seeds* 16–20, transversely ovate, .4 in. long, .25 in. wide, .2 in. thick, testa smooth brown shining with distinct duller darker-brown ovate areola, without arillus. *Inga Saman* Willd. Sp. Pl. IV, 1024. *Pithecolobium Saman* Benth. Hook. Lond. Journ. Bot. III, 216. *Calliandra Saman* Griseb. Fl. W. Ind. 225. The RAIN TREE.

PLANTED in many of the provinces and now appearing spontaneously, at least in the Andamans and Nicobars. A native of Guiana; introduced in the West Indies whence it has been sent to Asia.

This species, though of much more recent introduction than *Pithecolobium dulce*, is also of some economic importance, owing to its rapidity of growth and the readiness with which it thrives, as compared with most native species, when used in the re-forestation of abandoned clearings. The sweet pulpy pods, of which it produces an abundant crop, are greedily eaten by cattle.

When Mr. Bentham tentatively placed the species in *Pithecolobium* he explained that the tree was unknown to him. Dr. Grisebach, who had the advantage of studying the tree in the living state, at once recognised that it cannot possibly be a *Pithecolobium* and placed it in *Calliandra*, no doubt owing to the sutures of its pods being thickened as in that genus. That the pods are septate and indehiscent militates however against his proposal, for the crucial test of a *Calliandra* is that its pods, which may not be septate, shall dehisce elastically from apex to base. The *Indes*



*Kewensis* has therefore replaced the 'Rain-Tree' in *Pithecolobium*; this, however, is a step which in turn similarly mars the generic limits of that group since the pods of *Pithecolobium* must not be septate. The writer places the species with more confidence in *Enterolobium* owing to its possessing the septate pods characteristic of that genus. The pulpy, in place of spongy at length indurated mesocarp, and the shortly pedicelled in place of sessile florets, cannot, in view of the variability of these characters within adjacent genera, be considered more than comparatively trivial deviations from the hitherto recognised characters of *Enterolobium*. The writer is unable, both on academic and on practical grounds, to agree with the proposal, made by some botanists, to amalgamate *Calliandra*, *Pithecolobium*, *Enterolobium* and *Albizzia*.

#### 68. CALLIANDRA Benth.

Shrubs or trees. *Leaves* bipinnate, with small or large leaflets. *Flowers* in globose heads, polygamous, 5-merous. *Calyx* campanulate, toothed. *Corolla* funnel-shaped, deeply 5-cleft. *Stamens* indéfnite, monadelphous at the base, filaments filiform much exerted; anthers minute, not gland-crested. *Ovary* stalked, many-ovuled; style filiform, stigma minute capitate. *Pod* strap-shaped, slightly falcate, flat, rigidly coriaceous, the valves dehiscing with elasticity, bordered by much-thickened sutures, continuous within, narrowed gradually to a short stalk. Species 80, mostly tropical American.

CALLIANDRA UMBROSA Benth. in Gen. Pl. I, 597. A tree 20-25 feet high, with slender glabrous branches and sometimes with small suberect stipular spines. *Leaves* 2-pinnate, petiole 1.25 in. long, glabrous; pinnæ 2, terminal, each with rachis 1.25-1.5 in. long, with a pair of large sessile, oblique, oblong, rigidly subcoriaceous end-leaflets, acute at apex, cuneate at base, 6 in. long, 2 in. wide and with an odd similar but much smaller leaflet 1.5-2 in. long, .5-.75 in. wide, on the outer side below; leaflets all glabrous on both sides, rather distinctly nerved beneath and each with a gland on rachis at base. *Flowers* sessile in small dense globose heads .4 in. across, with minute bracts, on short ascending slender peduncles .4-.5 in. long, usually several together from old nodes on the branches; elongating in fruit to 1.5-2 in. *Calyx* campanulate, teeth valvate. *Corolla* .12 in. long, yellow, inodorous. *Pod* 6-9 in. long, .75-1 in. wide, smooth, finely veined, the valves with elevated rounded thickened edges. *Seeds* 6-9, ovate, .5 in. long, .35 in. wide, long diameter transverse, very much compressed; testa smooth shining thin crustaceous brown. Bak. in Flor. Brit. Ind. II, 302. *Inga umbrosa* Wall. Pl. As. Rar. t. 124; Cat. 5273. *Albizzia umbrosa* Benth. in Hook. Lond. Journ. III, 86.

PENANG; *vide* Baker in *Flora of British India*.

There are no Malayan specimens at Calcutta; Mr. Baker, however, alludes to the existence of Penang examples.

## 69. ALBIZZIA Durazz.

Large trees or, sometimes, (*A. myriophylla*) shrubs usually climbing. *Leaves* bipinnate. *Flowers* (in the Indian species) in globose heads, sessile or pedicellate, usually pentamerous and all hermaphrodite. *Calyx* campanulate or funnel-shaped, distinctly toothed. *Corolla* funnel-shaped, petals firmly united below the middle. *Stamens* indefinite, monadelphous at the base, filaments several times the length of the corolla; anthers minute, not gland-crested. *Ovary* sessile or shortly stalked; style filiform, stigma capitate minute. *Pod* large, thin, flat, strap-shaped, straight, indehiscent or subindehiscent, continuous within, the sutures not thickened. **DISTRIB.** Species 25–30, spread through the Tropics of the Old World.

Shrub, often climbing, the pulvinus below leaf-base enlarging into a firm short recurved hook; the leaflets (numerous) narrowly linear with a median main-nerve ...

1. *A. myriophylla*.

Erect usually large trees, pulvinus not accrescent; the leaflets ovate or oblong, or if linear with the main-nerve nearly marginal:—

Main-nerve close to upper margin; leaflets (numerous) dimidiate-lanceolate; stipules very large; (flowers shortly pedicellate) ... ..

2. *A. stipulata*.

Main-nerve removed one-third to one-half the width of leaflet from upper margin; leaflets ovate or oblong; stipules small:—

Leaflets never more than 2 in. long, rather numerous:—

Glands confined to main-rachis of leaf, leaflets sessile or subsessile:—

Florets pedicellate:—

Pinnæ never more than 4-jugate:—

Umbels small, few-fl., pedicels longer than calyx ... ..

3. *A. littoralis*.

Umbels large, many-fl., pedicels not longer than calyx ... ..

4. *A. Lebbek*.

Pinnæ 6–12-jugate; *indehiscent pod very large and sinuate along the sutures* ... ..

5. *A. pedicellata*.

Florets sessile; *main-nerve nearer upper than lower leaf-margin* ... ..

6. *A. odoratissima*.

Glands on the secondary rachises as well as on the main-rachis, leaflets shortly petiolulate; (florets sessile) ... ..

7. *A. procera*.

Leaflets few, large; the terminal pairs 4 in. long; (main and secondary rachises both gland-bearing, pinnæ normally 1-jugate) ... ..

8. *A. lucida*.

1. ALBIZZIA MYRIOPHYLLA Benth. in Hook. Lond. Journ. Bot. III,

90. An evergreen unarmed shrub or strong climber 15–20 feet long if climbing, 8–12 ft. high if unsupported, the young shoots shortly tawny-

pubescent, bark thinnish, dark-brown, much lenticelled. *Leaves* evenly 2-pinnate; rachis 5-9 in. long, densely tawny-pubescent, with a medium sessile gland very near the base and with 2-4 small glands between the bases of as many pairs of distal pinnæ, stipules subpersistent, subulate, puberulous, .15 in. long, deciduous; pulvinus hardening into a recurved almost woody hook; pinnæ 12-20-jugate, 1-1.5 in. long, their rachises sparsely pubescent; leaflets 35-50 pairs, crowded, linear, sessile, slightly falcate, apex subacute, base slightly oblique, rigidly chartaceous, .2-.25 in. long, .07 in. wide, dark-green and glabrous above, margin ciliate or glabrous, paler beneath and glabrous or sometimes sparsely adpressed-pubescent; midrib central. *Flowers* in small 10-20-fld. heads .5 in. across, pale-yellow with greenish-yellow stamens, or white; peduncles slender puberulous, .4-.5 in. long, solitary or 2-6 together on nodes in the upper half of pubescent corymbose branchlets 1-1.5 in. long, with pubescent ovate-acute bracts .2 in. long, usually accompanied by 2 subulate stipules like those of the leaves, the branchlets disposed in terminal leafy panicles 4-8 in. long, 2-4 in. wide; pedicels 0. *Calyx* campanulate, teeth small, ovate-acute, tube externally densely pubescent, .04 in. long. *Corolla* infundibuliform, yellowish or white, .15 in. long, teeth ovate-lanceolate one-third the tube and like it uniformly externally softly puberulous. *Filaments* few, 12-20, united below in a white tube half as long as that of corolla, free portion greenish or white, .4 in. long. *Pod* dehiscent, 4-5 in. long, .8-1.2 in. wide, thin, flexible, bright-brown, smooth and shining; opposite the seeds darker and distinctly reticulated. *Seeds* 6-8, obovate, apex obtuse, base cuneate, .25 in. long, .2 in. wide, much compressed, testa dull-brown, smooth, distinctly areolate. *Bak.* in *Flor. Brit. Ind.* II, 300. *Acacia myriophylla* Grah. in *Wall. Cat.* 5242. *A. foliolosa* Grah. in *Wall. Cat.* 5241. *Mimosa microphylla* Roxb. *Fl. Ind.* II, 549.

KEDAH; Langkawi, *Curtis* 2135! 2801! PENANG; *Curtis* 718! 1702 *Kunstler* 1444! PERAK; *Scortechini* 28! 128!

This does not become a tree. When a climber it has not the assistance, as in climbing *Acacias*, of prickles; it develops however hard recurved hooks, that help to serve as hold-fasts, from the thickening of the pulvini at the leaf-bases.

2. *ALBIZZIA STIPULATA* Boiv. *Énycl.* XIX Siècle II, 33. An unarmed evergreen tree, often 100-120 feet high, young shoots finely grey-downy, bark dark-grey rugose, stem 3-4 feet thick; heart-wood dark-brown. *Leaves* evenly 2-pinnate, rachis 6-18 in. long, pubescent, with a large sessile gland 1 in. above the base and with 2-6 small between the bases of as many distal pairs of pinnæ; pinnæ 6-20-jugate, the secondary rachises tawny-pubescent, 2.5-4 in. long; leaflets 20-45-jugate, dimidiately falcate-lanceolate, sessile, apex acute slightly pointed

forward, base obliquely rounded on lower margin, membranous, .25-.3 in. long, .1 in. wide, pale-green glabrous above, glaucous finely downy beneath, the midrib very close to the upper margin; stipules very large, usually 1-1.5 in. long, .4 in. wide, obliquely cordate-acuminate, velvety-pubescent beneath, puberulous above. *Flowers* in numerous heads 1.75 in. across, yellowish-white, the stamens often more or less flushed with pink; peduncles pubescent 1.25 in. long, solitary or in fascicles of 2-4 on nodes in the upper half of pubescent racemose branchlets 3-5 in. long, with large pubescent deciduous ovate-acuminate bracts .5 in. long, the branchlets in panicles 8-12 in. long, 6-8 in. wide, at the ends of leafy branches; pedicels .05 in. long, pubescent. *Calyx* .1 in. long, infundibuliform, teeth short acute, densely uniformly pubescent externally. *Corolla* .2 in. long, teeth lanceolate acute, half as long as tube and like it densely-pubescent outside. *Filaments* connate at the base in a yellowish tube longer than that of corolla, the free portion of filaments yellowish with a pink flush, or white, .75 in. long. *Pod* indehiscent 5-6 in. long, .75-1 in. wide, thin, rigid, pale-brown, dull; valves faintly wide-reticulate. *Seeds* 8-10, ovate, .25 in. long, .2 in. wide, much compressed, testa dark-brown, smooth, dull, not areolate. Benth. in Hook. Lond. Journ. Bot. III, 92; Bedd. Fl. Sylvat. t. 55; Miq. Flor. Ind. Bat. I, 28; Bak. in Flor. Brit. Ind. II, 300. *Acacia stipulata* DC. Prodr. II, 469; Wall. Cat. 5326; W. & A. Prodr. 274. *A. Smithiana* Wall. Cat. 5237. *A. marginata* Ham. in Wall. Cat. 5243. *Mimosa Smithiana* Roxb. Hort. Beng. 40; Fl. Ind. II, 550. *M. stipulata* Roxb. Hort. Beng. 40. *M. stipulacea* Roxb. Fl. Ind. II, 549. *Arthrosprion stipulatum* Hassk. Retzia I, 212. THE WHITE SIRIS.

ANDAMANS; rare, *E. H. Man!* NICOBARS; Kamorta, common, *Kurz!*  
DISTRIB. Throughout South-Eastern Asia.

This was once found by Mr. Man in the forests of South Andaman many years ago; none of the numerous collections made in the group during recent years contain any specimens of the species. It becomes quite common again in the Nicobars and in the Malay Archipelago it seems to be as plentiful as it is in India and Indo-China. But from the intervening Malay Peninsula no collector has ever sent a specimen to Calcutta.

Miquel describes three varieties:—

(*a.*) *typica* with greenish stamens.

(*β.*) *vegeta* with pinkish stamens.

(*γ.*) *stipulis persistentibus* with permanent, more pubescent stipules.

But his varieties (*β.*) and (*γ.*) are only forms of one tree and that tree is what constitutes in reality *typical A. stipulata*. What Miquel treats as VAR. *typica* is Roxburgh's *Mimosa Smithiana*, which has small stipules, and is, if not a distinct species, certainly a very good variety. The Andamans and Nicobars tree is true *A. stipulata*; the other form has not been met with in our area.

3. *ALBIZZIA LITTORALIS* Teysm. & Biunend., Nat. Tijds. Ned. Ind. XXIX, 259. An unarmed tree 30–40 feet high, young branches glabrous, lenticelled; with ash-grey bark. *Leaves* evenly 2-pinnate; rachis glabrous, 4–8 in. long, with a large sessile gland near base; pinnæ 2–4-jugate, the distal pair 4–5 in. long with leaflets 5–6-jugate, the proximal 3–4 in. long, leaflets 3–4-jugate; leaflets elliptic-oblong or obovate, obtuse or retuse, base obliquely rounded, or rounded on lower cuneate on upper margin, subsessile, submembranous, glabrous pale-green above, faintly puberulous glaucescent beneath, .75–1.25 in. long, .4–.75 in. wide. *Flowers* in small few-fl. umbels, under .5 in. across, white with pink stamens; peduncles slender the longest 1.5 in. long, glabrous or puberulous, corymbosely arranged on leafless branchlets 1–3 in. long, themselves disposed in a terminal corymbose panicle; pedicels .2–.25 in. long, very slender, glabrous. *Calyx* .1 in. long, teeth obscure, tube pubescent. *Corolla* .2 in. long, teeth ovate-lanceolate, externally closely grey-silky as is the tube. *Filaments* connate at base in a uniform white tube shorter than corolla, the free portion of filaments pink. *Pod* 6–7 in. long, 1 in. wide, linear, tapering at both ends, flat, much compressed, glossy pale greenish-brown, uniformly wide-reticulate. *Seeds* 12–16, transversely oval, much compressed, .4 in. long, .2 in. wide, .1 in. thick, testa smooth brown. Kurz, Journ. As. Soc. Beng. XIV, 2, 129.

NICOBARS; Nancowry, *Jelinek!* King's Collector! Great Nicobar, *Jelinek.* PENANG; Pulo Jungah, *Curtis!* DISTRIB. Malay Archipelago.

The Nicobarese name is "*Unjiha*;" the name in the Moluccas is "*Kellor-laut.*"

4. *ALBIZZIA LEBBEK* Benth. in Hook. Lond. Journ. Bot. III, 87. An unarmed deciduous tree 40–70 feet high, young shoots puberulous or almost glabrous; with pale bark. *Leaves* evenly 2-pinnate; rachis 3–9 in. long with a large sessile gland near base; pinnæ 2–3- (less often 4-, rarely 1-) jugate, 4 in. long with a gland on the main-rachis above between the bases of the distal, sometimes of the 2 distal pinnæ; leaflets 5–9-jugate, often with glands between their bases, elliptic-oblong or the upper more oblique and obovate-oblong, very obtuse or retuse, base obliquely rounded, or rounded on lower, cuneate on upper margin, subsessile, glabrous above, glabrous or faintly pubescent beneath, reticulate, pale-green, 1–2 in. long, .5–.75 in. wide. *Flowers* in globular subcapitate umbels 1.25 in. across, white and fragrant; peduncles 2–4 in. long, glabrous or puberulous, solitary or 2–4 together from axils of upper leaves, or corymbose at the ends of short leafless branches; pedicels .1–.15 in. long, slender, puberulous. *Calyx* .15–.2 in. long, teeth short deltoid, tube glabrous or puberulous. *Corolla* .3 in. long, tube glabrous, the teeth ovate-lanceolate, externally pubescent. *Filaments* connate at base in a uniform tube shorter than corolla. *Pod* 4–12 in. long, 1–2 in.

broad; linear-oblong, blunt at both ends, flat, much compressed, with slightly thickened sutures, smooth, glossy, pale straw-coloured except opposite the seeds, there reticulated, pale-brown. *Seeds* 4–12, transversely oval, much compressed, .6 in. long, .3 in. wide, .1 in. thick, testa smooth, pale-brown. *Bedd. Fl. Sylvat.* t. 53; *Bak. in Flor. Brit. Ind.* II, 298. *Albizzia latifolia* Boiv. *Encyc.* II, 33; *Miq. Flor. Ind. Bat.* I, 22. *Acacia Lebbek* Willd. *Sp. Pl.* IV, 1066; *DC. Prodr.* II, 466. *Acacia speciosu* Willd. *Sp. Pl.* IV, 1066; *DC. Prodr.* II, 467; *W. & A. Prodr.* 275. *Acacia Sirissa* Ham. in *Wall. Cat.* 5265. *Mimosa speciosa* Jacq.  *Ic. t.* 108. *M. Sirissa* Roxb. *Hort. Beng.* 40; *Flor. Ind.* II, 544. **THE SIRIS.**

Planted in some of the provinces:—ANDAMANS; *Kurz!* PENANG; *Curtis* 296! **DISTRIB.** Planted throughout the tropics; appears to be wild in the drier regions of Asia and Africa.

5. **ALBIZZIA PEDICELLATA** Bak. ex Benth. in *Trans. Linn. Soc.* XXX, 563. A tall erect unarmed tree sometimes over 100 feet high, young shoots dark-coloured, faintly rusty-puberulous, bark dark-coloured; stem 3 feet in diam., heart-wood black. *Leaves* evenly 2-pinnate; rachis 5–8 in. long, with a large sessile gland .5 in. above base, stipules persisting as two firm recurved thickly coriaceous hooklets; pinnæ 6–12-jugate, 4–6 in. long, the main and secondary rachises alike puberulous; leaflets 12–16-jugate, oblong-obtuse, sessile, with slightly obliquely rounded base, rigidly subcoriaceous, .5–.75 in long, .3–.4 in. wide, dark-green above, pale but hardly glaucescent beneath, reticulate-veined, quite glabrous on both surfaces. *Flowers* in many-fl. umbels .75–1 in. across, yellowish-white with green stamens; peduncles slender finely pubescent, 1–1.25 in. long, panicled in fascicles of 2–8 on nodes towards the apices of numerous axillary main-rachises, the nodes sometimes evolved as branchlets 1–2 in. long so as to form compound umbels; main-rachis puberulous, the peduncular portion beneath the flowers 3 in. long towards ends of branches, to 12–15 in. long in the axils lower down; pedicels rusty-pubescent very slender, .25–.3 in. long. *Calyx* .15 in. long, teeth short deltoid, densely pubescent externally. *Corolla* .3 in. long, teeth ovate-acute externally, densely pubescent as is the tube. *Filaments* connate at base in a white tube shorter than corolla, free portions of filaments over 1 in. long, bright-green. *Pod* indehiscent, 12–18 in. long, 2.25–2.5 in. wide, very thin and brittle, pale yellowish-brown, very faintly reticulated opposite the seeds, sinuate-repand along the unthickened sutures. *Seeds* 6–9, transversely ovate, .25 in. long, .2 in. wide, much compressed, testa smooth dark-brown. *Bak. in Flor. Brit. Ind.* II, 299.

PERAK; Goping, Ulu Bubong, etc. *Kunstler* 4474! 7988! 10436!

PENANG; Waterfall, Curtis 1921! MALACCA; Maingay 581! 586!  
 Goodenough, 1796! SINGAPORE; Kranji Road, Ridley 6297!

A very fine species.

6. *ALBIZZIA ODORATISSIMA* Benth. in Hook. Lond. Journ. Bot. III, 88. A tall erect unarmed tree sometimes 100 feet high, young shoots rather dark-coloured, stem 2-2.5 feet in diam., heart-wood black. Leaves evenly 2-pinnate; rachis 6-12 in. long, finely-downy, with a large sessile gland .5 in. above base and 1-2 small ones between the bases of the distal pairs of pinnae, stipules small quite deciduous; pinnae 3-4 (rarely 2-) jugate, usually 5-8 in. long, the secondary rachises glabrous or pubescent; leaflets 8-24-jugate, obliquely oblong, sessile, obtuse, with very obliquely rounded base, rigidly subcoriaceous, .75-1 in. long, .3-.5 in. wide, dark-green above, glaucescent beneath, reticulate-veined, the midrib removed by one-third from, and parallel to, the upper edge, glabrous or faintly sparsely adpressed-hairy above, more densely adpressed-hairy beneath. Flowers in numerous small 10-12-fl. heads, .75-1 in. across, yellowish-white with pale-yellow stamens; peduncles slender, puberulous, .75 in. long, solitary or oftener in fascicles of 3-6 on nodes in the upper third of numerous small corymbose branchlets 2-2.5 in. long, themselves in panicles 8-12 in. long at the ends of leafy branches; pedicels 0. Calyx .05 in. long, teeth obsolete, tube campanulate, externally densely pubescent. Corolla .15 in. long, oblong in bud, teeth ovate-lanceolate, externally densely grey-silky as is the tube. Filaments connate at the base in a white tube half as long as that of the corolla, free portion of filaments .4 in. long, pale-yellow. Pod indehiscent, 6-9 in. long, 1.2-1.6 in. wide, thin, flexible, warm-brown, glossy or dull, sutures straight or slightly repand; valves uniformly wide-reticulate. Seeds 8-12, broadly ovate, .3 in. long, .25 in. wide, much compressed, testa smooth, dull greenish-yellow, faintly areolate. Bedd. Flor. Sylvat. t. 54; Bak. in Flor. Brit. Ind. II, 299. *Albizzia micrantha* Boiv. Encyc. II, 34; Miq. Flor. Ind. Bat. I, 24. *Acacia odoratissima* Willd. Sp. Pl. IV, 1063; DC. Prodr. II, 466; Wall. Cat. 5234; W. & A. Prodr. 275. *Acacia lomatarpa* DC. Prodr. II, 467. *Mimosa odoratissima* Linn. f. Suppl. 437; Roxb. Cor. Pl. t. 120; Hort. Beng. 40; Fl. Ind. II, 546. *Mimosa marginata* Lamk. Encyc. Meth. I, 12. The BLACK SIRIS.

MALACCA; (*vide* Baker). DISTRIB. India and Indo-China.

Mr. Baker notes the presence of this in Malacca and the species is therefore included here. It is, however, possible that Mr. Baker's specimens are from planted trees, for no botanist has ever communicated Malayan specimens to the Calcutta Herbarium.

7. *ALBIZZIA PROCERA* Benth. in Hook. Lond. Journ. Bot. III, 89.

An erect unarmed tree 60–80 feet high, young shoots rather pale, much lenticelled, subrugose, glabrous, bark pale-gray outside reddish within, stem 1·5–2 feet in diam.; heart-wood brown. *Leaves* evenly 2-pinnate; rachis 12–18 in. long, glabrous, with a large gland ·25 in. above the base; pinnæ 2–6-jugate, 5–6 in. long, secondary rachises glabrous, with sessile ovate gland below the last pair of leaflets; leaflets 6–12 jugate, obliquely ovate to ovate-oblong with petiolules ·05 in. long, blunt or subacute, the base obliquely cuneate on upper rounded on lower margin; thinly coriaceous, 1–1·5 in. long, (in young trees sometimes 2 in. long) and ·6–·8 in. wide, dark-green glabrous above, paler beneath and when young densely silvery later sparsely adpressed-pubescent. *Flowers* in numerous small 20–25-fld. heads, ·75 in. across, yellowish-white with pale-yellow stamens; peduncles slender puberulous or glabrous, ·5 in. long, in fascicles of 3–5, less often solitary on nodes in the upper half of numerous racemose branchlets 3–5 in. long at the ends of leafy branches; pedicels 0. *Calyx* ·1 in. long, teeth triangular distinct, glabrous externally as is the tube. *Corolla* ·25 in. long, teeth lanceolate half as long as tube, densely uniformly pubescent externally. *Filaments* connate at base in a yellow tube as long as that of corolla, free portion of filaments ·35 in. long, greenish-yellow. *Pod* at length dehiscent, 4–8 in. long, ·7–·9 in. wide, thin, flexible, bright reddish-brown, glossy, sutures straight, slightly thickened; valves not reticulated. *Seeds* 6–12, broadly ovate, ·35 in. long, ·25 in. wide, much compressed, testa smooth pale-brown. *Bedd. Flor. Sylvat.* 96; *Miq. Flor. Ind. Bat.* I, 21; *Bak. in Flor. Brit. Ind.* II, 299. *Acacia procera* Willd. *Sp. Pl.* IV, 1063; *DC. Prodr.* II, 466; *W. & A. Prodr.* 275. *Acacia elata* Grah. in *Wall. Cat.* 5233; *Voigt, Hort. Suburb. Calcutt.* 261 (not *Mimosa elata* Roxb.). *Mimosa procera* Roxb. *Cor. Pl.* t. 121; *Hort. Beng.* 93; *Flor. Ind.* II, 548.

ANDAMANS; Coco Group, common, *Prain!* *DISTRIB.* Indo-China, China; Malay Archipelago.

It is strange that though this species extends from Nepal to Central China on the north and from Java to the Philippines on the south, it should never have been collected in the Malay Peninsula. More extraordinary still, though quite common at the north end of the Andamans, it seems to be altogether absent from the southern islands of that group and from the Nicobars.

8. *ALBIZZIA LUCIDA* Benth. in *Hook. Lond. Journ. Bot.* III, 86. An unarmed deciduous tree 50–60 feet high, all parts glabrous, bark thin, greyish, pustular, stem 1–1·5 feet in diam.; heart-wood pale-brown. *Leaves* evenly 2-pinnate, rachis 1·5–2·5 in. long, quite glabrous, with a sessile cup-shaped gland ·3–·8 in. above the base and with another near the tip; pinnæ usually 1-jugate with secondary rachis 2–3·5 in. long, with a gland on upper side ·25 in. below the distal pair of leaflets and often with a second ·25 in. below the penultimate pair, the leaflets usually 2-



sometimes 3-, rarely 1-jugate, (when leaflets 3-jugate on the distal pinnæ, leaves occasionally with a second pair of pinnæ with short eglandular rachis under .5 in. long, bearing 1 pair of small leaflets); leaflets ovate to elliptic-oblong or oblong-lanceolate, apex rather abruptly acuminate, base obliquely cuneate, glossy dark-green above, dull paler beneath, glabrous on both surfaces, thinly chartaceous, decreasing downwards, the distal pairs 4 in. long, 1.5 in. wide, the lowest 1.5 in. long, .7 in. wide. *Flowers* in small heads .6-.7 in. across, yellowish; peduncles slender, faintly puberulous, .75-1 in. long, solitary or in fascicles of 2-3 in corymbs on nodes in the upper fourth, or subumbellate at the tips, of numerous branchlets 1.5-6 in. long, themselves in corymbose panicles 8-10 in. long and nearly as wide, at the ends of leafy branches; pedicels .05-1 in. long. *Calyx* .07 in. long, campanulate, faintly toothed, externally puberulous. *Corolla* .2 in. long, teeth lanceolate, uniformly sparsely silky externally. *Filaments* connate at base in a white tube slightly shorter than that of corolla, free portion of filaments .35 in. long, pale-yellow. *Pod* at length dehiscent, 6-10 in. long, 1-1.25 in. wide, thin, flexible, pale-brown, dull, reticulated opposite the seeds, smooth glossy elsewhere. *Seeds* 6-8, orbicular, .3 in. in diam., much compressed, testa smooth, pale-brown. Benth. Pl. Jungh. 268; Miq. Flor. Ind. Bat. I, 18; Bak. in Flor. Brit. Ind. II, 299. *Mimosa lucida* Roxb. Hort. Beng. 40; Flor. Ind. II, 544. *Inga lucida* Wall. Cat. 5267 mostly.

SINGAPORE: *vide* Baker. DISTRIB. Eastern Himalaya and Indo-China; also Java (*vide* Miquel).

Like *A. odoratissima* this species is included on the authority of Mr. Baker, who records it from the Malayan Peninsula. Dr. Miquel reports it also from Java, but no British or Dutch botanist has ever sent a Malayan specimen to Calcutta.

#### 70. PITHECOLOBIUM Mart.

Erect trees. *Leaves* abruptly 2-pinnate. *Flowers* in globose heads, rarely in small loose spikes or subumbellate corymbs, usually hermaphrodite and pentamerous. *Calyx* campanulate or funnel-shaped, shortly toothed. *Corolla* funnel-shaped, the petals united below from one-half to two-thirds their length. *Stamens* monadelphous, much exerted; anthers without glands. *Ovary* sessile or stipitate, many-ovuled; style filiform, stigma minute capitate. *Pod* strap-shaped, circinate or rarely falcate or nearly straight, usually dehiscent throughout the lower suture and much twisted in a late stage, sutures not or slightly thickened.

Species about 100; cosmopolitan in the Tropics, about 80%. American, only 1-2 African.

- Armed with spinescent stipules; seeds arillate; (pinnæ of leaves 1-jugate, their rachises gland-bearing; leaflets 1-jugate; pods close-spiral, dehiscent along lower suture, testa of distant seeds thin) ... .. 1. *P. dulce.*
- Unarmed; seeds without arillus:—
- Pod indehiscent, (horse-shoe shaped), seeds (distant) with a thick leathery testa; (pinnæ 1-jugate, their rachises gland-bearing, leaflets glabrous 2-jugate) ... .. 2. *P. confertum.*
- Pods dehiscent, seeds with a thin crustaceous testa:—
- Pods straight or slightly falcate, opening along both sutures, valves thick, fleshy, seeds close-set, mutually compressed; (pinnæ 1-jugate, their rachises gland-bearing, leaflets glabrous 1-2-jugate) ... .. 3. *P. bubalinum.*
- Pods spirally twisted, opening only along the lower suture, valves coriaceous, seeds distant:—
- Pods deeply lobed between the seeds half-way down to upper suture or further, dehiscing only opposite the seeds; (pinnæ 1-jugate, their rachises gland-bearing, leaflets glabrous 2-3-jugate) ... .. 4. *P. lobatum.*
- Pods only faintly sinuate on lower suture between the seeds, dehiscence along lower suture continuous:—
- Pinnæ 1-jugate without glands on their rachises; (leaflets glabrous):—
- Pods large, .75 in. broad; seeds somewhat compressed, .6 in. long; leaflets 2-jugate apex acute ... .. 5. *P. nicobaricum.*
- Pods small, .4 in. broad; seeds pisiform, .2 in. across; leaflets 3-4-jugate, apex caudate-acuminate ... .. 6. *P. microcarpum.*
- Pinnæ more than 1-jugate or, if casually 1-jugate then with glands on their rachises; (pods large):—
- Pods broad, 1.25 in. wide or more; leaflets very large, glabrous; (pinnæ 2-jugate, distal much exceeding the proximal casually absent pair):—
- Rachises of pinnæ with glands between each pair of leaflets; flowers in dense many-fl. heads .75 in. across; leaflets shining on both surfaces; branches of panicle terete ... .. 7. *P. affine.*
- Rachises of pinnæ with glands between bases of terminal leaflets only; flowers in few-fl. heads .2 in. across; leaflets dull beneath, branches of panicle subcompressed ... .. 8. *P. ellipticum.*
- Pods narrow, .75 in. wide or less; leaflets medium or small, puberulous or pubescent beneath:—
- Flowers large (.5 in. long); pod long-stipitate, seeds with long axis parallel to sutures; (pinnæ 2-jugate or casually 1-jugate, leaflets medium; branches terete) ... .. 9. *P. Kunstleri.*
- Flowers small (under .25 in. long); pod short-stipitate, seeds with long axis transverse:—

Florets sessile, branches terete; leaflets of distal pinnæ 15-20-jugate; (pinnæ 5-8-jugate, leaflets small, all rhomboid, the distal pairs not much exceeding the others) ... 10. *P. contortum*.

Florets pedicellate, branches angled; leaflets of distal pinnæ 5-8-jugate :—

Pinnæ 3-6- (rarely 8-10-) jugate; leaflets small, all trapezoid, the distal pairs not much exceeding the others; glands stipitate ... .. 11. *P. Clypearia*.

Pinnæ 2-4-jugate; leaflets medium, terminal cuneate at base, considerably exceeding the subtrapezoid others; glands sessile ... 12. *P. angulatum*.

1. *PITHECOLOBIUM DULCE* Benth. in Hook. Lond. Journ. Bot. III, 199. A tree 25-40 feet high with glabrous branches; stem 2 feet in diam., the ultimate branchlets pendent, armed with stipular thorns. *Leaves* evenly 2-pinnate, rachis 1 in. long glabrous, basal gland 0, with a sessile small cupped-gland at its apex between the bases of the 1-jugate pinnæ, with secondary rachises .25 in. long also gland-bearing at apices between the bases of the 1-jugate leaflets glabrous on both surfaces, pale-green, approximated, oblique obovate-oblong, rigidly subcoriaceous, obtuse or occasionally subacute, 1-2 in. long, .3-7 in. wide; stipules ascending, .2-3 in. long, converted into conical smooth thorns, the main and secondary rachises both shortly produced in acute points. *Flowers* in dense heads .4-.5 in. in diam., on puberulous pedicels .25 in. long, solitary or 2-3 together in the axils of small lanceolate bracts .1 in. long, along slender nodiform branchlets slightly zig-zag towards their tips, glabrous or puberulous, striate, from 3-5 in. long, the bracts of the lower two-thirds accompanied by minute stipular spines, those of the lowest fourth often replaced by reduced foliage leaves; the branches arranged in terminal panicles 7-12 in. long, 5-8 in. wide, extending into the upper axils. *Calyx* .05 in. long, grey-downy, subcampanulate, shortly toothed. *Corolla* white, .1 in. long, puberulous tube wide-infundibuliform, rather longer than the ovate-acute teeth. *Filaments* united at base in a tube as long as that of the corolla, shortly exerted. *Ovary* puberulous, shortly stipitate. *Pod* turgid, twisted, dehiscent along the lower suture, both sutures slightly indented between the seeds, 4-5 in. long, .5 in. wide; glabrous, wide-reticulated, the valves coriaceous, claret-red when ripe. *Seeds* 6-8, obovate-oblong, .5 in. long, .3 in. wide, .2 in. thick, testa smooth shining purplish, enveloped in a firm edible pulpy pale arillus. *Miq. Flor. Ind. Bat. I, 40; Bedd. Flor. Sylvat. t. 188; Bak. in Flor. Brit. Ind. II, 302. Mimosa dulcis* Roxb.

Cor. Pl. I. t. 99; Hort. Beng. 40; Flor. Ind. II, 556. *Inga dulcis* Willd. Sp. Pl. IV, 1005; DC. Prodr. II, 436; Wall. Cat. 5282; W. & A. Prodr. 268; Wight, Ic. t. 198.

Cultivated in most of the Provinces; PENANG; *Curtis* 59! SINGAPORE; *Maingay* 579! ANDAMANS: common. NICOBARS; Car Nicobar, *King's Collector*!

A native of America whence it has been introduced, by way of the Philippines, to Malaya generally, and to India.

2. *PITHECOLOBIUM CONFERTUM* Benth. Trans. Linn. Soc. XXX, 304. An unarmed small tree with glabrous lenticelled branchlets with dark-brown bark. *Leaves* evenly 2-pinnate, rachis glabrous .75 in. long, with no basal gland but with a long elliptic gland just below the bases of the 1-jugate pinnæ; rachises of pinnæ glabrous, 2 in. long, with glands between the bases of each of the 2 pairs of leaflets glabrous on both surfaces, bright-green shining above, paler dull beneath, rigidly papery, oblong, shortly obtusely pointed, cuneate at base, distal 3.25–3.75 in. long, 1.75–2 in. wide, proximal 2.5 in. long, 1.25 in. wide, lateral nerves 3–4 pairs ascending; petiolules distinct, glabrous, .2 in. long. *Flowers* in small 5–10-fl. heads .75 in. across, on pubescent pedicels .75 in. long, arranged in small axillary and terminal corymbs 2 in. long and broad with pubescent main-rachises, 1 in. long or less. *Calyx* sessile .05 in. long, puberulous, campanulate, teeth obsolete; bracteoles minute. *Corolla* white, .25 in. long, tube glabrescent externally, twice as long as the lanceolate teeth, puberulous on the outside. *Filaments* united at base in a tube slightly longer than that of corolla, free portion white, exerted .35 in. *Ovary* glabrous, subsessile. *Pod* indehiscent, slightly turgid, horse-shoe shaped or loosely spirally twisted, 10–12 in. long, 1.5 in. wide, sutures firm not at all indented between the seeds, valves thinly coriaceous, glabrous, shining, faintly wide-reticulate. *Seeds* 11–13, compressed ovate, .75 in. long, .5 in. wide, .25 in. thick; testa brown, dull, areolate on the outside, thick, tough and leathery. *Bak.* in Flor. Brit. Ind. II, 304. *Albizzia splendens* Miq. Flor. Ind. Bat. Suppl. 280.

MALACCA; *Griffith* 1951! *Goodenough* 1766! *Hervey*! *DISTRIB.* Sumatra (*Teysmann* 4228)!

This species is remarkable in having pods that do not twist spirally and that are apparently quite indehiscent. The seeds have no true arillas but have a thick softly coriaceous tough coat which apparently takes the place of an arillate structure.

3. *PITHECOLOBIUM BUBALINUM* Benth. Trans. Linn. Soc. XXX, 576. An unarmed tree 30 feet high with pale-brown pubescent branchlets and grey bark. *Leaves* evenly 2-pinnate, rachis puberulous .5 in. long, with no basal gland but with a round gland just below the bases of the

1-jugate pinnæ; rachises of pinnæ .75–1.75 in. long with glands between the 1–2 pairs of leaflets, the leaflets oftener 1- than 2-jugate, sometimes 1-jugate on one and 2-jugate on the other pinna of the same leaf; leaflets glabrous on both surfaces, bright-green shining beneath as well as above, rigidly papery, oblong-lanceolate, shortly subacutely pointed, cuneate at base, distal 4–5 in. long, 1.75–2.25 in. wide, proximal 2.5 in. long, 1.25 in. wide, lateral nerves 4–5 pairs ascending, petiolules distinct, glabrous, .2 in. long. *Flowers* in small 5–8-fl. heads .3 in. across, on puberulous very slender pedicels .4–.6 in. long, fascicled in the axils of small bracts and subumbellate at the tips of puberulous peduncles .75 in. long, subcorymbosely set on branchlets 2.5 in. long, themselves disposed in terminal and axillary panicles 6–8 in. long, 4–6 in. wide. *Calyx* sessile .05 in. long, pubescent, campanulate, teeth short, deltoid, bracteoles minute. *Corolla* white, .12 in. long, teeth lanceolate nearly as long as tube, uniformly puberulous externally. *Filaments* united in a tube longer than that of corolla, free portion white, exerted, .35 in. long. *Ovary* pubescent, distinctly stipitate. *Pod* dark-green inside, reddish outside, dehiscent along both sutures, oblong, straight or falcate, apex obtuse, base obliquely rounded, 3–4 in. long, 1 in. wide, .75 in. thick, sutures thin not at all indented, valves thick, fleshy, fœtid, densely shortly velvety externally. *Seeds* 8–10, crowded, ovoid, with sides flattened from mutual compression, .75 in. long, .4 in. wide and as thick, testa thin crustaceous smooth shining dark-purple; arillus absent. *Bak. in Flor. Brit. Ind. II, 304. Inga bubalina* Jack, *Mal. Miscel. II, 7. 77; Hook. Comp. Bot. Mag. I, 224.*

PENANG; *vide* BAKOR. MALACCA; *Griffith! Maingay 576! Goodenough 1552! DISTRIB. Sumatra (Jack; Forbes 1801!)*

Jack gives the Malay name of this as "*Bua Karbau*" in Sumatra; Forbes does not give any native name. In Malacca the name given by Griffith is "*Ingria*," that noted by Goodenough is "*Gerdas Padi*." The fleshy pod is eaten, in spite of its offensive odour.

4. *PITHECOLOBIUM LOBATUM* Benth. in Hook. *Lond. Journ. Bot. III, 208.* A tree 60–80 feet high with spreading crown, stem 15–20 in. thick; branchlets glabrous; bark grey. *Leaves* evenly 2-pinnate; rachis glabrous .6–1 in. long, with a gland near the middle but none at base or between the bases of the 1-jugate pinnæ; rachises of pinnæ glabrous 4–6 in. long, with gland between the bases of the 2–3-jugate leaflets; leaflets oblong to oblong-lanceolate, acute, base cuneate, firmly papery, flexible, glabrous and shining on both sides, medium-green, distal pair 5–8 in. long, 2–3 in. wide, proximal 3 in. long, 1.5 in. wide; petiolules glabrous, .25 in. long. *Flowers* in small 3–5-fl. heads .25 in. across, on glabrous slender pedicels .2–.3 in. long, solitary or 2–3 together on nodes with small glabrous bracts along glabrous branchlets 1–4 in. long,

the larger paniculately branched; fascicled in leaf-axils and on nodes below the leaves near and at the ends of branches. *Calyx* sessile, glabrous or sparsely puberulous, .05 in. long, tube campanulate, teeth short deltoid ciliate, bracteoles minute glabrous. *Corolla* white, glabrous, .15 in. long, tube infundibuliform one and a half times the length of the lanceolate teeth. *Filaments* united at base in a tube rather shorter than that of corolla, free portion white, exerted, .25 in. long. *Ovary* glabrous, stipitate. *Pod* 9–10 in. long, horse-shoe shaped or loosely spirally twisted, valves firmly coriaceous, glabrous, deeply lobed along the lower suture half-way or more towards the entire upper, indehiscent in the sinuses, but dehiscing along the convexities of the one-seeded suborbicular rudely umbonate lobes 2 in. in diam., 1 in. thick. *Seeds* 3–6, (usually some of the lobes are abortive, occasionally two may be confluent), orbicular, .75 in. in diam., .35 in. thick, testa dark-brown, thin, rather dull, crustaceous; arillus absent. Hassk. *Retzia* I. 222; Miq. *Flor. Ind. Bat.* I, 33; Bak. in *Flor. Brit. Ind.* II, 305. *Mimosa Koeringa* Roxb. *Hort. Beng.* 40. *M. Djiringa* Roxb. *Hort. Beng.* 93. *M. Kaeringa* Roxb. *Flor. Ind.* II, 543. *M. Jiringa* Jack, *Mal. Miscell.* I, 1, 14; Hook. *Bot. Misc.* I, 282. *Inga Jiringa* Jack, *Mal. Miscell.* II, 7, 78. *Inga attenuata* Grah. in *Wall. Cat.* 5276. *Inga lobata* Grah. in *Wall. Cat.* 5280A. *Inga bigemina* Bl. *Cat. Buitenz.* 88; Hassk. *Cat. Bog.* 291, not of Willd. *Acacia Koeringa* Royle, *Ill. Him. Pl.* 183. *Pithecolobium Koeringa* Kuntze *MSS.* in *Herb. Kew.*

PENANG; *Curtis* 105! 711! 720! 2916! PERAK; *Wray* 499! *Kunstler* 5665! 7116! 8651! 10841! MALACCA; *Griffith* 1954! *Maingay* 572/2! SINGAPORE; *Kunstler* 1163! *Hullett* 47! *DISTRIB.* Tenasserim; Sumatra, ("wild," *Forbes* 1519! 3051!); Java, cultivated (*Kurz* 2110! *Koorders* 4199! 11514!); Philippines, (*vide* Baker).

*Curtis* gives the Malay name in Penang as "Jereng;" Jack gives "*Bua Jiring*" as the name in Sumatra; Roxburgh uses this name and, perhaps, also the name "*Koeringa*."

Specimens issued by Javanese botanists as *P. bigeminum* always belong to this species; *P. bigeminum* does not occur anywhere in the Malayan countries. Hasskarl states that the name "*Tjering*" is, in Java, limited to the eastern parts of the island where alone the tree occurs uncultivated. The cultivated tree in West Java is termed "*Djenkol*." This last is the only name cited by *Koorders* and *Valeton* (*Bijdr.* I, 268) who say that, though occurring as an escape, the tree is nowhere wild in Java.

Roxburgh, it is to be noted, published two names:—*Mimosa Koeringa* (*Hort. Beng.* 40)—this he afterwards described as having seeds covered with edible fleshy pulp; and *M. Djiringa* (*Hort. Beng.* 93)—this he never did describe. It is to the former alone that *Royle* adverts under the name *Acacia Koeringa*, and it is the latter alone that *Jack* is careful to cite as synonymous with his *Inga Jiringa*. Of *Inga Jiringa* *Jack* does not say that the seeds are enveloped in pulp; he is careful, however, to imply that, like *I. bubalina*, its seeds have no arillus, but that the legume

is fleshy and esculent. When therefore Bentham and, following him, Miquel describe the seeds of their *Pithecolobium lobatum*, for which they cite both of Roxburgh's names, as enveloped in edible pulp, they give a character derived from Roxburgh's description of *M. Koeringa* only.

On Burmese specimens Sir D. Brandis has noted "fruit sold;" Gallatly says "edible.....common in the bazars;" Kurz has said nothing about the fruits or seeds and has not described the latter; Baker too has refrained from describing them. Hasskarl in describing the use of the fruits does not say whether it is the pod or the seed that is employed; he *does* say that the pulp of the seed disappears when the fruit is ripe!\* Koorders and Valetton say that the foetid seeds are eaten *cooked*. Watt in the *Dictionary of the Economic Products of India* only quotes Roxburgh. What the actual facts may be it is for Malayan botanists to declare. Is it the succulent pod, a fleshy pulp, or the seed itself of *Jiring* that is eaten? And has *Jiring* any pulp at all? If so, is this pulp an arillus?

Roxburgh, though he laboured under the double disadvantage of working in the East, and of dealing largely with living plants, was nevertheless remarkably given to being accurate; in spite of the fact that systematists in Europe, whose labours have been simplified by being confined to dried specimens, propose to unite the two, the writer thinks it should be left an open question whether there may not be a *Pithecolobium Koeringa* whose seeds have an edible pulp, and a *Pithecolobium Jiringa* without a pulp enveloping the seeds. If this be so, these are the names that should be used to designate the two trees, since the name *P. lobatum*, though the best to employ so long as the point is in dubiety, must obviously be discarded should it be found that Roxburgh was right.

5. *PITHECOLOBIUM NICOBARICUM* Prain. A small tree with slender glabrous zig-zag branchlets with dark greenish-brown bark. *Leaves* evenly 2-pinnate; rachis .75 in. long, glabrous, with a gland just above the middle but none at base or between the 1-jugate pinnæ; rachises of pinnæ 1.5-2 in. long, glabrous, glandless; leaflets 2- (very rarely 3-) jugate, ovate-lanceolate, gradually tapering to the acute apex and cuneate base, bright-green, glabrous on both surfaces, shining above, duller beneath, distal pair 3-4 in. long, 1.4-1.8 in. wide, others 1-2.5 in. long, .5-1.25 in. wide; petiolules distinct, glabrous, .1 in. long. *Flowers* in small few-fl. heads on puberulous pedicels .25 in. long, in terminal and axillary racemes .75-2 in. long. *Calyx* pubescent, campanulate, .05 in. long, teeth deltoid, small. *Corolla* and *stamens* not seen. *Pod* dehiscent along lower suture, 5-6 in. long, .75 in. wide, spirally twisted, valves thickly coriaceous, glabrous, dull, purplish-red, sinuate between the seeds along the upper margin. *Seeds* 8-10, orbicular-ovate, somewhat compressed, .6 in. long, .5 in. wide, .25 in. thick, testa thin, crustaceous, dark-purple smooth shining; arillus absent. *Albizzia bubalina* (*Pithecolobium bubalinum*) Kurz, Journ. As. Soc. Beng. XLV, 2. 129 not of Benth. *Pithecolobium oppositum* Kurz, *loc. cit.*, not of Miq.

\* There is no pulp visible in any of our specimens at Calcutta in any stage of the pod, whether the specimens come from Burma, the Malay Peninsula, or the Archipelago.

NICOBARS; Nancowry, *Jelinek!* Kamorta, *Kurz!*

The Nicobarese name for this tree is "*Kawas*." Kurz has erred in identifying it with *P. bubalinum* Bth., which it does not much resemble as regards leaves and which it is totally unlike as regards fruits. He has erred still further in identifying it with *P. oppositum* Miq. which he supposed to be identical with *P. bubalinum*. In reality *P. oppositum* has 2-jugate leaves, with leaflets more like those of *P. microcarpum* than like those of either *P. bubalinum* or *P. nicobaricum*, and with the gland on the main-rachis similarly situated. In spite of the fact that Miquel's specimens have neither flowers nor fruits, the writer thinks they belong to a tree that, though a member of the same group as, is probably quite distinct from, all three species mentioned.

6. *PITHECOLOBIUM MICROCARPUM* Benth. in Trans. Linn. Soc. XXX, 576. An unarmed tree 30–70 feet high, with slender pubescent branches with red anastomosing wrinkles, stem 10–15 in. thick, bark greyish-brown. *Leaves* evenly 2-pinnate, rachis puberulous .5–.75 (rarely 1.25–1.5) in. long, with a gland just below the middle but none at base or between the 1-jugate pinnæ; rachises of pinnæ 2–4 in. long, puberulous, glandless; leaflets 3–4 (rarely only 2-) jugate, firmly chartaceous, ovate, apex rather long obtusely caudate-acuminate, base of distal leaflets cuneate of the others rounded, dark-green shining above, glaucescent beneath, glabrous on both surfaces, distal pair 4–6 in. long, 2–3 in. wide, proximal 3 in. long, 1.5 in. wide; petiolules distinct, glabrous, .15 in. long. *Flowers* in small 5–8-fl. heads .4 in. across, on puberulous slender pedicels .4–.6 in. long, fascicled in the axils of small bracts and subumbellate at the tips of puberulous peduncles 1 in. long, subcorymbosely set on branchlets 2–3 in. long, themselves disposed in terminal and axillary panicles 6–8 in. long, 4–6 in. wide. *Calyx* sessile glabrescent, .05 in. long, tube campanulate, teeth short deltoid, bracteoles short lanceolate. *Corolla* white, .15 in. long, teeth ovate-lanceolate equalling the tube, uniformly glabrous externally. *Filaments* united in a tube shorter than that of corolla, free portion white, exerted, .35 in. long. *Ovary* glabrous subsessile. *Pod* dehiscent along lower suture, spirally twisted, 1.75–2 in. long, .3–.4 in. wide, sutures thin, the upper very faintly sinuate between the seeds, the valves thinly coriaceous, waxy bright-red. *Seeds* 8–10, pisiform, .2 in. in diam., testa thin, crustaceous, smooth, shining, dark-purple; arillus absent. Bak. in Flor. Brit. Ind. II, 304. *Inga bubalina* Wall. Cat. 5272 not of Jack. *Pithecolobium bigeminum* var. *bubalina* Benth. in Hook. Lond. Journ. Bot. III, 207; Miq. Flor. Ind. Bat. I, 33 and Suppl. 281, as to the *Wallichian* synonym only.

PERAK; *Scortechini* 64! 1978! *Kunstler* 1297! 5492! 5842! 10354! 10729! 10802! PENANG; *Porter* (Wall. Cat. 5272)! *Curtis* 1093! MALACCA; *Griffith* 1947! *Maingay* 567! 574! *Goodenough* 1413! *Derry* 1161! *Hervey!* SINGAPORE; *Ridley* 1634! 6666! *T. Anderson* 40! *Kurz!* DISTRIB. Sumatra (*vide* Miquel); Borneo.



This very common species has been compared with *P. bubalinum*; in reality the resemblance is very superficial; the leaves differ in having glandless secondary rachises, the leaflets are quite different in shape and the flowers are also very different; in inflorescence the two species are, however, remarkably similar. The nearest ally is undoubtedly *P. oppositum* Miq., of which neither flowers nor fruits are yet known. The leaflets of the two species are of the same shape and have the same caudate tips but those of *P. oppositum* are rather thinner in texture and have puberulous instead of glabrous petiolules besides being arranged on 2 pairs of pinnæ whereas none of our numerous examples of *P. microcarpum* have more than 1 pair of pinnæ.

Goodenough gives "*Kradus*" as the Malay name in Malacca.

7. *PITHECOLOBIUM AFFINE* Bak. ex Benth. in Trans. Linn. Soc. XXX, 577. A small unarmed tree 15–25 feet high, stem 6–8 in. in diam., young branches rusty-puberulous to pubescent. *Leaves* evenly 2-pinnate, rachis glabrous or puberulous 4–6 in. long, with a large sessile gland .35 in. above the base, and with similar glands between the bases of the 1–2-jugate pinnæ; secondary rachises of distal pinnæ 6 in. long, with leaflets 4-, (less often 3-) jugate, of proximal pinnæ when present 1.5–2.25 in. long with leaflets 2- (sometimes only 1-) jugate, both with glands between the bases of each pair of leaflets; leaflets papery, glabrous on both surfaces, bright-green, glossy, obovate-acute with subequal cuneate bases, diminishing downwards, distal pair 6–7 in. long, 3–3.25 in. wide, proximal 3 in. long, 1.5–1.75 in. wide; lateral nerves 4–6 pairs ascending; petiolules distinct, glabrous, .15 in. long. *Flowers* in dense heads .75 in. across, on slender peduncles .6 in. long, arranged singly or in fascicles of 2–3 together along branchlets 3–8 in. long, themselves forming an ample terminal panicle 10–15 in. long and broad. *Calyx* subsessile, minutely bracteolate at the base, .15 in. long, tube funnel-shaped, teeth very short, uniformly brown-silky externally. *Corolla* white, .25 in. long, uniformly grey-silky externally, teeth ovate-lanceolate, half as long as tube. *Filaments* united in a tube as long as that of corolla, exerted .35 in., pure white. *Ovary* puberulous, shortly stipitate. *Pod* dehiscent along lower suture, spiral, 8 in. long, 1.25 in. wide, hardly sinuate along upper suture, valves thinly coriaceous, glabrous, shining, faintly wide-reticulate, dark-green externally, bright orange-red within. *Seeds* 6–8, transverse, ovate-oblong, 1 in. long, .5 in. wide, .4 in. thick, testa thin crustaceous dark-purple smooth shining; without arillus. Bak. in Flor. Brit. Ind. II, 304.

MALACCA; *Maingay* 577! *Hervey*! PERAK; *Kunstler* 3406! 3957! 5560! SINGAPORE; Tanjong Bunga, *Ridley* 6408!. **DISTRIB.** Burma (*Brandis*!); Borneo.

The pod is given in the *Flora of British India* as .25 in. wide; this may be a misprint for 1.25 in. At all events the fruit of the species of which *Maingay* n. 577 forms the basis is as now described. The Borneo locality is given doubtfully

by Mr. Bentham; the pod which he describes, and which belonged to his Borneo specimens, evidently agrees very closely with that of the Peninsular plant.

8. *PITHECOLOBIUM ELLIPTICUM* Hassk., *Retzia* I, 225. A tree 15–30 feet high (occasionally higher) branchlets tawny-puberulous soon glabrescent, bark grey. *Leaves* evenly 2-pinnate, rachis glabrous 3–4 in. long, with a large gland above base and another between the bases of the distal pinnæ; pinnæ 2-jugate, rachises of distal pair 4–7 in. long, with small glands between each pair of leaflets except the lowest, of proximal pair often only subopposite always within an inch of base of main-rachis .75–1 in., with gland between the end pair of leaflets; leaflets very large, of upper pinnæ 3–4-jugate, distal 6–8 in. long, 2.5–3 in. wide, of proximal 3 in. long, 2 in. wide; leaflets of lower pinnæ usually 2-jugate, distal 4 in. long, 1.5 in. wide, lowest 2 in. long, 1 in. wide, the leaflets often unequally-jugate on the corresponding pinnæ of the same leaf, elliptic-oblong, apex rather abruptly pointed, base rounded, glabrous on both surfaces, bright green shining above, paler dull beneath; petioles glabrous, .25 in. long, lateral nerves 5–8 pairs, ascending. *Flowers* in very small 2–5-fl. heads .2 in. or less across, on short tawny-puberulous peduncles .25–.35 in. long, solitary or 2–3 vertically superposed above the axils of bracts with a large gland, on subcompressed branchlets 1.5–6 in. long, also 2–3 vertically superposed above the axils of larger bracts .25–.6 in. long with a large sessile gland and small rudimentary leaflets; the branches of each axil diminishing downwards; branches themselves similarly disposed on a subcompressed tawny-pubescent main-rachis as a terminal panicle 16–20 in. long, 6–12 in. wide. *Calyx* campanulate, tawny-pubescent, .05 in. long, teeth short obtuse. *Corolla* yellow, silky, .15 in. long, teeth ovate-lanceolate nearly as long as tube. *Filaments* united at base in a thick short ring, yellowish, .2 in. long, shortly exerted. *Ovary* with a short stipe as long as staminal tube. *Pod* spirally twisted, 3–7 in. long, dehiscent along the lower suture, 1.25 in. wide, valves firmly coriaceous, glabrous, dull, dark-green, at length becoming yellow externally, orange within. *Seeds* 3–7, oblong, .8 in. long, .6 in. wide, .4 in. thick, testa thin, crustaceous, dark-purple, smooth, shining; without arillus. *Inga elliptica* Bl. Cat. Gew. Buitenz. 88; Ind. Kew. I, 1216. *Inga Jiringa* Wall. Cat. 5268 not of Jack. *Inga Clypearia* Wall. Cat. 5270 B. not of Jack. *Pithecolobium fasciculatum* Beuth. Hook. Lond. Journ. Bot. III, 208?; Miq. Flor. Ind. Bat. I, 33; Bak. in Flor. Brit. Ind. II, 304. *Albizia fasciculata* Kurz, Journ. As. Soc. Beng. XLV, 2, 129, excl. syn. *Pithecolobium macrophyllum* Teysm. & Binnend.

NICOBARS; Kamorta, *Kurz!* KEDAH; Pulo Songsong, *Curtis* 2604! PAHANG; Pulo Chugu, *Ridley* 2637! MALACCA; *Griffith!* Goodenough 1894! *Maingay* 571! 578! PERAK; *Wray* 542! 2666! 4171! *Scortechini*

1159! 1790! *Kunstler* 2326! 3331! 3771! 4799! 4822! 5674! 6637!  
10104! PENANG; *fide* Baker. SINGAPORE, *fide* Baker. DISTRIB. Borneo  
(*fide* Miquel); Java! and Sumatra!

A very common species for which none of our English collectors have cited a Malay name; Hasskarl and Miquel give the Javanese name as "*Kitjang*."

This is certainly the *P. fasciculatum* alike of Baker and of Miquel and is the *Albizzia fusciculata* of Kurz. Mr. Baker moreover quotes Wall. Cat. 5268—the basis of Bentham's species, and Wall. Cat. 5270 B. from Singapore as the same. There is unfortunately no example of either of these Wallichian numbers at Calcutta though there are examples both of the Griffithian and the Maingayan Malacca sheets named *P. fasciculatum* by Mr. Bentham himself. The original description given by Mr. Bentham states that the pinnæ of *P. fasciculatum* are 1-jugate, and the account of the species being incomplete in other respects it seems better to treat the identity of Bentham's plant with Hasskarl's one as doubtful. As regards Hasskarl's plant no dubiety is possible; his description is very complete and accurate and there is besides an authentic example of his species in the Calcutta Herbarium. Since in any case Hasskarl's name conserves the oldest specific epithet, it may be better to continue its use even if it should turn out that Bentham's *P. fasciculatum* is really the same thing.

Mr. Kurz's identification of *P. macrophyllum* T. & B., with this species cannot be sustained, for Teysmann's tree is a very distinct one with pods lobed as in *P. lobatum* though with leaves very different from those of *P. lobatum*; the leaflets while much larger than, considerably resemble those of *P. ellipticum*. Mr. Kurz's notice of *P. macrophyllum* T. & B., in 1876, appears to be the earliest mention of the plant. As another species from America, *P. macrophyllum* Spruce, was published in 1875, it is necessary to re-name Teysmann's plant *P. Teysmanni*.

By a *lapsus calami* the *Index Kewensis* gives *Inga elliptica* Bl. as the name, *Pithecolobium ellipticum* Hassk. as a synonym, for our species; the reverse is the actual state of affairs. The tree has not been sent to Calcutta from Penang or from Singapore during recent years.

9. *PITHECOLOBIUM KUNSTLERI* Prain. A tree 20–30 feet high, with spreading branches; branchlets slightly pubescent, stem 8–12 in. thick, bark brown. *Leaves* evenly 2-pinnate, rachis puberulous 1·5–2·5 in. long, with 1 or 2 large elliptic glands some distance below the bases of the 1 or 2 pairs of pinnæ; rachises of terminal pinnæ 4 in. long with large glands some distance below the bases of the 3 pairs of leaflets, basal rachises when present ·5 in. long with a gland some distance below the 1-jugate leaflets; leaves in the inflorescence sometimes small with short 1-jugate pinnæ and small 1-jugate leaflets; leaflets ovate with rounded bases and rather long caudate-acuminate blunt apices, pale yellowish-green, glabrous shining above, dull uniformly sparsely adpressed-puberulous beneath, distal pair 3–4·5 in. long, 1–2 in. wide, proximal 1–2 in. long, ·5–1 in. wide; those of the basal pinnæ 1·5–2·5 in. long, 1–1·5 in. wide; petiolules puberulous, ·15 in. long. *Flowers* in 4–8-fld. heads ·5–·75 in. across, on puberulous pedicels ·5 in. long, sparsely racemose, singly or 2–3 together in axils of bracts or subumbellate or

corymbose at the ends of branchlets 1-2 in. long, disposed in lax terminal panicles extending into the upper leaf-axils, 6-12 in. long, 4-8 in. wide. *Calyx* sessile, tubular, .15 in. long, densely pubescent externally, teeth short triangular; the bracteoles small spatulate, pubescent. *Corolla* white, .5 in. long, densely silky externally, tube narrowly funnel-shaped, teeth lanceolate .12 in. long. *Filaments* at base united in a white tube puberulous outside, as long as that of corolla, free portion glabrous bright-yellow, 1.25 in. long. *Ovary* very long, stipitate, pubescent. *Pod* with a puberulous stipe .75 in. long, dehiscent along the lower suture, spirally twisted, 8-10 in. long, .6 in. wide; valves thinly coriaceous puberulous, not sinuate between the seeds. *Seeds* 8-10, ovate, their long axis parallel with sutures, .7 in. long, .4 in. wide, compressed, testa pale-brown, crustaceous, shining.

PERAK; at low elevations, *Kunstler* 7875! *Scortechini* 178! JOHORE; *Lake & Kelsall* 4072! **DISTRIB.** Borneo.

A very distinct species; more nearly related to the Indian *P. bigeminum* than to any Malayan species but easily distinguished by its large florets and its long-stipitate pod.

10. *PITHECOLOBIUM CONTORTUM* Mart. in *Flora* XX, 2, Beibl. 115. A tree 15-30 feet high, with spreading grey-pubescent terete or slightly compressed branches, stem 4-6 in. thick, bark dark-brown. *Leaves* evenly 2-pinnate; rachis terete, pubescent, 4-8 in. long, petiolar portion 2 in. long with a large gland below the middle, foliar portion with 1-4 small glands below as many pairs of pinnæ; pinnæ usually 5-8-jugate, sometimes as few as 3-jugate, rarely as many as 15-jugate, rachises with 1-2 small sessile glands below bases of end-pairs of leaflets, diminishing downwards, the distal 4-6 in. long, the basal 1.5-2 in.; leaflets of upper pinnæ 15-20-jugate, of lowest 9-10-jugate, oblong or trapezoid, obtuse or subacute at upper angle, base obliquely unilaterally truncate, upper and lower margins subparallel, main nerve diagonal; rigidly papery, pale-green puberulous above, pubescent beneath, .5-.75 in. long, .25-.35 in. wide, petiolules 0. *Flowers* in terminal and axillary simple deltoid panicles 1 foot across, with slender main-rachis 8-20 in. long, the filiform pubescent branches 3-8 in. long, bracts small lanceolate, pedicels puberulous .25-.4 in. long, the sessile florets scattered or sub-aggregated near their tips in the axils of small acute puberulous bracteoles. *Calyx* .05 in., campanulate, puberulous, teeth triangular. *Corolla* greenish-white, glabrous, .15 in. long, teeth lanceolate spreading, almost as long as tube. *Filaments* united below in a tube as long as that of corolla, free portion cream-coloured, .35 in. long. *Ovary* faintly puberulous, stipitate. *Pod* 6-8 in. long, 5-7 in. wide, spirally twisted, dehiscent along the lower suture; valves firmly coriaceous, finely pu-

berulous externally, bright orange, within smooth, vermilion, stipe .2 in. long; slightly sinuate between seeds on lower margin. *Seeds* 8-10, ovate, with long axis across the pod, .35 in. long, .25 in. wide, .2 in. thick, testa dark-purple, thin, crustaceous. Benth. in Hook. Lond. Journ. Bot. III, 210; Bak. in Flor. Brit. Ind. II, 305. *Inga contorta* Grah. in Wall. Cat. 5283. *Inga Finlaysoniana* Grah. in Wall. Cat. 5284.

KEDAH; *Ridley* 5223! PENANG; *Porter* (Wall. Cat. 5283)! *Stolizka!* *Curtis* 19! 264! MALACCA; *Griffith* 1941! *Maingay* 573! *Hervey!* *Derry* 149! PERAK; *Scortechini* 1658! 1899! *Wray* 2636! 4249! *Kunstler* 1010! 3775! 3889! SINGAPORE; *Finlayson.*

Nearest *P. Clypearia* but very easily distinguished by its terete branches and its sessile glands, as well as by its sessile florets.

11. PITHECOLOBIUM CLYPEARIA Benth. in Hook. Lond. Journ. Bot. III, 209. A tree 25-30 feet high with spreading brown-pubescent angular branches, bark dark-brown. *Leaves* evenly 2-pinnate; rachis angular, puberulous, 2-7 in. long, petiolar portion 1-1.5 in. long with a large shortly stipitate gland just above base, foliar portion with small distinctly stalked glands just below each pair of pinnæ except the lowest, pinnæ usually 3-6- (rarely 8-10-) jugate, their rachises with small stipitate glands between each pair of leaflets except the lowest, diminishing downwards, distal 5-6 in. long, basal 1.5-2 in. long; leaflets of upper pinnæ 5-7-jugate, of lowest 3-4-jugate, trapeziform, wide-triangular at upper angle, base obliquely unilaterally truncate or rounded, upper and lower margins subparallel, main nerve diagonal; rigidly papery, dark-green glabrous or faintly puberulous shining above, glaucous with scattered adpressed hairs beneath, terminal 1.5 in. long, .75 in. wide, lowest .5 in. long, .3 in. wide; petiolules 0. *Flowers* in small subumbellate corymbs .35-.4 in. across, on short peduncles .3-.5 in. long, solitary or 2-3 vertically superposed above the axils of bracts with a large gland, on angular branchlets 3-4 in. long similarly disposed on the angular main-rachis but with the bracts reduced to an angled petiolule bearing a large bract at its tip; pedicels of florets .1 in. long, slender, puberulous, their bracteoles minute or obsolete; the whole inflorescence forming a large terminal panicle extending into axils of upper leaves, 15-18 in. long, 10-15 in. wide. *Calyx* campanulate, .05 in. long, puberulous externally, teeth short deltoid. *Corolla* white, glabrous, .1 in. long, teeth lanceolate half as long as tube. *Filaments* united at base in a tube shorter than that of corolla, free portion white, .35 in. long. *Ovary* puberulous stipitate. *Pod* spirally twisted, 4-5 in. long, .4 in. wide, dehiscing along the lower suture, valves thinly coriaceous, orange outside, red within, glabrous; stipe .15 in. long; distinctly sinuate between

the seeds on lower margin. *Seeds* 8–10, ovate, with long axis across the pod, .25 in. long, .2 in. across, .15 in. thick, testa dark-purple, thin, crustaceous. Pl. Jungh. 268; Miq. Flor. Ind. Bat, I, 35; Bak. in Flor. Brit. Ind. II, 305. *Mimosa trapezifolia* Roxb. Hort. Beng. 93; Fl. Ind. II, 546. *Inga dimidiata* Hook. & Arn. Bot. Beech. Voy. 181. *Inga Clypearia* Jack, Mal. Miscell. II, 7. 78?; Hook. Comp. Bot. Mag. I, 224; Wall. Cat. 5270A. *Clypearia rubra* Rumph. Herb. Amboin. III, 176 t. 112?

PENANG; *Porter* (Wall. Cat. 5270 A)! *Curtis* 209! PROV. WELLESLEY; *Kunstler* 1612! PAHANG; *Ridley* 1476! SINGAPORE; *T. Anderson* 38! *Hullett* 58! 5698! MALACCA; *Griffith*! *Maingay* 570! *Hervey*! PERAK; *Scortechini* 481! 2024! *Wray* 1889! 2643! DISTRIB. Sumatra, Java, Moluccas.

This is apt, when its leaflets are unusually small, to simulate *P. contortum* from which it is, however, easily distinguished by its smaller fruits, its pedicelled florets, and its terete branchlets. It is also apt, when its leaflets are unusually large, to simulate *P. angulatum*; as both have angular branches and pedicelled florets the only safe diagnostic character is the nature of the glands, especially those on the partial rachises of the pinnæ; these glands are stipitate in *P. Clypearia*, sessile in *P. angulatum*.

There is just a trace of doubt as to whether this is Rumphins' *Clypearia rubra* since that author figures no glands, or even that it is *Inga Clypearia* Jack, since Jack says there is no petiolar gland on the leaf of his species. Jack's plant is, he says, known in Sumatra as "*Jiring muniet*."

12. *Pithecolobium angulatum* Benth. in Hook. Lond. Journ. Bot. III, 306. A tree 25–30 feet high with spreading shortly puberulous angular branches, bark dark-brown. *Leaves* evenly 2-pinnate; rachis angular, puberulous, 3–8 in. long, with a large sessile gland .5–.75 in. above the base and near the middle of the petiolar portion, foliar portion with smaller sessile glands below the bases of all but the last pair of pinnæ set obliquely on the upper truncate ends of sharp-edged ridges; pinnæ 2–4-jugate, their rachises with similar but small glands just below each pair of leaflets, the distal 6–7 in., the lowest 1–1.5 in. long; leaflets of upper pinnæ 5–8-jugate, of lowest 2–3-jugate, all diminishing downward; terminal leaflets of most of the pinnæ 3.5–6 in. long, 1.25–2 in. wide, ovate-lanceolate, gradually tapering to an acute tip, the base wide-cuneate, the midrib central, the bases of the remainder progressively more obliquely rounded and the midribs progressively more diagonal, proximal leaflets 1 in. long, .75 in. wide; all membranous, sparsely puberulous above, softly pubescent beneath when young; thinly subcoriaceous, dark-green glabrous shining above, dull puberulous beneath when mature, lateral nerves 5–7 pairs rather prominent beneath; petiolules .07 in. long. *Flowers* in small subumbellate corymbs .5 in. across, on short peduncles .75 in. long, fasciated

in axils of small gland-bearing bracts on angular branchlets 4–10 in. long, themselves fascicled in axils of bracts with a large basal gland and a foliar simply-pinnate rudimentary lamina, so as to form a terminal panicle extending into axils of upper leaves, 15–20 in. long, 12–18 in. wide; pedicels of florets .2–.25 in. long, bracteoles minute or obsolete. *Calyx* puberulous, campanulate, .05 in. long, teeth short acute. *Corolla* pale-yellow or white, .2 in. long, tube infundibuliform, teeth lanceolate half as long; uniformly sparingly silky. *Stamens* united in a tube nearly as long as that of corolla, filaments white or faintly tinged with pink, .5 in. long. *Ovary* puberulous, shortly stalked. *Pod* spirally twisted, 7–8 in. long, .7 in. wide, dehiscing along the lower suture, valves firmly coriaceous, red opposite the seeds elsewhere orange and puberulous externally, red and glabrous within; distinctly sinuate between the seeds on the lower margin, stipe very short. *Seeds* 8–10, ovate-oblong, .5 in. long, .35 in. wide, .2 in. thick, testa dark-purple, dull, thin, crustaceous. Miq. Flor. Ind. Bat. I, 34; Bak. in Flor. Brit. Ind. II, 306. *Mimosa heterophylla* Roxb. Hort. Beng. 40; Flor. Ind. II, 545. *Inga acutangula* Grah. in Wall. Cat. 5271. *Pithecolobium acutangulum* Miq. Flor. Ind. Bat. Suppl. 282.

ANDAMANS; very common. NICOBARS; *King's Collector!* PENANG; *Wallich* 5270 C! *Curtis* 489! MALACCA; *Derry* 552! 971! *Maingay* 569! PERAK; *Scortechini!* *Wray* 1102! SELANGOR; *Kunstler* 8669! SINGAPORE; *Hullett* 802! *Idley* 5576! 6407! *Goodenough* 289! DISTRIB. Eastern Himalaya, Assam, Burma, Sumatra.

A rather variable species, with two leading types, hardly, however, to be distinguished even as varieties owing to the number of intermediate forms that occur. Of these, (a.) *heterophylla*—the original plant of Roxburgh with large terminal leaflets—extends from the Himalaya to Chittagong, the Andamans and Sumatra. This is very uniform in character and constitutes both *Inga acutangula* Grah. (*Wall. Cat.* 5271), and *Pithecolobium acutangulum* Miq., although it happens that Miquel when describing *P. acutangulum* conceived it to be different from *Inga acutangula*. The other plant, (b.) *intermedia*—with smaller terminal leaflets and usually more numerous pinnæ and leaflets—extends from Upper Burma east of the Irrawaddy though the Shan Plateau to Tenasserim, the Malay Peninsula and Java. This is less uniform than the preceding and often has leaflets so like those of *P. Clypearia* that it can only be safely distinguished by its longer pedicels and sessile glands. This is the plant of *Wall. Cat.* 5270 C, from Penang, and is the *Pithecolobium angulatum* of Miquel as opposed to that author's *P. acutangulum*. *P. angulatum* Benth., like *P. angulatum* as defined in this paper, includes both plants.

#### ORDEE XXXIX. ROSACEÆ.

Herbs, shrubs or trees. *Leaves* stipulate, rarely opposite, simple or compound. *Flowers* usually bisexual and regular (very irregular in *Chrysobalanæ*). *Calyx-tube* free or adnate to the ovary, limb usually

5-lobed, often bracteolate, imbricate or valvate. *Petals* 5, or 0, inserted under the margin of the disc, deciduous, usually imbricate. *Disc* lining the calyx-tube or forming a ring at its base. *Stamens* perigynous, indefinite (rarely 1, 5 or 10) in one or many series, often connate and unilateral in *Chrysobalanææ*; filaments subulate or filiform, usually incurved in bud; anthers small, didymous. *Ovary* of one or more free or connate carpels, with free or connate basal lateral or subterminal styles; stigmas simple, penicillate or capitate; ovules 1 or more in each carpel. *Fruit* variable, consisting of achenes or berries or drupes, rarely capsular. *Seeds* erect or pendulous, testa membranous or coriaceous, albumen 0; cotyledons large, plano-convex; radicle short.—**DISTRIB.** About 1,200 species, found in all climates and countries, but chiefly in the temperate.

Of the ten tribes into which this order is subdivided by Messrs. Bentham and Hooker in their *Genera Plantarum*, only four are (as yet) represented by specimens from the Provinces within our area, and these four tribes are represented by only six genera which Sir Joseph Hooker (in his *Flora of British India*) distinguishes as follows:—

Tribe I. CHRYSOBALANÆÆ. *Flowers* usually irregular. *Carpel* 1; style basal; ovules 2, ascending. *Fruit* a drupe. *Radicle* inferior.—Trees or shrubs with simple quite entire leaves.

Calyx-tube elongate. Stamens many, united in a phalange.

Ovary 2-locellate ... .. 1. PARINARIUM.

Calyx-tube short. Stamens 2. Ovary 1-celled ... .. 2. PARASTEMON.

Tribe II. PRUNÆÆ. *Flowers* regular. *Carpel* 1, rarely 2; style subterminal, rarely basal; ovules 2, pendulous. *Radicle* superior.—Trees or shrubs with simple usually serrated leaves.

Calyx 5-lobed. Petals 5, large, glabrous. *Carpel* solitary, fruit drupaceous ... .. 3. PRUNUS.

Calyx 5-10-toothed. Petals 5 and minute, or absent. *Carpel*

1. *Drupe* coriaceous, usually elongated transversely ... .. 4. PYGEUM.

Tribe III. RUBEÆÆ. *Flowers* regular. *Calyx* ebracteolate. *Stamens* very numerous. *Carpels* many; styles sub-basal or ventral; ovules 2, collateral, pendulous. *Fruit* of many dry or fleshy carpels, not included in the calyx-tube. *Radicle* superior.—Usually shrubs, often with compound leaves ... .. 5. RUBUS.

Tribe IV. POMEÆÆ. *Flowers* regular. *Calyx-tube* (or the apex of the peduncle) becoming fleshy after flowering, and enclosing the carpels. *Stamens* numerous. *Ovules* 2 or more, ascending. *Fruit* a pome or berry, with 2-5 bony or coriaceous 1-seeded stones; shrubs or trees ... .. 6. PYRUS.

### 1. PARINARIUM, JUSS.

Trees. *Leaves* simple, alternate, evergreen, quite entire. *Flowers* hermaphrodite, in panicles or corymbose racemes, 2-bracteolate, white or pink. *Calyx-tube* oblong, campanulate, turbinate, or funnel-shaped;



lobes 5, thick, subequal, imbricate. *Petals* 5, sessile or clawed, deciduous. *Stamens* 6–30, the filaments united into an incomplete ring at the base, or connate into an unilateral bundle, all perfect or some without anthers. *Carpel* 1, adnate to one side of the calyx-tube, 2-celled, rarely 2-seeded; style basal, filiform; ovules 2 collateral, or 1 erect. *Drupe* spherical, oblong, obovoid or ovoid, with a 1–2-celled, 1–2-seeded, woody or bony or rarely coriaceous pericarp. *Seeds* erect, testa membranous, cotyledons large fleshy, radicle small inferior. **DISTRIB.** About 50 species, natives of the tropics of both worlds.

Calyx-tube villous inside. Fruit 2-celled, more than 5 in. long; the pericarp woody, bony or crustaceous.

Leaves rusty-grey or dirty white beneath, with numerous spreading parallel stout nerves; stamens 8–10, not united in a phalange.

Leaves with 10–12 pairs of main nerves, rusty-pubescent beneath ... .. 1. *P. costatum.*

Leaves with 15–18 pairs of main nerves, pale, areolate and puberulous beneath ... .. 2. *P. polyneurum.*

Leaves with 25–30 pairs of main nerves, pale, obliquely areolar and puberulous on the nerves beneath... 3. *P. oblongifolium.*

Leaves glabrous beneath or with only a few strigose hairs on the midrib near its base; main nerves 10–16 pairs, always spreading.

Flowers in spikes, sessile, solitary.

Stamens about 10; fruit about 1 in. in diam. ... 4. *P. spicatum.*

Stamens 12–16; fruit several inches in diam. ... 5. *P. Maingayi.*

Flowers in racemes or panicles.

Leaves subsessile with broad bases; main nerves 12–14 pairs; fruit ovoid, not compressed ... 6. *P. elatum.*

Leaves distinctly petiolate.

Leaves oblong-lanceolate, narrowed at the base; stamens 10 ... .. 7. *P. asperulum.*

Leaves elliptic-oblong, broad at the base; stamens 12–16 ... .. 8. *P. scabrum.*

Leaves quite glabrous on both surfaces; main nerves 5–7 (rarely 10) pairs, obliquely ascending, never spreading.

Flowers straight; petals subequal.

Main nerves of leaves 6 or 7 pairs; fruit covered with crustaceous scurf, its cells glabrous inside ... 9. *P. Kunsteri.*

Main nerves 7–10 pairs; fruit quite glabrous, its cells sericeous inside ... .. 10. *P. Griffithianum.*

Flowers much curved; sepals and petals very unequal 11. *P. heteropetalum.*

Calyx-tube glabrous and lined by the glabrous staminal tube; fruit less than 5 in. long, quite glabrous; the pericarp thin, leathery... .. 12. *P. nitidum.*

1. **PARINARIUM COSTATUM**, Blume *Mel. Bot.* (1855) Pt. 1. A small tree; young branches slender, deciduously puberulous, the bark pale

and minutely lenticellate. *Leaves* coriaceous, ovate-elliptic or ovate-lanceolate, shortly and obtusely acuminate, the base rounded or cuneate; upper surface glabrous and shining except the pubescent midrib, the lower pale brown when dry, reticulate and covered, except the 10 or 12 pairs of conspicuous slightly ascending glabrous main nerves, with a thin layer of cobwebby hair; length 1·5–3 in., breadth ·75–1·25 in.; petiole ·25 in., pubescent. *Panicles* axillary, longer than the leaves, with a few distant short few-flowered branches, tawny-tomentose. *Flowers* nearly ·25 in. long, on short pedicels, solitary or in cymes of three. *Calyx-tube* densely puberulous outside, internally with a line of subulate processes at the throat and a broad belt of deflexed silky hair, the ovate lobes shorter than the tube. *Petals* thin, obovate, clawed, longer than the calyx-lobes, sparsely pubescent. *Stamens* about 8, half of them anatherous, the filaments villous. *Pistil* 1, the ovary villous. *Fruit* oblong, blunt, slightly compressed, with many pale scurfy patches, slightly more than 1 in. long and ·65 in. broad. *Miq. Fl. Ind. Bat. Vol. I, Pt. 1, 354; Hook. fil. Fl. Br. Ind. II, 311 (excl. syn. P. sumatranum, Benth. and Kurz's Petrocarpa sumatrana); Jack Mal. Misc. II, VII, 67. Elæocarpus? punctatus, Wall. Cat. 2676.*

MALACCA; *Maingay* 621, 621/2. PENANG; *Curtis* 259, 2163. PERAK; *King's Collector* 5227. SINGAPORE; *Ridley* 398.

2. PARINARIUM POLYNEURUM, *Miq. Fl. Ind. Bat. Suppl. 306*. A tree 60 to 100 feet high; young branches slender, pale brown, profusely lenticellate, puberulous. *Leaves* coriaceous, oblong or ovate-oblong, rather bluntly acuminate; the base rounded, eglandular; upper surface glabrous, shining; the lower pale, areolate, puberulous; main nerves 15 to 18 pairs, spreading, prominent beneath; length 3 to 5 in., breadth 1·35 to 2 in. *Panicles* axillary and solitary, or terminal and in clusters of 2–4, rather shorter than the leaves when in flower, longer in fruit, hoary-tomentose; the branches short, rather crowded, the ultimate branchlets cymosely 3-flowered; bract shorter than the calyx-tube, oblong, obliquely acute, tomentose. *Flowers* ·25 in. long, on very short pedicels. *Calyx* infundibuliform, tomentose outside, deflexed-villous inside; the lobes lanceolate, acuminate, pubescent on the inner face. *Petals* as long as the calyx-lobes, oblong, slightly dilated upwards, obtuse, not clawed at the base, glabrous. *Stamens* 10, shorter than the petals, all bearing anthers. *Ovary* sericeous. *Style* glabrous. *Fruit* oblong, compressed, obtuse, slightly tapered to the base, covered with a dense layer of tawny scurf, about 2 in. long when ripe and 1·2 in. across, 2-celled; pericarp crustaceous, very hard, ·25 in. thick.

MALACCA; *Griffith, Maingay* 622. PERAK; *King's Collector* 4624, 6087. *DISTRIB.* Sumatra.

3. *PARINARIUM OBLONGIFOLIUM* Hook. fil. Fl. Br. Ind. II, 309. A tree 50–70 feet high; young branches lenticellate, deciduously puberulous. *Leaves* very coriaceous, oblong- or oblong-elliptic, the apex subacute, the base rounded; upper surface glabrous and shining, the lower pale with oblique areolae, puberulous on the nerves and midrib; main nerves 25–30 pairs, stout, oblique, rather straight; length 5·5–8·5 in., breadth 1·85–3 in.; petiole ·35–·65 in., stont. *Panicles* axillary and terminal, solitary, many-flowered, spreading, minutely tawny-tomentose, 3–6 in. across. *Flowers* ·2 in. long, on very short pedicels; bracts ovate-rotund, concave, acute, tomentose. *Calyx-tube* infundibuliform, subgibbous, minutely tomentose outside, deflexed-villous inside, lobes broadly ovate, acute. *Petals* not longer than the calyx-lobes, spatulate, glabrous. *Stamens* 8, about as long as the petals. *Ovary* villous; style sparsely pubescent. *Fruit* elliptic-ovoid, obtuse, compressed, densely coated with grey hard scurf, 2·75 in. long and 1·5 in. in diam.

MALACCA; *Griffith, Maingay* 623. PAHANG; *Ridley* 5026. PERAK; *King's Collector* 10369, 10422.

A species readily distinguished by its large oblong fruit, large leaves with numerous parallel nerves prominent on the lower surface, and small flowers with the stamens and petals not longer than the calyx-lobes. It approaches *P. sumatranum*, Miq. in its leaves, but the under-surface in that species is uniformly and minutely tomentose, whereas in this the under surface has very peculiar oblique areolae and there is no tomentum. The fruits of the two differ also in size.

4. *PARINARIUM SPICATUM*, King, n. sp. A tree 60 to 80 feet high; branches slender, dark-coloured, puberulous. *Leaves* coriaceous, elliptic-ovate, shortly and broadly acuminate, the base rounded but slightly produced along the sides of the upper half of the petiole; both surfaces reticulate when dry; the upper glabrous, shining; the lower slightly dull and paler, minutely pustulate, glabrous except the sparsely strigose midrib; main nerves about 12 pairs, spreading, faint; length 2–3 in., breadth ·85–1·6 in., petiole ·1 in. *Spikes* axillary and terminal, about as long as the leaves, in clusters of 2 or 3, everywhere tawny-pubescent with many adpressed hairs intermixed. *Flowers* ·5 in. long, solitary, rather distant, sessile, bibracteate at the base; the bracts much shorter than the flower, oblong, subacute, tomentose. *Calyx-tube* narrowly funnel-shaped, slightly gibbous, tomentose outside, deflexed-villous in its upper part inside; its lobes broadly oblong, obtuse, deflexed. *Petals* longer than the calyx-lobes, broadly elliptic, very obtuse, glabrous. *Stamens* about 10, longer than the petals, shorter than the pistil; the filaments glabrous, united at the very base. *Ovary* sericeous; style sparsely hairy in its lower half, otherwise glabrous. *Fruit* about 1 in. in diam., suborbicular, slightly compressed, densely covered with a yellowish crustaceous scurf, 2-celled; the pericarp ·2 in. thick, tomentose inside.

PERAK; *King's Collector* 6145, 10326.

This approaches *P. costatum*, Bl. in the shape and nervation of its leaves; but is distinguished from that species by its spicate inflorescence and solitary flowers. Its fruit also is more orbicular than that of *P. costatum*.

5. PARINARIUM MAINGAYI, King n. spec. A tree; young branches with dark bark bearing a few oblong lenticels, glabrous. *Leaves* very coriaceous, elliptic-oblong, very shortly and obtusely acuminate, the base rounded; both surfaces glabrous and with minutely papillate reticulations, the upper shining, the lower dull and rather pale; main nerves 10–12 pairs, spreading, curving, rather prominent beneath; length 3–4.5 in., breadth 1.35–2 in.; petiole .3 in., stout. *Spikes* usually in pairs, axillary, shorter than the leaves, pedunculate, minutely tomentose. *Flowers* sessile, .3 in. long, or (to the apex of the stamens) .6 in.; bracts shorter than the calyx-tube, broadly ovate-obtuse, tomentose. *Calyx-tube* infundibuliform, tomentose outside, deflexed-villous inside; the lobes short, broad, rounded very obtuse. *Petals* longer than the calyx-lobes, obovate, sessile, glabrous. *Stamens* 12–16, much longer than the petals, decurved. *Ovary* densely wooly; style long, slender. *Drupe* spherical, the size of a small apple (Hooker); the pericarp thick and bony, smooth on the inner surface, furrowed on one side. *Seed* large, with a thin testa. *P. asperulum*, Hook. fil. in Fl. Br. Ind. II, 310 (not of Mig.)

MALACCA; *Maingay* 618, and probably also *Griffith* 2049.

This in some respects resembles *P. asperulum* and *P. scabrum*, but differs from both in its much larger fruit and sessile flowers, and from the former also in the venation of its leaves.

6. PARINARIUM ELATUM, King n. spec. A tree 60–120 feet high; young branches as thick as a quill, blackish-cinereous, lenticellate. *Leaves* thickly coriaceous, subsessile, elliptic to ovate-elliptic, acute or shortly acuminate; the base broad, rounded or minutely cordate; upper surface glabrous, shining, the main nerves and midrib slightly prominent; lower surface darker and duller than the upper when dry, glabrous except a few strigose hairs at the base of the very prominent midrib; the 12–14 pairs of spreading curved main nerves very prominent; length 4.5–7.5 in., breadth 1.5–3.25 in.; petiole only about .15 in., strigose. *Panicles* axillary, solitary or several together, shorter than the leaves, with few short rather distant branches, or unbranched, minutely tomentose, few-flowered; bracts 2 at the base of each flower, slightly shorter than the calyx-tube, elliptic, acute, adpressed-pubescent. *Calyx-tube* funnel-shaped, adpressed-tomentose outside, deflexed-villous inside at the mouth; the lobes unequal, nearly as long as the tube, broadly ovate, subacute, very tomentose on both surfaces. *Petals* longer and

more narrowed than the calyx-lobes, subacute, glabrous. *Stamens* longer than the petals, glabrous. *Ovary* sericeous, the style glabrous in its upper half. *Fruit* ovoid, not compressed, crustaceous-scurfy outside, pale-brown, 2-celled, 1.15 in. long and .8 in. in diam.; the pericarp crustaceous, .2 in. thick, minutely hairy inside.

PERAK; *King's Collector*, 3436, 3711.

A species resembling *P. oblongifolium*, Hook. fil. in its leaves which however have fewer nerves; but differing greatly from that species both in its inflorescence and flowers.

7. *PARINARIUM ASPERULUM*, Miq. Fl. Ind. Bat. Suppl. 307. A tree 50–80 feet high; young branches slender, with dark-coloured bark and a few scanty deciduous pale flexuous hairs. *Leaves* thinly coriaceous, oblong-lanceolate, tapering gradually to the obtusely acuminate apex; the blade narrowed slightly to the base and continued along the sides of the upper half of the short petiole; both surfaces glabrous and with minute pitted papillæ, the lower paler and more reticulate; main nerves 10–16 pairs, faint, spreading; length 3–5.5 in., breadth 1–1.65 in., petiole .25 in. *Racemes* or panicles axillary or terminal, solitary, half as long as the leaves, minutely tomentose; the flowers about .3 in. long, (.6 in. to the apex of the exerted stamens); the pedicels .1 in. long; bracts at the base of the flower 2, obtuse, tomentose. *Calyx* densely tomentose; the tube clavate, deflexed-pilose inside; the lobes broadly ovate, subacute, imbricate. *Petals* longer than the calyx-lobes, obovate-oblong, not clawed, glabrous. *Stamens* about 10; the filaments glabrous, united at the base. *Ovary* densely and the style sparsely villous. *Fruit* sub-ovoid, compressed, very obtuse, with a vertical groove along the two sides, minutely rugulose and densely covered with hard pale-brown scurf, nearly 1 in. long and .6 in. broad, 2-celled; pericarp thick, bony, hairy inside.

PENANG; *Curtis*, 203. PAHANG; *Ridley*, 2603. PERAK; *King's Collector*, 3537, 7568. *DISTRIB.* Sumatra.

There is an original and authentic specimen of *P. asperulum* in the Calcutta Herbarium collected by Teysmann in Sumatra, and it agrees absolutely with the Penang and Perak specimens above quoted. The species is near to *P. scabrum*, Hassk., but has fewer stamens and smaller and differently shaped leaves. The ripe fruit is also presumably much smaller, for specimens of unripe fruit of *P. scabrum* are as large as specimens of ripe fruit of this species.

8. *PARINARIUM SCABRUM*, Hassk. Cat. Hort. Bot. Bogor. (1844), 269. A tall tree; young branches dark-coloured and with a few scattered hairs. *Leaves* coriaceous, elliptic-oblong, shortly and bluntly acuminate; the base broad, rounded or very slightly cuneate, eglandular; both surfaces glabrous, shining, strongly but minutely reticulate, and with numerous small perforate-topped papillæ especially on the reticulations; main

nerves 13–15 pairs, slender, spreading, with a few shorter intermediate; length 4–6 in., breadth 1·75–2·75 in., petiole ·2 in. *Panicles* (sometimes reduced to racemes) axillary and terminal, often two or three together, much shorter than the leaves, adpressed-pubescent; the flowers not numerous, collected near the ends of the branches; bracts oblong, obtuse, pubescent, shorter than the calyx-tube. *Flowers* (from the point of insertion) ·5 or ·6 in. long; the calyx-tube merged in the pedicel, clavate, pubescent outside, deflexed-villous inside. *Calyx-lobes* ovate-rotund, undulate, subacute, imbricate, minutely tomentose on both surfaces. *Petals* larger than the calyx-lobes, obovate, clawed, glabrescent. *Stamens* 12–16; the filaments united at the base into a tube open at one side, much curved, deflexed. *Ovary* lanate, 2-celled. *Style* sparsely pubescent, shorter than the stamens. *Fruit* ovoid, obtuse, slightly compressed, vertically grooved, rough and covered with pale scurf; pericarp bony, thick, 2-celled, the cells pubescent, 1 in. long and ·6 in. broad (not ripe). Hassk. in *Flora* (1844), p. 585. Miq. *Fl. Ind. Bat.* Vol. I, pt. I, 354 t. V.

PERAK; *Scortechini* 1981.

Only once collected in Perak. This species is very closely allied to *P. glaberrimum*, Hassk. and I greatly doubt whether the two should be kept separate. The latter species is described at great length by Hasskarl in the volume of *Flora* for 1844, p. 533; but I have seen only one authentic specimen, and that consists only of leaves. *P. scabrum*, on the other hand, is described by Hasskarl in nine words: but of it there are in the Calcutta Herbarium several excellent authentic flowering specimens. And with these Scortechini's specimens numbered 1981 agree absolutely.

9. PARINARIUM KUNSTLERI, King n. spec. A tree 50–80 feet high; young branches slender, cinereous, glabrous. *Leaves* coriaceous, oblong-lanceolate, tapering from about the middle to each end, the apex acuminate; the base acute, eglandular; both surfaces glabrous and rather dull, the lower with wide slightly conspicuous reticulations and minute papillæ; main nerves 6 or 7 pairs, curving upwards, only slightly conspicuous on the lower surface; length 3·25–4·5 in., breadth 1·15–1·65 in., petiole ·25–·3 in.; lobes of the *calyx* oblong, obtuse, tomentose on both surfaces. *Petals* longer than the calyx-lobes, obtuse, glabrous. *Stamens* about 20 or 30, glabrous; the filaments united by their bases, longer than the petals. *Style* as long as the stamens, villous. *Fruit* oblong, ovoid, slightly compressed, obtuse, tapering slightly to the base, 1·25 in. long and about ·9 in. broad, 2-celled, densely covered with pale-brown crustaceous scurf; pericarp crustaceous, smooth inside.

PERAK; *King's Collector* 3715, 3745, 6917.

I have seen no specimens of this in flower. The description of the parts of the flower above given has been taken from withered remains found persisting at the base of some of the ripe fruits. In its leaves this resembles *P. asperulum*,

Miq., but there are only 6 or 7 pairs of nerves as against 10–16 pairs in that species. The fruits of this are moreover slightly larger and much more globular, and the interior of the cells is glabrous; whereas in those of *P. asperulum* the cells are hairy inside.

10. *PARINARIUM GRIFFITHIANUM*, Benth. in Hook. Niger Flora, 334. A large tree (Curtis); young branches rather stout, with dark lenticellate bark. *Leaves* coriaceous, oblong-lanceolate or elliptic-lanceolate, caudate-acuminate, narrowed at the base to the short petiole; both surfaces glabrous, the upper very polished, the lower duller; main nerves 7–10 pairs, curving upwards, faint; length 3·5–6 in., breadth 1·2–2·25 in., petiole ·25–·35 in. *Panicles* axillary and terminal, pedunculate, longer than the leaves, pyramidal, nearly glabrous, the branches sparsely-flowered; bracts, if any, deciduous (not seen). *Flowers* ·5 in. long, on short pedicels. *Calyx-tube* narrowly funnel-shaped, hoary-pubescent, the lobes rotund. *Petals* broadly oblong, concave, subglabrous, about as long as the calyx-lobes. *Stamens* 20–30; the filaments longer than the petals, united at the base into a short tube. *Ovary* very tomentose; the style longer than the stamens, glabrous. *Fruit* narrowly ellipsoid or slightly obovoid, blunt, glabrous, 2-celled, about 1·5 in. long and ·75 in. in diam.; pericarp crustaceous, ·15 in. thick, lined with dense silky pubescence. Hook. fil. Fl. Br. Ind. II, 310. *P. multiflorum*, Miq. Fl. Ind. Bat. Vol. I, Pt. 1, 356. *Maranthes multiflora*, Korth. Verh. Nat. Gesch. Bot. 259, t. 70.

MALACCA; Griffith 2047/2; Maingay 620. PAHANG; Ridley 1354. KEDAH; Curtis. SINGAPORE; Ridley 4792. PENANG; Curtis 1514, 2416.

Griffith's specimen 2047/2, which is the type of the species, has more polished leaves and an opener panicle than the other specimens quoted above. But I can detect no difference in the flowers. Griffith's specimen has no fruit, and the whole material is imperfect. It may turn out that there are really two species included under *P. Griffithianum*.

11. *PARINARIUM HETEROPETALUM*, Scortechini MSS. A tree 60–80 feet high; young branches rather slender and with rather rough cinereous glabrous bark. *Leaves* coriaceous, eglandular, oblong-lanceolate, tapering from the middle to both ends, the apex acuminate, the base acute; both surfaces glabrous, rather dull when dry, the lower very minutely punctate; main nerves faint on both surfaces, 5 or 6 pairs, oblique, ascending; length 3·5–4·5 in., breadth 1–1·6 in., petiole ·35 in., stout. *Panicles* axillary and terminal, about one-third to one-half as long as the leaves, with short branches, everywhere rusty-pubescent; bract at the base of the flowers solitary, lanceolate, tomentose. *Flowers* ·5 in. long, sessile. *Calyx-tube* curved, narrowly tubular below the bend and suddenly expanded above it; the lobes thick, concave, reflexed, unequal, from oblong to suborbicular or obovate, everywhere pubescent

or tomentose, the hairs inside the tube not deflexed. *Petals* 5, pink, glabrous, longer than the calyx-lobes, very unequal; the two posterior erect, broadly elliptic, concave, clawed; the three anterior narrowly oblong, revolute, imbricate, flat. *Stamens* 25–30, in a single semi-tubular phalange, as long as the petals, glabrous; the anthers small. *Ovary* villous, 2-celled. *Style* curved, longer than the stamens, villous in the lower, glabrous in the upper half. *Fruit* unknown.

PERAK; *Scortechini*, 240, 2040. *King's Collector*, 664, 6899.

A species easily recognised by its curved flowers and very unequal sepals and petals.

12. *PARINARIUM? NITIDUM*, Hook. fil. *Fl. Br. Ind.* II, 310. A tree 15–40 feet high; young branches very slender, with pale-brown glabrous shining bark. *Leaves* elliptic to elliptic-lanceolate, shortly and bluntly acuminate, the blade much narrowed to the base and continued along the sides of the upper half of the petiole; both surfaces quite glabrous, the upper very shining; the lower slightly dull, paler, almost glaucous when young; main nerves 7–9 pairs, ascending, faint; length 2.25–3.5, rarely 4 in., breadth .8–1.75, rarely 2 or 2.5 in.; petiole below the winged part .1–.2 in. *Panicles* slightly shorter or longer than the leaves, hoary-tomentose, axillary and terminal, with short sub-horizontal cymosely 3-flowered branches; bracts oblong, shorter than the flowers, broadly ovate, acute, concave. *Flowers* .15 in. long and about the same in width at the mouth, subsessile. *Calyx* widely funnel-shaped, the lobes broadly triangular, acute; the exterior hoary-tomentose; the interior lined by the subglabrous tube formed by dilated bases of the filaments, and with a thickened hairy process on the side opposite the 8–10 anthers. *Petals* longer than the calyx-lobes, oblong-obtuse, incurved. *Ovary* densely sericeous, the style short. *Fruit* obovoid-rotund, glabrous, 1-celled, .35 in. long and about .25 in. in diam.; the pericarp thin, leathery, densely woolly inside.

MALACCA; *Griffith* 2047/1, *Maingay* 619. *Derry* 189, 1180. PERAK; *King's Collector* 8599, 8680, 8711. PENANG; *Curtis* 147, 853; *King's Collector* 1274, 1472.

Very few of the specimens which I have seen of this have fruit, and of these not one has a seed. When the material has been fully completed by the receipt of seeds, I think a new genus might with advantage be formed for this plant; for it differs from the other species of *Parinarium* here described in having a cushion-like process in its calyx-tube the other parts of which are lined by the tube formed by the lower part of the dilated filaments. It also has a small 1-celled fruit with a thin leathery pericarp.

## 2. *PARASTEMON*, A. DC.

A shrub or small tree. *Leaves* simple, alternate, evergreen, quite



entire. *Flowers* polygamo-dicœcious, minute, racemose, minutely bracteolate. *Calyx-tube* shortly campanulate; lobes 5, imbricate. *Petals* 5, (or 6), oblong, deciduous. *Stamens* 2 perfect unilateral, and several imperfect. *Carpel* 1, adnate to one side of the calyx-tube, 1-celled; style basilar; ovules 2, erect. *Fruit* oblong, coriaceous, 1-celled, 1-seeded, indehiscent. *Seed* solitary, erect; testa membranous, pubescent; cotyledons fleshy, radicle inferior, plumule hairy.

PARASTEMON UROPHYLLUM, A. DC. in Ann. Sc. Nat. Ser. 2. XVIII, 208. A tall tree with pendulous habit, young branches very slender, glabrous. *Leaves* coriaceous, ovate-lanceolate to lanceolate, sometimes slightly oblanceolate, obtusely caudate-acuminate, the base much narrowed; both surfaces glabrous, the lower minutely lepidote; main nerves very faint, 4-6 pairs, oblique, the intermediate almost as distinct; length 2·5-3 in., breadth ·85-1·5 in., petiole ·25 in. *Racemes* nearly as long as the leaves, slender, axillary, glabrous, usually solitary but sometimes 2 together. *Flowers* ·15 in. long to the apex of the stamens, on short pedicels each with a minute concave ovate bracteole at its base. *Fruit* cylindric, tapering a little to each end, glabrous, ·45 in. long, and ·25 in. in diam.

In all the provinces, except the Andamans.

### 3. PRUNUS, Linn.

Shrubs or trees. *Leaves* alternate, simple, quite entire, or serrate or crenate or glandular-serrulate; petiole often 2-glandular. *Flowers* white or red, solitary, fascicled, corymbose or racemed. *Calyx* deciduous in fruit; lobes 5, imbricate. *Petals* 5. *Stamens* 15-60, perigynous, inserted in the mouth of the calyx-tube, filaments free. *Carpel* 1; style terminal; ovules 2, collateral, pendulous. *Drupe* with an indehiscent or 2-valved, 1-seeded, smooth, or rugged stone. *Seed* pendulous, testa membranous or coriaceous, albumen scanty or 0. **DISTRIB.** N. temp. regions, rare in the tropics; species about 80.

PRUNUS MARTABANICA, Kurz For. Flora Burma, I, 434. A tree 40-60 feet high; all parts, except the inflorescence, quite glabrous; young branches rather slender, lenticellate. *Leaves* membranous, elliptic-oblong to ovate-oblong, acuminate, suddenly slightly and often unequally narrowed to the base, with minute black dots on the lower surface; main nerves 5-7 pairs, spreading, very faint; length 3-6 in., breadth 1·65-2·5 in.; petiole ·4-·75 in., eglandular. *Racemes* solitary or in pairs, from the axils of fallen leaves and about as long as the leaves, pubescent. *Flowers* rather distant, about ·35 in. in diam. on puberulous pedicels ·3-·35 in. long. *Calyx-tube* campanulate, tomentose; the lobes erect, ovate, subacute. *Petals* orbicular, about ·1 in. long, deciduous.

*Stamens* 60–80. *Ovary* ovoid, glabrous, the style much longer than the stamens, the stigma dilated. *Drupe* cylindrical, with a pointed apex and rounded base, glabrous, 1–1.25 in. long; pericarp thin, woody, smooth inside. *Seed* minutely hairy. Hook. fil. Fl. Br. Ind. II, 316. *Cerasus? mariabanica*, Wall. Cat. 4902.

ANDAMAN ISLANDS; *Kurz, King's Collectors*. DISTRIB. Burma.

VAR. *Scortechinii*, King, bases of leaves rounded, main nerves 9–12 pairs; racemes less than half the length of the leaves; flowers .25 in. in diam.; stamens 30–40, fruit about .6 in. long.

PERAK; *Scortechini* 1782; *King's Collector* 5638.

This variety may possibly prove to be a distinct species. Although differing from the Andamanese and Burmese specimens in the points noted above, the Perak specimens have the same general *facies*.

#### 4. PYGEUM, Gærtn.

Evergreen trees or shrubs. *Leaves* alternate, usually quite entire; stipules minute, fugacious, (large and persistent in one species) basal glands 2 or 0. *Flowers* small, racemose or paniculate, sometimes unisexual by want of the ovary. *Calyx-tube* obconic urceolate or campanulate, deciduous; limb 5–15-toothed, often unequally. *Petals* minute, 5–6 in the 5–6-toothed calyx, 0 in the 10–15-toothed, villous or tomentose, rarely glabrous, often undistinguishable from the calyx-lobes. *Stamens* 10–50, in one or more series at the orifice of the calyx-tube; filaments slender, incurved; anthers small. *Carpel* 1, basal in the calyx-tube, ovoid or subglobose; style terminal, slender, exerted from the bud, stigma capitate; ovules 2, collateral, pendulous. *Fruit* a transversely oblong, obscurely didymous, rarely subglobose drupe; pericarp thin, dry or juicy. *Cotyledons* very thick, hemispheric; radicle minute, superior. DISTRIB. Species about 30, tropical Asiatic and one African.

Edges of leaves entire:—

Stipules large and persistent ... .. 1. *P. stipulaceum*.

Stipules small and fugacious:—

Flowers .5 in. in diam. ... .. 2. *P. grandiflorum*.

Flowers much less than .5 in. in diam.:—

Ovary glabrous:—

Racemes not much longer than the petioles:—

Leaves 4 or 5 in. long and 2 in. broad, lower surface puberulous; main nerves 7 pairs ... 3. *P. intermedium*.

Leaves 1.5–2 in. long and .65–1.1 in. broad, lower surface deciduously pubescent and rugulose beneath; main nerves 4–6 pairs ... 4. *P. Maingayi*.

Leaves 3–3.5 in. long, 1–1.4 in. broad, glabrous beneath and subglaucous; main nerves 4 or 5 pairs ... .. 5. *P. lanceolatum*.

Racemes 2 or 3 inches long :—

Flowers .15 in. long, 6-merous, stamens 30;  
leaves with 6 or 7 pairs of nerves, their apices  
much tapered ... .. 6. *P. acuminatum*.

Flowers .25 in. long, 5-merous; stamens 40 or  
50; leaves with 7-10 pairs of nerves, their apices  
slightly and obtusely acuminate ... .. 7. *P. polystachyum*.

Ovary villous or hirsute :—

Racemes much longer than the petioles (from .75-  
1.5 in. long) :—

Leaves glabrous on the lower surface ... 8. *P. Scortechinii*.

Leaves rugulose, the lower surface glabrous  
except for a few scattered adpressed hairs ... 9. *P. persimile*.

Leaves with short adpressed hairs on the lower  
surface, not glabrous or rugulose ... .. 10. *P. parviflorum*.

Racemes very little longer than the petioles :—

Lower surfaces of leaves with short adpressed  
hairs; bases of leaves cuneate, their apices  
caudate-acuminate ... .. 10. *P. parviflorum*.  
VAR. *densa*.

Lower surfaces of leaves minutely pubescent  
with adpressed bristles intermixed with the  
hairs; bases of leaves rounded, their apices  
obtusely and emarginate ... .. 11. *P. ovalifolium*.

Lower surfaces of leaves minutely rusty-pubes-  
cent, the hairs partly deciduous; leaves with  
rounded bases and acuminate apices ... 12. *P. Hookerianum*

Leaves glabrous on the under surface ... 13. *P. brevifolium*.

Edges of leaves sinuate-dentate ... .. 14. *P. Griffithii*.

1. PYGEUM STIPULACEUM, King n. sp. A tree; young branches stout, densely rusty-tomentose. *Leaves* very coriaceous, broadly elliptic, acute, the base broad and slightly cordate, the edges revolute; upper surface glabrous, the nerves and midrib deeply depressed, the latter pubescent; lower surface rusty-pubescent especially on the midrib, main and transverse nerves; main-nerves 10-12 pairs, spreading, curving upwards; length 5-7 in., breadth 2.5-3.75 in., petiole .5 in., very stout and densely rusty-tomentose; stipules persistent, broadly ovate, or caudate, acute, boldly ribbed, puberulous, persistent. *Racemes* in fascicles from the branches below the leaves, 1.25-2 in. long, rusty-tomentose; bracts broadly elliptic, concave, tomentose outside, glabrous inside. *Flowers* .15 in. long, on pedicels about as long as themselves. *Calyx-tube* campanulate, with 10 short obtuse teeth, tomentose outside. *Petals* 0. *Stamens* about 15, exserted, glabrous. *Pistil* longer than the stamens; ovary villous; style stout, erect, subglabrous; stigma capitate, discoid. *Fruit* unknown.

PERAK; *Scortechinii* 11020.

2. *PYGEUM GRANDIFLORUM*, King n. spec. A tree 50–70 feet high; all parts, except the inflorescence, glabrous; young branches rather stout. *Leaves* thinly coriaceous, elliptic to oblong-elliptic, sometimes slightly obovate, with an abrupt short blunt point; the base cuneate, eglandular; upper surface shining, smooth, the lower less shining and minutely pustulate; main nerves 8 or 9 pairs, spreading but curving upwards, prominent on the lower surface; length 5–8 in., breadth 2.75–3.5 in., petiole .75 in. *Panicles* solitary, axillary, nearly as long as the leaves, with a few lax corymbose branches, almost glabrous below, rusty-tomentose towards the apex; bracts broadly ovate, concave, blunt, puberulous. *Flowers* .5 in. across, on pedicels .15 in. long; bracteoles near the apex of the pedicels 1 or 2, minute. *Calyx-tube* widely campanulate, short, with 5 broad blunt subreniform lobes tomentose outside. *Petals* 5, much larger than the calyx-teeth (.2 in. long), subrotund to broadly oblong, blunt, reflexed. *Stamens* very numerous, glabrous. *Pistil* slightly longer than the stamens, the ovary pubescent, style puberulous; stigma small, capitate. *Fruit* unknown.

PERAK; *King's Collector* 7425.

A very distinct species with large glabrous leaves, and larger flowers than any here described.

3. *PYGEUM INTERMEDIUM*, King n. spec. A tree 30–40 feet high; young branches dark-coloured, lenticellate, subglabrous. *Leaves* coriaceous, broadly elliptic to oblong-elliptic, the apex acute or shortly acuminate, the base rounded or slightly cuneate; upper surface minutely punctulate, not shining when dry, glabrous except the broad, depressed, pubescent midrib; lower surface puberulous, pubescent on the nerves and midrib; main-nerves 7 pairs, oblique, curved, prominent beneath; length 4–5 in., breadth about 2 in., petiole .35 in. *Racemes* about .5 in. long, from the axils of fallen leaves, solitary or several together, densely tawny-tomentose; bracts shorter than the very short pedicels, ovate-obtuse, concave. *Flowers* less than .15 in. long. *Calyx-tube* widely infundibuliform, with 6 oblong blunt hairy teeth. *Petals* none. *Stamens* about 20, glabrous, exerted. *Pistils* as long as the stamens, glabrous; stigma capitate. *Fruit* subglobular, compressed, crowned by the style, glabrous, .3 in. long and about .2 in. thick.

MALACCA; *Maingay* 626. PERAK; *King's Collector* 3791.

4. *PYGEUM MAINGAYI*, Hook. fil. Fl. Br. Ind. II, 319. A tree; young branches slender, with dark-coloured glabrous bark. *Leaves* coriaceous, elliptic-lanceolate, acuminate, with slightly cuneate rather broad bases and often with 2 small glands a little above the petiole; the upper surface glabrous, smooth but not shining (when dry); the lower dark-brown in colour and rugulose, deciduously pubescent; main-nerves

4-6 pairs, spreading, curving upwards, rather prominent on the lower, obsolete on the upper surface; length 1·5-2 in., breadth ·65-1·1 in., petiole ·2 in. *Racemes* axillary and extra-axillary, about as long as the petioles, rusty-tomentose; bracts solitary at the base of the pedicels, ovate-acute, concave, tomentose outside, glabrous inside. *Flowers* ·15 in. in diam., on pedicels shorter than themselves. *Calyx-tube* funnel-shaped, its mouth with 6 obtuse villous teeth. *Petals* none. *Stamens* about 16, glabrous, much exerted. *Ovary* small, often abortive; style slender, glabrous. *Fruit* transversely oblong with a sharp mucronate apex, ·25 in. long, and ·35 in. broad.

MALACCA; *Maingay* 625. PERAK; *King's Collector* 5336; *Scortechini* 217.

This species comes very near *P. lanceolatum*, Hook. fil. It has, however, no petals, whereas *P. lanceolatum* has. The leaves of this in the young state are more-over pubescent, while those of the latter are glabrous at all stages.

5. PYGEUM LANCEOLATUM, Hook. fil. Fl. Br. Ind. II, 319. A tree 30 or 40 feet high; young branches slender, dark-coloured, adpressed-puberulous. *Leaves* thinly coriaceous, elliptic-lanceolate, obtusely acuminate; the base cuneate, with 2 narrow glands just above it; both surfaces glabrous, the lower subglaucous and with a few adpressed hairs on the main nerves and midrib; main nerves 4 or 5 pairs, curved, ascending, slightly prominent and dark-coloured on the lower surface; length 3-3·5 in., breadth 1-1·4 in., petiole ·25-3 in. *Racemes* only about ·5 in. long, axillary and extra-axillary, tomentose; the bracteole at the base of each pedicel sub-orbicular, acute, glabrous inside. *Flowers* on pedicels as long as themselves, ·15 in. in diam. *Calyx-tube* widely campanulate, tomentose externally, glabrous inside and with 10 broad short teeth. *Petals* (if any) deciduous. *Stamens* about 20, much exerted. *Ovary* glabrous, compressed; *style* stout, glabrous, longer than the petals; stigma compressed. *Fruit* transversely oblong, with a slight vertical groove, glabrous, ·3 in. long, and ·4 in. broad, 2-seeded.

SINGAPORE; *Lobb* 328. PENANG; *Curtis* 216, 735.

The racemes of this are often very short, almost sessile, and subglobular. It is a very distinct species. I have not been able to discover any petals.

6. PYGEUM ACUMINATUM, Colebr. in Trans. Linn. Soc. XII, 360, t. 18. A tall tree; young branches cinereous, glabrous, rough. *Leaves* coriaceous, elliptic to elliptic-oblong, shortly and obtusely caudate-acuminate; the base rounded or slightly cuneate and unequal, often with 1 or 2 obscure glands; upper surface glabrous, shining, the midrib and nerves depressed; lower surface brown when dry, subrugulose, glabrous, dull; main nerves 6 or 7 pairs, curving upwards, prominent (almost winged)

beneath; length 4-6.5 in., breadth 1.75-3.25 in., petiole .35-.5 in. *Racemes* from the axils of fallen leaves, solitary or several together, 2 or 3 inches long, slender, tawny-pubescent. *Flowers* .15 in. long, on pedicels .1 in. long; bracts narrowly oblong, sub-acute, very deciduous. *Calyx-tube* broadly campanulate, .15 in. wide at the mouth; teeth about 6, narrowly lanceolate. *Petals* 6, oblanceolate, obtuse, sericeous outside. *Stamens* about 30, long-exserted, glabrous. *Pistil* as long as the stamens; ovary glabrous; style slender, straight; stigma discoid-capitate. *Fruit* transversely oblong, slightly compressed, minutely apiculate, glabrous, but slightly rough, .5 in. long and .8 in. broad.

ANDAMAN ISLANDS. DISTRIB. Burma, Chittagong, Assam Range, Eastern Tropical Himalaya.

7. *PYGEUM POLYSTACHYUM*, Hook. fil. Fl. Br. Ind. I, 320. A tree 30-60 feet high; young branches with dark-coloured glabrous leucicellate bark. *Leaves* very coriaceous, elliptic-oblong, usually with an abrupt obtusely acuminate apex; the base broad or slightly and suddenly cuneate and with 2 large thick glands on its upper surface just above the petiole; upper surface glabrous, shining, pale greenish-brown when dry; the lower brown when dry, dull, minutely rugulose, glabrous; main nerves 7-10 pairs, oblique, rather straight, depressed on the upper and prominent on the lower surface; length 4.5-7 in., breadth 2.5-4 in., petiole .5 in., stout. *Racemes* (occasionally racemoid panicles) axillary, shorter than the leaves, slender, covered with short scanty rusty pubescence. *Flowers* about .2 in. long and .25 in. in diam., on pedicels varying from .1-.2 in. long; bracts (if any) deciduous. *Calyx-tube* campanulate, ribbed and tomentose externally, glabrescent within; lobes 5, oblong, obtuse, rufous-tomentose. *Petals* 5, like the calyx-lobes. *Stamens* 40-50, much exserted. *Ovary* glabrous; style as long as the stamens, glabrous; stigma dilated, compressed laterally. *Drupe* sub-globular or transversely oblong, bluntly apiculate, .65 in. long and from .6-.75 in. broad, glabrous. *Seeds* glaucous.

MALACCA; *Maingay* 627. SINGAPORE; *Ridley* 3830, 4453, 4666. PERAK; *Scortechini* 2045, 2063. *King's Collector* 5676, 6603, 5676, 6847, 10942; *Wray* 3113, 3384.

This species is very near *P. acuminatum*, Colebr., of which I believe it to be probably only a southern form.

8. *PYGEUM SCORTECHINII*, King n. sp. A slender tree 40-50 feet high; young branches puberulous, the bark dark-coloured. *Leaves* coriaceous, elliptic to oblong-lanceolate, acute or shortly acuminate; the base cuneate, eglar-dular; upper surface shining, glabrous except for occasionally a few scattered hairs on the depressed midrib near its base; lower surface pale, not shining, glabrous, minutely rugulose; main nerves

6 or 7 pairs, slender, spreading; length 2–3 in., breadth .8–1.35 in., petiole .25–.35 in. *Racemes* solitary, axillary, 1–1.25 in. long, coarsely adpressed rusty-pubescent, bracts (if any) deciduous. *Flowers* .15 in. long, their pedicels .1 in. *Calyx-tube* narrowly campanulate, with 6 oblong subacute hirsute lobes. *Petals* none. *Stamens* about 12, exerted. *Pistil* shorter than the stamens, ovary with long white hairs; style glabrescent. *Fruit* transversely oblong, glabrous, minutely pubescent, .3 in. long and .4 in. broad.

PERAK; *Scortechini* 357.

9. PYGEUM PERSIMILE, Kurz in Journ. As. Soc. Bengal Vol. XLI, 306. A tree; young branches slender, deciduously rusty-pubescent. *Leaves* thinly coriaceous, elliptic to elliptic-lanceolate, shortly and obtusely acuminate; the base rounded or slightly cuneate, eglandular; upper surface glabrous or glabrescent, very minutely punctate, dull, the midrib coarsely pubescent; lower surface brown, rugulose, with few scattered adpressed bristles, the nerves (but especially the midrib) strigose-pubescent; main nerves 7 or 8 pairs, spreading, very prominent (almost winged) on the lower surface; length 2.5–4 in., breadth 1.3–1.6 in.; petiole .25–.3 in., slender, pubescent. *Racemes* usually in fascicles of 2 or 3 (sometimes united near the base), rarely solitary, from above the scars of fallen leaves, .75–1.75 in. long, densely tawny-tomentose; bracts broadly ovate, acute or obtuse, longer than the pedicels. *Flowers* .1 in. long and .15 in. wide at the mouth, their pedicels less than .1 in. *Calyx-tube* campanulate, tomentose outside, glabrous inside, the mouth with 6 distant obtuse teeth. *Petals* none. *Stamens* about 12 or 18, glabrous, spreading, exerted. *Pistil* erect, as long as the stamens, the ovary tawny-sericeous; the style glabrous above, sericeous below; stigma obliquely discoid. *Fruit* transversely oblong, with a deep vertical groove, scarcely apiculate, glabrous except for a few adpressed hairs in the groove, .25 in. long and .35 in. broad. Kurz For. Flora Burma, I, 436; Hook. fil. Fl. Br. Ind. II, 320.

MALACCA; *Griffith*. SINGAPORE; *Ridley* 4452.

Mr. Kurz inadvertently referred to this Griffith's No. 2056 from Tenasserim which he says is closely allied to *P. Lampongum*, Miq. In my own opinion Griffith's No. 2056 is *P. Lampongum*. Kurz's description of his *P. persimile* exactly agrees with Griffithian specimens from Malacca (without any number), and on some of these he has written the name *P. persimile* with his own hand. This species must therefore henceforth be considered as Malayan and not as Burmese.

10. PYGEUM PARVIFLORUM, Teysm. & Binn. in Nat. Tijds. Ned. Ind. II, 309. A tree 50–70 feet high; young branches dark-coloured, minutely rusty-pubescent. *Leaves* coriaceous, elliptic to elliptic-oblong, shortly caudate-acuminate, the base cuneate, upper surface shining,

glabrous except sometimes the midrib pubescent; lower surface with sparse short adpressed hairs, the midrib and main nerves pubescent; main nerves 5 or 6 pairs, oblique, not curved, very prominent on the lower, faint on the upper surface; length 2·5–3·5 in., breadth 1·5–2 in., petiole 3–4 in. *Racemes* from 85–1·5 in. long, solitary or several together from the axils of fallen leaves, tomentose; bracts broad, obtuse, tomentose, (subglabrous in *VAR. densa*). *Flowers* 1 in. long, sub-sessile. *Calyx-tube* campanulate, with 6 obtuse short villous teeth. *Stamens* about 18, exerted, glabrous. *Pistil* as long as the stamens, ovary villous. *Style* sparsely pubescent especially towards the base; stigma capitate, discoid, grooved. *Fruit* slightly broader than long, compressed, sparsely adpressed-pubescent, subglabrous when old, 25 in. long and 3 in. broad. *Miq. Flor. Ind. Bat. Vol. I, pt. I, 361; Hook. fil. Fl. Br. Ind. II, 320. P. arboreum, Endl. Gen. Pl. 1250, in part. Polydonthia arborea, Blume Bijdr. 1105. Polystorthia, Blume Fl. Javae Praef. VIII, in part.*

MALACCA; *Ridley* 1872. PENANG; *Curtis* 162. PERAK; *King's Collector* 7236, and 10827; *Curtis* 1293. *DISTRIB.* Java, Borneo.

*VAR. densa*; racemes not much longer than the petioles, the flowers much crowded and quite sessile, densely covered with pale tomentum; bracts very broad, subglabrous.

PERAK; *King's Collector* 6986, 10195, 10396, 10753.

It is possible that this variety ought to be treated as a species.

11. PYGEUM OVALIFOLIUM, King n. spec. A small tree 15–20 feet high; young branches with rather rough cinereous bark, deciduously rusty-pubescent. *Leaves* oval or broadly ovate; the apex obtuse, obliquely and minutely emarginate; the base rounded and eglandular; upper surface shining, minutely punctate and rugulose, the midrib convex and rusty-pubescent; lower surface dull, minutely pubescent, with adpressed bristles intermixed, the midrib tomentose; main nerves 7 or 8 pairs, spreading, slightly depressed on the upper and slightly prominent on the lower surface when dry; length 1·75–2·15 in., breadth 1–1·5 in., petiole 3–4 in. *Racemes* axillary, stout, from 3–5 in. long, few-flowered, densely rusty-tomentose; bracts obliquely ovate, very concave, glabrous inside, densely tomentose outside. *Flowers* 2 in. long, and 3 in. wide at the mouth, sessile. *Calyx-tube* campanulate, densely tomentose outside, glabrous inside except at the base; the mouth with 10 oblong obtuse teeth. *Petals* none. *Stamens* about 30 or 40, glabrous, much exerted, spreading. *Pistil* shorter than the stamens; the ovary narrowly ovoid, sericeous; style stout, subglabrous; stigma obliquely discoid. *Fruit* subglobose with a slight vertical groove and shortly apiculate apex, sparsely strigose, 35 in. in diam.

PERAK; at an elevation of about 5000 feet, *King's Collector* 7329.



12. *PYGEUM HOOKERIANUM*, King n. spec. A shrub or small tree; young branches dark-coloured, glabrous. *Leaves* thinly coriaceous, more or less broadly ovate, sometimes ovate-oblong, shortly acuminate, the base broad and rounded or sometimes slightly narrowed to the petiole; upper surface glabrous, the lower minutely rusty-pubescent especially on the midrib and nerves, the hairs partially deciduous; main nerves 6 or 7 pairs, spreading, slightly oblique, interarching rather far from the edge; length 2-4 in., breadth 1-1.8 in., petiole .25 in. *Racemes* axillary and extra-axillary, sometimes crowded, usually less than .5 in. long, densely rufous-tomentose. *Flowers* .2 in. in diam., on very short pedicels each with a broadly ovate concave bracteole at its base. *Calyx-tube* tomentose outside, glabrous inside, widely campanulate, with 6 obtuse teeth. *Petals* 6, about as long as the calyx-teeth, lanceolate, pubescent externally. *Stamens* from the mouth of the calyx-tube, about 20, glabrous, much exerted. *Ovary* sericeous; style longer than the stamens, puberulous, stigma obliquely discoid. *Fruit* sub-globular, 1-seeded and .25 in. in diam., or transversely elongate with a shallow vertical groove and often 2-seeded, .25 in. long and .4 in. broad, always glabrous and slightly apiculate, black or dark purple; seed when ripe covered with white down.

PERAK; *Scortechini* 1234; *Wray* 3969; *King's Collector* 1970, 2083, 2753, 4789, 6425.

To this species I believe belongs No. 628 of the Maingay Herbarium referred to by Sir Joseph Hooker in a note on p. 322, Vol. II of the *Flora of British India*, but left undescribed by him for want of sufficiently good material.

13. *PYGEUM BREVIFOLIUM*, Hook. fil. Fl. Br. Ind. II, 321. A shrub 3 or 4 feet high; young branches dark-coloured, glabrous. *Leaves* coriaceous, broadly oblong, shortly and obtusely acuminate, sometimes minutely emarginate, both surfaces quite glabrous; the upper olivaceous brown, the lower brown; main nerves 4 or 5 pairs, spreading and interarching, faint beneath; length 2-2.5 in., breadth 1.1-1.3 in., petiole .25-3 in. *Racemes* axillary, only about .3 in. long, sub-globose, tomentose, 6-10-flowered, bracts small. *Calyx-tube* urceolate, with 5 or 6 obtuse unequal teeth. *Petals* none. *Stamens* 10-16, filaments short. *Ovary* villous; style rather short, glabrous. *Fruit* unknown.

MALACCA; Summit of Mount Ophir, *Griffith* 2051.

14. *PYGEUM GRIFFITHII*, Hook. fil. Fl. Br. Ind. II, 322. A tree? Young branches stout, densely tomentose. *Leaves* coriaceous, oblong or oblong-lanceolate, obtuse or obtusely cuspidate; the edges ciliate and obscurely sinuate-toothed; the base rounded or acute, with 2 small basal glands; both surfaces very minutely dotted; the upper glabrous, the midrib and main nerves impressed and puberulous; lower

surface minutely puberulous; main nerves 8–10 pairs, spreading, inter-arching; length 5 or 6 in.; petiole .2 in., very stout. *Racemes* axillary, solitary, stout, .5 in. long, few-flowered, densely tomentose. *Flowers* sessile. *Calyx-tube* obconic, with 6 oblong teeth. *Petals* none. *Stamens* 12. *Ovary* globose, hairy. *Fruit* unknown.

MALACCA; Griffith 2050.

This species is very imperfectly known, the only specimens of it being Griffith's which are quite fragmentary. The above description is taken entirely from Sir Joseph Hooker, who in turn took the description of the flowers from Griffith's MSS. It may be distinguished by its sinuate-toothed leaves.

### 5. RUBUS, Linn.

Sub-erect or sarmentose shrubs, always prickly. *Leaves* alternate, simple or compound; stipules free or adnate to the petiole. *Flowers* in terminal and axillary corymbose panicles, rarely solitary, white or red. *Calyx-tube* broad; lobes 5, persistent. *Petals* 5. *Stamens* many. *Disc* lining the calyx-tube. *Carpels* many, on a convex receptacle; style subterminal; ovules 2, collateral, pendulous. *Drupes* many, 1-seeded, crowded upon a dry or spongy conical or cylindrical receptacle. *Seed* pendulous. **DISTRIB.** Abundant in the northern hemisphere, rare in the southern; species about 200.

Leaves simple:—

- |   |                           |
|---|---------------------------|
| Leaves palmately 5–7-lobed; terminal panicle shorter than the leaves; young branches tomentose, woolly or villous. ... ..   | 1. <i>R. moluccanus</i> . |
| Leaves ovate or ovate-triangular, with 2 or 4 shallow lobes at the base only; terminal panicle as long as the leaves; young branches with thin cobwebby pubescence. | 2. <i>R. glomeratus</i> . |
| Leaves broadly ovate, not lobed; terminal panicle much longer than the leaves; young branches puberulous at first but speedily glabrous ... ..                      | 3. <i>R. elongatus</i> .  |
| Leaves pinnate ... ..   | 4. <i>R. rosæfolius</i> . |

1. **RUBUS MOLUCCANUS**, Linn. Spec. Pl. 707. A powerful subscandent shrub; the young branches, under surfaces of the leaves and inflorescence densely tawny or rusty-tomentose, villous or woolly; prickles short (.1 in. or less) and recurved on the branches, petioles and lower surfaces of the midribs, often absent on the main nerves. *Leaves* coriaceous, usually broader than long, broadly ovate or orbicular, deeply cordate; palmately 5–7-lobed, the lobes often lobulate; 2–10 in. in diam., the petioles 1–2.5 in. long; upper surfaces of leaves rugulose, sparsely hispid, the edges irregularly dentate or serrate. *Stipules* varying in size, oblong, toothed, pinnatifid or lacinate. *Panicles* axillary and terminal, much shorter than the leaves, few-flowered. *Flowers* from .5–1 in. in diam., bracts like the stipules not with glandular hairs. *Calyx-*

lobes 2-4 in. long, more or less triangular, sometimes deeply toothed. *Petals* obovate, white, shorter than the calyx-lobes; ovaries numerous, glabrous. *Fruit* globose, succulent, the individual carpels red, the receptacle hairy. Roxb. Flor. Ind. II, 518; Miq. Flor. Ind. Bat. I, part 1, 382; Wall. Cat. 743; Kurz For. Flor. Brit. Burm. I, 437. *R. rugosus*, Smith in Rees Cyc. XXX, Rubus 34; Don Prodr. 234; Wight et Arn. Prodr. 299; Dalz. & Gibs. Bomb. Flor. 89; Thwaites' Enum. 101; Wight Ic. t. 225; Wall. Cat. 748. *Rubus Hamiltonianus*, Wall. Plant. As. Rar. III, 19, t. 234. *R. micropetalus*, *R. macrocarpus*, and *R. Fairholmanianus*, Gardner in Calc. Journ. Nat. Hist. VIII, 6. *R. cordifolius*, Don Prodr. 233. *R. reflexus*, Ker in Bot. Reg. 461; Benth. Hong-Kong Flor. 104. *R. Hamiltonianus*, Seringe in DC. Prodr. II, 566. Rumph. Amboin. V, 88, t. 47, f. 2.

In all the Provinces except the Andaman and Nicobar Islands; common on the hilly parts. **DISTRIB.** British India, Malayan Archipelago.

**VAR. *alceæfolia***; pubescence very soft and velvety, leaves 4.5-10 in. in diam., prickles often .2 or .25 in. long, stipules and bracts pectinate, terminal panicle often 6 in. long, calyx-teeth spreading. *R. alceæfolius*, Poir. Encycl. VI, 247; Miq. Fl. Ind. Bat. Vol. 1, Pt. 1, 379.

**PERAK**; elevation 2000 feet, *Wray* 1463. **DISTRIB.** Malay Archipelago.

2. **RUBUS GLOMERATUS**, Blume Bijdr. 1111. A semi-scandent shrub; young branches slender, with pale deciduous cobwebby pubescence. *Leaves* thinly coriaceous, ovate or ovate-triangular, with 2-4 shallow lobes near the cordate base only, the upper half tapering to the acuminate apex, not lobed, the edges everywhere dentate; upper surface glabrous except the pale-pubescent midrib and sometimes the nerves, minutely rugulose; lower surface minutely rusty- or tawny-tomentose or sparsely pubescent, reticulate; length 3-4 in., breadth 1.75-2.5 in.; petiole 1-1.5 in. long, with minute prickles which extend sometimes to the midrib. *Stipules* ovate, pinnatifid, deciduous. *Panicles* axillary and shorter than the leaves, or terminal and as long as the leaves, few-flowered, tawny-tomentose. *Flowers* .35 in. in diam. *Calyx-lobes* triangular, entire, acute, tomentose. *Petals* as long as the calyx-lobes, obovate. *Carpels* of the fruit numerous, red. *R. Hasskarlii*, Miq. Flor. Ind. Bat. Vol. I, Pt. 1, 381. *R. acerifolius*, Wall. Cat. 744.

**PENANG**; **SINGAPORE**; **PERAK**. **DISTRIB.** Malay Archipelago.

**VAR. *gracilis***, King; terminal panicles twice as long as the leaves; pedicels of the flowers .4-.6 in. long.

In its long terminal panicles this variety resembles *R. elongatus*, but the flowers have longer pedicels; moreover the venation of the leaves is quite that of *R. glomeratus*.

3. **RUBUS ELONGATUS**, Smith Icon. Ined. III, t. 62. A scandent

shrub; young branches at first pubescent but speedily glabrous, the bark dark-coloured and with minute deflexed prickles. *Leaves* coriaceous, broadly ovate, deeply cordate at the base, the apex acute; the edges sinuate and remotely dentate, not lobed; upper surface smooth, glabrous except the pubescent midrib; under surface pale, and (except 3 or 4 on the midrib) without prickles; the nerves and veins glabrous and chestnut brown, the areolæ minutely pale-tomentose; length 3·5–5·5 in., breadth 2·5–3·5 in., petiole 1·35–2 in., with a few small prickles. *Stipules* ovate, pinnatifid, deciduous. *Panicles* pubescent and with small scattered prickles, a few axillary and shorter than or as long as the leaves; the terminal one much longer than the leaves (often 15 in. long) with distant branches; the flowers mostly clustered at their extremities, subsessile or shortly pedicelled, 3 in. in diam. *Calyx-lobes* triangular, blunt, tawny-tomentose. *Fruit* with numerous red carpels. DC. Prodr. II, 567; Blume Bijdr. 1112. *R. Lobbianus*, Hook. Ic. Pl. t. 741–742.

PERAK; *Wray* 421, 1849; *King's Collector* 3465, 5732; *Scortechini* 1468. DISTRIB. Sumatra.

4. *RUBUS ROSAEFOLIUS*, Smith Ic. Ined. III, t. 60. A subscaudent woody shrub; branches, petioles leaf-rachises and inflorescence with long stiff usually glandular hairs, with shorter softer hairs intermixed and a few sharp polished hooked spines. *Leaves* pinnate, 2–5 in. long; leaflets 3–7, membranous, lanceolate or ovate-lanceolate, unequally incised-serrate, rarely with 1 or 2 basal lobes, the apex acuminate, the base rounded; upper surface sparsely strigose, the midrib and nerves villous; lower surface less strigose than the upper, minutely reticulate, never white or glaucous; length of leaflets 1–3 in., breadth 35–1·2 in.; petiolules of the lateral leaflets 1–2 in., those of the terminal ones 5–1·1 in. *Stipules* linear-lanceolate, acuminate. *Flowers* 75–1 in. in diam., on pedicels much longer than themselves, solitary or in lax few-flowered panicles. *Calyx-lobes* lanceolate, acuminate, not prickly, woolly or glabrous. *Petals* usually larger than the calyx-lobes, broadly obovate, white. *Fruit* elongated, rarely subglobose, the numerous red carpels on a glabrous receptacle. Roxb. Flor. Ind. II, 518; Wall. Cat. 728; Kurz For. Flora Brit. Burm. I, 439; Hook. Ic. Pl. t. 349; Hook. fil. Fl. Br. Ind. II, 341. *R. pinnatus*, Willd. *R. asper*, Don Prodr. 234; Wall. Cat. 741.

PERAK; at 3900 feet. *Wray*, at 4500 feet, No. 4187. DISTRIB. British India, Java.

#### 6. *PYRUS*, Linn.

Trees or shrubs. *Leaves* deciduous, simple or pinnate; stipules deciduous. *Flowers* white red or pink, in terminal cymes or corymbs; bracts subulate or linear. *Calyx-tube* urceolate turbinate or obconic,

lobes 5, erect or reflexed, persistent or deciduous. *Petals* 5, quincuncially imbricate in bud. *Stamens* 20 or more, filaments sometimes connate at the base. *Disc* annular, or lining the calyx-tube. *Carpels* 2-5, connate and adnate to the calyx-tube; styles 2-5, free or connate below, stigmas truncate; ovules 2 in each cell, basal, collateral, ascending. *Fruit* (a pome) fleshy, 2-5-celled; cells with a membranous or cartilaginous often 2-valved endocarp, 1-2-seeded. *Seeds* when in pairs planoconvex, testa coriaceous; cotyledons amygdaloid. **DISTRIB.** N. temp. and cold regions; species about 100.

*PYRUS GRANULOSA*, Bertol. in Mem. Acad. Sc. Bolog. Ser. II, IV, 312. A small glabrous tree. *Leaves* coriaceous, ovate, usually acuminate, the base cuneate or rounded, the edges serrate or sinuate-serrate; upper surface shining, the lower dull-brown when dry; main nerves 7-9 pairs, prominent on the lower surface, oblique. *Fruits* globose-pyriform, minutely rugulose, glabrous, the calyx-lobes not persistent, .75 in. long and .6 in. in diam., 4-celled, in lax terminal glabrous corymbs longer than the leaves; fruit pedicels from .4-1.5 in. long, endocarp of large granules. Hook. fil. Fl. Br. Ind. II, 378. *P. sikkimensis*, Wenzig in Linnæa, 1874, 58, *in part*; Kurz For. Flor. Brit. Burm. I, 442. *P. Karensium*, Kurz in Journ. As. Soc. Beng. 1872, II, 306; 1873, II, 232.

**PERAK**; at an elevation of 2000-2500 feet; *Scortechini*. **DISTRIB.** Burma; Khasia Mountains; Sumatra, *Forbes* 2050! 2376.

#### ORDER XL. SAXIFRAGACEÆ.

Trees shrubs or herbs. *Leaves* alternate and exstipulate, or stipules adnate to the base of the petiole, or opposite and exstipulate. *Inflorescence* various; flowers hermaphrodite or polygamo-dioecious; the sepals, petals and stamens symmetrically regular. *Calyx* more or less adnate to the ovary, sometimes nearly free, sometimes quite inferior; lobes imbricate or valvate. *Petals* 5 or 4, rarely 0, perigynous or epigynous, rarely sub-hypogynous, imbricate or valvate. *Stamens* inserted with the petals, equalling or double their number, rarely numerous. *Ovary* of 2 or 3-5 united carpels; usually 2- or 3-5-celled with axile placentas, occasionally 1-celled with parietal placentas; styles as many as the carpels, distinct or combined nearly to the summits, stigmas capitate or lateral and subcapitate; ovules numerous, anatropous, erect or pendulous. *Fruit* capsular or berried. *Seeds* numerous or several (solitary in *Polyosma*) albuminous; the albumen rarely scanty or nearly wanting. **DISTRIB.** Species 580; in the cold or temperate regions of the whole world and in the mountains of the tropics; together with a few genera of tropical trees.

- A sub-herbaceous shrub, with simple exstipulate leaves, and succulent fruits with numerous small seeds ... .. 1. DICHROA.  
 Woody shrubs or trees with pinnate (rarely simple) stipulate leaves; fruits small, dry, capsular, dehiscent, 2-celled; seeds few hairy ... .. 2. WEINMANNIA.  
 Trees or large woody shrubs with simple leaves, 4-merous flowers, and dry fruit with a single large smooth seed ... 3. POLYOSMA.

## 1. DICHROA, Lour.

A sub-herbaceous shrub. *Leaves* opposite, more or less serrate, lanceolate, persistent, exstipulate. *Panicle* terminal. *Calyx-tube* adnate to the ovary; limb 5-6-toothed. *Petals* 5 or 6, thick, valvate, blue or purplish. *Stamens* 10 or 12, epigynous. *Ovary*  $\frac{2}{3}$ -inferior, 1-celled; styles 3-5; ovules numerous, on 3-5 parietal placentas formed by the inflexed margins of the carpels. *Berry*  $\frac{3}{4}$ -inferior, blue. *Seeds* numerous, small, obovoid; testa with large reticulations.

DICHROA FEBRIFUGA, Lour. Fl. Cochinch, 301. A shrub 3-6 feet high; branches terete, nearly glabrous. *Leaves* membranous, caudate-acuminate, the base cuneate, the edges more or less distinctly serrate in the upper three-fourths, entire in the lower fourth; main nerves 8 or 9 pairs, ascending; length 4-5 in., breadth 1.4-1.8 in.; petioles unequal, from .6-1.75 in. *Panicles* adpressed-pubescent. Hook. fil. Fl. Br. Ind. II, 406; Benth. Fl. Hongk. 128; Maxim. in Mem. Acad. Petersb. X 16, p. 2. *D. cyanitis* and *D. latifolia*, Miq. Fl. Ind. Bat. I, 721, 722. *Adamia versicolor*, Fortune in Journ. Hort. Soc. I, 298; Lindl. & Paxt. Fl. Gard. I, t. 5. *A. cyanea*, Wall. Cat. 44J; Tent. Fl. Nep. t. 36; Pl. As. Rar. t. 213; Bot. Mag. t. 3016; DC. Prodr. IV, 16; H. f. & T. in Journ. Linn. Soc. II, 76. *A. chinensis*, Gardn. & Champ. in Kew Journ. Bot. I, 311. *Cyanitis sylvatica*, Reinw. in Blume Bijd. 921; DC. Prodr. IV, 16.

PERAK; on the Central Range; *Scortechini* 266. DISTRIB. On the higher parts of the Malayan Archipelago; China; Philippines; Temperate Himalaya from Bhotan to Nepal; Khasia Mountains.

## 2. WEINMANNIA, Linn.

Trees or shrubs, usually with terete opposite branches. *Leaves* stipulate, opposite, coriaceous, unequally pinnate, 3-foliolate or simple, leaflets usually glandular-serrate. *Flowers* hermaphrodite or polygamodiceous. *Calyx-tube* short, the lobes 4 or 5, imbricate, persistent or deciduous. *Petals* 4 or 5, sessile, imbricate, spathulate or obovate, inserted under the lobed margin of the perigynous disc. *Stamens* 8 or 10, inserted with the petals, the filaments often elongated and exserted; the anthers small, 2-celled. *Ovary* free, ovoid or conical, 2-celled, 2-beaked;

styles 2, subulate, persistent, the stigmas simple. *Capsule* small, coriaceous, 2-celled, septicidally 2-valved, the valves boat-shaped, few- or many-seeded. *Seeds* oblong, reniform or subglobose; the testa membranous, often hairy. *Embryo* terete, in the axis, or towards the apex, of the fleshy albumen. **DISTRIB.** Species about 80; Malayan, Mascarene, Australasian, and American.

**WEINMANNIA BLUMEI**, Planch. in Hook. Lond. Journ. Bot. Vol. 6, (1847), p. 470. A small tree; young branches with sparse black stiff hairs and many lenticels. *Stipules* obovate-rotund, adpressed-pubescent, .2 in. in diam. *Leaves* 2-3.5 in. long, pinnate; leaflets 9-11, opposite, sessile, narrowly oblong-lanceolate with acute apices and slightly narrowed and oblique bases, their edges remotely glandular-serrate, the upper surfaces glabrous, the lower glabrous but for a very few scattered black hairs; main nerves 6 or 7 pairs, dark-coloured; length .75-1 in., the terminal one longer, breadth .2-3 in. *Racemes* clustered at the apices of the branches, about as long as the leaves, puberulous, many-flowered. *Flowers* less than 1 in. long, their pedicels shorter. *Capsules* narrowly elliptic, glaberrulous, crowned by the 2 divergent styles. *Seeds* elongated, very comose at one end, less so at the other. Miq. Fl. Ind. Bat. Vol. I, pt. 1, 718. *Spiræa pinnata*, Blume, Cat. Hort. Bot. Bogor. *Arnoldia pinnata*, Blume Bijdr., 868.

**MAJACCA**; on Mount Ophir, *Griffith*. **PERAK**; on Gunong Bubu, at an elevation of 5000 feet, *Wray* 3814; on Gunong Idjan at 5000 feet, *Scortechini* 446.

### 3. POLYOSMA, Blume.

Evergreen trees or shrubs. *Leaves* opposite or subopposite, petioled, acute or acuminate. *Flowers* in terminal racemes (in some non-Indian species solitary) 3-bracteolate. *Calyx-tube* entirely adnate to the ovary; lobes 4, small, persistent. *Petals* 4, epigynous, linear, valvate, white, yellowish or greenish, much recurved when expanded, fugacious, usually hairy within. *Stamens* 4, epigynous, filaments hairy. *Ovary* inferior, 1-celled; style columnar, stigma simple; ovules numerous, ascending, on two parietal placentas which project considerably into the cavity of the ovary. *Fruit* sub-baccate, 1-seeded. *Seed* ascending, subbasal. **DISTRIB.** Species 18; Malayan, British Indian and tropical Australasian.

Leaves quite glabrous on both surfaces:—

Leaves sharply sinuate-dentate, membranous; flowers .2 in. long

1. *P. parviflora*.

Leaves quite entire, coriaceous, flowers .3 or .35 in. long:—

Leaves elliptic to elliptic-rotund, or obovate; calyx strigose

2. *P. coriacea*.

- Leaves oblong or oblong-lanceolate, calyx nearly glabrous 3. *P. Scortechinii*.  
 Leaves glabrous on the upper surface, the midrib and nerves, often with the intervening spaces on the lower surface also adpressed-pubescent :—  
 Fruit truncate at the base and with 4 deep vertical grooves ; flowers not more than .3 in. long ; leaves entire ... 4. *P. mutabilis*.  
 Fruit not truncate at the base and not vertically ridged :—  
 Fruit subglobular ; flowers .35 in. long ; leaves entire ... 5. *P. fragrans*.  
 Fruit ovoid, tapering at the base ; flowers .45 in. long ; leaves entire or remotely serrate ... 6. *P. integrifolia*.  
 Leaves glabrous on the upper surface, the lower surface always in the young leaves, and usually in adult leaves covered with dense yellowish tomentum :—  
 Fruit sub-globular, not ridged, .25 in. long ... 7. *P. læte-virens*.  
 Fruit ovoid with a truncate base, and with 4 deep vertical ridges, .4 in. long ... 8. *P. velutina*.  
 Imperfectly known species near *P. velutina*, Bl. ... 9. *P. Ridleyi*.

1. *POLYOSMA PARVIFLORA*, King n. spec. A small tree ; young branches slender, glabrous. *Leaves* membranous, narrowly elliptic, shortly caudate-acuminate, the edges sinuate-dentate in the upper three-fourths, entire in the lower fourth, the base cuneate ; both surfaces glabrous, dull and dark-coloured when dry, the lower slightly paler than the upper ; main nerves 10-12 pairs, sub-horizontal, slightly prominent on the lower surface only ; length 2.5-3.25 in., breadth 1-1.5 in. ; petiole .3-.5 in., sparsely pubescent, channelled. *Racemes* terminal, shorter than the leaves, puberulous. *Flowers* .2 in. long, their pedicels .05 in., adpressed-pubescent ; the bracteoles linear, longer than the pedicel. *Calyx-tube* narrow, nearly glabrous, the mouth with triangular acuminate teeth. *Petals* only twice as long as the calyx, linear, obtuse, pubescent externally, longer than the anthers. *Fruit* flask-shaped, the apex crowned by the calyx-teeth and the pointed base of the style, the base rounded and slightly gibbous, glabrous, .5 in. long, and .3 in. in diam.

PERAK ; on Gunung Inas, at 5000 feet, Wray 4143.

A species somewhat resembling *P. ilicifolia*, Blume in the shape of its leaves ; but having much shorter racemes and smaller flowers, and an almost glabrous calyx.

2. *POLYOSMA CORIACEA*, King n. spec. A shrub or small tree ; young branches glabrous, sparsely lenticellate. *Leaves* coriaceous, elliptic to elliptic-rotund, rarely sub-obovate, the apex acute or shortly acuminate, the edges entire and slightly revolute when dry, the base cuneate ; both surfaces glabrous, the upper shining, the lower dull and paler ; main nerves 9-11 pairs, spreading, interarching freely, slightly prominent on the lower surface only ; length 2.75-4 in., breadth 1.5-2 in., petiole about .75 in. *Racemes* terminal, about as long as or longer than



the leaves, sparsely adpressed-pubescent. *Flowers* .35 in. long; their pedicels .1 in., bearing 3 unequal linear-acuminate strigose bracteoles. *Calyx-tube* shorter than the pedicel, slightly constricted under the mouth; the teeth triangular, acute, strigose like the tube. *Petals* much longer than the calyx and slightly longer than the stamens, linear, obtuse, minutely strigose outside, sub-villous inside. *Fruit* (very young) ovoid, glabrous, crowned by the calyx-teeth.

PERAK; on Gunong Bubu at an elevation of 5000 feet; *Scortechini* 805; *Wray* 3819, 3855, 4131. Ridley's 5219 from Kedah Peak possibly belongs to this species. Its leaves, however, are thinner, and their nerves more distinct.

3. *POLYOSMA SCORTECHINII*, King n. spec. A medium-sized tree (*vide* *Scortechini*); young branches slender, with pale almost polished bark, all parts except the inflorescence glabrous. *Leaves* coriaceous, oblong or oblong-lanceolate, sometimes oblanceolate, acute, much narrowed to the base; the edges entire, slightly revolute when dry; both surfaces shining, glabrous, except sometimes a few hairs on the midrib beneath; main nerves 10–12 pairs, spreading, interarching, faint on both surfaces; length 4–6.5 in., breadth 1.5–2 in., petiole .35–.6 in. winged. *Racemes* terminal, shorter than the leaves, sparsely puberulous. *Flowers* .3 in. long, their pedicels about .05 in.; the bracteoles small, lanceolate, hairy. *Calyx-tube* nearly glabrous; its lobes shallow, triangular. *Petals* linear, subacute, pubescent outside, only slightly so inside, about as long as the almost glabrous stamens. *Fruit* unknown. *P. integrifolia*, Herb. *Scortechini* (not of Blume).

PERAK; *Scortechini* 1900.

Readily distinguished by its perfectly glabrous leaves and nearly glabrous flowers.

4. *POLYOSMA MUTABILIS*, Blume, Mus. Bot. Lugd. Bat. I, 261. A tree 20–40 feet high; young branches lenticellate, deciduously rusty-pubescent. *Leaves* narrowly elliptic, tapering gradually from about the middle to each end, not caudate-acuminate, the edges quite entire; upper surface black when dry, glabrous, shining; the lower deep-olivaceous, very sparsely pubescent, the midrib and nerves adpressed-pubescent; main nerves 8–10 pairs, spreading, slightly prominent on the lower and slightly depressed on the upper surface, length 3.5–6 in., breadth 1.25–1.75 in.; petiole .5–1.1 in., slender. *Racemes* terminal, much longer than the leaves, with short rather sparse pubescence. *Flowers* .3 in. long, their pedicels about .05 in. long with 2 adpressed bracteoles. *Calyx-tube* about as long as the pedicel, pubescent; its lobes short, triangular. *Petals* many times longer than the calyx, linear, sub-obtuse, pubescent, slightly longer than the stamens. *Fruit* ovoid from a

broad truncate base, the apex pointed and crowned by the small persistent calyx-teeth; length .45 in.; breadth at the base .25 in.; puberulous, black when ripe, the pedicel .25-.3 in. long, pubescent. Miq. Flor. Ind. Bat. Vol. I, pt. 1, 724; Suppl. 336.

PERAK; *King's Collector* 2596, 4344, 8332; *Wray* 925. JOHORE; *Lake and Kelsall* 4057. MALACCA; *Goodenough* 438.

This species is closely allied to *P. integrifolia*, Blume; but has flowers only .3 in. long on pedicels only .05 in. long, while the flowers of *P. integrifolia* measure .45 in. and its pedicels .1 in. The best distinction between the two species lies however in the fruit which is in this truncate at the base and vertically ridged, while in *P. integrifolia* the fruit has a tapering base and is not ridged.

5. *POLYOSMA FRAGRANS*, Benn. Pl. Jav. Rar. 196. A shrub 5 or 6 feet high; young branches slender, deciduously pubescent. *Leaves* elliptic, tapering much to each end, the apex abruptly acuminate; the base cuneate, the edges entire; the upper surface quite glabrous; the lower sparsely adpressed-pubescent especially on the midrib and 7-10 pairs of subhorizontal faint main-nerves; length 2.5-3 in., breadth 1.1-1.35 in.; petiole .4 in., slender, pubescent. *Raceme* terminal, erect, rather longer than the leaves, tawny-pubescent. *Flowers* .35 in. long, rather crowded, their pedicels under .1 in. long with 2 adpressed bracteoles. *Calyx-tube* short, sericeous; the mouth with 4 small triangular teeth. *Petals* many times longer than the calyx, linear, acute, adpressed-pubescent. *Stamens* shorter than the petals. *Anthers* linear, elongate; filaments broad, sparsely villous on the inner side. *Fruit* sub-globular, apiculate, glabrous, .2 in. in diam. H. f. & T. in Journ. Linn. Soc. II, 77; Miq. Fl. Ind. Bat. I, pt. I, 724; Suppl. I, 336; Clarke in Hook. fil. Flor. Br. Ind. II, 408. *Itea fragrans*, Wall. in Roxb. Flor. Ind. II, 420; Wall. Cat. 8472, partly.

PERAK; *Scortechini* 520. SINGAPORE; *Wallich*. DISTRIB. Sumatra.

6. *POLYOSMA INTEGRIFOLIA*, Blume Bijdr. 659. A tree 20-40 feet high; young branches lenticellate, deciduously rusty-pubescent. *Leaves* oblanceolate, the apex shortly and abruptly caudate-acuminate, gradually narrowed from the middle or above it to the petiole, the edges entire or remotely serrate, drying of a rather dark-brown colour; upper surface glabrous or with a few hairs on the midrib; the lower paler, with adpressed hairs on the midrib and sometimes also on the nerves; main nerves 8-12 pairs, spreading, interarching, slightly prominent on the lower surface only; length 3.5-8 in., breadth 1.35-3 in.; petiole .5-1 in., rather stout, pubescent. *Racemes* terminal, often longer than the leaves, subadpressed-sericeous. *Flowers* .45 in. long, rather crowded; their pedicels .1 in. long, pubescent, with 2 linear-lanceolate bracts. *Calyx-tube* about as long as the pedicel, pubescent; the mouth with 4

spreading triangular teeth. *Petals* linear, subacute, longer than the stamens and much longer than the calyx, slightly pubescent; anthers elongate, filaments slightly pubescent. *Fruit* ovoid, tapering to each end, the apex crowned by the persistent calyx-teeth and base of the style, puberulous, black when dry, .4 in. long and .25 in. in diam.; the pedicel .15 in. long, puberulous. *Benn. Pl. Jav. Rar.* p. 196; *DC. Prodr.* IV, 276; *Blume Mus. Bot.* I, 260; *H. f. & T. in Journ. Linn. Soc.* II, 77; *Miq. Fl. Ind. Bat.* I, pt. I, 724; *Suppl.* I, 335. *Clarke in Hook fil. Fl. Br. Ind.* II, 409. *Itea fragrans*, *Wall. Cat.* 8472, partly.

*VAR. 1. typica*; leaves entire.

*MALACCA*; *Griffith* 2510 (*Kew Distrib.*); *Maingay* 632. *PERAK*; *Wray* 508; *King's Collector* 3802. *PENANG*; *Curtis* 1081. *ANDAMAN ISLANDS*; *King's Collectors*, *Prain*.

*VAR. 2. Wallichii*, *Clarke in Hook fil. Fl. Br. Ind.* II, 409; leaves remotely serrate. *P. Wallichii*, *Benn. Pl. Jav. Rar.* p. 196; *Wall Cat.* 8471; *H. f. & T. in Journ. Linn. Soc.* II, 77; *Kurz For. Flora Burma*, I, 444.

*ANDAMAN ISLANDS. DISTRIB. Khasia Hills, Assam.*

As I have noted under *P. mutabilis*, *Bl.*, the only tangible distinction between that plant and this is that the former has fruit truncate at the base and with 4 bold vertical grooves, while this has smooth fruit. Many of the specimens above-quoted as belonging to this are not in fruit, and I accept them as *P. integrifolia* in deference to the authority of the *Flora of British India*.

7. *POLYOSMA LETE-VIRENS*, *Griff. MSS.* in *Herb. Kew.* A tree 20–50 feet high; young branches yellowish-tomentose. *Leaves* drying of a yellowish-green, coriaceous, oblanceolate or narrowly-elliptic, shortly acuminate, much narrowed to the base; the edges entire, slightly revolute when dry; upper surface glabrous, shining, the midrib minutely tomentose, lower surface yellowish-tomentose; main nerves 8 or 9 pairs, spreading, interarching, prominent on the lower surface only; length 3.25–5.5 in., breadth .8–2.25 in., petiole .35–.5 in. *Raceme* solitary, terminal, tomentose, rather longer than the leaves. *Flowers* .3 in. long, on pedicels .1 in. long. *Calyx-tube* slightly longer than the three narrowly oblong adpressed bracteoles, its mouth with 4 broad triangular obtuse teeth, yellowish-tomentose. *Petals* much longer than the calyx and slightly longer than the stamens, linear, tapering to the obtuse apex, villous in front, tomentose behind. *Filaments* nearly as long as the anthers, villous in front. *Fruit* ovoid or globular-ovoid, crowned by the calyx-teeth, deciduously adpressed sericeous and lepidote, .25 in. long, the pedicel .1–.2 in. *P. mutabilis*, *Clarke in Hook. fil. Fl. Br. Ind.* II, 469 (not of *Blume*).

*MALACCA*; *Griffith* 2508, 2509; *Maingay* 633. *PERAK*; *King's Collector* 8775. *PENANG*; *Curtis* 377, 758.

Griffith's original specimens, to which he gave the MSS. name *P. late-virens*, have smaller leaves and more ovoid fruit on shorter pedicels than any specimens subsequently collected. But in other respects they agree with specimens more recently collected in Perak and Penang.

8. *POLYOSMA VELUTINA*, Blume Mus. Bot. Lugd. Bat. I, 261. A small tree; young branches stout, deciduously tomentose. *Leaves* coriaceous, elliptic to elliptic-oblong, sometimes slightly obovate, sub-acute or obtuse, the base cuneate; the edges entire, revolute when dry; upper surface at first with a few scattered adpressed hairs, glabrous when old except the pubescent depressed midrib and main nerves; lower surface covered with soft velvety yellowish tomentum; main nerves 9-12 pairs, prominent on the lower surface only; length 4-7.5 in., breadth 1.75-3.25 in., petiole .6-1.5 in. *Raceme* terminal, about one and a half times as long as the leaves, stout, densely yellowish-tomentose like the calyx. *Flowers* .4 in. long, their pedicels rather over .1 in., with 3 narrow unequal adpressed bracteoles. *Calyx-tube* tomentose; its teeth triangular, acute. *Petals* narrowly linear, sub-acute, slightly longer than the stamens, much longer than the calyx; the filaments slightly villous in front, about equal to the anthers. *Fruit* ovoid, with a broad sub-truncate base, and with an apiculus formed by the remains of the base of the style, boldly 4-ridged, sparsely and deciduously strigose, .4 in. long and .3 in. in diam. at the base; the pedicel .2 in.; endocarp woody, deeply 4-grooved.

PENANG; *Curtis* 1165; *King's Collector* 1352. PERAK; *Scortechini* 2111; *King's Collector* 3685, 4362. *DISTRIB.* Sumatra, Java.

I identify the Penang and Perak plants with Blume's *P. velutina* by description only; for I have seen no authentic specimen of that species. The deep vertical ridging of the endocarp is noted of no other described species except *P. mutabilis*, Bl., and I think my identification is correct.

9. *POLYOSMA RIDLEYI*, King n. spec. A tree; young branches densely and minutely tomentose. *Leaves* coriaceous, narrowly-elliptic, caudate-acuminate, the edges entire and slightly revolute when dry, the base cuneate; upper surface when young sparsely adpressed-pubescent, when adult glabrous and shining; lower surface covered with dense yellowish tomentum; main nerves 9-11 pairs, spreading, curving and interarching, rather prominent on the lower surface, the intermediate nerves almost as prominent; length 6-6.5 in., breadth 2-2.5 in.; petiole 1-1.75 or even 2 in., tomentose. *Raceme* terminal, stout, shorter than the leaves, densely covered with pale yellowish or whitish tomentum like the calyx and petals. *Flowers* .4 in. long, their pedicels .1 in., with 3 equal lanceolate bracteoles on the same level. *Calyx-tube* shorter than the pedicel, wide; the teeth broad, shallow. *Petals* much longer than the calyx, linear, blunt, villous in front. *Stamens* nearly as long

as the petals; the filaments flat, villous in front, scarcely so long as the anthers. *Style* subglabrous. *Fruit* unknown.

SINGAPORE; *Ridley* 3972.

A very distinct species in the neighbourhood of *P. velutina*, Bl., but with narrower leaves, much more tomentose flowers and inflorescence, and a wider calyx-tube.

NOTE.—I here take the opportunity of describing a very distinct new species from Sumatra.

*POLYOSMA LONGE-PEDICELLATA*, King n. spec. A shrub or tree 15 feet high; young branches coarsely adpressed-pubescent. *Leaves* elliptic or obovate-elliptic, abruptly and shortly acuminate; the edges slightly sinuate and very obscurely and minutely toothed, slightly recurved when dry; the base cuneate; upper surface glabrous, finely reticulate; the lower with short coarse adpressed hairs especially on the midrib, finely reticulate; main nerves 14–16 pairs, almost horizontal, slightly curved and interarching towards the edge of the blade, slightly prominent on the lower surface only when dry, the intermediate nerves almost as distinct; the reticulations minute, distinct on both surfaces; length 5·25–7 in., breadth 2·2–3·25 in.; petiole 75–1·25 in., puberulous. *Raceme* solitary, terminal, rather longer than the leaves, with pubescence like the young branches. *Flowers* 5 in. long, on slender adpressed-pubescent pedicels 3–35 in. long, and bearing three adpressed bracteoles towards their apices. *Calyx-tube* 1 in. long, adpressed-pubescent, its teeth broadly triangular. *Petals* 4 in. long, linear, obtuse, adpressed-pubescent outside. *Fruit* ovoid, tapering to each end, crowned at the apex by the very short calyx-lobes and by the sharp base of the style, minutely adpressed-pubescent, 5 in. long, and 3 in. in diam. *Fruit* pedicels 5–7 in. long, sometimes deflexed.

EASTERN SUMATRA; at elevations of 3200 and 3700 feet, *Forbes* 2037, 2250.

## ORDER XLI. DROSERACEÆ.

Herbs; catching insects by means of glandular viscid hairs, or by means of petioled leaves with automatically closing laminae. *Flowers* hermaphrodite, regular. *Calyx* 4–5- (rarely 8-) partite; or sepals free, imbricate, persistent. *Petals* and *stamens* as many as the sepals, hypogynous or nearly so. *Ovary* nearly free, globose or ovoid, 1–3-celled; styles 5–3, capitate, fimbriate or bifid; ovules numerous, on parietal placentas equal in number to the styles. *Capsule* membranous, 5–3-valved, many-seeded. *Seeds* with fleshy albumen; embryo cylindrical or minute. **DISTRIB.** Species 110; spread over nearly all temperate and tropical lands except the islands of the Pacific.

### 1. DROSERA, Linn.

Perennial herbs, scapigerous or with a leafy stem, glandular-pilose. *Leaves* radical or alternate, usually circinate in vernation; stipules 0, or scariose and adnate to the petiole. *Calyx* free from the ovary, 4–8-partite, sepals persistent. *Petals* 4–8, hypogynous or scarcely perigynous, white or rose-coloured, withering, persistent. *Stamens* as many

as the petals, hypogynous or scarcely perigynous. *Ovary* 1-celled with 2-5 styles; ovules parietal, numerous. *Capsule* loculicidally 2-5-valved. *Seeds* numerous; in the Indian species obovoid-ellipsoid, with the testa black, smooth, reticulate, not lax. **DISTRIB.** Species 100; scattered throughout the world except Polynesia; very numerous in Australia.

Leaves cauline, linear ... .. 1. *D. indica*.  
 Leaves all radical, spatulate-cuneate ... .. 2. *D. Burmanni*.

1. *DROSERA INDICA*, Linn. Sp. Pl. 282. *Stems* suberect, from 1-6 in. high. *Leaves* cauline, alternate, linear, elongate, very glandular-pubescent, hardly broader than the glabrous petiole; the stipules much shorter than the petioles. *Racemes* leaf-opposed; flower-pedicels .25 in. or more in length, glandular-hairy. *Styles* 3, bifid to near the base. DC. Prodr. I, 319; Roxb. Fl. Ind. II, 313; Wall. Cat. 1244; Wight Ill. t. 20; W. & A. Prodr. 34; Planch. in Ann. Sc. Nat. Ser. III, Vol. IX, 204; Miq. Fl. Ind. Bat. I, Pt. II, p. 120; H. f. & T. in Journ. Linn. Soc. II, 82; Thwaites Enum. 21; Dalz. & Gibs. Bomb. Fl. 12; Kurz in Journ. As. Soc. 1876, Pt. II, 310; Clarke in Hook. fil. Fl. Br. Ind. II, 424. *D. Finlaysoniana*, Wall. Cat. 3752. *D. serpens*, Planch. l. c. 204. *D. hexagyna*, Blanco Fl. Filip. 139; Rheede Hort. Mal. X, t. 20.

In swampy places in all the Provinces, except the Andaman and Nicobar Islands. **DISTRIB.** The southern part of British India, Ceylon, Burma, the Malayan Archipelago, China, tropical Australia, Africa.

2. *DROSERA BURMANNI*, Vahl Symb. III, 50. *Stem* very short; the leaves all radical, spatulate-cuneate, glandular-pubescent; the stipules nearly as long as the petioles. *Scapes* 1-3, two to eight inches high, the raceme occupying the upper fourth only, glabrescent. *Flower-pedicels* less than .25 in. long, glabrous. *Styles* 5, not bifid. Don Prodr. 212; DC. Prodr. I, 318; Roxb. Fl. Ind. II, 113; Wall. Cat. 1242; Wight Ill. t. 20; Wight Ic. t. 944; W. & A. Prodr. 34; Planch. in Ann. Sc. Nat. Ser. III, Vol. IX, 190; Miq. Fl. Ind. Bat. I, Pt. II, p. 120; H. f. & T. in Journ. Linn. Soc. II, 82; Clarke in Hook. fil. Fl. Br. Ind. II, 424; Thwaites Enum. 21; Dalz. & Gibs. Bomb. Fl. 12; Kurz in Journ. As. Soc. 1876, Pt. II, 310.

In swampy places in all the Provinces, except the Andaman and Nicobar Islands. **DISTRIB.** Plains of British India, Ceylon, the lower Himalaya, Malayan Archipelago, China, Japan, Australia, West Africa.

#### ORDER XLII. HAMAMELIDÆ.

Trees or shrubs. *Leaves* alternate, petiolate, simple or palmately lobed; stipules 1-2, rarely wanting, deciduous or rarely persistent. *Flowers* hermaphrodite or unisexual, collected into heads or spikes. *Calyx* small or 0, adnate to the ovary. *Petals* 0 or 4-5, perigynous or

nearly epigynous. *Stamens* 4-∞, perigynous, or rarely hypogynous; anthers dehiscing longitudinally. *Ovary* 2-celled; styles 2, separate and ultimately divaricate, usually persistent; ovules 1-∞, axile, pendulous. *Capsule* woody, its segments often bifid; endocarp often horny and separating from the exocarp. *Seeds* 1, or many and then usually only the lowest in each cell perfect. **DISTRIB.** Species 35; Eastern Asia, the Himalaya, Khasia Hills, Malaya, China and Japan; also in North America and in South Africa.

Ovules solitary in each cell :—

Stipules small and deciduous; heads ebracteate; stamens 5,  
with short filaments, the connective produced into a horn;  
flowers hermaphrodite ... .. 1. MAINGAYA.

Ovules 6 or more in each cell :—

Stipules large, coriaceous; heads ebracteate; stamens 10-14,  
without appendages; flowers polygamous ... .. 2. BUCKLANDIA.

Stipules absent; heads with numerous coloured bracts;  
stamens 7-10 without appendages; flowers hermaphrodite... 3. RHODOLEIA.

### 1. MAINGAYA, Oliver.

A tree. *Leaves* alternate, undivided, petioled, persistent; stipules small, deciduous. *Heads* peduncled, quasi-terminal, ebracteate, of about 15 flowers. *Calyx-tube* adherent to the ovary; the limb closed, splitting up on one side a little way from the base and then circumscissile and deciduous. *Petals* 5, perigynous, linear, circinate in æstivation. *Stamens* 5, perigynous, filaments very short, connective produced as a horn. *Staminodes* about 10, horned. *Ovary* half-inferior, 2-celled; styles 2, distinct, short; ovule 1 in each cell, pendulous. *Capsule* woody, ovoid; endocarp horny, separating from the exocarp. *Seed* narrowly ellipsoid, and with pale thick iridescent testa.

MAINGAYA MALAYANA, Oliver in *Trans. Linn. Soc.* XXVIII, 517, t. 44. A tree 50 or 60 feet high; young branches rather slender, glabrous, pale-coloured when dry, lenticellate. *Leaves* membranous, oblong-lanceolate or elliptic, acuminate; the base broad, rounded or minutely cordate, sometimes slightly peltate; both surfaces glabrous, shining, the lower of a bright brown tint when dry; main nerves 7-10 pairs, curving upwards, slightly prominent on the lower surface only; length 6·5-9 in., breadth 2-4·5 in., petiole ·75-1 in., slender; stipules small, tomentose, caducous. *Capitules* from ·75-1 in. in diam., solitary, or two or three from a short peduncle. *Flowers* ·5 in. long, sessile; buds oblong or obovoid-oblong. *Calyx* thin, puberulous, not opening but separating in an irregular circumscissile manner. *Petals* linear, obtuse, glabrous, four or five times as long as the calyx. *Capsule* woody, ovoid, tapering into the thick pedicel, with truncate compressed apex, more than half enve-

loped by the calyx-tube, striate, minutely pubescent, .6 in. long, .4 in. wide at the apex. *Seeds* narrowly ellipsoid, tapering much to the apex; the testa thick, white, iridescent, with elongate reticulations. Clarke in Hook. fil. Fl. Br. Ind. II, 428.

PENANG; *Maingay* 1513; *Curtis* 659. PERAK; *Scortechini* 819; *King's Collector* 7330.

## 2. BUCKLANDIA, Br.

A tall glabrous tree. *Leaves* alternate, acuminate, entire, long-petioled; stipules solitary or in pairs, large, oblong, coriaceous, deciduous. *Inflorescence* of 2-5 peduncled heads, at first enclosed between a pair of stipules; flowers adnate by their calyces, about 8 in a head, polygamous. *Calyx-tube* adnate to the ovary; limb 5-lobed. *Petals* in the ♀ flower linear-spathulate, fleshy, variable in number; in the ♂ fl. rudimentary. *Stamens* 10-14 (in the ♀ none); filaments long. *Ovary* half-inferior, 2-celled; styles 2, separate, soon divaricate; ovules in each cell 6 in two rows. *Capsule* nearly superior, woody, subglobose; endocarp horny, showing a tendency to separate from the exocarp. *Seeds* in each cell 6, oblong, trigonous; the upper wingless, solid, without any embryo, the lower one in each cell winged and fertile.

BUCKLANDIA POPULNEA, R. Brown in Wall. Cat. 7414. *Leaves* broadly ovate sub-reniform or sub-orbicular, the apex acuminate or tricuspidate, the edges entire; the base broad and rounded, subcordate or truncate, or narrowed and cuneate; both surfaces glabrous; the lower sometimes pubescent on the nerves; main nerves 5-7, radiating palmately from the base, the lower on each side slender, prominent on the lower surface; length 2.5-6.5 in., breadth 1.5-7 in.; petiole .8-3 in., usually glabrous but sometimes pubescent; stipules oblong, sub-falcate, obtuse, .9-1.25 in. long, slightly pubescent at the base, breadth .25-.45 in. Griff. in Asiat. Res. XIX, 95, with two plates; Clarke in Hook. fil. Fl. Br. Ind. II, 429. *B. populifolia*, H. f. & T. in Journ. Linn. Soc. II, 86; Kurz Forest Fl. Brit. Burma, I, 445. *Liquidambar tricuspis*, Miq. Fl. Ind. Bat. I, Pt. I, 1097; and Suppl. 346, with a figure.

PERAK; *Scortechini*; on Gunong Inas, elevat. 5000 feet, *Wray* 4151; on Ulu Batang Padang, about 3900 feet, *Wray* 1535. **DISTRIB.** The temperate Himalaya from Nepal to Bhotan, elevat. 5000-8000 ft.; Khasia Hills 4000-6000 feet; Burma, Java, Sumatra.

None of the Perak specimens have flowers or fruit. *Scortechini's* have leaves in no way differing from those from the Himalaya and Khasia mountains, except that the main nerves and petioles, even when old, are pubescent. *Wray's* specimens, on the other hand, have smaller ovate leaves, rarely tri-cuspidate and never sub-rotund or reniform; their petioles are sometimes slightly hairy, but their main



nerves have tufts of hair only in their axils. In all the Perak specimens the stipules are much narrower than in those from the Himalaya and Khasia mountains.

### 3. RHODOLEIA, Hook.

Glabrous woody shrubs. *Leaves* exstipulate, evergreen, alternate, with long petioles, coriaceous, glaucous beneath. *Flowers* in few-flowered axillary pedunculate reflexed capitula surrounded by numerous whorls of coloured bracts, increasing in size from without inwards. *Flowers* unsymmetrical, hermaphrodite, adnate in the capitula by their calyces. *Calyx-tube* adherent to the lower half of the ovary; its limb annular, truncate, glandular inside. *Petals* rosy, 2-4, very unequal, unilateral, deficient in the central flowers, clawed, oblong-ob lanceolate. *Stamens* 7-10, inserted with the petals; the filaments thick, elongate; the anthers linear-oblong, basifixed, 2-celled, the connective not produced. *Ovary* half-inferior, ovoid, the apex bifid, 2-celled, or 1-celled by abortion of the septum. *Style* subulate, elongate, deciduous, stigma simple. *Ovules* numerous in each cell, inserted on two biseriate axile placentas. *Capsule* sub-ligneous, bicuspidate, 2-celled, 2-valved; the valves bifid, many-seeded. *Seeds* imbricate, not winged, angular, compressed, testa crustaceous. **DISTRIB.** Two species; Hongkong and Sumatra.

RHODOLEIA TEYSMANNI, Miq. in Versl. en Meded. K. Akad. v. Wetensch. VI, 124. *Leaves* oblong to elliptic, the apex obtuse, slightly narrowed at the base to the long petiole, both surfaces rugulose when dry; main nerves 7-9 pairs, spreading, faint; the midrib prominent beneath; length 2.5-5 in., breadth 1.5-2 in., petiole .75-1.75 in. *Capitula* solitary, about .75 in. long, ovoid, on decurved peduncles about .25 in. long; the bracts broad, blunt, the outer short and glabrous, the inner longer and covered with reddish hair. *Stamens* and petals subequal, about .5 in. long. *Ripe capsules* glabrous, about .4 in. long, dehiscing widely for about half their length. **Miq. Fl. Ind. Bat. Vol. I, pt. 2, p. 669; Suppl. 532.**

MALACCA; *Hervey*; *Ridley* 3289. PERAK; elev. 3900 feet in Batang Padang Valley, *Wray* 1481. **DISTRIB.** Sumatra.

### ORDER XLIII. HALORAGEÆ.

Herbs, often aquatic. *Leaves* opposite or whorled, or partly alternate, when submerged often pinnatisect, always exstipulate. *Flowers* small, axillary, solitary or fascicled, sessile or pedicelled, hermaphrodite or unisexual, the nodes between the floral whorls sometimes developed. *Calyx-lobes* 4 or 0. *Petals* 4 and epigynous, or absent. *Stamens* 8, 4 or 1, epigynous in the bisexual flowers. *Ovary* inferior, 4- 2- or 1-celled;

the styles equal in number to the cells, simple or finely lobed; ovules 4, (1 in *Hippurus*) pendulous. *Fruit* small, dry or drupaceous, with cells as in the ovary, indehiscent, or separating into its component carpels. *Seeds* 4 or 1. **DISTRIB.**; about 80 species, cosmopolitan.

Terrestrial; fruit 1-celled, 1-seeded...	...	..	1.	HALORAGIS.
Aquatic (floating); fruit separating into its component carpels ... ..	...	...	2.	MYRIOPHYLLUM.

### 1. HALORAGIS, Forst.

Branching herbs. *Leaves* opposite, the upper sometimes alternate, toothed, rigid. *Flowers* minute, nearly sessile in the axils of bracts, spicate or racemose, partially unisexual or hermaphrodite. *Calyx-tube* 4–8-ribbed; lobes 4, erect, persistent, acute, valvate. *Petals* 4, coriaceous, often wanting in the ♀. *Stamens* 8, epigynous. *Ovary* 2- or 4-celled, with 4 pendulous ovules; stigmas 4 (in the females at least), sessile, feathery. *Fruit* a dry, 2–4-celled, 2–4-seeded nut; but in the following species by abortion 1-celled, 1-seeded. **DISTRIB.** Species 40; N. Asia, Australia.

HALORAGIS MICRANTHA, R. Brown in Flinders Voy. II, 550. A branching glabrous herb. *Leaves* opposite, ovate, acute, denticulate; the petioles very short, diminishing in size towards the inflorescence. *Flowers* about .05 in., on pedicels shorter than themselves, in terminal panicle-like racemes. *Sepals* triangular, much smaller than the petals. *Fruit* shining, 8-ribbed, about .05 in. long, 1-celled, 1-seeded. Clarke in Hook. Flor. Br. Ind. II, 430; Benth. Fl. Austral. II, 482. *H. tenella*, Brongn. in Duperr. Voy. t. 68. *Gonocarpus micranthus*, Thunb. Fl. Jap. t. 15; DC. Prodr. III, 66. *Goniocarpus micranthus*, Koen. & Sims Ann. Bot. I, 546, t. 12.

At elevations of about 5000 feet on the Perak Central Range? **DISTRIB.** Malaya, China, Australia and New Zealand. Khasia mountains; at elevations of from 5000–7000 feet.

I include this as a Perak plant with some hesitation. Scortechini's specimens are not now in the Calcutta Herbarium, although his field note is.

### 2. MYRIOPHYLLUM, Linn.

Glabrous, aquatic herbs. *Leaves* dentate-serrate or pectinate-pinnatifid, or entire, often whorled. *Flowers* small, sessile or nearly so, in the axils of floral leaves or in nearly naked spikes; monœcious or hermaphrodite. **MALE**; calyx-tube short, limb 2–4-fid or 0; petals 2–4; stamens 2–8. **FEMALE**; calyx-tube deeply 4-furrowed, limb 0 or of 4 minute lobes; petals minute or 0; ovary inferior, 4- or 2-celled; styles 2 or 4, short, usually recurved, the stigmas plumose; ovules solitary

in each cell, pendulous. *Fruit* 4-furrowed, or separating into 4 or 2 carpels. **DISTRIB.** Species 15; cosmopolitan.

**MYRIOPHYLLUM INTERMEDIUM**, DC. Prodr. III, 69. *Leaves* alternate, solitary or in fascicles of two or three, sometimes in whorls, linear, entire or serrate, .5-1 in. long. *Fruit* axillary, oblong, only about .05 in. long, with rounded and minutely scabrous ridges and shallow furrows between, ultimately separating into its component carpels. Miq. Flor. Ind. Bat. Vol. I, pt. 1, 634; Clarke in Hook. fil. Fl. Br. Ind. II, 433. *M. indicum*, Wight Ill. t. 102, (exclude the fruit). *M. varix-folium*, Hook. Ic. Pl. t. 289. *M. lineare*, Heyne MSS. *Haloragis oligantha*, W. & A. Prodr. 338; Wight Ic. t. 1061 (not of Arn.)

**MALACCA**; *Griffith* (probably on Mount Ophir). **DISTRIB.** Mountains of the Malayan Archipelago and of the South of British India; Australia, New Zealand, South America.

#### ORDER XLIV. RHIZOPHOREÆ.

Trees or shrubs. *Leaves* opposite and stipulate (alternate and exstipulate in *Anisophyllea*), usually coriaceous, glabrous; stipules interpetiolar, very caducous. *Flowers* axillary, usually bisexual (unisexual in *Anisophyllea*), surrounded at the base by connate or cupuliform bracts, or ebracteate. *Calyx* more or less adnate to the ovary; limb produced beyond the ovary, 4-14-lobed; lobes valvate, persistent. *Petals* equal in number to but usually smaller than the sepals, entire, emarginate, 2-fid or lacerate. *Stamens* usually twice the number of the petals, in pairs, opposite to and partly embraced by them; rarely indefinite (*Kandelia*); anthers 2-celled, rarely multi-loculate (*Rhizophora*). *Ovary* more or less adnate to the calyx, from 5-1-celled by solution of the septa; styles connate (distinct in *Anisophyllea*); stigma often lobed; ovules usually 2 in each cell, pendulous. *Fruit* coriaceous or woody, crowned or surrounded by the calyx-limb, mostly indehiscent, 1-celled, 1-seeded. *Seed* pendulous, arillate or not; albumen fleshy or 0; embryo inverted, small if surrounded by albumen, elongated if exalbuminous; radicle macropodous in the tribe *Rhizophoreæ*, perforating the apex of the pericarp and germinating while the fruit still adheres to the tree.—**DISTRIB.** Tropical plants; many sharing with an arboreal vegetation the muddy shores of the estuaries of rivers. Genera 17, species about 70.

*Leaves* opposite, stipulate; style connate:—

**TRIBE I. RHIZOPHOREÆ.** Embryo exalbuminous, with a large radicle germinating while the fruit is still on the tree:—

- |  |     |     |     |                |
|--|-----|-----|-----|----------------|
| Calyx 4-lobed; petals 4, entire; stamens 8; ovary 2-celled ...                                   | ... | ... | ... | 1. RHIZOPHORA. |
| Calyx 8-14-lobed; petals 8-14, 2-lobed or deeply emarginate; ovary 2-4-celled; stamens 16-28 ... | ... | ... | ... | 2. BRUGUIERA.  |

- Calyx 5- or 6-lobed; petals 5 or 6, their apices ciliate or with clavate or capitate bristles; stamens 10-12 ... 3. CERIOPS.
- Calyx 5- or 6-lobed; petals 5 or 6, multifid; stamens indefinite; stigma 3-lobed ... 4. KANDELIA.
- TRIBE II. LEGNOTIDÆ. Embryo immersed in fleshy albumen, radicle not unusually large and not germinating in the fruit :—
- Flowers 5-8-merous in trichotomous cymes; calyx-tube minutely bracteolate, half-superior, the calyx-lobes erect; stigma small, not lobed ... 5. CARALLIA.
- Flowers 5-merous, axillary, solitary or in pairs; calyx ebracteolate, half-superior, its lobes reflexed; stigma discoid, 5-10-lobed ... 6. PELLACALYX.
- Flowers 4-5-merous, in axillary fascicles; calyx-tube ebracteolate, adnate to the base of the ovary, its lobes reflexed; stigma discoid, 5-lobed ... 7. GYNOTROCHES.
- Leaves alternate, exstipulate; style distinct :—
- TRIBE III. ANISOPHYLLÆ. Leaves alternate and exstipulate; flowers unisexual; styles distinct ... 8. ANISOPHYLLEA.

## 1. RHIZOPHORA, Linn.

Trees. *Branches* marked by leaf-scars. *Leaves* coriaceous, glabrous, opposite, mucronate. *Stipules* large, in pairs, interpetiolar, caducous. *Flowers* rather large, on axillary 2-3-chotomously-divided and few-flowered cymes. *Calyx* 4-lobed, surrounded at the base by connate bracteoles. *Petals* 4, entire, inserted on a fleshy disc. *Anthers* 8, subsessile, multi-loculate. *Ovary* 2-celled, half-inferior, projecting beyond the calyx as a fleshy cone; cells 2-ovuled; stigma bifid. *Fruit* coriaceous, ovoid or obconic, with the reflexed persistent calyx-teeth at its base. *Radicle* elongated, perforating the apex of the fruit and descending from the tree into the mud.—*DISTRIB.* About 5 species; frequent on muddy tropical shores.

- Leaves elliptic; cymes longer than the petioles, usually 3-flowered; petals fleshy, lanate in front ... 1. *R. mucronata*.
- Leaves oblong to oblong-lanceolate; cymes shorter than the petioles, 2-flowered; petals thin, glabrous ... 2. *R. conjugata*.

1. RHIZOPHORA MUCRONATA, Lamk. Dict. VI, 160, t. 396, f. 2. A large evergreen glabrous shrub or tree; young branches thick, with bold cicatrices, rather pale. *Leaves* elliptic, tapering to each end, the apex mucronate; upper surface reticulate when dry, the main nerves faint and depressed; the lower surface minutely rugulose and with black dots, even when dry the nerves invisible; length 5-7 in., breadth 2.5-4.25 in., petiole 1.2-1.75 in. *Cymes* axillary, slightly longer than the petioles, usually 3- rarely 2-flowered. *Flowers* .5-.6 in. long, their pedicels shorter. *Calyx-lobes* coriaceous, triangular, subacute, glabrous.

*Petals* shorter than the sepals, linear-lanceolate, thick, lanate on the margins and inner face. *Stamens* 8, filaments short, anthers linear. *Fruit* inversely obovoid with the reflexed persistent calyx-teeth at its base, 1·5 in. long; the extruded radicle 1–2 feet long, cylindric, 6 in. in diam. when dry. DC. Prodr. III, 32; Bedd. Fl. Sylv., Anal. Gen. t. XIII, fig. 4; Dalz. & Gibs. Bomb. Fl. 95; Wight Ill. I, 209; Ic. t. 238; Kurz For. Flor. Burm. I, 447; Hook. fil. Fl. Br. Ind. II, 435; Trimen Flora Ceylon, I, 151. *R. macrorrhiza*, Griff. in Trans. Med. Phys. Soc. Calc. VIII, 2. *R. candelaria*, W. & A. Prodr. I, 310; Wall. Cat. 4878. *R. Mangle*, Roxb. (not of Linn.) Fl. Ind. II, 456. *R. latifolia*, Miq. Fl. Ind. Bat. Suppl. 324.—Rheede Hort. Mal. VI, t. 34.

In all the provinces, at the mouths of rivers; very common. **DISTRIB.** The Tropics of the Old World and of Australia.

The original specimens in the Calcutta Herbarium of *R. latifolia*, Miq. are only large-leaved specimens of this.

2. RHIZOPHORA CONJUGATA, Linn. Sp. Pl. 634. A small glabrous tree; young branches clavate, smooth, pale, the upper part with bold cicatrices. *Leaves* oblong to oblong-lanceolate, tapering to each end, the apex mucronate; when dry the upper surface faintly reticulate, the main nerves visible; the lower surface not showing the main-nerves but the midrib there prominent, remotely pustulate and minutely dotted; length 5–6 in., breadth 1·65–2·5 in., petiole 8–1·25 in. *Cymes* axillary, shorter than the petioles, 2-flowered. *Calyx-lobes* oblong, concave, acute. *Petals* slightly shorter than the calyx, thin, glabrous. *Stamens* 6–8; filaments short, anthers linear. *Fruit* inversely clavate, 1 in. long, the protruding radicle from a few inches to a foot long, cylindric; 2·5–3 in. in diam., when dry. DC. Prodr. III, 33; Blume Mus. Bot. I, 134; Wight Ill. I, 309; Kurz. For. Flora Burma, I, 447; Hook. fil. Fl. Br. Ind. II, 436. *R. apiculata*, Blume Flor. Jav. I, 91. *R. candelaria*, DC. Prodr. III, 32; Trimen Flora Ceylon, I, 151.

In all the Provinces, at the mouths of rivers and in tidal marshes. **DISTRIB.** The Tropics of the Old World.

## 2. BRUGUIERA, Lamk.

Trees or shrubs. *Leaves* usually coriaceous, oblong, quite entire. *Peduncles* axillary, cymose, or solitary. *Flowers* rather large, coriaceous. *Calyx* 8–14-merous, obconical or campanulate, ebracteate, adnate to the base of the ovary; lobes subulate-lanceolate, valvate. *Petals* oblong, equal in number to the calyx-lobes, 2-lobed or emarginate, appendiculate, embracing the stamens by pairs. *Stamens* 16–28; filaments filiform; anthers linear, mucronate, about as long as the filaments. *Ovary* 2–4-celled, included in the calyx-tube; cells 2-ovuled; style filiform;

stigma 2-4-lobed, minute. *Fruit* coriaceous, included in or adnate to the calyx-tube, 1-celled, 1-seeded. *Germination* as in *Rhizophora*.

DISTRIB. Species about 7, in the tropics of the Old World.

Flowers 1 in. long or upwards, solitary :—

Petals 2-lobed, each lobe with 2-4 apical bristles, otherwise glabrous ... .. 1. *B. gymnorrhiza*.

Petals 2-lobed, the sinus between the lobes with one bristle; the edges densely clothed with short white hairs ... 2. *B. eriopetala*.

Flowers not more than .5 in. long, in axillary cymes :—

Lobes of the calyx as long as the tube, spreading or reflexed; petals bifid, each lobe crowned by 3-5 pale hairs, their edges with scanty white hairs outside ... 3. *B. caryophylloides*.

Lobes of calyx only one-fourth the length of the tube, erect; petals with broad emarginate apex, bearing 5 white flexuose hairs, the edges glabrous ... 4. *B. parviflora*.

1. BRUGUIERA GYMNORHIZA, Lamk. Encycl. IV, 696; Ill. t. 397. A large glabrous evergreen tree: young branches stout, marked with cicatrices towards the apex. *Leaves* elliptic or elliptic-oblong, acute, the base cuneate; upper surface shining when dry, the nerves faint; the lower dull, the veins invisible but the midrib very prominent; length 3.5-6 in., breadth 1.75-2.5 in., petiole 1.3-1.6 in. *Flowers* solitary, axillary, 1.25-1.5 in. long; the peduncles about .35 in., deflexed. *Calyx* coriaceous, campanulate, ribbed, cut for half its length into 12 narrow acute suberect teeth. *Petals* shorter than the calyx-lobes and equal to them in number, sub-convolute, two-lobed at the apex and with 2-4 bristles at the point of each lobe, pubescent at the base, otherwise glabrous. *Stamens* two opposite each petal and shorter than it, each alternate filament short; anthers linear. *Fruit* small, in the fundus of the calyx-tube, containing a single seed germinating *in situ* and forming a cylindric radicle 1-2 feet long prior to its fall. W. & A. Prodr. 311; Brand. For. Fl. 219; Miq. Fl. Ind. Bat. I, pt. 1, 586; Blume Mus. Bot. 136; Kurz For. Flor. Burm. I, 450; Hook. fil. Fl. Br. Ind. II, 437; Dalz. & Gibs. Fl. Bomb. 95; Trime Flora Ceylon, I, 153. *B. Rheedii*, Miq. l. c. 587; Blume, l. c. 136; Wight Ic. t. 239; Dalz. & Gibs. Bomb. Fl. 95; Hook. Ic. Pl. t. 397. *Rhizophora gymnorrhiza*, Linn. Sp. 634; Roxb. Fl. Ind. II, 460; Griff. Ic. Pl. Asiat. t. 645; Wall. Cat. 4874; Thwaites En. Pl. Ceyl. 120.

Tidal Forests in all the provinces. DISTRIB. Malaya, Australia, Africa.

2. BRUGUIERA ERIOPETALA, W. & A. in Wight Ill. I, p. 210; Wight Icon. 239 B. A tree; young branches slender, with cicatrices towards the apex. *Leaves* oblong-lanceolate or oval-oblong, sometimes rather oblanceolate, acute, the base very cuneate; upper surface shining, the

nerves faint; the lower reddish-brown when dry, the nerves very faint or obsolete but the midrib prominent; length 3·25–4 in., breadth 1·25–1·65 in., petiole ·6–·75 in. *Flowers* 1–1·25 in. long, solitary, axillary; the peduncle short, decurved. *Calyx* as in *B. gymnorhiza*, but the lobes only 10. *Petals* shorter than the calyx-lobes, deeply bifid, with a stout seta in the sinus between the two narrow lobes, the edges densely clothed with stout white hair, the apices of the lobes bearing one short bristle each. *Fruit* as in *B. gymnorhiza*, but the germinating radicle shorter. Wall. Cat. 2451; Brandis For. Flora, 219; Hook. fil. Fl. Br. Ind. II, 438. *B. Rumphii*, Blume Mus. Bot. Lugd. Bat. I, 138. *B. parietosa*, Griff. Notul. IV, 670; Ic. Pl. Asiat. t. 641.

In similar situations to the last, but not so common. MALACCA; Griffith 2206; Maingay 642. PENANG; Curtis 514. PAHANG; Ridley 1045 C. PERAK; Scortechini; Wray 2711. DISTRIB. Malayan Archipelago, Australasia.

3. *BRUGUIERA CARYOPHYLLOIDES*, Blume Enum. Pl. Javæ I. 93. A tree; young branches slender, with cicatrices towards the apex. *Leaves* oblanceolate or ovate-oblanceolate, slightly oblique, acute, the base cuneate; upper surface shining when dry, the lower dull, both pale in colour and the nerves faint in both; length 2·5 to 4 in., breadth 1–1·65 in., petiole ·75–1 in. *Cymes* axillary, rather longer than the peduncles, erect, laxly 2- or 3-flowered, (rarely only 1-flowered). *Flowers* about ·4 in. long, on short pedicels. *Calyx-tube* clavate, not grooved when fresh, surmounted by about 8 linear obtuse fleshy lobes as long as itself, at first spreading, but finally reflexed. *Petals* as many as but shorter than the calyx-lobes, apex bifid, the margins with scanty white hairs outside; the apical lobes obtuse, each crowned by 3–5 flexuose pale hairs, the sinus with a single bristle. *Stamens* 16, unequal. *Fruiting-calyx* about ·5 in. long, the fruit in its fundus with the growing radicle protruding and growing to 6–8 in. in length. Arn. in Ann. Nat. Hist., I, 368; Wight Ill. 210; Miq. Fl. Ind. Bat., Vol. I, Pt. I, 589; Kurz For. Flora Burma I, 450; Hook. fil. Fl. Br. Ind. II, 438. Trimen Flora Ceylon, I, 153. *Rhizophora caryophylloides*, Jack Mal. Misc. I. 34; Hook. Bot. Misc. II, 80; Wall. Cat. 4879; DC. Prod. III, 32. *Kanilia caryophylloides*, Blume Mus. Bot. Lugd.-Bat. I, 141; Thwaites En. Pl. Ceyl. 120. *B. parviflora*, Wall. (not of Blume) Cat. 4877 C and D.

In tidal Forests like the other species of the genus; in all the provinces. DISTRIB. Malay Archipelago.

4. *BRUGUIERA PARVIFLORA*, W. & A. Prodr. 311; Arn. in Ann. Nat. Hist. I, 369. A shrub or small tree; young branches slender, the cicatrices distant. *Leaves* oblong-lanceolate to elliptic-lanceolate, acute, much attenuate at the base; upper surface shining and showing the

nerves faintly when dry; the lower dull and evenious; length 3-3.5 in., breadth .8-1.25 in., petiole .75-1 in. *Cymes* axillary, longer than the petioles, laxly 2-5-flowered, erect. *Flowers* erect, .4-.5 in. long, their peduncles slightly shorter. *Calyx-tube* cylindric, crowned by 8 lanceolate erect lobes about a fourth of its own length. *Petals* as many as the calyx-lobes but shorter, oblong; the apex broad; emarginate and bearing five white short hairs, otherwise glabrous. *Stamens* 16, unequal, two embraced by each petal. *Ovary* 3-celled, fruiting-calyx cylindric, ribbed, 1 in. long, the fruit concealed in it; radicle growing to 4-5 in. before falling. Wight Ill. 210; Miq. Flor. Ind. Bat. Vol. I., Pt. 1, 588; Kurz For. Flora Burma, II, 449. *B. cylindrica*, W. & A. Prod. 311. *Rhizophora cylindrica*, Roxb. Hort. Beng. 36. *R. parviflora*, Roxb. Fl. Ind. II, 461; Wall. Cat. 4877. *Kanilia parviflora*, Blume Mus. Bot. Lugd.-Bat. I, 140 t. 30; Dalz. & Gibs. Flora Bombay 95.

Tidal Forests in all the provinces. **DISTRIB.** Malaya.

### 3. CERIOPS, Arn.

Shrubs. *Leaves* opposite, ovate or obovate. *Stipules* caducous, axillary. *Cymes* condensed. *Calyx* 5-6-merous, surrounded at the base by connate bracts. *Petals* 5-6, inserted at the base of a 10-12-lobed fleshy disc, emarginate or truncate; their apices ciliate or with clavate or capitate bristles. *Stamens* 10-12, filaments inserted between the lobes of the disc; anthers 2-celled. *Ovary* 3-celled (at least above), cells 2-ovuled; style short, stigma simple. *Fruit* obovoid, the reflexed limb of the calyx persistent at its base, 1-celled, 1-seeded. *Germination* as in *Rhizophora*. **DISTRIB.** Species 7; river-mouths, tropics of Old World.

Flowers sessile; petals setose-ciliate at the apex; anthers linear, longer than the filaments ... .. 1. *C. Roxburghiana*.  
Flowers pedicelled; petals with 3 short clavate processes at apex; anthers ovate, acute, much shorter than filaments 2. *C. Candolleana*.

1. **CERIOPS ROXBURGHIANA**, Arn. in Ann. Nat. Hist. I, 364. A glabrous dwarf tree or shrub 2-4 feet high. *Leaves* elliptic, slightly obovate, or orbicular-elliptic, the apex rounded, the edges slightly recurved, rather narrowed at the base, (often somewhat abruptly); main nerves faint on both surfaces; the upper surface shining, the lower dull; length 2.25-3.75 in., breadth 1.5-2.25 in., petiole .75-1.15 in. *Cymes* axillary, shortly pedunculate, not branched; flowers .2 in. long, sessile, densely crowded. *Calyx* with 5 or 6 ovate-lanceolate sub-acute lobes. *Petals* oblong-obovate, the apex emarginate or sub-truncate, setose-ciliate. *Anthers* linear, much longer than the short filaments. *Fruit* clavate, .5 or .6 in. long, the protruded radicle a few inches long, clavate,



deeply ridged and furrowed. Miq. Fl. Ind. Bat. Vol. I, Pt. 1, 591; Kurz For. Flora Burma, I, 448; Hook. fil. Fl. Br. Ind. I, 436; Trimen Flora Ceylon I, 153. *Rhizophora decandra*, Roxb. Hort. Beng. 36; Wall. Cat. 4875.

At the mouths of rivers, probably in all the provinces. **DISTRIB.** Tropical-tidal forests of the old World.

2. **CERIOPS CANDOLLEANA**, Arn. in Ann. Nat. Hist. I, 364. A glabrous shrub or dwarf tree 3-6 feet high. *Leaves* obovate-oblong, obtuse, sometimes emarginate, much and gradually attenuate to the base, the edges slightly reflexed, main nerves slightly visible on both surfaces when dry, length 1.75-2 in., breadth 1-1.5 in., petiole .6-1 in. *Cymes* axillary, peduncled, branched; flowers .25 in. long, on short pedicels. *Calyx-lobes* 5, oblong, sub-obtuse. *Petals* oblong-obovate, the apex truncate or emarginate and with 3 short clavate appendages. *Stamens* 10, nearly as long as the petals; the anthers ovate, acute, only about a fourth of the length of the filaments. *Fruit* clavate, .5 in. long, the protruded radicle a few inches to a foot long, (rarely longer,) gradually thickening to near the apex and then becoming acute, deeply grooved and ridged. Blume Mus. Bot. Lugd.-Bat. I, 142; Wight Ill. 209; Icones t. 240; Miq. Fl. Ind. Bat. Vol. I, Pt. 1, 590; Brandis For. Flora 218; Kurz For. Flora Burm. I, 448; Hook. fil. Fl. Br. Ind. II, 436; Trimen Flora Ceylon I, 152. *Rhizophora timorensis*, DC, Prod. III, 32.

At the mouths of rivers and in tidal swamps in all the provinces. **DISTRIB.** Tropics of old World.

#### 4. **KANDELIA**, Wight & Arn.

A small tree. *Leaves* opposite, coriaceous, oblong, obtuse; stipules caducous. *Peduncles* axillary, dichotomously branched, few-flowered. *Flowers* rather large, white. *Calyx* 5-6-merous, surrounded at the base by connate bracteoles, adnate to the base of the ovary; lobes linear-lanceolate, valvate. *Petals* 5 or 6, bifid; the lobes multifid, segments capillary. *Stamens* indefinite, anthers small; filaments slender, exserted. *Ovary* 1-celled, half-inferior, prolonged above the calyx into a fleshy cone; style slender, stigma 3-lobed; ovules 6, fixed in pairs to a central column. *Fruit* ovoid, girt at the base by the reflexed limb of the calyx, 1-celled, 1-seeded. *Radicle* fusiform, very acuminate. *Germination* as in *Rhizophora*. **DISTRIB.** A single species; British India, Malaya.

1. **KANDELIA RHEEDI**, W. & A. Prodr. I, 310. *Leaves* narrowly elliptic-oblong, obtuse, narrowed at the base, glabrous, 2-4 in. long, the petiole .4-.6 in. *Peduncles* longer than the petiole, 2-3-chotomous, 4-9-flowered. *Flowers* .6-.8 in. long, white. *Fruit* 1 in. long, obovoid; the protruded radicle 6-15 in. long, cylindric, not ridged. Arn. in Ann. Nat.

318 G. King—*Materials for a Flora of the Malayan Peninsula*. [No. 1, Hist. I, 365; Blume Mus. Bot. 135; Wight Ill. I, t. 89; Hook. Ic. Pl. t. 362; Wall. Cat. 4876; Kurz For. Flor. Brit. Burm. I, 449. Kurz For. Flora Burma, I, 449; Hook. fl. Fl. Br. Ind. II, 437. *Rhizophora Candell*, Linn. Sp. Pl. 443; DC. Prodr. III, 32; Roxb. Hort. Beng. 36; Wall. Cat. 4876.

ANDAMAN ISLANDS, and probably also in the other provinces.

#### 5. CARALLIA, Roxb.

Trees or shrubs. *Leaves* coriaceous, glabrous, petiolate, ovate or elliptic; stipules caducous. *Peduncles* short, rather thick. *Flowers* small, in short 3-chotomous axillary branching cymes, sessile and often crowded. *Calyx-tube* cylindrical or campanulate, minutely bracteate at the base; limb 5-8-lobed, the lobes erect, short, valvate. *Petals* 5-8, inserted on the margin of a crenulated disk lining the calyx-tube, clawed, orbicular, 2-fid or entire, subserrate or lacerate at the apex. *Disc* epigynous, 10-16-lobed. *Stamens* inserted with the petals, filaments filiform; anthers small, oblong. *Style* subulate or filiform. *Fruit* small, globose, coriaceous, 1-celled, 1-seeded (*unknown in two species*). *Seed* globose-reniform, testa fibrous, embryo curved.—**DISTRIB.** Species about 12, natives of the Indian Ocean.

- |  |     |     |                             |
|--|-----|-----|-----------------------------|
| Cymes on peduncles as long as the petioles, bearing numerous crowded sessile flowers .15 in. long                  | ... | ... | 1. <i>C. lucida</i> .       |
| Cymes on peduncles slightly longer than the petioles, bearing from 3-5 shortly pedicelled flowers .1 in. long      | ... | ... | 2. <i>C. Scortechinii</i> . |
| Cymes on peduncles much longer than the petioles, bearing 3 flowers .25 in. long on pedicels as long as themselves | ... | ... | 3. <i>C. eugenoidea</i> .   |

1. *CARALLIA LUCIDA*, Roxb. Hort. Beng. 92; Corom. Plants III, t. 211. A small glabrous tree; young branches thin, dark-coloured when dry. *Leaves* coriaceous, varying from obovate to elliptic-oblong, oval or oblong-lanceolate; the edges recurved, entire or serrulate in the upper half or three-fourths, the apex usually shortly cuspidate, the base more or less cuneate; both surfaces shining and reticulate; the main nerves numerous, spreading and interarching freely; length 2.5-3 in., breadth 1-1.75 in., petiole .25-.35 in. *Cymes* axillary and from the axils of fallen leaves, on stout peduncles about as long as the petioles, densely umbellate, usually trichotomous. *Flowers* .15 in. long, sessile. *Calyx-tube* cylindrical, its mouth with 6 or 7 short triangular incurved teeth. *Petals* equal in number to the calyx-teeth, orbicular, crenate, clawed, not embracing the stamens. *Stamens* twice as many as and longer than the petals, the filaments much longer than the ovate anthers. *Fruit* pisiform, glabrous, pulpy, 1-celled and usually only 1-seeded. Roxb. Fl. Ind. II, 481; Wall. Cat. 4880; Wight Ic. 605; Kurz For. Flora Burma, I, 451. *C. integerrima*, DC. Prodr. III, 33; Wight Ill. t. 90;

Benth. in Journ. Linn. Soc. III, 74; Bedd. Fl. Sylvat. t. CXCIII; Dalz. and Gibs. Fl. Bomb. 96; Brandis For. Flora 219; Hook. fil. Fl. Br. Ind. II, 439. Trimen Flora Ceylon I, 155. *C. ceylanica*, *C. corymbosa*, and *C. sinensis*, Arn. in Ann. Nat. Hist. I, 371. *C. ceylanica*, Arn. Wight III. 211 t. 90. *C. timorensis*, Blume Mus. Bot. Lugd. Bat. I, 128? *C. octopetala*, Muell. Fl. Aust. Trop. Occ. ex Benth. in Journ. Linn. Soc. III, 74. *C. symmetria*, Blume Mus. I. c. 130.

PERAK; very common. SINGAPORE, and probably also in several of the other provinces. DISTRIB. Malayan Archipelago, China, Australia, British India.

DeCandolle's *C. integerrima*, published in 1828, is in my opinion merely the entire-leaved form of this very common Indian tree, the leaves of which are sometimes serrulate and sometimes entire. It is a tree which Roxburgh could not possibly have overlooked. He published and figured the serrulate-leaved form of it as *C. lucida* in his Coromandel Plants (1819), having previously given the name in his Hortus Bengalensis, p. 92. In the belief that *C. lucida* is the oldest name for this plant, I have followed Kurz in restoring it. DeCandolle's name *C. integerrima* is however adopted by Mr. Benthham, and also by Mr. Henslow who described the *Rhizophoreæ* in Hooker's Flora of British India.

2. CARALLIA SCORTECHINII, King n. spec. A shrub or small tree; young branches slender, opposite, smooth, dark-coloured when dry. *Leaves* lanceolate or ovate-lanceolate, shortly caudate-acuminate, the base slightly cuneate; the edges entire, slightly revolute when dry; both surfaces shining, the lower with sparse black dots and with the numerous spreading main nerves slightly prominent; length 2-2.75 in., breadth 1-1.25 in., petiole .2-25 in. *Stipules* lanceolate, .25 in. long, caducous. *Cymes* axillary, on pedicels slightly longer than the petioles, trichotomous, spreading, not crowded. *Flowers* 3-5, rather more than .1 in. long and about the same in width at the mouth, on pedicels nearly .1 in. long and bracteolate at the base. *Calyx-tube* campanulate, with 5 triangular lobes half as long as itself, their apices slightly inflexed. *Petals* 5, thin, reniform, rose-crenate, clawed, each embracing a stamen. *Stamens* 10, inserted on the 10-toothed epigynous disc, unequal. *Ovary* adnate to the calyx-tube, 5-celled, with 2 axile ovules in each cell. *Style* stout, as long as the calyx-lobes, stigma 5-lobed. *Fruit* unknown.

PERAK; *Scortechini* 2023; *King's Collector* 1013. SINGAPORE; *Ridley* 5593.

The specimens collected by Scortechini are described by him as taken from a shrub 5 or 6 feet high, while those collected by Mr. Kunstler are noted as from a tree 30-40 feet in height. They resemble each other exactly both in flowers and leaves, and I have no doubt whatever that the two belong to the same species. I give this species a name with considerable hesitation; for it does not differ much from Roxburgh's description of *C. lancæfolia*. It also closely resembles *C. cuspidata*, Blume, in leaves, but has larger flowers.

3. *CARALLIA EUGENOIDEA*, King n. spec. A tall tree; young branches slender, glabrous, reddish when fresh, black when dry. *Leaves* oblanceolate, the apex sub-acute, the base cuneate, the edges thickened and with black glandular dots, entire; upper surface shining when dry; the lower dull, the 6-8 pairs of spreading main-nerves slightly prominent; length 1.75-2.25 in., breadth .8-1.1 in., petiole .2-.25 in. *Stipules* in pairs, lanceolate, .25 in. long, caducous. *Cymes* axillary, their peduncles an inch or more in length, bearing at the apex, on pedicels as long as themselves, 3 flowers .25 in. in length. *Calyx-tube* narrowly campanulate, with 5 triangular lobes as long as itself. *Petals* apparently none. *Stamens* twice as many as the calyx-lobes; the filaments alternately shorter, inserted on the 10-lobed disc. *Ovary* occupying the tube of the calyx, 5-celled, with 2 nearly pendulous ovules in each cell; *stigma* 5-lobed. *Fruit* unknown.

PERAK; *Scortechini*, 326.

In the externals of the flowers and also in its leaves this has a superficial resemblance to a *Eugenia*; but the presence of stipules and the structure of the flower show it to be a true *Curallia*.

#### 6. PELLACALYX, Korth.

Trees with bifarious opposite petiolate entire or obscurely serrulate leaves and interpetiolar elongate caducous stipules. *Flowers* axillary, solitary or in pairs, minutely bracteolate. *Calyx* ebracteolate, its tube tubular-campanulate, adherent to the ovary at its base; the mouth expanded and with 4-6 short recurved valvate teeth. *Petals* 4-6, lacerate at the apex, inserted on the margin of the tube of the calyx. *Stamens* 8-12, incurved, inserted on the margin of the thin crenulated disc lining the calyx-tube. *Ovary* half-inferior, 5-10-celled. *Style* subulate; stigma discoid, 5-10-lobed; ovules many in each cell, fascicled, attached to the axis. *Fruit* fleshy, sub-globose, 5-10-celled, many-seeded. *Seeds* ovoid, with striate testa; albumen copious with the embryo in its axis; cotyledons flat, narrow; the radicle terete and elongate. *DISTRIB.* Two species, both Malayan.

Calyx-tube with 5 or 6 teeth; flowers 5-merous; leaves

densely stellate rusty-pubescent beneath ... .. 1. *P. axillaris*.

Calyx-tube with 4 teeth; flowers 4-merous; leaves glabrous 2. *P. Saccardianus*.

1. PELLACALYX AXILLARIS, Korth. in Van der Hoeff. & De Vr. Tijdsch. III, 20, t. 2. Young branches rusty-pubescent. *Leaves* thinly coriaceous, oblong, sometimes slightly wider above the middle, the apex shortly and abruptly acuminate, the base rounded; upper surface with a few small scattered sub-stellate hairs, or sub-glabrous when old, the midrib always pubescent; lower surface boldly reticulate and stellately

rusty-pubescent; main nerves about 12 pairs, conspicuous beneath, curving sharply upwards; length 4·5–7 in., breadth 1·25–2 in.; petiole 2–3 in., rusty-pubescent; *stipules* lanceolate, rusty-pubescent, 35 in. long. *Flowers* 25–35 in. long, on pedicels of about the same length, both rusty-pubescent. *Fruit* pisiform, fleshy, 25 in. in diam., crowned by the persistent wide upper part of the calyx. Benth. in Journ. Linn. Soc. III, 76; Griff. Notul. IV, 420; Ic. Pl. Asiat. t. 486.

MALACCA; *Griffith* 2217/1; *Maingay* 638. PENANG; *Griffith*; *Curtis* 937. SINGAPORE; *Ridley* 6917; *Anderson*, 81. PERAK; *Scortechini* 119; *King's Collector*, 1049, 2036.

2. PELLACALYX SACCARDIANUS, *Scortechini* in Nuov. Giorn. Bot. Ital. XVII, 143. A small tree, young branches rusty-puberulous. *Leaves* thinly coriaceous, oblong, shortly acuminate, edges entire, base rounded or cuneate; upper surface quite glabrous, shining; the lower dull, paler, slightly reticulate, glabrous or sometimes puberulous near the midrib and nerves; main nerves 7–9 pairs, rather prominent beneath, spreading and curving upwards; length 4–7 in., breadth 1·6–2 in., petiole 25 in. *Flowers* about 25 in. long, on slightly shorter pedicels, rusty-puberulous. *Calyx-tube* as in *P. axillaris* but only 4-cleft. *Petals* 4, broadly oblong, emarginate, irregularly toothed towards the apex, narrowed and entire at the base. *Stamens* 8. *Ovary* usually 9-celled. *Fruit* as in *P. axillaris*, but glabrous. Hemsley in Hooker's Ic. Pl. 1546.

PERAK; *Scortechini* 325. *Wray* 701, 1328. MALACCA; *Maingay* 639.

This differs from *P. axillaris*, Korthals, in having glabrous or nearly glabrous leaves with only 7–9 pairs of main nerves, and also in its tetramerous flowers.

## 7. GYNOTROCHES, Blume.

Trees or shrubs. *Leaves* coriaceous, shining; *stipules* deciduous. *Flowers* small, axillary, fascicled, the peduncles joined in the middle. *Calyx* ebracteolate, 4–5-partite; segments valvate, reflexed. *Petals* 4–5, inserted below the margin of an 8–10-lobed perigynous disc, clawed, spathulate, fimbriate-lacerate. *Stamens* 8–10, inserted on the disc, filaments filiform, anthers small. *Ovary* superior, adhering by a broad base to the calyx, ovoid-globose, 3–6-angled, 3–6-celled; style columnar, furrowed, conical at the base; stigma peltate, deeply 5-lobed; lobes emarginate, recurved; ovules 4 in each cell, ascending, fascicled. *Berry* globose, 4–6-celled, many-seeded. *Seeds* small, obovoid, testa crustaceous and wrinkled, albumen fleshy, embryo terete. **DISTRIB.** Species 2, both Malayan.

GYNOTROCHES AXILLARIS, Blume Bijdr. 219. A tree; young branches dark-coloured, smooth. *Leaves* oblong, or elliptic-oblong to elliptic, tapering to each end; the apex shortly and rather bluntly acuminate,

the edges entire; both surfaces shining, the lower much reticulate; main nerves 9–12 pairs, spreading, curving upwards; length 3·5–5·5 in., breadth 1·25–2·5 in., petiole ·25–·35 in. *Fascicles* 6–10-flowered, axillary, shorter than the petioles. *Flowers* less than 1 in. long, the pedicels about as long as the fruit-producing flowers, sub-dioecious; the stamen-bearing flowers with perfect petals, but the ovary and stigma abortive; the flowers with fertile ovaries and with perfect stigmas having imperfect stamens and often abortive petals. *Fruit* a globular glabrous berry ·1–1·5 in. in diam. Blume Mus. Bot. Lugd. Bat. I, 127, t. XXXI; Miq. Fl. Ind. Bat. Vol. I. Pt. I, 592; Kurz For. Flora Burma, I, 451; Hook. fil. Fl. Br. Ind. II, 440. *G. Dryptopetalum*, Blume Mus. l. c. 127; Miq. Fl. Ind. Bat. l. c. 592. *Dryptopetalum coriaceum*, Arn. in Ann. Nat. Hist. I, 372. *G. reticulata*, A. Gray. Bot. Amer. Expl. Expedit. Vol. I, 607? *Microtropis coriacea*, Wall. Cat. 4338. *Casearia? acuminata*, Wall. Cat. 7198. *Rubiacea*, Wall. Cat. 8455.

In all the provinces; common. **DISTRIB.** The Malayan Archipelago.

#### 8. ANISOPHYLLEA, Br.

Trees and shrubs. *Leaves* exstipulate, distichous, obliquely ovate-lanceolate or elliptic, with 3–5 main nerves proceeding from the base (the nervation pinnate in one species), quite entire; the alternate leaves sometimes smaller or minute and stipuliform. *Flowers* monoecious, minute, in axillary simple or fascicled spikes, ebracteate or minutely bracteolate. *Calyx-tube* of ♀ flower ovoid, adnate to the ovary, terete or ribbed; limb 4-fid, lobes erect. *Petals* 4, small, involute, entire, lobed or lacerate. *Stamens* 8; filaments short, subulate; anthers small, didymous, usually abortive in the females. *Ovary* inferior, 4-celled; styles 4, subulate, erect or recurved, stigmas acute or subcapitate; ovules solitary in each cell, pendulous, anatropous. *Fruit* coriaceous, oblong or pyriform, ribbed or smooth, 1-seeded. *Seed* pendulous, exalbuminous, testa coriaceous, embryo clavate, cotyledons very small or 0, radicle large. **DISTRIB.** Species 10, natives of Tropical Asia and Africa.

Leaves dimorphous ... ..	1. <i>A. disticha</i> .
Leaves uniform :—	
Flowers apetalous ... ..	2. <i>A. apetalata</i> .
Flowers with 4 petals :—	
Petals minute, deltoid .. ..	3. <i>A. Gaudichaudiana</i> .
Petals thick, subquadrate, entire or subemarginate	4. <i>A. Griffithii</i> .
Petals 3-fid at the apex ... ..	5. <i>A. Scortechinii</i> .
Petals divided to the very base into narrow segments ... ..	6. <i>A. Curtisii</i> .

1. ANISOPHYLLEA DISTICHA, Baill. in Adansonia, XI, 311. A shrub with ferruginous-pilose slender branches. *Leaves* dimorphous, in two

series; the longer oblong-rhomboid, subfalcate, acute, the base cuneate, subsessile, 3-nerved, puberulous or pubescent or sometimes nearly glabrous on both surfaces, .75–1.5 in. in length and about one-third or one-quarter as much in breadth; the smaller set stipule-like, lanceolate and only .25–.3 in. long, inserted below the larger and overlapping their bases. *Male flowers* in short few-flowered axillary fascicles and racemes much shorter than the leaves, .05 in. in diam., on short pedicels; *calyx* with 4 broad lobes; *petals* shorter than the calyx, trifid; *stamens* 8, as long as the petals. *Female flowers* solitary, larger than the males, subsessile; *calyx-tube* elongated, tubular, pubescent externally, connate with the ovary, crowned at the apex with 4 triangular lobes; *petals* and *stamens* as in the male; *styles* stout, shorter than the petals, truncate; *stigmas* 2-lobed; *fruit* narrowly elliptic, tapering to each end, with 8 vertical grooves, glabrous; seed oblong. Hook. fil. in Herb. Kew; Hensl. in Hook. fil. Fl. Br. Ind. II, 442. *Anisophyllea trapezoidalis*, Baill. in Adansonia, XI, 311. *Anisophyllum trapezoidale*, Baill. in Adansonia, III, 24, 26. *Haloragis disticha*, Jack Mal. Misc. VII, 19; Wall. Cat. 2519; Hook. Journ. Bot. I, 371; Calc. Journ. Nat. Hist. IV, 336.

In all the provinces except the Andamans and Nicobars; common. **DISTRIB.** The Malayan Archipelago.

The name *Anisophyllea* was first given to this genus by Robert Brown, who however published no description of it. In 1823, Sabine (in a paper published in the *Trans. Hort. Soc. Lond.*) first used it in giving a popular description of a plant from Sierra Leone under the name *A. laurina*. Overlooking this publication, Don founded for that very plant the genus *Anisophyllum*, and named it *Anisophyllum laurinum*, and this name was published in 1849 in Hooker's *Niger Flora*, 342. In the addenda and corrigenda to that volume, Don's name is however reduced and Brown's is restored. Baillon (in *Adansonia* III, 24 and 36,) applied the generic name *Anisophyllum* to three plants of which the present species is one. But, in a subsequent volume of *Adansonia* (XI, 310 and 378) and in his *Histoire des Plantes* (VI, 304), Baillon abandons Don's name *Anisophyllum* and adopts Brown's earlier one.

2. **ANISOPHYLLEA APETALA**, Scortechini MSS. in Herb. Calcutt. A tree 30–40 feet high; young branches slender, glabrous. *Leaves* membranous, oblong to elliptic or ovate-elliptic, or elliptic-lanceolate, caudate-acuminate, the base rounded or slightly cuneate; both surfaces glabrous, minutely reticulate; the upper shining, the lower somewhat dull when dry; main nerves 5, springing from the apex of the petiole, the middle three bold, the two lateral rather faint; length 3–8 in., breadth 1.25–3 in., petiole .25–.3 in. *Racemes* in lax few-branched extra-axillary panicles as long as the leaves, the rachises glabrous. *Flowers* monocious, depressed-globular, usually tetramerous, sometimes (fide Scortechini) pentamerous. *Male flowers* on pedicels longer than

themselves; *calyx* deeply cut into 4 (rarely 5) triangular thick concave segments; *petals* none; *stamens* 4, exserted, the filaments dilated at the base; *styles* and *ovary* rudimentary. *Female flowers* on the same branches as the males, sessile; *calyx-tube* slightly elongated, the lobes of the mouth smaller than in the male, staminodes shorter than the calyx-lobes; *ovary* tetragonous, included in the calyx-tube, the styles exserted; *fruit* ovoid or elliptic, tapering to each end, glabrous, with vertical purple stripes, 2-3 in. long and 1-1.25 in. in diam.; pericarp woody, thick.

PERAK; *Scortechini*, 684 and 1808; *Wray* 2340, 2758; *King's Collector* 2932, 4326, 4792, 6587, 6318, 7399.

This resembles *A. Gaudichaudiana*, Baill. in the shape of its leaves which are, however, much thinner in texture and more caudate-acuminate. It differs from that, however, in having apetalous flowers, and in the males having longer pedicels. The fruit also differs, being pointed at each end and quite glabrous, whereas the fruit of *A. Gaudichaudiana* is obtuse at the ends and rusty-pubescent.

3. ANISOPHYLLEA GAUDICHAUDIANA, Baill. in *Adansonia*, XI, 311. A tree 50-80 feet high; young shoots rather slender, glabrous, minutely lenticellate. *Leaves* coriaceous, broadly oblong to elliptic-oblong, entire, shortly and rather bluntly acuminate, the base rounded or slightly narrowed; both surfaces glabrous, dull when dry, with wide reticulations and 5, rarely 7, bold vertical curving main nerves springing from the apex of the petiole, the transverse connecting veins distinct; length 6-10 in., breadth 2.5-4 in.; petiole .25-3 in., stout, channelled, articulate at the base. *Panicles* axillary, solitary or in fascicles, much shorter than the leaves, with few short distant spicate rusty adpressed-pubescent branches. *Flowers* monœcious. *The males* depressed-globose, mostly about .05 in. in diam., on short pedicels; *calyx* of 4 triangular concave fleshy segments; *petals* deltoid, much smaller than the calyx-lobes. *stamens* 8, incurved, pistil rudimentary. *Female flowers* sessile, longer than the males; the *calyx-tube* elongate, tubular, containing the ovary, its mouth with segments like the male; *stamens* none; *styles* 4, recurved. *Fruit* large, subpyriform or ellipsoid, sub-oblique, obtuse, minutely rusty-pubescent, 3.5 in. long, and 2.25 in. diam.; pericarp woody, .5 in. thick. *Seed* solitary. Hook. Ic. Plant. 1551. *A. grandifolia*, Hensl. in Hook. fil. Fl. Br. Ind. II, 442. *Cocculus* ?? *flavicans*, Wall. Cat. 4976. *Strychnos* ? *grandis*, Wall. Cat. 4454. *Anisophyllum flavicans*, Hook. & Thoms. Fl. Ind. 175. *A. grande*, Benth. in Journ. Linn. Soc. I, 79.

PENANG; *Gaudichaud*, *Maingay* 1517, *Curtis* 521, *Stolickza*. PERAK; *King's Collector* 2706, 2731, 5472; *Ridley* 3029.

On the principle by which Herr Otto Kuntze desires to guide botanical nomenclature Baillon's name *A. Gaudichaudiana* would have to give way to the name *A.*



*grandis*, because, although Wallich referred the plant to a family with which it has no affinity, he gave it the earliest specific name "*grandis*."

4. ANISOPHYLLEA GRIFFITHII, Oliver in Trans. Linn. Soc. XXIII, 460. t. 48. A tree 40-50 feet high, with drooping branches; young branches slender, glabrous. *Leaves* thinly coriaceous, greenish-yellow when dry, lanceolate, ovate-lanceolate or broadly elliptic-lanceolate, the apex bluntly acuminate, the base cuneate, the edges entire and slightly revolute when dry; both surfaces glabrous and very minutely dotted, the upper shining, the lower rather dull; length 2.5-3.5 in., breadth 1.2-2 in., petiole .15-.2 in.; a basal nerve springing from the apex of the petiole on each side and running close to the edge; main nerves pinnate, about 6 pairs, oblique, curving but slightly. *Spikes* solitary or in pairs, axillary or extra-axillary, slender, tawny-puberulous, .75-1 in. long, (1.5-2.75 in., *vide* Oliver), laxly-flowered. *Male flowers* .05 in. in diam., sessile; *calyx-limb* with 4 triangular coriaceous lobes; *petals* 4, shorter than the calyx-lobes, thick, broadly-oblong, subquadrate, entire or faintly emarginate; *stamens* 8, the 4 opposite to the petals attached to the latter, filaments dilated, anthers broadly-elliptic; *styles* 4, free, subulate, ovary imperfect. *Female flowers* like the males, but the *calyx-tube* elongated and containing the 4-celled ovary. *Fruit* globular-ellipsoid, obtuse at each end, glabrous, smooth, 1.75 in. long and 1.35 in. in diam. Laws. in Hook. fl. Fl. Br. Ind. II, 442.

MALACCA; Griffith 2439. PENANG; Curtis 148 and 1511. PERAK; King's Collector 7600.

This differs from all other Malayan species in the pinnate venation of its leaves. There are indeed two nerves which spring along with the midrib from the apex of the petiole and run round the edges, but the midrib has pinnate branches.

5. ANISOPHYLLEA SCORTECHINII, King n. spec. A tree 25-30 feet high; young branches slender, rusty-tomentose. *Leaves* falcately lanceolate-rhomboidal, the apex much acuminate, the base obliquely acute; both surfaces shining, the upper quite glabrous, the lower glabrous except for a few thin scattered brown apically-directed adpressed hairs on the intercostal spaces; the nerves (and particularly the middle one) more pubescent, especially towards the base; main nerves 3, 4 (from the splitting of the middle one) or rarely 5, springing from the apex of the petiole, the middle one straight, the two lateral curved; all prominent on the lower and deeply depressed on the upper surface; connecting veins sub-horizontal, prominent; length 2.5-3 in., breadth .6-1.25 in., petiole .15 in. *Panicles* extra-axillary, with only 1 or 2 branches, .5-1 in. long, rusty-pubescent. *Male flowers* .1 in. in diam., on pedicels as long as themselves, minutely bracteolate at the base; *calyx-lobes* 4 or 5, broadly ovate-acute, not concave, reflexed; *petals*

shorter than the calyx-lobes, 3-fid at the apex; *stamens* 8; *styles* 4, conical, rudimentary. *Female flower* larger than the male and with the calyx-tube elongated and containing the ovary; lobes of the mouth broadly ovate; *stamens* 8; rudimentary *styles* 4, stout, as long as the calyx-lobes; *stigmas* sub-capitate. *Fruit* ellipsoid, glabrous, .75 in. long and .4 in. in diam., glabrous, smooth; the pericarp woody.

PERAK; *Scortechini* 1807. *Wray* 960 and 2100; *King's Collector* 5681, 8821.

A species closely allied to the Bornean *A. rhomboidea*, Baill. The latter species has however leaves of thinner texture, and their main nerves are more pubescent beneath while, instead of being deeply depressed on the upper surface, they are scarcely visible. The transverse veins are also finer and less visible than in the leaves of this, while the lower surface has numerous minute white scales; the leaves of this have no scales. The petals of *A. rhomboidea* are described by Baillon as flabellate-incised.

6. ANISOPHYLLEA CURTISII, King n. spec. A tree 30–40 feet high with drooping branches; young twigs slender, deciduously and sparsely adpressed rusty-pubescent. *Leaves* thinly coriaceous, elliptic-lanceolate, slightly oblique especially towards the rather abruptly and obliquely cuneate base, gradually tapering to the caudate-acuminate apex; upper surface glabrous, not reticulate; the lower faintly reticulate, glabrous except for a few adpressed hairs near the base; main nerves 5, springing from the apex of the petiole, the two outer faint and running close to the edge, the three middle prominent on the lower surface but obsolete on the upper; length 2.5–3.25 in., breadth .8–1.25 in., petiole .2 in. *Male and female flowers* on distinct adpressed-pubescent spikes about .5 in long, each flower with a short blunt bracteole at its base. *Male flowers* .15 in. long, sessile, clavate; calyx-tube elongate, rusty adpressed-pubescent externally, its mouth with 4 broadly triangular lobes; *petals* 4, as long as the calyx-lobes or longer, cut almost to the base into filiform lobes; *stamens* 8, with filaments of unequal length, those with short filaments attached to the petals; *styles* subulate, ovary abortive. *Female flowers* .25 in. long, the calyx-tube longer than in the male and ribbed; lobes of the mouth reflexed. *Petals* as in the male but larger and with more lobes; *stamens* as in the male; *style* as long as the petals. *Fruit* unknown.

PENANG; *Curtis* 746.

A very distinct species, at once recognised by its comparatively large flowers and deeply fimbriate petals; allied to *A. rhomboidea*, Baill. and to *A. Scortechinii*, King; but well distinct from either.

#### ORDER XLV. COMBRETACEÆ.

Trees or shrubs, often climbers. *Leaves*. alternate subopposite or

opposite, sometimes ternate, petioled, entire, simple (in *Illigera* 3-foliolate); stipules 0. *Flowers* bracteolate at the base, in the tribe *Gyrocarpeæ* cymose; in the *Combretææ* spicate or racemose (the racemes often paniced); often polygamo-monœcious. *Calyx-tube* adnate to the ovary and produced above it (sometimes to a great length), the limb of 4-5 (rarely 4-7) valvate lobes. *Petals* 4-5 or 0, (rarely 6-7). *Stamens* 4-5 or 8-10, inserted on the calyx; (in the *Gyrocarpeæ* the filaments with staminodes attached at the base, and the anthers dehiscing by recurved lateral valves). *Ovary* inferior, 1-celled; style simple; stigma simple or in *Illigera* sinuate, almost lobed; ovules 1-7 (usually 2-3), pendulous from the apex of the cell. *Fruit* coriaceous or drupaceous, generally indehiscent, ovate, angular or very commonly winged; in *Calycopteris* and *Gyrocarpus* crowned by the greatly enlarged calyx. *Seed* 1, without albumen; cotyledons in *Terminalia* and others convolute; in *Combretum* and others plano-convex. **DISTRIB.** Species about 320, in the tropics of the whole world; and in S. Africa outside the tropics.

**SUB-ORDER I. COMBRETÆÆ.** *Calyx-lobes* valvate; *stamens* without basal glands or staminodes; the anthers with longitudinal dehiscence. *Ovules* 2-7, suspended by long funicles.

*Flowers* in spikes or racemes:—

*Flowers* apetalous:—

- |                              |     |     |     |                 |
|------------------------------|-----|-----|-----|-----------------|
| Limb of the calyx deciduous  | ... | ... | ... | 1. TERMINALIA.  |
| Limb of the calyx accrescent | ... | ... | ... | 2. CALYOPTERIS. |

*Flowers* with 4 or 5 petals (except in *Combretum apetalum*):—

- |  |     |     |     |                |
|--|-----|-----|-----|----------------|
| Limb of the calyx persistent, leaves alternate     | ... | ... | ... | 3. LUMNITZERA. |
| Limb of the calyx deciduous, leaves opposite:—     |     |     |     |                |
| Calyx-tube prolonged above the ovary for less than |     |     |     |                |
| '5 in. ...   | ... | ... | ... | 4. COMBRETUM.  |
| Calyx-tube prolonged above the ovary for from '75- |     |     |     |                |
| 2'5 in. ...  | ... | ... | ... | 5. QUISQUALIS. |

**SUB-ORDER II. GYROCARPEÆ.** *Calyx-lobes* valvate or imbricate; *stamens* with glands or staminodes at their bases; anthers dehiscing by up-turned valves. *Ovule* 1, suspended by a short funicle. *Flowers* cymose:—

- |                              |     |     |     |                |
|------------------------------|-----|-----|-----|----------------|
| Scandent; leaves 3-foliolate | ... | ... | ... | 6. ILLIGERA.   |
| Trees; leaves entire         | ... | ... | ... | 7. GYROCARPUS. |

### 1. TERMINALIA, Linn.

Large trees. *Leaves* alternate or subopposite, exstipulate, entire or slightly crenulate, often with glands on the petiole or near the base of the midrib beneath. *Flowers* small, spicate, (the spikes sometimes paniced), hermaphrodite, the upper flowers on the racemes often males and the lower hermaphrodite; a narrow deciduous bract at the base of each flower. *Calyx-tube* produced above the ovary, having a campanulate

mouth with 5 short valvate triangular lobes, deciduous. *Petals* 0. *Stamens* 10, inserted on the calyx-tube; the epigynous disc within them densely hairy. *Ovary* 1-celled, inferior; style long, simple; ovules 2 or 3, pendulous from the summit of the cell. *Fruit* ovoid, various in size and texture, smooth or angular, or with 2-5 wings, indehiscent, coriaceous. *Seed* solitary, exalbuminous, cotyledons convolute. **DISTRIB.** Species 135; in the tropics of both worlds.

**SECT. I.** Fruit ovoid or elliptic, sometimes compressed, never winged, but sometimes keeled at the edges or obscurely 4-5-ridged:—

- |   |                           |
|---|---------------------------|
| Leaves broadly oblong, lanceolate-oblong to elliptic-oblong; fruit sub-clavate, obscurely 5-ridged, glabrous, 2-3 in. long  | 1. <i>T. citrina.</i>     |
| Leaves elliptic or ovate, acuminate; fruit oblong, obscurely 5-ribbed, slightly compressed on one side, '6-'75 in. long, glabrous ... ..  | 2. <i>T. Manii.</i>       |
| Leaves obovate, broadly elliptic or sub-rotund, minutely papillose on the upper surface, the petioles very long (1'75-4 in.); fruit ovoid or globular-ovoid, minutely tomentose ... | 3. <i>T. belerica.</i>    |
| Leaves obovate, tapering to a very narrow base; fruit glabrous:—  |                           |
| Fruit elliptic, 2'25 in. long, with very thick corky pericarp; leaves 3-4 in. long ... ..   | 4. <i>T. phellocarpa.</i> |
| Fruit obovate-ellipsoid, plano-convex, 1'5 in. long; leaves 5-6'5 in. long... ..  | 5. <i>T. fatidissima.</i> |
| Fruit ellipsoid, somewhat compressed, keeled at the edges, 2 in. long; pericarp fleshy; leaves 6-9 in. long   | 6. <i>T. Catappa.</i>     |

**SECT. II.** Fruit narrowly elliptic, its edges produced into 2 broad leathery wings:—

- |  |                             |
|--|-----------------------------|
| Leaves obovate or oblong-obovate, 6-9 in. long, the petioles 2'25-2'75 in.; fruit 1'25-1'75 in. long, its breadth (including the wings) 2'5-3'5 in. ... .. | 7. <i>T. bialata.</i>       |
| Leaves spatulate-oblanceolate, 3-4 in. long, the petioles 1'15-1'5 in.; fruit '75-1'25 in. long; its breadth (including the wings) 1'2-2 in. ... ..        | 8. <i>T. subspathulata.</i> |

1. **TERMINALIA CITRINA**, Fleming in *Asiat. Res.* XI, 183. A glabrous tree 60-80 feet high; young shoots slender, rusty-pubescent, but at an early stage glabrous. *Leaves* thinly coriaceous, sometimes almost opposite, from broadly oblong-lanceolate to elliptic-oblong, on short bi-glandular petioles, the apex acute or shortly acuminate, the base cuneate or sometimes rounded; both surfaces when very young rusty-puberulous, afterwards perfectly glabrous and shining, the lower minutely areolate-reticulate, the bottom of the areolæ covered with white felt; main nerves 8-12 pairs, curving upwards, distinct on both surfaces when dry; length 3-6 in., breadth 1'25-2'5 in., petiole '4 or '5 in. *Spikes* in small panicles shorter than the leaves, axillary, deciduously rusty-puberulous.

*Flowers* .2 in. in diam., sessile, all hermaphrodite, each with a deciduous linear bracteole. *Calyx* glabrous outside, rusty-villous inside, the tube oblong; glands 5, rusty-woolly. *Drupe* oblong-lanceolate, slightly clavate, smooth, glabrous, obscurely 5-ridged, 2-3 in. long, and .75-1 in. in diam. Roxb. Hort. Beng. 33; Fl. Ind. II, 435; Wall. Cat. 3970; DC. Prodr. II, 12; Miq. Fl. Ind. Bat. I, pt. I, 602; Kurz For. Flora Burma, I, 456; Clarke in Hook. fil. Fl. Br. Ind. II, 446; W. & A. Prodr. 313; Brand. For. Fl. 223. *Myrobalanu citrina*, Gaertn. Fruct. II, t. 97.

## BRITISH INDIA.

VAR. 2. *malayana*, Clarke in Hook. fil. Fl. Br. Ind. II, 447. *Petioles* .75-1.25 in. long. *Fruit* about 1 in. long.

NICOBAR ISLANDS; *Jelinek*, Kurz. MALACCA; *Griffith* 2178. *Maingay* 643. PERAK; *King's Collector* 3173.

This species and its variety *malayana* may be readily distinguished from *T. Chebula*, Retz (which in many respects it resembles) and from every other Asiatic *Terminalia* by the peculiar areolate reticulation of the under surface of the leaves.

2. *TERMINALIA MANII*, King n. spec. A tree 20-40 feet high; young shoots slender, deciduously rusty-puberulous, lenticellate. *Leaves* thinly coriaceous, almost opposite, not crowded, scattered, elliptic or ovate, shortly and rather abruptly acuminate, the base rounded or somewhat cuneate and slightly oblique; both surfaces glabrescent or glabrous, minutely reticulate, the reticulations on the lower tessellate; main nerves 9-12 (rarely 14) pairs, spreading, curving upwards at the tips; length 3.25-6.5 in., breadth 2-3 in.; petiole .75 in. long, often with 2 sessile oblong glands at the sides near its apex. *Panicles* lateral and terminal, with numerous spike-like rusty-puberulous ultimately glabrous branches shorter than the leaves when in flower, longer when in fruit. *Flowers* .15 in. in diam. at the mouth, each subtended by a linear puberulous bracteole as long as itself. *Ovary* narrow, cylindric, thickened and pubescent towards the base, the upper half and the mouth glabrous outside; the mouth cupular with inconspicuous broad shallow teeth, woolly inside. *Stamens* exerted, glabrous. *Fruit* oblong, tapering a little to each end, slightly compressed on one side, obscurely 5-ridged, quite glabrous, .6-.75 in. long, and .3-.35 in. in diam.; pericarp crustaceous, hard, thick.

NICOBAR and ANDAMAN ISLANDS; *King's Collectors*.

Named in honour of Mr. E. H. Man, C. I. E., Deputy Superintendent of the Andaman and Nicobar Islands, whose powerful help has made it possible to explore the Forests of these most interesting islands; a species of which the nearest ally is probably *T. citrina*, Roxb.

3. *TERMINALIA BELERICA*, Roxb. Fl. Ind. II, 431. A tall tree. J. II. 42

*Leaves* clustered at the apices of the branches, coriaceous, obovate, broadly elliptic or sub-rotund, the petioles long; the apex usually broad and rounded, rarely subacute; the base slightly cuneate, sometimes slightly unequal; both surfaces puberulous when young, glabrous and reticulate when old, the upper with numerous minute papillæ; main nerves 6–8 pairs, spreading, prominent, the midrib prominent on both sides and sometimes with 2 glands near the sides of its base; length 4.5–8 in., breadth 3.5–4.75 in., petiole 1.75–4 in. *Spikes* axillary, slender, longer than the petioles, shorter than the leaves, rusty-pubescent. *Flowers* about .25 in. in diam., those in the upper part of the spike male, those in the lower hermaphrodite. *Calyx-tube* short, stout, including the ovary, minutely tomentose, the mouth with broad triangular lobes, pubescent outside, densely villous inside. *Stamens* much exerted. *Drupe* ovoid or globular-ovoid, densely covered with minute pale tomentum, when dried obscurely 5-angled, 1 in. long and .75 in. in diam. W. & A. Prodr. 313 (excl. syn.); Wall. Cat. 3963; Wight Ic. t. 91; Thwaites Enum. 103; Dalz. & Gibs. Bomb. Fl. 91; Brand. For. Fl. 222; Kurz For. Fl. Brit. Burma I, 455; Hook. fil. Fl. Br. Ind. II, 445; Bedd. Fl. Sylvat. t. 19; Trimen Fl. Ceyl. I, 159. *T. Gella*, Dalz. in Hook. Kew Journ. III, 227. *T. punctata*, Roth Nov. Sp. 381; DC. Prodr. III, 13. *T. eglanulosa*, Roxb. Herb. (*wrongly referred in Willd. Sp. Pl. IV, 968*). *T. moluccana*, Roxb. Hort. Beng. 33; Fl. Ind. II, 432.

PERAK; *Scortechini* 1684; *King's Collector* 8778. DISTRIB. British India.

Roxburgh describes and figures (Corom. Plants t. 198; Fl. Ind. II, 431) a form of this with two glands at the apex of the petiole on the under surface of the leaf; but this form has not hitherto been collected in any Malayan country, and its occurrence in British India must be rare.

4. *TERMINALIA PHELLOCARPA*, King n. sp. A tree; young branches rather slender, deciduously rusty-tomentose. *Leaves* crowded near the apices of the branches, coriaceous, obovate, blunt, tapering from above the middle to the petiole, slightly oblique at the base; both surfaces glabrous and shining, the lower widely reticulate and minutely dotted; main nerves 4–6 pairs, spreading but curving upwards; length 3–4 in., breadth 1.75–2 in.; petiole about .8 in., thickened towards the base, rusty-pubescent. *Flowers* unknown. *Fruit* elliptic, blunt at each end, 2.3 in. long, breadth 1.5 in.; the apex with a short sharp mammilla .15 in. long, the pericarp thick, spongy, with horizontal layers of fibrous tissue, the endocarp woody.

SINGAPORE; on Bukit Mandai, *H. N. Ridley*.

This has been collected only once, and the specimens are without flowers. I have named it from its corky fruit. In its leaves this greatly resembles the Philippize species *T. nitens*, Presl; but that has a very much smaller fruit than this; more-

over the petioles of its leaves are glabrous, whereas in this the petioles are pubescent.

5. *TERMINALIA FETIDISSIMA*, Griff. Notul. IV, 685. A tall tree; young branches as thick as a swan's quill, puberulous, rather rough. *Leaves* coriaceous, obovate, minutely cuspidate, narrowed from above the middle to the acute base; upper surface quite glabrous, very shining when dry the lower duller, glabrous except the sparsely rusty-pubescent midrib and nerves; main nerves 7-9 pairs, spreading but curving upwards; length 5-6.5 in., breadth 2.25-3.25 in.; petiole about .8 in., terete. *Spikes* solitary, axillary, nearly as long as the leaves, rusty-pubescent. *Flowers* nearly all hermaphrodite, about .2 in. in diam.; their ovaries elongate, clavate, rusty-tomentose, each with a linear bracteole. *Calyx-teeth* sparsely hairy, the mouth rusty-villous inside. *Drupe* obovate-ellipsoid, subacute, plano-convex, glabrous when ripe, 1.5 in. long. Clarke in Hook. fil. Fl. Br. Ind. II, 445.

MALACCA; Griffith, *Maingay* 643½ and 644. DISTRIB. Burma.

6. *TERMINALIA CATAPPA*, Linn. Mant. II, 519. A tree 80-120 feet high; young branches stout, puberulous, becoming glabrous, the tips with large cicatrices. *Leaves* coriaceous, obovate or obovate-oblong, with a much attenuate cordate and often bi-glandular base; the petiole very short, stout, broad and channelled; both surfaces glabrous; main nerves 8-12 pairs, spreading, not prominent when dry; length 6-9 in., breadth 3.5-5 in., petiole .35 in. *Spikes* axillary, slender, glabrous, shorter than the leaves. *Flowers* .2 in. in diam., each with a small bracteole, those in the upper part of the raceme mostly male and shortly pedicelled, those in the lower part hermaphrodite; calyx-tube containing the ovary, conical. *Calyx* glabrous outside, the mouth villous inside. *Ovary* glabrous. *Drupe* ellipsoid, somewhat compressed, keeled all round, pointed at the base, glabrous; pericarp pulpy, endocarp woody and very hard; length 2 in., breadth 1.25 in. Willd. Sp. Pl. IV, 967; Roxb. Hort. Beng. 33; Fl. Ind. II, 430; Lamk. Ill. t. 848; DC. Prodr. III, 11; Wall. Cat. 3975; W. & A. Prodr. 313; Wight Ic. 172; Bot. Mag. 3004; Miq. Fl. Ind. Bat. I, pt. I, 599; Bedd. Fl. Sylv. t. 18; Kurz For. Fl. Brit. Burma, I, 454; Hook. fil. Fl. Br. Ind. II, 444. *T. Catappa* and *T. Badamia*, Tulasne in Ann. Sc. Nat. Ser. IV, Vol. VI, 92. *T. moluccana*, Lamk. Dict. I, 349, (not of Roxb.); DC. Prodr. III. 11; Willd. Sp. Pl. IV, 96 (excluding the synonym *T. eglandulosa*, Roxb.) *T. procera*, Roxb. Hort. Beng. 33; Fl. Ind. II, 249; Wall. Cat. 3974; Kurz For. Flora Burma, I, 454. *Terminalia* nov. spec. 168, Kurz in Journ. As. Soc. Beng. 1876, pt. II, p. 130. *T. Myrobalana*, Roth Nov. Sp. 378. *T. subcordata*, Willd. Sp. Pl. IV, 968. *T. intermedia*, Spreng. Syst. II, 359. *Juglans Catappa*, Lour. Fl. Cochinch. 703. *Catappa do-*

*mestica*, *C. litorea* and *C. sylvestris*, Rumph. Herb. Amboin. I, t. 68. *Badamia Commersoni*, Gaertn. Fruct. II, 97; Rheede Hort. Mal. IV, t. 3, 4.

In all the provinces; near the coast.

A magnificent species, at times attaining an enormous height, and usually with horizontal branches. The stem is frequently most picturesquely buttressed. The embryo is eatable, and is often known to Europeans in the East as the "Indian Almond." I have reduced to this *T. procera*, Roxb., the only tangible distinction between which and *T. Catappa* is said to be its obscurely 5-ridged fruit. But fruits with this peculiarity may be gathered from the same trees as those bearing the ordinary sharp-edged smooth fruit.

7. *TERMINALIA BIALATA*, Steud. Nomencl. II, 668. A glabrous tree 80–100 feet high; young branches stout and with large cicatrices. *Leaves* crowded at the apices of the branches, alternate, thinly coriaceous, obovate or obovate-oblong, with long petioles, the apex abruptly and shortly cuspidate, narrowed from above the middle to the cuneate and usually oblique base; upper surface shining when dry, the lower dull and paler, the reticulations rather distinct on both; main nerves 7–9 pairs, spreading, rather distinct on both surfaces when dry; length 6–9 in., breadth 2.75–4.5 in., petioles 2.25–2.75 in. *Spikes* axillary, drooping, solitary, longer than the petioles but rather shorter than the leaves, rusty-puberulous. *Flowers* 2 in. in diam., sessile, the male flowers in the upper part, the hermaphrodite flowers in the lower, each with a minute deciduous bracteole. *Calyx* rusty-pubescent outside, densely rusty-villous inside; the lobes triangular, reflexed. *Stamens* exserted. *Ovary* villous. *Fruit* ellipsoid, tapering to each end, somewhat flattened on one side, covered with minute dense rusty tomentum and with 2 large slightly wavy, coriaceous, puberulous, horizontally striate lateral wings; length of fruit 1.25–1.75 in., breadth .5–.75 in., the wings from 1.25–1.75 in. in width. Kurz For. Flora Burma, I, 456; Clarke in Hook. fil. Fl. Br. Ind. II, 449. *Pentaptera bialata*, Roxb. Hort. Beng. 34; Fl. Ind. II, 441; Wall. Cat. 3986.

ANDAMAN, and probably also the NICOBAR ISLANDS. *DISTRIB.* Burma.

8. *TERMINALIA SUBSPATHULATA*, King n. spec. A tree over 100 feet high; young branches rather slender, deciduously puberulous. *Leaves* alternate, crowded near the ends of the branches, coriaceous, spatulate-oblong, shortly and bluntly cuspidate, tapering from near the apex to the long petiole, eglandular and sometimes slightly oblique at the base, the edges thickened and slightly revolute; upper surface glabrous and shining, the lower pale and sub-glaucous, both minutely reticulate; main nerves about 8 pairs, spreading and curving upwards, distinct; length 3–4 in., breadth near the apex 1–1.6 in., petiole 1.15–1.5 in. *Spikes* solitary, axillary, shorter than the leaves when in flower, longer



when in fruit, rusty-pubescent. *Flowers* .15 in. in diam., those in the upper part of the spike male, those in the lower hermaphrodite. *Calyx* minutely rusty-pubescent outside; the tube narrow, sub-cylindric in the female, tapering much upwards; the mouth wide, cupular and with 5 broadly triangular shallow reflexed teeth, shortly lanate at the base. *Stamens* exerted. *Fruit* narrowly elliptic, cylindric at the ends, .75–1.25 in. long; the edges produced into 2 coriaceous, horizontally striate, glabrous wings each .6–1 in. wide.

SINGAPORE; *Ridley* 5733. MALACCA; *Derry* 1037. PERAK; *King's Collector* 4529.

## 2. CALYCOPTERIS, Lamk.

A diffuse sub-scandent shrub with drooping branches. *Leaves* opposite, shortly petioled, elliptic or ovate, acuminate, entire. *Racemes* dense, axillary, and crowded towards the ends of the branches so as to form large panicles. *Flowers* small, greenish, each with a lanceolate bract. *Calyx-tube* 5-striate, produced above the ovary; limb 5-fid, persistent and much enlarged in fruit. *Petals* 0. *Stamens* 10, the five upper ones between the calyx-teeth, the five others alternate with them and lower down on the calyx-tube. *Ovary* 1-celled, inferior; *style* subulate, simple; ovules 3, pendulous from the top of the cell. *Fruit* narrowly ovoid, 5-ribbed, villous, 1-seeded, surmounted by the enlarged calyx. *Cotyledons* convolute. The only species.

CALYCOPTERIS FLORIBUNDA, Lamk. Dict., Suppl. II, 41, and III. t. 357. A diffuse scrambling shrub, sub-scandent; young branches slender, puberulous. *Leaves* sub-coriaceous, ovate-lanceolate to ovate-oblong, sometimes shortly acuminate, the base rounded or slightly narrowed; both surfaces minutely tomentose, the upper tawny, the lower rusty and pitted; main nerves 5 or 6 pairs, ascending, curved, rather prominent beneath; length 2.5–4 in., breadth 1–2 in., petiole .2–.3 in. *Inflorescence* rusty-tomentose. *Flowers* .35 in. in diam., sessile, yellowish-green, each with a short lanceolate pubescent bracteole. *Stamens* unequal, but all much shorter than the linear-lanceolate calyx-lobes. *Fruit* about .35 in. long, narrowly oblong, 5-angled, crowned by the enlarged veined calyx-lobes which often attain from .75–1 in. in length. *Brandis* For. Flora 220; *Clarke* in Hook. fil. Fl. Br. Ind. II, 449. *Calycopteris nutans*, Kurz Journ. As. Soc. Beng. Vol. XLVI, pt. II, p. 59; For. Flora Burma, I, 468. *Getonia floribunda*, Roxb. Cor. Pl. t. 87 and Fl. Ind. II, 428; Roth Nov. Sp. 216; DC. Prodr. III, 15; Dalz. & Gibs. Bomb. Fl. 91; Miq. Fl. Ind. Bat. I, pt. I, 605; W. & A. Prodr. 315; Wall. Cat. 4013. *Getonia nutans*, Roxb. Hort. Beng. 33; Fl. Ind. II, 428; Wall. Cat. 4012; Miq. l. c.; DC. Prodr. III, 15. *Getonia nitida*, Roth Nov. Sp. 217. *Combretum sericeum*, Wall. in Herb. Calc.

PENANG; *Wallich*. SINGAPORE; *Lobb*. TRANG; *King's Collector*.  
ANDAMANS; *King's Collector*. DISTRIB. British India.

There is a variety of this, with glabrous leaves and with the longer stamens equalling the calyx-lobes, to which Kurz has given the varietal name *floribunda*, his name for the typical form being *C. nutans*. I have seen no specimens of the glabrous variety from any of the Malayan provinces.

### 3. LUMNITZERA, Willd.

Large glabrous shrubs or small trees, growing in tropical salt marshes along with Mangroves and closely resembling them in habit. *Leaves* clustered towards the ends of the branches, alternate, thickly leathery, subsessile, narrowly obovate, entire or scarcely crenate. *Flowers* in racemes. *Calyx-tube* with two adnate bracteoles near the base, oblong, narrowed at both ends, produced above the ovary; lobes 5, persistent. *Petals* 5, oblong. *Stamens* 10 in two series, or fewer. *Ovary* inferior, 1-celled; style subulate, simple; ovules 2-5, pendulous from the top of the cell. *Fruit* woody, elliptic-oblong,  $\frac{1}{2}$ -1 in. (including the calyx-limb), longitudinally striate or nearly smooth. *Seed* 1; cotyledons convolute.—DISTRIB. Species 2; on the shores of the tropics of the Old World and of Polynesia.

Petals scarlet; stamens twice as long as the petals and of the same colour	...	...	...	...	...	1. <i>L. coccinea</i> .
Petals white; stamens of the same colour and length as the petals	...	...	...	...	...	2. <i>L. racemosa</i> .

1. LUMNITZERA COCCINEA, W. & A. Prodr. 316. A small tree 12-40 feet high. *Leaves* oblanceolate, obtuse, 2-3 in. long. *Racemes* terminal, sometimes several together forming a panicle. *Petals* scarlet, .25 in. long. *Stamens* 5-10 (usually 7), twice as long as the petals and of the same colour. Miq. Fl. Ind. Bat. I. pt. I, p. 606; Clarke in Hook. fil. Fl. Br. Ind. II, 452. *L. littorea*, Voigt Hort. Suburb. Calc. 39 Kurz For. Fl. Brit. Burma, I, 469. *L. pentandra*, Griff. Notul. IV, 684, and Ic. Pl. Asiat. t. 644. *Pyrranthus littoreus*, Jack Mal. Misc. II, 57; Wall. Cat. 4018.

ANDAMAN ISLANDS. PERAK; *King's Collector* 1180; *Scortechini* 1001; and probably in the Mangrove swamps of all the provinces; DISTRIB. British India, the Malayan Archipelago, North Australia and Polynesia.

2. LUMNITZERA RACEMOSA, Willd. in Ges. Naturf. Fr. Neue Schr. IV, (1803), 187. A small tree 20-40 feet high. *Leaves* oblanceolate to oval, obtuse, 1-3 in. long. *Racemes* axillary, elongating in fruit. *Petals* minute, white. *Stamens* 5-10, about as long as the petals and also white. DC. Prodr. III, 22; W. & A. Prodr. 316; Miq. Fl. Ind. Bat. I, pt. I, 606; Dalz. & Gibs. Bomb. Fl. 90; Tulasne in Ann. Sc. Nat. Ser. IV, Vol. IV, p. 103; Bedd. Fl. Sylv. Pl. XXI; Brand. For. Fl. 221;

Kurz For. Fl. Brit. Burma I, 468; Clarke in Hook. fl. Fl. Br. Ind. II, 452. *Pyranthus albus*, Wall. Cat. 4019. *Petaloma alternifolia*, Roxb. Fl. Ind. II, 372. *Bruguiera madagascariensis*, DC. Prodr. III, 23: Rheede Hort. Mal. VI, t. 37.

In Mangrove-swamps in all the Provinces. **DISTRIB.** British India, the Malayan Archipelago, North Australia and Polynesia.

4. **COMBRETUM**, Linn.

Shrubs with long pendent or scandent branches. *Leaves* entire, petioled, opposite or more seldom alternate or ternate. *Flowers* hermaphrodite or polygamo-dicecious, in spikes or panicles, bracteoles small. *Calyx-tube* constricted above the ovary, short or long-produced, urceolate funnel-shaped tubular or campanulate; limb 4-5-lobed, deciduous. *Petals* as many as the calyx-lobes, (0 in *C. apetalum*), placed on the calyx-limb. *Stamens* twice as many as the petals, inserted in two series with them. *Ovary* inferior, 1-celled; style 1, subulate, simple; ovules 2-5, pendent from the top of the cell. *Fruit* with 4-5 wings angles or ridges, dry, generally indehiscent. *Seed* 1; cotyledons plaited or flat, in a few species convoluted. **DISTRIB.** Species 160, common in the tropics of America, Africa and Asia; also in South Africa.

- Flowers 5-merous; fruit 5-angled ... .. 1. *C. trifoliatum*.
- Flowers 4-merous; fruit 4-angled ... .. 2. *C. tetralophum*.

Flowers 4-merous; fruit 4-winged:—

Tube of calyx much elongate; flowers not squamose, buds ellipsoid, their apices very much pointed:—

- Flowers condensed in globose masses at the ends of the branches of the panicle ... .. 3. *C. sundiacum*.
- Flower-spikes elongated ... .. 4. *C. extensum*.

Tube of calyx long; flowers squamose, buds globose, the apex rather acute ... .. 5. *C. chinense*.

Tube of calyx short; buds not pointed:—

Flowers squamose; leaves not cordate and with distinct petioles .3-.4 in. long:—

- Fruit not compressed, its faces all narrow and equal, its wings broad and thin ... .. 6. *C. squamosum*.
- Fruit compressed, two of its faces broad and two narrow, its wings short and thick ... .. 7. *C. Wrayi*.

Flowers not squamose; leaves cordate and with very short petioles (.05-.15 in. long):—

Leaves glabrous except the midrib:—

- Panicle and calyx with short thick glandular hairs ... .. 8. *C. Kunstleri*.
- Panicles cinereous-tomentose; flowers puberulous; fruit black when ripe and with narrow wings ... .. 9. *C. nigrescens*.
- Leaves, except when old, with long adpressed hairs beneath; panicles sericeous-tomentose; fruit pale-brown when dry, with broad thin wings ... .. 10. *C. Scortechinii*.

1. *COMBRETUM TRIFOLIATUM*, Vent. Choix t. 58. A powerful climber; young branches slender, terete, glabrous or puberulous; in the older branches the bark scaling off. *Leaves* coriaceous, opposite or alternate, oblong-lanceolate or oblong-oblancoelate, or narrowly elliptic, sub-acute, the base cuneate; both surfaces glabrous and shining; main nerves 5-7 pairs, spreading or ascending, distinct on the lower surface, hardly visible on the upper, reticulations indistinct; length 1·75-5·5 in., breadth ·8-2 in., petiole ·2-·25 in. *Spikes* axillary, solitary or in pairs, or terminal and in panicles, puberulous. *Flowers* ·15 in. in diam. at the mouth, densely crowded. *Calyx-tube* with a very short constriction above the ovary; the mouth wide, cupular, and with 5 broad triangular teeth, everywhere adpressed-pubescent externally. *Petals* lanceolate, slightly exceeding the calyx-lobes in length. *Disc* and bottom of the mouth of the calyx pubescent. *Stamens* exserted. *Fruit* 1·1-1·25 in. long and ·5 in. in diam., with 5 very acute angles, glabrous, dark-brown when ripe. G. Don in Trans. Linn. Soc. XV, 439; Miq. Fl. Ind. Bat. I, pt. I, 610; Kurz For. Fl. Brit. Burma I, 461; Clarke in Hook. fil. Fl. Br. Ind. II, 454. *C. lucidum*, Blume Bijl. 641. *C. undulatum* and *C. elegans*, Wall. Cat. 3993, 4003. *C. subalternans*, Wall. Cat. 4008? *Terminalia lancifolia*, Griff. Notul. IV, 685. *Embryogonia lucida*, Blume Mus. Bot. II, t. 52. *Cacoucia? trifoliata*, DC. Prodr. II, 22. *C. lucida*, Hassk. in Flora 1844, p. 607.

TRANG; *King's Collector*; doubtless also occurring in other provinces.

DISTRIB. British India, Java.

2. *COMBRETUM TETRALOPHUM*, Clarke in Hook. fil. Fl. Br. Ind. II, 454. A powerful climber; young branches slender, with minute brown rusty scales. *Leaves* opposite, thinly coriaceous, oblong-elliptic, shortly acuminate, the base cuneate; upper surface glabrous, shining, the lower with scattered brown glands when young and puberulous on the midrib and nerves; main nerves 7 or 8 pairs, oblique, ascending, inconspicuous on both surfaces; length 2·5-5·5 in., breadth 1-2 in., petiole ·3-·4 in. *Spikes* axillary, solitary, much shorter than the leaves, slightly scaly below the flowers, very scaly and puberulous between them. *Flowers* ·1 in. in diam. at the mouth. *Calyx-tube* constricted above the ovary, the constricted part as long as the ovary; the mouth campanulate and with 4 ovate erect pubescent lobes. *Petals* slightly longer than the calyx-lobes but much narrower, linear. *Disc* and fundus of the mouth of the calyx rusty-villous. *Stamens* and *style* exserted. *Fruit* ·75-1 in. long and half as broad, shining, dark-coloured, the edges very acute but not winged.

MALACCA; *Griffith* 2195. PERAK; *King's Collector* 1012. DISTRIB. Siam, Borueo.

3. *COMBRETUM SUNDIACUM*, Miq. Fl. Ind. Bat. Suppl. 327. A very powerful climber; young branches closely covered with deciduous scales. *Leaves* opposite, thinly coriaceous, broadly elliptic to elliptic-orbicular, abruptly and very shortly acuminate; the base rounded, rarely slightly cuneate, sometimes unequal-sided; both surfaces glabrous, the upper punctate and with very sparse scales; the lower with the scales more numerous and white with dark centres; main nerves about 6 pairs, oblique, curving slightly, not prominent on the upper surface but slightly so on the lower when dry; length 2·75–4 in., breadth 1·8–2·75 in., petiole 4–8 in. *Panicles* axillary and terminal, umbellate, longer than the leaves, the branches ending in dense globose minutely bracteolate spikes. *Calyx-tube* about 35 in. long, minutely pubescent, not scaly, 4-ridged along the ovary, above it cylindric, expanding upwards into a funnel-shaped mouth with 4 narrowly triangular-acuminate reflexed lobes; calyx inside with a ring of hairs at its base but not filled with long coarse hair, narrowly ovate and very acute in bud. *Petals* much shorter than the calyx-lobes, oval, not clawed, glabrous. *Stamens* exerted. *Fruit* about 1 in. long and nearly as broad, with 4 coriaceous horizontally-striate shining wings, and with a few minute scattered scales. Clarke in Hook. fil. Fl. Br. Ind. I, 458.

MALACCA; *Maingay* 648. SINGAPORE; *Hullett* 89; *Ridley* 4668. PERAK; *Scortechini* 1016. *King's Collector* 4360, 4452, 5864, 7827; *Wray* 4272.

Readily recognised by its paniced inflorescence, the branches being umbellate and each ending in a globose spike of flowers with very acute buds which are not scaly.

4. *COMBRETUM EXTENSUM*, Roxb. Hort. Beng. 28; Fl. Ind. II, 229. A large climber; young shoots rather slender, sometimes angled, very sparsely lenticellate. *Leaves* opposite or nearly so, coriaceous, broadly elliptic to sub-rotund, rarely ovate, the apex shortly and abruptly acuminate or sub-acute; the base broad and rounded, rarely slightly cuneate; both surfaces glabrous; the lower reticulate, punctate and slightly rough; main nerves 6 or 7 pairs, spreading, interarching a little way from the edge; length 4·5–7 in., breadth 2·75–4 in., petiole 6–1·5 in., stout. *Spikes* axillary and solitary, or sometimes in few-branched panicles, rarely terminal, often as long as or longer than the leaves, puberulous. *Flowers* 25 in. wide at the mouth when expanded; the buds ovate, very acute at the apices. *Calyx-tube* very long, (35 in.) infundibuliform, puberulous; the mouth 15 in. long, deeply cut into 4 triangular acuminate reflexed lobes. *Petals* ovate-truncate or obovate, shorter than the calyx-lobes; calyx with a ring of hairs at the throat inside, otherwise nearly glabrous. *Fruit* when fully ripe about 1·25–1·5 in. long, and (including the wings) nearly as broad, wings scariose,

glabrous or glandular-puberulous. Wall. Cat. 3996; G. Don in Trans. Linn. Soc. XV, 422; Miq. Fl. Ind. Bat. I, pt. I, 608; Kurz For. Fl. Brit. Burma I, 463; Clarke in Hook. fil. Fl. Br. Ind. II, 458. *C. rotundifolium*, Roxb. Fl. Ind. II, 226; Wall. Cat. 3995. *C. Wightianum*, Wall. Cat. 4007; W. & A. Prodr. 317; Wight Ic. t. 227; Dalz. & Gibs. Bomb. Fl. 90. *C. Horsfieldii*, Miq. l. c. 609; Kurz in Flora 1871, p. 289. *C. platyphyllum*, Heurck & Muell.-Arg. Obs. Bot. 242; Kurz in Journ. As. Soc. Beng. 1874, pt. II, 188. *C. macrostachyum*, Wall. Cat. 3997. *C. latifolium*, Blume Bijd. 641; Miq. l. c. 609. *C. leucanthum*, Heurck & Muell.-Arg. Obs. Bot. 240. *C. formosum*, Griff. Notul. IV, 682, (*vide* Kurz).

MALACCA; *Derry* 386. ANDAMAN ISLANDS; very common. Not common in the other Provinces. DISTRIB. British India.

5. COMBRETUM CHINENSE, Roxb. Hort. Beng. 28. A powerful climber; young branches slender, terete, with sparse minute scales. *Leaves* opposite, or in whorls of three (VAR. *ternatum*), thinly coriaceous, elliptic or elliptic-oblong, sometimes obovate, shortly and abruptly acuminate, the base slightly narrowed; both surfaces glabrous, sparsely squamulose like the young branches and inflorescence, the upper surface of a dark colour when dry, the lower pale-brown (pubescent in VAR. *pubescens*); main nerves 7 or 8 pairs, spreading, curved, slightly prominent on the lower surface, scarcely visible on the upper; length 3.25–5 in., breadth 1.5–2.25 in., petiole .15–.4 in. *Spikes* solitary, axillary, longer than the leaves, many-flowered; the bracteoles linear, deciduous. *Calyx-tube* .25 in. long, slender at the base, expanding into a funnel-shaped mouth .15 in. in diam. when fully expanded, with 4 deep erect triangular acute scaly lobes, globular when in bud but the apex acute. *Petals* broadly obovate, clawed, longer than the lobes of the calyx, glabrous. *Disc* and interior of calyx fulvous-pubescent. *Fruit* 1–1.25 in. long and .8–1 in. broad, with 4 slightly unequal scarious coriaceous horizontal striate sparsely squamulose wings. Roxb. Fl. Ind. II, 230 (*not of G. Don*); Kurz For. Flora Burma, I, 463; Clarke in Hook. fil. Fl. Br. Ind. II, 457. ? *C. Griffithii*, Heurck and Muell.-Arg. Obs. Bot. 231.

ANDAMAN ISLANDS; very common. PERAK; *Wray* 2314, 2743. *King's Collector* 4646.

VAR. *ternatum*; Clarke in Hook. fil. Fl. Br. Ind. II, 453; leaves often in whorls of three, usually obovate. *C. ternatum*, Wall. Cat. 4002. In the ANDAMANS (doubtful). DISTRIB. Chittagong. Burma.

VAR. *Porterianum*, Clarke in Hook. fil. Fl. Br. Ind. II, 457; leaves elliptic-oblong, acuminate, never obovate, main nerves about 8 pairs. *C. Porterianum*, Wall. Cat. 4000.

## PENANG.

This variety does not appear to have been collected since Wallich's time. I much doubt whether it is worth keeping up even as a variety.

VAR. *pubescens*, King. *Leaves* pubescent in the under surface.

PERAK; *King's Collector* 889.

6. *COMBRETUM SQUAMOSUM*, Roxb. Fl. Ind. III, 231. A large creeper; young branches slender, cylindric, covered (like almost all other parts of the plant) with scales with broad pale margins. *Leaves* opposite, thinly coriaceous, broadly elliptic or elliptic-rotund, rarely ovate-lanceolate, shortly and abruptly acuminate; the base rounded, rarely sub-cuneate; both surfaces dull when dry and scaly, but without hairs; length 3·25–5·5 in., breadth 2·25–4·5 in.; petiole ·3–4 in., scaly. *Spikes* axillary or terminal, solitary or in panicles, shorter than the leaves, few-branched. *Flowers* ·15 in. in diam. at the mouth. *Calyx-tube* shortly constricted above the 4-angled ovary; the mouth cupular, with 4 broadly triangular teeth. *Petals* small, obovate. *Disc* and fundus of mouth of calyx fulvous-villose. *Fruit* ·75–1·5 in. long and nearly as broad (including the wings), with 4 wide thin membranous wings, squamose at the bottom of the deep grooves between the wings. Wall. Cat. 3987; Miq. Fl. Ind. Bat. I, pt. I, 607; G. Don in Trans. Linn. Soc. XV, 438 (*inaccurate as to the floral symmetry*); W. & A. Prodr. 317; Kurz For. Fl. Brit. Burma I, 463; Clarke in Hook. fil. Fl. Br. Ind. II, 456. *C. lepidotum*, Presl Bemerk. 142 (*see Kurz in Flora 1871, p. 289*). *C. Maluloea*, Wall. Cat. 3991.

MALACCA; *Maingay* 648. ANDAMAN ISLANDS. PERAK; *King's Collector* 5083. PENANG; *Wallich, King's Collector* 1335, *Curtis* 258.

A species easily recognised by being everywhere covered with scales. Some of the Penang specimens have ovate-elliptic leaves; otherwise they do not differ from specimens from other places.

7. *COMBRETUM WRAYI*, King n. spec. Young branches slender, striate when dry, glabrous but slightly scaly. *Leaves* opposite, coriaceous, narrowly elliptic, subacute or very shortly and bluntly acuminate, the base rounded; both surfaces reticulate, the upper glabrous and shining; the lower dull, glabrous elsewhere, but with some coarse hairs along the sides of the midrib near its base; main nerves 6 or 7 pairs, ascending, curved, slightly prominent beneath; length 2·5–3·5 in., breadth 1·15–1·5 in.; petiole ·35–4 in., rather rough when dry, those in the upper part of the stem and in the axils of which the spikes arise much smaller. *Spikes* axillary, solitary, about 1 in. long, the peduncles glabrous, the floriferous part pubescent and scaly. *Flowers* few, in clusters of 2 or 3. *Calyx-tube* ·15 in. long, shortly constricted above the ovary, the mouth campanulate and deeply cut into 4 triangular acute erect

teeth, every part densely covered with brown scales externally. *Petals* slightly exceeding the calyx-lobes, oblanceolate, obtuse, glabrous, erect. *Stamens* 8, exserted. *Fruit* compressed, ovate, pointed at each end, dark-brown when dry, with 4 short wings, about 1·2 in. long and ·6 in. broad on the compressed surfaces, the other two surfaces narrow and grooved, all parts sparsely scaly.

PERAK; sea-shore at Matang, *Wray* 2504.

8. *COMBRETUM KUNSTLERI*, King n. spec. A powerful climber; young shoots slender, terete, very slightly puberulous and with very few scattered rusty hairs intermixed. *Leaves* opposite, narrowly elliptic or elliptic-oblong, shortly and bluntly acuminate, slightly narrowed to the minutely cordate base; upper surface glabrous except the minutely pubescent midrib, shining; the lower dull, glabrous even on the midrib; main nerves 5-7 pairs, ascending, curving, length 3-5·5 in., breadth 1·1-1·85 in.; petiole ·1 in. or less, glabrous. *Panicles* axillary and shorter than the leaves or terminal and much longer, pedunculate, with many short thick glandular hairs, the branches rather short and spreading, bracteoles shorter than the ovaries. *Calyx-tube* about ·1 in. long, constricted both below and above the ovary, the limb widely campanulate and with 4 very shallow broad reflexed teeth, clothed outside with glandular hairs. *Petals* inserted near the edge of the calyx-limb and projecting beyond its lobes, broadly ovoid, reflexed, pubescent. *Fruit* 4-winged, tapering to the ends (when young), unknown in the ripe state.

PERAK; *King's Collector* 3435, 6664; *Scortechini* 2014.

9. *COMBRETUM NIGRESCENS*, King n. spec. A slender climber 20-40 feet long; young branches rusty-puberulous and with sparse long rusty-silky hairs. *Leaves* opposite, membranous, black when dry, narrowly elliptic to oblong, shortly acuminate, the base rounded, the petioles very short; upper surface shining, glabrous except the rusty-sericeous midrib; lower surface with the midrib and main nerves rusty-sericeous, the intercostal spaces almost glabrous; length 2·25-2·75 in., breadth ·75-1 in., petiole less than ·1 in. *Panicles* terminal, lax, spreading, longer than the leaves, minutely cinereous-tomentose with a few long rusty hairs intermixed, the branches interruptedly spicate, bracteoles shorter than the calyx-tube. *Calyx-tube* only about ·05 in. long; the limb rather longer, campanulate and with 4 rather shallow broad acute teeth, puberulous on the outer surface, pubescent on the inner, with a wing of hairs in the throat. *Petals* about as long as the calyx-lobes, broadly ovate or slightly obovate, blunt, puberulous on the outer surface, sericeous on the inner. *Stamens* 8, unequal, the outer row the longest. *Fruit* black when dry, shining, glabrous, with 4 narrow wings, ·8 in. long and ·4 in. broad.



PERAK; *King's Collector* 3469, 8140.

10. COMBRETUM SCORTECHINII, King n. spec. Young branches slender, softly sericeous-tomentose. *Leaves* opposite, thinly coriaceous, oblong-elliptic or sometimes oblong-ob lanceolate, the base rounded or very minutely cordate; upper surface shining, glabrous except the depressed rusty-sericeous midrib; lower surface reticulate, with many long adpressed hairs near the base and along the prominent midrib, the nerves and intercostal spaces with shorter scattered hairs, when old almost glabrous; main nerves about 7 pairs, ascending, curved, prominent on the lower surface, slightly depressed on the upper, length 3·25–4·5 in., breadth 1·4–1·75 in., petiole ·1–·15 in. *Panicles* axillary and terminal, shorter than the leaves; the branches few, short and few-flowered, everywhere softly sericeous-tomentose. *Calyx-tube* ·1 in. long, cylindric; the mouth slightly longer, widely campanulate, with 4 shallow broad acute reflexed teeth, softly tomentose like the tube. *Petals* 4, inserted near the edge of the calyx and projecting beyond it, broadly ovate-lanceolate, reflexed, pubescent. *Stamens* 8, exserted. *Fruit* with 4 thin sub-coriaceous wings, pointed at each end, glabrous, 1·25 in. long, and ·65 in. broad.

PERAK; *Scortechini*.

Collected only once, and the specimens are few.

### 5. QUISQUALIS, Linn.

Large shrubs scandent or subscandent. *Leaves* opposite, oblong or obovate, acuminate, entire. *Flowers* large, in short axillary or terminal spikes. *Calyx-tube* slender and much prolonged above the ovary, deciduous, its limb 5-lobed. *Petals* 5. *Stamens* 10, short. *Ovary* 1-celled; style filiform, partially adherent to the calyx-tube, stigma sub-capitate; ovules 3 or 4, suspended from the apex of the loculus. *Fruit* dry, 5-angled or 5-winged, coriaceous, subindehiscent. *Seed* solitary, cotyledonous plane. **DISTRIB.** Species 5, tropical Asian or African.

Calyx-tube less than 1 in. long	...	...	...	1. <i>Q. densiflora</i> .
Calyx-tube from 1·5–2·5 in. long	...	...	...	2. <i>Q. indica</i> .

1. QUISQUALIS DENSIFLORA, Wall. Cat. 4011. Young branches minutely rusty-puberulous. *Leaves* elliptic-oblong or oblanceolate-oblong, shortly acuminate, the base rounded or minutely cordate; upper surface glabrous except the pubescent midrib and main nerves; lower surface glabrous, the 6 pairs of curved ascending main nerves with tufts of hair in their axils; both surfaces shining and minutely papillose; length 3·5 to 4·5 in., breadth 1·5–2 in.; petiole ·2–·3 in., pubescent on the upper surface. *Spikes* axillary and solitary, or terminal and almost paniced, rusty-pubescent; bracteoles lanceolate, sub-persistent, rusty-

pubescent, .5–.75 in. long. *Calyx-tube* produced beyond the ovary for .25–.5 in., cylindric, rusty-tomentose; its mouth funnel-shaped and deeply divided into 5 narrow lanceolate-subulate lobes. *Petals* shorter than the calyx-lobes, oblong, obtuse, about .2 in. long, scarlet, rusty-pubescent on the outer side, nearly glabrous on the inner. *Fruit* oblong, shining, with 5 rather narrow unequal thin coriaceous wings, 1 in. long and .65 in. broad.

PENANG; *Wallich*. PERAK; *Wray* 3353.

2. *QUISQUALIS INDICA*, Linn. Sp. Pl. 556. Young branches deciduously rusty-pubescent. *Leaves* elliptic, shortly acuminate, the base rounded; both surfaces more or less rusty-pubescent, nearly glabrous when adult except the midrib and nerves, always minutely papillose; main nerves 6–8 pairs, ascending, little curved, length 3–4 in., breadth 1.5–2 in., petiole about .3 in. *Spikes* axillary, their rachises shorter than the leaves, many-flowered, very unequal, rusty-tomentose; bracts lanceolate, sub-persistent, .35 in. long, pubescent. *Calyx-tube* produced beyond the ovary for 1.5–2.5 in., its mouth short, funnel-shaped and divided into 5 broad triangular acute lobes. *Petals* oblong or oblong-rotund, obtuse, .5 in. or more in length, red, puberulous. *Fruit* narrowly ellipsoid, tapering much to the apex, less so to the base, sharply 5-angled, almost 5-winged, glabrous and of a deep brown colour, .75–1.25 in. long and from .3–.45 in. broad. Lour. Fl. Cochinch. 336; Lamk. Ill. t. 357; DC. Prodr. III, 23; Roxb. Fl. Ind. II, 427; Wall. Cat. 4010; Wight Ill. t. 92; W. & A. Prodr. 318; Miq. Fl. Ind. Bat. I, pt. I, 610; Brandis For. Fl. 220; Clarke in Hook. fil. Fl. Br. Ind. II, 459; *Q. villosa*, Roxb. Fl. Ind. II, 426; Spreng. Syst. II, 331; DC. Prodr. III, 23. *Q. glabra*, Burm. Fl. Ind. t. 28. *Q. pubescens*, Burm. Fl. Ind. t. 35. *Q. ebracteata*, Beauv. Fl. Owar. t. 35. *Q. Loureiri*, G. Don Gen. Syst. II, 667. *Q. sinensis*, Lindl. in Bot. Reg. N.S. Vol. XXX, t. 15. *Q. longiflora*, Presl Epimel. 216. *Quisqualis sp.*, Griff. Notul. IV, 683. Rumph. Herb. Amboin. V, t. 38.

MALACCA, and probably truly wild; in the other provinces often cultivated as a garden plant. DISTRIB. Burma.

## 6. ILLIGERA, Blume.

Scandent shrubs. *Leaves* alternate, petioled, with three entire petioluled leaflets. *Flowers* in elongate lax peduncled cymes; bracteoles 1–3 at the base of each flower. *Calyx-tube* shortly constricted above the ovary; limb of 5 valvate oblong deciduous lobes. *Petals* 5, valvate, oblong, alternate with and as long as the calyx-lobes. *Stamens* 5, epigynous, filament near the base carrying on each side a staminode; anthers dehiscing by lateral valves. *Ovary* 1-celled; style, 1, filiform,

ending in a dilated undulate sinuate stigma; ovule 1, pendulous from the apex of the cell. *Fruit* broadly 2-4-winged (2-winged in the known Indian species), the wings veined. *Seed* with plano-convex (not convoluted) cotyledons. **DISTRIB.** Species about 7, extending from Khasia to Singapore, Malaya and the Philippines; and one aberrant species in Angola having 5 leaflets.

Main nerves of leaves 2 or 3 pairs, oblique ... .. 1. *T. appendiculata*.  
Main nerves of leaves 12-14 pairs, horizontal... .. 2. *T. lucida*.

1. *ILLIGERA APPENDICULATA*, Blume Bijdr. 1153; Nov. fam. exp. p. 14. A powerful climber 40-80 feet long; young branches slender, tawny-pubescent, soon becoming glabrous, striate when dry. *Common petiole* about 3 in. long, with an annular swelling at the base, glabrous or glabrescent. *Leaflets* thinly membranous, very variable in shape, often oblique, oblong, elliptic to sub-rotund, the apex shortly acuminate acute or sub-acute; the base cuneate or rounded, sometimes unequal-sided; upper surface usually glabrous; the lower very minutely lepidote, glabrous or pubescent all over or only on the 2 or 3 pairs of oblique indistinct main nerves; length 3-5.5 in., breadth 1.75-4 in., petioles .2-6 in. *Panicles* pendulous, very lax, 9-15 in. long, glabrous below but usually pubescent towards the extremities, the branches cymose. *Flowers* .2-.35 in. in diam., on pubescent pedicels shorter than themselves. *Calyx* puberulous. *Petals* lanceolate, narrower than the lobes of the calyx, their midribs thick. *Stamens* curved inwards, longer than the staminodes when unfolded. *Fruit* narrowly oblong, tapering at the ends, 4-angled, minutely tomentose, 1-1.25 in. long, two of its margins produced into broadly oblong obtuse horizontally striate puberulous leathery wings 1.25 in. or more in width. DC. Prodr. XV, pt. I, 251; Kurz For. Flora Burma, I, 469. *I. Coryzadenia*, Meissn. DC. Prodr. XV, Pt. I, 251; Clarke in Hook. fil. Fl. Br. Ind. II, 460; *Coryzadenia trifoliata*, Griff. Notulæ, IV, 356.

Common in PERAK and the ANDAMAN ISLANDS, and probably to be found in all the other Provinces. **DISTRIB.** British India, in Burma and Assam.

Variable in the shape and pubescence of the leaflets, the under surfaces of some being rather densely pubescent, while others are almost quite glabrous. For a form of the latter sort, the under surfaces of which are moreover somewhat glaucous, Kurz suggested the varietal name *pubescens*. Individual plants vary also as to the size of their flowers. The following, which I treat as a variety, was made a species by Clarke in Hooker's Flora of British India.

**VAR.** *Kurzii*, leaves glabrous, not lepidote, very coriaceous, the margin recurved and thickened. *I. Kurzii*, Clarke l. c.

MALACCA; *Mainingay* 650, 649.

2. *ILLIGERA LUCIDA*, Teysm. & Binn. Nat. Tijds. Ned. Ind. XXVII, 29. A slender climber; young shoots puberulous, angled when dry. *Common petiole* .75–2 in. long, glabrous. *Leaflets* membranous, oblong or elliptic-oblong, often oblique, the apex shortly and bluntly acuminate; the base rounded and usually minutely cordate; both surfaces glabrous and shining; the lower reticulate; main nerves 12–14 pairs, horizontal, interarching far from the edge, slightly prominent on the lower surface, obsolete on the upper; length 3–5 in., breadth 1.25–2.25 in., petiole .15–.3 in. *Panicles* axillary and terminal, very lax; the ultimate branches sparse, few-flowered. *Flowers* .3 in. in diam., on thin puberulous pedicels. *Calyx-lobes* oblong, sub-acute, glabrous except for a patch of white hairs at the base in front. *Petals* about as long as the calyx-lobes but much narrower, villous at the base. *Stamens* shorter than the petals, the anthers large, the filaments villous in the lower half. *Fruit* (*vide* T. & B.) 4-winged, two of the wings larger than the other two, glabrous, about 1 in. long. Miq. Fl. Ind. Bat. Vol. I, pt. I, 1094.

PERAK; *Scortechini* 1610, *Curtis* 3182. DISTRIB. Java.

This differs from *I. appendiculata*, Bl. in having narrower leaflets, with much shorter petioles and more numerous nerves which are quite horizontal. The leaves are moreover quite glabrous and shining. The Perak specimens from which the above description has been taken agree absolutely with type specimens of *I. lucida* received at the Calcutta Herbarium from the Buitenzorg Botanic Garden.

#### 7. *GYROCARPUS*, Jacq.

A tall tree. *Leaves* alternate, long-petioled, large, entire or lobed, clustered towards the ends of the branches. *Flowers* small, unisexual, very numerous, clustered in large branched cymes without bracts. *Male flowers* very numerous; calyx 4–7-partite; *petals* 0; *stamens* 4–7, inserted at the base of the calyx with as many alternate clavate glands; *anthers* 2-celled, dehiscing by valves; *ovary* 0. *Female* or *hermaphrodite* flowers few; *calyx-tube* adherent to the ovary, limb 2-partite, persistent, enlarging in fruit; *petals* and *stamens* 0; *ovary* 1-celled; style 0, stigma sessile; ovule solitary, pendulous from the apex of the cell. *Nut* bony, crowned by the elongate spathulate coriaceous calyx-lobes. *Seed* with convolute cotyledons. A single species.

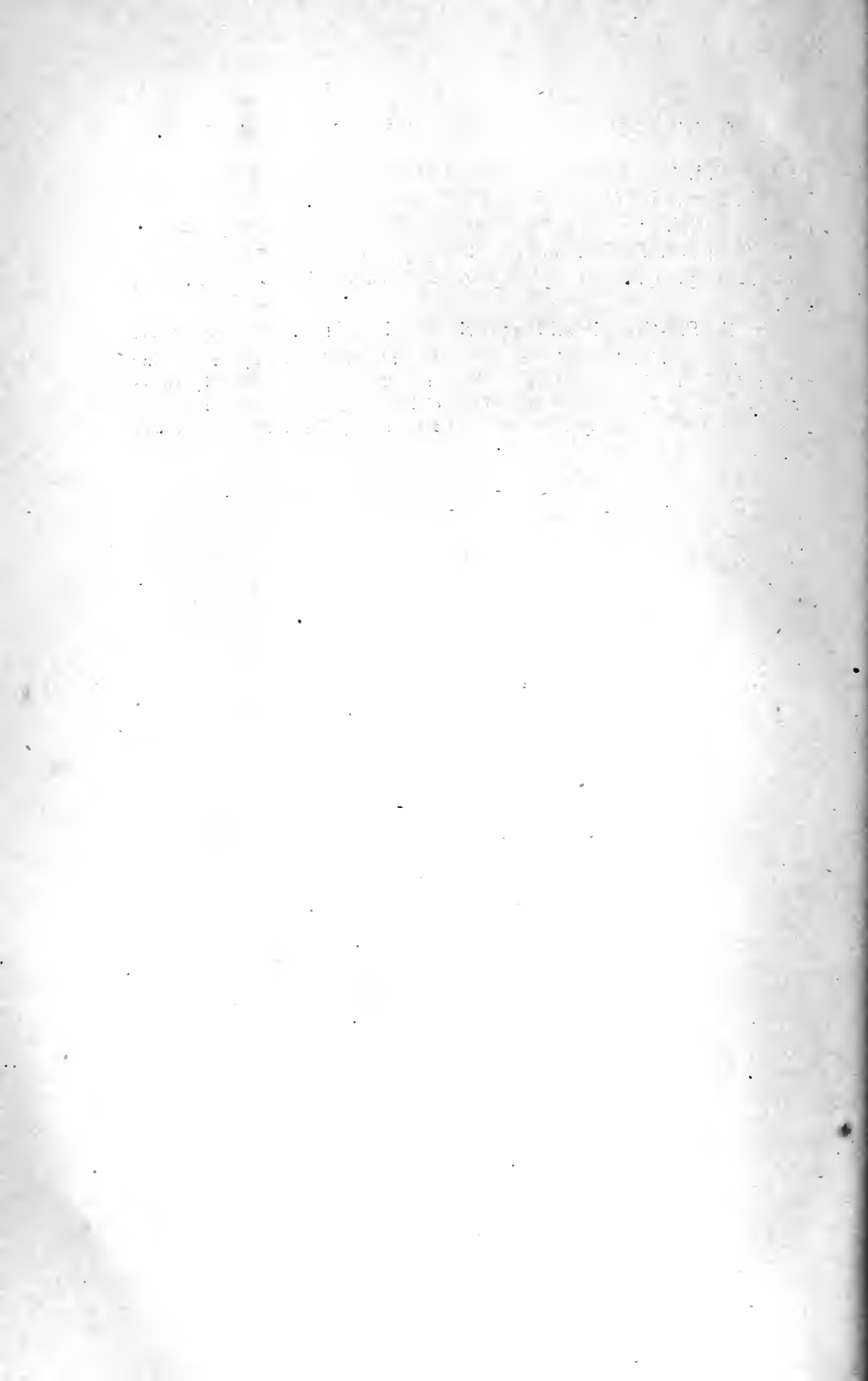
*GYROCARPUS AMERICANUS*, Jacq. Select. Am. 282. t. 178. Young branches stout, glabrous. *Leaves* membranous, broadly rotund-ovate, acuminate, the base broad and sometimes sub-cordate; the base usually 5-nerved, the midrib with about 3 pairs of main nerves; length 4.5–6 in., breadth 4 or 5 in., petiole 3–5.5. *Fruit* sub-globular, about 1 in. in diam., minutely pubescent; the wing narrowly spathulate, .3 in. long. *G. Jacquini*, Gaertn. Fruct. II. 92; Roxb. Hort. Beng. 11, Cor. Pl. t.

1 ; Fl. Ind. I, 445 ; Lamk. Ill. t. 850 ; Bedd. Fl. Sylv. t. 196 ; Kurz For. Fl. Brit. Burma I, 470 ; Clarke in Hook. fil. Fl. Br. Ind. II, 461. *G. asiaticus*, Willd. Sp. Pl. IV, 982 ; Wall. Cat. 968 ; Miq. Fl. Ind. Bat. F, pt. I, 978 ; DC. Prodr. XV, pt. I, 248. *G. acuminatus*, Meissn. in DC. Prodr. XV, pt. I, 248. *G. sphenopterus* and *G. rugosus*, R. Br. Prodr. 405.

On the Sea-Coast in all the provinces. DISTRIB. Tropics generally.

The anthers of this species are two-celled and dehisce by upward-opening valves. Those of the genus *Hernandia* are also 2-celled, but dehisce by valves which open laterally. In habit and form of leaves *Gyrocarpus* much resembles *Hernandia* ; whereas it is quite an aberrant form amongst *Combretaceæ*, as is also *Illigera*.

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# JOURNAL

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## ASIATIC SOCIETY OF BENGAL.



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Noviciæ Indicæ XV. *Some additional Leguminosæ.*—By D. PRAIN.

[Read February 3rd, 1897.]

The present paper contains descriptions of species that are new to India in the sense that they are not included in the account of this Order prepared in 1876 by Mr. J. G. Baker, F.R.S., the distinguished Keeper of the Herbarium, Royal Gardens, Kew, for Sir Joseph Hooker's *Flora of British India*, Vol. II. Some of the species are new to science or at all events are not to be traced in any of the works in the library of the Calcutta garden and are not provided with names either in the Calcutta Herbarium or in that at Kew. Others are species already described elsewhere but not included in the *Flora of British India* because they had not been reported from within the limits of the Indian Empire up to the time when Mr. Baker's account of the *Leguminosæ* was being prepared. And in order that these contributions may preserve the character of being in substance, as well as in form, supplementary to the *Flora*, definitions of species of both kinds have been given in the hope that they may prove helpful to members of our Society who use the *Flora* itself in the field.

In the *Flora of British India* Mr. Baker has indicated points that were doubtful to him and has urged the attention of Indian botanists to these points, in the hope that the difficulties may be removed by the supply of more adequate material. Some of these difficulties it has been possible from the possession of more recent and more adequate suites of specimens to satisfactorily settle; naturally, too, the more ample material at our disposal now, has indicated other difficulties where

formerly all seemed clear. And in this paper allusion is made to both these kinds of difficulties, wherever they have been detected.

From the present review the writer regrets to have had to exclude the large genus *Astragalus*; many species belonging to that genus have been added to the Indian Flora owing to the extension of the Indian Empire during recent years along its north-western frontier. It is his hope however to present to the Society at another time a separate review of the Indian species of *Astragalus* and of the closely allied genus *Oxytropis*, which has also for the present been omitted from consideration.

### 1. PIPTANTHUS D. DON.

#### 1. PIPTANTHUS NEPALENSIS *D. Don.*

Add to localities of *F. B. I.*:—ASSAM; Khasia; at Lailankote, etc., *C. B. Clarke!* *G. Gammie!* Jaintea; *Prain!* Manipur, on a hill north-east of Chingsow, *Watt!* BURMA; Chin Hills, *C. R. Dun!*

### 2. THERMOPSIS R. BR.

3. THERMOPSIS LANCEOLATA *R. Br.* in *Ait. Hort. Kew.* ed. ii. iii. 3; finely downy, leaflets ovate-oblong, corolla yellow, pod narrowly oblong-linear. *DC. Prodr.* ii. 99; *Ledeb. Flor. Alt.* ii. 112; *Flor. Ross.* i. 510. *Sophora lupinoides Linn. Sp. Pl.* 374.

EASTERN TEMPERATE HIMALAYA; Phari; *King's Collectors!* DISTRIB. Siberia, China.

*General habit* of the other Himalayan species. *Rootstock* woody. *Leaves* petioled, petioles short  $\frac{1}{8}$ – $\frac{1}{4}$  in., leaflets glabrous above, downy below,  $1\frac{1}{2}$  in. long,  $\frac{1}{2}$  in. across, apex obtuse base cuneate. *Stipules* like leaflets and almost as large. *Flowers* verticillate 3-nate, stalks  $\frac{1}{2}$ – $\frac{1}{4}$  in. *Calyx* finely downy, the three lower teeth hardly as long as tube. *Pod* distinctly stalked, 6–8-seeded, thin, flat,  $2\frac{1}{2}$  in. long,  $\frac{1}{3}$  in. across from suture to suture.

An extremely interesting addition to the Himalayan Flora. In general appearance it much resembles the other species but is easily distinguished by its long narrow pods and its petioled leaves.

### 4. ARGYROLOBIUM ECKL. & ZEYH.

#### 2. ARGYROLOBIUM ROSEUM *Jaub. & Spach.*

This species is said in *F. B. I.* to be 'nearly or quite glabrous' with leaflets truncate or emarginate and with corollas yellow tinged with red. The result has been that this species has been frequently sent to Calcutta, after comparison with the *F. B. I.* description, with the suggestion that it is either a new species or the one next to be described. Sometimes, but very rarely, it is nearly glabrous and occasionally all the leaflets are truncate or emarginate: much more usually, however, the leaflets are mucronate. The flowers are "rose" (*Jacquemont*) or "purplish"



(*A. O. Hume*); "there is no trace of yellow" (*Collett*); the colour of the next species has been attributed in the *F. B. I.* to this one.

3. ARGYROLOBIUM TRIGONELLOIDES *Jaub. & Spach.* in *Ann. Sc. Nat.* ser. ii. xix, 50; end leaflet obovate-cuneate, obtuse, emarginate, truncate or mucronulate, calyx-teeth lanceolate all subequal, upper lip 2-partite. *Jaub. & Spach. Ic. t.* 60; *Boiss. Flor. Orient.* ii. 33.

BRITISH BELUCHISTAN; *Nal, Duke!* *DISTRIB.* Persia.

Hardly distinguishable in the herbarium from *A. roseum* of which it has the habit and foliage. The pods however are shorter, flatter, and few seeded;  $\frac{1}{2}$  in. long  $\frac{1}{10}$  in. broad 3-6-seeded, strigose; the flowers are yellow, with a tinge of purple, and the upper lip of the calyx in place of being only 2-fid as in *A. roseum* is 2-partite almost to the base.

### 8. CROTALARIA LINN.

6. CROTALARIA TRICHOPHORA *Benth.*

Add to localities of *F. B. I.*:—BEHAR; *Kurz!*

8. CROTALARIA VESTITA *Bak.*

This species is common on the Western Ghauts, as at Khandalla and Mahableswar.

9. CROTALARIA PROSTRATA *Roxb.*

Add to localities of *F. B. I.*:—UPPER BURMA; Sandow Hill, *Prager!*

10. CROTALARIA HUMIFUSA *Grah.*

Add to localities of *F. B. I.*:—NAGA HILLS; Kohima, *Clarke!* UPPER BURMA; Nat-toung Mts. *Cross!*

11. CROTALARIA FERRUGINEA *Grah.*

Add to distrib.:—Yunnan (*Anderson!*)

12. CROTALARIA ACICULARIS *Ham.*

Add to localities of *F. B. I.*:—MADRAS PRESIDY.; Ganjam, frequent, *Gamble!* Anamallays, *Beddome!*

14. CROTALARIA HIRSUTA *Willd.*

Add to localities of *F. B. I.*:—BURMA; South Shan States, *King's Collectors!*

16. CROTALARIA MULTIFLORA *Bth.*

Add to localities of *F. B. I.*:—Anamallay Mts., *Beddome!*

17. CROTALARIA ALATA *Ham.*

Add to localities of *F. B. I.*:—MALAY PENINSULA; Singapore, *Hullett!* *Ridley!*

18b. CROTALARIA COLLETTII *Prain*; diffuse, stipular wing broad, leaves small orbicular obtuse coriaceous, peduncle elongated leafy, pod distinctly stalked. *C. alata Coll. & Hemsl. Journ. Linn. Soc.* xxxviii. 37 (1890) *not of Ham.*

UPPER BURMA; Popah Hill, 5000 feet, *Collett!*

A spreading shrub with stems 6-12 in. long densely grey velvety. *Leaves* sessile orbicular  $\frac{1}{2}$  in. across densely velvety especially beneath, stipules forming a broad wing for the whole extent of an internode, their points lanceolate-deltoid. *Racemes* 2-3-fl. and flowers often solitary, bracts small persistent ovate-acuminate. *Calyx*  $\frac{1}{2}$  in. densely silky, tube campanulate. *Pod* oblong 1 in. long, glabrous, its stalk  $\frac{1}{4}$  in., 20-30-seeded.

This plant, which has exactly the facies of *Crotalaria scabrella* W. & A. differs from that Southern Indian plant in having peduncles and stipular wings exactly like those of *C. alata*. On this account Sir H. Collett and Mr. Hemsley unite it with *C. alata*, which they can find no character to distinguish as a species from *C. rubiginosa* Willd. the plant to which Mr. Baker has referred *C. scabrella*. With this view the author cannot altogether agree though it is true that if we accept the treatment of the remaining forms in the *Flora of British India* it is logically necessary. After an examination, however, of 20 specimens, (seven gatherings), of *Crotalaria rubiginosa* and of 34 specimens, (ten gatherings), of *Crotalaria scabrella* the writer is convinced that the union of the two as varieties of one species, except on the comprehensive principle advocated by Collett and Hemsley which would recognise but one species with wing-like stipules, cannot be sustained. There are no intermediates between the two plants which, though not dissimilar in size, differ in habit, tomentum, shape and venation of leaves, size and shape of stipules, and above all in size and shape of pods—those of *C. rubiginosa* being  $\frac{1}{2}$  shorter and nearly  $\frac{1}{2}$  narrower than those of *C. scabrella* and being quite sessile while those of *C. scabrella* are stalked. As this character alone will quite sufficiently enable members to distinguish the two species in the field a detailed description of *C. scabrella* is not here given. It is otherwise however with *C. Wightiana*, also reduced by Mr. Baker to *C. rubiginosa*, which differs so widely that it is essential, in restoring it to the specific rank that it deserves, to provide a description.

18c. CROTALARIA WIGHTIANA *Grah.* in *Wall. Cat. n.* 5358; tall erect branched, stipular wing broad triangular-ovate much expanded at apex; leaves thin elliptic-obovate obtuse mucronate, peduncles usually very long, pod long-stalked. *W. & A. Prodr.* i. 181. *C. rubiginosa* VAR. *Wightiana* *Bak.* in *Flor. Brit. Ind.* ii. 69.

SOUTH INDIA; Dindygul Hills, *Wight* (*Cat. n.* 693! *Wall. Cat. n.* 5358! *Kew Dist. n.* 587!) Coonoor, 6000 feet elev., *Gamble n.* 13256! CEYLON; Kandy, *Thwaites!* *Watson!* Pedrotalla, *T. Thomson!*

A shrub, 3-4 feet high, fastigiately branched. *Stem* and leaves beneath closely adpressed rusty-tomentose. *Leaves* very short-petioled 2 in. long, 1.75 in. across, stipule  $\frac{1}{2}$  in. wide or more at top forming a wing for whole length of internode. *Racemes* 2-5-fl., bracts large persistent ovate-acute. *Calyx*  $\frac{3}{8}$  in. densely silky, tube short campanulate bracteoles inserted above the base, teeth lanceolate. *Corolla* pale-yellow slightly exserted, standard 1 in. long. *Pod* oblong, glabrous 2 in. long (including stalk  $\frac{1}{4}$  in.)  $\frac{5}{8}$  in. diam., 30-40-seeded.

A very distinct species.

## 22. CROTALARIA TRIQUETRA *Dulz.*

Add to localities of *F. B. L.*:—RAJPUTANA; Mt. Abu, common, *King!*

23. *CROTALARIA ALBIDA* Heyne.

Add to localities of *F. B. I.*:—MALAY PENINSULA; Selangor, *Ridley!*

Also add the following variety:—

VAR. *inopinata*; leaves rigid linear acute densely silky beneath, calyx densely silky. *C. inopinata* Prain MSS.

SHAN HILLS; Yindaw, *King's Collector!*

This plant has exactly the calyx-teeth and precisely the pod of *C. albida* of which it moreover has quite the habit. The foliage and tomentum are however very dissimilar. The corollas on our specimens are not in a fit state for examination, and it seems better to place the plant for the time being under *C. albida*, though it is more likely that it will be found specifically distinct.

24. *CROTALARIA NANA* Burm.

VAR. *typica*; leaves oblong, broader upwards, obtuse; flowers few on lateral pedicels.

VAR. *umbellata*; leaves oblong, acute; flowers many in terminal umbels. *C. umbellata* Wight in *Wall. Cat.* n. 5383.

WEST and SOUTH INDIA; Dindygul Hills, *Wight!* Nediwattam, *Gamble!* Canara, *Tulbot!* Mahableshwar, *Cooke!*

A very distinct plant perhaps deserving the specific rank claimed for it by Wight.

VAR. *patula* Baker. *C. patula* *Grah.* in *Wall. Cat.* 5371.

Has also been collected, in a 'wild' condition, in Hort. Bot. Calcutta, doubtless having been introduced accidentally from Burma. Probably also quite a distinct species.

27. *CROTALARIA OCCULTA* *Grah.*

Add to synonyms:—*C. Stacyana* *Wall.* in *Trans. Med. Phys. Soc. Calcutta* vii. 228 (1830).

Add to localities:—NAGA HILLS; Kohima, common, *Prain!*

28. *CROTALARIA CALYCINA* *Schrank.*

Add to localities of *F. B. I.*:—CHITTAGONG, UPPER BURMA and SHAN HILLS; common.

29. *CROTALARIA SESSILIFLORA* *Linn.*

Add to localities of *F. B. I.*:—NICOBARS; Kamorta, *Kurz!* (*C. calycina* *Kurz, Journ. As. Soc. Beng.* xlv. pt. 2. 147. *not of Schrank*). Add to distrib.:—Java.

29b. *CROTALARIA BURMANICA* *Coll. & Hemsl. Journ. Linn. Soc.* xxviii. 38; annual or perennial, laxly silky with long hairs; leaves narrowly oblong-lanceolate or the uppermost almost linear; flowers in elongated terminal racemes, with a number of empty tracts disposed along the stem between highest leaf and lowest flower, calyx middle-sized laxly clothed with spreading silky hairs, teeth oblong two upper rather broader; pod unknown.

UPPER BURMA; Shan Hills, at Pwehla, 4000 feet elev., *Collett!*

*Stems* over 2 feet high apparently simple. *Leaves* herbaceous, shortly petioled 1-1½ in. long, acute or sub-acute hirsute on both faces but especially beneath; stipules minute subulate. *Racemes* 10-15-flid. about 3 in. long, separated by an interval of equal length bearing only barren bracts from the leafy stem, bracts long setaceous persistent. *Calyx* ½ in. long, tube short campanulate. *Corolla* ⅔ in. long. *Ovary* sessile oblong glabrous many-ovuled.

That this species is nearly related to *C. sessiliflora*, as remarked by Genl. Collett and Mr. Hemsley, is evident; it however differs very markedly in having the upper surface of its leaves hirsute, and in having a space with only barren bracts intervening between leaves and flowers. In some respects it is allied to *C. chinensis* but differs in having many-flid. elongated racemes and in being unbranched. Till, however, it is known whether its pod is included or exerted its exact position cannot be determined.

30. *CROTALARIA CHINENSIS* Linn. •

Add to localities of *F. B. I.*:—MALAY PENINSULA; Perak, *Wray!*

33. *CROTALARIA CAPITATA* *Grah.*

Add to localities of *F. B. I.*:—MANIPUR; Chingsow, *Watt!* UPPER BURMA; Maymyo, *King's Collector!* Saiktha, *Prazer!* South Shan Hills, *King's Collectors!*

34b. *CROTALARIA PERPUSILLA* *Coll. & Hems. Journ. Linn. Soc. xxviii.* 37; diffuse laxly silky, stems and branches prostrate slender, leafy; leaves very small ovate-rotund, flowers few in lax terminal heads, calyx small densely villous, teeth all lanceolate the two upper rather the longer and wider, pod oblong (immature) hardly exerted.

UPPER BURMA; Shan Hills at Koni, 4000 feet elev., *Collett!*

A slender procumbent branched annual or perennial, branches 6 in. long or less, densely clothed with adpressed brownish hairs. *Leaves* short petioled rather close-set thinly herbaceous, ½ in. long ¼ in. wide, numerous, clothed on both surfaces with long spreading white hairs and minutely punctate; stipules 0. *Racemes* sub-capitate, 2-5-flid., flowers shortly pedicelled; bracts and bracteoles lanceolate persistent. *Calyx* ⅓ in. tube campanulate the two upper teeth sub-obtuse. *Corolla* ½ in. long, purple, slightly exerted. *Pod* sessile glabrous, hardly exerted (unripe), few-seeded.

Associated by Sir H. Collett and Mr. Hemsley with *C. pusilla* and *C. hirta*; appears to the writer to be most nearly related to *C. priestleyoides*.

36. *CROTALARIA NERIIFOLIA* *Wall.*

Add to description of *F. B. I.*:—

*Pod* 1¾-2¼ in. long, narrowly oblong, thick-walled, glabrous, gynophore ⅓ in.

40. *CROTALARIA ASSAMICA* *Benth.*

Add to localities of *F. B. I.*:—UPPER BURMA; Poneshee, *Anderson!* Chin Hills, *King's Collector!* Shan States, *Manders!* *King's Collectors!*

67b. *CROTALARIA UNCINELLA* *Lamk., Encyc. Meth., ii.* 200 (1790); shrubby, branches long, woody, spreading, slender, flexuous, slightly hirsute as are the leaflets beneath, leaflets rather large elliptic-obtuse entire; racemes many-flowered, corolla twice as long as calyx. *Lamk.*

*Ill. t. 617 f. 2. C. elliptica Roxb. Hort. Beng. 54; Flor. Ind. iii. 279; Benth. in Hook. Lond. Journ. ii. 580; Flor. Hong-Kong. 75; Forbes & Hemsl. Ind. Sinens. i. 151. C. Vachellii Hook. & Arn. Bot. Beechy Voy. 180; Walp. Rep. i. 588.*

MALAY PENINSULA; Pahang, *Ridley!* Malacca, *Derry!* *Goodenough!*

An almost stemless undershrub with several almost procumbent spreading branches, 1–2 feet long. *Leaflets* glabrous above, sub-equal or often the terminal rather larger than the other two, 1–1½ in. long, ½–¾ in. broad; petioles about 1 in.; stipules small acute rigid recurved glabrous above, hirsute beneath. *Racemes* lateral and terminal, 2 in. long, 20–25-fl., flowers close-set, bracts small recurved ovate-acuminate. *Calyx* hirsute, teeth lanceolate ¼ in. long. *Corolla* ¼ in. yellow, far exserted, glabrous. *Pod* ¼ in., style sharply hooked, closely adpressed-pubescent, 2-seeded.

First described, from communicated specimens, by Lamarck as a native of Mauritius; again and independently, from introduced specimens, by Roxburgh, as a native of China; refused a place in the Indian Flora by Wight and Arnott and by Baker; now, having been sent from the Malay Peninsula, requiring to be formally added to the Indian list.

70. CROTALARIA INCANA Linn.

No doubt naturalized only; to the localities of *F. B. I.* must now be added Chittagong, *King's Collectors!* and Penang, *Curtis!*

73. CROTALARIA SALTIANA Andr. Bot. Rep. t. 648 (1811).

This name is given as a synonym in *F. B. I.* It is however older than the name *C. striata* DC., which is more usually employed; having been adopted in the Kew Index it is necessary to use the name *C. Saltiana* in the *F. B. I.* also.

At the same time it has to be pointed out that some of the synonyms of the *F. B. I.* do not belong here. *Crotalaria latifolia* Roxb. ex Wight and Arnott, *Prodr. i. 180*, of which an authentic specimen exists in Herb. Calcutta, is not the same as *C. Saltiana* Andr. (*C. striata* DC.) It is however, the same as *C. Brownei* Bertero in *DC. Prodr. ii. 130*. But unfortunately, it is also the same as *C. lanceolata* Roxb. *Hort. Beng. 54* and as that is the older name doubtless some bibliographers will say that it must be employed to designate the plant. But as this would involve the further displacement of Meyer's *C. lanceolata*, a name given with good reason to a South African species, it seems more in accordance with common sense to retain for the plant in question the name given to it by Bertero. Though named first in the Calcutta Garden the plant is a native of the West Indies and might therefore be left unnoticed, especially as it is no longer in cultivation in the Calcutta Garden, but for the fact that it turns out to have escaped, and become apparently as thoroughly naturalized as *C. incana*, in Chittagong.

73b. CROTALARIA BROWNEI Bertero, DC. *Prodr. ii. 130*; shrubby, faintly silky, leaflets large oblong acute, racemes terminal and lateral elongated, bracts minute setaceous, corolla much exserted, pod sessile glabrous cylindric. *C. lanceolata* Roxb. *Hort. Beng. 54* (nomen prius) not of Mey.; *W. & A. Prodr. i. 180*. *C. latifolia* Roxb. ex Wall. *MSS. in Hort. Calc. ; W. & A. Prodr. i. 180*.

CHITTAGONG; naturalized, *King's Collector!* Native of West Indies.

An erect shrub 3-6 feet high with robust sulcate stem and branches. *Stipules* minute setaceous, deciduous, petiole 2 in., leaflets 3-5 in. long, narrowed at both ends, glabrous above, obscurely silky below. *Racemes* 20-30-fl., 4-6 in. long, flowers close-set, much like those of *C. Saltiana*; pods also similar but somewhat more turgid and without appreciable stalk.

Exceedingly closely related to the Indian and African *C. Saltiana* but easily distinguished by its much shorter racemes with closely packed flowers and by its totally different foliage. The leaves of this species are exactly like those of *C. bracteata*, for which species, in the absence of fruits, this is apt to be mistaken. After an examination of 75 specimens of 29 different gatherings of the common *C. Saltiana* the writer finds that from such various localities as Sikkim, Western India, Ceylon, Bengal, Assam, Burma, Siam, Perak, Penang, Malacca, Singapore and Java, the species shows no tendency to vary; it *never* has any but obtuse leaflets and in no instance is even the larger terminal leaflet more than  $2\frac{1}{2}$  in. long.

75. CROTALARIA QUINQUEFOLIA *Linn.*

Add to localities of *F. B. I.*:—MALAY PENINSULA; Kedah, *Kunstler!* Singapore, *Hullett!*

10. TRIFOLIUM LINN.

1\*. TRIFOLIUM DUBIUM *Sibth. Fl. Oxon.* 231; trailing, peduncles very slender elongated naked, flowers yellow, very small. *T. minus Relhan, Fl. Cantab.* ed. 2. 290; *Smith, Engl. Flor.* iii. 310. *T. filiforme Smith, Flor. Brit.* ii. 792 *via Linn.*

HIMALAYA; Simla, *Gamble! Collett! Darjeeling; Jallapahar, King!* NILGIRIS; Ootacamund, *Schmidt! Wight! Clarke! King!* *DISTRIB.* Europe.

Annual, stems 10-20 in. and leaves nearly glabrous. *Leaflets* truncate or notched, finely toothed; petiole short slender. *Heads* 4-20-fl., very small, flowers small turning ultimately brown. *Calyx* campanulate; pod obovoid.

This is so completely naturalised in the neighbourhood of hill-stations both in South and in North India that it must now be given a place in the Indian Flora.

12. TRIGONELLA LINN.

1. TRIGONELLA OCCULTA *Delile.*

Add to localities of *F. B. I.*:—RAJPUTANA; Marwar, *King!* *CENTL. INDIA; Jerdon!*

4. TRIGONELLA HAMOSA *Linn.*

No doubt Indian: localities of specimens in *Herb. Calcutta* are:—UPPER GANGETIC PLAIN; Gohanee, *A. O. Hume!* near Etawah, *Duthie* n. 4594! *CENTL. INDIA; Jerdon! King!* RAJPUTANA; Jodhpur, *King!*

13. MELILOTUS JUSS.

1. MELILOTUS INDICA *All. Flor. Ped.* i. 308.

This being the older name must be substituted for the name *M. parviflora.*

## 15. LOTUS LINN.

1. LOTUS CORNICULATUS *Linn.*

Add to localities of *F. B. I.* :—

TENASSERIM ; on Taepo, at 5000 feet elev., *Gallatly* n. 836 !

A very curious extension of distribution, seeing that the species has not yet been reported from Upper Burma or from the Himalayas east of Nepal.

## 17. INDIGOFERA LINN.

2. INDIGOFERA LINIFOLIA *Retz.*

Add to localities :—UPPER BURMA ; *Dr. King's Collectors !*

4b. INDIGOFERA SQUALIDA *Prain* ; suffruticose, sparsely adpressed-pubescent, leaves subsessile ovate-lanceolate acute, flowers 12–18, in small sessile congested axillary racemes, pod straight tetragonous about 8-seeded, not torulose.

UPPER BURMA ; Koni, *King's Collector !* Fort Stedman, *King's Collector !*

An undershrub  $1\frac{1}{2}$ –3 feet high, branching near base only, persistently sparsely adpressed grey-pubescent. *Stipules* linear-subulate ; petiole 0–2 in. long, lamina chartaceous 2 in. long, .75 in. across. *Racemes* .3–5 in., rather longer in fruit. *Calyx*  $\frac{1}{2}$  in. white-pubescent, teeth long setaceous. *Corolla* purple, twice the calyx. *Pod* deflexed, .75–1 in. long, the valves slightly adpressed-puberulous.

To leaves that, but for being sessile or nearly so, considerably resemble those of *I. Brunoniana* this species adds the habit, and practically the inflorescence and pods of the otherwise very different *I. trifoliata*.

5. INDIGOFERA CALONEURA *Kurz.*

Add to localities :—SHAN HILLS ; Lwekaw, 4000 feet, *Collett* 706 ! TENASSERIM ; Taepo, 5000 feet, *Gallatly* 714 !

6. INDIGOFERA BRUNONIANA *Grah.*

Recent gatherings of this species in Upper Burma show that it is as usual for the leaves to be 3-foliolate as to be simple. The species thus connects *I. caloneura*, which seems always to be 1-foliolate, with the next species.

6b. INDIGOFERA BELLA *Prain* ; shrubby, leaves odd-pinnate, leaflets 7–9 large, ovate-acute, stipules deciduous, racemes close-flowered rather large, peduncled, individual flowers short-pedicelled, pods cylindrical many-seeded with somewhat thickened sutures and a very sharp abruptly upturned beak.

UPPER BURMA ; Myingin Hills, *Prazer !* Kalay Hills, *Prazer !* Pegu, *Kurz !*

A shrub 8–12 feet high ; branches long virgate slender slightly 4-angled. *Leaflets* quite glabrous above, very sparsely puberulous and very glaucous beneath, 3 in. long, 1.75 in. wide, rather conspicuously veined beneath ; stipules deciduous, stipels setaceous sub-persistent, leaf-rachis 4–5 in. long, petiolules .2 in. *Racemes* up to 8 in. long, copious. *Calyx* campanulate  $\frac{1}{2}$  in., teeth short deltoid. *Corolla* white .6 in. long, standard thinly pubescent. *Pod* 2 in. long, glabrous, tip very abruptly recurved.

A handsome and striking species; apparently nearly related to a Central Chinese plant (*Henry* n. 3865).

8. INDIGOFERA TRIGONELLOIDES *Jaub. & Spach.*

Add to localities:—PANJAB; Amritsar, *T. Anderson* n. 123!

19b. INDIGOFERA CONSTRICTA *Trimen Cat. Ceyl. Pl.* 23; shrubby, branches and membranous leaves thinly clothed with adpressed grey hairs; leaflets 9–11 oblong-oval the side ones opposite, racemes elongated, pod long recurved, 3–7-seeded, constricted between the seeds. *Trimen Handbook Fl. Ceyl.* pt. ii. 27. *Indigofera flaccida* VAR. *constricta* *Thw. Enum.* 411; *Bak. in Flor. Brit. Ind.* ii. 99 (*sub I. tinctoria.*)

WESTERN INDIA; Canara, on Wuddee Ghat and on Nilkhund Ghat, *Talbot* nn. 320! 788! CEYLON; Motale East, *Thwaites* n. 3811!

A shrub 3–4 feet high, branches few virgate cylindrical. *Leaflets* thin, glabrescent above, finely hairy on both surfaces, especially beneath. *Flowers* numerous, racemes about as long as leaves. *Calyx* silky, tube campanulate, teeth short triangular acute. *Pod* 1½ in., slightly recurved and 4-angled, pointed and much constricted between the seeds, sparingly silky.

This has been compared by Mr. Baker and by Dr. Trimen with *I. tinctoria*; in the writer's opinion the original comparison by Dr. Thwaites with *I. flaccida* (*I. subulata*) more truly indicates its natural affinities. It has quite the habit and appearance of *I. subulata* and is much less like *I. tinctoria* in facies. The *F. B. I.* compares *I. subulata* with *I. trita* but, so far as Calcutta specimens go, and we have 22 different gatherings of that species, all very uniform, the resemblance is far from striking; *I. trita* is always a much more rigid shrub than any of the three mentioned; *I. subulata* indeed is subsucculent.

Both *I. subulata* and *I. marginulata* are described by Mr. Baker (the former by Dr. Trimen also), as having leaves with 5 leaflets; Mr. Baker qualifies the statement further on by saying leaflets "always 5 on the leaves of the main branches." In specimens collected by Dr. Wight (*Wall. Cat.* 5475 and *Wight, K.D.* 667), almost all the leaves have 5 leaflets; also in specimens obtained by Mr. Gamble in the Anamallai Hills (*Gamble* n. 14592). In the only specimen of Dr. Roxburgh's collecting at Calcutta (from Golconda) and in Ceylon specimens (*Thwaites* n. 1460, *Beckett* n. 2378), the majority of the leaves have 7 leaflets.

Dr. Trimen describes *I. constricta* as having 9 leaflets. This is true of *Thwaites* n. 3811 and *Talbot* n. 788 but in *Talbot* n. 320 as many of the leaves have 11 leaflets as have 9.

25. INDIGOFERA HIRSUTA *Linn.*

Add to localities of *F. B. I.*:—SINGAPORE; *Hullett!*

28. INDIGOFERA TINCTORIA *Linn.*

As Mr. Kurz has pointed out (*Journ. As. Soc. Beng.* xlv. pt. 2. p. 269) *Indigofera Anil* is a very common wild or semi-wild species in Burma. It has now similarly found its way into the Andamans and become quite naturalised. Specimens from India are very rare. Mr. Kurz proposes that *I. Anil* should be looked on as a variety of *I. tinctoria*, a proposal for which there is much to be said. But Mr. Kurz's further belief that the *Indigofera argentea* VAR. *coerulea* of the *F. B. I.* should also be referred here seems quite untenable; that plant is, without any doubt, a form,



hardly even a variety, of the extremely distinct *I. argentea* Linn.—the species known as “Nil” in Rajputana. The “Nil” of most other parts of India—the Indigo plant (*I. tinctoria*)—is on the other hand known in Rajputana as “Jin-gini,” all the use made of it being that its seeds are sometimes eaten during periods of scarcity. If the form referred to by Mr. Baker must be treated as a variety it would perhaps be better to substitute the name VAR. *brachycarpa* or VAR. *retusa* for the name VAR. *coerulea*; it happens that Dr. Roxburgh's *I. coerulea* is exactly = *I. argentea* Linn. and is not quite = *I. retusa* Grah. or *I. tinctoria* VAR. *brachycarpa* DC., both of these being exactly Mr. Baker's plant.

29. INDIGOFERA WIGHTII *Grah.*

Add to localities of *F. B. I.*:—TENASSERIM; Endine-ghor, 1000 feet elev., *Gallatly!*

30. INDIGOFERA CYLINDRACEA *Grah.*

Add to localities of *F. B. I.*:—NAGA HILLS; Pulinabadza, 7500 feet elev., *Prain!*

31. INDIGOFERA LEPTOSTACHYA *DC.?*

Add to localities of *F. B. I.*:—UPPER BURMA; Maymyo and Lwekaw, *Dr. King's Collectors!*

32. INDIGOFERA ATROPURPUREA *Ham.*

Add to localities of *F. B. I.*:—NAGA HILLS; Mao, *Clarke!* UPPER BURMA; Bhamo and Maymyo, *King's Collectors!* Shan Hills, *King's Collectors!* Karen Hills, *O'Reilly!* DISTRIB. Yunnan, at Momien (*J. Anderson*).

38. INDIGOFERA DOSUA *Ham.* var. *TOMENTOSA Bak.*

Add to localities of *F. B. I.*:—UPPER BURMA; Shan Hills, common.

18. PSORALEA LINN.

1. PSORALEA CORYLIFOLIA *Linn.*

Add to localities of *F. B. I.*:—

BURMA; Paganmyo, *Wallich!* Poneshee, *Anderson!* Meiktila, *Collett!* Shan States, very common, *King's Collectors!*

In Burma the corolla is sometimes yellow, much more often it is reported as ‘blue’ or ‘purple;’ in India also it is more often quoted as ‘blue’ (*Gamble*) or ‘white with carina purple-tipped’ (*Hooker and Thomson*) than ‘yellow.’ The plant often reaches 5-6 feet in height.

1b. PSORALEA DRUPACEA *Bunge, Pl. Lehmann., 249;* herbaceous, leaves simple, racemes elongated, pod villous. *Boiss. Fl. Orient. ii. 187.*

NORTH-WEST HIMALAYA; Gilgit, *Giles!* DISTRIB. N. Persia, Turkestan.

An erect annual 3-4 feet high. Branches firm, striated, villous. Leaves distinctly petioled roundish widely serrate, harsh, conspicuously dotted; petiole villous, blades glabrescent. Flowers 25-50 in elongated lax racemes. Calyx subsessile villous  $\frac{1}{8}$  in. long; teeth lanceolate the lowest slightly longest. Corolla bluish-white distinctly exserted. Pod obovate, densely villous, twice as long as calyx.

## 20. MILLETTIA W. &amp; A.

The genus *Millettia*, here retained because its species are familiar under that name to residents in the East, does not differ, as Baron von Mueller has shown, from *Wistaria*. Unfortunately though *Wistaria* has become most familiar as the name of the genus it is by no means the oldest and therefore is not the one that ought to be employed. As Sir J. D. Hooker and Mr. Jackson show (*Index Kewensis* vol. ii. p. 1232) there are at least four names with a prior claim to being used. The oldest of these is *Kraunhia* (Raf. *Med. Rep. N. Y.* v. 352 [1808]) and the propriety of restoring the use of this name seems to be unquestionable. Dr. Otto Kuntze, however, proposes to employ the name *Phaseolodes*,—a modification of his own, of *Phaseoloides*, a name employed before the time of Linnaeus—to indicate the genus. To this the writer cannot agree, because of the inadvisability of employing an adjective, even when a wrong spelling is adopted, as the name of a genus.

1b. *MILLETTIA PUERARIOIDES* Prain; leaflets 5–7 membranous narrowly elliptic-oblong exstipellate densely silky beneath, standard densely silky on back, stamens monodelphous, pod glabrescent. *Millettia sericea* Kurz, *Journ. As. Soc. Beng.* xlv. pt. 2, 275; *For. Flor.* i. 353 *not of W. & A.* *Kraunhia puerarioides* Prain MSS.

TENASSERIM; Choungya, 4000 ft., *Gallatly* n. 531! PEGU; Tonkyeghat, Nakawachoung, Kurz n. 1765! UPPER BURMA; Poneshee, *J. Anderson!*

A woody climber, the branches glabrous and lenticelled. *Leaves* 2 feet long; leaflets 7–10 in. long, narrowed from the middle towards both extremities, the base cuneate, the apex very long caudate-acuminate, green and glabrous above, densely grey-silky beneath, the petiolules  $\frac{1}{4}$ – $\frac{3}{8}$  in. long and the rachis densely brown-tomentose. *Racemes* lateral a foot long, the lower half naked the upper densely set with fascicles of pedicellate flowers. *Calyx*  $\frac{1}{8}$  in., silky, scarcely toothed. *Corolla*  $\frac{1}{4}$  in., pale-pink, very silky. *Pod* (unripe) 2–3 in. long, sparsely coated with adpressed hairs, becoming ultimately glabrescent.

This is the Burmese plant referred by Mr. Kurz to *M. sericea*; it is difficult to decide whether it differs most from that species as to pods, which are narrower and become, even while young, glabrescent; as to flowers, which are about half the size; as to inflorescence, which is much longer and narrower, or as to leaflets which are densely silky beneath with much longer hairs, which taper gradually into a very long caudate sharp point instead of being abruptly shortly bluntly cuspidate, and which are membranous in place of coriaceous.

*Millettia sericea* has never been sent to Calcutta from Burma.

4. *MILLETTIA PULCHRA* Bth.

VAR. *tomentosa*; branchlets and leaf-rachises densely tomentose, leaflets softly tomentose beneath. *Millettia tomentosa* Watt MSS. in *Herb. Calcutta*.

ASSAM; Silhet, *De Silva* (Wall. *Cat.* 5630 C)! Naga Hills, below Kohima, 3500 ft., Prain! Manipur, at Laireain, 3000 feet, Watt n. 6,274!

This variety is very different in appearance, owing to its tomentum, from the typical plant; its leaflets are also larger.

Colebrooke has written on *Wall. Cat.* 5630 C "Tephrosia pulchra?"; it seems probable that Dr. Watt is right in claiming specific rank for the form. Since, however, neither DeSilva, Watt nor the writer have collected fruits, and as there is no difference in flower between this and typical *M. pulchra*, it seems better, till fruits are obtained, to treat it only as a variety.

5. *MILLETIA RACEMOSA Benth.*

Add to synonyms of *F. B. I.*:—*Millettia leiogyna Kurz, Journ. As. Soc. Beng.* xlii. pt. 2. 67. *Kraunhia racemosa Prain MSS.*

Add to localities of *F. B. I.*:—BEHAR; common, *Kurz!* BURMA; Pegu, Nagkawa, *Kurz!* Shan Hills at Toungyi, *King's Collectors!* Tenasserim, Thounghyen, *Gallatly!*

Like most *Millettias* this is slightly variable, but there is no essential difference between the Concan plant, and that from Behar and Orissa; the plant from Pegu and the Shan Hills is exactly like that from Behar, the plant in Tenasserim is exactly like that in the Concan and in Canara.

7b. *MILLETIA MULTIFLORA Coll. & Hemsl. Journ. Linn. Soc.* xxviii. 41; leaflets 9-13, usually 11, coriaceous, ovate-oblong to rounded, stipellate, minutely strigosely hairy on both surfaces, at length glabrous, standard slightly silky, stamens 2-adelphous, pod sparsely silky indehiscent. *Kraunhia multiflora Prain MSS.*

BURMA; Shan Hills, *Collett n. 553! King's Collectors!*

A tree 30-40 ft. high, young branches rusty-tomentose. *Leaflets* obtuse 1-1.5 in. long, apex sometimes acuminate, sometimes rounded or even retuse, always rather firm, finely reticulated especially beneath; petiolules  $\frac{1}{2}$  in. *Flowers* in fascicled racemes, shortly pedicelled. *Calyx* silky even in fruit. *Corolla* .7 in. long. *Pod* almost woody, straight pointed, uniformly covered with white silky hairs that do not conceal the raised reticulate nervation, 4 in. long, .75 in. across.

This is compared by its authors with *M. Brandisiana*; it seems also to have a marked affinity with *M. cana* which the writer does not, however, know well, there being but one example in Herb. Calcutta.

8b. *MILLETIA WRIGHTIANA Prain*; leaflets ovate shortly cuspidate thickly chartaceous, at first uniformly softly velvety beneath, standard glabrous on the back, stamens monadelphous, pod flat on the face, woody, thin, sutures slightly thickened but not winged. *Kraunhia Wrightiana Prain MSS.*

BURMA; Shan Hills, *King's Collectors!*

*Leaflets* rather rigid. *Racemes* close simple 4-6 in. long with puberulous rachis. *Pedicels* exceeding the calyx, slender, with a linear bracteole at calyx-base. *Calyx*  $\frac{1}{2}$  in., puberulous; teeth very short. *Corolla*  $\frac{3}{8}$  in., standard 2-callose at base. *Pod* 3-4 in. long, .5 in. wide.

Most nearly related to *M. glaucescens* from which it differs chiefly in the thinner pod not winged along the sutures and not lenticelled along the valves, also in its smaller bracts and its shorter puberulous rachis. The leaves when old are at times only pubescent on the nerves as in *M. pubinervis*, and at times glabrous beneath as in *M. glaucescens*.

The species is named in honour of Mr. Wright of the Kew Herbarium staff.

9. *MILLETIA PUBINERVIS* Kurz.

This is more like an *Otosema* than a *Eumillettia* because the standard is 2-callose; its racemes are not leaf-opposed. Its nearest ally among the species described in the *Flora of British India* is *M. glaucescens* Kurz, which also has a 2-callose standard. These two, with three other species—*M. Hemsleyana*, *M. Wrightiana* and *M. decipiens*, and with apparently a fourth from Borneo, of which the fruit is still unknown, and a fifth, *M. dehiscens*, from Java, constitute an extremely natural group of forms. This one has recently been obtained again in Tenasserim by Gallyatly, but the fruit is still unknown.

9b. *MILLETIA HEMSLEYANA* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 90; leaflets narrowly elliptic-obovate or lanceolate-acuminate, glaucous and softly pubescent ultimately glabrescent beneath except on main nerves, stipules large ovate deciduous, standard glabrous on the back, ovary pubescent, pod narrow thin glabrous, sutures slightly thickened not winged. *Kraunhia Hemsleyana* Prain MSS.

PERAK; Pulo Kamiri, Wray 3310! 3608!

An erect tree, the young parts puberulous. *Leaves* 6–8 in. with puberulous rachis, leaflets 4–5 pairs, 2–3 in. long, chartaceous. *Racemes* axillary, rachis puberulous, slender, simple, bracts large lanceolate, pedicels capillary pubescent solitary or fascicled. *Calyx* pale-green tinted with claret, broader than deep,  $\frac{1}{10}$ – $\frac{1}{8}$  in., densely pubescent. *Corolla* white faintly tinged with pink, standard  $\frac{1}{2}$  in. long, 2-callose at base. *Pod* 3–4 in. long,  $\frac{1}{5}$  in wide.

This is very closely related to *M. pubinervis* and seems to be its representative in Perak. It is however readily distinguished by its large stipules nearly  $\frac{1}{4}$  in. long, and its large bracts.

The species is named in honour of Mr. Hemsley, Principal Assistant, Royal Herbarium, Kew.

9c. *MILLETIA DECIPIENS* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 90; leaflets lowest pair broadly ovate the rest elliptic-obovate all obtusely acuminate, green on both surfaces, with a few sparse hairs on the midrib beneath; standard densely silky on the back, ovary pubescent, pod narrow thin glabrous, sutures not thickened. *Kraunhia decipiens* Prain MSS.

MALAY PENINSULA; Perak, *Scortechini!* Wray! Pahang, *Ridley!*

A spreading tree 40–50 feet high, 2–3 feet in diam., branches glabrous. *Leaves* 6–8 in., rachis glabrous, leaflets 4–5 pairs, basal  $1\frac{1}{2}$  the others  $2\frac{1}{2}$ –3 in. long 1– $1\frac{1}{2}$  in across. *Racemes* slender, axillary, simple, 6–8 in. long; pedicels capillary, puberulous, solitary or fascicled. *Calyx* reddish, slightly pubescent. *Corolla* pink, standard above  $\frac{1}{2}$  in. long, 2-callose at base; ovary pubescent, ovules 4.

Very near the preceding but easily distinguished by the silky standard; also very near *M. glaucescens* but further easily distinguished by the different pod. The flower of this species is, but for its rather smaller size, remarkably like that of *Pongamia glabra* and can only be safely distinguished by its ovary having 4 instead of 2 ovules. Another species very closely related to this is the Javanese *Millettia dehiscens* (*Pongamia dehiscens* Koord. & Val., *Bijdr.* ii. 96) from which this perhaps only differs as a variety.

10. *MILLETIA MONTICOLA* Kurz.

This is not a *Millettia* but a *Derris*; it is not confined to Burma, but extends to the Khasia Hills, where it has been collected by Capt. Badgely and by Mr. Mann, and to the Daphla Hills where it has been obtained by Mr. Lister. It should therefore be known in the meantime as *Derris monticola*. But, from the description, it seems closely related to, and may prove to be the same as, the imperfectly known *Derris secunda* Bak., of which the writer has seen no specimen.

It may be mentioned that, on the other hand, the species described as *Derris microptera* by Mr. Benthams has quite dehiscent pods and should be treated rather as a *Millettia* than as a *Derris*. There seems to be little doubt that it is the same as *Derris acuminata* Benth., and if so it must be known as *Millettia*, or *Kraunhia*, *acuminata*.

10b. *MILLETIA MACROSTACHYA* Coll. & Hemsl. Journ. Linn. Soc. xxviii. 41; leaflets 9-11, membranous, ovate-oblong obtusely acuminate, stipellate, softly sparsely hairy ultimately glabrescent beneath, standard sparsely silky on the back; stamens diadelphous; pod flat long narrow rigidly coriaceous glabrous. *Kraunhia macrostachya* Prain MSS.

BURMA; Shan Hills, 2000 to 4000 feet, Collett! King's Collectors!

A small tree, about 20 feet high, young shoots glabrescent. Leaves 1-1½ feet long, leaflets shortly petiolulate 2-6 in. long, pale-green, glabrous above, sparsely covered at first with grey pubescence but ultimately glabrous beneath. Racemes axillary as long as the leaves or longer; flowers shortly pedicelled. Calyx wide, sub-2-labiate, the two upper teeth forming a deltoid lip. Corolla rose-coloured, nearly 1 in. long, externally puberulous; standard rounded. Ovary sessile pubescent. Pod quite glabrous.

11. *MILLETIA PACHYCARPA* Benth.

Add to localities of *F. B. I.*:—UPPER BURMA; Ponesbee, J. Anderson! Shan Hills, at Koni, Prazer! Delete from localities of *F. B. I.*:—MALACCA.

In the Khasia Hills this is known as 'Kharina' and the fruits are used in poisoning streams to catch fish.

The Malayan plant referred to this species in the *F. B. I.* has very similar flowers, leaves and stems. But the leaflets are always smaller and the standard in place of being glabrous is very silky outside; the plant itself (*Griffith* n. 1769) is not at Calcutta but the recent Malayan gatherings identified with it at Kew belong to *Derris elliptica* Bth.

12b. *MILLETIA DORWARDI* Coll. & Hemsl. Journ. Linn. Soc. xxviii. 40; leaflets 5 ovate-oblong, cuspidate, coriaceous, stipellate, soon glabrescent beneath, standard densely silky on the back, stamens diadelphous.

BURMA; Shan Hills at Koni, Collett! Prazer!

An erect tree (*Collett* n. 773!) or a woody climber (*Collett* n. 759! Prazer!) young branches thickish and leaves beneath puberulous soon becoming glabrous. Leaflets 2-4½ in. long, paler beneath, stipels subulate. Racemes in a dense panicle above the leaves, flowers pedicelled 2-bracteolate. Calyx ½ in., densely silky, teeth rounded. Corolla 75 in., densely grey-silky. Ovary sessile densely villous; pod not seen.

Very closely related to *M. cinerea*; its smaller firmer leaflets and its much larger buds and flowers give it however, in all stages, a facies of its own.

The authors of the species had, they write, considerable hesitation about giving specific rank to this plant which they think may perhaps after all be only a variety of *M. cinerea*. Dr. King has very kindly examined the specimens with the writer and likewise agrees in thinking that Sir H. Collett and Mr. Hemsley were justified in according it specific rank. It is oftener a climber than a tree; fruits are still unfortunately wanting.

15. *MILLETTIA GLAUDESCENS* Kurz.

Add to localities of *F. B. I.*:—SIKKIM; Terai at Panchenai and Chunbati, *Gamble* 689! 2240! MALAY PENINSULA; Perak, *Wray* n. 168! *Ridley*! *Scortechini*!

Both in Sikkim and in Perak this is an erect tree. Its affinities are altogether with *M. pubinervis*, *M. Hemsleyana*, *M. Wrightiana*, *M. dehiscens* and *M. decipiens*. Like these species it has a 2-callose standard and ought perhaps to be removed from the section in which it is placed in the *F. B. I.*

The following key may assist in explaining the relationships of the species of the group to which *M. glaucescens* belongs, all the members of which have exstipellate leaves, and all of which except *M. glaucescens* itself have densely silky ovaries.

Standard pubescent on the back, (flowers pink):—

Leaflets 5-7, thinly adpressed-silky beneath,  
ovules 2... .. 1. *Millettia* (*sp. borneensis*.)

Leaflets 7-9 with only a few sparse hairs on  
midrib beneath:—

Ovules 4 ... .. 2. *Millettia decipiens*.

Ovules 5 or more ... .. 3. *Millettia dehiscens*.

Standard glabrous on the back, (ovules 6):—

Standard longer than broad, flowers yellowish-  
white or white:—

Petals yellowish-white with purple veins, calyx  
black-purple, stipules and bracts small ... 4. *Millettia pubinervis*.

Petals white flushed with pink, calyx green  
tinged with claret, stipules and bracts  
large ... .. 5. *Millettia Hemsleyana*.

Standard as broad as long, flowers blue:—

Pod thin without lenticels, sutures not winged 6. *Millettia Wrightiana*.

Pod thick woody lenticular, sutures winged ... 7. *Millettia glaucescens*.

The Bornean species mentioned occurs in Mr. Haviland's collection from that island, of which a complete set is present in the Calcutta Herbarium. No fruit has been collected and as it has only 2 ovules it is not possible to predict with certainty whether it may prove a *Millettia* or a second species of *Pongamia*, though the probabilities are somewhat against its belonging to the latter genus. In any case the writer is precluded from employing a distinctive name for the species since Mr. Haviland has expressly requested that none of his probably new species shall be named in Herb. Calcutta. The field-ticket of the specimen in question bears the marks "c. k. q. g."

18. *MILLETIA ERIANTHA* Benth.

Add to localities of *F. B. I.*:—PERAK; Wray! *Scortechini!* PAHANG; SINGAPORE; *Ridley!*

22. *MILLETIA EXTENSA* Benth.

This species must be deleted from the list. Its foliage, flowers and fruit are exactly those of *Millettia auriculata* Bak. If retained as a variety it can only be distinguished, and then not in every case, by its rather shorter racemes.

23. *MILLETIA LEIOGYNA* Kurz.

This species also must be deleted; it is simply *Millettia racemosa* Benth., differing in no respect from the Indian plant. Roxburgh's Orissa plant does not in any way differ from the Concan one. The species is quite as common in Central India and in Behar as it is in the Concan. In Burma it extends from Tenasserim to the Shan Plateau.

25. *MILLETIA CAULIFLORA* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 94; leaflets 13, upper oblong, lower ovate, base somewhat obliquely rounded, apex long caudate-acuminate; stipellate; flowers solitary from small conical papillae along leafless stem; pod closely silky-tomentose, not woody.

LARUT; Perak, *Kunstler* n. 2558!

A shrub 6-8 feet high, with dark lenticelled bark and with short conical flower-bearing processes in axils of fallen leaves. *Leaves* clustered at apex of stem; stipules subulate, caducous; rachis rusty-puberulous as are the petiolules and the setaceous persistent stipules; leaflets thin, glabrous on both surfaces, bright-green, dull beneath with 5-7 pairs of prominent lateral nerves, shining above with nerves and midrib slightly impressed; the lowest leaflets 2 in. long, 1.25 in. across, terminal and upper 2-3 pairs 6 in. long, 2 in. wide. *Calyx* .2 in., glabrescent. *Corolla* apparently pink. *Pod* 3-3.5 in. long, .6 in. wide, narrowed towards base, slightly recurved, rigidly coriaceous, closely grey silky-tomentose.

A very distinct species with leaves very like those of *Millettia macrophylla* Hook. fil., but with fewer lateral nerves and with a very different inflorescence. The pods in this species have thinner valves than in any of the other Indian species except *Millettia pulchra* which, however, it in no other respect recalls. It is doubtful if this species belong really to § *Otosema*; it resembles much in foliage and habit a Sumatran species\* which has however different pods, exstipellate leaflets, and very different stipules; this species (*M. stipularis*) is an *Eumillettia*.

\* *MILLETIA STIPULARIS* Prain; leaflets 17-19, upper oblong, lower ovate, base rounded, apex rounded abruptly narrowly candate; exstipellate; flowers in short racemes from small conical papillae along leafless stem; pod glabrous not woody.

SUMATRA; R. Roepit, 300 feet, *Forbes* n. 2948!

A shrub 8 feet high with ash-grey bark and with short conical raceme-bearing processes in axils of fallen leaves. *Leaves* 2 feet long with glabrous rachis, clustered at apex of stem; stipules very large, obliquely oblong, acute, .9 in. long, .25 in. wide, persistent; leaflets lowest pair 3 in. long, 1.5 in. wide; terminal and upper pairs 6-8 in. long, 2.25 in. across, glabrous on both surfaces, green shining above, dull with prominent midrib and 8-10 pairs of lateral nerves beneath. *Racemes* 1-3 from each papilla, 3-5 in. long, 10-15-fl., flowers shortly pedicelled, usually solitary on small produced nodes showing traces of 3-5 abortive or fallen flowers. *Calyx* .12 in.,

26. *MILLETTIA ALBIFLORA* Prain, *Journ. As. Soc. Beng.* lxxi. 2. 92; leaflets 5, rarely 7, more rarely only 3, elliptic-lanceolate, apex caudate, subcoriaceous, glabrous; standard glabrous; stamens monadelphous; pod very large flat rather woody, finely brown-velvety.

MALAY PENINSULA; Perak, common. Pahang, *Ridley* n. 2641!

A large spreading tree sometimes 80–100 feet high (*Kunstler*) usually 30–50 feet, trunk 2–3 feet in diam. *Leaflets* 5–10 in. long, 1·5–2·5 in. across, lowest pair rather smaller, shining above, dull beneath; petiolule ·25 in. *Flowers* in long narrow panicles longer than the leaves, from the upper axils of branches, often 1–1·25 ft. in length; individual racemes 4–6 in., flowers solitary on pedicels ·15 in. long; peduncles, pedicels and calyx all rusty-puberulous. *Calyx* ·25 in. long, tube campanulate, teeth triangular rather shorter than tube, the two upper connate emarginate. *Corolla* pure-white, ·75 in. long, standard orbicular 2-auriculate above the claw. *Vexillary* filament cohering half way up the staminal sheath, or at length free. *Ovary* puberulous. *Pod* linear, 7–13 in. long, 1·5–2 in. wide, softly brown-velvety.

27. *MILLETTIA UNIFOLIATA* Prain, *Journ. As. Soc. Beng.* lxxi. 2. 93; leaflets solitary obovate-oblong or lanceolate, subcoriaceous, glabrous; standard glabrous; stamens monadelphous; pod large flat, rather woody, finely pale yellowish-velvety.

MALAY PENINSULA; Pangkore, *Curtis* n. 1615! Perak, *Wray* n. 2836! *Scortechini* 124! 1023! 1711! *Kunstler* 4251! 4492! 8210!

A spreading tree 30–40 feet high, trunk 1 foot in diam., branches glabrous. *Leaflets* with reticulations visible on both surfaces, 6–8 in. long, 1·5–3 in. wide, beneath dull, above shining. *Flowers* in very slender axillary panicles shorter than the leaflets, individual racemes short, few-fl., separated by intervals 1 in. long, peduncles pedicels and calyx-tube glabrous. *Calyx* ·2 in. long, 2-bracteolate at the base, bracteoles ovate-lanceolate very small, teeth glabrous externally pubescent within. *Corolla* ·75 in. long, pure-white, standard orbicular retuse, 2-callose at base of lamina. *Stamens* monadelphous in a sheath split along vexillary side. *Ovary* puberulous. *Pod* linear, 6 in. long, 1 in. across, tapering to both ends.

Very distinct owing to its 1-foliolate leaves but nevertheless very closely related to the preceding species, which in leaflets, buds, corolla and pods it much resembles.

28. *MILLETTIA MAINGAYI* Bak. in *Flor. Brit. Ind.* ii. 110.

Add to description of *F. B. I.* :—

A creeper over 100 feet long. *Leaves* light green. *Flowers* in small axillary panicles one-third as long as leaves, 2·5 in. long, 1·5 in. across, rachis and pedicels rusty-pubescent. *Calyx* campanulate, externally rusty-pubescent, ·2 in. long, teeth wide-triangular half as long as tube. *Corolla* white tinged with pink, ·5 in. long, standard orbicular emarginate, slightly puberulous externally.

rusty-puberulous. *Corolla* purple, standard orbicular ·3 in. long, emarginate, externally slightly pubescent, exauriculate. *Stamens* monadelphous. *Mature pod* quite glabrous, linear, straight, rigidly coriaceous, 3–4 in. long, ·5–·75 in. broad.

The flower of this species are like those of *M. caudata*, as are the pods; the standard is however without auricles.



Add to localities :—SELANGOR ; 800–1200 feet, *Kunstler* 8759 !

To the kindness of Mr. Ridley the Calcutta Herbarium owes the possession of excellent flowering and fruiting specimens from a plant cultivated in the Singapore Botanic Garden. Mr. Kunstler has collected in flower, in Selangor, specimens that agree in every detail with Mr. Ridley's flowering specimens.

29. *MILLETTIA OOCARPA* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 92 ; leaflets 9–13, oblong, subcoriaceous, terminal usually much larger than the others, rounded at base, apex acute, glabrous finely reticulate beneath ; standard very sparsely silky externally ; stamens monadelphous ; pod large egg-shaped, softly dark-brown velvety.

PERAK ; *Scortechini* n. 429 ! *Wray* n. 2141 !

A climber, leaves light-green above, whitish beneath, 6–8 in. long, rachis-puberulous, leaflets 2–3 in. long, 1–1.5 in. wide, terminal exceeding the others. *Flowers* in small axillary panicles one-half as long as leaves, rachis and pedicels slightly puberulous, 2.5 in. long, 1.5 in. across. *Calyx* campanulate, externally grey-puberulous, .2 in. long, teeth obscure. *Corolla* white tinged with pink, .5 in. long, standard uniformly sparsely puberulous externally, orbicular, entire. *Stamens* diadelphous, vexillary filament free. *Ovary* 2-ovuled, densely pubescent. *Pod* shape and size of a fowl's egg, 3.5 in. long, 1.75 in. in diam., densely softly brown-velvety.

Nearly related to the preceding species but very distinct by reason of its leaflets glabrous beneath, and its very different pod.

## 22. TEPHROSIA PERS.

### 1. TEPHROSIA TENUIS Wall.

Add to localities of *F. B. I.* :—BURMA ; Segain Hills, *Wallich* n. 5970 ! Shan Hills, *King's Collectors* ! LACCADIVE ISLANDS ; Cardamum, *Alcock* ! Aucutta, *Alcock* !

### 2. TEPHROSIA CANDIDA DC.

Add to localities of *F. B. I.* :—MALAYA ; Singapore, *T. Anderson* n. 43 ! *Hullett* n. 670 ! perhaps introduced.

### 4. TEPHROSIA TINCTORIA Pers.

*VAR. coccinea* Bak. (*T. coccinea* Wall.) : in the light of the specimens received from Upper Burma since the plant was first issued by Dr. Wallich this seems to deserve recognition as a species. It differs more from typical *T. tinctoria* as regards foliage than does *T. calophylla* Bedd. and it has at the same time the long lax racemes on the strength of which *T. calophylla* is kept separate from *T. tinctoria*.

4b. *TEPHROSIA GRAHAMI* Wall. *Cat.* 5652 ; slender, branches finely adpressed-sericeous, leaves simple large oblong-lanceolate obtuse mucronate sessile, rarely casually petioled and then sometimes with a pair of diminutive basal leaflets ; flowers very lax on long slender axillary peduncles. *Kurz* in *Journ. As. Soc. Beng.* xlv., pt. 2, 272. *T. tinctoria* W. & A. *Prodr.* i. 211 ; *Bak.* in *Flor. Brit. Ind.* ii. 112 in part, hardly of *Pers.*

BURMA; Prome, *Wallich!* Kurz n. 2529! South Mingyin, *Prazer!*

General habit of *T. tinctoria* but more slender, leaves  $2\frac{1}{2}$  in. by  $\frac{3}{4}$  in. Peduncles 1-3-fld., 2-3 in. long. *Calyx, corolla* and *pod* as in *T. tinctoria*.

As represented by the large suites of specimens collected by Kurz and Prazer this is very uniform and distinct; the writer therefore has preferred Mr. Kurz's view to that expressed in the *Prodromus* and in the *Flora of British India* which are both based on the examination of Dr. Wallich's solitary gathering.

7b. TEPHROSIA PUMILA *Pers. Synops.* ii. 330. *T. diffusa* *W. & A. Prodr.* i. 213. *Galega diffusa* *Roxb. Flor. Ind.* iii. 387. *T. purpurea* *VAR. pumila* *Bak. in Flor. Brit. Ind.* ii. 113; *Prain, Bot. Laccad.* 35.

Further examination of the very extensive material in Herb. Calcutta serves to confirm the writer in the opinion expressed by him in 1892 that this plant must be re-recorded specific rank.

### 23. SESBANIA PERS.

#### *Key to the Indian Species.*

Flowers small, bud straight (SUBGEN. I. EUSESBANIA):—

Pods twisted, pendulous; flowers  $\frac{1}{2}$  in. long or upwards;  
(unarmed):—

Perennial; stems woody; flowers  $\frac{5}{8}$  in.; pods 6 in.  $\times$   $\frac{1}{8}$  in., sutures undulate and valves widely depressed between the seeds; a small tree ... .. 1. *S. ægyptiaca.*

Annual; stems pith-like; flowers  $\frac{3}{4}$  in.; pods 10-12 in.  $\times$   $\frac{3}{16}$  in., sutures straight, valves slightly abruptly depressed between the seeds; a swamp species with tree-like habit ... .. 2. *S. paludosa.*

Pods not twisted, erect or ascending (except at times in *S. cannabina*); flowers never exceeding  $\frac{3}{8}$  in.; all annuals with woody stems:—

Leaves and branches sericeous-tomentose; (unarmed); pods not torulose ... .. 3. *S. sericea.*

Leaves and branches glabrous:—

Stems and rachises of leaves smooth:—

Stems erect, very tall; pods with straight sutures and undepressed valves oftenest spreading or pendulous, 4-8 in.  $\times$   $\frac{1}{8}$  in. ... .. 4. *S. cannabina.*

Stems diffuse procumbent; pods subtorulose erect 3-4 in.  $\times$   $\frac{1}{10}$  in. ... .. 5. *S. uliginosa.*

Stems and rachises of leaves armed with weak prickles:—

Stems erect; fruiting raceme several-podded; flowers  $\frac{3}{8}$  in.; pods 9-12 in.  $\times$   $\frac{1}{8}$  in., sutures slightly undulate, valves widely depressed ... .. 6. *S. aculeata.*

Stems prostrate; fruiting raceme usually 1-podded, flowers  $\frac{1}{4}$  in.; pods 3 in.  $\times$   $\frac{1}{12}$  in. distinctly torulose ... .. 7. *S. procumbens.*

Flowers large (3 in. long); bud falcately recurved (SUBGEN.

II. AGATI)... .. 8. *S. grandiflora.*

An examination of the species of this genus that occur in Bengal, when living examples and not merely herbarium material are dealt with, shows that the only good account of them hitherto published is that by Dr. Roxburgh who treated them as species of *Aeschynomene*.

### 1. *SESBANIA ÆGYPTIACA Pers.*

The *Jait*, *Jayti* or *Jaynti*; a very familiar hedge plant in Indian fields and gardens. Its wood is still, as in Dr. Roxburgh's day, highly reputed as a source of charcoal for gunpowder manufacture. The fact that this is a small tree, lasting for several years, has prevented any confusion between it and the other species in the field. In herbaria however it is often mixed with the second species which like it has twisted pods and which has even larger flowers; in literature on the other hand, this second species is referred to *S. aculeata*. *S. ægyptiaca* is, by colour of flowers merely, separable into three varieties:—

1. *typica*; flowers uniformly yellow. *Sesban P. Alpin, Pl. Ægypt.* 81. t. 82; *Kedangu Rheede Hort. Malab.* vi. 49, t. 27; *Emerus Burm. Fl. Zeyl.* 93, t. 41. *Plukenet, Phytogr.* t. 165, f. 2.

Wight and Arnott refer here another figure of Plukenet's, while they refer Rheede's fig. to VAR. 3 and Burman's to VAR. 2. Both the latter authors however speak of the flowers simply as yellow. This seems to be one of the original Indian forms, it is however much more rarely grown now-a-days than either of the other two varieties.

2. VAR. *picta*; standard externally dotted with purple. *Plukenet, Phytogr.* t. 164, f. 5. *S. picta Pers. Synops.* ii. 316; *Lindl. Bot. Reg.* t. 873. *Aeschynomene picta Cav. Ic.* iv. 7, t. 314. Apparently not originally native in India though now very widely cultivated there. From a perusal of Rheede's description and from Burmann's diffidence about referring Plukenet's figure of this plant to his *Emerus* it seems fairly clear that this variety had, in Rheede's and Burmann's time, already reached India from America, where it seems truly native. This particular variety is commoner in Bengal than the typical form but is not nearly so common as the next. In Burma on the other hand this and the next appear to be equally common.

3. VAR. *bicolor* W. & A. *Prodr.* 214; standard dark-maroon or purple outside. *Aeschynomene Sesban Roxb. Flor. Ind.* iii. 332. *Sesbania picta Hort. Calcutta; Flor. Brit. Ind.* ii. 114 *not of Pers. and not of Bot. Reg.*

This form is as common in Burma as the preceding and in Bengal is the one that is usually cultivated. It has long stood in Indian gardens as the representative of the name *S. picta*; this misapprehension, no doubt owing to reliance placed upon wrongly-named specimens distributed from the Calcutta Herbarium, has crept into the *Flora of British India*.

2. *SESBANIA PALUDOSA Prain, Journ. As. Soc. Beng.* lxi. 2. 82; very tall annual marsh-plants of tree-like habit, quite unarmed; flowers large, pod long twisted flexible with strong, not indented sutures. *S. grandiflora Miq. Flor. Ind.-Bat.* i. 288 *not of Pers.* *S. cochinchinensis Kurz As. Soc. Beng.* xlv. 2, 271 *not of DC.* *S. aculeata* VAR. *paludosa Bak. in Flor. Brit. Ind.* ii. 115 (*excl. syn. Aeschynomene uliginosa.*) *S. punctata Bth. MSS. in Herb. Kew. not of DC.* *Aeschynomene paludosa Roxb. Hort. Beng.* 56; *Flor. Ind.* iii. 333 *not S. paludosa Jacq.*

BENGAL; in stagnant pools near villages and in swamps, very common. BURMA; not infrequent in swamps and swampy pastures all over the plains of Pegu, *Kurz!* MALAY PENINSULA; open marshy ground in Kedah near rice fields, *Kunstler* n. 1712! DISTRIB. Java (*Horsfield!*) Formosa (*Henry* n. 1802!)

A large tree-like annual reaching 12 ft. in height, stems 2 in. in diam. full of white pith; no prickles on stems or leaf-rachises. *Leaves* 8–12 in., sessile, leaflets 10–30 pairs, sparsely hirsute above. *Racemes* drooping, 8–12-flid., about as long as the leaves in whose axils they arise. *Flowers* yellow, the standard externally dotted with small purple spots,  $\frac{3}{4}$  in. long. *Pods* 10–12 in., always pendulous and always twisted.

This is the familiar *Kathsola* of Bengal, so named because of its great similarity in appearance to *Aeschynomene aspera*, the true *Sola*; the pith of this being a little harder it is known as the *Kath* (woody) *sola*. Though it is preferable to use Roxburgh's epithet "*paludosa*" for the species it must be pointed out that this is not *S. paludosa* Jacq. That species, as the description of the flowers and fruits shows, is *S. uliginosa* Sweet (*Aeschynomene uliginosa* Roeb.) Mr. Baker, it is true, identifies *A. paludosa* with *A. uliginosa* (*Flor. Brit. Ind.* ii. 115); both are *Sesbanias* and both grow in swamps, but as they differ in habit, in foliage, in flowers and in fruit it seems better to keep them separate. Mr. Kurz thinks this may have been what Loureiro meant by *Coronilla cochinchinensis*, but as that species has erect torulose pods, the identification is impossible. Dr. Kuntze's treatment of this form (*Rev. Gen. Pl.* i. 181) which he reduces to *S. ægyptiaca*, makes it clear that he never saw the plant itself; his whole discussion is an excellent example of the unscientific use of the imagination.

3. *SESBANIA SERICEA* DC. *Prodr.* ii. 266. *S. aculeata* VAR *sericea* Benth. in *Thw. Enum.* 441; *Bak.* in *Flor. Brit. Ind.* ii. 115; *Trimen*, *Flor. Ceylon*, 34.

CEYLON; Colombo, *Ferguson!*

There is no doubt that this differs *specifically* in the points noted by Mr. Baker. The pods most resemble those of *S. cannabina*, the foliage that of *S. paludosa*. It has been only once collected in Ceylon, and may possibly be an introduced species.

4. *SESBANIA CANNABINA* Pers. *Synops.* ii. 316; annual unarmed, racemes few-flid., short but distinctly peduncled, pods very often solitary, rarely more than 2, spreading or pendulous very rarely erect, rigid not twisted, sutures stout straight, valves not depressed between the seeds.

INDIA and BURMA; cultivated only.

This is the *Dhunchi* plant which is quite as well known to European residents as the *Jaynti* or the *Kathsola*, and which differs so greatly in habit, flowers and fruit from these that by no licence can they be conceived conspecific. This is *Aeschynomene cannabina* Retz. *Obs.* v. 26; *Roeb. Flor. Ind.* iii. 335; *S. cannabina* DC. *Prodr.* ii. 265; *S. affinis* Schrad. in DC. *Prodr.* ii. 265. It must, however, be noticed that it is *not* the *S. cannabina* of Wight & Arnott (*Prodr.* 215), as an examination of their specimens and a perusal of their description shows. The fibre of *Dhunchi* is sometimes used instead of *Jute* fibre for various purposes, its chief employment being by fishermen for nets and lines, the fibre having a reputation for resisting the effects of

water better than many others. But it is for its tall and slender stems which sometimes reach 20 feet in height without being more than ½ in. thick at the base, and which are always hard, never soft and pith-like as in *S. paludosa*, that the plant is mainly cultivated; these long lithe stems are used as the wattles of which are constructed the walls of the houses wherein *Piper Betle* is grown.

5. *SESBANIA ULIGINOSA* Sweet *Hort. Brit.* 129; diffuse, unarmed, racemes short few-flid., pods erect subtorulose, not twisted. *Aeschynomene uliginosa* Roxb. *Hort. Beng.* 56, *Flor. Ind.* iii. 334. *S. paludosa* Jacq. in *DC. Prodr.* ii. 265 not *Aeschynomene paludosa* Roxb.

BENGAL; in swamps.

This species Dr. Roxburgh compares with the South Indian *S. procumbens*, and Wight and Arnott would endorse this comparison. What these authors mean precisely when they say that Roxburgh's *A. uliginosa* is not the *S. uliginosa* of "authors," is hardly clear, for there would appear to be only one published *S. uliginosa*, that of Sweet, which is founded, Sweet indicates, on the *Aeschynomene uliginosa* of the *Hortus Bengalensis*. It is just possible that the *S. uliginosa* referred to by Wight is *S. paludosa* (*Aeschynomene paludosa* Roxb.)

6. *SESBANIA ACULEATA* Pers. *Synops.* ii. 316 (*excl. citations* Plunkenet and Rheede); *DC. Prodr.* ii. 265; *Bak. in Flor. Brit. Ind.* ii. 114 (*excl. all the varieties*).

A weed of rice fields and swamps throughout India. Two more or less distinct varieties are recognisable. They differ, however, only in habit, the flowers and fruits of the two are identical and intermediates are numerous.

1. *typica*; stems reddish, rather densely sprinkled with minute prickles. *Aeschynomene spinulosa* Roxb. *Flor. Ind.* iii. 333. *S. aculeata* W. & A. *Prodr.* 215 (*excl. syn. A. cannabina* Roxb. and *A. bispinosa* Jacq.).

2. *VAR. elatior*; stems green, sparsely prickly, taller, lax and slender. *Aeschynomene bispinosa* Jacq. *IC. Rar.* iii. t. 564. *Coronilla cochinchinensis* Lour. *Flor. Cochinchin.* ii. 552. *S. cochinchinensis* DC. *Prodr.* ii. 266. *S. cannabina* W. & A. *Prodr.* i. 215 not *Aeschynomene cannabina* Roxb.

Wight and Arnott refer Roxburgh's *Aeschynomene cannabina*, the *Dhunchi* plant, to *S. aculeata*. This is so obviously wrong that the only conclusion to be formed is that they never had an opportunity of examining a *Dhunchi* plant. And that they are right in regarding their *S. cannabina* (which the writer cannot separate specifically from their *S. aculeata*) as the plant that Retzius named *Aeschynomene cannabina* and that Willdenow named *Coronilla cannabina*, is highly improbable. The description given by Retzius really only fits well, among Indian *Sesbanias*, Wight and Arnott's own *S. procumbens*. It is merely the fact that Retzius has said, on Koenig's authority, that the plant to which he refers is the fibre-yielding species (and therefore the *Dhunchi*), which has led Roxburgh, whom the writer is quite willing to follow, to apply the name "*cannabina*" to the *Dhunchi* plant.

7. *SESBANIA PROCUMBENS* W. & A. *Prodr.* i. 215; *Bak. in Flor. Brit. Ind.* ii. 115. *Aeschynomene procumbens* Roxb. *Flor. Ind.* iii. 337.

As already mentioned this is the species which best fits the description given by Retzius of *Aeschynomene cannabina*; the reasons that have led the writer to adopt the Roxburghian interpretation have been stated.

8. *SESBANIA GRANDIFLORA Pers.*

Often cultivated, especially in Southern India, as a support for the Pepper-Vine.

24. *CARAGANA LAMK.**Key to the Indian Species.*

- Leaf-rachis suppressed ... .. *C. pygmaea.*  
 Leaf rachis produced :—  
 \* Leaf-rachis terminating in a naked point :—  
 Leaf-rachis persisting as a woody spine after fall of leaflets ;  
 calyx-teeth long :—  
 Ripe pods woolly within :—  
 Pods short, hardly thrice calyx, hirsute externally ... *C. Gerardiana.*  
 Pods long, 4–5 times calyx, glabrous externally ... *C. brevispina.*  
 Ripe pods glabrous within :—  
 Leaflets lanceolate, longer than broad :—  
 Leaflets pubescent with long spreading hairs on both  
 surfaces ... .. *C. chumbica.*  
 Leaflets glabrous above, sparsely adpressed-pubescent  
 below ... .. *C. conferta.*  
 Leaflets hardly longer than broad, oblong or ovate :—  
 Leaflets densely pubescent, pod glabrous ... *C. polyacantha.*  
 Leaflets finely hoary, pods pubescent :—  
 Pods turgid curved, abruptly pointed ... .. *C. ambigua.*  
 Pods narrow straight, gradually tapering ... *C. ulicina.*  
 Leaf-rachis usually deciduous with leaflets ; calyx-teeth  
 short :—  
 Stipules persistent as strong spreading woody spines ;  
 flowers solitary ... .. *C. Aitchisoni.*  
 Stipules weakly spinescent ; flowers several from one node *C. arborescens.*  
 Leaf-rachis bearing a leaflet at its tip :—  
 Leaf-rachis persisting after fall of leaflets ... .. *C. crassicaulis.*  
 Leaf-rachis not persisting :—  
 Leaflets retuse at apex ... .. *C. cuneata.*  
 Leaflets rounded at apex ... .. *C. acaulis.*

2. *CARAGANA CONFERTA Benth.*

Add to description of *F. B. I.* :—

*Pod* linear acute,  $1\frac{1}{4}$  in. long,  $\frac{1}{2}$  in. across, straight, glabrous within, externally sparsely covered with long spreading silky white hairs.

This has recently been collected in a complete state by Mr. Duthie in Astore ; Gudhai valley, 11–12000 ft., *Duthie* n. 12196 !

3. *CARAGANA GERARDIANA Royle.*

Add to localities of *F. B. I.* :—

EASTERN HIMALAYA ; at Ha-thom-py-ong, in Chumbi, *Dr. King's Collectors !*

3b. *CARAGANA CHUMBICA Prain* ; leaflets 8–12, narrowly ovate-lanceolate acute, densely pubescent, stipules pungent, flowers 1–2, short-pedicelled, pod glabrous within.

EASTERN HIMALAYA; Ta-long, two days from Chumbi, *Dr. King's Collectors!*

A shrub with close nodes, young branches pubescent with long spreading tawny hairs. *Leaflets*  $\frac{1}{2}$  in. long, tips pungent, whitish and densely pubescent with long silky hairs beneath, dark-green and sparsely pubescent above; leaf-rachis and lanceolate stipules both pungent-tipped and densely hirsute with long spreading tawny hairs. *Calyx*  $\frac{3}{8}$  in. long, externally very thinly grey-puberulous, pedicels  $\frac{1}{12}$  in. long only, in axils of small 2-3-jugate leaves, by the sheaths of which they are enclosed; bracteoles 0; calyx-teeth triangular,  $\frac{1}{3}$  as long as campanulate tube. *Corolla* twice the calyx. *Pod*  $\frac{3}{4}$  in. long,  $\frac{1}{2}$  in. wide, glabrous within, sparsely pubescent with spreading silky hairs outside.

A very distinct species resembling in many respects *C. Gerardiana*, but with different tomentum and very different pods.

4. *CARAGANA POLYACANTHA* *Royle.*

Add to description of *F. B. I.*:—

*Pod* linear acute,  $1\frac{1}{4}$  in. long,  $\frac{1}{2}$  in. across, slightly curved; glabrous internally and externally.

Add to distribution:—KASHMIR; Gilgit, *Duthie! Giles!*

4a. *CARAGANA AMBIGUA* *Stocks, Hook. Journ. Bot. iv. 145;* leaflets small, 4-6, elliptic-mucronate, adpressed hoary-pubescent, stipules spinescent, flowers usually solitary on distinct peduncles; pod pubescent oblong, shortly mucronate, distinctly recurved, sharply acuminate. *Boiss. Flor. Orient. ii. 199.* *C. Gerardiana* *Herb. Lace, not of Royle.*

SCINDE; *Stocks!* BRITISH BELUCHISTAN; near Quetta, *Hamilton!* Ziarat, *Lace n. 3697* (issued as *C. Gerardiana*)! *DISTRIB.* Beluchistan (*Stocks!*) S. Afghanistan (*L. O. Rind!*)

A small much branching shrub, with strong spreading spines 1- $1\frac{1}{4}$  in. long. *Leaves*  $\frac{1}{2}$ - $\frac{2}{3}$  in.; leaflets pale-green  $\frac{1}{4}$ - $\frac{1}{2}$  in., leaf-rachises hoary-puberulous. *Peduncle*  $\frac{1}{2}$  in., 2-bracteolate close below the calyx (*i.e.*, pedicels very short), pubescent with somewhat spreading hairs. *Calyx* adpressed-hoary, tube wide-campanulate,  $\frac{1}{4}$  in. deep, teeth triangular-lanceolate nearly as long as tube. *Corolla*  $\frac{3}{4}$  in. long. *Pod*  $\frac{3}{4}$  in. long, turgid,  $\frac{1}{2}$  in. wide.

This is nearest, as M. Boissier has already suggested, to *C. polyacantha*. A specimen named, and *correctly* named; *C. ambigua*, by Stocks himself, was sent by him to the Calcutta Herbarium with the locality "Scinde" on the ticket. All Stocks' other specimens, which have reached Calcutta either from Herb. Dalzell or from Herb. Kew, are marked "Beluchistan."

4b. *CARAGANA ULICINA* *Stocks, Hook. Journ. Bot. iv. 145;* leaflets small, 4-6, elliptic-retuse, mucronulate, adpressed hoary-pubescent, stipules spinescent, flowers 1-2 on distinct peduncles; pod pubescent, lanceolate, gradually tapering to apex, quite straight. *Boiss. Flor. Orient. ii. 199;* *Aitch. & Bak. in Journ. Linn. Soc. xviii. 44.*

N.-W. FRONTIER; Kurram Valley, *Aitchison n. 8!* *DISTRIB.* Beluchistan (*Stocks!*)

A small much branching shrub, with spreading spines rarely exceeding  $\frac{1}{2}$  in., usually slightly recurved and always weaker than in the preceding species. *Leaves*  $\frac{1}{2}$  in., leaflets pale-green  $\frac{1}{4}$ – $\frac{1}{3}$  in., leaf-rachises adpressed-puberulous with very short hairs. *Peduncle*  $\frac{1}{2}$  in., 2-bracteolate below the 1–2 slender pedicels,  $\frac{1}{4}$  in. long. *Calyx* sparsely adpressed-puberulous, tube wide-campanulate,  $\frac{1}{4}$  in. deep, teeth triangular half as long as tube. *Corolla*  $\frac{1}{2}$  in. long. *Pod*  $\frac{3}{4}$  in. long, not turgid,  $\frac{1}{8}$  in. wide.

M. Boissier suggests that this hardly differs from the preceding species; it differs however in spines, in flowers and in fruits so markedly that nothing could be gained by their union. Dr. Aitchison suggests (*Journ. Linn. Soc.* xviii. 43) that both *C. ulicina* and *C. ambigua* are perhaps only forms of an expanded species that would include *C. brevispina*. The writer, on the other hand, finds it necessary to recognise as specifically distinct from both of Stocks' species the plant identified by Dr. Aitchison with *C. ambigua*. The reasons for this will appear in the specific diagnosis and description which follow.

5b. *CARAGANA AITCHISONI* Prain; leaflets 6–8, very rarely 10, elliptic-mucronate, very sparsely adpressed-pubescent, stipules strongly spinous, flowers solitary on a long slender peduncle, pod glabrous linear not woolly within. *C. ambigua* Aitch. *Journ. Linn. Soc.* xviii. 43 not of Stocks.

N.-W. FRONTIER; Kurram Valley, Aitchison n. 549! n. 1220! Hazara, Bellew! Chitral, at Broz, Harriss!

A large spiny shrub with greenish *Laburnum*-like bark and short stoutish spreading stipular spines  $\frac{1}{4}$  in. long. *Leaves*  $\frac{1}{2}$ – $\frac{3}{4}$  in., leaflets pale-green,  $\frac{1}{4}$ – $\frac{1}{3}$  in. *Peduncle* very slender, jointed above middle,  $\frac{3}{4}$ –1 in. *Calyx*  $\frac{1}{4}$  in. long, membranous, wide-tubular, externally sparsely pubescent, teeth short. *Corolla*  $\frac{3}{4}$  in., glabrous. *Pod* flat,  $1\frac{1}{2}$  in. long,  $\frac{1}{8}$  in. across.

This differs very much in pedicels, calyx and pod from the true *C. ambigua*. It is not possible to place it in *C. brevispina*, the calyx and pod are so different. It is nearest to *C. microphylla* Lamk. of which it has almost the calyx and quite the corolla and pods; it differs, however, in having much longer and thinner pedicels and shorter leaves with far fewer leaflets. From *C. arborescens* Lamk. VAR.  $\beta$ . Ledeb. it is best distinguished by its thicker much smaller leaflets, and its compressed not cylindrical pods.

5c. *CARAGANA ARBORESCENS* Lamk. *Encyc. Meth.* i. 615; leaflets 8–14, elliptic-mucronate glabrescent, stipules weakly spinous, flowers several together from one node on long slender peduncles, pod glabrous linear not woolly within. *DC. Prodr.* ii. 268; *Ledeb. Flor. Ross.* i. 569; *Aitch. Journ. Linn. Soc.* xviii. 44.

N.-W. FRONTIER; Kurram Valley, Aitchison n. 1219!

A tall shrub with very short weak spreading stipular spines  $\frac{1}{2}$  in. long. *Leaves* 1–2 in., leaflets  $\frac{1}{2}$  in. by  $\frac{1}{4}$  in., pale-green, thinly membranous. *Peduncle* very slender, jointed above middle,  $\frac{3}{4}$ –1 in., 2–5 from the same node. *Calyx*  $\frac{1}{4}$  in. long, membranous, wide-tubular, externally sparsely pubescent, teeth short. *Corolla*  $\frac{3}{4}$  in., glabrous. *Pod* cylindrical,  $1\frac{1}{2}$  in. long.,  $\frac{1}{8}$  in. in diam.

7b. *CARAGANA ACAULIS* Bak. in *Journ. Linn. Soc.* xviii. 44; leaflets 7–9, flowers solitary.



N.-W. FRONTIER; Kurram Valley, *Aitchison* n. 1218!

*Stemless*; leaves rosulate crowning a slender elongated woody rhizome. *Leaflets* sessile obovate-cuneate,  $\frac{1}{3}$ – $\frac{2}{3}$  in. long, apex rounded or obtuse, petiole short, stipules small deltoid. *Peduncle*  $\frac{1}{2}$ – $\frac{3}{4}$  in. long. *Calyx*  $\frac{3}{4}$ – $\frac{1}{2}$  in., downy, teeth lanceolate half as long as tube. *Corolla* 1 in., standard  $\frac{1}{2}$  in. wide, silky, dirty-purple externally, yellow within. *Pod* linear, straight, thinly hoary, 18–20-seeded.

## 24b. CALOPHACA FISCH.

Perennial diffuse unarmed shrubs or undershrubs. *Leaves* odd-pinnate. *Flowers* solitary or umbellate on axillary peduncles. *Calyx* tubular, lobes almost equal or the 2 upper subconnate. *Corolla* exerted standard ovate or suborbicular, erect, margins reflexed; wings obovate-oblong, subfalcate, free; keel incurved about as long as the wings. *Stamens* 2-adelphous; anthers uniform. *Ovary* sessile, many-ovuled; style filiform, stigma small terminal. *Pod* linear, at length round or turgid; seeds subreniform. Species about 8; Oriental and North Asiatic.

1. CALOPHACA DEPRESSA *Oliv.* in *Hook. Icon. Plant.* t. 2304; leaflets 5–9, subalternate, oblong or obovate-elliptic the terminal obovate-cuneate, mucronulate, silky-pubescent; flowers very small solitary; pod turgid-cylindric mucronulate villous, 5–6-seeded.

KASHMIR; Baltistan, 6000 feet, *Giles*: Indus Valley, 7–8000 feet, *Duthie*!

A small depressed shrublet, hoary tomentose in all its parts. *Leaves*  $\frac{1}{2}$ –1 in. long, short-petioled; leaflets  $\frac{1}{4}$  in. or less with distinct petiolules; stipules small, ovate-lanceolate. *Flowers* on peduncles shorter than the leaves,  $\frac{1}{4}$ – $\frac{1}{3}$  in. long. *Calyx*, 3 lower teeth deltoid, 2 upper linear-subulate. *Standard* twice as long as calyx, shortly clawed, rounded, about as long as obtuse keel; wings shortly oblong-obtuse. *Pod* about  $\frac{1}{2}$  in. long,  $\frac{1}{3}$  in. wide.

## 25. GULDENSTÆDTIA FISCH.

3. GULDENSTÆDTIA MULTIFLORA *Bunge.*

Add to localities of *F. B. I.*:—BURMA; Shan Hills at Saga, 4000 feet, and Koni, 4500 feet *Collett*!

## 28. TAVERNIERA DC.

## 1. TAVERNIERA NUMMULARIA DC.

Add to localities of *F. B. I.*:—CENTRAL INDIA; *Jerdon*! SOUTHERN DECCAN; *Cleghorn*!

The plant appears to be very rare in the dry parts of the Deccan; it has not as yet been reported from Rajputana, where, however, considering the eastward extension just noted, it probably occurs and where it should be looked for.

## 31. ONOBRYCHIS GÆRTN.

1. ONOBRYCHIS STEWARTII *Bak.*; leaflets oblanceolate, subacute; pod reniform, turgid, 1-seeded; perennial.

2. *ONOBRYCHIS LAXIFLORA* *Bak. in Journ. Linn. Soc.* xix. 159; leaflets elliptic-obtuse 4–8-jugate the terminal not exceeding the lateral; pod circinnate flat semi-orbicular, 1-seeded; perennial.

NORTH-WEST HIMALAYA; Gilgit, *Giles!* DISTRIB. Afghanistan.

Herbaceous, perennial, stems slender  $1\frac{1}{2}$ –2 ft., finely puberulous. *Leaf-rachis* 3–6 in. long, including petiole  $\frac{1}{2}$ –2 in.; leaflets 9–17, shortly petiolulate,  $\frac{1}{3}$ – $\frac{1}{2}$  in. long, pale-green, obscurely canescent; stipules deltoid-acuminate, persistent. *Racemes* long-peduncled, lax, elongated, 6–9 in.; buds rather crowded; bracts minute scarious persistent. *Calyx* campanulate, obscurely pilose,  $\frac{1}{8}$  in.; teeth lanceolate as long as tube. *Corolla* 5 times calyx; standard glabrous, veined. *Pod* circinate, flat, semi-orbicular, faces areolate with hexagonal deepish pits, their walls sparingly spinescent; margins armed with numerous small teeth.

3. *ONOBRYCHIS NUMMULARIA* *Stocks in Hook. Journ.* iv. 146; leaflets ovate-orbicular or obovate-obtuse, mucronate; the terminal much exceeding the sometimes abortive lateral; pod circinnate flat, orbicular, 2-seeded; annual. *Boiss. Flor. Orient.* ii. 545. *O. tavernieræfolia* *Stocks ex Boiss. l.c.*

NORTH-WEST FRONTIER; British Beluchistan, very common. DISTRIB. Throughout Beluchistan and Afghanistan.

An annual dwarf stemless herb, hoary-tomentose. *Leaf-rachis*, including very long petiole, 4–5 in., leaflets 3 or 5, or very often only the terminal present; terminal  $\frac{1}{2}$ – $1\frac{1}{4}$  in. in diam. the others rarely exceeding  $\frac{1}{2}$  in., densely tomentose. *Racemes* long-peduncled, 6–8 in. long, rather lax, usually slightly exceeding the leaves; pedicels short, bracts rather long,  $\frac{1}{2}$  in., subulate. *Calyx* hirsute externally, including teeth  $\frac{1}{2}$  in., teeth subulate from broad bases twice as long as the short wide-campanulate tube. *Corolla* twice as long as calyx, under  $\frac{1}{2}$  in., standard puberulous, veined. *Pod* orbicular 2-locular, faces areolate with radiating pits, their walls little raised, unarmed; margins beset with long cottony setae.

Nearly related to the Persian *O. Aucheri* Boiss., but differing by its 2-seeded pods. The two species recognised by M. Boissier were by Dr. Stocks himself latterly supposed to be only two varieties of one species. The writer finds too many intermediates in Herb. Calcutta to admit of his even separating them as varieties.

## 32. LESPEDEZA MICHX.

### SUBGEN. I. EULESPEDEZA.

#### 1. LESPEDEZA SERICEA *Miq.*

Add to localities of *F. B. I.*:—Mountains of BEHAR and CENT. INDIA; very common. RAJPUTANA; Mt. Abu, common. UPPER BURMA; common.

A very distinct variety with long petioled leaves, var. *longepetiolata*, has recently been collected in Upper Assam (Makúm), by Mr. G. Gammie. This variety is common in South-West China.

6b. *LESPEDEZA SERICOPHYLLA* *Coll. & Hemsl. Journ. Linn. Soc.* xxviii. 45; petiole distinct, leaves rather large, densely silvery-tomentose on both sides, calyx densely hirsute with long hairs.

UPPER BURMA ; Shan Hills at Toungyi, 5000 feet elev., *Collett!*

A rather large shrub, the flowering branches thickish, angular, adpressed-silky. *Leaves* pinnately 3-foliolate, silvery-sericeous everywhere, shortly petiolulate, rachis and petiole 1-1.5 in. long; leaflets thick, soft, elliptic, terminal 1.25-1.75 in. long, .75-1 in. wide, lateral pair rather smaller. *Flowers* .5 in. long, in dense racemes, pedicels shorter than calyx, bracts small persistent. *Calyx* .2 in. long, sub-2-labiate, lobes narrow acute, the two upper almost completely connate, everywhere softly hirsute. *Petals* subequal glabrous; standard broad, claw very short; wings oblong, claw long slender; keel 2-auriculate above the long, slender claw; long-beaked. *Stamens* 2-adelphous. *Ovary* shortly stipitate, bearded along the upper suture, elsewhere glabrous. *Pod* not seen.

6c. *LESPEDEZA PINETORUM* Kurz, *Journ. As. Soc. Beng.* xlii. 2. 230; petiole distinct, leaflets large ovate-lanceolate acute softly velvety above, densely softly tomentose beneath, flowers is very dense sessile racemes, pod sessile hardly exerted.

BURMA; Natoung Mts., *Revd. Cross!* Pegu, Bookee Ridges, 4-6000 feet, Kurz 1637! TENASSERIM; Moolyet Range, common, *Gallatly!*

A stout erect simple or branching shrub 2-4 feet high; all parts densely tawny-pubescent. *Leaves* 3-foliolate, petiole .6-8 in. hardly produced, densely villous; leaflets very shortly and stoutly petiolulate, 2-3.5 in. long, 1-1.25 in. wide, base cuneate or rounded, tip mucronulate, coriaceous, subrugose under the soft velvety pubescence, prominently nerved and everywhere softly tomentose beneath. *Flowers* .35 in. long, in very dense racemes 1.5-3 in. long, .7 in. across, pedicels shorter than the calyx, bracts small persistent. *Calyx* .2 in. long, sub-2-labiate, lobes subulate, everywhere softly hirsute. *Petals* subequal glabrous, standard broad. *Pod* dimidiate-ovate, .25 in. long, silky.

A very fine and very distinct species.

SUBGEN. II. *MICROLESPEDEZA* Maxim. *Keel* transverse obtuse, flowers often apetalous, 1-3 fasciculate, axillary. Small annuals.

6d. *LESPEDEZA STRIATA* Hook. & Arn. *Bot. Voy. Beech.* 262; herbaceous, rigid, suberect, stems hoary, stipules longer than petiole, leaflets cuneate-oblong or obovate, obtuse or retuse, mucronulate, margin ciliate, veins numerous parallel, flowers axillary 1-3, shortly pedicelled, corolla when present twice the calyx; pod in perfect flowers slightly, in apetalous flowers far exerted. *Miq. Prol. Fl. Japon.* 237; Maxim. *Synops. Laped.* 56; *Benth. Pl. Hong-Kong.* 85. L. stipulacea Maxim. *Prim. Fl. Amur.* 85, 470; *Schmidt, Fl. Sachal.* 124. *Hedysarum striatum* Thunb. *Fl. Japon.* 289.

KHASIA; common, Mann! Clarke nn. 18604! 40531! 45227! DISTRIBUTION. China; Corea; Mandschuria; Japan; Saghalien; Bonin.

An annual herb 3-15 in. high, somewhat branched. *Stipules* striate, adpressed. *Leaflets* shortly petiolulate, rigid, midrib beneath adpressed-strigose, elsewhere glabrous except the ciliate margins, .35 in. long. *Bracteoles* 2, ovate, striate, ciliate, adpressed to calyx-base. *Calyx* narrowly campanulate, striate subangled plicate, 5-fid, teeth almost equalling tube, the two upper narrower and rather shorter than

the lower. *Petals* when present twice as long as calyx, subequal; standard obovate emarginate; wings linear-oblong; keel obtuse. *Pod* rounded.

An exceedingly distinct species, ascertained during recent years to be quite common in the Khasia Hills.

SUBGEN. III. OXYRAMPHIS *Wall.* (*Campylotropis Bunge; Maxim.*)

7. LESPEDEZA MACROSTYLA *Bak.* in *Maxim. Synops. Lesped.* 22 in part. Delete from synonyms of *F. B. I.*:—*L. Royleana* *Miq. Ann. Mus. Lugd. Bat.* iii. 50 (*L. sericea* *Royle* not of *Miq.*); also *Oxyramphis stenocarpa* *Klotzsch* in *Reis. Pr. Wald.* 158 t. i. fig. 2, (*O. sericea* *Grah.* in *Wall. Cat.* 5349).

Delete all localities except NEPAL; *Wallich* (Cat. n. 5348)!

7b. LESPEDEZA STENOCARPA *Maxim. Synops. Lesped.* 23. *L. Royleana* *Miq. Prol. Fl. Jap.* 238. *L. sericea* *Royle* MSS. not of *Miq.* *Oxyramphis stenocarpa* *Klotzsch, Reis. Pr. Wald.* 151, t. I, fig. 2. *O. sericea* *Grah.* in *Wall. Cat.* 5349.

N.-W. HIMALAYA; Kamaon and Garhwal, very common, *Govan* (*Wall. Cat.* 5349/B)! *Wallich* 5349/A! *Royle!* *Griffith!* *Thomson!* *Anderson!* *King!* *Gamble!* *Lace!* *Hume!* *Stoliczka!*

To Mr. Maximowicz Indian botanists are indebted for having pointed out that the Nepalese plant (*L. macrostyla*) is very different from the representative form in Kamaon and Garhwal (*L. stenocarpa*); the two are easily distinguished by their pods, those of *L. stenocarpa* being grey-silky, narrowly oblong, and gradually tapering upwards to the base of the style, while those of *L. macrostyla* are shortly broadly ovate, abruptly rounded at the apex whence the long style arises, and are tawny-pubescent. The leaves too of *L. macrostyla* are only sparsely tomentose beneath, those of *L. stenocarpa* are densely so.

Mr. Maximowicz refers, in part, to *L. stenocarpa* another plant that occurs in the North-West Himalaya, of which *Falconer* n. 443 K. D. is an example. In this, however, he is certainly in error, for *Falconer* n. 443 includes two plants that cannot be referred either to *L. macrostyla* or to *L. stenocarpa* but which are much more closely related to *L. eriocarpa*; one of them indeed is that species.

The *F. B. I.* gives Khasia as a locality of *L. macrostyla* in the sense which incorporates the two preceding species. No botanist has, however, hitherto sent either *L. macrostyla* or *L. stenocarpa* to Calcutta from the Khasia Hills.

8. LESPEDEZA ERIOCARPA *DC.*

VAR. *Falconeri* *Prain*; petiole hardly produced, leaflets smaller ovate-acute, pods (young) more softly tomentose; habit spreading as in "*L. paniculata* *Royle.*" *L. macrostyla* *Maxim. in part, not of Bak.*

GARHWAL; *Falconer* n. 443 K. D. (flowering specimens only)! SIMLA; Elysium Hill, *Gamble* 4968!

The fruiting portion of the sheet of *Falconer's* collection quoted is only *L. paniculata* *Royle*, which Mr. Baker very justly has reduced to *L. eriocarpa*. The plant represented by the flowering specimens will, in all probability, when more fully known have to be recognised as a species apart, *L. Falconeri*.

8b. *LESPEDEZA BICOLOR* Turcz. in *Bull. Soc. Mosc.* (1840) 69; petiole produced, leaflets sparsely adpressed-puberulous beneath, stipules subulate, calyx and small subincluded pod very sparsely adpressed-hairy. *Ledeb. Flor. Ross.* i. 715; *Maxim. Synops. Lesped.* 29. *Desmodium racemosum* Sieb. & Zucc. *Fl. Jap. Fam. Nat.* i. 121 not of DC.

NORTH-WEST HIMALAYA; Black Mountain, 6–9000 feet, *Duthie* 7460! Hazara; Dohar, etc., in the Kagan Valley, *Duthie's Collector* 19308! 19309! **DISTRIB.** Siberia, China, Japan.

A copiously branched erect shrub, with slender virgate rounded branchlets, adpressed-puberulous or glabrous. *Petioles* .5–1.5 in. long; leaflets ovate-rotund, membranous, obtuse or emarginate, with a slender terminal mucro; green, glabrous, reticulate-venose above, glabrous or sparsely adpressed-puberulous beneath, the stipules slender subulate. *Racemes* axillary many-fl. lax, much exceeding the leaves, bracts and bracteoles minute; pedicels  $\frac{1}{2}$  in. *Calyx*  $\frac{1}{2}$  in., teeth ovate or lanceolate, obtuse or acute. *Corolla* purple, .35 in. long. *Pod* .25 in. long, rounded-elliptic, mucronate, reticulate.

9b. *LESPEDEZA PRAINII* Coll. & Hemsl. in *Journ. Linn. Soc.* xxviii. 46; petiole produced, leaflets large minutely strigillose beneath, calyx glabrescent, pod quite glabrous.

BURMA; Shan Hills, 4–5000 feet, *Collett! King's Collector!*

A handsome shrub, 10 feet high, branchlets slender, striate, puberulous, at length glabrescent, internodes abbreviated. *Leaves* pinnately 3-foliolate, petiole very slender 1 in. long, stipules persistent, narrow-lanceolate, .25 in. long, leaflets shortly petiolulate, terminal .5–1 in. long, rather exceeding lateral, thin submembranous, obovate with rounded apiculate tips and cuneate bases, dark-green glabrous above, paler strigillose beneath; stipules obsolete. *Flowers* purple, .5–.6 in. long, in dense, axillary racemes longer than the leaves with slender peduncles and capillary pedicels exceeding the calyx. *Calyx* glabrescent, lobes 5, ovate-acute. *Petals* glabrous subequal. *Pod* shortly stipitate, ovate-oblong, .4–.5 in. long, glabrous, reticulate.

A very handsome species, nearest to *L. macrocarpa* Bunge, from China, which has, however, a ciliate pod.

10. *LESPEDEZA DECORA* Kurz.

Add to synonyms of *F. B. I.*:—*Desmodium angulatum* Wall. *Cat.* 5729 in part (letter I only).

This species is very common in the Shan States and in Tenasserim.

11. *LESPEDEZA PARVIFLORA* Kurz.

Also very common throughout the Shan Plateau.

### 33. ALHAGI DESV.

1. *ALHAGI CAMELORUM* Fisch. *Ind. Hort. Gorenk.* ed. ii. 72 (1812); *Boiss. Flor. Orient.* ii. 559. *A. maurorum* Bak. in *Flor. Brit. Ind.* ii. 145 *via* Tournef.

The *Flora of British India* adopts the view, suggested by Bentham and Hecker, that the various forms of *Alhagi* should be reduced to a single species. After a care-

ful analysis of examples of all the forms hitherto reported, the writer feels unable to accept this extreme view. He cannot, however, quite follow Mr. Boissier, *l.c.*, in keeping *A. graecorum* Boiss. as a species apart from *A. maurorum* and would propose the recognition in the genus of only two species, *viz.* :—

1. *A. maurorum* Tournef. Cor. 54; DC. Prodr. ii. 352; ovaries silky.

2. *A. camelorum* Fisch. *l.c.*; ovaries quite glabrous.

The name given by Desvaux to the first-named species was *A. mannifera*; he did not anywhere use the name cited in the *Flora of British India*.

All our Indian specimens of *Alhagi* have glabrous ovaries and hence belong to the second species; those from the Panjab, North-West Frontier and North-West Himalaya are indistinguishable from the Persian and Armenian species of *A. camelorum*, while curiously many of those from Rajputana have the broader leaves characteristic of the form from Turkestan and Soongaria which Schrenk proposed to recognise as a species under the name *A. Kirghisorum*.

### 34. HEDYSARUM LINN.

#### 6. HEDYSARUM SIBIRICUM Poir. *Encyc. Meth. Suppl.* v. 17.

Specimens of this species grown in the Imperial Garden, St. Petersburg, as well as others collected by Turczaninov and named by Dr. Regel, are indistinguishable from the plant named *H. laxiflorum* by Mr. Bentham.

### 38. SMITHIA AIT.

#### 1. SMITHIA SENSITIVA Ait.

Add to localities of *F. B. I.* :—ANDAMANS and NICOBARS; common, but only in the convict settlements, and evidently a recently introduced weed.

1b. *SMITHIA FLAVA* Dalz. *MSS.*; stems not bristly, leaflets small, 16–20; flowers in short simple racemes, calyx-lips equal, corolla yellow; flowers much larger than in *S. sensitiva*. *S. sensitiva* VAR. *flore majore* *Herb. Ind. Or. H. f. & T.*

WESTERN INDIA; Concan, *Law! Stocks!* Canara, in damp rice fields *Talbot n. 257!*

General habit of *S. sensitiva*, but with much stouter sparingly branched stems and very much larger flowers.

This is only accorded specific rank because *S. javanica* Benth., from Java and Sumatra, which has corolla and pods very like those of *S. sensitiva* and mainly differs in having no bristles on the calyx and bracts, is so recognised.

#### 5. SMITHIA BIGEMINA Dalz.

Add to localities of *F. B. I.* :—SCINDE; *Stocks!* RAJPUTANA; on Mt. Abu, very common, *King! Duthie n. 6627!*

#### 7. SMITHIA CILIATA Royle.

Add to localities of *F. B. I.* :—NAGA HILLS; Kohima, *Clarke n. 41705!* BURMA; Pegu, Bookee ridges, *Kurz n. 1633!* DISTRIB. Formosa (*Henry n. 1521!*)

10. *SMITHIA SALSUGINEA* Hance, *Journ. Bot.* vii. 164 (1869). *S. dichotoma* Dalz. ex Bak., in *Flor. Brit. Ind.* ii. 150 (1876).

Add to localities of *F. B. I.*:—BURMA; Arracan, amongst high grass along the sea-shores opposite Akyab, *Kurz!* DISTRIB. China.

Dalzell's name, though proposed for the plant many years before Hance's, was unfortunately not published till seven years later.

11. *SMITHIA GRANDIS Benth.*

This species is not confined to Sikkim, it has been collected in Bhūtan by Parkes, in Assam by Fisher (where it was also collected 45 years ago by Simons), at the foot of the Akha Hills by one of Dr. King's collectors, and in the lower Khasia Hills by Mr. G. Mann and Mr. C. B. Clarke. Dr. Griffith's specimens, it now appears, came also from Assam, not from Sikkim.

12. *SMITHIA BLANDA Wall.*

VAR. 3. *humilis* Prain; annual, stems slender short, leaflets as in VAR. *racemosa*; corymbs rather lax, calyx  $\frac{1}{4}$  in., corolla  $\frac{2}{3}$ — $\frac{3}{4}$  in. much larger than in any of the other varieties or than in the type. *S. hirsuta* Dalz. in *Kew. Journ.* iii. 135, not of Bak. *S. humilis Benth. MSS.* in *Herb. Ind. Or. H. f. & T.*

WESTERN GHATS; at Mahableshwar, *Cooke!* Canara, *Talbot* n. 626! CONCAN; *Stocks!* *Gibson!*

40. *ORMOCARPUM BEAUV.*

2. *ORMOCARPUM GLABRUM* *Teysm. & Binnend., Nat. Tijd. Ned. Ind.* xxvii. 56; pod 6-7-jointed; joints oblong, thrice as long as broad, plicate smooth.

ANDAMANS; common, probably only as an escape from cultivation.

General habit of *O. senmoides*, of which it seems to be only a cultivated form; the pods are, however, much longer, sometimes 6 in long, with larger joints which are never muricated. It must not be overlooked that the original description of this form was drawn up from cultivated specimens.

46. *URARIA DESV.*

\* *Upper leaves 5-9-foliolate.*

2b. *URARIA ACUMINATA* *Kurz, Journ. As. Soc. Beng.* xlv. pt. 2, 235, 236; leaflets linear-lanceolate, glaucous-green not clouded, sharply acuminate; pedicels clothed with long bristles; joints of pod opaque and covered with a short sparse pubescence.

BURMA; Pegu, Tonkyeghat, *Kurz* n. 1645! Shan Hills, Makhoye, *King's Collector!* Madoe, *King's Collector!*

General habit of both *U. picta* and *U. crinita*, but abundantly distinct from both in the nature of its foliage, the leaflets beneath having, as *Kurz* remarks, a very thin and lax net-venation.

In the *Index Kewensis*, *U. acuminata* is doubtfully referred to *U. picta*, a suggestion that would never have been made had specimens been available for comparison. The leaves, except for being narrowly sharply acuminate, have indeed much the

shape of those of *U. picta*, but have a very different venation, and are of somewhat different texture. The pods, however, which Mr. Kurz has described in a rather misleading manner, and the pedicels, are exactly like those of *U. crinita*; if it be necessary to reduce Mr. Kurz's species to another it must be to *U. crinita* not to *U. picta* that it should be referred. But in the light of the ample material recently received, it seems clear to the writer that either reduction would be unjustifiable.

2c. *URARIA MACROSTACHYA* Wall. *Pl. As. Rar.* ii. t. 110; leaflets broadly ovate, subacute, not clouded; pedicels clothed with long soft spreading hairs; joints of pod straw-coloured dimpled shining, perfectly glabrous. *Wall. Cat.* 5675 I.

UPPER BURMA: Hills south of Kyali, *Prazer!* TENASSERIM: Endine Ghor, *Gallatly!* *DISTRIB.* China, whence seeds were sent to Dr. Wallich.

General habit of the three other species of the group. Leaflets 7-8 in. long by 3 in. across, with the thin texture and wide venation of those of *U. acuminata*.

Dr. Wallich, when he first obtained seeds of this plant, supposed it to be a distinct species and had it figured for the *Pl. As. Rar.* as *U. macrostachya*. Subsequently he obtained from Silhet very fine specimens of *U. crinita*, and came to the conclusion (see his note on *Wall. Cat. Lith.* n. 5675 D. and his remarks in the text of *Pl. As. Rar.* ii. 8) that his *U. macrostachya* was the same as *U. crinita*; his Chinese plant (*Cat.* 5675 I.) he therefore subsequently issued as *U. crinita* VAR. *macrostachya*. It is worthy of remark that his Calcutta Garden specimens were all gathered without any of them being permitted to set their fruits, and most unfortunately Dr. Wallich has allowed himself to add as the fruit of the plant delineated on t. 110, a figure obviously derived from his Silhet specimens. In August 1835, he again sowed seeds sent him from China by Mr. Deard in January of that year; these flowered and fruited in Nov. 1836, and so for the first time it became possible to see that his reduction of his *U. macrostachya* to *U. crinita* was altogether unnecessary. And although in the *Index Kewensis*, Dr. Wallich's erroneous identification has been followed, it will be noticed that the *Flora of British India* has omitted the *Pl. As. Rariores* citation. As there was then no evidence that *U. macrostachya* was an Indian plant, Mr. Baker does not quote the species at all; its recent discovery both in Upper Burma and in Tenasserim renders it now necessary to supply a diagnosis.

\* \* *Leaves 1- and 3-foliolate intermixed.*

### 3. *URARIA LAGOPOIDES* DC.

This species is very easily recognised owing to its having been founded on the excellent figure by Burmann—nor is there now any doubt that the *Hedysarum lagopodioides* of Linnaeus is the same, excellent Chinese specimens agreeing in every respect with the Indian plant having recently been sent from Hainan by Dr. Henry. Dr. Roxburgh's coloured drawing at Calcutta and Kew is an excellent representation also.

The species extends from Bengal and Assam throughout Indo-China to South China on the one hand and to the Nicobars (where it was collected by Mr. Kurz) and the Malay Archipelago on the other. In Burma it is remarkably common, and the flowers are there as often white or yellow as they are pink. For the plant, as it occurs in Java, Dr. Otto Kuntze has proposed the varietal name "rhomboidea;"



there are some rhomboid leaflets on nearly every plant. This is Dr. Wallich's *Uraria retusa* in its entirety; Mr. Baker says that it forms part of Dr. Wallich's *U. hamosa* also, which may well be the case, for evidently Dr. Wallich misunderstood those Indian species, as elaborated by Dr. Roxburgh, of *Hedysarum* (or *Doodia*, as Roxburgh afterwards called them), that constitute the genus *Uraria*. The writer has not, however, seen an instance of this particular confusion among the Wallichian specimens.

To this species the most nearly related *Uraria* is *U. alopecuroides* Wight, (*Doodia alopecuroides* Roxb.), which differs in having a stouter habit, rather larger racemes with broader more shortly tailed bracts, and larger differently shaped clouded leaves. Wight and Arnott (*Prodr.* 222) have suggested that *U. alopecuroides* may be the same as *U. lagopoides* Wall., which is impossible, because *U. lagopoides* Wall. is certainly *U. lagopus* DC.; in this Wight and Arnott have been followed by the *F. B. I.*

#### 4. URARIA LAGOPUS DC.

This species has been confused with the preceding by Dr. Wallich who issued it as *U. lagopoides* Wall. Cat. n. 5676 E. from Nepal and n. 5676 F. from Silhet, and still more hopelessly with the next two species by practically every Indian author who has dealt with the genus. The confusion is, as it chanced, devoid of excuse since this is the most easily characterised species of its own group, owing to its having hirsute pods, those of *U. lagopoides*, *U. alopecuroides* and *U. neglecta* being quite glabrous.

From the synonyms given in the *Flora of British India* must be excluded *U. alopecuroides* Wight, ( *Ic. t.* 290) regarding which no mistake is possible because it is a copy of Roxburgh's manuscript drawing; also *Doodia alopecuroides* Roxb. (*Fl. Ind.* iii. 368) which is the description of the plant there delineated, and *Hedysarum alopecuroides* Roxb. (*Hort. Beng.* 57), the earliest reference to the plant in question. The *F. B. I.* has referred here also a part of *Uraria hamosa* Wall., since it has identified Wall. Cat. n. 5681 C. with *U. lagopus*. This is not, however, possible; Wall. Cat. 5681 C. has glabrous pods with 3-6 segments, the segments being much smaller than those of *U. lagopus*.

The *F. B. I.* locates the species in Burma; no specimens from Burma have ever been received at Calcutta. Specimens have, however, been sent from the Chumbi Valley, the plant consequently occurs at a considerably higher level than the *F. B. I.* indicates.

#### 5. URARIA ALOPECUROIDES Wight, *Ic. t.* 290. *U. repanda* Wall. Cat. 5677.

This is Dr. Roxburgh's *Doodia alopecuroides*. Just as Dr. Wallich failed to recognise Roxburgh's *D. lagopodioides*, to which he gave the name *U. retusa*, so he failed to recognise *D. alopecuroides* and issued it as *U. repanda*. The plant is perhaps not specifically distinct from *U. lagopoides*; it certainly can never be referred to *U. lagopus*, for though it has the erect habit of the latter instead of the trailing habit of *U. lagopoides*, its bracts differ but slightly and its calyx, corolla, and pods do not differ at all from those of *U. lagopoides*.

The localities of the species are :—

Dehra Dun; *Vicary!* Behar; *Kurz!* *Anderson!* *Wood!* *Clarke!* Khasia Hills; *G. Mann!* Burma; *Wallich!* *King's Collector!* It probably came originally from Dehra Dun to Dr. Roxburgh; it was one of the species of which he received seeds from Genl. Hardwicke—these, as we know now, came mostly from the Sub-Himalayan tract. This species has not been collected in the Himalaya.

Wallich's name has been deliberately abandoned, partly because by so doing it is possible to conserve the oldest trivial epithet, under which Dr. Roxburgh characterised the plant more accurately than any subsequent author has been able to, but mainly because it is only by so doing that one can emphasise the need there is for a thorough change in our conception of the species of *Uraria*.

5b. *URARIA NEGLECTA* Prain; stems erect, leaflets large oblong not cordate, racemes long dense cylindrical, lower calyx-teeth subequal. *Uraria lagopodioides* Wall. in part (Cat. 5675). *U. hamosa* Wall. in part (Cat. 5681 C.) *U. lagopoides* Royle, Ill. Him. Pl. t. 33, f. 1. *U. lagopus* Royle, Ill. Him. Pl. 201; Bak. in Flor. Brit. Ind. ii. 156 in part, not of DC.

KAMAON; *Blinkworth! Vicary! King! Duthie! Gamble! Kangra, Stolicka! Darmsala, Clarke! DUARS; Heawood! ASSAM; Masters! BENGAL; Kurz! Clarke! MISHMI; Griffith!*

Branches woody slender shortly pubescent. Leaves as in *U. hamosa*. Racemes exactly as in *U. lagopus* but with bracts quite as in *U. hamosa*; pedicels 2-3 times the calyx, densely crinite. Calyx  $\frac{1}{6}$ - $\frac{1}{8}$  in. Corolla purple, little exserted. Joints 2-6, pale to lead-coloured polished.

This is in reality one of the best characterised species in this troublesome genus. Its characters, as the above description shows, make it intermediate between *U. lagopus* of which it has the inflorescence, and *U. hamosa* of which it has the bracts and foliage. It agrees, as a matter of fact, in many more points with *U. hamosa*, with which Dr. Wallich wished to associate it, than with *U. lagopus* to which it has been referred by subsequent botanists. The pods are more like those of *U. hamosa* than those of *U. lagopus*, but they are glabrous, whereas in both these species the pods are hirsute. Dr. Royle has figured the plant as *U. lagopoides*, and in the text has referred it, equally erroneously, to *U. lagopus*; the F. B. I. account of the genus omits all reference to Royle's names or plate.

## 6. *URARIA HAMOSA* Wall.

This is *Doodia hamosa* Roxb. As in the case of *D. lagopodioides* which, not recognising it, Wallich issued as *U. retusa* and *D. alopecuroides* which, not recognising it, he issued as *U. repanda*, so, not recognising *D. hamosa*, Wallich issued it as *U. leptostachya*. And just as Wallich mistook *U. lagopus* for *U. lagopoides*, so he mistook the species just described as *U. neglecta* for *U. hamosa*. By a happy accident, however, he did not always recognise his own *U. leptostachya*, and as he has chanced to issue one gathering of it (his Cat. n. 5681 B.) along with the plant that he supposed to be *U. hamosa*, Dr. Wight and after him Mr. Baker, have been able to employ this name and thus to conserve Roxburgh's trivial epithet for the species.

Wight and Arnott in their *Prodr.* 222 have not made any observation on the Wallichian confusion, the detection and elucidation of which we owe to Mr. Baker.

To the synonyms of *U. hamosa* should be added *Doodia simplicifolia* Roxb. from Chittagong which is a state of this species with leaves simple and acute at the apex, as they often are, instead of obtuse; also *Uraria lagopus* var. *polysperma* O. Kuntze, a reduction that it would have been impossible to suggest, so different is this plant from *U. lagopus*, were not authentic specimens of Kuntze's n. 6520, so named, before the writer.

6b. *URARIA PANICULATA* Clarke, *Journ. Linn. Soc.* xxv. 15, t. 4 ; stems erect, leaflets large narrow-ovate, acute, mucronate ; racemes laxly paniculate, lower calyx-teeth not elongated.

NAGA HILLS ; Kohima, 3000 feet, Clarke n. 40924 !

Stems 3-6 feet high, small twigs and racemes covered with long spreading hairs brown below and with white tips, scattered in a close brown short tomentum ; petioles 2 in. long densely-brown tomentose, leaflets 4-6 in. long,  $2\frac{1}{2}$ -3 in. across, green and very sparsely hairy above, paler beneath more closely covered with brown hairs on midrib and veins, white over the interspaces. *Racemes* a foot long, nearly as wide, much branched laterally ; bracts ovate-acute, externally brown-tomentose. *Calyx*  $\frac{1}{2}$  in., much as in *U. hamosa*. *Corolla* 2-3 times the calyx, rose-purple. *Joints* 5-6, black, pod completely exserted, with a few hairs on the sutures, otherwise glabrous, reticulated.

This is an extremely distinct species, nearest perhaps, as Mr. Clarke says, to *U. hamosa* but differing in the points that he notes. Its most striking peculiarity, which it shares with the next two species, is that its pods are far exserted.

6c. *URARIA GRACILIS* Prain ; stems erect, leaflets small ovate-oblong, racemes laxly paniculate, lower calyx-teeth not elongated.

BURMA ; Sagaing, Dr. King's Collectors !

Branches woody, very slender, shortly pubescent. *Leaves* very like those of *U. hamosa*, terminal leaflet  $1\frac{1}{2}$  in. long,  $\frac{3}{4}$  in. wide, base truncate, apice retuse mucronate. *Racemes* axillary and terminal, all laxly paniculate ; bracts very small ovate-acute, externally sparsely puberulous as is the calyx. *Calyx*  $\frac{1}{2}$  in., as in *U. hamosa*. *Corolla* 2-3 times the calyx, purple. *Joints* 4-6, black, puberulous, pod quite exserted as in *U. paniculata*.

Very like *U. hamosa*, but more slender than that species usually is and with very different, much smaller, not cuspidate bracts, also with different pods. In its lax inflorescence it resembles *U. paniculata* ; this it likewise does in having exserted pods, but it is a much smaller plant with different tomentum and very different leaves and bracts.

\* \* \* *Leaves usually all 1-foliolate.*

7b. *URARIA LATIFOLIA* Prain ; stems erect, leaflets orbicular cordate at base, apex subacute or acute, racemes simple close cylindrical.

BURMA ; Fort Stedman, King's Collectors !

Branches stout woody, densely clothed with short spreading hairs. *Leaves* 5 in. in diam. shortly hairy on the raised veins below, secondary nervation very prominent ; petiole  $1\frac{1}{2}$ -2 in. *Racemes* terminal only, dense, 4-8 in. long ; bracts narrow ovate-acuminate ; pedicels  $\frac{1}{4}$ - $\frac{3}{8}$  in., abruptly recurved at tip after flowering. *Corolla* white, exserted. *Joints* of pod 2-3, black, pubescent with short straight hairs.

The leaves of this species much resemble those of *U. cordifolia* for which at first sight it might be mistaken, especially as the flowers are white as in that species. But the inflorescence and bracts are totally different as are the pods which are more like those of *U. crinita* and *U. acuminata*.

7c. *URARIA COLLETTII* Prain ; stems erect, leaflets orbicular cordate at base, apex subacute or acute, racemes copiously panicled.

BURMA; Pinmona, in forest, *Collett! King's Collector!*

Branches stout woody, densely clothed with short spreading hairs. *Leaves* 5 in. in diam., shortly hairy on the raised nerves beneath, secondary nervation very prominent, petiole  $1\frac{1}{2}$ –2 in. *Racemes* 4–6 in. long forming copious terminal panicles with densely pubescent peduncles, bracts ovate-cuspidate pubescent, pedicels  $\frac{1}{4}$ – $\frac{3}{8}$  in., densely crinite. *Calyx*  $\frac{1}{8}$ – $\frac{1}{6}$  in., teeth setaceous nearly equal. *Corolla* slightly exerted. *Joints* of pod 2–4, pubescent with short straight hairs.

This combines the leaves of the preceding with the panicles and bracts of *Lourea campanulata*; like *U. latifolia* it is very nearly related to *U. cordifolia*, all three having very similar flowers. In *U. cordifolia*, however, the bracts are very different being narrowly lanceolate, and the inflorescence though paniculate is subdigitately so as in *U. hamosa* not laxly so as in *Lourea campanulata* and *Uraria Collettii*.

## 47. ALYSICARPUS NECK.

2. ALYSICARPUS HAMOSUS *Edgew.*

Add to synonyms:—*Hedysarum procumbens* *Roxb. Hort. Beng.* 56; *Flor. Ind.* iii. 345.

The identity of this species with Roxburgh's *H. procumbens* has been overlooked in the *F. B. I.*; in the *Index Kewensis* Roxburgh's species is given as a synonym of *Desmodium retroflexum* which it does not much resemble.

6. ALYSICARPUS RUGOSUS *DC.*

At first sight it seems hardly possible to think that *Alysicarpus rugosus* and its *VAR. styracifolius* *Bak.* can be conspecific, but a very careful examination of the large suites of specimens at Calcutta shows that Mr. Baker's treatment of this species is amply justified. It is however necessary in the writer's opinion to recognise two other well-marked varieties besides those defined by Mr. Baker. These are:—

*VAR. 4. minor*; dwarf, diffuse, stems and leaves below glabrous, leaflets small oblong, ovate, or orbicular, obtuse or subacute, racemes short dense, bracts and calyx glabrous.

N. W. HIMALAYA; *Griffith!* PANJAB; Pathankote, *Clarke* n. 22006! RAJPUTANA; Abu, *King!* KATTIAWAR; Rajkote, *McNaghten!* WESTERN INDIA; *Gibson!* BENGAL; Lohardugga, *Clarke* n. 33937! Seebpore, *Kurz!* ASSAM; Nowgong, *Simons!* BURMA; Shan States, *King's Collector!*

This variety combines the habit of *VAR. styracifolius* with the glabrous leaves and stems, and the inflorescence of the true *A. rugosus*. It has been identified with *VAR. Heyneanus* by Mr. Kurz, but it has not the hirsute leaves and stems, nor has it the elongated racemes of that form; it has been referred to *VAR. styracifolius* by Mr. Clarke in which it is equally difficult to place it. It does not occur among Dr. Wallich's specimens at Calcutta.

*VAR. 5. pilifer*; ascending, stems and leaves below finely pubescent, leaflets lanceolate, racemes short dense, calyx conspicuously ciliated. *A. pilifer* *Wall. Cat.* 5675. *A. scariosus* *Herb. Ind. Or. H. f. & T. viz* *Grah.*

S. INDIA; *Wall. Cat.* 5675! *G. Thomson!* BURMA; Shan Hills, *King's Collector!*

This combines the habit of true *A. rugosus* with the inflorescence, etc., of *VAR. styracifolius*, and the recent communication of a large suite of specimens from

Burma with all the characters of the South Indian plant originally differentiated by Dr. Wallich, makes it more satisfactory to give the form varietal rank because its inclusion in VAR. *styracifolius* somewhat mars the symmetry of an otherwise very well characterised form; the establishment of this variety obviously involves the deletion of the synonym *A. pilifer* under Mr. Baker's VAR. *styracifolius*. It should be added moreover that Dr. King's Collectors note the corollas as yellow in this variety, all the others are noted as having them purple.

\* \* \* DESMODIASTRUM. *Calyx* much longer than the first joint of the pod, its teeth not imbricated in the fruiting stage. *Pods* as in *Desmodium*.

9. *ALYSICARPUS BELGAUMENSIS* Wight.

10. *ALYSICARPUS RACEMOSUS* Benth.

This is reduced, in the *F. B. I.*, to *A. belgaumensis*. It is, however, impossible to confound the two plants, their pods being remarkably different and no intermediates occurring; and there is hardly a doubt that Mr. Bentham was justified in giving the present one specific rank. There is, however, very considerable difficulty in separating this species from the two plants named by Dalzell *Alysicarpus parviflorus* and *A. rotundifolius*, both of which the *F. B. I.* has transferred to *Desmodium*. That these two are congeneric with *Alysicarpus racemosus* admits of no doubt; the question whether, with Mr. Baker, we are to treat *A. parviflorus* and *A. rotundifolius* as *Desmodia* or, with Mr. Dalzell, to treat them as *Alysicarpi* is one that may be answered with much reason either way. But wherever these two are placed, *A. belgaumensis* and *A. racemosus* must accompany them. Compromises in taxonomy are necessary, indeed the systematic arrangement of species is essentially the art of happy compromise. But an arrangement which places one half of a natural group of forms in one genus, the other half in a second, strains unduly the privileges that the art of compromise allows.

11. *ALYSICARPUS PARVIFLORUS* Dalz. in *Hook. Kew Journ.* iii. 211.  
*Desmodium parviflorum* Bak. in *Flor. Brit. Ind.* ii. 172.

Only distinguished from *A. racemosus* by its further-exserted pods and its rather longer pedicels; its leaves are occasionally 3-foliolate as in *A. belgaumensis*, the leaflets being oblong or lanceolate as in that species.

12. *ALYSICARPUS ROTUNDIFOLIUS* Dalz. *Desmodium rotundifolium* Bak. in *Flor. Brit. Ind.* ii. 172.

Fruits exactly as in *A. parviflorus*, from which it is distinguished by its rather larger, slightly exserted corollas and its obovate-oblong to orbicular leaves which are hardly distinguishable from those of *A. racemosus*. The writer's reason for proposing a new subgenus for this natural group is that the calyx-teeth in none of them become imbricated: hence all of them violate the limits of the section *Macrocalycinæ* as defined in the *F. B. I.*, which includes two of them therein. His reason moreover for retaining the group in *Alysicarpus* rather than for transferring all four species to *Desmodium*, of which all have the pods, is that it seems better to locate the group in a small manageable genus like *Alysicarpus*, than to transfer them to one, like *Desmodium*, already of unwieldy bulk. As a matter of fact the group stands intermediate between these two genera, and indicates that probably they are not naturally separable.

The characters finally separating the two genera are, according to the Key in the *Flora of British India*, joints "turgid" in *Alysicarpus*, "flattened" in *Desmodium*. Yet the joints of the pods of *Desmodium umbellatum* without being broader are thrice the thickness of those in *Alysicarpus belgaumensis*. In the definitions of the two genera the only tangible distinctions are corolla "included" in *Alysicarpus*, "exserted" in *Desmodium*; after having described the corolla as exserted for the genus as a whole, it becomes necessary for the *F. B. I.* to indicate that one of the distinctive characters of *Desmodium parviflorum* is that the corolla is included. It seems therefore better to adopt an arrangement which excludes from *Desmodium* a species that, by its admission, violates the solitary distinctive generic character.

#### 47b. NEOCOLLETTIA HEMSL.

A slender trailing herb rooting at the nodes. *Leaves* pinnately 3-foliolate; stipules rigid striate persistent. *Flowers* small axillary solitary or 2-3 together on a rather long slender peduncle, 2-bracteolate near the calyx; the peduncle bearing a large stipitate saddle-shaped bract enveloping the calyx. *Calyx* tubular 15-nerved subequally 5-lobed, lobes short rounded. *Standard* suborbicular without appendages; wings free, keel straight quite obtuse. *Stamens* diadelphous; anthers uniform. *Ovary* sessile, 1-ovulate; style inflexed. A single species.

1. NEOCOLLETTIA GRACILIS *Hemsl. Journ. Linn. Soc.* xxviii. 44, t. 6. *Stylosanthes* "facie oxalidea" *Wall. Cat.* 5974. *Desmodium Rottleri* *Bak. in Fl. Brit. Ind.* ii. 174 *in part.* *Teramnus Wallichii* *Kurz, Journ. As. Soc. Beng.* xlv. pt. 2. 255.

BURMA; Prome, *Wallich* 5974! Posoboio, in the plains, *Collett* n. 26!

Apparently perennial; stems creeping elongated very slender slightly strigose. *Leaves* trifoliolate, petiole slender 1-2 in. long; leaflets petiolulate, middle petiolule longest; membranous pale-green obcordate,  $\frac{3}{4}$  in. long, glabrous above, sparsely strigose beneath, stipules small; stipels minute subulate. *Flowers* under  $\frac{1}{4}$  in., peduncles rather shorter than the flowers, strigose as are the bracts and bracteoles beneath, and the calyx externally. *Petals* long-clawed, standard retuse, wings oblong, spurred and also toothed on lower margin; ovary glabrous.

An interesting genus more resembling a *Phaseolid* than a *Hedysarioid*, but with floral structure most closely approaching that of the next genus. The single species bears a considerable superficial resemblance to *Desmodium Rottleri* *Bak.* (*Eleiotis Rottleri* *W. & A.*), for which it may casually be mistaken. Ripe fruit is unknown, and it is to be hoped that members who may meet with the plant in Burma will kindly communicate complete specimens.

#### 47c. PHYLACIUM BENN.

Climbing herbs. *Leaves* 3-foliolate; stipules persistent small linear or lanceolate, leaflets stipellate. *Flowers* in axillary racemes, shortly pedicelled, 2-bracteolate near the calyx, completely enveloped, as ultimately is the legume, in a large boat-shaped membranous much accres-

cent bract. *Calyx* tubular sub-2-labiate, 4-toothed. *Standard* ovate apex retuse, base 2-auriculate; wings oblong, long-spurred, spurs incurved clasped by the auricles of standard; keel straight obtuse shortly spurred. *Stamens* diadelphous, posterior filament adnate to base of standard-claw. *Ovary* short-stalked, its base surrounded by a shallow disc; ovule solitary; style inflexed. *Legume* short-stalked ovate-rotund, acute. Species 2; Indo-Chinese and Malayan.

1. *PHYLACIUM MAJUS* *Coll. & Hemsl., Journ. Linn. Soc.* xxviii. 44. t. 7; young parts rather densely adpressed-hirsute; leaves densely hairy beneath; axillary racemes longer than leaves, sometimes paniculately branched; upper lip of calyx subentire deltoid-rotund, lower 3-lobed, lobes subequal ovate-rotund acute imbricated; pod turgid densely strigose not reticulated, both sutures convex.

BURMA; Shan Hills, near Fort Stedman, *Collett!* Lwekaw and Makhoye, *King's Collectors!*

A slender climber; *leaves* pinnately 3-foliolate long-petioled, leaflets ovate-oblong, base rounded, apex tapering to an obtuse point, margin entire, rather thickly herbaceous, glabrous and green above, grey and densely adpressed-puberulous beneath, 3-4 in. long, 1½ in. wide, stipules and stipels linear, persistent, puberulous; petioles puberulous 2 in. long. *Racemes* 5-6 in. long, occasionally branching, fasciculate; flowers numerous. *Bracts* 1-1½ in. long, glabrous externally, hirsute within, at length scarious. *Calyx* ½ in., externally hirsute. *Corolla* glabrous, ¾ in. long. *Pod* ¼ in.

2. *PHYLACIUM BRACTEOSUM* *Benn. Pl. Jav. Rar.* 159. t. 33; young parts and leaves beneath sparingly adpressed-hirsute; axillary racemes shorter than leaves, aggregated few-fl.; upper lip of calyx entire ovate, lower 3-lobed, lobes lanceolate the central rather larger, none overlapping; pod compressed, sparsely hirsute, reticulate-veined, convex in front, straight posteriorly. *Benth. Pl. Jungh.* i. 231; *Miq. Flor. Ind. Bat.* i. 228; *Prain, Journ. As. Soc. Beng.* lxvi. 2. 129.

PERAK; near Gunong Pondo, 200-300 feet above sea level, in open jungle, *Kunstler* n. 8367! *DISTRIB.* From Sumatra (*Forbes* n. 1436! n. 2646!) and Java to the Philippines.

A slender climber; *leaves* pinnately 3-foliolate, long-petioled, leaflets ovate-oblong, base rounded, apex obtuse, margin entire, thinly herbaceous, green on both surfaces, glabrous above, sparingly hirsute beneath, 2-3 in. long, 1½ in. wide, stipules and stipels linear, persistent, sparsely hirsute, petioles glabrescent, 1½ in. long. *Racemes* 2-10 together, about 1½-2 in. long, fasciculate, flowers few. *Bracts* 1-1½ in. long, glabrous externally, sparingly hirsute within, pale-green. *Calyx* ½ in., externally sparsely hirsute. *Corolla* white with pink tinge, glabrous, ½ in. long. *Pod* ¼ in.

## 50. DESMODIUM DESV.

### 1. DESMODIUM UMBELLATUM DC.

This is a purely littoral species that extends, as so many of the class do, from W. Polynesia to the Mascarene Islands. It is scarcely truly Indian, being only report-

ed from Ceylon and the Sundribuns to the west of the Sea of Bengal. It is, however, extremely plentiful, to the east of that sea, on the shores of Southern Burma, of the Andaman and Nicobar Islands, and of the Malay Peninsula and Archipelago. All inland localities cited in botanical works for this species are erroneous.

VAR. *hirsutum* DC. *Prodr.* ii. 325, not mentioned in the *F. B. I.* account of the species, looks very distinct on account of its more villous branches and petioles and its persistently pubescent pods, but is not perhaps a very valid variety. Strangely it is only known from plants grown in the Calcutta garden and in the garden at Buitenzorg, where (as the Collector's ticket notes) it was an introduction from Calcutta; *Wall. Cat.* n. 5687 D, *Hort. Bogor.* n. 2037 are good examples of the form. This 'variety' has been by Dr. Wallich and others confounded with the very different *Wall. Cat.* n. 5687 B., which at first apparently Dr. Wallich *did* consider separable, and which is a very distinct species. \*

1b. *DESMODIUM WALLICHII* Prain; branches slightly angled, leaflets obtuse mucronulate, mesial rhomboid almost as long as broad, joints of pod large as long as broad, persistently hirsute. *D. umbellatum* Wall. *Cat.* 5687 B; *Coll. & Hemsl., Journ. Linn. Soc.* xxviii. 42, not of DC.

UPPER BURMA; Segain, Lime Hills, *Wallich!* Meiktila, *Collett!*

A shrub with densely fulvous young branches, *Petioles*  $\frac{3}{4}$ -1 in., leaflets subcoriaceous, glabrous above, rather densely fulvous-tomentose beneath, the veins and veinlets very distinctly raised, end-leaflet  $2\frac{1}{2}$  in. in diam. *Flowers* subumbellate, the peduncle prolonged beyond the basal whorl. *Calyx*  $\frac{1}{4}$  in., silky, teeth longer than tube. *Corolla*  $\frac{1}{2}$  in. *Pod* 1-1 $\frac{1}{2}$  in., joints 3-4, strigose.

Dr. Wallich at first gave to this the MSS. name *Desmodium rhomboideum*. The name unfortunately cannot be used as there is a *nomen nudum*, *D. rhomboideum* Sweet, *Hort. Brit.* ed. ii. 151, which cannot refer to this plant. Sweet's name is one of those purely catalogue publications that give so much trouble to botanists. It was employed by its author to indicate *Hedysarum rhombifolium* Roxb. (not of Elliott) a plant that was raised in the Calcutta garden from seed sent to Dr. Roxburgh from Upper India in 1811 by Genl. Hardwicke. Roxburgh allowed it to drop out of his lists for the subsequent *Flora Indica*, (he issued the name in the *Hortus Bengalensis*) and he makes no reference to it in the manuscript copy of his description of Indian plants preserved at Calcutta. Dr. Wallich's annotated copy of the *Hortus Bengalensis* shows that he did not know the plant, and Voigt's reference to it in the *Hortus Suburbanus* where (not knowing that Sweet had already taken the trouble to change its name) he calls it *D. Harwickianum*, is copied from Roxburgh's original reference. All the evidence now available points to its being the plant at present known as *D. podocarpum*.

1c. *DESMODIUM RUGOSUM* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 137; branches terete, leaflets acute, mesial nearly twice as long as broad, joints of pod large,  $1\frac{1}{2}$  times as long as broad, persistently hirsute.

TENASSERIM; Lathorga, 2000 feet, common, *Gallatly!* KEDAH; Langkawi, *Curtis* n. 2550!

A gregarious straggling shrub with glabrescent lenticelled branches. *Petioles* 1-1 $\frac{1}{2}$  in., leaflets coriaceous, glabrous above, hirsute only on the very prominent veins and veinlets beneath, end-leaflet 6-7 in. long by 3 in. across, ovate-acute tapering in both directions from the middle, the base narrowly truncate. *Flowers* umbellate,



peduncles short. *Calyx*  $\frac{1}{8}$  in., teeth twice as long as tube. *Pods*  $\frac{1}{2}$ -1 in., 2-4-jointed; strigose.

A very distinct species, resembling *D. umbellatum* in its inflorescence and *D. Wallichii* in the reticulated under-surface of its leaves, but differing extremely from both in the shape of its leaflets. Like *D. Wallichii* this is an inland species.

## 2. DESMODIUM CEPHALOTES Wall.

VAR. *typica*; pod silky. *D. Cephalotes* Wall. *Cat.* 5721; *W. & A. Prodr.* 224. *Hedysarum Cephalotes* Roxb. *Flor. Ind.* iii. 360.

Sub-Himalayan tract from Dehra Dun (*King! Duthie!*) eastward. Very common throughout Indo-China, extremely rare in India proper.

VAR. *congestum*; pod glabrescent, leaves and branches glabrous or only slightly silky. *D. congestum* Wall. *Cat.* 5723; *W. & A. Prodr.* 224. *Hedysarum umbellatum* Roxb. *Flor. Ind.* iii. 360 (*not of Linn.*)

Very common from Canara and the Concan southwards, also in Ceylon. MISHMI; *Griffith!* UPPER BURMA; *Anderson!* PEGU; *Wallich!* KURZ! TENASSERIM; *Parish!* CHITTAGONG; *Hooker!* *Clarke!*

The two varieties are very distinct; there is however little doubt that Mr. Baker is right in refusing to follow Drs. Roxburgh, Wallich and Wight in treating them as specifically separable. The typical *D. Cephalotes* is as rare in India as the variety "*congestum*" is in Indo-China.

2b. DESMODIUM OLIVACEUM Prain; branches triquetrous, leaflets acuminate twice as long as broad, joints of pods small, broader than long.

UPPER BURMA; Chindwin Hills, *Prazer!* Maymyo, *King's Collector!* Shan Hills, *King's Collectors!*

A shrub or small tree, with sharply triangular branches, densely clothed, especially along the angles, with long patent greenish-yellow hairs; petioles 1-1 $\frac{1}{2}$  in., deeply channelled, densely villous, leaflets glabrous except midrib above, densely uniformly velvety beneath, end-leaflet 8 in. long, 3 $\frac{1}{2}$  in. across. *Flowers* in dense globose heads, on short, angled, villous pedicels; *calyx*  $\frac{1}{8}$  in., teeth  $\frac{1}{2}$  as long as tube; corolla white,  $\frac{1}{2}$  in. *Pod*  $\frac{1}{2}$  in. long, sparsely strigose, joints 2 only, each broader than long.

Near to *D. Cephalotes* but larger in all its parts and with different tomentum and a very different pod.

## 4. DESMODIUM GRANDE Kurz.

Apparently a rare species; the specimens originally described by Kurz were not collected by him but by Dr. J. Anderson, F.R.S., at Tagoung. The specimens previously collected by Dr. Griffith, which the *F. B. I.* suggests may have come from Tenasserim, came from Upper Burma; they were collected during the journey made by Griffith from Upper Assam through the Hukung Valley to Ava. The only recent collection of this species is from Mingyin, where it was obtained by Prazer.

## 7. DESMODIUM LABURNIFOLIUM DC.

Add to localities of *F. B. I.*:—UPPER BURMA; Maymyo, *King's Collector!*

## 8. DESMIDIUM TRIQUETRUM DC.

To this species the F. B. I. has reduced *D. auriculatum* DC., *D. pseudo-triquetrum* DC., and *D. alatum* DC. The three plants so named by M. De Candolle are, however, extremely distinct from *D. triquetrum* and from each other, and as no intermediates occur even in places where two or more of the forms have been found growing side by side, it is highly probable that they should all be recognised as specifically distinct. It may, however, suffice if, for the present, they are dealt with as only subspecies of one somewhat variable "species."

SUBSP. *genivina*; erect; pods hairy throughout. *Desmodium triquetrum* DC. Prodr. ii. 326. *Hedysarum triquetrum* Linn. Sp. Pl. 746; *Burm. Flor. Ind. t. 52. f. 2.* *H. alatum* Roxb. Hort. Beng. 56; *Flor. Ind. iii. 348.*

CENTRAL, WESTERN and SOUTHERN INDIA and CEYLON. ASSAM, KHASIA, CHITTAGONG, BURMA, TENASSERIM, PERAK. DISTRIB. Java, Tonkin, China (Hong-Kong only, and perhaps introduced).

This is common in both the Eastern and Western Peninsulas; it is somewhat remarkable that it has never been found in the sub-Himalayan tract where *D. pseudo-triquetrum* is so common.

At Shaila in the Khasia Hills Mr. C. B. Clarke has found this (Clarke n. 14883) and *D. alatum* (Clarke n. 14469) growing side by side; in the Island of Pah-tau, Tenasserim, Mr. Proudlock has similarly found this and *D. auriculatum* growing together; in neither case were any intermediates collected.

SUBSP. *auriculatum*; erect; pods firmly cartilaginous, glabrous throughout. *Desmodium auriculatum* DC. Prodr. ii. 326.

SILHET, Clarke! Coasts of TENASSERIM and ANDAMANS, plentiful. DISTRIB. Malay Archipelago, Mascarene Islands.

This appears to be almost purely a seashore species though it has been found on two occasions in Silhet, both times by Mr. Clarke. On the specimens from Mauritius in Herb. Calcutta, Bouton has suggested that it is an introduction from India. More probably, however, it is a member of the littoral flora of the Malay region which extends as far as, and includes the coast species of, the Mascarene group. The plant was originally described from Timor specimens.

SUBSP. *alatum*; erect; pods thinly membranous, very broad, glabrous throughout. *Desmodium alatum* DC. Prodr. ii. 326 (not *Hedysarum alatum* Roxb.)

ASSAM; KHASIA; CACHAR; CHITTAGONG.

This is the most palpably distinct of all the four forms included under *D. triquetrum*. It is apparently confined to the area indicated, and has never been found in India proper. De Candolle's description is unmistakable; he has, however, very unfortunately cited both the locality and the synonym given by Roxburgh for the genuine *D. triquetrum*. Roxburgh expressly states that the pod of his *Hedysarum alatum* is "hairy;" this alone is sufficient to show that the "*alatum*" of Roxburgh and the "*alatum*" of De Candolle cannot possibly be the same plant.

SUBSP. *pseudo-triquetrum*; diffuse; pods thin glabrous except along the sutures each of which has a line of adpressed hairs. *Desmodium pseudo-triquetrum* DC. Prodr. ii. 326. *Hedysarum triquetrum* Roxb. Hort. Beng. 56 and *Flor. Ind. iii. 347* not of Linn.

Along the foot of the HIMALAYA from Dehra Dun, the Nepal and Sikkim Terai to the Duars; plains of BENGAL, and valley of ASSAM, common. Khasia Hills, Clarke! Naga Hills, Prain! Watt!

Roxburgh has left no figure of his *Hedysarum alatum*, but his description fits *D. triquetrum* and *D. triquetrum* only. The account of his own *Hedysarum triquetrum* is incomplete because it does not fully describe the pods. Its prostrate habit, however, should almost have sufficed to indicate that this is the plant intended, and Roxburgh has fortunately left a drawing which proves that his *Hedysarum triquetrum* is not that of Linnaeus but is the *Desmodium pseudo-triquetrum* of De Candolle. Wight and Arnott (*Prodromus* 225) clearly never saw *D. alatum* DC., the plant which they supposed to be that species is *D. auriculatum*.

#### 9. DESMODIUM ORMOCARPOIDES DC.

VAR. *typica*; leaves inconspicuously downy beneath. DC. *Prodr.* ii. 327. *Bak.* in *Flor. Brit. Ind.* ii. 164. Add to synonyms of *F. B. I.*:—*D. teres* Clarke, *Journ. Linn. Soc.* xxv. 16 not of Wall.

Add to localities:—ASSAM; Gauhati, *G. Mann!* Nichuguard, *Clarke!*

Mr. Clarke has identified his plant with *D. teres* Wall. which mainly differs from *D. ormocarpoides* in having a very short petiole and is perhaps not specifically distinct; even in that case, however, *D. ormocarpoides* is the older name.

VAR. *velutina* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 142; leaves densely velvety beneath.

S. ANDAMAM; Goplakabang, Hobdaypur, etc., *King! King's Collectors!* PAHANG; Kwala Tembeling, *Ridley* n. 2605! SELANGOR; *Ridley* 7295!

#### 10. DESMODIUM TERES Wall.

This is evidently very rare or at least very local in Upper Burma. Mr. Prazer has sent to Calcutta a solitary specimen from Mingyin, the only one received since Dr. Wallich first found the plant.

13. DESMODIUM PODOCARPUM DC.; *Bak.* in *Flor. Brit. Ind.* ii. 165, *excl. syn.* *D. japonicum*. Leaflets broadly ovate, terminal rhomboid, lateral subrhomboid, sparsely puberulous above and below.

Add to synonyms of *F. B. I.*:—*Desmodium rhomboideum* Sweet, *Hort. Brit.* ed. ii. 151. *D. Harwickianum* Voigt, *Hort. Calcutt.* 223. *Hedysarum rhombifolium* Roeb. *Hort. Beng.* 57 not of Elliott.

Amend localities:—NORTH-WEST HIMALAYA; very common from Kashmir, *Clarke*, to Kamaon, *Blinkworth*, etc.

The locality given by Roxburgh for Genl. Hardwicke's plant is "Cawnpore;" this probably only means that it was from Cawnpore that Hardwicke despatched the seeds to Roxburgh. It is usual to suppose that the plants which were introduced to the Calcutta garden through the kindness of Genl. Hardwicke, came from the plains of Upper India; the writer has already had occasion to point out that, in the majority of instances, Genl. Hardwicke's contributions that proved unfamiliar to Dr. Roxburgh have been found eventually to have come from Dehra Dun, the Garhwal Babur and the lower slopes of the North-West Himalaya.

Dr. Wallich sent this plant to Geneva among the specimens from Nepal that were described by M. De Candolle in the volumes of the *Prodromus* published before 1828, the year in which the dispersal of the Hon'ble East India Company's

Herbarium was begun. Hence it happens that M. De Candolle gives Nepal as its locality in the *Prodromus*. As a matter of fact, however, Dr. Wallich did not collect this species in Nepal at all; his specimens came from Kamaon where they were collected by Mr. Blinkworth. The species is represented in the Wallichian herbarium by n. 5711 A. And a specimen of the North-West Himalayan species of which Wall. Cat. 5711 A. is an example has been kindly compared by M. Casimir De Candolle and Mr. Buser with the type of *D. podocarpum* in the *Prodromus* Herbarium; the result has been to show that the two are the same plant. Dr. Scully and Mr. Maries, the only other collectors who have sent plants from Nepal since Dr. Wallich's visit to that country, have equally failed to find *D. podocarpum* there.

Dr. Wallich's Cat. n. 5711 B. *did* come from Nepal. Unfortunately, however, under this letter was issued a mixture of two plants, neither of which is *D. podocarpum*. One of them is *D. laxum* DC. which was at a later date redescribed by Mr. Bentham as *D. Gardneri*. In the *Flora of British India* a compromise is adopted as regards *D. laxum*; the Himalayan examples of the plant are treated as belonging to *D. podocarpum*, though Mr. Baker deviates from Dr. Wallich's treatment to the extent of making them varietally distinct; the South Indian examples are, however, kept apart under Bentham's name *D. Gardneri*. In the *Flora of British India* Kamaon is given as a locality for *D. laxum* though no one has hitherto sent it from that region; Assam as a locality is omitted, though one of the specimens quoted (*Wall. Cat.* n. 5720) came from that province. And it will be observed that although, as a Nepal plant, Wallich merged it in *D. podocarpum*, as an Assam one he issued it as a distinct species, *D. trinerve*.

The other plant mixed with *D. podocarpum* by Wallich under n. 5711 B. is *D. oxyphyllum* DC., regarding the identity of which a wide-spread misunderstanding has arisen; the thanks of Indian botanists are due to M. Casimir De Candolle who, with Mr. Buser, has compared specimens of the plant with the type sheets in the *Prodromus* Herbarium, and has been so kind as to present to Herb. Calcutta, from his own herbarium, one of the actual Nepalese specimens that were originally sent to Geneva by Dr. Wallich and that formed the basis of *D. oxyphyllum*. He has thus finally removed any doubt that might exist as to the identity of the species.

#### 14. DESMODIUM LAXUM DC. *Prodr.* ii. 336.

Add to synonyms of *F. B. I.*:—*D. trinerve* *Grah.* in *Wall. Cat.* 5720. *D. Gardneri* *Benth. Pl. Jungh.* 226. *D. podocarpum* var. *laxum* *Bak.* in *Flor. Brit. Ind.* ii. 165 not *D. podocarpum* DC.

Add to localities of *F. B. I.*:—NEPAL; *Wallich!* SIKKIM; from the Terai (*Clarke* 36801! *Kurz!*) up to 2000 feet elev., (*King!* *Clarke* 13195!) Eastern Duars, *Heawood!* ASSAM Valley at Goalpara, *Hamilton!* Gauhati, *Simons!* Sibsagar, *Masters!* MALAY PENINSULA; Perak, *Wray* n. 1608!

This species does not vary in any of its localities and is always very easily distinguished by its acuminate leaflets, boldly 3-nerved at the base, and by the very long stalks to its pods.

M. Casimir De Candolle and M. Buser have also kindly examined specimens of veritable *D. Gardneri* and find that *D. Gardneri* is true *D. laxum* DC.

#### 14b. DESMODIUM OXYPHYLLUM DC. *Prodr.* ii. 336; corolla small, bracts linear, minute, stalk of pod twice as long as calyx, pedicels short,

leaflets ovate-lanceolate all gradually narrowing to an acute point. *D. japonicum* *Miq. Ann. Mus. Lugd.-Bat.* iii. 46. *D. podocarpum* *Wall. Cat.* 5711 B (*in part*); *Bak. in Flor. Brit. Ind.* ii. 165 *in part, not of DC.*

HIMALAYA; Sirmur; *Vicary!* Nepal; *Wallich!* Sikkim; *Hooker! Gammie!* ASSAM; Khasia, *Hooker! Clarke! Mann!* Naga Hills, *Prain!*  
DISTRIB. China, Japan.

*Stems* 2-3 feet, herbaceous, terete, branches angular glabrous. *Stipules* small. *Corolla* and *pod* as in *D. podocarpum*.

It may be admitted that this is the eastern representative of *D. podocarpum* but that it should be reduced, even as a distinct variety, to *D. podocarpum* the writer cannot believe. The foliage is totally different and there are no intermediates.

The confusion that has grown up round this and the two preceding species illustrates well the danger of placing too great a reliance on the numbered sheets of the Wallichian Herbarium. That these show a larger number of erroneous identifications than other issued collections is not implied; on the contrary, the Herbarium was carefully distributed by one of the most accurate botanists then living, with the assistance in particular families of some of the most eminent European systematists of their time. In spite of this errors were bound to creep in and the trouble caused by these errors in the families that had already been dealt with by Mr. De Candolle in those volumes of the *Prodromus* published before Dr. Wallich's *Herbarium* was issued, is so great that the writer would warn all botanists, who wish their results to be accurate, to place no confidence in the Wallichian name for a species of any of these families until he has confirmed it by comparison with the specimen so named in the *Prodromus* Herbarium. For Dr. Wallich put no number on any of the sheets that he sent originally to Mr. De Candolle and many of the identifications with species which Mr. De Candolle had described were manifestly made subsequently by Dr. Wallich without referring either to Mr. De Candolle's descriptions or specimens. The same remarks apply to the specimens sent by Wallich to Lambert and used by D. Don in the preparation of his *Prodr. Flor. Nepal*. Here, also, the difficulty is greater, since the keepers of the national Collections unfortunately failed to secure the Wallichian bundles in the *Herb. Lambert.*, when Mr. Lambert's collection was dispersed.

In an angry pamphlet Dr. Griffith complained, when he came to act as Dr. Wallich's substitute, that the Calcutta Herbarium had been depleted by the distribution of the H. E. I. C. Herbarium. This was true; still on the whole Indian botanists may be said not to have grudged the rather wholesale dispersal, seeing that what was their loss was the gain of the great European Herbaria. It was besides always possible to begin afresh, and there has been brought together at Calcutta, since his time, a collection such as probably Dr. Wallich never dreamed of. But what has been in the highest degree detrimental to Indian systematic botany has been the peculiar way in which Wallichian specimens, no matter how fragmentary, have been converted into fetishes; and in which Wallichian names, in cases like the present, have been made to override names that, accompanied by intelligible descriptions, are to be found attached to the same plants in the *Prodromus* Herbarium. Indian botanists have never grudged the loss of the typical Wallichian specimens, but they have often felt, considering how these types have been misused, that it would have been a greater blessing to Indian botany, had the Wallichian Herbarium, by some happy accident, totally disappeared.

16. *DESMODIUM SCALPE DC.*

Add to localities of *F. B. I.*:—MANIPUR; *Clarke* n. 42029!

17. *DESMODIUM OBCORDATUM Kurz.*

Add to distribution:—Sumatra (*Teysmann* n. 3909!)

18. *DESMODIUM OBLONGUM Wall.*

VAR. *typica*; leaves oblong, obtuse.

Add to localities of *F. B. I.*:—MANIPUR, *Watt* n. 5083!

VAR. *acutifolium*; leaves larger, ovate-lanceolate acute, flowers rather smaller, whole plant larger and stouter. *D. substipulaceum Kurz, Journ. As. Soc. Beng.* pt. 2. xlv. 230 *not of Bl.*

BURMA; Nattoung Mts., *Revd. Cross!* Mogouk, *Cooper!*

It is just possible that this variety may be specifically distinct from *D. obtusum*; this at least was the opinion of Mr. Kurz. Its fruits, however, are exactly like those of *D. oblongum* and are not like those of the plant to which he has referred it. The plant with which Mr. Kurz has united it has, besides, 3-foliolate leaves, while all our specimens of this have simple leaves. The latter difference, however, may not be of specific importance, since *D. oblongum* proper is described by Mr. Baker as having simple leaves, which is true of all our specimens at Calcutta *except Wall.* *Cat.* n. 5714 itself, where the leaves are 3-foliolate.

19. *DESMODIUM OBLATUM Bak.*

This, as the *F. B. I.* points out, is very close to n. 44. *D. reniforme*, which is also cited as occurring in Burma. Mr. Kurz has doubted (*Journ. As. Soc. Beng.* xlv. pt. 2. 230) that *D. reniforme* is Burmese; certainly all Kurz's specimens from Burma, as well as the only Wallichian one at Calcutta (*Wall. Cat.* n. 5702—the Prome portion only) are *D. oblatum* rather than *D. reniforme*; recently, however, genuine *D. reniforme* has been received from Maymyo and elsewhere. But the plants do not appear to the writer to differ even as varieties; *D. oblatum* does not always have longer pedicels than *D. reniforme*, and some of our Maymyo specimens are interesting on account of their having the slightly indented pods of *D. reniforme* and the deeply indented ones of *D. oblatum* on the same branch.

20. *DESMODIUM SINUATUM Blume.*

Add to localities of *F. B. I.*:—UPPER BURMA; Mogouk, *Cooper!*

Add to distribution:—Szechuen, *Pratt* (n. 422!)

This appears to be no more than the representative in the Eastern Peninsula of the Himalayan *D. sequax* (n. 31). Except for the rather closer tomentum on the leaves beneath, and for the fact that the end-leaflet is rhomboid and obtuse in this plant, instead of ovate-oblong and acute as in *D. sequax*, it would be impossible to distinguish the two. From their position in the *F. B. I.* it might be gathered that the two plants differ as regards calyx. This, however, is not the case, the calyx in the two is indistinguishable, as are the corollas and the pods.

*Pratt* n. 422 has been issued as *D. grossicrenatum* Franch. If this identification be correct then Mr. Franchet's name becomes a synonym of *D. sinuatum*. There is not, however, any authentic example of *D. grossicrenatum* at Calcutta.

21. *DESMODIUM SAMBUENSE DC.*

Add to localities of *F. B. I.*:—BURMA; common from the Chin Hills to the Shan Plateau.

This species is the *Desmodium floribundum* of G. Don (*Hedysarum floribundum* of D. Don). The *F. B. I.* suggests that it is the same as *D. sambuense* DC. (*Hedysarum sambuense* D. Don); this is undoubtedly the case. The name *D. floribundum*, used in the *F. B. I.*, only dates from 1832, whereas the names *D. multiflorum* DC. and *D. elegans* Lindl., given as synonyms, date from 1825 and 1826 respectively. Authors have accorded preference now to one, now to another of the rival names *D. floribundum* and *D. multiflorum*, while as a matter of fact the synonym that should have been used throughout is the one here employed.

*D. elegans* has thinner leaves, less hairy beneath, and blunter at the points than those of *D. sambuense* proper; *D. floribundum* (*D. multiflorum*) has more numerous racemes and smaller leaves than *D. sambuense* proper. But all sorts of intermediates occur, and it is impossible to separate the three even as varieties.

21b. *DESMODIUM KULHAIENSE* C. B. Clarke MSS.; leaflets entire, pedicels long, joints many small quite glabrous.

SIKKIM; at Hee, 4000 feet, Clarke nn. 13096! 13109!

Branches woody, obscurely angled, sparsely hirsute. *Stipules* lanceolate,  $\frac{1}{2}$  in., leaflets subcoriaceous, wide-lanceolate, perfectly glabrous above, very densely velvety with adpressed grey-silky hairs beneath; end-leaflet  $2\frac{1}{2}$ -4 in. long,  $\frac{3}{4}$ -1 in. across, on a petiole  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, gradually tapering upwards from junction of lower and middle thirds to a long subacuminate point, and downwards to a rounded or cuneate-truncate base; lateral leaflets almost sessile, 2-3 in. long,  $\frac{1}{2}$  to  $\frac{3}{4}$  in. across, tapering upwards like the central but with a very oblique rounded base. *Racemes* rather copious, axillary and terminal, 5-8 in. long; pedicels usually  $\frac{1}{2}$  in., very slender, glabrescent. *Calyx*  $\frac{1}{2}$  in., teeth larger than tube. *Corolla* unknown. *Pods* 1-1 $\frac{1}{2}$  in. long, under  $\frac{1}{2}$  in. broad; joints 6-8, longer than broad, without pubescence, finely reticulate-veined.

This plant is very nearly related to the preceding, of which it has the habit. But its less angular branches, its very different leaves, and its glabrous pods with finely reticulate joints borne on slender pedicels twice as long, make it very distinct. Mr. Clarke, the only botanist who has met with the plant, originally gave to his specimens the name now quoted, perhaps without any intention of incurring the responsibility of recognising it as specifically distinct; indeed he has, at a later date, himself reduced it to *D. multiflorum* (*D. sambuense*). Mr. Kurz, Mr. Brace, Dr. King and the writer having at different times independently examined Mr. Clarke's specimens, and having all formed the opinion that his plant must be distinguished as a species, this opportunity is taken of providing the diagnosis necessary for its recognition; Mr. Clarke's original tentative name, being an excellent one, has been adopted here.

The relationship of this plant is, however, even more close with the next species, of which it has the long-pedicelled flowers and glabrous pods, with joints reticulated externally, than it is with *D. sambuense*. But the species referred to (*D. khasianum*) has much larger pods, as large as in *D. serriferum* and in *D. tiliaefolium*, while the somewhat similar leaflets, also glabrous above, are smaller and much less hairy beneath.

21c. *DESMODIUM KHASIANUM* Prain; leaflets entire, pedicels long, corolla large, bracts lanceolate, joints of pod many large quite glabrous, reticulate-veined. *D. serriferum* Wall. *Cat.* 5708 (C only, in

*Cat. Lith.* p. 215 *inter addend.*) *D. oxyphyllum* *Herb. Ind. Or. H. f. & T.*, *not of DC. and hardly of Bak.*

KHASIA and JAINTEA Hills; "Montes Sillet," *i.e.*, Khasia, Gomez (*Wall. Cat.* 5708 C)! Khasia, 2-4000 feet, *Hooker and Thomson! Griffith* (*Kew Dist. n.* 1621, *Field n.* 389)! *Gallatly n.* 676! *Mann n.* 281! *Clarke nn.* 15154! 17813! 19167! 40415! 45119! Jowai, *Dr. King's Collector!*

Branches slender terete, soon glabrescent. *Petiole*  $\frac{3}{4}$  in. to 1 in. long; leaflets subcoriaceous ovate, terminal 2-2 $\frac{1}{2}$  in. long, 1 in. across, tapering from the middle to an abruptly short-acuminate apex and to a cuneate-truncate base, on a petiolule  $\frac{1}{2}$  in. long; lateral similar but smaller, shortly petioluled, 1-1 $\frac{1}{2}$  in. long and with a subequally rounded base; all quite glabrous above, clothed with adpressed silky hairs, and finely reticulate-veined beneath. *Racemes* copious, axillary and terminal, moderately close; bracts lanceolate, ciliated,  $\frac{1}{2}$  in. long; pedicels erecto-patent, slender, glabrescent,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. *Calyx*  $\frac{1}{8}$  in., teeth triangular as long as tube. *Corolla*  $\frac{3}{8}$  in. *Pod* 1 $\frac{1}{2}$ -2 in., joints  $\frac{3}{16}$  in. wide, rather longer than broad, 4-7, quite glabrous, finely reticulated.

This species is apparently confined to the mountain slopes to the north of Silhet. It was issued under n. 5708 C. by Dr. Wallich—though at a date subsequent to the original issue of n. 5708—as part of his *Desmodium serriferum*, a species from Nepal and Kamaon of which the types are *Wall. Cat. n.* 5708 A. & n. 5708 B. (*Lith. Cat.* p. 195).

Though somewhat nearly related to *D. serriferum*, this is very easily distinguished by its longer pedicels, its perfectly entire and somewhat differently shaped leaflets, as well as by its quite glabrous pods, the reticulations of which stand in bolder relief, and by its very different calyx with acute teeth as long as the tube.

*Wall. Cat. n.* 5708 C. is not referred to in the *F. B. I.*, but that this plant (which occurs as *D. oxyphyllum* both in *Herb. Griffith.* and in *Herb. Ind. Or.*) has been included under *D. oxyphyllum* in *Flor. Brit. Ind. ii.* 167 seems probable from the fact that Khasia is there cited as a locality for that species; *D. serriferum* (*D. oxyphyllum* *Bak.*, not *DC.*) does not occur anywhere to the east of Nepal, whence came the specimen originally described by Mr. De Candolle.

## 22. DESMODIUM CONFERTUM DC.

The original specimens of *Hedysarum dioicum* Ham. (*Desmodium dioicum* DC.), named by Hamilton himself, show that *D. confertum* is only *D. dioicum* DC. But from the fact that the name employed in the *F. B. I.* is much more familiar, and also because the plant is not truly diœcious, it seems unnecessary to give up its use in favour of the synonym that perhaps technically ought to replace it.

23. DESMODIUM SERRIFERUM *Wall. Cat.* 5708 A and B. *D. oxyphyllum* *Bak.* in *Flor. Brit. Ind. ii.* 167 *not of DC. nor of Herb. Ind. Or.*

This species is nearly related to the preceding but is at once distinguished by its very short obtuse calyx-teeth.

A slight alteration must be made in the account of the distribution of the species as given in the *F. B. I.* The plant has never been found in Assam or in Khasia; these localities must therefore be deleted; they depend, as already explained, on the erroneous identification by Dr. Wallich of *D. khasianum* with his own *D. serrif-*



*ferum*. Nor are there any specimens from the Eastern Himalaya at Calcutta; all the Sikkim examples of a plant with flowers and fruits like those of *D. serriferum* have the obtuse or subacute leaves characteristic of *D. tiliæfolium*.

As has been already explained under that species, the true *D. oxyphyllum* is a member of § *Podocarpum* and does not bear the faintest resemblance to *D. serriferum*.

The var. *serriferum* of the *F. B. I.* has no existence. It is made up of two plants:—*Wall. Cat.* 5708 A.—which is, as it happens, exactly the same as *Wall. Cat.* 5708 B.; in any case, even had the two differed, the specimen under the letter A. must obviously have marked the type of Wallich's species: and *Wall. Cat.* 5710 issued by Dr. Wallich as *D. polycarpum*—which it in no way resembles. Indeed, n. 5710 is not distinguishable from *D. tiliæfolium*, as represented by his n. 5707.

#### 24. DESMODIUM TILIÆFOLIUM *G. Don.*

This species bears to *D. serriferum* very nearly the relationship that *D. sinuatum* bears to *D. sequax*; that is to say its floral structure is identical and it is only to be distinguished by the shape of its leaflets and the different degree of tomentum on its leaves. To this species Mr. Baker reduces *D. nutans* Wall. which has thicker leaves and very large lax panicles, and *D. argenteum* which has rugose almost coriaceous leaves very densely villous beneath. As represented by Dr. Wallich's three sheets, viz., 5707 (*D. tiliæfolium*); 5713, (*D. argenteum*) and 5706, (*D. nutans*), it would be perfectly easy to define three "species." But intermediates of all kinds abound and the writer has found it impossible to give satisfactory characters for separating them as varieties. The fruits of all three are identical and, indeed, hardly differ from those of *D. serriferum*, in which a monographer must, the writer believes, necessarily ultimately merge all three.

True *D. tiliæfolium* extends from the Kuram Valley, *Aitchison!* and Hazara, *Stewart!* to Sikkim, *King!* and Szechuen, *Pratt!* But it is very rare in Sikkim, and has never been reported from Nepal or from any portion of the Assam ranges. The other two forms are more local; *D. argenteum* extends only from Nepal westward to Chamba, while *D. nutans* seems to be confined to Kamaon and Garhwal and to be rare there.

The *F. B. I.* reports one or other of the forms, without indicating which, from Tavoy, but no one has hitherto sent specimens of the plant to Calcutta from any part of Burma. In Upper Burma its place appears to be taken by the not dissimilar *D. karenium*, which is at once recognised by its subulate calyx-teeth as long as the tube. In Tenasserim it is replaced by another very distinct species, *D. insigne*, which, with a calyx like that of *D. karenium*, is distinguished both from that species and from *D. tiliæfolium* by its persistent scarious bracts.

24b. DESMODIUM KARENIUM *Kurz in Journ. As. Soc. Beng.* xlv. pt. 2. 228 and 232; leaflets usually large acuminate softly velvety-pubescent beneath, pedicels moderately long, bracts lanceolate deciduous, corolla large, joints many, densely clothed with minute brown-pubescence and with white spreading hairs intermixed.

BURMA; Pegu, Bookee Ridges, 4500 feet, *Kurz* n. 1676/C. ! Thongyeen, *Brandis!* Shan Hills; at Madoe, Lwekaw, and near Fort Stedman, *King's Collectors!*

A shrub 4–5 feet high, branches black, angular, glabrescent. *Petiole* 4 in.; leaflets herbaceous 6 in. long, 3½ in. wide, green sparsely setulose-hirsute above,

densely velvety beneath with grey-silky pubescence, all ovate-oblong acuminate, the central wide-cuneate at base, on a petiolule  $1\frac{1}{2}$  in. long, the lateral with very short petiolules, almost rounded at base, margins slightly repand-sinuate. *Racemes* copious lax axillary and terminal, very slender and usually shorter than the leaves, often compound, branched at base; pedicels  $\frac{1}{4}$  in., very slender, finely puberulous, ascending. *Calyx*  $\frac{1}{2}$  in., sparsely pubescent, teeth subulate as long as the widely campanulate tube. *Corolla*  $\frac{3}{8}$  in. *Pods*  $1-1\frac{1}{4}$  in., joints 5-6, rather longer than broad.

This in general appearance resembles *D. tiliaefolium*, but the black angular stems and the very different calyx and pods amply distinguish it. Though it bears less general resemblance to *D. sambuense* it is in reality most closely related to that species; it has similar stems, not however as in *D. sambuense* with lines of spreading hairs along the angles, and similar though much larger pods, the joints being four times the size of those of *D. sambuense*. The leaves also are very different in shape besides being many times larger; the calyx teeth, too, are much narrower in this species.

24c. *DESMODIUM INSIGNE* Prain; leaflets very large, ovate-acute, densely hoary beneath, pedicels moderately long; bracts lanceolate scarious persistent, corolla large; joints quite glabrous reticulate-venose.

TENASSERIM; at Endine Ghor, 1000 feet, *Gallatly!*

*Branches* woody, angular, densely uniformly rusty-pubescent. *Petioles* short,  $1-1\frac{1}{2}$  in. only; leaflets thick flexible subcoriaceous, green rugose and sparsely setulose above, densely persistently matted with whitish silky hairs beneath; all ovate-acute with rounded bases; the end one, on a petiolule that may be 2 in. long and always exceeds the petiole proper, 9 in. long, 6 in. across; the lateral almost sessile, 6 in. long, 4 in. across. *Racemes* copious lax, sometimes a foot long, axillary and terminal, the latter at times paniculate, pedicels  $\frac{1}{4}$  in. finely downy, arising in fascicles from the axils of 2-3 lanceolate externally rusty-pubescent rigid persistent bracts. *Calyx*  $\frac{1}{8}$  in., pubescent, teeth triangular, acuminate, rather shorter than the narrow-campanulate tube. *Corolla*  $\frac{3}{8}$  in. *Pods* 1 in.; joints about 6, rather broader than long, quite glabrous.

A species very distinct on account of its peculiar persistent rigid bracts, disposed in groups along the rachis of the racemes and with fascicles of pedicels in their axils. The leaves, though of larger size, have the facies of those of that form of *D. tiliaefolium* which constitutes *D. argenteum*.

24d. *DESMODIUM KINGIANUM* Prain; leaflets obtuse or subacute, softly grey-silky beneath, bracts small, pedicels short, joints broad densely shortly tomentose, the sutures densely pubescent with longish white hooked hairs.

BURMA; Shan States at Saga, *King's Collectors!*

Shrubby, branches and petioles rusty-pubescent. *Petiole* 2 in., leaflets rather thick, green, sparsely pubescent above, densely silky beneath, all broad obovate obscurely repand, bases wide-deltoid; central petiolule  $\frac{3}{4}$  in. *Racemes* short dense 4 in. long, axillary and terminal pedicels  $\frac{1}{8}$  in., erect, puberulous. *Calyx*  $\frac{1}{12}$  in. wide, campanulate, pubescent, teeth subulate, remote, as long as tube. *Pod*  $1\frac{1}{2}$  in. long,  $\frac{1}{4}$  in. wide, dorsal suture straight, ventral very slightly sinuate; joints usually 6, broader than long, the last apiculate, thin, tardily separating.

An exceedingly distinct species with pods altogether different from those of

any other Indian species. The corollas, said by the native collector to be blue, are absent from the specimens reported. The pods most resemble those of *D. gyrans*, but are altogether different in not opening along the ventral suture and in delhiscent transversely. The leaves recall those of *D. sinuatum*.

24e. *DESMODIUM MEGAPHYLLUM* Zoll. *Nat. en Geneesk. Arch.* iii. 58; leaflets all ovate-lanceolate acuminate repand, densely softly velvety or sparsely silky beneath, pedicels long slender, bracts lanceolate deciduous, corolla medium, joints many, reticulate-veined, sparsely puberulous or glabrous. *Prain, Journ. As. Soc. Beng.* lxxi. 2. 139.

VAR. *typica*; leaves softly velvety beneath; secondary nervation hidden by the tomentum; pods sparingly puberulous. *Miq. Flor. Ind. Bat.* i. 245, *excluding both synonyms.*

PERAK; Valley of Batung Padang, 2000 feet, *Wray* n. 1441! **DISTRIB.** Java, Tjiboddas (*Kurz* n. 939! issued under the name *D. sequax*; *Zollinger*; *Junghuhn*).

VAR. *glabrescens*; leaves sparsely covered with silky hairs beneath, secondary nervation prominent; pods quite glabrous.

TENASSERIM; Meetan, 4000 feet, and Moolyet 5000 feet, *Gallatly!* Moolyet, *Beddome* n. 21.

A shrub 8 feet high, with dark glabrescent subterete branches. *Petioles* 2 in; leaflets rather pale-green membranous, very sparingly puberulous above, beneath from densely velvety to sparingly puberulous, secondary nervation always prominent but in the Perak and Java form hidden by the denser pubescence; end-leaflet 5 in. long,  $2\frac{1}{2}$ -3 in. across, its petiolule  $\frac{3}{4}$  in., its base wide-cuneate, lateral-leaflets  $3\frac{1}{2}$  in. long, 2 in. across, their bases obliquely rounded, their petiolules short. *Racemes* in rather lax terminal panicles 8-12 in. long; pedicels  $\frac{1}{4}$ - $\frac{1}{2}$  in., glabrous, erecto-patent. *Calyx* very small  $\frac{1}{7}$  in. long, campanulate, glabrous, teeth triangular shorter than the tube. *Corolla* pale-violet  $\frac{3}{8}$  in. *Pod* dull-crimson, 2-2 $\frac{1}{2}$  in. long,  $\frac{1}{3}$  in. wide, slightly indented on both sutures; joints 6-8, rather longer than broad, distinctly reticulate-venose, sparingly puberulous or glabrous.

A very distinct and beautiful species; the identity of the Perak plant with *Zollinger's* original specimens has been established by Mr. C. B. Clarke who kindly compared the *Desmodia* of Dr. King's Malayan collections with the material of the genus at Kew. Miquel's synonym "*D. scandens* Bl." refers to a plant that he elsewhere treats as a variety of *D. strangulatum*, and that was subsequently advanced to specific rank in the *F. B. I.* under the name *D. sinuatum* Bl. MSS.: Miquel's second synonym "*D. rubescens* Bl." refers to *D. sequax* Wall., which also occurs in Java (*Kurz* n. 965). But both of Miquel's proposals are untenable, for even if it be ultimately found necessary to merge *D. sinuatum* in *D. sequax*, it with still obviously be necessary to keep *D. megaphyllum* apart from both as a very distinct species.

26. *DESMODIUM GANGETICUM* DC.

Add to localities of *F. B. I.*:—PENANG; Pinara Bukit, *Curtis* 2771! NICOBARS; *Jelinek* 233!

26b. *DESMODIUM VIRGATUM* Zoll. *Nat. en Geneesk. Arch.* iii. 58; leaflet membranous or subcoriaceous, oblong entire acute, glabrescent

on the upper surface; corolla 3–4 times the calyx, pod densely clothed with minute hooked hairs. *D. latifolium* Bak. in *Flor. Brit. Ind.* ii. 168 not of DC. *D. latifolium* VAR. *virgatum* Miq. *Flor. Ind. Bat.* i. 247. *D. gangeticum* VAR. *acuminatum* Miq. *Flor. Ind. Bat.* i. 248.

CHITTAGONG; Rangamati, Clarke! BURMA; Prome, Wallich (*Cat.* n. 5692 G. in part); Pegu, Kurz! Shan Hills, Collett! PERAK; Scortechini n. 1594! DISTRIB. Malay Archipelago.

Stems suberect reaching 3–4 feet high, woody, slightly angular. Leaflet oblong 5–6 in. long, thinly clothed beneath with grey hairs. Racemes copious ascending 4–8 in. long, slender. Pod  $\frac{1}{2}$ – $\frac{3}{4}$  in. long,  $\frac{1}{2}$  in. broad, 4–6 jointed.

This plant in habit and foliage resembles *D. gangeticum*; in flowers and fruits, *D. latifolium*.

27. *DESMODIUM LATIFOLIUM* DC.

Delete the synonym *D. virgatum* Zoll.

31. *DESMODIUM SEQUAX* Wall.

Very nearly related to *D. sinuatum* Blume, to which it bears the relationship that *D. serriferum* bears to *D. tiliæfolium*. The specimens from Mishmi collected by Dr. Griffith apparently include both "species," those at Kew being referred by Mr. Baker to *D. sinuatum*. All the Mishmi specimens at Calcutta belong on the contrary to *D. sequax*, the end-leaflets being narrowed gradually to a point.

32. *DESMODIUM CONCINNUM* DC.

Add to localities of *F. B. I.*:—BURMA; Bookee ridges, Kurz!

The Burmese specimens are referable to VAR. *amæna* Bak., but intermediates from the Khasia Hills are so plentiful that the existence of this variety cannot be satisfactorily maintained.

33. *DESMODIUM RETROFLEXUM* DC.

Delete the locality "Tenasserim."

34. *DESMODIUM CAPITATUM* DC.

Add to localities of *F. B. I.*:—PERAK; common, Kunstler n. 361! Scortechini n. 45! TENASSERIM; Helfer.

35. *DESMODIUM GRIFFITHIANUM* Bth.

Add to localities of *F. B. I.*:—BURMA; Chin Hills, King's Collectors!

38. *DESMODIUM POLYCARPUM* DC.

Some of the forms included by Dr. Wight and Prof. Walker-Arnott in this species are at least varietally distinct, notably that issued by Dr. Wallich as *D. ovalifolium*, in which the leaflets are narrowed to an acute apex and have sometimes a truncate or even subcordate base. This form is plentiful in Tenasserim, the Andamans, the Malay Peninsula and Sumatra. The *D. polycarpum* of the *F. B. I.* is rather a group of forms aggregated for convenience, than a well-defined species. The object of the aggregation is readily appreciable: it will be noticed, however, that the reasons for adopting it are the reverse of those made use of in the similar *D. triquetrum* group. There, all the forms whose foliage happens to be similar are grouped together in spite of their having somewhat different flowers and totally different fruits. Here, a number of forms with flowers and fruits that are not

easily distinguishable are brought together in spite of very great and apparently constant differences in foliage. Under this mode of treatment, if consistently applied, *D. sequax* and *D. sinuatum* should have been united, as also should *D. serriferum* and *D. tiliæfolium*, and again *D. reniforme* and *D. oblatum*.

40. *DESMODIUM ROTUNDIFOLIUM* Bak.

41. *DESMODIUM PARVIFLORUM* Bak.

These two species do not accord at all well with the generic definition of *Desmodium*, and are more conveniently referred to *Alysicarpus*, in which they were originally placed by Dalzell.

42b. *DESMODIUM BIRMANNICUM* Watt; shrubby, suberect, leaflets 3, pedicels long, spreading or deflexed, bracts large, flowers and joints of pod small. *D. oblongum* Kurz in *Journ. As. Soc. Beng.* xlv. pt. 2. 226, 229 not of Wall.

BURMA; Pegu, rather frequent, Kurz n. 1677 bis. ! 2532 !

A suberect undershrub with woody slightly angular slender branches, sparingly clothed upwards with longish adpressed whitish hairs. *Petiole*  $\frac{1}{2}$  in.; leaflets membranous elliptic, sparingly clothed with adpressed silky hairs on both surfaces, green above, glaucescent beneath; end-leaflet  $1\frac{3}{4}$  in. long, 1 in. across, its petiolule  $\frac{1}{4}$  in. long; lateral almost sessile 1 in. long. *Racemes* in laxly spreading terminal panicles a foot long or more; bracts large membranous subsistent ovate-acuminate; pedicels  $\frac{1}{2}$  in. long, almost glabrous. *Calyx*  $\frac{1}{3}$  in., teeth acuminate twice as long as the tube. *Corolla* under  $\frac{1}{4}$  in. *Pod*  $\frac{1}{2}$ – $\frac{3}{4}$  in. long,  $\frac{1}{8}$  in. broad, minutely puberulous, splitting throughout along the lower suture; joints 4–6, only occasionally separating transversely.

A very distinct species which Mr. Kurz at first appears to have considered a variety of *D. polycarpum*, but which he afterwards treated and issued as *D. oblongum*. Dr. Watt, who has placed a MSS. description of the plant in Herb. Calcutta, has, however, very justly proposed to treat it as a species. It is most nearly related to *D. polycarpum*, but the lax panicles, very long pedicels and very differently dehiscent pods, amply distinguish it.

44. *DESMODIUM RENIFORME* DC.

Very nearly, perhaps too nearly, related to this is *D. oblatum* Bak.

45. *DESMODIUM HETEROPHYLLUM* DC.

This seems to be the representative in Indo-China and Malaya of *D. triflorum*. It occurs, but is rare, in S. India and Ceylon, while it is extremely common, as an indigenous species, in Burma, the Andamans and Nicobars, Tenasserim and the Malay Peninsula. *D. triflorum*, which is so common in India, is rare in Burma, and in the Andamans and Malaya occurs only sparingly about the various settlements, with all the appearance of being a quite recent introduction from India.

49. *DESMODIUM GYROIDES* DC.

Add to localities of *F. B. I.*:—PERAK; Kinta river, *Kunstler* n. 765 !

56. *SHUTERIA* W. & A.

1. *SHUTERIA VESTITA* W. & A.

Add to localities of *F. B. I.*:—DAPHLA HILLS; *Lister* ! NAGA HILLS;

*Prain!* MANIPUR; *Watt!* BURMA; Poneshee, *J. Anderson!* North Shan States, *Gatucre!* South Shan States, *King's Collectors!* Karen Hills, *Brandis!* Pegu, *Kurz!* TENASSERIM; on Moolyet, 5000 feet, *Gallatly!* DISTRIB. Java (*Kurz* 1103!)

The specimens from all these localities and from those mentioned in the *Flora of British India* agree exactly.

VAR. *glabrata* Bak.; (*S. glabrata* W. & A.) is hardly distinguishable as a variety. Its calyx, even in Wight's original authentic examples, is not at all glabrescent, and the leaflets, though elsewhere glabrous, have a few hairs on the main-nerves beneath. None of Simons' Khasia specimens at Calcutta belong to this variety; of sixteen different gatherings from the Assam Hills preserved in Herb. Calcutta, every specimen belongs to typical *S. vestita*.

The two other varieties of the *F. B. I.* are founded on plants that are specifically quite distinct from *S. vestita*.

1b. SHUTERIA DENSIFLORA *Benth.* in *Pl. Jungh.* 232. *S. vestita* VAR. *densiflora* *Bak.* in *Flor. Brit. Ind.* ii. 182.

GARHWAL; KUMAON; NEPAL. C. INDIA; Pachmarhi, *Duthie!*

This species is very distinct from *S. vestita*, to which it has been reduced in the *Flora of British India*. It is easily recognised by its glabrous pods and by the more horizontal, early-forking secondary nerves of its larger leaflets.

2. SHUTERIA HIRSUTA *Bak.* *Amphicarpæa ferruginea* *Herb. Ind. Or. H. f. & T. not of Benth.* *Pueraria anabaptista* *Kurz* in *Journ. As. Soc. Beng.* xlv. pt. 2. 253.

Substitute for localities of *F. B. I.* :—

SIKKIM; very common, *Hooker!* *Anderson!* *Clarke!* *Gamble!* BOOTAN; *Clarke!* KHASIA; *fide* Baker in *F. B. I.* BURMA; Chin Hills, *King's Collectors!* near Bhamo, *J. Anderson!* Shan Hills, *Collett!* *Fulton!* *King's Collectors!* Pegu, *Kurz!* Karen Hills, *Mason!* TENASSERIM; at Lathorgee, 2500 feet, *Gallatly!* DISTRIB. Sumatra (*Forbes* n. 1240!)

Mr. Kurz has distinguished two varieties which differ from each other exactly as *Shutertia vestita* proper and its VAR. *glabrata* do from each other, and are therefore hardly worthy of being distinguished. The writer, to avoid confusion, here follows the *F. B. I.* in keeping this species in *Shutertia*, to which it is referred on account of the axillary stamen being quite free from the others. But with the exception of this single character the plant is altogether a *Pueraria*, and as the definition of *Pueraria* in the *Genera Plantarum* admits species exhibiting this character, it will no doubt ultimately be necessary to readopt the view held by Mr. Kurz.

3. SHUTERIA FERRUGINEA *Bak.*

This has recently been collected again in Nepal by Dr. Scully, and an examination of his and Dr. Wallich's original specimens leads the writer to think that Mr. Baker's view as to its generic position may be correct; Mr. Kurz, however, did not assent to it. There appear to be two varieties :—

*a. typica*; bracts deciduous. *S. ferruginea* *Bak.* in *Flor. Brit. Ind.* ii. 182. NEPAL; on Sheopore, *Wallich* n. 5516! *Scully* n. 121! SIKKIM; *Kurz!*

b. VAR. *bracteosa*; bracts persistent. *S. bracteosa* C. B. Clarke MSS. *Pueraria strobilifera* Kurz MSS.

SIKKIM; Clarke n. 13493! KHASIA; G. Mann! Collett! Clarke n. 40383!

Both Mr. Brace and Mr. Clarke have independently noted their belief that this plant is a species of *Shuteria* distinct from any yet described, and in this they only share an opinion noted at a still earlier date by Mr. Kurz who, however, placed it, as he did *S. hirsuta*, in *Pueraria*.

The calyx-teeth of the Sikkim plant are rather shorter than in genuine *S. ferruginea*, but its bracts are exactly like those of the Khasia plant, in all three gatherings of which it is impossible to find a floral character that will separate the form from the Nepal one. None of the gatherings of either variety has ripe fruits and in their absence the writer has not ventured to follow Mr. Clarke and the other botanists whose opinion is quoted, in giving it specific rank. Should its validity as a species be ultimately established, the plant, if accepted as a *Shuteria*, will be known as *S. bracteosa* Clarke; should it prove a *Pueraria*, it will be *P. strobilifera* Kurz.

4b. SHUTERIA INVOLUCRATA W. & A. Prodr. 207. *S. vestita* VAR. *involutrata* Bak. in *Flor. Brit. Ind.* ii. 182.

NORTH-WEST HIMALAYA and NEPAL; common.

This species is quite distinct from *S. vestita*; it is very closely related, however, to *S. suffulta* Bth., which is the representative form in Burma and which might be reduced to *S. involucrata*, as a variety, with rather more justice than *S. densiflora* can possibly be to *S. vestita*.

## 58. GLYCINE LINN.

### 1. GLYCINE JAVANICA Linn.

Add to distribution:—Sumatra (*Forbes!*)

### 2. GLYCINE PENTAPHYLLA Dalz.

Recent specimens of this from Canara, collected by Mr. Talbot, have all the leaves 7-foliolate.

3. GLYCINE HISPIDA Maxim. *Mel. Biol.* ix. 70 (1873). *Soja hispida* Moench; DC. *Prodr.* ii. 396. *Glycine Soja* Benth. in *Journ. Linn. Soc.* viii. 266; Bak. in *Flor. Brit. Ind.* ii. 184, not of Sieb. & Zucc. THE SOY BEAN.

Mr. Maximowicz in 1873 pointed out that *Glycine Soja* S. & Z. is not the cultivated "Soy," but is the wild species that was subsequently redescribed by Regel and Maack as *Glycine ussuriensis*. For this reason Mr. Maximowicz suggested the use of the name *Glycine hispida*, since Moench had named the "Soy" *Soja hispida* and because that name had become almost classical owing to its use in the *Prodromus*. As Sir J. D. Hooker and Mr. Jackson have adopted Mr. Maximowicz' suggestion in their *Index Kewensis*, and as Mr. Duthie has also followed it in his *Field and Garden Crops*, it is necessary to indicate the fact here. There is, however, no doubt that the "Soy" is Roxburgh's *Dolichos Soja* and it is almost equally certain that it is *Dolichos Soja* Linn.; it would therefore, in the writer's opinion, be far better to retain the name *Glycine Soja* for our plant, citing as our authority Bentham in *Journ. Linn. Soc.* viii. 266, and allow the name *G. ussuriensis* to be substituted for that of the wild species previously named *G. Soja* by Siebold and Zuccarini.

Mr. Baker says of the Soy, 'often cultivated'; this might lead to the supposi-

tion that it is a wild species in India. This it most certainly is not; even as an escape it is of rare occurrence. In connection with this it may be mentioned that in one of the few unequivocal instances of 'escape' among Herb. Calcutta examples, (specimens collected by Mr. Kurz on the banks of the Ganges at Sahebganj) the plant, instead of having suberect, has long trailing stems; but for their greater hispidity the specimens might well pass as representing the wild *G. ussuriensis*. Very probably, therefore, Mr. Maximowicz' suspicion that the Soy is only a cultivated variety of the Ussuri plant may be correct.

## 59. TERAMNUS Sw.

### 2. TERAMNUS FLEXILIS Bth.

Add to synonyms of *F. B. I.*:—*Glycine oxyphylla* *Grah.* in *Wall. Cat.* 5522. *Galactia?* *oxyphylla* *Bth.* in *Plant. Jungh.* 233. *Teramnus oxyphylla* *Kurz* in *Journ. As. Soc. Beng.* xlv. pt. 2. 254.

## 60. MUCUNA ADANS.

The genus *Mucuna* Adans. is admittedly the same as the genus *Stizolobium* Pers.; the name given by Adanson in 1763 is therefore much older than that used by Persoon in 1807. By Persoon's own showing, however, the name *Stizolobium* did not originate with him but was first used by P. Browne in his *History of Jamaica* in 1756. There seems then, at first sight, as Dr. Otto Kuntze remarks (*Rev. Gen. Plant.* v. 206) no reason why the name *Stizolobium* should be suppressed. Dr. Kuntze has therefore proposed to recognise our genus *Mucuna* as *Stizolobium* P. Br.; this gives him the opportunity of enumerating all the species hitherto known, except those described by Persoon, as Kuntzean species.

But the subject bears closer examination. It is to be noted that the name *Stizolobium* was applied by Browne exclusively to species with seeds that have a small hilum. The only species of *Mucuna* (as now understood) with seeds having a large annular hilum, that Browne knew, was treated by him as the type of a distinct genus which he named *Zoophthalmum*. Adanson, it is true, in his generic description ascribes to the genus as a whole the seeds characteristic only of Browne's *Zoophthalmum*, but his citations show that he included in it one plant belonging to *Zoophthalmum* and another plant belonging to *Stizolobium*. There is therefore no doubt that the oldest name for the genus as a whole is, as De Candolle in *Prodr.* ii. 404 has indicated, the name *Mucuna* Adans. Persoon used the name *Stizolobium*, not in the sense of P. Browne, but as the precise equivalent of *Mucuna* Adans. And Kuntze's remark that Bentham and Hooker in the *Genera Plantarum* "incorrectly" attribute the name *Stizolobium* to Persoon is, to say the least, disingenuous. If the two "genera" of P. Browne are to be considered, as Kuntze apparently agrees to consider them, only parts of one genus, then the oldest name for that conjoint genus is *Mucuna* Adans. To quote as the name of the enlarged genus the word *Stizolobium* and to give as the authority for the name in this sense the reference by P. Browne, is to say and to claim something quite other than was said or claimed by the author of the name. Persoon can be quoted as the authority for the word in precisely this sense, but when quoted on Persoon's authority the name is not so old as the name *Mucuna*.\*

\* One may ask why, while he was about it, Dr. Kuntze did not try to revive the name *Parrana* of Rumphius, which is, no doubt, an older name for a species of *Mucuna* than any that Kuntze mentions.



If this hunting for prior names is to be made a pastime, which it appears to have become with a number of botanists who, if the truth must be told, mostly hold appointments wherein they are paid to do work far other and far more useful, then let the game be played, as games should,—fairly. When priority-mongers cease to be disingenuous,—when they cease to put into the mouths of authors expressions of opinion that the authors themselves did *not* utter, and would probably most strongly repudiate,—serious botanists, who are content to use nomenclature as a working-tool and not as a plaything, will be able to meet them halfway and to help in the task of bringing order out a chaos that, after all, is largely of their own making. This much, however, is certain; if good is to be done, it must be done by men of greater judgment than any who as yet have taken it upon themselves to criticise the nomenclature codified in De Candolle's *Prodromus*, in the *Genera Plantarum* of Bentham and Hooker, or in Asa Gray's *Manual*.

Turning from this profitless discussion to the species of *Mucuna* themselves, one finds that various groupings of these have been proposed from time to time. There are two very natural groups within the genus, readily determined by the nature of the seeds. In one group, which exactly corresponds to *Stizolobium* P. Br., the small oval seeds have a small lateral oblong-linear hilum; in the other, which equally exactly corresponds to *Zoophthalmum* P. Br., the large discoid seeds are provided with a large hilum that extends round from two-thirds to three-fourths of the periphery of the disc. So very natural is the distinction between the two groups that the writer, though he does not here venture to formally propose the step, is quite convinced that, were the genus adequately monographed, it would be found necessary to recognise in them two separate genera; when this happens the bibliographical discussion will end, of its own accord, in the restoration of both the generic names proposed by P. Browne.

In *Prodromus* ii. 405, De Candolle has practically recognised the groups in question but has only treated them as separate sections; he has used to designate them, in a *sectional* sense, the two generic names of P. Browne. M. De Candolle did not, however, note the error into which M. Adanson had fallen regarding the seeds; like Adanson, he has attributed to all the species a circumferential hilum. He has thus been led to use, in distinguishing his two sections, a purely external and, as we now know, a somewhat variable character,—the presence or absence of plaits and furrows on the sides of the pods. This has led to his inclusion in *Stizolobium* of one species (*M. gigantea*) that most certainly does not belong to the section.

In the *Genera Plantarum*, for the first time, Bentham and Hooker made full use of the natural character derived from the seeds. At the same time, however, they continued to employ the character used by M. De Candolle. They have consequently been led to recognise three sections:—

1. *Citta*; including those species with a circumferential hilum and with plaits across the face of the pods.
2. *Stizolobium*; including all species with a small lateral hilum.
3. *Carpopogon*; including those species with a circumferential hilum but without plaits across the face of the pods.

This arrangement has obviously the great disadvantage of intercalating the very distinct and very natural group *Stizolobium* between two artificially separated portions of another equally natural group, similar in rank and importance to *Stizolobium*.

The name *Citta* is one that had been used generically by Loureiro, but it is not

clear why its use is preferred to that of *Zoophthalmum*; the limits of § *Zoophthalmum* DC. and § *Citta* Bth. & Hk. f. are exactly the same. The name § *Stizolobium* is used as in DC. *Prodr.*, except that the species *Mucuna gigantea* is very properly excluded from the section; one of its varieties is placed in § *Citta*, while another variety of the same species forms, along with *M. macrocarpa*, the § *Carpopogon* of Bth. & Hk. f. The name *Carpopogon* is one that had been used in a generic sense by Roxburgh as the exact equivalent of *Mucuna* Adans. or *Stizolobium* Persoon. Of the convenience of the *Genera Plantarum* arrangement there can be no question, and the writer would only propose to deviate from it to the extent of treating *Stizolobium*, in the meantime, as a subgenus rather than as a section; the other two sections may be considered as together forming a second subgenus *Zoophthalmum* which, like *Stizolobium*, will probably at an early date be once more treated as generically distinct.

In the *Flora of British India* the arrangement advocated by Messrs. Bentham and Hooker has been rejected entirely. The genus is subdivided into four groups, to each of which is given the rank of a subgenus, and though, for three of the proposed subgenera, the sectional names used by Bentham and Hooker are retained, the definition and the limits of each of the three are altered. The section *Citta* is divided into two subgenera, AMPHIPTERA Bak. and CITTA "Lour." The first of these is distinguished by having wings down the sutures as well as plaits across the pods, while the second has plaits but no wings. This subdivision does not possess the advantage of being natural. *Mucuna monosperma*, placed in CITTA, instead of being wingless down the suture as is postulated in the definition given of that subgenus, has wings that are sometimes as broad as those of *M. imbricata* which is the type of AMPHIPTERA. The only actual difference between the wings in the two species is that in *M. monosperma* the plaits extend from the surface of the body of the pod quite across the wings; in *M. imbricata* the plaits do not extend quite across the wings. The difference then, in place of being a subgeneric one, is so slightly a difference of degree as to be, if taken alone, barely specific. The pods of *M. atropurpurea* and also of *M. biplicata*, which is included in *M. atropurpurea* in the *F. B. I.*, do appear, when cursorily examined, to be wingless. But closer inspection shows that they are winged, exactly as in *M. monosperma*, with the transverse plaits continued across the wings, only the wings are here lobed to their bases between each pair of plaits.

The subgenus CARPOGON is confined to species broadly winged down both sutures, thus limiting the subgenus to the single species *M. gigantea*. The *Genera Plantarum* section of this name includes species that are no more than ribbed down each side of the suture and thus, naturally enough, includes *M. macrocarpa*, which has long woody pods and has seeds with a circumferential hilum. But *M. macrocarpa*, in spite of its circumferential hilum, is put in *Stizolobium* by the *F. B. I.* thus again rendering the definition given in the *Genera Plantarum* inapplicable, since that restricts to the section *Stizolobium* those species that have a small hilum to the seeds. Most unfortunately Mr. Taubert, in the authoritative *Natürlichen Pflanzenfamilien*, has adopted the quite untenable divisions proposed in the *F. B. I.* For not only is there no doubt that Bentham and Hooker are right in accommodating *M. macrocarpa* and *M. gigantea* in the same natural group, there is now equally no doubt that *M. gigantea* cannot be separated from the natural group containing *M. imbricata* and *M. monosperma*. The writer has collected, in the Andamans, specimens of *M. gigantea*, some of the pods of which have ridges across the face in exactly the position of the plaits in the other species.

Mr. Baker quotes Persoon as the author of his subgenus STIZOLOBIUM. But to Persoon *Stizolobium* was a genus including *all* Baker's subgenera. So he quotes Roxburgh as the author of the subgenus CARPOPOGON; the same objection applies here. The citation of Loureiro as the authority for CITTA is however particularly unhappy, for it is in the highest degree probable, from a study of Loureiro's description and from the knowledge we now possess of its distribution and characters, that *Mucuna imbricata*, which is the basis of AMPHIPTERA, is the species described by Loureiro as *Citta nigricans*; specimens of what is undoubtedly *M. imbricata*, noted as having white flowers with purple spots, have recently been sent from the Shan Hills to Herb. Calcutta; there is, therefore, not one character now left which militates against the identification of Loureiro's plant with *M. imbricata*. In any case since Loureiro's plant had 3-seeded pods, it cannot possibly have been either *M. monosperma* or *M. atropurpurea*, which constitute the CITTA of the *F. B. I.*

Subgen. I. ZOOPHTHALMUM. Perennial climbers; seeds large flat, with a large hilum extending round the greater portion of their circumference.

§. CITTA. Pods plaited across their faces.

1. MUCUNA IMBRICATA DC.

Add to localities of *F. B. I.*:—NORTH-WEST HIMALAYA; *Vicary! A. O. Hume! King!* MANIPUR; *Watt!* BURMA; Pegu, *Brandis!* SHAN HILLS; "flowers white and purple," *King's Collectors!* ANDAMANS; common, *King's Collectors!*

Bracteoles at base of calyx in bud similar to bracts but many times smaller and more deciduous.

Nearest to this is perhaps *Mucuna Junghuhniana* [*Stizolobium Junghuhnianum* Kuntze (*Rev. Gen. Pl. i.* 208)] from Java, which differs in being strigosely hirsute and in having pods with plaits extending partly across the wings. The plant referred to by Kurz (*Journ. As. Soc. Beng. xlv. pt. 2, 246*) as a new species near *M. atropurpurea* is *M. imbricata*; Mr. Kurz has himself made the reduction in Herb. Calcutta.

2. MUCUNA MONOSPERMA DC.

Add to localities of *F. B. I.*:—ANDAMANS; very common everywhere in the interior jungle. DISTRIB. Sumatra.

Bracts at base of pedicels small triangular, much smaller and much more early deciduous than the linear bracteoles exceeding the bud. One of the Calcutta examples of Wall. Cat. 5623 is *Mucuna imbricata*, the other is a mixture of *M. imbricata* and *M. macrocarpa*; there is no *M. monosperma* whatever on either sheet. Wall. Cat. 5622 must be equally confused; Mr. Baker finds that the plant represented is *M. monosperma*; at Calcutta on the other hand 5622 is *M. gigantea*.

3. MUCUNA ATROPURPUREA DC. *Zoophthalmum atropurpureum* Prain MSS.

Delete from localities of *F. B. I.*:—MALACCA.

The Malacca plant referred to *M. atropurpurea* in the *F. B. I.* belongs to a distinct species and proves to be *M. buplicata* Teysm. & Binnend.

3a. MUCUNA BPLICATA *Teysm. & Binnend.* in *Cat. Hort. Bog.* 261; leaflets glabrous, racemes short-peduncled close, upper calyx-lip very

short truncate, pod two-seeded twice as long as broad, plaits with reflexed double-margins. *Prain, Journ. As. Soc. Beng.* lxvi. 2. 66. *M. atropurpurea* *Bak. in Flor. Brit. Ind.* ii. 185 (as to the Malayan plant only). *Zoophthalmum biplicatum* *Prain MSS.*

MALACCA; *Maingay.* PERAK; very common, *Kunstler!* *Scortechini!* *Wray!* PENANG; *Curtis!* DISTRIB. Sumatra (*Forbes*). Borneo (*Teysmann*).

A slender woody climber 30-40 feet long, with glabrous branches. *Leaflets* papery, dull-green, ovate-oblong cuspidate, 6-8 in. long, 5 in. across. *Racemes* 2 in. long, usually branching at the very base, occasionally further up; bracts and bracteoles much as in *M. monosperma* but the latter much smaller and shorter than the buds. *Calyx* greenish-brown, .35 in. long, all the teeth minute densely bristly. *Corolla* dark-purple, 1.75 in. long, keel abruptly incurved at end, wings 1.25 in. long, standard .75 in. wide. *Pod* hardly stipitate, 3.5 in. long, 1.75 in. wide; plaits very close; bristles pungent, abundant, brown.

§ CARPOPOGON. *Pods* not plaited across their faces.

3b. *MUCUNA ACUMINATA* *Grah. in Wall. Cat.* 5621; *Prain, Journ. As. Soc. Beng.* lxvi. 2. 67. *Zoophthalmum acuminatum* *Prain MSS.*

Add to localities of *F. B. I.*:—PERAK; Kinta, *Kunstler!* SINGAPORE; Chan Chu Kang, *Ridley!* DISTRIB. Java (*Forbes*).

This species is referred to in the *Flora of British India* under *M. imbricata*. Its pod has now been reported and is like that of *M. gigantea*; the species is therefore a member of § *Carpopogon* Bth. & Hk. f. It further resembles *M. gigantea* in having a pale-green corolla. From *M. gigantea* it is however easily distinguished by its short corymbose inflorescence, its long calyx-teeth, its much larger flowers, and its large boat-shaped floral bracts.

4. *MUCUNA GIGANTEA* *DC.* *Zoophthalmum giganteum* *Prain MSS.*

Add to localities of *F. B. I.*:—BENGAL; Sundribuns, very common, *Kurz!* *Heinig!* CEYLON; *Walker!* TENASSERIM; Tavoy, *Gomez* (*Wall. Cat.* n. 5622)! MALAY PENINSULA; Pahang, *Ridley!* PERAK; *Scortechini!*

This species is very common in the Andamans where it has been collected not only by *Kurz* but by *Liebig*, E. H. Man, and the writer, who has obtained it on outlying islands like Narcondam, the Coco Group and Little Andaman, as well as on the main island. The locality "plains of Western Peninsular," given in the *F. B. I.*, the writer has been unable to authenticate. The only locality mentioned by *Rheede*, whose figure of the plant is excellent, is one near the sea in Malabar; he says it occurs "in other places" than the one mentioned but does not say they are inland ones. The only place where *Wight* gathered it was at Negapatam on the Coromandel Coast; in *Hooker's Botanical Miscellany* it is said to grow only near the sea.

The writer, who has given some attention to the various *Mucunas* in the field, has always found *M. gigantea* a strictly littoral species elsewhere and more evidence is necessary before its inland occurrence in the Indian Peninsula can be credited. Mr. E. H. Man notes on a specimen that this, which the Andamanese know as *châkunda*, is always found on the borders of salt-creeks and is in this respect quite unlike *M.*

*monosperma*, which the Andamanese know as *pûlê-da* and which never grows near salt-creeks but always in the interior jungle. The lianes of *M. gigantea* form indeed one of the most striking features of the muddy margins of our Indian Mangrove-swamps. The writer when in the Great Coco was at pains to obtain one entire plant, the following were its measurements:— *Diameter* of main stem, close to the mud, 5 in.; at 4-6 feet from the mud there issued, from latent buds, 4 of the characteristic umbelliform pendent racemes of the species, with slender peduncles 8-15 in. long. The first branch was at a distance of 50 feet from the root, the first leaf was at a distance of 205 feet from the mud, about 200 feet from the only flowers on this particular plant; the leafy branches, only 15 in. in diam., extended 25-30 feet further. This feature of flowering from old wood has been met with in *Mucuna monosperma* as well.

During another journey the writer collected, on Little Andamans, specimens of *M. gigantea* with pods ridged, though not plaited, across the face, thus unfortunately invalidating the distinction between the "subgenera" *Amphiptera* and *Carpogon* of the *F. B. I.*

#### 5. *MUCUNA MACROCARPA* Wall.

Add to synonyms of *F. B. I.*:—Wall. *Pl. As. Rar.* i. 41. t. 47; Kurz in *Journ. As. Soc. Beng.* xlv. pt. 2. 245. *Mucuna* sp. *Coll. & Hemsl.* in *Journ. Linn. Soc.* xxviii. 47. *Zoophthalmum macrocarpum* Prain MSS.

Add to localities of *F. B. I.*:—UPPER BURMA; Poneshee, *J. Anderson!* Shan Hills plateau, 4000 feet, *Collett!* Pegu; in pine forests on the Bookee ridge, common, *Kurz!*

The Burmese plant always has the lowest calyx-tooth longer than in the Nepal and Sikkim plant. In specimens collected by the writer in the Khasia hills, however, the calyx is exactly as in those collected by Dr. J. Anderson at Poneshee and by Sir Henry Collett in the Shan hills. The pod is so exactly alike in the Burmese and in the Himalayan plants that the writer, instead of being able to adopt the suggestion of Sir Henry Collett and Mr. Hemsley that the Burmese one may be a new species, is not inclined to treat it as even varietally distinct.

The perennial stems and the large circumferential hilum of the seed, mark the species as undoubtedly a *Zoophthalmum* not a *Stizolobium*.

Subgen. II. *STIZOLOBIUM*. Stems above ground annual; seeds small ovoid with a small lateral hilum.

#### 6. *MUCUNA BRACTEATA* DC. *Stizolobium bracteatum* Kuntze *Rev. Gen. Plant.* i. 208.

The Assam specimens recently issued by Mr. Clarke as *M. exserta* belong to this species.

#### 8. *MUCUNA CAPITATA* W. & A. *Stizolobium capitatum* Kuntze *Rev. Gen. Plant.* i. 207.

This is not confined to the foot of the Himalayas; though found in that area it is less common there than in the forests of Central India and Chota Nagpur. The racemes of this are not always short, nor are the racemes of *M. pruriens* always elongated; the species are only distinguishable by their pods. These last are, however, as Mr. Baker points out, very different.

## 61. APIOS MENCH.

APIOS CARNEA *Bth.*

Add to localities of *F. B. I.*:—BURMA; Chin Hills, *King's Collectors!* Shan Hills, at Fort Stedman, *King's Collectors!*

## 62. ERYTHRINA LINN.

1. ERYTHRINA INDICA *Lamk.*

This is, save when planted, a purely littoral species and is common in the jungles along the sea-face from the Sundribuns at the head of the Bay of Bengal down the Burmese and Tenasserim coasts, occurring also along the shores of the Andamans and Nicobars; it is as plentiful in remote outlying islets like Narcondam as it is in the larger ones. In all probability it never occurs inland except as an introduced tree.

2. ERYTHRINA STRICTA *Roxb.*

Add to localities of *F. B. I.*:—ASSAM, MANIPUR, CHITTAGONG, BURMA, very common.

This species is, on the other hand, apparently altogether an inland one; it is, to judge by the number of undoubtedly wild specimens sent to Herb. Calcutta, quite as common in Indo-China as it is in India.

In the *F. B. I.*, *E. spathacea* Wall. (Lith. Cat. n. 5965) is cited as *E. indica*. In the Catalogue Dr. Wallich only wrote "*E. spathacea?*"; on the sheets themselves he wrote "*E. stricta* Roxb.;" further, he queries in the Catalogue whether the sheets marked 5965 B. and 5965 C. are the same as 5965 A. Sheets B. and C. came from Kamaon and Hardwar respectively; 5965 C. is not represented in Herb. Calcutta and the writer cannot therefore express any opinion respecting it. But sheet 5965 A. at Calcutta, which came from a tree grown in the Calcutta garden, is as the ticket upon it states, *E. stricta* and not *E. indica*, and sheet 5965 B. at Calcutta, collected in Kamaon by Mr. Blinkworth, is *E. suberosa* Roxb.

3. ERYTHRINA RESUPINATA *Roxb.*

This interesting little species was found again in 1884 by Mr. C. B. Clarke on Parasnath.

5. ERYTHRINA SUBEROSA *Roxb.*

VAR. *glabrescens*; leaflets as in type, but glabrescent beneath at an early stage.

NORTH-WEST HIMALAYA; Kamaon, *Blinkworth!* Bashahr, *Lace!* SIKKIM; *King!* BURMA; Pegu, *Adamson!* *Brandis!* *Kurz!* Shan Hills, *King's Collectors!*

This is, at first sight, very unlike *E. suberosa* owing to the absence of tomentum from the under surface of the leaves; the leaflets, however, are in shape and size exactly as in typical *E. suberosa* while the flowers, pods and seeds are indistinguishable. In Langkawi, off the Kedah Coast, Mr. Curtis collected one specimen of an *Erythrina* as to flowers exactly like this plant but with intensely prickly branchlets,—one of the features of all the varieties of *E. suberosa* is that the branchlets are almost unarmed. In the absence, however, of leaves and of fruits it is not possible to identify Mr. Curtis' plant. Very near to this, if not actually the same species, is *E. microcarpa* Koord. & Val. from Java, of which, however, the writer has only seen leaves and pods, not flowers.

7. ERYTHRINA LITHOSPERMA *Miq.*

Add to localities of *F. B. I.*:—PEGU; common, *Adamson! Brandis! Kurz! SHAN HILLS; Terai, Collett! TENASSERIM; Makana, 2000 feet elev., Gallatly! PERAK; at Kinta, Kunstler n. 7103! PENANG; Wallich! SINGAPORE; Hullett n. 80! DISTRIBUTION. Sumatra (Teymann); Java, common.*

There is no doubt as to the accuracy of Mr. Kurz's statement that the Indo-Chinese plant is exactly the same as *E. sumatrana* *Miq.*, from Sumatra, of which there are authentic specimens in Herb. Calcutta. But the Java plant described as "*E. lithosperma* *Bl.*" by Miquel, to which Mr. Baker has referred the present species does not differ even as a variety from the plant of Sumatra, the Malay Peninsula and Burma. It must, however, be recollected that Mr. Kurz has noted that *E. lithosperma* *Bl.*, as described by Miquel, is not the true *E. lithosperma* of Blume which, Kurz says, was a plant introduced to Java from Mauritius. Messrs. Koorders and Valetton, in their recently issued Java Herbarium, issue the Java form of the species under review as *E. lithosperma*. They have, however, issued it as "*E. lithosperma* *Miq.*," not as "*E. lithosperma* *Bl.*"—their reason for this being that Blume's *E. lithosperma* is only *E. indica*, and that the name is thus left free, but on Miquel's authority, not on Blume's, to designate our species.

*Erythrina holosericea* Kurz, *Journ. As. Soc. Beng.* xlii. pt. 2. 69, the validity of which Mr. Baker has already doubted, is a spurious species manufactured by combining in one description the characters of the flowers of *E. ovalifolia* and of the leaves of *E. lithosperma* which had been sent to Herb. Calcutta, by an officer of the Indian Forest Department, under the idea that they belonged to the same tree. The citation of this composite "species" as *Corallodendron holosericeum* by Kuntze in that author's *Rev. Gen. Plant.* i. 172, in a passage where he takes the opportunity to (as the writer thinks) unnecessarily resuscitate an obsolete generic name, might lead to the belief that Kuntze had taken the trouble to verify the validity of the Kurzian species, as to the existence of which Baker had justly expressed a doubt. Obviously Kuntze has done nothing of the kind, and any one but a botanist would be inclined to conclude, from a citation such as this, that the object of much of the *bouleversement* effected by priority-mongers is less the restoration of generic names that may have been improperly suppressed than the search for opportunities of posing as the authorities for species of whose characters they are ignorant.

## 63. STRONGYLODON VOGEL.

1. STRONGYLODON RUBER *Vogel.*

Add to localities of *F. B. I.*:—ANDAMANS; very common, *Prain! King's Collector's!*

## 64. GRONA LOUR.

1. GRONA GRAHAMI *Benth.*

Add to localities of *F. B. I.*:—BENGAL; Manbhum, *Campbell!*

## 65. GALACTIA P. BR.

1. GALACTIA TENUIFLORA *W. & A.*

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It would, for the purposes of the field-botanist, be better to recognise some of the "varieties" of this species as distinct. The following appears to the writer to be the most satisfactory arrangement.

a. *Galactia tenuiflora* W. & A. *Prodr.* 206.

VAR. *typica* = *G. tenuiflora* proper in *F. B. I.*

VAR. *minor* = var. 2. *minor* Bak. in *F. B. I.* (*G. tenuiflora* VAR.  $\beta$ . W. & A.)

b. *Galactia longiflora* Benth. in *Ann. Wien. Mus.* ii. (1838); *Wight, Icones* t. 482.  
= var. 1. *lucida* Bak. in *F. B. I.* (*Glycine lucida* *Grah.*)

This is very justly kept up in the *Index Kewensis*; by a *lapsus* unavoidable in a work of such magnitude *Glycine lucida*, which is the same thing, is referred not to *G. longiflora* but to *G. tenuiflora*. The *F. B. I.* does not quote Wight's figure or refer to his description.

c. *Galactia villosa* W. & A. *Prodr.* 207.

VAR. *typica* = var. 3. *villosa* Bak. in *F. B. I.*

VAR. *latifolia* = var. 4. *latifolia* Bak. in *F. B. I.*

No diagnostic marks require to be given, as those given by Mr. Baker could hardly be improved on.

[2. GALACTIA ? OXYPHYLLA Benth. *Pl. Jungh.* 233. *Glycine oxyphylla* *Grah.* in *Wall. Cat.* 5522. *Teramnus oxyphylla* *Kurz* in *Journ. As. Soc. Beng.* xlv. pt. 2. 254.]

There is no doubt whatever that this is, as Mr. Kurz says, a *Teramnus*. It is however only *Teramnus flexilis* with the rachis of all the racemes unusually short. In pretty well any plant of *T. flexilis* some of the racemes are to be found abbreviated in this fashion, and by judicious collection both the "species" may be obtained from one plant. In the *Index Kewensis*, pending further research, both names are quoted. The two are, however, based on the same specimen, and *Galactia oxyphylla* must be now treated as a synonym of *Teramnus flexilis*.

## 67. SPATHOLOBUS HASSK.

### 1. SPATHOLOBUS ROXBURGHII Benth.

There are two very distinct forms of this species—one with leaves glabrescent beneath, the other with leaves densely silky beneath. The latter was distinguished as *Butea sericophylla* by Wallich, and issued under that name as *Cat.* n. 5541. The specimens obtained along the Sub-Himalayan tracts from Garhwal to Assam, and those from the Chin hills and the Khasia range are of the first form—those of the second form include the specimens from Southern India and those from Tenasserim and Pegu. There is not however a single character of flower or fruit that can be used to separate the forms, and they are not even strictly geographical, for in 1862 Dr. T. Anderson collected at 2500 feet elevation in Sikkim an undoubted example of the common S. India form, and on the other hand Mr. Lawson has recently sent to Calcutta one specimen of the North Indian form from Travancore. In Chittagong and Upper Burma the two forms appear to be equally common and to grow side by side.

The *F. B. I.* "variety" *platycarpa* is not confined to the Concan; specimens with pods as broad as those described have been collected in Central India, in the Sikkim Terai, and in Chittagong, while some of those from Burma have pods  $2\frac{1}{4}$ – $2\frac{1}{2}$  in. across.



But there is no difference between the plants bearing the broad and the narrower pods; it is at times possible to collect both "varieties" on different parts of one plant.

1b. *SPATHOLOBUS BRACTEOLATUS* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 76; leaflets subcoriaceous almost glabrous beneath all ovate-lanceolate, flowers small, buds shorter than the narrow-lanceolate bracteoles.

MALAY PENINSULA; Perak, on Gunong Batu Pateh, 3000 feet elev., *Kunstler* n. 8079!

A slender creeper 15-20 feet long with sparsely rusty-pubescent branches. *Petiole* 1.5-2.5 in., rusty-puberulous; leaflets glossy bright-green with minute scattered adpressed rusty-brown hairs on both surfaces, subequal and subsimilar, lateral nerves 8-9 pairs ascending, prominent especially beneath; 8-9 in. long, 3.5 in. across. *Panicles* terminal and axillary 1.5-2 ft. long, branches 4-6 in., rusty-pubescent, pedicels very short; bracteoles .2 in. *Calyx* .15 in., pale-brown pubescent, lower teeth sublinear shorter than tube. *Corolla* rather larger than calyx. *Pod* not seen.

In general appearance this most resembles *S. Roxburghii*, but the flowers are very different; it may perhaps be the same as *S. Roxburghii* var. *denudata* Bak. from Penang, which is not represented in Herb. Calcutta. It is quite unlike any other Malayan species.

2b. *SPATHOLOBUS FERRUGINEUS* Benth. *Pl. Jungh.* 238; leaflets coriaceous ferrugineo-pubescent beneath, end one ovate-obtuse, flowers almost medium, calyx densely rusty-pubescent, teeth short, pod sessile narrowed to the tip. *Miq. Flor. Ind. Bat.* i. 204; *Prain, Journ. As. Soc. Beng.* lxxvi. 2. 75. *Drebbelia ferruginea* Zoll. in *Nat. en Geneesk. Arch.* iii. 79.

MALAY PENINSULA; Perak, common, *Wray! Scortechini! Kunstler!* PENANG; common, *King! Abrams! Curtis!* MALACCA; common, *Griffith! Maingay! Derry! Goodenough!* SINGAPORE; *Hullett! Ridley!* *DISTRIB.* Sumatra; Borneo; Java.

A robust woody climber with densely ferrugineo-pubescent branches. *Petiole* 3-4 in.; leaflets dull-green puberulous throughout above, densely beset with spreading hairs and reticulate-venose beneath, at times densely rusty-silky; the bases rather rounded, the end-leaflet 5-6 in. long. *Panicle* 8-10 in.; branches densely rusty-pubescent; pedicels distinct .2 in. long. *Calyx* .2 in. long; teeth deltoid. *Corolla* claret-coloured to dark-blue, .25 in. long, standard as broad as deep, notched at apex. *Pod* as in *S. gyrocarpus*, softly velvety, semi-transparent, 3-5 in. long, .7 in. broad at base, .3 in. wide at seed-bearing tip.

Mr. Ridley has collected twice at Singapore what is apparently a form of this species with the leaves densely silky beneath, thus repeating within *S. ferrugineus* the relationship that within *S. Roxburghii* is borne by *Butea sericophylla* to the typical *Butea parviflora*.

The nearest ally of the species is *S. gyrocarpus*; it is however readily distinguished by its nearly always rather smaller leaves; its always different tomentum, its always larger flowers with much longer pedicels, and its differently shaped, more persistent bracts.

### 3. *SPATHOLOBUS ACUMINATUS* Benth.

The basis of this species is *Butea acuminata* Wall. (*Cat.* 5443) from Martaban. Since Dr. Wallich first obtained the plant it has been again collected in Martaban by

Dr. Falconer and by Mr. Stoliczka; more recently it has been reported abundantly by Dr. King's plant collectors from the Andaman group.

Mr. Baker finds that *Wall. Cat.* 5907 from Burma, as represented in Herb. Kew, is the same as *Wall. Cat.* 5443. He also is of opinion that *Wall. Cat.* 5908 may likewise be the same species. The latter is not represented in Herb. Calcutta, but in the Calcutta collection *Wall. Cat.* 5907 is the very distinct species here described as *Spatholobus roseus*. Mr. Baker adds that *Wall. Cat.* 9054 from Penang, which is also absent from the Calcutta collection, most probably belongs here, and on the strength of this probability gives Penang as a locality for the species; one objection to this is that, in another place, the *F. B. I.* identifies *Wall. Cat.* 9054 with *Derris thyrsoiflora*. There is at Calcutta, however, an example of *Wall. Cat.* 8082, issued by Dr. Wallich as a *Sapindaceous* plant, that certainly is a *Spatholobus* and possibly belongs to this species. But it is strange that no one has collected the plant in Penang since Dr. Wallich's time.

*S. purpureus* Benth., referred to under *S. acuminatus* is, as Mr. Baker suspects, very distinct. Its fruits have recently been reported by Mr. Talbot.

Mr. Kurz refused to accept, in his *Contributions* to the botany of Burma, the genus *Spatholobus* as distinct from *Butea*; in this there is no doubt that Mr. Kurz was wrong. Moreover, in enumerating *Butea acuminata* he attributes to it "white" flowers, whereas Mr. Baker describes them as being bright-red. Most unfortunately no one has ever recorded the colour of the flowers of true *S. acuminatus*, but in any case, on consulting Mr. Kurz's specimens, it is found that he never himself collected either the true *S. acuminatus* or the true *S. roseus*, and that the specimens on which his *S. acuminatus* is based belong to the two different species here termed *S. squamiger* and *S. riparius*, which are quite distinct from each other and equally distinct both from Wallich's original *Butea acuminata* and Graham's *Pongamia rosea*.

Mr. C. B. Clarke collected in the Khasia Hills in 1871 a plant (*Clarke n.* 14981) that must be nearly related to *S. acuminatus*. Yet to the writer it hardly seems to be that species; its leaflets have longer caudate tips, its stipels are longer, its stipules are different and it is especially unlike *S. acuminatus* in having the twigs hirsute with spreading hairs. As yet this form has not been met with by any other botanist and there are neither flowers nor fruits at Calcutta.

3b. *SPATHOLOBUS PURPUREUS* Benth. ex Bak. in *Flor. Brit. Ind.* ii. 194; leaflets coriaceous, oblong, shortly bluntly cuspidate, rounded at base, the lateral pair obliquely, flowers small, calyx puberulous, teeth oblong-obtuse half as long as tube; pod sessile not much narrowed to the thick tip; wing shining glabrous.

W. INDIA; Canara, *Stocks!* Talbot n. 1630!

A lofty climber with glabrous branches. *Petiole* 1-3 in. long, leaflets dark-green glabrous, shining on both surfaces, end-leaflets 3.5 in. long. *Panicles* short, 3-6 in. long, dense; pedicels equalling calyx. *Calyx* .1 in. *Corolla* dark-purple, much exerted. *Pod* 4 in. long, .7 in. across below, .6 in. across at thickened apex, quite glabrous.

Recently specimens of this, in fruit, have been collected by Mr. Talbot at Digghi Ghant; these show that the species is a very distinct one.

3c. *SPATHOLOBUS SQUAMIGER* Prain; leaflets membranous ovate-acute tip mucronulate, base wide-cuncate, panicles longer than leaves,

bracts at origin large, flowers small, calyx obscurely downy, teeth oblong half as long as tube. *Butea acuminata* Kurz, *Journ. As. Soc. Beng.* xlv. pt. 2. 243 *not of Wallich.*

PEGU; Kurz 2596!

A large climber, branches glabrous. *Petiole* 1–2 in.; leaflets pale-green, end one 3–4 in. long, 1·5–2 in. wide. *Panicle* over a foot long very much exceeding the leaves, the peduncle with a collar of large lanceolate scarious bracts, each ¼ in. long, at its origin from stem. *Pedicels* shorter than calyx. *Calyx* ¼ in. long, teeth obtuse. *Corolla* white. *Pod* not seen.

This differs from *S. acuminatus* (which it otherwise closely approaches) in having more numerous and ascending, not almost transverse, lateral nerves; in having, if Mr. Kurz' and Mr. Baker's notes be accurate, white not red flowers; in having leaflets that are not at all cuspidate; and in having much longer panicles whose peduncles arise from woody nodes, the long leaf-scales of which surround their bases.

3d. SPATHOLOBUS ROSEUS Prain; leaflets papery, elliptic, shortly widely obtusely cuspidate, rounded at base, glabrous on both surfaces, flowers small, calyx obscurely downy, teeth oblong shorter than the tube. *Pongamia rosea* Grab. in *Wall. Cat.* 5907.

MARTABAN; at Phanoë, on the Salween river, *Wallich* n. 5907! UPPER BURMA; Kendat, *Prazer*!

A large climber, branches glabrous. *Petiole* 4–6 in. long. *Leaflets* pale grey-green, terminal 8 in. long, 4 in. wide, very shining on upper surface, quite glabrous beneath from the beginning. *Pedicels* very short, panicles a foot long, lax, very sparsely flowered. *Calyx* ¼ in. *Corolla* rose-coloured three times as long as calyx, limb of standard broader than deep, emarginate. *Pod* not seen.

Perhaps this may prove to be the same as *Griffith* n. 1678 which is referred to in the *F. B. I.* but which is not at Calcutta; it has a pod 6 in. long. This differs from *S. acuminatus* in the thicker much larger leaflets, with much shorter tips; also in the longer more lax panicles. From *S. crassifolius* it differs in having much broader leaves with more numerous nerves, and in having obtuse, not acute, calyx-teeth; its nearest ally is the next species which has, however, very much thinner leaves with different nervation.

3e. SPATHOLOBUS LISTERI Prain; leaflets membranous ovate-acute tip hardly mucronulate, base wide-cuneate, glabrous beneath, panicles shorter than leaves, bracts at origin small, calyx obscurely downy, teeth oblong half as long as tube, pod sessile narrowed at tip, puberulous.

CHITTAGONG; very common, *Lister* n. 98! n. 293! n. 323! n. 345!

A large climber, branches glabrous. *Petiole* 1–2 in.; leaflets pale-green, end one 6–7 in. long, 3 in. wide. *Panicle* 3–6 in. long, shorter than the leaves, peduncle with a few small scarious bracts at its origin from stem. *Pedicels* shorter than calyx. *Calyx* ¼ in. long, teeth rounded. *Corolla* apparently pink. *Pod* finely downy, 3–5 in. long, 7 in. wide below, 3 in. wide at seed-bearing apex.

Very near to *S. squamiger*, having similar but larger leaves and laxer much shorter panicles that have much smaller and fewer bracts at their point of origin; also very near *S. acuminatus* but with different leaves, rather laxer panicles and a different pubescence on pod.

3f. *SPATHOLOBUS MERGUENSIS* Prain; leaflets very thick and rigid, oblong shortly cuspidate, base rather narrowly cuneate, quite glabrous on both surfaces, panicles rather shorter than leaves, bracts at their origin small, calyx finely downy, teeth triangular half as long as tube; pod not seen.

MERGUI ARCHIPELAGO; *J. Anderson! Proudlock!*

A strong climber, branches glabrous lenticelled. *Petiole* .5-1.5 in., leaflets 4 in. long, 2 in. wide. *Panicle* 3-5 in. long, almost equalling the leaves, peduncles with a few small scarious bracts at its origin from stem. *Pedicels* as long as calyx. *Calyx* .1 in., teeth subacute. *Corolla* claret-coloured.

Very near to *S. Listeri* and *S. roseus*; while resembling these in inflorescence it has a different calyx and very dissimilar leaves. The leaves, though somewhat unlike in shape, have the venation and consistence of those of *S. crassifolius* which species has, however, a totally distinct inflorescence and quite different flowers.

5. *SPATHOLOBUS RIPARIUS* Prain; leaflets thick, very rigid, obovate-obtuse, cuneate at base, lateral slightly obliquely, glabrous above, sparsely shortly puberulous on the nerves beneath, flowers small, calyx obscurely downy, upper and lower teeth oblong, lateral triangular, nearly as long as the tube, pod sessile narrowed to the tip.

TENASSERIM; on Taepo, 5000 feet, *Gallatly! PEQU*; on Tounkye-ghat, *Kurz* n. 1709!

A low spreading tree (*vide* Gallatly) hanging over streams. *Leaflets* very rigid but not so thick as those of *S. crassifolius*, with 6-8 pairs of almost straight, oblique lateral nerves much raised on both surfaces, cross reticulations beneath very distinct; shining above, dull beneath. *Panicles* a foot long, pedicels shorter than calyx. *Calyx* .1 in. *Corolla* pink, .2 in. long, limb of standard hardly as broad as long, emarginate at tip. *Pod* semi-transparent, finely downy, 3-5 in. long, .6 in. across below, .3 in. wide at thickened apex.

To this, owing to its having the same very distinctive calyx, the writer has referred Mr. Kurz's n. 1709 (which formed part of *Butea acuminata* Kurz, *not* of Wall.), although Mr. Kurz's specimen has not any leaves. By the leaves alone this is remarkably distinct from any of the other Indian species of *Spatholobus*. Possibly it may turn out to be the same as *Pongamia rigida* Grah. in Wall. Cat. 5908, which is not at Calcutta; should this prove to be the case the species must be known as *Spatholobus rigidus*.

6. *SPATHOLOBUS MAINGAYI* Prain, *Journ. As. Soc. Beng.* lxi. 2. 79; leaflets thick and rigid, ovate-acute, rounded at the base, glabrous beneath, flowers small, calyx adpressed brown-puberulous, teeth all rounded one-third the length of tube; pod unknown.

MALACCA; *Maingay* 611! PERAK; *Kunstler* 3535! 4652! 6906! 10428! *Scortechini* 206! 1537! *Wray* 1270! SINGAPORE; *Ridley!*

*Branches* glabrous. *Leaflets* rather like those of *S. acuminatus* but thicker, shorter, quite glabrous, 3 in. long, 1.75 in. wide. *Inflorescence* in terminal and axillary panicles 6-8 in. long. *Pedicels* shorter than calyx, bracts minute persistent. *Calyx* .12 in. long. *Corolla* .25 in. long, standard orbicular very slightly emarginate.

A very distinct species, which has in the field been referred by Father Scortechini to *Derris* § *Aganope* and supposed by that learned botanist to be perhaps Miquel's *Derris macrophylla*. The presence sometimes, though not always, of stipels shows, however, that the plant cannot well be a *Derris* and indicates that it is almost certainly a *Spatholobus*. It is unfortunate that, of all the gatherings reported, not one should be in fruit.

7. *SPATHOLOBUS DUBIUS* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 79; leaflets rigid-ovate, acute, rounded at the base, adpressed-puberulous beneath, flowers small, calyx adpressed-pubescent, teeth half as long as tube triangular except the 2-fid upper; pod unknown.

PERAK; on Gunong Bubu, *Kunstler* 7585! PENANG; *Curtis*!

A large climber 100–150 feet long, stem 6–8 in. in diam. Leaflets like those of *S. Maingayi* but thinner, adpressed-puberulous beneath, and often larger, 2–6 in. long, 1.5–3 in. wide; the upper leaves are at times 1-foliolate as in *S. bracteolatus* and in *S. littoralis* Hassk. Inflorescence in terminal and axillary spreading panicles, the former 8 in. the latter 4 in. long, sometimes several in same axil. Bracts small persistent. Calyx 12 in. long. Corolla .25 in. long, pure-white, standard orbicular retuse.

Also a very distinct species, but, like the preceding, in the absence of fruit not absolutely certainly a *Spatholobus*. - It appears to be nearest to *S. littoralis* Hassk., from which it differs in having the lip of calyx toothed and in having the leaves uniformly adpressed-puberulous beneath.

8. *SPATHOLOBUS RIDLEYI* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 80; leaflets rigid, chartaceous, oblanceolate, apex acuminate, quite glabrous beneath, flowers small, calyx adpressed-pubescent, teeth very unequal, upper truncate the others rounded half as long as tube, pod sessile narrowed to the tip.

SINGAPORE; cult. in Bot. Garden, original locality not given; *Ridley* 6401!

A climber with glabrous, slightly angled branches. Leaflets bright-green shining above, 3–3.5 in. long, 1–1.25 in. wide. Inflorescence in axillary racemes 3 in. long. Pedicels rather larger than calyx. Calyx 12 in. Corolla .25 in. long, white, standard orbicular, limb slightly auriculate at base, apex retuse. Pod 4 in. long, 1 in. across below, .4 in. wide at opaque seed-bearing tip; membranous part sparsely puberulous, reticulate-veined.

A very distinct species, though nearest to *S. macropterus* Miq., from Sumatra.

## 69. MASTERSIA BENTH.

1. *MASTERSIA ASSAMICA* Benth. in *Trans. Linn. Soc.* xxv. 300 (1865).  
M. cleistocarpa Bak. in *Hook. fil. Flor. Brit. Ind.* ii. 195 (1876).

There is only one species; therefore Mr. Bentham's name, which is nine years prior to that used in the *F. B. I.*, must stand.

## 70. CANAVALIA ADANS.

3. *CANAVALIA TURGIDA* Grah. in *Wall. Cat.* 5534; leaflets ovate or oblong acute rarely obtuse, racemes few-flowered, pod few-seeded turgid;

the endocarp separating from the pericarp, woolly. *Miq. Flor. Ind. Bat. i.* 215; *Prain, Bot. Laccad.* 36. *C. ensiformis* var. *turgida* *Bak. in Flor. Brit. Ind. ii.* 196. *Dolichos rotundifolius* *Roxb. Flor. Ind. iii.* 302.—*Rheede Hort. Malab. viii. t.* 43.

LACCADIVES; Minikoi, *Alcock!* SUNDIRBUNS; *Kurz! Clarke! Heinig!* S. INDIA; Cochin, on sandy coasts, *Rheede!* Islands at mouth of Godaveri, *Roxburgh.* BURMA; Arracau, *Kurz! Pegu, Prain! Martaban, Cleghorn.* ANDAMANS and NICOBARS; common on the coasts. PERAK; *Scortechini! Kunster!* PENANG; *Wallich!* SINGAPORE; *Hullet!*

A glabrous perennial, climbing on bushes along the coasts. *Leaflets* as in *C. ensiformis.* *Flowers* as in *C. ensiformis* but fewer. *Pod* 5 in. long, 2-2½ in. wide, very turgid.

There is no doubt that this plant is specifically distinct from *C. ensiformis*, with which it has been placed in the *F. B. I.*; the separable endocarp at once amply differentiates it. This, however, is the plant to which the name *C. obtusifolia* properly belongs. For *C. obtusifolia* DC. is *Dolichos obtusifolius* Lamk. and *Dolichos obtusifolius* Lamk. is the plant figured by *Rheede (loc. cit.)*. It is, moreover, *Dolichos rotundifolius* Vahl., of which indeed De Candolle had seen a specimen, thus confirming the conclusion that *Roxburgh* had already formed. This, from his drawing, is without any possibility of doubt *Roxburgh's Dolichos rotundifolius.*

The plant named *C. obtusifolius* in the *F. B. I.* is certainly the plant figured by *Dr. Cleghorn (Madr. Journ. n. s. i. t. 4)* and is in all probability the Chinese plant that *Roxburgh* named *D. obcordatus.* The pods of the two are quite alike and differ totally from those of *C. turgida.* The writer cannot, however, separate this *Madras* and Chinese species from *Dolichos lineatus* *Thunbg. (Canavalia lineata DC.)*, either by *Thunberg's* or *De Candolle's* descriptions, by the specimens in *Herb. Calcutta* received from *Japan*, or by the figure published in the *Somoko Dusets*, ed. ii. xiii. t. 20. In this indeed he only agrees with *Mr. Baker.* The true name of the *C. obtusifolia* of the *F. B. I.* is therefore *C. lineata* DC. In any case the species now being discussed should be put in some particular place; as arranged in the *F. B. I.* it is given, if it comes from *India*, under *C. obtusifolia* and, if it comes from *Malaya*, is made a variety of *C. ensiformis*; it cannot well be both.

## 71. DIOCLEA H. B. K.

1. DIOCLEA REFLEXA *Hook. fil.* Leaves beneath sparsely hairy or glabrescent.

Add to synonyms of *F. B. I.*:—*Dolichos hexandra* *Roxb. Hort. Beng.* 55; and delete the synonyms *D. javanica* and *D. fergusonii.* Add to localities:—ANDAMANS; very common.

*Roxburgh's Dolichos hexandra* came from *Silhet* where *Hooker* and *Thomson* also afterwards found the species; in *Herb. Calcutta* *Roxburgh* has left a beautiful coloured figure of the plant. It is particularly plentiful in the *Andamans.* The vexillary stamen in both the *Indian Dioclea* is free at the base though not above; is rather shorter than the others and has a perfect anther; the anthers of the 9 stamens united in the keel-sheath are alternately perfect and abortive; there are thus 5 perfect anthers in the sheath and a sixth perfect on the vexillary stamen; hence *Roxburgh's* very excellent specific name.

2. *DIACLEA JAVANICA* Benth., *Pl. Jungh.* 236; leaflets beneath densely softly velvety, always rather smaller. *D. Fergusonii* Thw. *Enum.* 412.

CHITTAGONG; Kodala Hill, *King's Collector!* CEYLON; *Ferguson!* (*Thwaites*, C. P. 3817) ! MALACCA; *Maingay!* PERAK; common, *Kunstler!* *Wray!*

Leaflets not exceeding 4 in. in length, puberulous above and always densely velvety beneath. *Flowers* and *Pods* as in *D. reflexa*, of which, as Mr. Baker thinks, this may be but a form. The two are, however, so easily recognised that it seems better, from the field-botanist's point of view, to keep them apart.

## 72. PUERARIA DC.

1b. *PUERARIA SIKKIMENSIS* Prain; calyx densely silky, teeth sub-obtuse shorter than the tube, bracts as long as buds, lamina of wings oblique subspathulate.

SIKKIM; Terai, *Anderson!* *Gamble!* *G. Gammie!* Teesta valley, *King!* Rungeet, 1000 feet elev., *Clarke* n. 27263!

Stems wide-twining, young branches rusty-puberulous. *Leaflets* membranous, very broadly rhomboid, acute, terminal 6 in. long by 7 in. wide, glabrous above, very sparsely adpressed-pubescent beneath. *Flowers* in dense clustered racemes and panicles from nodes along the stem, usually only 4-6 in. long, pedicels short densely fascicled, densely rusty-tomentose as are the lanceolate bracts 25 in. long, and the rachis. *Calyx* 3 in. long, densely rusty-tomentose. *Corolla* large, 75 in. long, limb of standard orbicular, auriculate, 5 in. wide. *Pod* unknown.

A very distinct species, nearest to *P. tuberosa*, but very readily distinguished by its rusty instead of grey-silky pubescence, its larger bracts, and its much larger flowers.

### 2. PUERARIA CANDOLLEI Grah.

Add to localities of *F. B. I.*:—ANDAMANS; Coco Group, *Prain!*

4. *PUERARIA WALLICHII* DC. Add to synonyms of *F. B. I.*:—*Dolichos frutescens* Ham. in *Don. Prodr.* 240.

Add to localities:—N.-W. HIMALAYA; Hardwar, *Wallich!*

Dr. Wallich's 5352 C., issued by some extraordinary oversight as *Pueraria tuberosa*, is this species. An original specimen of *Dolichos frutescens*, to which Dr. Hamilton has himself added name and manuscript description, shows that that species is *Pueraria Wallichii*. The writer is of the same opinion regarding *P. composita* Grah. as is Mr. Baker, and cannot follow Mr. Kurz even to the extent of making Graham's Burmese plant a variety of *P. Wallichii*.

6. *PUERARIA THUNBERGIANA* Benth. *Journ. Linn. Soc.* ix. 122. *Pachyrhizus Thunbergianus* Sieb. & Zucc. *Fam. Nat. Fl. Japon.* ii. 113. *Neustanthus chinensis* Benth. *Fl. Hongkong.* 86. *Pueraria Thomsoni* Benth. *Journ. Linn. Soc.* ix. 122; *Bak.* in *Flor. Brit. Ind.* ii. 198. *Dolichos grandifolius* Grah. in *Wall. Cat.* 5556. *D. spicatus* Wall. (*partly*) in *Cat.* 5557.

A careful examination of the now abundant material of this species both from India and from China shows that Mr. Bentham's two proposed species are not separable even as varieties. Recently the species has been obtained by Mr. Clarke and by the writer in the Naga Hills of Upper Assam, and by Dr. A. Henry in Hupeh, so that its geographical area is probably continuous from Japan to Sikkim, where it is quite common.

7b. *PUERARIA COLLETTII* Prain; shrubby when young, sometimes climbing when older, pedicels in flower not exceeding the small calyx; pod pubescent 8–10-seeded. *Pueraria* sp. nov. *Coll. & Hemsl., Journ. Linn. Soc.* xxviii. 48.

UPPER BURMA; Shan Hills at Ywagyen, 4000 feet, *Collett 654!* Maymyo, *King's Collectors!* Fort Stedman, Indine, Taungyi, Saga, etc., very common, *King's Collectors!*

Perennial; when shrubby 5–6 feet high, with subterete velvety branches. *Leaflets* thickly membranous, usually densely velvety on both surfaces and not losing their tomentum even when aged; end one ovate-acute, 5–7 in. long, base cuneate from the middle, lateral similar but with oblique base, externally slightly rounded. *Racemes* spicate axillary, canescent, 8–10 in. long; bracts small soft usually falling; pedicels in fruit .25 in. *Calyx* .2 in., velvety. *Corolla* .4 in., purplish. *Pod* linear, flat, pale, 2 in. long, .25 in. wide, very uniformly 10-seeded, occasionally 1 or 2 abortive.

This is extremely near *P. stricta* Kurz, but differs in having longer axillary racemes with soft hardly persistent bracts; in having pubescent pods with thicker valves and in having densely pubescent, indeed almost velvety leaves, the pubescence persisting even when the plant is in ripe fruit. Sir H. Collett and Mr. Hemsley had already decided that this was probably an undescribed species, but in the absence of fruit were unable to provide a diagnosis. It is therefore named in honour of Sir Henry, who first collected it.

Sir Henry found it an erect shrub, as have all our native collectors save one, who notes that at Maymyo it was climbing. It is very strange that although this species has now been found so plentifully, none of our Calcutta collectors have again met with *P. stricta*, *P. hirsuta* or *P. brachycarpa*, three species described in this *Journal* (vol. xlii) by the late Mr. Kurz, and all of them described from rather inadequate material; none of the three are in flower and of none were there duplicate specimens for distribution, so that Mr. Baker when dealing with the genus in the *Flora of British India* had seen no specimens. That *P. hirsuta* is very distinct is certain; its leaflets have 8–10 pairs of lateral nerves that are of equal strength. Otherwise its general appearance is exactly that of the other three species, all of which have primarily sub-3-nerved leaflets, owing to the lowest pair of lateral nerves being stronger than the others. *P. brachycarpa* indeed looks as if it might only be a short-podded variety of *P. stricta*, and it is within the bounds of possibility that when their flowers are known it may be necessary to reduce the one to the other and to unite *P. Collettii* with the two.

#### 10. *PUERARIA PHASEOLOIDES* Benth.

The synonym usually quoted as *Phaseolus decurrens* is an error for *P. decurvus*, the latter being what Graham and Wallich actually wrote.

10b. *PUERARIA SUBSPICATA* Benth, *Journ. Linn. Soc.* ix. 125; Kurz



in *Journ. As. Soc. Beng.* xlv. 2:253. *Dolichos ficifolius* Grah. in *Wall. Cat.* 5563. *Dolichos spicatus* Wall. *Cat.* 5557 A. B. (not C).

NORTH BENGAL; at Dingra Ghat, *Kurz!* E. BENGAL; Mymensingh, *Clarke* n. 7980! SIKKIM; at Selim, 1000 feet, *Clarke* 36867! BOOTAN; *Parkes!* DUARS; Mahakulgiri, *Heawood!* SILHET; *Wallich* 5557 A! *Clarke* 18502! 14341! ASSAM; *Masters!* *Simons!* KHASIA; *Clarke* 44995! NAGA HILLS; *Clarke* 40819! CHITTAGONG; very common, *King's Collectors!* BURMA; Pegu, *Wallich* 5563! *R. Scott!* Arracan; *Kurz!* TENASSERIM; *Helper!* *Gallatly!*

It is impossible to assent to the reduction of this species to *P. phaseoloides*; the leaves are almost always more deeply lobed, the flowers are always very much larger—the calyx being .35, the corolla .8–1 in. long.; the pods are usually longer, are always broader and have the sutures, especially the dorsal, slightly thickened. There are moreover no intermediates to be found among the specimens in Herb. Calcutta, which include representatives of 20 gatherings of *P. phaseoloides* and 27 gatherings of *P. subspicata*.

### 73. PHASEOLUS LINN.

The species of *Phaseolus* cultivated and wild in India, stand much in need of careful revision and comparison with the types of the species originally named by Linnæus. This remark applies with especial force to the species and forms of the section *Strophostyles*. Many very competent botanists have dealt with the subject in the light of Herbarium material in Europe; the only author who ever really knew the plants themselves was unable to collate his knowledge with the early references. And till another author who knows the plants themselves as Dr. Roxburgh knew them shall be able to deal with the subject, it is impossible to hope for a disentanglement of their very vexed synonymy or indeed to decide their exact specific limitation.

#### 3. PHASEOLUS ADENANTHUS *G. F. Mey.*

Add to localities of *F. B. I.*:—ANDAMANS; sea-coasts, *King's Collectors!* Narcondam, *Prain!*

#### 4. PHASEOLUS TENUICAULIS *Bak.*

The specimen of *P. sublobatus* var. *tenuicaulis* Grah.—the basis of this species, —is at Calcutta indistinguishable from *Dolichos falcatus* Klein.

#### 8. PHASEOLUS ACONITIFOLIUS *Jacq.*

In the *Index Kewensis* it is stated that Roxburgh's *P. aconitifolius* of the *Hortus Bengalensis* and of the *Flora Indica* is not this species but is *P. trilobus*.

This is not what is said either by Wight and Arnott or by Baker; these authors are right. The *Index Kewensis* citation is perhaps based on the fact that on a figure of *P. trilobus* sent to the E. I. C. Museum, Roxburgh wrote "*P. aconitifolius*" by a *lapsus calami*. This has been mentioned by Wight and Arnott; but both in his *Hortus Bengalensis* and in his *Flora Indica*, Roxburgh indicated by the name *P. aconitifolius* the plant known in India as the *Moth*, which is undoubtedly *P. aconitifolius* Jacq.

#### 10. PHASEOLUS PAUCIFLORUS *Dalz.*

Add to localities of *F. B. I.*:—RAJPUTANA; Mt. Abu, *King!*

This does not appear to the writer to differ specifically from *P. calcaratus*, though it seems a fairly distinct variety.

### 11. PHASEOLUS RADIATUS Linn. Sp. Pl. 725.

The writer quite agrees with Mr. Baker in considering that *P. Max* Roxb.—the *Krishna Múng*, and *P. aureus* Roxb.—the *Sona Múng*, are only varieties of *P. Mungo* Roxb.—the *Múng* itself. But the *Másh* or *Urd*, which is a totally different plant, yielding an entirely distinct crop, hardly deserves to be treated as specifically identical with *Múng*. The two plants perhaps differ as species of subordinate rank only, and from the monographer's point of view may be sufficiently differentiated if treated as subspecies. But in a *Flora* no good purpose is served by introducing academic refinements of this kind into the discussion, and it is better to treat the two plants apart from each other, as Indian cultivators and Government officers, from the necessities of the case, are compelled to treat them.

The unfortunate thing is that the name which Linnæus gave to *Múng*, as is shown by his diagnosis and his reference to Dillenius' excellent figure in *Hort. Eltham*. t. 235, f. 304, does not conserve the vernacular name of the plant. This would not, of course, have mattered very greatly had Linnæus not at a later date used the word *Mungo*, as his description of the plant shows, to designate NOT *Múng*, but *Tikari*. Roxburgh endeavoured to set matters right by reversing the names;—Roxburgh's *P. Mungo* is *Múng*; his *P. radiatus* is *Másh*. In Mr. Baker's account of the plants Roxburgh's treatment is followed, for the *P. Mungo* of the *Flora of British India* is *Múng* and is Roxburgh's *P. Mungo*, but not *P. Mungo* Linn.; Mr. Baker's *P. Mungo* VAR. *radiata* is Roxburgh's *P. radiatus*, but most certainly is not *P. radiatus* Linn., for it is not the plant figured by Dillenius.

The variety *glabra* of the *F. B. I.* (which is *P. glaber* Roxb., a plant introduced to the Calcutta garden from Mauritius) is a variety of *P. calcaratus*. The variety *Wightiana* is not a form of *Múng* but of *Másh*, as its short ascending pods show. And the writer thinks it possible that in *P. trinervius* of the *F. B. I.* (an older name for which is *P. sublobatus* Roxb.) we have the wild form from which perhaps both *Múng* and *Másh* have originated. All three, however, deserve, he believes, to be considered equally distinct now.

The three leading varieties of *Múng* (*P. radiatus* Linn.) may be readily distinguished as follows:—

1. VAR. *typica*; foliage dark-green, pods spreading, seeds green. *P. radiatus* Linn. Sp. Pl. 725. *P. Mungo* Roxb. *Flor. Ind.* iii. 292. *P. Mungo* also of the majority of Indian plant-lists; the *Múng* or *Cheyti Múng* crop; certainly not *P. Mungo* Linn.
2. VAR. *aurea*; foliage paler, pods reflexed, seeds yellow. *P. aureus* Roxb. *Flor. Ind.* iii. 297. *P. Atsuki* Sieb. *Verh. Batav. Gen.* xii. 57. *Sona Múng*, the most esteemed form of *Múng*, generally believed by the natives not to be a 'deshi,' or native variety.
3. VAR. *grandis*; foliage medium-green, pods longer, spreading, seeds black. *P. Max* Roxb. *Flor. Ind.* iii. 295 *via* Linn.; *Krishna Múng*, the least esteemed form of *Múng*. This is certainly an introduced form, probably from the Chinese Empire where it is widely grown from Shanghai to Yarkand. In S. China it is called *Luton*, "green-beans" (*A. Henry* n. 68); in Yarkand Dr. Scully notes that *this* is what is known as *Másh*, a name that in India is restricted to *P. radiatus* Roxb. (*P. Mungo* Linn.)—the *Másh-Kulai* or *Urd* crop.

*P. Max* Linn. is a composite species. Wight and Arnott say that the plant from Hermann's herbarium included here, and on which the species was probably based,

has no flowers. The American plant quoted by Linnæus under *P. Maa* is, according to Savi, a distinct species *P. Hernandezii*; the *Cadelium* of Rumphius (*Herb. Amboin.* v. t. 140) also quoted, is obviously a form of *Glycine hispida* Maxim., the *Soy* or *Soja*.

### 11b. PHASEOLUS MUNGO Linn.

Of this there are two fairly distinct forms:—

1. *Vera*; stems hirsute, scandent or subscaudent, seeds black. *P. Mungo* Linn. *Mantiss.* 101. *P. Wightii* W. & A. *Prodr.* 245; *Herb. Ind. Or. H. f. & T.* *P. Wightianus* Grh. Wall. *Cat.* 5591. The *Tikari*; perhaps hardly varietally distinct from the next.

2. *Roxburghii*; stems hirsute, diffusely spread but not scandent, seeds grey. *P. radiatus* Roxb. *Flor. Ind.* iii. 296 not of Linn. *P. Roxburghii* W. & A. *Prodr.* 246. "Udidi" Rheede *Hort. Malab.* viii. 50. The *Urd* or *Másh-Kulai*; a very important Indian crop, totally different from, and much more important than, the *Múng* crop.

*Phaseolus subvolubilis* Ham. in Wall. *Cat.* 5605, referred in the *F. B. I.* to the first form, is at Calcutta *P. calcaratus* Roxb. *P. setulosus* Dalz, referred in the *F. B. I.* to the second, has pods and seeds like those of *P. trinervius*, of which the writer treats it as a variety.

### 12. PHASEOLUS SUBLOBATUS Roxb. Hort. Beng. 54; Flor. Ind. iii. 288.

In a monograph of the genus *Phaseolus* the writer would feel inclined to reduce this (but as a sub-species, not as a mere variety) to *P. Mungo* in the wide sense which would make *P. Mungo* include both the *Múng* and the *Másh-Kulai* under one name. In this plant we probably see the wild stock whence both cultivated plants were originally derived. Here there are three fairly distinct forms, though the two first are very close to each other and can only be separated by the colour of their tomentum; their pods and seeds are identical, as are their flowers. In the *Flora of British India* the two are referred to different species.

1. VAR. *typica*; flowers small, tomentum on stems and pods reddish. *P. sublobatus* Roxb. *P. trinervius* Heyne in Wall. *Cat.* 5603; Bak. in *Flor. Brit. Ind.* ii. 203. *Vigna brachycarpa* Kurz, *Journ. As. Soc. Beng.* xliii. pt. 2, 185.

Behar westward to the Concan; thence south to Ceylon: Arracan.

2. VAR. *setulosa*; flowers small, tomentum on stems and pods grey. *P. setulosus* Dalz. in *Kew. Journ.* ii. 33.

Concan and Western Deccan only.

3. VAR. *grandiflora*; flowers large, tomentum on stems and pods reddish. *P. trinervius* Kurz, *Journ. As. Soc. Beng.* xlv. pt. 2. 249 hardly of Heyne. This may prove to be more than varietally distinct, the septa between the seeds being decidedly narrower than in the two preceding varieties.

BURMA; Pegu, Kurz, 1725! Martaban, Falconer 620! DISTRIB. Sumatra, Java.

Dr. Roxburgh's name for this species has been omitted from the *Flora of British India*; regarding the plant Roxburgh intends, which is the *Gora-múng*, dispute is impossible, both on account of the native name and from Roxburgh's figure. In the *Index Kewensis* Roxburgh's *P. sublobatus* is given as = *P. trilobus*, an impossible identification for which the writer has failed to trace any bibliographic authority.

12b. PHASEOLUS RICCIARDIANUS Ten. Ind. Sem. Hort. Neap. (1833) 4; stems flexuose clothed with fine deciduous spreading hairs, stipules large lanceolate, leaflets entire or faintly lobed, racemes usually branched,

bracteoles linear, flowers rather large, pods glabrous. *Savi Mem. Ac. Torin.* xxxviii. 173 t. 3.

VAR. *macrocarpa*; pod large, flat.

NAGA HILLS; Kohima, *Watt.* n. 7343! CHITTAGONG; Kodala, *King's Collector.*

*Leaflets* narrowly ovate-lanceolate, 3-4 in. long by 1.5-2.5 in. wide; stipules .4 in. long, fixed a little below middle. *Flowers* yellow, .65 in. long, lower pedicels twice as long as calyx, bracteoles shorter than calyx. *Pods* 5 in. long, .4 in. broad, distinctly compressed, 8-10-seeded, seeds brown .25 in. long, .2 in. across, with prominent white hilum set on one side towards lower end of seed.

It is with some dubiety that this *Phaseolus* is here referred to *P. Ricciardianus*. The stems, leaves and flowers agree well with those figured by Savi, and still better with those of Japanese specimens named *P. Ricciardianus* by Mr. Maxiowicz. But Savi (*loc. cit.*) describes the pod as terete and has figured a pod that is much smaller than the one in this plant. Not impossibly this Naga and Lushai vegetable may yet prove to be a distinct species.

### 13. PHASEOLUS CALCARATUS *Roxb.*

Very commonly cultivated and very variable. Besides the typical form, the following varieties may be noted:—

a. VAR. *major*; foliage and tomentum as in type but flowers much larger. *P. hirtus* *Wall. Cat.* 5593 not of *Retz.*

KHASIA; Nunklow, *Clarke* n. 44819! NAGA HILLS; Jotsoma *Prain!* BURMA; cult. on the Salween, *Wallich!* Shan Hills, *King's Collector!*

This only differs from ordinary *P. calcaratus* by its larger flowers, and may be no more than a form of the type.

b. VAR. *glabra*; foliage and habit of VAR. *major* and of the type but leaves and stems almost glabrous; flowers as in VAR. *major*. *P. glaber* *Roxb. Hort. Beng.* 55.

PANJAB; at Pathankote, *Clarke* 21964! SIKKIM and BOOTAN; not uncommon. SILHET; *Gomez* (*Wall. Cat.* 5549 G. and 5589 H.) KHASIA; *Clarke* 14684! *G. Mann* 38!

Roxburgh describes the plant as not twining in the Calcutta garden; it does, however, twine when it has opportunity. The gatherings quoted will be found to agree extremely well with the plant Roxburgh depicts. In any case his *P. glaber* can by no possibility be a form of *P. Mungo* even in the widest sense; its pods are glabrous and, as if this were not sufficient, its seeds, as delineated by him, have not the hilum of *Mung* or of *Másh-kalai*, but have the very different hilum and are quite the shape of those of the *Sutri* which is *P. calcaratus*; indeed, VAR. *glabra* is even less easily separable from typical *P. calcaratus* than is VAR. *major*. *Wall. Cat.* 5549 G., at Calcutta (which ought to be *Vigna Catjang* *Endl.*) is this same plant!

c. VAR. *Rumbaiya*; stems short erect or diffuse. *Phaseolus* n. 40, *Herb. Ind. Or. H. f. & T.* *P. Clarkeanus* *Brace MSS.* in *Herb. Calcutta.*

KHASIA HILLS.

*P. torosus* *Roxb. Flor. Ind.* in. 298 only differs from this in having

Pods torulose when ripe, and is probably but another form of the variety. Roxburgh received it through Buchanan-Hamilton from Nepal.

This is the very puzzling crop, sometimes called *Khasia Mung*, but known to the Khasias themselves as *Rumbaija*. It is certainly not a form of *P. radiatus*—the true *Mung*, still less is it a form of *P. Mungo*—the *Urd*. It does not, however, in the writer's opinion deserve to be considered a distinct species, the flowers and fruits are so exactly those of typical climbing *P. calcaratus*.

d. VAR. *gracilis* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 50; stems very slender twining, quite glabrous as are the leaves; leaflets usually narrower than in VAR. *typica*; flowers and pods as in the type.

MALAY PENINSULA; Perak, very common in open grassy places, *Kunstler* 990! 1035! 2467! *Wray* 1756! *Scortechini* 1476! Pahang, *Ridley* 1124! DISTRIB. Sumatra (*Forbes*!)

*Phaseolus subvolubilis* Ham. in *Wall. Cat.* 5605, referred at Kew by Mr. Baker to *P. Mungo* happens in Herb. Calcutta to be *P. calcaratus*.

#### 14. PHASEOLUS FUSCUS *Wall.*

This has a naked style with a capitate stigma, and therefore not only is not a *Phaseolus*, but does not even belong to the subtribe *Euphaseoleæ*.

#### 15. PHASEOLUS VELUTINUS *Grah.*

This species, placed in the same section as the preceding, has no better right to be included in the genus *Phaseolus*; quite as certainly it is not at all nearly related to *P. fuscus*; both are members of the tribe *Phaseoleæ*; there all comparison between them ends. The nearest ally of *P. velutinus* is *Vigna lucens*, Bak., from which it is hardly distinguishable by foliage, by fruit, or by inflorescence, and is only to be separated by its larger flowers. Mr. Kurz has already pointed out that the two are unmistakably congeneric; he has, however, proposed to treat them as *Canavalias*. They do, as to pods, a good deal resemble *Canavalia*, but their stigmas being bearded differ so greatly that it is inconvenient to adopt Mr. Kurz's proposal, and a preferable course is to treat this as the type of a distinct genus which will include *Vigna lucens* as well.

### 73.\* DYSOLOBIUM PRAIN.

(*Phaseolus* § *Dysolobium* Benth. *Pl. Jungh.* 239, footnote.)

Twining, usually woody, with 3-foliolate stipellate leaves. *Flowers* in copious axillary racemes, bracteoles inconspicuous deciduous. *Calyx* campanulate, the lower tooth lanceolate longer than the rest, but shorter than the tube, the two uppermost connate. *Corolla* much exerted, keel beaked and sometimes distinctly curved and laterally deflexed. *Stamens* diadelphous; anthers uniform. *Ovary* sessile many-ovuled, style filiform bearded below the oblique stigma. *Pod* thick woody subterete oblong villous, very markedly septate, with double septa between the velvety seeds. Species 4; Indian.

This genus is made to comprise four undoubtedly congeneric forms, three of which constitute the group *Dysolobium* founded by Bentham in 1851 (*Pl. Jungh.* 239)

as a section of *Phaseolus*. In the *Genera Plantarum* (i. 539) Bentham and Hooker, while still recognising the group, doubt whether it constitutes a section of *Phaseolus*, and suggest that it may be found preferable to refer it to *Vigna*. The natural character of the group is, however, somewhat marred in the *Genera Plantarum* by the inclusion of a species figured by Wallich as a *Phaseolus* (*Pl. As. Rar.* i. 6, t. 6) which Kurz has clearly shown to be a *Dunbaria* (*Journ. As. Soc. Beng.* xliiii. 2, 186; xlv. 2. 255). Kurz, who treated the group in the sense originally understood by Bentham, recognised quite clearly that it can by no possibility be included in *Phaseolus*; he has consequently adopted a suggestion made in a MSS. note that Wallich has left in Herb. Calcutta, and referred all the *Dysolobia* to *Canavalia*. For this, at first sight, there is something to be said; the structure of the pod in all the species is very much that of *Canavalia*. When, however, it is considered that the calyx differs altogether from the calyx of *Canavalia*, that the style is bearded, and that the seeds are hirsute, it seems less convenient to adopt Wallich's suggestions than to adopt Bentham's. Baker has attempted a compromise; in the *Flora of British India* he still treats *Dysolobium* as a section of *Phaseolus*; he leaves in it, however, only two forms, viz.—the species of the group that has the longest beak to its keel, and the *Dunbaria* that has, by inadvertence, been cited as a *Dysolobium* in the *Genera Plantarum*; the other two he has referred to *Vigna*. The last species of the group he has, in the absence of flowers, dealt with tentatively as a *Psophocarpus*. Taubert (in Engler's *Natürlichen Pflanzenfam.* iii. 3, 380) has thrown no new light on the affinities of the group; on the contrary he has accorded it, without qualification of any kind, the treatment and the position regarding which the authors of the *Genera Plantarum* have so expressly enjoined caution.

That the group as originally recognised by Bentham forms, in consequence of its firm, septate pods and its hirsute seeds one of the most natural and definite genera in the whole of the *Phaseolidæ* does not, the writer thinks, admit of question; to settle the dubiety that has prevailed as regards its proper position, it seems to the writer most convenient to adopt Mr. Bentham's name in a generic sense and to treat the forms it covers as a group apart alike from *Canavalia*, *Phaseolus* and *Vigna*.

#### *Key to the Species.*

- Racemes lax long-peduncled, flowers large; pods closely velvety-villous, seeds sparsely velvety; (pods keeled along suture but not winged):—
- Leaflets rounded cuspidate, chartaceous, hirsute on nerves beneath; flowers 1·75 in. long, keel with long laterally deflexed beak, style bearded down the face ... 1. *D. grande*.
- Leaflets narrowed to a point, membranous, glabrescent; flowers only ·6 in., long, beak of keel not deflexed, style penicillate round stigma ... .. 2. *D. lucens*.
- Racemes dense short-peduncled; flowers small (·3 in. long or less); pods softly hirsute with long hairs, seeds densely velvety; (beak of keel not deflexed):—
- Leaflets roundish cuspidate; pod neither keeled nor winged ... 3. *D. dolichoïdes*.
- Leaflets lanceolate; pod subquadrandular, prominently winged along the angles ... .. 4. *D. tetragonum*.

1. *DYSOLOBIUM GRANDE* Prain. *Phaseolus grandis* Ham. in *Wall. Cat.* 5602; *Bth.* in *Pl. Jungh.* i. 239 footnote; not *P. grandis* Dalz. *P. velutinus* Grah. in *Wall. Cat.* 5615; *Bak.* in *Flor. Brit. Ind.* ii. 204. *Canavalia grandis* [*Wall. MSS.* in *Herb. Calcutta*]; *Kurz.* in *Journ. As. Soc. Beng.* xliii. 2. 185 and xlv. 2. 252.

NORTH BENGAL; *Kurz!* SIKKIM; *T. Anderson!* KHASIA; at Nungpo, *Clarke* n. 40703! *G. Mann!* ASSAM; at Goalpara, *Hamilton* (*Wall. Cat.* 5602)! *Jenkins!* *Masters!* BURMA; Taong Doung Mts., *Wallich* (*Cat.* 5615 A)! Shan Hills, at Fort Stedman, Saga, etc., common, *King's Collectors!* *DISTRIB.* Yunnan. (*J. Anderson!*)

This species has a very long, deflexed beak to the keel of the corolla, hooked round so as almost to complete a spiral; in this respect it resembles, to a considerable extent, a *Phaseolus*; its pods and seeds are however totally unlike those of any *Phaseolus*. Nothing requires to be added to Mr. Baker's excellent description.

In reducing this species to *Canavalia* Mr. Kurz has omitted to state that he was only following the treatment already proposed by Dr. Wallich in a manuscript note dated "25th October 1833."

2. *DYSOLOBIUM LUCENS* Prain. *Phaseolus lucens* *Wall. Cat.* 5601; *Benth.* in *Pl. Jungh.* 239 footnote. *Canavalia lucens* *Kurz. Journ. As. Soc. Beng.* xliii. 2. 185 and xlv. 2. 252. *Vigna lucens* *Bak.* in *Flor. Brit. Ind.* ii. 207. *Phaseolus grandis* *Herb. Ind. Or. vix* *Wall.*

CHITTAGONG; *Hooker and Thomson!* PEGU; *Kurz* n. 2550! RANGOON *Cleghorn!* TAVOY; *Gomez* (*Wall. Cat.* 5601)!

So remarkably like the preceding that without flowers it is difficult to distinguish the two species. The flowers are, however, very unlike; in the present plant they are less than half the size and have a much shorter beak to the keel than in *D. grande*. Again nothing can be added to Mr. Baker's clear description.

3. *DYSOLOBIUM DOLICHOIDES* Prain. *Phaseolus dolichoides* *Roxb. Hort. Beng.* 54; *Fl. Ind.* iii. 290; *Wall. Cat.* 5600; *Benth.* in *Pl. Jungh.* 239. *Mucuna recta* *Wall. Cat.* 5625. *Dolichos dasycarpus* *Miq. Flor. Ind. Bat.* i. 186. *Canavalia dolichoides* *Kurz* in *Journ. As. Soc. Beng.* xliii. 2, 185. *Vigna dolichoides* *Bak.* in *Flor. Brit. Ind.* ii. 207.

SILHET; *Wallich* (*Cat.* n. 5600 A)! *Hooker and Thomson!* ASSAM; *Jenkins!* *Masters!* *Simons!* CHITTAGONG; *Clarke* n. 8312! ARRACAN; Kolodyne valley, *Kurz!*

This, with the next species, makes a very distinct section of the genus *Dysolobium*.

4. *DYSOLOBIUM TETRAGONUM* Prain; stems woody, brown-pubescent, leaves subcoriaceous entire lanceolate prominently veined; with copious adpressed bristly hairs, racemes many-fl'd. sub-sessile or shortly peduncled, corolla middle-sized, pod stout short straight square, the angles winged, the faces densely clothed with persistent firm short spreading greyish-brown hairs. *Psophocarpus* sp., *Bak.* in *Flor. Brit.*

*Ind.* ii. 212. *Canavalia tetragona* Kurz MSS: (on specns.); *Vigna tetragona* Kurz MSS. (on covers) in *Herb. Calcutta*.

NORTH BENGAL; Alipur Duars, *Heawood!* ASSAM; *Masters; G. Mann!*

*Stem* wide-twining, densely clothed with persistent pale-brown pubescence. *Stipules* lanceolate minute; leaflets entire 4-6 in. long, .75-1 in. wide, bristly-hirsute on both surfaces. *Racemes* 2-3 in. long, sometimes nearly sessile; pedicels shorter than the calyx, bracteoles minute lanceolate. *Calyx* .1 in., clothed with adpressed hairs; teeth deltoid, lowest lanceolate. *Corolla* blue (*Heawood*), 3-4 times the calyx. *Pod* 2-2.5 in. long, .5 in. wide, firm, septate; the angles distinctly winged as in *Psophocarpus*.

Very nearly related to *D. dolichooides*, but amply distinct by its narrow leaflets and its *Psophocarpus*-like pods. Mr. Kurz apparently refrained from publishing this species because, like Mr. Baker, he only knew the plant in fruit. Excellent flowering specimens with full MSS. notes of the plant have recently been supplied by Mr. Heawood from the Alipur Duars, so that a description can now be given. In foliage and habit this greatly resembles *Vigna Clarkei*, but in that species the hairs on petioles and stems are reflexed, the flowers are yellow, and the pod is almost exactly like that of *Vigna pilosa*.

#### 74. VIGNA SAVI.

##### 2. VIGNA LUTEA A. Gray.

Add to localities of *F. B. I.*:—CEYLON; *Thwaites!* LACCADIVES; *Alcock!*

It is pointed out in the *Index Kewensis* that the oldest name for this, as a *Vigna*, is *V. retusa* Walp. Rep. i. 778, and the name *V. lutea* has accordingly been there changed to *V. retusa*. There seems no object in making this reduction, firstly because *V. retusa* Walp. is only partially equivalent to *V. lutea* A. Gray, since Walpers distinguished in the same work a *V. anomala* which is part of this species; and secondly because Gray's name is now much better known than Walper's one. The name *V. lutea* has the further advantage of conserving the oldest specific epithet, since this is *Dolichos luteus* of Swartz (*Prodr.* 105) and of De Candolle (*Prodr.* ii. 398). Dr. O. Kuntze reduces this to the next species, and the two are certainly almost identical as regards flowers, fruits and seeds; their leaves are however very different, and the differences appear to be constant.

##### 3. VIGNA LUTEOLA Benth.

Here again the *Index Kewensis* proposes that the oldest name for this as a *Vigna*, (*V. glabra* Savi), should replace the better known name *V. luteola*. The objections to the proposed change are parallel to those given under the preceding species. *V. glabra* is only part of *V. luteola*, for Savi recognised another species *V. villosa* that is also referable to *V. luteola*, while again Bentham's name conserves the oldest specific epithet, since this is *Dolichos luteolus* Jacq. (*Hort. Vindob.* i. 39 t. 90).

In the event of the adoption of Dr. Kuntze's view that *V. lutea* is after all only a form of *V. luteola*, his name for the two (*Vigna repens*) will have to be considered, since it is clear, as Kuntze says, that this is, perhaps both are, covered by the name *Dolichos repens* Linn. But this is apparently not the *Phaseolus repens* Grah. which Mr. Baker has renamed *Vigna repens*; of the last mentioned plant the writer has not seen specimens.



5. *VIGNA VEXILLATA Benth.*

To the synonyms of this species should apparently be added *Dolichos umbellatus* Thunb. *Trans. Linn. Soc.* ii. 339; at all events the Japanese species identified by M. Maximowicz and other authorities on the botany of Japan with *D. umbellatus* is identical with this. The *Index Kewensis* points out that the oldest name for this as a *Vigna* is *V. capensis* Walp. (*Linnæa* xiii. 533), but it seems a pity to replace the familiar name *V. vexillata*, (which moreover retains the oldest specific epithet, since this is *Phaseolus vexillatus* Linn.), by one so unfamiliar and so inappropriate as the name *V. capensis*.

6. *VIGNA BRACHYCARPA Kurz.*

Of this there is but one specimen in Herb. Calcutta; it is in ripe fruit, and all that is known of its flowers is from Mr. Kurz's field-note that they were small and were yellow. The fruits and leaves, however, amply suffice to show that the plant is only a form of *Phaseolus sublobatus* Roxb. (*P. trinervius* Heyne).

8. *VIGNA DOLICHOIDES Bak.*

This species is not a *Vigna*. It is certainly congeneric with *Vigna lucens* Bak., but it is at the same time equally certainly congeneric with *Phaseolus velutinus* Grah., and the writer has proposed to raise Mr. Bentham and Sir J. Hooker's section *Dysolobium* to the rank of a genus in order to accommodate these three species and another obviously congeneric one that Mr. Kurz has in MSS. named *Vigna tetragona*, but that Mr. Baker has tentatively placed in *Psophocarpus*.

9. *VIGNA PILOSA Bak.*

Add to localities of *F. B. I.*:—ANDAMANS; very common, *King's Collectors!*

9b. *VIGNA CLARKEI Prain*; stems slender, finely pubescent with reflexed hairs, leaflets membranous narrowly lanceolate, entire, with a few adpressed hairs on both surfaces, racemes few-flid. peduncled, corolla small, pod slender dotted, with dense adpressed rusty-pubescence.

FOOT OF EASTERN HIMALAYA; Dalkajhar in the Sikkim Terai, *Clarke* n. 37032! Mahakalguri in the Alipur Duars, *Heawood*, 74! 124!

Branches slender but firm, densely reflexed-pubescent as are petioles and peduncles. *Stipules* minute lanceolate, leaflets 4 in. long, under 5 in. wide. *Racemes* 5 in. or less, on peduncles 1-3 in. long; pedicels sparsely reflexed-pubescent 1 in. long, bracts and bracteoles minute. *Calyx* 25 in., teeth pubescent triangular as long as tube. *Corolla* 4 in., yellow. *Pod* 3 in. long, 2 in. in diam., subcylindric, densely adpressed-pubescent, 6-8-seeded.

A very distinct species with ripe pods much like those of *V. pilosa*, but with adpressed instead of spreading hairs.

77. *DOLICHOS LINN.*

## SUBGEN. I. LABLAB.

1. *DOLICHOS LABLAB Linn.*

It would be better to follow Roxburgh and Wight, who were thoroughly acquainted with the two plants cultivated in India that are united under this name

in the *F. B. I.*; even if the two are not to be treated as distinct species, they are, in any case, quite deserving of varietal rank. They may be distinguished as follows:—

1. *DOLICHOS LABLAB* Linn.; pods longer, more tapering at point, seeds with long axis parallel to sutures. *D. Lablab* Linn. *Sp. Pl.* 725. *D. lignosus* Roxb. *Flor. Ind.* iii. 305 not of Linn. *Lablab vulgaris* Savi *Diss.* 19; *DC. Prodr.* ii. 401; *W. & A. Prodr.* 250; *Miq. Flor. Ind. Bat.* i. 189. *D. cultratus* Forsk. *Flor. Aegypt.-Arab.* 134.

2. *DOLICHOS LIGNOSUS* Linn.; pods shorter more abruptly truncated at end, seeds with long axis at right angles to sutures. *D. lignosus* Linn. *Sp. Pl.* 726. *D. Lablab* Roxb. *Flor. Ind.* iii. 307 not of Linn. *D. cultratus* Thunb. *Trans. Linn. Soc.* ii. 320 not of Forsk. *Lablab cultratus* DC. *Prodr.* ii. 402; *W. & A. Prodr.* 251; *Miq. Flor. Ind. Bat.* i. 190. *L. microcarpus* DC. *Prodr.* ii. 402; *Miq. Flor. Ind. Bat.* i. 190.

Here, as in the case of *Phaseolus Mungo* and *P. radiatus*, Roxburgh has reversed the incidence of the Linnean names, no doubt because of the fact of that the epithet "*lignosus*" is so much more appropriate when applied to "*Lablab*" than when given to the plant to which Linnæus assigned it. That *D. lignosus* Roxb. cannot be *D. lignosus* Linn., both Wight and Walker-Arnott in their *Prodromus*, and Miquel in his *Flora* of the Dutch-Indies have already pointed out. But Wight and Arnott have considered that Linnæus and Roxburgh had the same plant in view when describing *D. Lablab*. This is hardly possible; Roxburgh identifies with his "*Lablab*" the plant figured by Rumphius in *Herb. Amboin.* v. t. 136, an identification that is obviously just; Linnæus gives this very figure as one of the types of his *D. lignosus*.

#### 6. *DOLICHOS FALCATUS* Klein.

Add to synonyms of *F. B. I.*:—*Phaseolus tenuicaulis* Kurz in *Journ. As. Soc. Beng.* xlv. pt. 2. 249, perhaps not of Bak. in *Flor. Brit. Ind.* ii. 201. *Dolichos tenuicaulis* Grah. in *Wall. Cat.* 5598 D. (at Calcutta).

Mr. Baker's *Phaseolus tenuicaulis* is based on *Wall. Cat.* 5598 D. Excellent specimens, exactly agreeing with the Calcutta example of this sheet, were obtained by Dr. J. Anderson in Upper Burma, and Mr. Kurz, with these before him, has inadvertently published this name without noting that the plant is simply *Dolichos falcatus*. As Mr. Baker finds that the examples of *Wall. Cat.* 5598 D. which he has examined represent a *Phaseolus*, it must follow that Dr. Wallich mixed two plants under this letter. But from Mr. Baker's description the *Phaseolus* in question very closely resembles this *Dolichos*, and no one except Dr. Wallich has collected that *Phaseolus* in Burma or elsewhere.

#### 7. *DOLICHOS SUBCARNOSUS* W. & A.

Exactly agreeing with this in fruit but with shorter and branching peduncles, is a plant common in Assam, Chittagong and Burma which has flowers like those of *Vigna Catjang* except in having the style penicillate round the stigma instead of bearded down the neck. The leaves however, are just as described by Mr. Baker and are not like those of *Vigna Catjang*.

The following numbered sheets may be quoted, and will indicate the difficulty that has been experienced in localising the species.

GARO HILLS; at Dalamgiri, *Clarke* n. 43117 (issued as *Vigna Catjang*)! CHITTAGONG; at Burundcherry, *Clarke* n. 19508! PEGU; Tongkyeghat, *Kurz* 1730; this forms.

part of Kurz's *Vigna sinensis* (*Journ. As. Soc. Beng.* xlv. pt. 2. 248), part of his *Phaseolus adenanthus* (*loc. cit.* 249), part of his *Lablab vulgaris* (*loc. cit.* 250) and, along with Kurz n. 2545, some part of Mr. Kurz's *Canavalia lucens*.

The pods are not like those of any other Indian *Dolichos* but recall those of a *Clitoria* or an *Apios*.

Considering how unsatisfactorily, even in the most authoritative works on the order, the various genera of *Phaseolidæ* have been limited, the writer prefers at present to leave the species, as Mr. Baker has left it, in *Dolichos*.

## 70. ATYLOSIA W. & A.

### SUBGEN. I. ATYLIA *Bth.*

#### 1. ATYLOSIA CANDOLLEI *W. & A.*

*Atylosia major* W. & A., reduced by Mr. Baker to *A. Candollei*, is a very distinct plant and is quite deserving of at least the rank of a variety.

#### 2. ATYLOSIA GEMINIFLORA *Dalz.*

This plant was unfortunately unknown to Mr. Baker; an examination of Dalzell's type specimens shows that the plant is not an *Atylia* at all, but that it is simply Mr. Bentham's *A. platycarpa*, a species of § *Rhynchosioides*, which section, by the way, the *F. B. I.* does not recognise. This section *Rhynchosioides* is, however, an extremely natural one; it includes the two species *A. elongata* and *A. platycarpa*. These species in the *Flora of British India* are separated by a wide interval, and their natural affinity is not alluded to. The treatment the section has received at the hands of Mr. Taubert in Engler's *Natürlichen Pflanzenfamilien* is even more disconcerting. There, only one of the two species is admitted into the section, and Mr. Taubert does not tell us which of the two it is that he excludes.

#### 4. ATYLOSIA SERICEA *Benth.*

Add to localities of the *F. B. I.* :— RAJPUTANA ; Abu, *King ! Duthie !*

#### 5. ATYLOSIA MOLLIS *Benth.*

Under this name Mr. Bentham has included two very distinct species, the diagnosis of the two being as follows :—

Leaves beneath densely uniformly grey-downy not reticulate, end-leaflet much longer than broad ; flowers over 1 in. long ; pod 2 in. long, 3 in. wide, 8-10-seeded, transverse depressions between seeds at right angles to the sutures, longer diameter of seeds across the pod ... .. *A. mollis.*

Leaves beneath more sparsely brown-pubescent, strongly reticulate, end-leaflet hardly longer than broad ; flowers 75 in. long ; pod 1-1.25 in. long, 6 in. wide, 3-5-seeded, transverse depressions between seeds oblique, longer diameter of seeds parallel to the sutures ... .. *A. crassa.*

In the Calcutta Herbarium the writer has analysed specimens of ten gatherings of *A. mollis* and thirty-nine gatherings of *A. crassa*, but has failed to find any intermediate state.

The distribution of the two species is quite distinct also. *A. mollis* is confined to the Himalayas from 2000 feet upwards ; *A. crassa* does not enter the Himalaya proper though it extends from the foot of that range through the greater part of

India, Indo-China and Malaya. The synonymy and distribution of the two plants are as follows:—

5a. *ATYLOSIA MOLLIS* Benth in *Pl. Jungh.* 243; *Bak.* in *Flor. Brit. Ind.* ii. 213 as to the synonym *Collæa mollis* only. *Collæa mollis* *Grah.* in *Wall. Cat.* 5574.

NORTH-WEST HIMALAYA; Chamba, *Clarke* 24283! Kamaon at Chajoorie, *Duthie* 530! Garhwal; below Kinali, *Duthie* 3951! Route to Tehri, *Davidson*! NEPAL; *Wallich* 5574! SIKKIM; Rinchingong, *T. Thomson*! *T. Anderson*! Siriong, *Clarke* 13137! Lingcham, *Clarke* 25485! Namchi, *King*!

5b. *ATYLOSIA CRASSA* *Prain*, *Journ. As. Soc. Beng.* lxxvi. 2, 45. *A. mollis* Benth. in *Pl. Jungh.* 343 excluding the synonym *Collæa mollis* *Grah.*; *Bak.* in *Flor. Brit. Ind.* ii. 213, exc. the synonyms *Collæa mollis* *Grah.*, *Cajanus glandulosus* *Dalz. & Gibs.*, and *Atylosia glandulosa* *Dalz.* *Dolichos reticulatus* *Ham.* in *Wall. Cat.* 5552, not of *Ait.* *D. crassus* *Grah.* in *Wall. Cat.* 5553. *Dunbaria Horsfieldii* *Miq.* *Flor. Ind. Bat.* i. 179. *Collæa cinerascens* *Grah.* in *Wall. Cat.* 5575.

FOOT of the N.-W. HIMALAYA; Hardwar, *Wallich*! Kamaon Bhabar, *King*! Dehra Dun, *King*! NEPAL; Terai at Noakote, *Wallich* 5552! ROHILKUND; *T. Thomson*! N. OUDH; *R. Thompson*! BENGAL; Maldah, *Clarke* 26977! CHOTA NAGPORE; *Wood*! *Gamble*! C. INDIA; Sambalpore, *Griffith*! Pachmarhi, *Duthie*, 10372! S. INDIA; Ganjam, *Gamble* 13658! Rampa, *Gamble* 16027! Vizagapatam, *Gamble* 21775! Jaipur Hills, *Beddome*! CONCAN; *Stocks*! *Dalzell*! ASSAM; Brahmaputra Valley, *Jenkins*! Garo Hills, at 300 feet, *Clarke* 43126! BURMA; common everywhere from Pegu and Bhamo to the Shan Plateau and the Karen Hills. ANDAMANS; very common. DISTRIB. Java, Philippines.

The citation of *Atylosia glandulosa* as a synonym of this or of the preceding plant is no doubt a *lapsus calami*, since *Dalzell* describes his species as having solitary pedicels reflexed in fruit, pods with long spreading hairs bulbous at their bases, and a vexillum with 2 callosities. Both *A. mollis* and *A. crassa* have geminate pedicels as described by *Mr. Baker*, their pods are not covered with long hairs, and they do not have callosities on the vexilla. One result of the slip has, however, been that a little farther on the species already described by *Dalzell* as *A. glandulosa*, is redescribed in the *F. B. I.* as *Atylosia rostrata*. That species as it happens is, moreover, not an *Atylosia* at all but a *Dunbaria*.

The oldest name for *A. crassa* as a species is *Dolichos reticulatus* *Ham.* But there is already an older *Dolichos reticulatus* from Australia published in the first edition of *Aiton's Hortus Kewensis*. As that also happens to be an *Atylosia* and now bears the name *A. reticulata* Benth., the writer has appropriated the specific epithet from the next oldest synonym, *Dolichos crassus*. Of *Dolichos blandus*, referred here by *Mr. Baker*, the writer has seen no specimen, and therefore refrains from giving the synonym a place.

5c. *ATYLOSIA BURMANICA* *Coll. & Hemsl.* in *Journ. Linn. Soc.* xxviii.

48; branches and leaves beneath shortly densely grey-downy, stipules minute caducous, pod tomentose with long silky hairs.

BURMA; Shan Hills, 5000 feet, *Collett 95!* *Maymyo, King's Collectors!*

Branches and stems as in *A. crassa* and *A. mollis*. Leaves exactly as in *A. crassa*; flowers larger, 1-1.25 in. long, like those of *A. mollis*, but rather more numerous. Pods as in *A. crassa* except for being clothed with long spreading hairs.

There is no doubt that this is exceedingly nearly related to *A. crassa* and to *A. mollis*; it has the foliage of the former with the flowers of the latter but differs equally from both by its tomentose pods.

7. *ATYLOSIA KULNENSIS Dalz.*

This species has no existence, the plant on which it is based being simply *Dunbaria Heynei* W. & A., from a different locality.

8. *ATYLOSIA GRANDIFLORA Benth.*

This species is not represented in Herb. Calcutta; the description given in the *F. B. I.* would apply without difficulty to *Dunbaria pulchra* Benth.

SUBGEN II. CANTHAROSPERMUM. This subgenus ought, in the writer's opinion, to receive the generic rank postulated for it by Wight and Arnott.

11. *ATYLOSIA ELONGATA Benth.*

The nearest ally of this species is *A. platycarpa*, along with which it forms the somewhat distinct section § *Rhynchosiodes* Bth.

14. *ATYLOSIA PLATYCARPA Benth.*

Add to synonyms of *F. B. I.*:—*Atylosia geminiflora Dalz.* in *Journ. Linn. Soc.* xiii. 185; *Bak.* in *Flor. Brit. Ind.* ii. 212.

Add to localities:—BEHAR; *Kurz!* C. INDIA; *Jubbulpur, Beddome!* *Sagor, Jerdon!*

15. *ATYLOSIA ROSTRATA Bak.*

This is the plant described by Dalzell as *A. glandulosa* but reduced in the *F. B. I.* to *A. mollis*. It is not an *Atylosia* but a *Dunbaria*.

81. DUNBARIA W. & A.

2. DUNBARIA HEYNEI W. & A. Add to synonyms:—*Atylosia kulnensis Dalz.* in *Journ. Linn. Soc.* xiii. 186; *Bak.* in *Flor. Brit. Ind.* ii. 214. *Cajanus kulnensis Dalz.* in *Kew Journ.* ii. 264; *Dalz & Gibs. Bomb. Flora,* 72.

Add to localities of *F. B. I.*:—CONCAN; near Kulna in the Waree country, *Stocks!* *Dalzell!* *Gibson!* CANARA; *Wadde Ghaut, Talbot!*

An examination of Dalzell's original specimens on which the species *Cajanus kulnensis* was founded, shows that they belong to a *Dunbaria* differing in no respect from *D. Heynei*.

3b. DUNBARIA GLANDULOSA Prain. *Dunbaria Heynei Kurz MSS.* in *Herb. Calcutta vix W. & A. Atylosia rostrata Bak.* in *Flor. Brit. Ind.*

ii. 216. *Atylosia glandulosa* Dalz. in *Journ. Linn. Soc.* xiii. 185. *Cajanus glandulosus* Dalz. & Gibs. *Bomb. Flora*, 73.

CONCAN; *Stocks!* CENTRAL INDIA; Godavery jungles, *Beddome!* Sagor, *Jerdon!* BENGAL; Mymensingh, *Clarke* 7800! BURMA; South Shan States at Lwekaw, *King's Collectors!*

There is no doubt that this is a *Dunbaria* but it is not, as Mr. Kurz was inclined to think, the same as the preceding. Mr. Baker's description is very good, but it does not mention the distinct callosities on the vexillum which mark it unmistakably as a *Dunbaria*; the fact has been overlooked that it was already a described species. The name *Atylosia glandulosa*, under which it is described by Dalzell, has been cited in the *Flora of British India* as a synonym of *Atylosia mollis*. Dalzell's description of the species, however, calls attention to the calli on the vexillum, the bulbous-based hairs on the pods and the retrofracted solitary pedicels, whereas neither in *A. mollis*, nor in the species *A. crassa* which is mixed with *A. mollis*, do we find long hairs on the pods, neither have calli on the vexillum, neither have retrofracted pedicels; finally, in both the pedicels are geminate.

3c. DUNBARIA FUSCA Kurz in *Journ. As. Soc. Beng.* xliii. 2. 186; xlv. 2. 255. *Phaseolus fuscus* Wall. *Pl. As. Rar.* i. t. 6; *Cat.* 5613; *Bth. & H. f. Gen. Pl.* i. 539; *Bak. in Flor. Brit. Ind.* ii. 204.

This species has been already referred to under *Phaseolus*.

In the *Genera Plantarum* the figure of this species is—obviously by oversight, for its pod is flat not terete, and its valves thin not thick,—quoted as that of a *Phaseolus* § *Dysolobium*.

It is not a *Phaseolus* at all; its style is glabrous, not bearded, its stigma capitate not oblique; the keel though beaked and with the beak moreover hooked, is not deflexed; more important still, the rachis is not nodiform. Finally the leaves are glandular beneath and though Dr. Wallich describes the leaves as having small deciduous stipels he figures none, and none of his specimens have any. But apart from the character of stipels the plant is certainly, as Kurz has pointed out, a *Dunbaria*; the mere presence of stipels has not been held by Mr. Bentham sufficient to outweigh all the other characters that go to distinguish the *Cajaneæ*—the subtribe to which *Dunbaria* belongs.

3d. DUNBARIA BELLA Prain; stems glabrescent, stipules caducous, leaflets subcoriaceous, shortly hispid especially on the nerves above, trinerved and distinctly reticulate-veined, softly pubescent beneath, lanceolate-acute three times as long as broad, flowers in peduncled lax racemes, calyx-teeth short, corolla much exerted, pod recurved velvety 8-10-seeded.

BURMA; Southern Shan States at Lwekaw, *King's Collectors!* Tenasserim, *Gallatly!*

A woody climber. Branches firm terete at first sparsely puberulous. Petiole 1·5 in., stipels 0; leaflets 3·5 in. long, 1-1·25 in. wide, petiolules very short. Racemes overtopping the leaves, flowers rather smaller than, but as showy as in *D. rostrata*; pedicels ·5-·7 in. Calyx ·35 in., broadly campanulate, glabrescent, all the teeth shorter than the tube. Corolla ·6 in. long, keel broad-beaked; standard ·75 in. across,

emarginate. *Pod* linear, 3·5 in. long, '5 in. wide, abruptly narrowed at tip, abruptly recurved at pedicel, closely softly velvety.

A very distinct and handsome species.

3e. *DUNBARIA SCORTECHNII Prain, Journ. As. Soc. Beng.* lxi. 2. 44; a slender climber, branches grey-velvety, leaflets exstipellate roundish-rhomboidal cuspidate, subcoriaceous, sparsely puberulous above, densely white-canescens below, flowers in long-peduncled rather dense racemes, calyx-teeth short, corolla exserted, pod recurved densely grey-canescens, 6-8-seeded.

PERAK; Dijong, *Scortechini* n. 1841! *Kunstler* n. 908! Ulu Bubong, *Kunstler* n. 10852!

*Stem* slender firm slightly sulcate, 10-20 feet long. *Petiole* 2-3 in., stipules small caducous; leaflets 2·5 in. long, 2 in. wide, petiolules '15 in., minutely stipellate. *Racemes* overtopping the leaves, on peduncles 4 in. long, grey-velvety like the stems; pedicels geminate '2 in. long. *Calyx* '3 in., lower tooth nearly as long as tube. *Corolla* '5 in. long, dark-brown externally, pale-yellow within, standard '6 in. across, orbicular entire. *Pod* linear, distinctly lineate, 2·5 in. long, '25 in. wide, narrowed at tip, abruptly recurved at pedicel, closely softly grey-canescens.

Also a very distinct species; distinguished from *Atylosia*, as *D. rostrata* and *D. bella* are, mainly by the pods not being depressed between the seeds.

#### 84. RHYNCHOSIA LOUR.

##### 1. RHYNCHOSIA RUFESCENS DC.

Add to localities of *F. B. I.* :—

ASSAM; Brahmaputra Valley, common, *Simons! Jenkins! Mann!*  
BURMA; Katha, *J. Anderson!* Mingyin Hills, *Prazer!*

##### 4. RHYNCHOSIA AUREA DC.

In the *Flora of British India* this is made to include *R. capitata* DC.; from the field-botanist's point of view this is not entirely necessary as the two plants cannot be confused. The diagnosis between the two forms is as follows :—

Racemes few-flowered, peduncle shorter than the leaves, naked;  
standard striped longitudinally with purple veins ... .. *R. aurea.*

Racemes many-flowered, peduncles longer than the leaves, with a  
slender leafless abortive shoot springing from near the middle;  
standard yellow without purple stripes ... .. *R. capitata.*

It is of little consequence whether we follow De Candolle and Wight and Arnott in treating the two as distinct species, or if we merely treat *R. capitata* as a variety of *R. aurea*. But it will be observed that the name "aurea" is rather more applicable to the plant to which it does not truly belong, than to the other.

##### 6. RHYNCHOSIA SUAVEOLENS DC.

Add to localities of *F. B. I.* :—

UPPER BURMA; Kyaukse, Sagaing, Collen, etc., everywhere common,  
*King's Collectors!*

##### 7. RHYNCHOSIA AVENSIS Benth.

Excellent specimens of this plant have been recently received from Maymyo.

This is said to be the same species as *Atylosia candidans* Kurz, in *Journ. As. Soc. Beng.* xliii. pt. 2. 186. Had such been really the case, the publication of a different MSS. specific name for the plant as a *Rhynchosia* was obviously unnecessary. And as there are some well-meaning but injudicious bibliographers who will hasten, if they read this note, to change the name, it is necessary to protect them against themselves and explain how matters stand.

Dr. Wallich issued two separate plants as *Dolichos candidans* Wall. *Cat.* 5567 and *Cajanus? candidans* Wall. *Cat.* 5576 respectively. These two plants resemble each other in that both have leaves woolly beneath; they differ totally in shape of leaflets. Mr. Kurz has however considered them conspecific and has based his "*Atylosia candidans*" on both. It is true that his description of *A. candidans* must apply mainly to *Cajanus? candidans*, for Mr. Kurz, in disposing of *Dolichos candidans*, ventured to do so although only one specimen was available to him for study and that specimen has neither flowers nor fruit.

By the rule that purists in nomenclature are so desirous of applying with Draconic rigidity it follows that the specific epithet "*candidans*," granted always that both the plants are *Rhynchosias*, must go to *Wall. Cat.* 5567 as the earlier number; *Wall. Cat.* 5576, the plant under discussion, being congeneric with the other but certainly not conspecific, had to receive a new epithet and has therefore been named *R. avensis* by Mr. Bentham. Mr. Kurz, in the Society's *Journal* xlv. pt. 2, 258, has by oversight transposed the citations and has identified *R. avensis* with precisely the plant that Mr. Bentham *did not* designate by that name.

#### 15. RHYNCHOSIA PILOSA *Wall.*

Dr. King's collectors have recently sent this from Sagaen, the locality in which it was originally discovered by Dr. Wallich. The pod is remarkably like the pod of *R. aurea* and the species must be transferred to § *Nomismia*.

#### 20. RHYNCHOSIA BRACTEATA *Benth.*

Add to synonyms of *F. B. I.*:—*Rhynchosia mollissima* *Dalz.* in *Journ. Linn. Soc.* xiii. 186.

The original specimens on which Mr. Dalzell founded his *R. mollissima* are absolutely typical examples of *Dolichos bracteatus* Wall. Dalzell's name is the first that was given to the plant in its proper genus, but there are at least three other plants to which the name *R. mollissima* has been applied; it is therefore better to abandon Dalzell's name and to use Bentham's one, which has the further merit of conserving the oldest specific epithet.

#### 21. RHYNCHOSIA ACUTISSIMA *Thwaites.*

Add to localities of *F. B. I.*:—SIKKIM; Terai at Bamanpokri, *Gamble!* ASSAM; Brahmaputra Valley, *Mann!*

#### 22. RHYNCHOSIA DENSIFLORA *DC.*

Add to localities of *F. B. I.*:—BURMA; Sagaen, *Wallich* 5499 E! *King's Collectors!* Shan Plateau, common everywhere.

### 85. FLEMINGIA ROXB.

#### SUBGEN I. OSTRYODIUM *Desv.*

Mr. Baker has reduced all the forms of this section, except *F. Chappar*, to *F. strobilifera* R. Br.; the impossibility of adopting this course is obvious to those



who know the plants as they grow. The section includes four very distinct and easily recognisable Indian species; no forms connecting one with another have hitherto been found. The following key will enable their separation:—

Erect shrubs 5–10 feet high; (leaves oblong or ovate-lanceolate, acute, rounded at base); bracts  $\frac{3}{4}$ –1 in. long:—

Lateral nerves all subequal 8–10 pairs; bracts 1 in., finely puberulous, usually all obscurely cuspidate (sometimes the highest slightly emarginate) ... .. 1. *F. strobilifera*.

Lateral nerves 4–6 pairs, the basal pair longer, stronger and more oblique than the rest; bracts  $\frac{3}{4}$  in. softly hirsute with long hairs usually all slightly emarginate (sometimes the lowest obscurely cuspidate) ... .. 2. *F. bracteata*.

Low shrubs 1–3 feet high; bracts emarginate  $\frac{3}{8}$ – $\frac{5}{8}$  in. long:—

Leaves ovate subacute or obtuse with subcordate base, bract  $\frac{5}{8}$  in. long, sparsely hirsute on the nerves with long adpressed hairs; habit trailing ... .. 3. *F. fruticulosa*.

Leaves lanceolate with cuneate base; bracts  $\frac{3}{8}$  in. long, softly pubescent with long spreading white hairs ... .. 4. *F. fluminalis*.

1. FLEMINGIA STROBILIFERA *R. Br.*: *Bak.* in *Flor. Brit. Ind.* ii. 227 (as to the typical form only).

This species has never been collected in the Himalayas. The following are the localities from which specimens in Herb. Calcutta have been reported.

SCINDE; *Campbell!* RAJPUTANA; *King!* C. INDIA; *Vicary!* *Jerdon!* *Duthie!* CONCAN; *Stocks!* *Gibson!* DECCAN; *Cooke!* *Balaji Nene!* CARNATIC; *Heyne!* NALAMALLAI HILLS; *Sim!* CEYLON; *Beckett!* CHOTA NAGPUR; *Wood!* *Gamble!* BEHAR; *Ball!* *Hooker!* ASSAM; *Griffith!* *Mann!* *Jenkins!* *Simons!* *Peal!* SILHET; *Wallich!* KHASIA; *Clarke!* JAINEA; *Rita!* NAGA HILLS; *Masters!* *Collett!* LUSHAI; *Prazer!* CHITTAGONG; *Clarke!* *Gamble!* *King's Collector!* CHIN HILLS; *King's Collectors!* YUNNAN; *Anderson!* PEGU; *Kurz!* TENASSERIM; *Falconer!* ANDAMANS; *Man!* *King's Collectors!* NICOBARS; *Jelinek!* *Kurz!* PERAK; *Scortechini!* *Kunstler!* PAHANG; *Ridley!* SINGAPORE; *Hullett!* PENANG; *Wallich!* *Scott!* MALACCA; *Griffith!* SELANGOR; *Ridley's Collector!* JAVA; *Kurz!* *Anderson!* CELEBES; *Barclay!* SIAM; *Schomburgk!* MAURITIUS; introd., (no collector's name)! JAMAICA; introd., *Lane!*

1b. FLEMINGIA BRACTEATA *Wight, Ic.* t. 268. *F. strobilifera* var. *bracteata* *Bak.* in *Flor. Brit. Ind.* ii. 227.

The following are the localities from which specimens of this species have been reported to Herb. Calcutta; it is by no means confined to the Eastern Himalaya and Burma; not a single Himalayan specimen has been sent from so high up as 1000 feet though it occurs all along the foot of the hills from the Kamaon Bhabar to the Eastern Duars.

NILGHIRIS; *Wight!* CONCAN; *Ritchie!* CANARA; *Talbot!* C. INDIA;

*R. Thompson!* Duthie! OUDH; *R. Thompson!* CHOTA NAGPUR; *Clarke!* Gumble! BEHAR; *T. Thomson!* *Clarke!* GARHWAL; Bhabar, *King!* KAMAON; Terai, *King!* NEPAL; Terai, *Scully!* *Hieronymus!* SIKKIM; Terai, *Kurz!* *Clarke!* BOOTAN; Duars, *Simons!* UPPER BURMA; *Anderson!* *King's Collectors!* PEGU; *McLelland!* *Brandis!* *Kurz!* YUNNAN; *Anderson!* SHAN HILLS; *Fulton!* TENASSERIM; *Gallatly!*

1c. *FLEMINGIA FRUTICULOSA* Wall.

The following are the localities for this species so far as is known; as will be seen it is not confined to the Central Himalaya.

N.-W. HIMALAYA; Simla, dry spots in sunny woods, 7000 feet, *Griffith!* *J. Anderson!* near Simla at 5000 ft., *Gamble!* Dalhousie, *Clarke* n. 33! *Clarke* n. 22076! Mattiana, 5000 feet, *Brandis!* Garhwal, near Owra, 6-7000 feet, *Duthie!* Kamaon, *King!* A specimen of this collected by Dr. T. Thomson, but with no precise locality, has been issued in *Herb. Ind. Or.* as *F. strobilifera* and has been noted as occurring at 1000 feet; no other botanist has met with the plant so low down. CENTL. HIMALAYA; Nepal, *Wallich* n. 5754!

1d. *FLEMINGIA PLUMINALIS* C. B. *Clarke* MSS.; leaves narrowly lanceolate, base cuneate; bracts subsecundly disposed, softly pubescent emarginate.

CHITTAGONG; Demagri, *Clarke* n. 19777! Burkul, *Lister* n. 117! BURMA; Hukong Valley, *Griffith* n. 1675! Pegu, *Kurz* n. 2524! Shan Plateau at Makhoye, *King's Collector!*

A small shrub 1-3 feet high; branches slender fluted, twiggy, velvety. *Leaves* subcoriaceous 2.5 in. long, .6 in. wide, green, adpressed-pubescent, above sparsely beneath densely; lateral nerves very oblique about 8 pairs, stipules scarious linear .3 in. long. *Racemes* 2-4 in. long; bracts erecto-patent, short-petioled, cordate, .4 in. long, all faintly emarginate. *Calyx* .2 in., finely pilose; teeth lanceolate exceeding the tube. *Corolla* pale, little exserted.

A very distinct form, evidently quite entitled to specific rank.

2. *FLEMINGIA CHAPPAR* Ham.

This species is quite common immediately to the south of Behar; it has been collected at Sambalpur by Griffith and in Ganjam by Gamble.

3. *FLEMINGIA PANICULATA* Wall.

This species is quite common in Upper Burma and has recently been repeatedly sent from the Chindwin Valley, from the Ruby Mines district, and from the Shan Plateau.

4. *FLEMINGIA LINEATA* Roxb.

VAR. *glutinosa* var. nov.; leaflets larger acute, flowers rather larger, all parts closely beset with sticky glandular hairs.

BURMA; S. Shan States at Taungyi, *King's Collector!* TENASSERIM; on Taepo, 5000 feet, *Gallatly!*

This will probably require to be recognised at some future time as specifically distinct.

5b. *FLEMINGIA PRÆCOX* C. B. Clarke MSS.; branches terete, leaflets thin large acuminate glabrous, bracts linear firm hardly exceeding the buds, calyx-tube ribbed glabrescent, teeth thinly silky.

CHITTAGONG; Clarke 19916! CENTL. PROVINCES; Chanda, *Duthia* 9408!

A tall shrub; woody subtriquetrous stems quite glabrous. *Stipules* medium; scariose, soon falling; petiole 3-4 in., triquetrous, deeply sulcate, slightly winged, leaflets subcoriaceous, 4-10 in. long, oblong narrowed to both ends, glabrous on both surfaces except for the faintly puberulous prominent midrib and 12-24 pairs of parallel oblique lateral veins beneath. *Racemes* dense, narrowly cylindric, 2-3 in. long, bracts overlapping, rigidly scariose, the longest only .25 in. long, margins silky otherwise glabrous; pedicels very short. *Calyx* .25 in., teeth linear, the lowest twice as long as the rest. *Corolla* as long as the lowest calyx-tooth.

A very distinct species, nearest to *F. stricta* and with similar foliage, but with totally different bracts.

#### 6. *FLEMINGIA GRAHAMIANA* W. & A.

Add to localities of *F. B. I.*:—BURMA; Shan Hills at Taungyi, Collett! Makhoye, etc., King's Collectors!

This is the plant alluded to under *Flemingia congesta* by Sir H. Collett and Mr. Hemsley (*Journ. Linn. Soc.* xxviii.) as a variety with clustered racemes.

#### 7. *FLEMINGIA CONGESTA* Roxb.

This name in the *Flora of British India* is made to include a number of distinct and quite unmistakable species. Some of these are treated as distinct varieties, others are simply merged in the type or in or other of these varieties. The following key may assist in distinguishing the plants themselves.

Erect woody undershrubs with rather tall stems:—

Racemes condensed shorter than the petioles:—

Calyx teeth longer than the tube, leaves green beneath:—

Bracts and calyx sparsely grey-silky ... .. *F. congesta.*

Bracts and calyx adpressed tawny-pubescent ... .. *F. prostrata.*

Calyx teeth shorter than the tube, leaves rusty beneath, the flowers very small ... ..

... .. *F. ferruginea.*

Racemes elongated exceeding the petioles:—

Leaves densely uniformly rusty-tomentose beneath, petioles not winged... ..

... .. *F. Wightiana.*

Leaves pubescent only on the nerves beneath, petioles slightly winged:—

Bracts and calyx densely brown-silky, leaves reddish beneath, racemes not so long as leaves ... ..

... .. *F. latifolia.*

Bracts and calyx sparsely grey-silky, racemes rather lax as long as the leaves ... ..

... .. *F. semialata.*

Low shrubs with a woody subteranean stem:—

Bracts and calyx glabrous or with short close pubescence ... ..

... .. *F. nana.*

Bracts and calyx with long silky pubescence ... ..

... .. *F. sericans.*

[The last species given in the key is united by Mr. Baker with *F. Wallichii* and not with *F. congesta.*]

The synonyms and distribution of these different species are as follows:—

7a. *FLEMINGIA CONGESTA* Roxb. *Hort. Beng.* 56; *Flor. Ind.* iii. 340; *DC. Prodr.* ii. 351; *W. & A. Prodr.* 241; *Wight, Ic.* t. 390; *Dalz. & Gibs. Bomb. Fl.* 75; *Wall. Cat.* 5747 (for the most part); *Miq. Flor. Ind. Bat.* i. 164; *Bak. in Flor. Brit. Ind.* ii. 228 (excl. syn. *F. angustifolia* Roxb. and all the varieties); *Kurz in Journ. As. Soc. Beng.* xlv. 2. 260. *Crotalaria macrophylla* Willd. *Sp. Pl.* iii. 982. *Rhynchosia crotalarioides* DC. *Prodr.* ii. 387.

Of this there are two very distinct varieties:—

VAR. *a. typica*; petioles not winged, leaves dark-green. (To this variety belong all the synonyms cited above).

Common everywhere throughout India, British Indo-China and the Malay Peninsula. Owing to this having been first described as *Crotalaria macrophylla*, Dr. O. Kuntze has taken the opportunity of employing the name "*F. macrophylla* Kuntze," with what precise significance he has failed to make clear.

VAR. *β. viridis*; petioles distinctly winged, leaves thinner and pale-green. *Flemingia semialata* Wall. *Cat.* 5746 D. (not at all of Roxb.) *F. semialata* VAR. *viridis* Kurz in *Journ. As. Soc. Beng.* xlv. 2. 261.

CONCAN; Stocks! Gibson! Vingorla, T. Cooke! BEHAR; Bettiah, Hieronymus! BURMA; Prome, Wallich 5746 D! Rangoon, Cleghorn! Pegu, Kurz! Brandis! Shan Hills, common, King's Collectors! TENASSERIM; Migatoom, Gallatly!

This variety, though very widespread in Burma, seems to be rare in India.

7b. *FLEMINGIA PROSTRATA* Roxb. *Flor. Ind.* iii. 338; *Benth. in Pl. Jungh.* 245; *Kurz in Journ. As. Soc. Beng.* xlv. 2. 260. *F. angustifolia* Roxb. *Flor. Ind.* iii. 341. *F. congesta* Bak. (in part) and *F. congesta* VAR. *semialata* Bak. (in part) loc. cit., but not at all either *F. congesta* or *F. semialata* of Roxb.

HARDWAR; Hardwicke. NORTH BENGAL; Titalya, Kurz! EAST BENGAL; Mymensingh, Clarke 7830! Comilla, Clarke 14228! ASSAM; Sadiya, G. Gammie! KHASIA; Hooker and Thomson! G. Mann! Clarke 18667! 38916! 40327! BURMA; Shan Hills, Collett 411! Martaban, Kurz! DISTRIB. China (Hupeh, Henry n. 1640).

The Comilla, the Sadiya, the Burmese, and some of the Khasia specimens accord well with the description given by Roxburgh of *F. prostrata*, which was not described by him from Indian specimens but from plants raised from Chinese seeds; the remainder either accord with *F. angustifolia* or serve to connect the two plants.

7c. *FLEMINGIA FERRUGINEA* Grah. in Wall. *Cat.* 5750; *Benth. in Pl. Jungh.* 245; *Kurz in Journ. As. Soc. Beng.* xlv. 2. 260. *F. congesta* VAR. *Wightiana* Bak. in *Flor. Brit. Ind.* ii. 229 in part, not *F. Wightiana* Grah.

BURMA; Pegu and Shan Hills, very common.

This is the most easily separated of all the "Congesta" group, owing to the extreme smallness of its flowers. The form with which it might most easily be confused is *F. congesta* VAR. *viridis*; in this case, however, besides the smaller flowers, the red colour of the leaves beneath at once effects a diagnosis.

7d. FLEMINGIA WIGHTIANA *Grah.* in *Wall. Cat.* 5751; *W. & A. Prodr.* 242. *F. congesta* VAR. *Wightiana* *Bak.* in *Flor. Brit. Ind.* ii. 229 (*excl. syn. F. ferruginea Grah.*)

NILGHIRIS; *Wight!*

Almost as easily separated as the preceding, in this case owing to the soft uniform pubescence on the leaflets beneath. It might most readily be mistaken for *F. Grahamiana* but its leaves are more densely pubescent and its bracts are not at all rigid.

7e. FLEMINGIA LATIFOLIA *Benth.* in *Pl. Jungh.* 246; *Miq. Flor. Ind. Bat.* i. 163. *F. congesta* VAR. *latifolia* *Bak.* in *Flor. Brit. Ind.* ii. 229.

Of this very distinct species there are two marked varieties:—

VAR. *α. typica*; bracts not broader than calyx, racemes more lax. *F. latifolia* VAR. *genuina* *Kurz* in *Journ. As. Soc. Beng.* xlv. 2. 261.

KHASIA; *Hooker and Thomson!* NAGA HILLS; *Masters!* BURMA; *Maymyo, King's Collector!* DISTRIB. JAVA.

This most resembles *F. congesta*, but its bracts are broader, its racemes longer, its flowers larger; the bracts and calyx are densely brown-silky, and the leaves beneath have a reddish tinge from the sparse rusty tomentum on the nerves.

VAR. *β. grandiflora* *Kurz loc. cit.*; bracts broader than calyx, racemes dense at first strobilate, flowers larger.

BURMA; Pegu, *Kurz* 1636! Shan Hills, *King's Collector!*

A very distinct variety that it may yet be necessary to raise to specific rank.

7f. FLEMINGIA SEMIALATA *Roxb. Hort. Beng.* 56; *Flor. Ind.* iii. 340; *Don. Prodr.* 242; *W. & A. Prodr.* 241; *Wight, Ic.* t. 326; *Wall. Cat.* 5746 (*mainly, but excluding letters E and G*). *F. congesta* VAR. *semialata* *Bak.* in *Flor. Brit. Ind.* ii. 229 (*excl. syn. F. prostrata Roxb.*)

HIMALAYAS; from Chamba to Bootan. KHASIA, NAGA and MANIPUR Hills. BEHAR; on Parasnath, *Hooker! Thomson! Anderson! Wood!* NILGHIRIS; *Wight!*

This cannot be mistaken for any of the preceding species owing to its long lax racemes; it has not yet been sent to Calcutta from Burma, Malaya or China.

7g. FLEMINGIA NANA *Roxb. Hort. Beng.* 56; *Fl. Ind.* iii. 339; *Wight, Ic.* t. 389. *F. congesta* VAR. *nana* *Bak.* in *Flor. Brit. Ind.* ii. 229 (*as to the foregoing citations only but not at all as to the plant described.*)

CANARA; *Dongi, Talbot* 960! C. INDIA; *Sagor, Jerdon!* BEHAR; *Pachet, Kurz! Manbhumi, V. Bull! Campbell!*

This could only be mistaken for the next species, not by any possibility for any of the preceding; the diagnosis as will be seen from the key is, however, sufficiently easy.

To what plant the *F. B. I.* diagnosis of *VAR. nana* refers it is impossible to ascertain because there is no example of *Wall. Cat.* 5748 A. or of *Wall. Cat.* 5749 at Calcutta. *Wall. Cat.* 5748 B., which is here, is certainly quite distinct specifically from Roxburgh's species.

Wight, *Icones* t. 389, is a black and white reproduction of Dr. Roxburgh's own excellent coloured drawing of this species. And Wight's, *Icones* t. 408, is a similar reproduction of the totally different *F. procumbens* Roxb. which has been redescribed in the *F. B. I.* under the name *F. vestita*.

7h. FLEMINGIA SERICANS Kurz in *Journ. As. Soc. Beng.* xliii. 2. 186; *Goll. & Hems.* in *Journ. Linn. Soc.* xxviii. 50. *F. Wallichii* Bak. in *Flor. Brit. Ind.* ii. 229 in part, not of *W. & A.* *F. nana* *Wall. Cat.* 5748 B: not of *Roxb.*

BURMA; Pegu, Kurz! Prome, Wallich! Shan Hills, Collett!

This is undoubtedly correctly restored to specific rank by Sir H. Collett and Mr. Hemsley. After dissecting flowers of all the Calcutta specimens both of this and of *F. nana* the writer is convinced that the two cannot be united. The nearest ally of *F. sericans* is in reality *F. ferruginea*.

8. FLEMINGIA WALLICHII *W. & A.*

Delete from synonyms of *F. B. I.*, both *F. nana* *Wall.*, and *F. sericans* Kurz.

Delete from localities:—Prome and Martaban.

10. FLEMINGIA PROCUMBENS *Roxb. Hort. Beng.* 56; *Flor. Ind.* iii. 338; *Wight Ic.* t. 408. *F. vestita* *Benth. ex Bak.* in *Flor. Brit. Ind.* ii. 230. *Dolichos vestitus* *Grah.* in *Wall. Cat.* 5545.

Roxburgh's original coloured drawing of *F. procumbens*, of which Wight's quoted figure is but a rough copy, shows that the species has nothing whatever in common with *F. nana*, but that it is on the contrary an excellent representation of the plant afterwards issued by Wallich as *Dolichos vestitus* and described since, in the *F. B. I.*, as *Flemingia vestita*.

## 86. DALBERGIA LINN. FIL.

[The oldest name for this genus is *Amerimmon* Browne, *Hist. Jamaic.* 288, t. 31, f. 3; this has been pointed out by Sir J. D. Hooker and Mr. Jackson in their *Index Kewensis* and by Dr. O. Kuntze in his *Rev. Gen. Pl.* i. 158.]

2. DALBERGIA LATIFOLIA *Roxb.*

It is singular that no one since the end of last century has found in the Andaman group *Dalbergia emarginata* *Roxb.* which both Mr. Bentham and Mr. Baker declare to be identical with the same author's *D. latifolia*. Perhaps it occurs in the little explored Northern Island where at one time a settlement existed, but which no one visits now.

*Dalbergia sissoides* Grah., treated in the *F. B. I.* as a variety of *D. latifolia*, is apparently a distinct species, differing in flowers as well as in leaves. Mr. Baker further suggests that *D. javanica* Miq. may be same as *D. sissoides*; it differs somewhat in the greater persistence of the obovate bracteoles that embrace the bud. But specimens that Messrs. Koorders and Valetton have recently issued, and others kindly sent from Java by Dr. Treub, show that Mr. Baker is perhaps justified in reducing *D. javanica* to *D. latifolia*.

### 3. DALBERGIA OVATA Grah.

Mr. Kurz keeps *D. glauca* separate from *D. ovata* as a species; in this he is perhaps right. *D. glauca* is the plant described in the *F. B. I.* as *D. ovata* var. *obtusifolia*.

### 4. DALBERGIA PSEUDO-SISSOO Miq.

Add to localities of *F. B. I.*:—MALAY PENINSULA; very common everywhere. DISTRIB. Borneo.

This is really, as Mr. Baker suggests, the same as *D. pseudo-sissoo* Miq. and Dr. Miquel's name, being the earlier, is the one that must be used for the species. For material of Dr. Miquel's species as well as for notes and drawings from all the types preserved in the Leyden Herbarium the writer is indebted to the great kindness of Mr. Suringar, who has also proved that *D. Sissoo* Miq. is not *D. Sissoo* Roxb. but is simply another form of the present species.

4b. DALBERGIA HULLETTII Prain, *Journ. As. Soc. Beng.* lxvi. 2. 119; a small tree, leafless when flowering; flowers in short clustered racemes emerging from tufts of small rusty-pubescent triangular bracts in axils of fallen leaves, lowest pedicels longer than the rest all rusty-pubescent as are the peduncles, petal-claws as long as calyx, pod unknown. Amerimnou *Hullettii* Prain MSS.

SINGAPORE; *Hullett*!

Branches glabrous rugose black, numerous blackish rugose rusty-puberulous branchlets densely covered with numerous clusters of racemes 1-1.5 in. long, laxly rusty-pubescent. Lowest pedicels .3 in. long; bracteoles at base of calyx subulate very small. Calyx campanulate, densely rusty-tomentose,  $\frac{1}{2}$  in. long. Corolla 2-3 times as long as calyx, blade of standard orbicular. Stamens 9, rarely 10, monadelphous. Ovary glabrous with densely pubescent stalk, ovule solitary.

The pod being unknown this may prove a *Sissoa* near *D. pseudo-sissoo* or a *Selenolobium* near *D. monosperma*, the probability being however that it is a *Sissoa*. The nearest ally is an apparently undescribed species from Borneo (*Haviland* n. 2894) which has exactly the inflorescence of *Hullett's* plant and has flowers that only differ in having the ovary as well as its stipe densely woolly. The Borneo plant (which, by agreement with Mr. Haviland, cannot be described in *Herb. Calcutta*) has leaves with either solitary or trifoliolate leaflets, when trifoliolate the lateral leaflets are subopposed.

### 7. DALBERGIA RUBIGINOSA Roxb.

Roxburgh says that this has ten stamens; Wight and Arnott say that usually they have found only nine; Bentham, too, says there are only nine. The writer has examined very many flowers and has never found fewer than ten, in one bundle;

Wight and Arnott and Bentham could hardly, however, be mistaken and, at least sometimes, there must be nine.

In the *F. B. I.* it is said of this that it has the habit of *D. monosperma* but that it is readily known by its stamens and ovary. By its ovary it is usually easily known since here there are almost always more than the solitary ovule which marks *D. monosperma*. What exactly is meant by the difference as to the stamens of the two species is not very clear. The *F. B. I.* does not say, with Roxburgh, that there are 10 or, with Bentham, that there are 9 in *D. rubiginosa*. As regards *D. monosperma* however, it says there are two bundles of 5 each, which is never the case in that species. Except that in *D. rubiginosa* the sheath has apparently usually 10, and in *D. monosperma* only 9 filaments there is no difference between the two. They differ, however, decidedly as to leaves, the secondary nerves being more numerous in *D. rubiginosa*, and as to pods those of *D. rubiginosa* being thin membranous and reticulately veined on the wings as well as opposite the seeds. The plant that Mr. Kurz supposed to be this (*Journ. As. Soc. Beng.* xlv. pt. 281) is *D. confertiflora*.

7b. *DALBERGIA GARDNERIANA* Benth. *Journ. Linn. Soc.* iv. *Suppl.* 43.

This was supposed by Gardner to be only a form of *D. rubiginosa* of which it has exactly the pods and the flowers, though the calyx is more woolly, and the leaflets which are of a different shape, are densely rusty underneath; Mr. Bentham has very justly given the species a separate place. Mr. Baker, on the other hand, reduces it to *D. congesta*; the following diagnosis between the two species will indicate their distinctness.

Leaves rounded or obtuse, glabrous and strongly closely reticulate above, densely woolly beneath; calyx woolly; pod thin reticulate everywhere	...	...	...	...	<i>D. Gardneriana.</i>
Leaves retuse or emarginate finely sparingly puberulous on both surfaces, calyx glabrous, pod thick, faintly reticulate opposite seeds, elsewhere smooth	...	...	...	...	<i>D. congesta.</i>

10. *DALBERGIA JUNGHUHNII* Benth.

VAR. *typica*; leaflets 7–9, oblong, glabrous or slightly puberulous.

PENANG; 500 feet, *Curtis!* SINGAPORE; *Hullett!* MALACCA; *Maingay* 547! *Goodenough* 1383!

VAR. *Scortechinii* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 115; leaflets 11–15, elliptic, more closely puberulous, as is the inflorescence.

MALACCA; *Maingay* 549! *Scortechinii* 1830! SINGAPORE; *Ridley* 6406!

DISTRIB. Borneo.

Unfortunately neither Griffith's Malacca plant nor Junghuhn's Sumatra one—the two on which Mr. Bentham founded the species—are at Calcutta. The typical variety, as here distinguished, includes all the specimens at Calcutta issued from Herb. Kew. as *D. Junghuhnii*; the plant separated as VAR. *Scortechinii* has either been distributed unnamed or has been marked variously “near *D. Junghuhnii*” and “near *D. sympathetica*.” It has the flowers of *D. Junghuhnii* exactly, and thus differs from *D. sympathetica* in having rather shorter petals. Its leaflets differ equally from those of *D. Junghuhnii* (as represented by Curtis' Penang plant) and those of *D. sympathetica*; considering how closely the species of *Dalbergia* approach each other it may be necessary at some future time to treat *Dalbergia Scortechinii* as specifically distinct. Its pods are, however, at present unknown, and it is more convenient therefore to subordinate it in the meantime to *D. Junghuhnii*.



The question has been raised whether this is the lost *D. parviflora* Roxb. The larger number of leaflets seems to the writer to be a fatal objection. This objection does not perhaps, apply so strongly to typical *D. Junghuhnii*, but there is another strong objection in the shape of the pods, which are described as falcate in *D. parviflora*; this character makes it certain, in the writer's opinion, that, in spite of the great authority of Mr. Benthams and Mr. Baker, the lost *D. parviflora* is to be sought for in the section *Selenobium* Bth. (the genus *Drepanocarpus* E. Mey.) and not in the section *Sissoa* at all. To the objection that *D. parviflora* has monadelphous stamens whereas the *F. B. I.* defines the section *Selenobium* as having the stamens in two bundles of 5 each, it may be answered that this definition is due to an oversight and does not accord with reality, for *D. torta* (*D. monosperma*), which is the type of the section, has, as Mr. Benthams quite correctly says, only monadelphous stamens.

11. DALBERGIA CONFERTIFLORA *Benth.* *D. rubiginosa* Kurz, *Journ. As. Soc. Beng.* xlv. pt. 2. 281 not of Roxb.

Add to localities of *F. B. I.*:—CHITTAGONG; *Lister! King's Collector!* BURMA; *Kurz!* ANDAMANS; very common.

The writer has seen no specimen from Oudh. There are in Herb. Calcutta two from the Concan that profess to belong to this species; one comes from *Herb. Ind. Or. H. f. & T.* the other from *Herb. Dalzell.* Both are *D. volubilis*.

12. DALBERGIA VELUTINA *Benth.*

VAR. *Maingayi* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 117; leaves ultimately glabrescent beneath, twigs almost black.

MERGUI; *Griffith!* MALACCA; *Maingay!* SINGAPORE; *Ridley!*

12b. DALBERGIA COLLETTII *Prain*; a tree, leaflets 9–15, ovate with rounded tip or ovate-lanceolate with blunt tip, puberulous above, pubescent beneath, flowers minute in ample terminal panicles with rather lax cymose branches, pedicels and petal-claws very short, pod lanceolate 1–2-seeded with very long stalk and long narrow tapering point. *Dalbergia* sp. *Coll. & Hemsl. Journ. Linn. Soc.* xxviii. 50. *Amerimoon Collettii Prain MSS.*

BURMA; Shan Hills at 4000–5000 ft.; Ywangen, *Collett 723!* Lwekay, *King's Collectors!*

A tree 25–30 feet high, branches grey-downy. Leaves grey-puberulous above, persistently rather densely pubescent beneath, leaflets 1.25–2 in. long, .5–1 in. wide, rather firm, reticulately veined, stipules small. Panicles short-peduncled, peduncles and branches densely pubescent, 1.5 in. long, 1 in. broad, the ultimate branchlets forming scorpioid cymes. Calyx pubescent  $\frac{1}{2}$  in.; teeth short-triangular. Corolla  $\frac{1}{2}$  in. Pod firm, reticulate-veined, 2–3 in. long, .5 in. wide, 1–2-seeded, stalk  $\frac{1}{2}$  in. long, point narrowed to an acute tip.

A very distinct species with flowers as in *D. Junghuhnii*, fruits rather like those of *D. lanceolaria*, and leaves a little like those of *D. velutina* with which Sir H. Collett and Mr. Hemsley have compared it. It has, however, very much smaller and very different flowers and stipules. The collectors of the Calcutta Herbarium have recently brought in an abundant supply of fruiting specimens so that a description of the species can now be given. The specimen in young fruit mentioned

by Collett and Hemsley as possibly the same has larger flowers, and proves on examination to be a *Dalbergaria* not a *Sissoa*. Its foliage is, indeed, remarkably like that of *D. Collettii*, but its leaflets are fewer and the tomentum is rusty not grey.

13. *DALBERGIA MELANOXYLON* Guill. & Perr., *Fl. Senegal*, 227, t. 53. (*D. Stocksii* Benth.).

This is more often planted than wild in the Concan and Canara; it goes there, according to a note in the Herbarium of Mr. Talbot, which has been kindly lent for study by its owner, under the name of "Chinese Blackwood." Mr. Bentham has described the stamens of *D. Melanoxylon* as being 10 in number and isadelphous, *i.e.*, in 2 bundles of 5 each. But he quotes the species described and figured by Guillemin and Perrottet, *loc. cit.*, as the plant he intends, in spite of these authors having described as either 9- or 10-stamened, the stamens being monadelphous with the central (vexillary) one rather longer than the others and rather more separated at the top from the lateral groups than the members of these groups are from each other; the figure, too, that Mr. Bentham cites, instead of showing 10 stamens in 2 bundles shows 9 in one bundle, the central one longer than the rest and according in other respects with the description. The description and figure referred to agree absolutely with the characters of Mr. Bentham's *D. Stocksii*, our present plant; after analysing flowers from every example, whether African or Indian, in Herb. Calcutta, the writer is convinced that whatever *D. Melanoxylon* Benth. (*Journ. Linn. Soc. iv. Suppl. 47*) may be, the true *D. Melanoxylon* Guill. & Perr. and *D. Stocksii* Bth. are one species.

14. *DALBERGIA SYMPATHETICA* Nimmo.

In the Calcutta Herbarium, *Wall. Cat.* 5848B. (from *Herb. Heyne*) is also this species.

14b. *DALBERGIA SUBSYMPATHETICA* Prain, *Journ. As. Soc. Beng.* lvi. 2. 116; scandent, leaflets 9-15, oblong truncate, thinly grey-pubescent beneath, flowers in small axillary panicles with dense corymbose branches, pod thin greenish oblong, 1-2-seeded not veined opposite the seeds, distinctly stalked. *Amerimnon subsympatheticum* Prain MSS.

PENANG; *Curtis!* PERAK, very common. SINGAPORE; *Hullett!*

*Branches* often twisted, the young ones finely grey-downy. *Leaves* 1.5-3 in. long; leaflets moderately firm; thinly adpressed-pubescent beneath. *Panicles* distinctly peduncled with finely pubescent ascending curved branches, the ultimate branchlets secund. *Calyx*  $\frac{1}{2}$  in., pubescent, with 2 small obtuse bracteoles at base, teeth short obtuse except the lowest lanceolate. *Corolla* twice the calyx, petal-claws short, standard narrow, white. *Stamens* 9 monadelphous. *Ovary* glabrous except along the lower suture. *Pod* thin membranous greenish glabrous, 2.5 in. long, 1 in. wide, 1-seeded, slightly cuneate at base and distinctly stalked.

Very nearly related to *D. Junghuhuii* and only differing by its much smaller leaflets and rather longer flowers which are arranged in smaller more numerous panicles. Also exceedingly like *D. sympathetica* from which it differs in its glabrous ovary, distinctly stalked pods and usually fewer leaflets not silky beneath.

14c. *DALBERGIA MILLETTI* Benth. *Journ. Linn. Soc. iv. Suppl.* 34; scandent, leaflets 25-35, glabrous, crowded, linear-oblong obtuse or

retuse, flowers in distinctly peduncled axillary cymes with glabrous or minutely puberulous branches, pedicels very short, petal-claws shorter than calyx, ovary pilose, pod ovate-oblong, 1-seeded, indurated and rugose opposite the seed. *D. tamarindifolia* Roxb. *Flor. Ind.* iii. 233 *in part*; *Wight Ic.* t. 242 (*as to the fruit*). *D. polyphylla* Benth. *Pl. Jungh.* 256, *in part*. *Derris pinnata* Lour. *Fl. Cochinch.* 432 (*possibly*).

KHASIA; 2-4000 feet, *G. Mann*! at Shampung, *Collett*! at Maoksan-dram, *Clarke*! DISTRIB. China.

Branches sparsely clothed with fine brown pubescence. *Leaves* 3-6 in. long, leaflets a little like those of *D. tamarindifolia*, but usually rather shorter and always narrower besides differing in not being oblique. *Cymes* 1-2 in. long, slender. *Flowers* small hardly  $\frac{1}{8}$  in. long. *Pod* 1.5-2 in. long,  $\frac{3}{8}$  in. wide, "swelled, scabrous, where the single seed is lodged" (*Roxburgh*).

*Mr. Kurz* has already pointed out in the *Society's Journal* (vol. xlv. pt. 2, p. 281) that there is something seriously amiss in the identification of *D. rufa* Grah. and *D. multijuga* Grah. with *D. tamarindifolia* Roxb. That the flowers and foliage of *D. tamarindifolia*, as described by *Roxburgh* and as figured by him in the plate subsequently published in *Wight's Icones* t. 242, are those of *D. rufa* and of *D. multijuga* is certainly true. But the fruit described and figured by *Roxburgh* is, as *Kurz* was the first to remark, widely different. *Mr. Kurz* was apparently inclined to suppose that the Assam (or Sylhet) plant described by *Roxburgh* might have different fruit from that of the Burmese one. This supposition was only natural since a mixture of flowers of one species with fruit of another is an accident of which, such was his care and accuracy, there is hardly an instance in the whole of *Roxburgh's* work. The present is, however, such an instance. There are now at Calcutta examples of the pods of *D. tamarindifolia* from every locality between the Himalayas and the Malaya Archipelago and they never differ in any respect. Moreover, since *Mr. Kurz* wrote, both *Mr. Mann* and *Genl. Collett* have collected in the Khasia hills a plant that has a pod which accords exactly with *Roxburgh's* description and figure; this plant proves an analysis to be in all respects the same as the Chinese *D. Milletti*. *Mr. Clarke* too has collected specimens with the same pods; his plant only differs from *Mann's* and *Collett's* in having leaflets rather broader in proportion to their length. The figured pod in *Wight's* plate is, as in the original coloured drawing, shown detached. Probably what happened was that *Roxburgh's* living plants of *D. tamarindifolia* did not produce fruits in the Calcutta garden, and that one of the fruits sent by a correspondent from Silhet as those of *Ketee*, which is the vernacular name that *Roxburgh* quotes for *D. tamarindifolia*, was drawn along-side the figure made from a living plant. But the fruit so figured, instead of belonging to *D. tamarindifolia*, was that of the similar, but still very different, species just described.

It has been usual to quote *Derris pinnata* Lour. as the equivalent of *D. tamarindifolia*. The latest author to do this is *Dr. Kuntze* (*Rev. Gen. Pl.* i. 159) and on this assumption, for it is no more, he uses the specific name first used by *Loureiro* instead of that used by *Roxburgh*. This is but another instance of bibliographic alteration of name without reference to authentic specimens. *Loureiro's* plant had glabrous leaflets and therefore, unless it was misdescribed by *Loureiro*, an assumption that no one has the slightest right to make, it cannot be *D. tamarindifolia*. That it may be *D. Milletti* is not impossible, but so far no one has given such an account of the

root as might enable one to decide. The rediscovery of Loureiro's plant in Cochin China ought to be easy, but till it takes place the writer prefers to let *Derris pinnata* remain a doubtful species.\*

15. *DALBERGIA TAMARINDIFOLIA* Roxb. *Hort. Beng.* 53.

This species is very common in the Andamans, in addition to the localities mentioned in the *F. B. I.*; it occurs even on outlying members of the group like Barren Island. The description in *Roxb. Flor. Ind.* iii. 233, as to leaves and flowers applies to this species; as to fruit it applies to *D. Milletti*.

15b. *DALBERGIA BURMANICA* Prain; a tree; leaflets 7-9, oblong-obtuse glabrous, flowers in congested sessile axillary panicles with corymbose branches, pedicels short, petal-claws as long as the calyx, pod unknown. *Amerimnon burmanicum* Prain *MSS.*

BURMA; Ruby Mines district, *King's Collectors!*

A tree 25 feet high or higher, young branches and leaves finely puberulous, soon glabrous. *Leaves* 4 in. long, leaflets moderately firm, 1.5-2 in. long, stipules small soon deciduous. *Panicles* sessile 1-2 in. long, the branches densely brown-pubescent; pedicels shorter than the calyx, the bracteoles at its base narrow lanceolate. *Calyx*  $\frac{1}{2}$  in., pubescent, teeth short obtuse. *Corolla* purple, 2-3 times the length of calyx, blade of standard oblong. *Stamens* 9 monadelphous. *Ovules* 1-2.

A very distinct species with leaflets like those of *D. velutina* but glabrous and less numerous, and with small not large stipules; combined with this we have an inflorescence exactly like that of *D. tamarindifolia* and flowers only distinguishable

\* In connection with this genus Kuntze allows his desire for "pure priority" to carry him away so completely that he would use the name *D. ferruginea* (Roxb. *Fl. Ind.* iii. 228) in place of *D. stipulacea* (Roxb. *Fl. Ind.* iii. 233), because it is given on an earlier page. *D. stipulacea* Roxb. being submerged, he is able to resuscitate the otherwise inadmissible *D. stipulata* (Wall. *Cat.* 5868) and to employ it instead of *D. velutina* (Benth. *Pl. Jungh.* 255) a name proposed by Bentham in order to obviate the trouble of having a "*stipulacea*" and a "*stipulata*" in the same genus. As Kuntze is at the same time replacing the name *Dalbergia* by the older but quite unfamiliar one *Amerimnon*, he thus affords himself an opportunity of upsetting all the old synonymy; *Dalbergia stipulacea* becomes *Amerimnon ferrugineum* Kuntze; our *D. velutina* becomes *A. stipulatum* Kuntze; our *D. tamarindifolia* becomes *A. pinnatum* Kuntze. Even if this were final it would be, in the writer's humble opinion, bibliography gone mad. But the worst of it is that it is anything but final. Kuntze's want of care in comparing the account that Loureiro gives of *Derris pinnata* has made him assume the responsibility of the name *Amerimnon pinnatum* as designating *Dalbergia tamarindifolia*. As *Derris pinnata* cannot, unless Loureiro blundered in his description—and this Kuntze has no right to assume—be *Dalbergia tamarindifolia* at all, Kuntze's name must be altered by the next bibliographic purist. More extraordinary still our bibliographer errs in his own particular province. The names *D. stipulacea* and *D. ferruginea* were not first published on pages 233 and 228 respectively of the third volume of Roxburgh's *Flora Indica*. They were issued first in the *Hortus Bengalensis*, *D. stipulacea* being published on p. 53 and *D. ferruginea* not till p. 98 of that work. So that after all, by Kuntze's own "rules," *D. stipulacea* is the prior name and the next "bibliographer" is recommended the happy task of undoing Kuntze's alterations.

from those of *D. tamarindifolia* in being purple, not white, and in having narrower and rather longer bracteoles under the calyx. From both *D. velutina* and *D. tamarindifolia* it differs in being a tree. Also like *D. lanceolaria* its leaves only begin to appear after flowering has commenced. The pod being unknown this may be a *Selenolobium*; more probably, however, it is a *Sissoa*.

17. *DALBERGIA PURPUREA* Wall.

Add to synonyms of *F. B. I.*:—*D. paniculata* Kurz, *Journ. As. Soc. Beng.* xlv. pt. 2. 279 and *For. Flor. Brit. Burm.* i. 345.

This, as Mr. Bentham and Mr. Baker have pointed out, is very nearly related to *D. lanceolaria*. Mr. Bentham in describing the plant suggests that it may be a climber; Mr. Baker in his description omits the doubt and speaks of it as scandent. It is, however, the tree known as *Tabou-ben* or *Ta-pouk-ben* in Pegu. The species is based on Wall. *Cat.* 5869, but under this number Dr. Wallich, as in many other instances, has in the hurry of distribution confused two very distinct species; the specimen of Wall. *Cat.* 5869 at Calcutta is the same as Wall. *Cat.* 5859, which is *Dalbergia cana* Grah. The effect of this mistake has been very far-reaching and has led to quite a number of misidentifications in Mr. Kurz's admirable *Forest Flora*, the most authoritative work on Burmese trees.

*D. purpurea* differs, as Mr. Bentham and Mr. Baker point out, from *D. lanceolaria*, of which it seems to be the representative in Burma, in having a calyx with shorter teeth and in having a rather shorter corolla. It differs besides in having no callosity on the standard. It appears further to form no new leaves till flowering is over; in *D. lanceolaria* the new leaves begin to show while flowering is still going on.

18. *DALBERGIA VOLUBILIS* Roxb.

This species is also very common in the Andamans; and all the specimens from the Western Ghats seen by the writer that profess to be *D. confertiflora* prove to be *D. volubilis*.

19. *DALBERGIA ASSAMICA* Benth.

This is, according to Mr. Peal, the tree known in Assam as *Medeloa*. Whether it is in no case a climber is not so clear as one would wish; there seems no foundation for the statement that it occurs in Kamaon. It is the Assamese representative of *D. lanceolaria* just as *D. purpurea* is the Burmese representative of that species.

20. *DALBERGIA PANICULATA* Roxb.

Add to synonyms of *F. B. I.*:—*D. nigrescens* Kurz, *Pegu Rep. App.* A 48 and *App.* B 45; *Journ. As. Soc. Beng.* xlv. pt. 2. 279.

Add to localities of *F. B. I.*:—BURMA; common everywhere from the Hukung Valley (*Griffith* n. 1810!) and Bhamo (*J. Anderson*!) to Pegu (*Kurz*!), the Karen Hills (*Eyre*!) and Shan Hills (*King's Collectors*!)

22. *DALBERGIA HIRCINA* Benth.

Add to synonyms of *F. B. I.*:—*D. robusta* Wall. *Cat.* 5849A (partly). *D. stenocarpa* Kurz, *Journ. As. Soc. Beng.* xlv. pt. 2. 205.

Dr. Wallich has apparently made an usually grave confusion in connection with this species and *D. lanceolaria*. Mr. Baker finds that in London the true *D. hircina* Ham. is represented by Wall. *Cat.* 5871B only, 5871A being *D. lanceolaria*. This is

also the case at Calcutta. But in London Mr. Baker finds that *D. robusta* Wall. (*Cat.* 5849A) is *D. lanceolaria*, whereas at Calcutta it is *D. hircina*. In neither case, however, is it Roxburgh's *D. robusta*; Dr. Roxburgh's species is a *Derris*.

23b. *DALBERGIA HEMSLEYI* Prain; a tree, leaflets 5-7 ovate-obtuse, ferrugineo-pubescent, flowers in peduncled axillary lax few-fl. panicles, pedicels longer than calyx, petal-claws medium, pod 1-3-seeded rather thickened and veined opposite the seeds. *Amerimum Hemsleyi Prain MSS.*

BURMA; Shan Hills, at Fort Stedman, Collett 682! Myingyan, Prazer! Indine, King's Collector!

Branches pedicels and leaves especially on the underside at first densely clothed with dark-brown tomentum. Leaves 4 in. long, leaflets usually 5, 1.5 in. long, .75 in. wide, firm, dull beneath, stipules small deciduous. Panicle about as long as leaves, branches densely brown-pubescent spreading, each 3-4-fl., pedicels .25 in. Calyx  $\frac{1}{2}$  in., lower tooth little exceeding the rest. Corolla twice the calyx. Pod 2.5-4 in. long, .8 in. wide, very like that of *D. lanceolaria*.

A very distinct species compared by Sir H. Collett and Mr. Hemsley with *D. Collettii*, but differing from that species in its larger flowers with 2-adelphous stamens and its rather larger and broader pods, also in its fewer leaflets with rusty-grey pubescence.

#### 24. *DALBERGIA CANA* Grah.

This is described as a climber in the *F. B. I.* Mr. Kurz, who collected specimens that agree absolutely with Wall. *Cat.* 5859, has pointed out that it is a tree. The native name, Mr. Kurz notes on his specimens, is *Toun-kassoh*. The specimen of Wall. *Cat.* 5869 (which ought to be *D. purpurea*) that is preserved in Herb. Calcutta belongs to this species.

24b. *DALBERGIA KURZII* Prain; a tree; leaflets 15-19 abruptly bluntly acuminate, flowers in long axillary panicles with corymbose branchlets, pedicels ebracteate as long as the calyx, calyx-teeth shorter than the tube, pod flat firm oblong-oblancoolate, tapering to a pubescent stalk, elsewhere glabrous, brown, thickened and obscurely veined opposite the seed. *D. purpurea* Kurz, *Journ. As. Soc. Beng.* xlv. pt. 2. 279 (*excl. cit.* Wall. *Cat.* 5869); *For. Flor. Brit. Burm.* i. 344, *not of Wall.*

BURMA; Pegu, Maclelland (n. 8 in *Herb. Ind. Or. H. f. & T.*)! Brandis 1170! Kurz 1780! 1783! 2603! 2608! Kalay Hills, Prazer! Shan Hills, Alpin!

Branches, leaf-rachises and leaves beneath glabrous. Leaves 9-18 in. long, leaflets rigidly subcoriaceous 2-4 in. long, tapering to base, obovate abruptly bluntly acuminate rarely obtuse at tip, veinlets rather raised on lower surfaces. Panicles sparse appearing before the leaves, the branches finely brown-silky. Calyx purple, minutely puberulous, teeth lanceolate-deltoid. Corolla twice the calyx, white or pale-rose. Pod 3-3.5 in. long, 1.25 in. wide.

This plant is the *Thit-poh* of the Burmese, the *Dalbergia purpurea* of all Mr. Kurz's writings. From the description it will be particularly obvious that it is not at all nearly related to *D. lanceolaria* and therefore cannot be the *D. purpurea*

described by Mr. Bentham. The origin of the discrepancy lies in the Wallichian mixture of specimens referred to under *D. purpurea*,—the sheets examined by Mr. Bentham and Mr. Baker exhibiting a plant nearly related to *D. lanceolaria*, whereas the one examined by Mr. Kurz is *D. cana*, a species with flowers so like those of *D. Kurzii* that they are only to be distinguished by their purple instead of white petals. The writer was at first inclined to think indeed that *D. Kurzii* was no more than a variety of *D. cana*, the differences of foliage and especially of fruit appear however to be quite constant. Mr. Kurz seems to have been quite aware, as a reference to his note in *J. A. S. B.* xlv. 2. 279 shows, that Dr. Wallich had here two plants under one number, since he quotes Mr. Bentham's reference to *D. purpurea*, 'in part' only. But obviously, as Mr. Bentham had access to the type specimen of 5869, while Mr. Kurz had no more than a distributed one before him, it was to the plant described by Mr. Bentham and not to his own quite different one that Mr. Kurz should have confined the name *D. purpurea*. But Mr. Kurz had already obscured the issue by identifying the real *D. purpurea* with *D. paniculata*, an identification which led him further into giving a description of the true *D. paniculata* under the name *D. r. grescens*.

### 25. DALBERGIA STIPULACEA Roxb.

Mr. Baker describes this as 'scandent,' Dr. Roxburgh says it is 'shrubby.' Both descriptions are accurate; in open land or along streams it is a shrub or small bushy tree reaching 20 feet or more in height. In the interior of forests it is a fairly strong climber.

25b. DALBERGIA WATTII Clarke, *Journ. Linn. Soc.* xxv. 17. t. 5; a spreading tree; leaflets 9–11, glabrescent lanceolate-acute, flowers in small axillary panicles with racemose branches, pedicels longer than the calyx with conspicuous persistent bracts and bracteoles, calyx-teeth shorter than the tube, pod glabrous short-stalked veined opposite the seed. *Amerimnum Wattii Prain MSS.*

MANIPUR; Meitaphum, 5000 feet, *Watt* 6830! Mayung, 3500 feet, *Clarke* 42034!

*Branches* glabrous. *Leaflets* subopposite 2.5–3 in. long, slightly pilose beneath. *Calyx* puberulous  $\frac{1}{2}$  in. *Corolla* twice as long as calyx, standard orbicular emarginate. *Pod* 2.25 in. long, .75 in. wide, 1-seeded.

A very distinct species closely related to *D. stipulacea* but without the marked thickening of pod opposite the seed and with very acute leaflets that are almost opposite.

25c. DALBERGIA OLIVERI Gamble *MSS.*; a tree; leaflets 10–15, oblong-obtuse emarginate (acute when young) glabrous, flowers in copious spreading terminal panicles with racemose pubescent branches, pedicels about as long as calyx with conspicuous bracts and ultimately deciduous bracteoles, calyx-teeth short, the two uppermost rounded, the rest acute, the lowest longest, all glabrous except the ciliate edges, pod 1–2-seeded narrowed at base into a slender stalk, acute at tip, prominently veined and thickened opposite the seed. *Amerimum Oliveri Gamble MSS.*

UPPER BURMA; Wuntho and Bhamo, *J. W. Oliver!*

*Branches* glabrous; *leaves* 6-8 in. long, leaflets 1-1.5 in. long, .5 in. wide. *Calyx*  $\frac{1}{2}$  in. *Corolla* 3-4 times as long as calyx, standard orbicular, .2 in. broad, wings as long as standard, keel much shorter. *Stamens* in 2 bundles of 5 each. *Ovary* falcate, pubescent below, ending in a curved style. *Pod* 3-4 in. long, .9-1.2 in. broad.

This is the *Tamalan*, a handsome tree with fine dark-red wood used for axe-handles, etc. The description is from a manuscript note by Mr. Gamble, accompanying specimens of the tree sent by him to *Herb. Calcutta* from the Imperial Forest School at Dehra Dun.

25d. DALBERGIA PRAZERI *Prain*; a tree; leaflets 15-17 obtuse, puberulous beneath, flowers in sparse axillary panicles, pedicels longer than the calyx, pod thin glabrous 1-3-seeded not much thickened opposite the seed.

BURMA; Koni, *Prazer!*

*Branches* glabrous. *Leaf-rachis* 6-8 in., leaflets moderately firm obtuse, 1-1.5 in. long, glabrous above, sparsely rusty-pubescent beneath and glaucescent. *Panicles* much shorter than the leaves with only a few lax branches, bracteoles, if any, deciduous. *Calyx* densely pubescent, lowest tooth linear exceeding the others. *Corolla* unknown. *Pod* thin, ovate-acute, 2-4 in. long, .75 in. wide, gradually narrowed into a stalk much longer than calyx.

Evidently exceedingly closely related to *D. stipulacea* from which, except for the sparse pubescence on the leaves beneath and the hirsute calyx it is hardly distinguishable in flower; the pods, however, are totally unlike and this renders the separation of the two forms absolutely necessary.

26. DALBERGIA TORTA *Grah.* in *Wall. Cat.* 5879.

Add to localities of *F. B. I.*:—BENGAL; Sundribans, very common, *Clarke! Heinig!*

This, being a much older name than the name *D. monosperma* Dalz., must be employed for the species.

Mr. Baker has defined § *Selenolobium* as having stamens in two bundles of 5 each thus implying that this is the case here. In *D. torta*, however, the stamens are, as Mr. Bentham has already described them, always monadelphous.

[29. DALBERGIA STENOCARPA *Kurz.*]

This is only *D. hircina* Ham., and must be deleted.

30. DALBERGIA PARVIFLORA *Roxb. Hort. Beng.* 98; scandent, leaflets glabrous 5-9, ovate-lanceolate with obtuse slightly emarginate tips, flowers very small in axillary and terminal panicles with corymbose branches, pedicels very short, pod turgid when young falcate along upper, when ripe convex along both sutures if 1-seeded, and if more than 1-seeded torulose between the seeds. *Flor. Ind.* iii. 225; *Miq. Flor. Ind. Bat.* i. 132; *Benth.* in *Journ. Linn. Soc.* iv. *Suppl.* 33; *Prain, Journ. As. Soc. Beng.* lxvi. 2. 121. *D. Cumingiana* *Benth. Pl. Jungh.* 225; *Journ. Linn. Soc.* iv. *Suppl.* 32; *Miq. Flor. Ind. Bat.* i. 129. *D. Zollingeriana* *Miq. Flor. Ind. Bat.* i. 130. *Drepanocarpus Cumingii* *Kurz, Journ. As. Soc. Beng.* xlv. pt. 2. 282.



ANDAMANS; *Helper* 1808! DINDINGS; *Curtis*! PAHANG; *Ridley*!  
PERAK; very common. DISTRIB. Malay Islands.

*Stem* 30–80 feet long, branches glabrous. *Leaflets* 2–3·5 in. long, '75–1·5 in. wide. *Calyx*  $\frac{1}{2}$  in. campanulate, teeth obtuse, upper two connate, lower three subequal as long as tube. *Corolla* white  $\frac{1}{4}$  in. long, claws of petals short. *Stamens* 10, monadelphous. *Pod* '75–2 in. long, '6 in. wide.

This is one at least of the plants yielding the *Kayu-lakka* of commerce.

31. DALBERGIA MENOEIDES *Prain, Journ. As. Soc. Beng.* lxvi. 2. 120;  
scandent, spineless, leaflets three, acute large, pod flat.

MALAY PENINSULA; Perak, *Scortechini* 1392!

A wide-twining shrub with twisting black branches. *Leaflets* usually 3, ovate-lanceolate, tapering to both ends, dark-green and glabrous above, sparsely adpressed-puberulous beneath, 3–3·5 in. long, 1–1·5 in. wide. *Flowers* very few sessile, clustered at the tips of short puberulous axillary peduncles. *Calyx*  $\frac{1}{2}$  in. campanulate, teeth short subequal obtuse. *Corolla* more than twice as long as calyx. *Stamens* 10, monadelphous. *Pod* greenish semilunar flat glabrous firm, reticulated throughout, upper suture recurved; 1·5 in. long, '75 in. wide, 1-seeded; tip acute stalk rather longer than calyx.

A very distinct species.

32. DALBERGIA KUNSTLERI *Prain, Journ. As. Soc. Beng.* lxvi. 2. 121;  
scandent, spineless, leaflets 7–9 acuminate, coriaceous, glabrous, pod turgid.

MALAY PENINSULA; Perak, *Kunstler*!

An extensive climber 40–150 feet long, with puberulous branches. *Leaflets* dark-green above, dull-grey and when young densely pubescent beneath, elliptic-acuminate, 4–6 in. long, 2 in. wide, with very prominent midrib and secondary veins beneath. *Flowers* in axillary panicles, 4–6 in. long, with puberulous branches. *Calyx*  $\frac{1}{4}$  in., teeth longer than tube. *Corolla*  $\frac{1}{2}$  in., blue; standard orbicular. *Pod* finely puberulous, rigid, much thickened throughout, 1–2-seeded, 1·5–2·5 in. long, '9 in. wide, '3 in. thick, short-stalked, dark-brown, almost black when ripe but with grey lines along the sutures due to rupture of the epicarp.

A fine species very nearly related to *D. reniformis*, of which it has much the pods. These are, however, larger and thicker as also are the leaflets. The pod is quite indehiscent, but as it ripens the skin cracks along both sutures and a "grey seam" (to which *Kunstler* alludes in his field-note) is produced by the exposure of the suberous mesocarp along two lines parallel to each suture. Sometimes the pod consists of but one reniform segment; usually there are two, but the seed in the distal segment rarely matures and the epicarp consequently not giving way, there are usually no "seams" along the sutures of that segment.

## 87. PTEROCARPUS LINN.

1. PTEROCARPUS INDICUS *Willd. Sp. Pl.* iii. 904.

Delete from the synonyms of *F. B. I.*:—*P. dalbergioides Roxb. Flor. Ind.* iii. 236; also, *P. Wallichii W. & A. Prodr.* 267; also *P. indicus Bedd. Fl. Sylvat.* t. 23.

A very strange error has found its way into some of our most authoritative works

on Indian vegetation in the statement that *P. indicus*, even in the sense that makes the species include *P. dalbergioides*, is a native of India. Wight and Arnott, extremely careful and accurate authors, who have not confounded *P. indicus* with *P. dalbergioides*, are at pains, in describing *P. dalbergioides*, to say of it "Our specimens are from the Madras Herbarium and were perhaps from the Missionaries' garden." And Col. Beddome in figuring *P. dalbergioides*, which he does under the belief that he is figuring *P. indicus*, says of it "a very handsome tree said to be indigenous in Southern India, but I have never met with it wild." Even as a cultivated tree, *P. indicus* proper is so rare in India as to be practically unknown. When it is planted it goes as a rule under the name *P. saxatilis*, and is not usually supposed, even by botanists, to be the same as *P. dalbergioides* which has appropriated the name *P. indicus* though it has no special claim to it. The only distributed "Indian" examples of true *P. indicus* (except those grown in the Calcutta garden), that the writer has seen, are from the herbarium of K. S. Naidoo, who was formerly in Dr. Wight's service, and from Dr. Wight's own Herbarium (K. D. 809); curiously, Naidoo has labelled his specimens "Andaman red-wood tree" which is precisely what *P. indicus* is not. The diagnosis between the two trees so often confounded is as follows:—

Leaflets finely-veined throughout, pedicels longer than the calyx, beak of pod distinctly raised above the outer base...	...	<i>P. indicus.</i>
Leaflets with 5-7 pairs of distinctly raised veins beneath, pedicels shorter than the calyx, beak of pod not raised above the outer base ...	... ..	<i>P. dalbergioides.</i>

The distribution of *P. indicus*, as shown by specimens of the plant preserved in Herb. Calcutta is as follows:—

TENASSERIM; Moulmein, *Falconer!* *Brandis!* Amherst, *Falconer!* Tavoy, *King's Collector!* MALAYA; Penang, *Wallich*, 5843 G. (*erroneously named P. dalbergioides!*) Malacca, *Griffith!* *Maingay* 550! Perak, *Kunstler* 1513! 8713! *Scortechini* 503! *Wray* 2003! 2280! Sumatra, *Teysmann!* Java, *Horsfield!* *Koorders and Valetton!*

There are also specimens, from *planted* examples only, from Rangoon, but the tree seems as thoroughly a stranger in Burma, *north of Martaban*, as it is in India. Mr. Kurz does indeed say that it is "very rare along the eastern slopes of the Pegu Yomah;" neither he, nor any one else, has ever communicated any specimens from there.

Some vague opinions have been held regarding this tree, as to points other than its geographical distribution. Thus it has been usual to say that *Pterocarpus flavus* Lour. is probably the same species. It is exceedingly difficult to understand why, for when one consults Loureiro one finds that he bases his species on a picture given by Rumphius of the *Kayu Malapari* of the Malays, the fruit of which Rumphius does not figure, and on another tree of which Loureiro knew the fruit but did not know the flowers. Moreover the description that Rumphius gives of the fruit of his tree does not even remotely agree with the description given by Loureiro. When one takes the trouble to look at Rumphius' figure and to read his description, one finds that his *Malaparius* has *opposite leaflets* and a *wingless pod*, and learns in fact that Rumphius' account of *Malaparius* is an excellent and un-

mistakable description of *Pongamia glabra*, one of the most familiar of trees to those who have collected on the coasts of Burma, the Andamans, or Malaya. *Pterocarpus obtusatus* Miq. has no foundation; it can be manufactured if one is careful to collect only the leaves toward the bases of branches; and *P. Zollingeri* Miq. is only *P. indicus* with its fruits collected at a particular stage of their development.

*P. Wallichii* W. & A., reduced to *P. indicus* by Mr. Bentham and also by Mr. Baker, is based on *Wall. Cat.* 5843D. which is not represented at Calcutta. There is at Calcutta, however, an example of *P. Wallichii*, named by Dr. Wight himself, collected in Western India by Stocks. This plant is not *P. indicus* at all, but comes nearer that variety of *P. Marsupium* (with less obtuse leaves and a broader pod) approaching *P. indicus*, which is mentioned by Mr. Bentham in *Journ. Linn. Soc. iv. Suppl.* 77.

*P. dalbergioides* Roxb. (the Andaman red-wood) is strictly confined, in a wild state, to the Andaman Group. It is now, however, frequently planted in India.

## 2. PTEROCARPUS MACROCARPUS *Kurz.*

It must be by a mere *lapsus calami* that Mr. Kurz has stated in his *Forest Flora* that this is frequent in Martaban and Tenasserim, for neither he nor any other botanist has reported it from Tenasserim, and he has himself only once collected the species in Martaban. The tree is very widely distributed in Burma, where it is known as *Padouk*, a name that has however been applied in Tenasserim to *P. indicus* also, and by Burmese convicts at Port Blair to the Andaman Red-wood (*P. dalbergioides*) as well. The localities, as shown by specimens in *Herb. Calcutta*, are as follows:—

MARTABAN; *Kurz!* PEGU; Tonkyeghat, *Kurz!* Eyre! Brandis! Sir D. Brandis' specimens has been named *P. indicus* by Mr. Kurz and form the basis of his remark (*For. Flora Brit. Burm.* i. 349) that *P. indicus* occurs in Pegu). UPPER BURMA; Karen Hills, Brandis 1159! Shan Hills, King's Collectors! at Kyoukse, Kyoukmyoung and elsewhere, common, King's Collectors! Chin Hills, King's Collectors!

## 4. PTEROCARPUS MARSUPIUM *Roxb.*

VAR. *typica*, leaflets oblong-obtuse. *P. Marsupium* *Roxb. Cor. Pl.* ii. t. 116.

### SOUTHERN INDIA and CEYLON.

VAR. *acuminata*; leaflets ovate cuspidate-acuminate, pods much larger than in type. *P. Wallichii* *W. & A. Prodr.* 267?

BEHAR; Rajmahal Hills near Sahibganj, *Kurz!* DECCAN; Naudoshi, *Tilak!* RAJPUTANA; Abu, *Stocks* n. 237! CONCAN; Gujeh jungles, *Ritchie!* Canara, *Yellapur, Talbot!*

The flowers of this variety are not distinguishable from those of *P. Marsupium*, the pod however is somewhat different and most probably the plant is quite worthy of specific rank. It is often issued from herbaria as *P. indicus* which it does not, either as to the flowers, fruit, or texture of leaves, in the least resemble. Without having an opportunity of examining *Wall. Cat.* 5843D, on which "*P. Wallichii*" is based, the writer cannot venture to say if Stocks' plant, so named by Wight, be the same. For this reason the name "*acuminata*" rather than the name "*Wallichii*" has, for the present, been given to the variety.

*Pterocarpus floribundus* *Wall. Cat.* 5846, a species to which neither Mr. Bentham nor Mr. Baker allude, is a *Derris* (§ *Aganôpe*).

## 88. PONGAMIA VENT.

## PONGAMIA GLABRA Vent.

VAR. *typica*; leaflets usually 5, occasionally 7, oblong or ovate, 2·5–3·5 in. wide, quite glabrous beneath; racemes always solitary simple, pedicels ·35 in. long, their bracteoles only subopposed and situated slightly above the middle. (Synonyms as in *F. B. I.* with in addition *P. grandifolia* Zoll. & Mor. *Syst. Verzeich.* 3; *Miq. Flor. Ind. Bat.* i. 147. *P. mitis* Kurz, *Journ. As. Soc. Beng.* xlv. 2. 128.—*Rumph. Herb. Amboin.* iii. t. 117.—*Lamk. Ill.* t. 603 (Pungamia).

SEA-COASTS; Banks of Tidal rivers and mangrove swamps on all the coasts: only occurs inland as a planted species.

VAR. *aerocarpa*; leaflets 7–9, very rarely 5, lanceolate, 1–1·35 in. wide, usually sparingly puberulous on the midrib and main-nerves beneath, racemes occasionally 2–3 in. an axil, sometimes sparingly branched, pedicels ·25 in. long the bracteoles opposed and placed close under calyx. *P. xerocarpa* Hassk. *Retz.*, ed. nov., 208.

CEYLON; *Thwaites* 1489! PAHANG; *Ridley*! KEDAH; *Kunstler*! PERAK; *Kunstler*! MALACCA; *Derry*! **DISTRIB.**; Java.

This well known littoral species is the *Pangam* of the Tamils, the *Karanj* of Hindustan, the *Thin-win* of the Burmese, the *Malapari* of the Malays.

It never climbs and only occurs inland as a planted tree on roadsides or in village groves; its timber is in use for making oil-mills in Northern India, solid cart-wheels in Southern India. The seeds yield the well-known "*Karanj-oil*," which is burned and is also used in skin complaints.

The typical variety occurs in two rather distinct forms that pass into each other, however, by all sorts of intermediates. These are:—1, a form with medium-sized leaflets and flowers (the original *P. glabra*) found everywhere; and 2, a form with decidedly larger leaflets and flowers (*P. grandifolia* Zoll. & Mor.) that, beginning in Chittagong, passes southwards through Arracan, the Andamans, the Nicobars, and Sumatra to Java, being evidently the most usual form along the whole line of distribution indicated; it nevertheless seems neither to extend westward to the Sundri-buns and India, nor eastwards to Tenasserim and the Malay Peninsula.

The plant here treated as VAR. *aerocarpa* was treated as a species by Hasskarl; an authentic example of his plant is preserved in Herb. Calcutta. The diagnosis now given shows that the characters which separate it from the type are individually trivial; yet it is, in general appearance, so unlike the type that there is some difficulty at first in believing them to be conspecific. On the other hand, this particular variety so closely resembles a species described as *Millettia decipiens* by the writer, and another described as *Pongamia dehiscens* (which is however also a *Millettia*) by Koorders and Valetton, that when no more than flowers are available it requires a careful examination of the ovary, (4–5-ovuled in the *Millettias*, only 2-ovuled in the *Pongamia*) to ensure accurate diagnosis. The fruits of the *Pongamia* are, however, exceedingly unlike the pods of the *Millettias*.

The name of this genus has been much debated. The question has been whether the name *Pongam*, proposed in 1763 by Adanson, modified by Lamarck in 1797 into *Pungamia*, and finally corrected by Ventenat in 1803 into *Pongamia*, is or is

not to be employed instead of the name *Galedupa*, used by Lamarck in 1786, and though spontaneously abandoned by that author in 1797, readopted by Roxburgh in 1814.

The name *Galedupa*, if we quibble over refinements of spelling, does indeed antedate the name *Pongamia* by 17 years and so cautious an authority as Taubert in the *Natürlichen Pflanzenfamilien* has recently followed Roxburgh's usage and re-adopted Lamarck's earlier name, thus abandoning the name familiarised by the usage of authorities like De Candolle, Bentham, Hooker, Wight, Kurz, Baillon and a host of others.

The usage readopted by Taubert appears to the writer to be highly inadvisable (1.) because the more familiar name (in the form *Pongam* at all events) long antedates the name *Galedupa*; and (2.) because the use of the name *Galedupa* at all was based on the identification of *Caju Galedupa* Rumphius (*Herb. Amboin.* ii. t. 13) with *Pongamia glabra*. This is so manifestly an impossible identification that one marvels at its ever having been suggested; *Caju Galedupa*, which is a *Sindora*, is figured as having equally-pinnate leaves, dehiscent pods, and an arillate funiculus, whereas in *Pongamia glabra* the leaves are unequally pinnate, the pods indehiscent, the seeds not arillate and with a small hilum. Moreover Rumphius knew and figured (*Herb. Amboin.* iii. t. 117) *Pongamia glabra* itself, under its Malay name *Malapari*. That Lamarck had detected his mistake before it was formally pointed out in 1803 by Ventenat, is abundantly clear from his having in 1797 (*Illustr.* t. 603) substituted the name *Pungamia* for the *Encyclopædia* name *Galedupa* of 1786.

These being the facts of the case it disconcerts one to find that Kuntze desires to deliberately revert to Lamarck's error; not only so, he proposes to employ a modified form of Rumphius' term *Caju* (*m*),—which is precisely the synonym that cannot possibly belong to the plant described by Lamarck—as the name of the plant to which Lamarck's definition applies. Perversity in bibliography could scarcely exceed this; nor perhaps could perversity in mere nomenclature. The Latin word *Arbor* is, it has been tacitly admitted, *tabued* as a generic name; it seems hardly fair that, even under the ægis of Kuntze's authority, its Malay equivalent,—erroneously transliterated, it is true—should be permitted to assert itself.

The *Malapari* of the *Herb. Amboin.* was referred by Loureiro, in opposition altogether to Rumphius' description of the pod, and in spite of his having figured the leaflets as opposite, to the genus *Pterocarpus*. Miquel (*Flor. Ind. Bat.* i. 1082 *addend.*) was the first to remove it from *Pterocarpus*; Miquel gave it generic rank, associating with it a plant collected by Teysmann in Sumatra; this plant is unfortunately not represented in *Herb. Calcutta*. In the *Genera Plantarum* (i. 465) the possibility is suggested that Rumphius' and Teysmann's plant may be specifically distinct; there is, however, nothing in Miquel's brief description to favour this suggestion; on the contrary it seems clear that the '*Malapari*' collected by Teysmann in Sumatra is *Pongamia glabra* just as the '*Malapari*' described by Rumphius from Amboina and the '*Malapari*' recently collected by Derry in Malacca both most certainly belong to it. It is, however, to be noted that while Rumphius' figure clearly indicates the typical plant, Derry's plant belongs to *var. ærocarpa* as, from the description of the pubescent petiolules, evidently does Teysmann's.

### 89. DERRIS LOUR.

[The name *Derris* was proposed in 1790 for a genus that had already in 1775 been named *Deguelia*.]

1. *DERRIS SCANDENS Benth.*

Add to localities of *F. B. I.*:—ANDAMANS; very common. NICOBARS; frequent.

3. *DERRIS ROBUSTA Benth.*

Add to localities of *F. B. I.*:—CHITTAGONG; very common. PEGU; Kurz! Brandis! *DISTRIB.* South-West Yunnan (*J. Anderson!*)

This is the well-known "*Korai*" of Assam and Silhet. Mr. Ellis gives the name "*Junguria*" as used in Chittagong, and Mr. Kurz notes the Burmese name as "*Tepu-kan*."

4. *DERRIS DALBERGIOIDES Bak.*

This tree is also very plentiful in Perak. In Malacca it has, according to Mr. Derry, two local names, "*Assam hutan*" and "*Pokó Pêtei bilalang*."

5. *DERRIS ULIGINOSA Benth.*

As *Cat.* n. 5879 this was distributed by Dr. Wallich under the name *Pongamia uliginosa*. Under one of the letters, however, (*Cat.* n. 5879 E.) he issued a very different plant which in *Pl. Junghuhn.* 252 (*adnot.*) Mr. Bentham treated as the type of a distinct species (*D. affinis* Bth.); this plant, at a later date, Mr. Bentham identified with *D. trifoliata* Lour. and reduced to *D. uliginosa* as a variety (*Journ. Linn. Soc.* iv. *Suppl.* 108). The acceptance of the latter view should obviously have involved the substitution of the name *D. trifoliata* Lour., which dates from 1790, for the name *Derris uliginosa* Bth. which is based on *Robinia uliginosa* Roxb. (in *Willd. Sp. Pl.* iii. 1135) dating only from 1800. Fortunately, however, the rule was in this case neglected.

The statement that the pod of *D. uliginosa* may be 2-seeded is not borne out by specimens reported to Calcutta. The writer has examined 137 fruiting herbarium specimens as well as numberless living plants, and has never found a pod of *D. uliginosa* with more than one seed. He has seen specimens from the Khasia Hills, named *D. uliginosa*, that have 2-seeded pods, but these have always been specimens of another species. The present species is a purely littoral one, met with, as Roxburgh says, "on wet banks of rivers, nullas, etc." (he might have added tidal rivers for it never occurs away from the influence of the tide), or as Wight and Arnott remark in "swampy places near the sea." For Mr. Bentham's statement that it extends "over the plains of Central India, to Khasiya" and for Mr. Baker's "Eastern Himalaya" locality there is no foundation.

That *Derris trifoliata* Lour. cannot possibly be any form of *D. uliginosa* is quite clear from Loureiro's description; *D. trifoliata* has 2-3-seeded pods and white flowers, whereas *D. uliginosa* has only 1-seeded pods and has pink flowers. Besides, the racemes of *D. trifoliata* are described as "long" which is precisely what those of *D. uliginosa* are not. M. De Candolle, too, who saw Loureiro's specimens (see *Prodr.* ii. 415) did not identify them with Roxburgh's plant which he also had seen (see *Prodr.* ii. 416).

Whatever the relationship of *D. trifoliata* and *D. uliginosa* may be, it is absolutely certain that *Wall. Cat.* 5879 E. does not belong to *D. uliginosa*; its long panicles with smaller flowers and its more numerous prominent lateral nerves that run to the edge of the blade make it very different from *D. uliginosa*, the leaves of which have faint lateral nerves, hardly stronger than the secondary venation, that loop at their ends some way within the margin.

6. *DERRIS VESTITA* Bak.7. *DERRIS ELEGANS* Benth.

The large suites of Malayan specimens collected by Kunstler, large suites from the Andamans sent by Man, and large suites of Tenasserim specimens collected by Falconer and more recently by Proudlock, make it necessary to treat *D. vestita* as only a form of *D. elegans*.

Both *D. vestita* and *D. elegans* are reported in every case as having 'white' flowers. Father Scortechini was of opinion that his specimens must belong to a distinct species since, though they otherwise agreed with the *F. B. I.* description of *D. vestita*, they had differently coloured flowers.

The typical form of the species occurs in Perak and in Sumatra as well as in Martaban and Tenasserim. An unnamed sheet of Dr. Wallich's, (*Wall. Cat.* 7540) from Moulmein, belongs to the species. The form named *D. vestita* by Mr. Baker occurs in Perak as well as in Malacca and has been collected in Tenasserim, at Moulmein, both by Dr. Falconer and by Mr. Kurz.

10. *DERRIS CUNEIFOLIA* Benth.

This extends to Chittagong and Burma; the form, however, which occurs in Malaya, though united to the type by Mr. Baker, was distinguished by Mr. Benthham as a variety "*malaccensis*." Since Mr. Baker's account of the genus appeared, large suites, including many specimens with ripe fruit, have been sent from Perak; these show that it is better to separate the Malayan plant as a species. Incidentally too these suites of specimens seem to indicate that *Derris discolor* Bth. is only *D. cuneifolia* with ripe fruit; the writer has not, however, yet seen this directly demonstrated by suites of specimens from Sikkim or Silhet, where *Derris discolor* was found. *Amerimum obovatum* Ham. which is the basis of *Pongamia obovata* Grah., as represented in Herb. Calcutta, belongs to this species.

10b. *DERRIS MALACCENSIS* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 107; leaflets 5-7, rather large, elliptic, abruptly long-acuminate, subcoriaceous, racemes shorter than the leaves, standard glabrous, pod winged or wingless when ripe. *Deguelia malaccensis* Prain MSS.

VAR. *typica*; pod distinctly winged, (as in a true *Derris*) along one or both sutures. *Derris cuneifolia* Bth. VAR. *malaccensis* Bth. *Journ. Linn. Soc.* iv. *Suppl.* 112.

TENASSERIM; Moulmein, *Falconer*! PERAK; *Scortechini* 110! *Kunstler* 4028! 4149! 4504! 8551! PENANG; *Curtis* 2735! MALACCA; *Griffith*! SINGAPORE; *Ridley*! *DISTRIB.* Borneo.

VAR. ? *aptera*; pod quite wingless when ripe (as in *Pongamia*).

MALACCA; *Maingay*, 613! PERAK; *Kunstler*, 4518! 6428! There are also specimens from Perak (*Kunstler* 3190! *Wray* 2025!) almost exactly intermediate, as to fruit, between typical *D. malaccensis* and the variety *aptera*.

VAR. ? *millettiodes*; pod as in VAR. ? *aptera*, but dehiscing when ripe (as in *Millettia*). PERAK; *Kunstler* 10696!

A climber 40-60 feet long, leaflets in all respects like those of *D. cuneifolia* except in their larger size and their long caudate-acuminate tips. *Flowers* as in *D.*

*cuneifolia* but pale yellowish-pink and larger (.65 in. long); ovules 4 (rarely 5). *Pod* larger; in the typical form distinctly winged down both sutures, in both varieties wingless. Possibly both varieties may prove specifically distinct.

The species seems intermediate between *D. cuneifolia* which has 2 (rarely 3) ovules, and *D. montana* Bth. from Java which has "about 8 ovules," and has leaves like those of *D. malaccensis*.

#### 11. *DERRIS MICROPTERA* Benth.

This is described by Mr. Bentham and accepted by Mr. Baker as having a 2-callose standard. In Herb. Calcutta all the specimens with a 2-callose standard are easily referable to *D. cuneifolia*, whereas all those that agree with fruiting specimens of *D. microptera* have the standard ecallose. But the fruits of *D. microptera* are decidedly dehiscent, so that the species might be placed in *Millettia* to which genus indeed Mr. Gamble, Dr. King and Mr. Clarke have in the field referred specimens of the plant collected by themselves.

The species extends from Sikkim to the Khasia Hills where it has been collected by Griffith, by Oldham and by Clarke. The most marked feature of the species is its horse-shoe shaped seeds.

#### 12. *DERRIS ELLIPTICA* Benth.

Add to localities of *F. B. I.*:—CHITTAGONG; *King's Collector*!

To this species belong the Malayan specimens of "*Millettia pachycarpa*" mentioned in *F. B. I.* ii. 106. It is not the only *Derris* with silky petals, *Derris eualata* Bedd. shows the same character though it does not have it so well marked.

13b. *DERRIS ANDAMANICA* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 104; leaflets 7-9, oblong, rather large, acute, racemes copiously paniced, with pubescent branches, pedicels twice as long as the calyx, corolla large, pod finely permanently silky, wings along both sutures subequal.

ANDAMANS; Coco Group, *Prain*! S. Andaman, *King's Collectors*! NICOBARS; *King's Collectors*!

A large creeper, with pale golden-brown-silky branches. *Leaflets* subcoriaceous glabrous, 4-6 in. long, 2-3 in. wide, veinlets distinct. *Flowers* in axillary panicles 6-18 in. long, pedicels .3 in. long, fascicled or in racemes on produced nodes. *Calyx* finely golden-brown-silky .15 in. *Corolla* white, .6 in. long, standard not callose. *Pod* ligulate thin, 3-4 in. long by 1 in. wide, 2-3-seeded, each wing .12 in. wide.

Nearest *D. eualata* but very distinct by its glabrous petals and its silky pod.

#### 14. *DERRIS EUALATA* Bedd.

A species of this genus issued as *Dalbergia* sp. by Dr. Wallich (*Cat.* 5977) but not accounted for by Mr. Bentham or in the *F. B. I.* is the same as a plant collected by Col. Beddome at Nediwattam in 1881, and at the same place by Mr. Gamble in 1889; the same plant was also collected by Col. Beddome in the Tinivelly hills. The plant agrees well with Col. Beddome's and Mr. Baker's descriptions but it has silky petals; it may be this species, at all events it is none of the others described in the *F. B. I.*

#### 15. *DERRIS HEYNEANA* Benth.

The limits of this species stand in need of definition. It is based on *Wall. Cat.* 5916 which is, unfortunately, not represented in the Calcutta collection.



Mr. Bentham identified with *Wall. Cat.* 5916 the plant issued as *D. paniculata* Wight (Herb. 920) and separated two varieties "*β. parviflora*" and "*γ? brevipes*." Mr. Baker has ascertained, however, that "*γ? brevipes*" is specifically distinct, and as regards the other two he reverses Mr. Bentham's judgment. He says that *Wall. Cat.* 5916 is not the same as Wight n. 920. which he makes a variety, while he gives the Concan plant, (Bentham's VAR. *β. parviflora*) as the equivalent of the type specimen. The point is of considerable importance because the two are very distinct; the Concan plant has a silky keel, the *D. paniculata* of Wight has all the petals glabrous; the two must be recognised as different species. What makes it most difficult to deal with the question in that Wight n. 920 is described by Mr. Baker as having considerably smaller leaflets than *Wall. Cat.* 5916. Its leaflets are, however, in reality much longer than those of the Concan plant referred to, or than those of the apparently closely related *D. eulata*. There is at Calcutta a specimen named "*D. Heyneana* VAR. *brevipes*" (*Herb. Ind. Or. H. f. & T.* n. 10) but it is exactly the same as the *D. Heyneana* of Dalzell and Gibson's *Bombay Flora* of which there is an authentic specimen at Calcutta—in any case it cannot be *D. brevipes* Baker because its pedicels exceed the calyx and its pods are quite glabrous. Members of the Society who live in Southern and Western India should endeavour to remove the difficulties that are connected with the differentiation of the species of this group.

16. DERRIS MARGINATA *Benth.*

Add to localities of *F. B. I.*:—CHITTAGONG; Helingomara and Demagiri, *Lister!* PEGU; *Brandis!*

16b. DERRIS AFFINIS *Benth. Pl. Jungh.* 252; leaflets 5, medium, firmly papery, ovate-acute, racemes laxly panicled, with sparsely adpressed-puberulous branches, corolla small. *Derris uliginosa* VAR. *Loureirii Benth.* in *Journ. Linn. Soc.* iv. *Suppl.* 108, in part. *Pongamia uliginosa Wall. Cat.* 5879 (E only) not of DC.

PENANG; *Wallich!*

A climber with pale-brown lenticular glabrous branches. *Leaves* 6 in. long, leaflets 2·5 in. long, 1·25 in. wide, lateral nerves 10 pairs prominent spreading, running almost to margin of leaf-blade. *Racemes* 6-8 in. long, their branches 2·5 in., spreading, nodes not produced. *Pedicels* filiform, 2 in. long, bibracteolate close under the calyx. *Calyx* campanulate, 12 in. long, subglabrous. *Corolla* 35 in. long, standard orbicular ecallose. *Ovary* sparsely hairy; ovules 4.

This is evidently very near to *D. marginata* and *D. amoena*; from the former it differs in having shorter pedicels bracteolate at their tips and in having more numerous prominent nerves to the leaves; from the latter it differs in having thinner pale leaves, and laxer panicles with spreading branches and more scattered flowers.

16c. DERRIS FLORIBUNDA *Benth. Journ. Linn. Soc.* iv. *Suppl.* 105; leaflets 3-5, medium, coriaceous, elliptic-oblong, racemes laxly panicled, with sparsely spreading puberulous pedicels, corolla small. *Brachypterum floribundum Mig. Flor. Ind. Bat.* i. 139.

PERAK; *Scortechini* 2180! DISTRIB. Java.

A stout rambling shrub with glabrous whitish branches. *Leaves* pale-green, 4-5 in. long, leaflets 2-2·5 in. long, 1-1·25 in. wide, with rounded base and obtusely acuminate apex, lateral nerves 4 pairs, faint below, invisible above. *Racemes* 1-1·5 feet

long, branches 4-6 in., spreading, pedicels 4 in. 2-bracteolate close under the calyx. *Calyx* campanulate, purple-brown, 12 in. long. *Corolla* white, standard orbicular ecallose, with a green spot at the top of the claw. *Ovary* sparsely puberulous; ovules 4.

This may, as Prof. Miquel thought, be a *Brachypterum*; it seems, however, on the whole to be more nearly allied to *D. affinis*, *D. amoena* and *D. marginata*, the two last of which are certainly members of the section *Dipteroderris*. Unfortunately the pod is still unknown.

#### 19. DERRIS MAINGAYANA *Bak.*

In consequence of the communication of intermediate forms it seems advisable to treat this as only a variety of *D. amoena*.

#### 21. DERRIS CANARENSIS *Bak.*

The authentic specimens of *Brachypterum canarense* at Calcutta cannot be separated by the writer from the Concan specimens collected by Stocks and included by Mr. Bentham in *D. oblonga* Bth. The fruits of the Concan and the Ceylon plants placed under *D. oblonga* may differ; unfortunately our Calcutta specimens of *D. oblonga* from Ceylon are in flower only.

#### 22. DERRIS SINUATA *Thw.*

Add to localities of *F. B. I.*:—BENGAL; Sundribuns, very common. PERAK; *Kunstler!* *Scortechini!*

#### 23. DERRIS THYRSIFLORA *Benth.*

Delete from localities of *F. B. I.*:—"EASTERN HIMALAYA and the KHASIA MTS."

The species has never been reported to Herb. Calcutta from any locality north of Kedah on the mainland; it is found also in the Nicobars. Perhaps the Himalayan plant associated with this one is the next species, which though nearly allied is very distinct; the only circumstance that makes this conclusion doubtful is that the Himalayan plant in question is Dr. Wallich's *Pterocarpus floribunda*, a species that neither Mr. Bentham nor Mr. Baker have accounted for, and one that is retained as a *Pterocarpus* in the *Index Kewensis*.

Mr. Baker cites *Amerinum obovatum* Ham. MSS. as a synonym of this species. But the only specimen in Herb. Calcutta which Dr. Buchanan-Hamilton has, in his own handwriting, named *Amerinum obovatum* is a specimen which Prof. Graham has, also with his own hand, named "*Pongamia? obovata*"; it constitutes *Wall. Cat.* 5897 and is, as Mr. Baker elsewhere says, only *Derris cuneifolia*. And *Wall. Cat.* 9054, which Mr. Baker likewise quotes as being *Derris thyrsoflora*, it is better in the meantime to omit. The plant so numbered is not represented at Calcutta; at Kew there are apparently two very distinct plants under the number because Mr. Baker has referred *Wall. Cat.* 9054 to *Spatholobus acuminatus* as well as to *Derris thyrsoflora*.

23b. DERRIS WALLICHII *Prain, Journ. As. Soc. Beng.* lxvi. 2. 99; leaflets acute two and half times as long as broad, pedicels as long as or longer than the calyx, pod broad not sinuate, distinctly winged down both sutures. *Pterocarpus floribundus* *Wall. Cat.* 5846.

SILHET; *Wallich* 5846! CACHAR; *Prazer!* KHASIA; *Griffith* 1770 [Kew Dist.]; *Calcutta Collectors!* at Mamloo, *Clarke* 43825! ASSAM; *King's Collectors!* ANDAMANS; *King's Collectors!*

Very similar to *D. thyrsiflora* but easily distinguished by the florets with pedicels 2-3 in. long, instead of subsessile, and by the broader pods, 1.5-4.5 in. long, 1.5 across, with 1-2 seeds.

The Andamans specimens have rather thicker leaves than the Assam ones, and in this resemble *D. thyrsiflora*, but the more numerous nerves to the leaves and the pedicelled florets and buds readily distinguish the plant. The Griffithian specimens have been issued as *D. thyrsiflora*, those of Mr. Clarke as *D. marginata*, those of Dr. Wallich as *Pterocarpus floribundus*. It has been impossible to employ the specific name "*floribunda*," however, as there are already both an *Aganope floribunda* and a *Brachypterum floribundum* in the genus *Derris*.

#### DOUBTFUL SPECIES.

##### DERRIS ACUMINATA *Benth.*

This includes *Wall. Cat.* 5886 and *Wall. Cat.* 5901; the former at Calcutta is represented by two specimens and their flowers have a callose standard; they are in fact simply *D. cuneifolia* Bth. *Wall. Cat.* 5901 is unrepresented at Calcutta, but the plant collected by Sir J. D. Hooker in Sikkim is here. It is the same as *D. microptera* Bth. or, to be more precise, it is the flowering part of the plant whose fruits are described by Mr. Benthham as those of *D. microptera*. What the plant with 2-callose standard described as *D. microptera* may be the writer cannot say, there being no authentic specimen here. But of the two very similar species that have been reported from Sikkim, that with long cuspidate leaves and with most of its nodes unproduced never has callosities on the vexillum, the one with its nodes all produced and with leaflets that are either obtuse or if acute are not cuspidate always has callosities. In any case the pod of the plant termed *Derris microptera* is dehiscent as in *Millettia*.

##### DERRIS SECUNDA *Bak.*

This is based on *Wall. Cat.* 5890 which unfortunately is not at Calcutta. But a plant that exactly agrees with Mr. Baker's very clear description has been collected in the following localities:—

DAPHLA HILLS; Toruputu, 7400 feet, *Lister!* KHASIA HILLS; 5-6000 feet, *G. Mann, 199!* *Badgeley!* BURMA; Nattoung Mts., *Kurz.*

To Mr. Baker's description it may be added that the leaflets are as often 9 as 7 and that in one specimen there are 11. The pods, collected by Capt. Badgeley, are thin strap-shaped 3-4 in. long, .8 in. wide, distinctly winged down the upper, very narrowly down the lower suture; seeds 2-3. This, as has already been remarked, is the plant described by Mr. Kurz as *Millettia monticola* which thus proves to be a *Derris* and must in all probability take the name *Derris secunda*.

##### DERRIS POLYSTACHYA *Benth.*

Add to description of *F. B. I.*:—*Pod* thin flat ligulate-oblong, glabrous, flexible, finely veined, 3-4 in. long, 1.25-1.5 in. wide, the upper wing .25 in. wide, the lower narrower.

Add to localities:—BOORAN; *King's Collectors!* SIKKIM; *J. Anderson!* *King!* *Gamble!*

The pod is very like that of *D. marginata* to which it is closely allied, but is not so pale in colour; this now ceases to be a doubtful species.

**DERRIS OVALIFOLIA Benth.**

The only S. Indian plant in the Calcutta Herbarium that agrees with the figure given by Wight is that distributed from Wight's herbarium as n. 834 [K. D.] This in turn suits very well the description given of *D. Wightii* Baker.

**DERRIS DISCOLOR Benth.**

This, as has been already mentioned, is almost certainly merely that state of *D. cuneifolia* with ripe fruits.

**89.\* KUNSTLERIA PRAIN.**

Climbing shrub with unequally pinnately 1-7-foliolate exstipellate leaves, stipules small deciduous. *Flowers* rather small in ample terminal thyrsoïd panicles extending into the axils of the upper leaves, pedicels solitary, nodes not tumid. *Calyx* campanulate, teeth lanceolate, the two upper connate. *Corolla* distinctly exerted, standard ovate entire, keel boat-shaped, the petals slightly cohering. *Stamens* diadelphous, the upper one quite free from the other 9 and adnate at base to standard-claw; anthers versatile, uniform, on alternately short and long free filaments. *Ovary* sessile, few-ovuled, style incurved filiform, stigma capitate. *Pod* thin flat strap-shaped, membranous or coriaceous, indehiscent, style terminal, sutures not winged. *Seeds* 1-3, much compressed, oblong, radicle inflexed. Species 5, Malayan.

This genus has the habit of *Spatholobus* with calyx and almost corolla and stamens of that genus. It differs, however, in having solitary not fascicled flowers and in having exstipellate leaflets as well as in having a pod indehiscent throughout, with its seeds centrally not terminally situated, and thus not distinguishable from a *Lonchocarpus* pod. From *Lonchocarpus*, however, *Kunstleria* differs in having the flowers unfascicled, in having the calyx deeply toothed and in having the vexillary stamen free. As regards inflorescence *Kunstleria* repeats the characters met with in *Derris* § *Aganope* with which it further agrees in having a free upper stamen. But from *Aganope*, *Kunstleria* differs in having a wingless pod, a deep-toothed calyx, and in having the free stamen adnate to the claw of the standard.

The calyx characters suggest that the natural place for the genus might be in *Phaseoleæ* along side of *Mastersia*, but the absence of stipels and the fact that the leaves may be 5-7-foliolate, together with the rather marked affinities as regards pod with *Lonchocarpus* and as regards inflorescence with *Aganope*, seem to render it more advisable to place it in *Dalbergiæ* beside *Lonchocarpus* and *Derris*.

1. **KUNSTLERIA CURTISII** Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 110; leaflet 1, glabrous or subscabridly pubescent, pod thin flat, densely rusty-pubescent, 2-3-seeded.

**VAR. typica**; leaves above and petioles glabrous, beneath and petiolules sparsely adpressed-pubescent with white hairs, rachis and branches of panicles sparsely rusty-pubescent.

PENANG; Tulloh Bahang, *Curtis* 3019!

**VAR. laxiflora**; leaves on both surfaces subscabridly, petioles and

petiolules densely softly rusty-pubescent as are rachis and branches of the laxer more spreading panicles.

PANGKORE; Tulloh Sera, *Curtis* 1632!

*Leaves* 5-8 in. long, leaflet ovate-lanceolate apex acute base rounded, 4-6·5 in. long, 2·5 in. wide, nerves ascending 4-5 pairs prominent beneath; petiole 75-1·5 in., petiolule 25 in., attached subpeltately. *Panicles* 8-12 in. long, 5-8 in. across. *Calyx* 15 in., teeth triangular, upper deltoid notched. *Corolla* 25 in. long. *Pod* 5 in. long, 1 in. wide, rather distinctly reticulated, at least in the typical variety.

2. *KUNSTLERIA KINGII* *Prain, Journ. As. Soc. Beng.* lxi. 2. 110; leaflets 3, glabrous on both surfaces, pod thin flat densely brown-silky, 1-2-seeded.

PERAK; Larut, *Kunstler* 3830! 6870! 6935!

An extensive climber, sometimes over 100 feet long. *Leaves* 5-8 in. long, leaflets ovate-lanceolate, 4-6 in. long, 1·5-2 in. wide, apex acute, base of lateral leaflets rounded, of central cuneate, nerves ascending 4-5 pairs prominent beneath; petiole 1·5-2·5 in., petiolule 2 in., attached marginally. *Panicles* 8-12 in. long, 5-8 in. across. *Calyx* 15 in., teeth triangular except broadly deltoid bifid upper. *Corolla* dark-purple, 25 in. long. *Pod* 2-4 in. long, 6 in. wide, 1-2-seeded, rather distinctly reticulated; seeds oblong, 1·25 in. long, 5 in. wide, cotyledons thin and leaf-like, testa very dark-brown.

3. *KUNSTLERIA FORBESII* *Prain, Journ. As. Soc. Beng.* lxi. 2. 111; leaflets 5, rigidly coriaceous subscabrid above, densely ferruginous beneath, shortly sharply acuminate.

PERAK; Salama, *Kunstler* 3094! **DISTRIB.** Sumatra; (at Biguni Telok, *Forbes* 3241!)

A small shrubby climber 6-10 feet long, with densely ferruginous branches. *Leaves* 8-10 in. long, leaflets elliptic 3·5-5 in. long, 2-2·5 in. wide, base round, apex rounded with a short abruptly acuminate tip, nerves spreading 6-9 pairs rather prominent beneath, petiole 3·5 in., petiolules 25 in. attached marginally. *Panicles* rather strict, 12-18 in. long, 5-6 in. wide, dense-ferruginous. *Calyx* 15 in., teeth lanceolate. *Corolla* deep lake-red, 25 in. long. *Pod* not communicated.

4. *KUNSTLERIA RIDLEYI* *Prain, Journ. As. Soc. Beng.* lxi. 2. 111; leaflets 5, firmly papery, glabrous on both surfaces, tips blunt-pointed, pod thin flat densely rusty-pubescent, 2-3-seeded.

SINGAPORE; *Ridley* 6395!

*Leaves* 6-8 in. long, leaflets elliptic 2-3·5 in. long, 1·25-2 in. wide, bases narrowed, apex tapering to a finally abrupt blunt point, nerves ascending 5-6 pairs rather prominent beneath, petiole 2-3 in., petiolules 2 in. attached marginally. *Panicles* 12-18 in. long, 4-5 in. wide. *Calyx* 15 in., teeth triangular except upper deltoid slightly notched. *Corolla* 25 in. long. *Pod* 6 in. long, 1·25 in. wide, very similar to that of *K. Curtisi* but with wider-meshed reticulations.

5. *KUNSTLERIA DERRYI* *Prain, Journ. As. Soc. Beng.* lxi. 2. 112 leaflets 7, rigid subscabridly pubescent on both surfaces, with cuneate apex.

MALACCA; Machap Tebung road, *Derry* 1006!

A climber with densely pale rusty-pubescent branches. *Leaves* 6-8 in. long, leaflets 1-3 in. long, .75-1.5 in. wide, bases of lateral leaflets rounded, of terminal deltoid, nerves ascending 6-7 pairs slightly prominent beneath, petioles 2.5-3 in., petiolules .2 in. marginally attached. *Panicles* 12-15 in. long, 2-3 in. wide, rachis and branches softly pale-rusty. *Calyx* .15 in. long, teeth triangular except upper broad notched. *Corolla* dark-purple, .25 in. long. *Pod* not communicated.

## 92. SOPHORA LINN.

6b. SOPHORA BAKERI *C. B. Clarke MSS.*; leaflets 11-15 oblong, obtuse, at first sparsely pubescent at length glabrous above, densely-pubescent beneath, pedicels shorter than the finely silky calyx; corolla middle-sized, pod silky. *Sophora* sp. *Bak.* in *Flor. Brit. Ind.* ii. 251.

BEHAR; Parasnath, *Thomson!* *Kurz!* *Clarke!* Manbhum, *Campbell!*

Branchlets sparsely puberulous. *Leaves* 6-8 in. long, leaflets papery 1.5-2 in. long, .6-.75 in. wide. *Racemes* 2-3 in. long, rather dense, half as long as leaves, pedicels .12 in. *Calyx* .25 in., subbilabiate, lower lip distinctly toothed. *Corolla* about twice as long as calyx. *Pod* 2-3 in., subdehiscent; joints oblong, silky, constrictions between them deep.

Nearest to *S. Wightii* but, as Mr. Baker suggests, very distinct.

6c. SOPHORA DUNII *Prain*; leaflets 17-19, narrowly ovate-acute, tip mucronulate, glabrous above even when young, softly densely-pubescent beneath as are the leaf-rachises, pedicels half the length of densely-tomentose calyx.

BURMA; Chin Hills, *C. R. Dun!*

Branchlets densely-pubescent. *Leaves* 6-8 in long, leaflets papery 1-1.5 in. long, .35-.45 in. wide. *Racemes* 4 in. long, rather lax, pedicels .12 in. *Calyx* .3 in., 2-labiate, upper lip ovate-oblong, obtuse, notched, lower of 3 ovate-acute teeth one-third the length of tube. *Corolla* one-half longer than calyx, keel and wings whitish, standard purplish-brown (in dried specimens). *Pod* not seen.

A very distinct species, only once reported. It much resembles, and is evidently most nearly allied to, *S. Bakeri* Clarke, but is very readily distinguished by its leaflets being quite glabrous above and its lower calyx-teeth being longer.

7b. SOPHORA PRAZERI *Prain*; leaflets 9-13, oblong subobtuse or acute obscurely silky beneath, pedicels as long as the finely silky calyx, corolla white medium-sized.

BURMA; beyond Meiktila, growing near streams, *Prazer.*

A small tree about 20 feet high, branchlets brown-puberulous. *Leaves* 4-6 in. long, leaflets membranous 1-2 in. long, .5-.75 in. wide, dark-green glabrous above, finely silky beneath. *Racemes* short peduncled, rather lax, axillary, 2.5 in. long, 10-15-flowered. *Pedicels* .25 in. long. *Calyx* green, .25 in. long, mouth very oblique, truncate, teeth obscure. *Corolla* pure-white, .6 in. long.

A very graceful species nearly allied to *S. acuminata* to which it bears much the relationship that *S. Bakeri* does to *S. Wightii*. The pods have not, so far, been reported.

9. *SOPHORA MOLLIS* *Grah.*VAR. *Duthiei*; pods wingless.CHITRAL; Markanda, 5000 feet, *Duthie* 16048!

A very interesting form, differing apparently in no way from ordinary *S. mollis* except in the absence of wings to the pods. Its existence rather effectively disposes of the attempt sometimes made to sustain, as a genus apart from *Sophora*, the section to which the species belongs.

9b. *SOPHORA GRIFFITHII* *Stocks* in *Hook. Journ.* iv. 147; flowers smaller, developed before the leaves in short crowded racemes, pods silky. *Keyserlingia Griffithii*, *Boiss. Flor. Orient.* ii. 630.

BRITISH BELUCHISTAN; Quetta, etc., *Griffith! Stocks! Rind! Hamilton! Duke! Lace! Duthie!* SULEIMAN RANGE; Fort Monro, *Sanders!* **DISTRIB.** Throughout Beluchistan and Afghanistan.

A low spineless shrub, all parts densely shortly hoary-pubescent. *Leaves* 4–8 in. long, leaflets 21–41, rigid, adpressed silvery, pubescent beneath, ovate or obovate, .25–.45 in. long, racemes few-fl., 1.5–2 in. long, pedicels shorter than the calyx. *Calyx* .2 in. long, very oblique, densely silky, teeth triangular obtuse. *Corolla* yellow, .5 in. long. *Pod* finely persistently silky, the joints with 4 faint longitudinal ridges.

This is so closely related to *S. mollis* that there are some stages in which it is difficult to distinguish the two; the rather shorter racemes with fewer flowers and the shorter pedicels being then the chief distinguishing marks. The leaflets are, however, almost always more numerous, and when full-grown are much smaller, remaining too, silvery-hairy beneath. But while, with Boissier, placing this in *Keyserlingia* (= *Sophora* § *Edwardsia*), the writer would point out that it might with almost as great propriety be placed in *Eusophora*, since even ripe pods have only 4 faint crenated ridges to represent the wings on the pods of *S. mollis*.

## 93. ORMOSIA JACKS.

2b. *ORMOSIA SCANDENS* *Prain, Journ. As. Soc. Beng.* lxvi. 2. 147; scandent, leaflets 5–7, ovate or obovate, oblong, shortly acuminate, dark-green, racemes crowded in terminal panicles, pedicels shorter than calyx.

PERAK; Larüt, *Kunstler* 3560!

A long climber sometimes reaching 100 feet, with glabrous branches. *Leaflets* coriaceous 6–9 in. long, acuminate, rounded at base, finely veined. *Racemes* in a terminal panicle reaching one foot in length, branches very finely grey-silky, bracts small, bracteoles subulate persistent. *Calyx* .25 in., grey-silky, three lower teeth deltoid as long as tube, two upper subconnate in a bifid lip. *Corolla* .35 in., white with reddish tinge, standard .25 in. across. *Ovary* with a line of hairs along upper suture, elsewhere glabrous; ovules 3. *Pod* unknown.

A very distinct species, differing much from the others by its scandent habit.

3. *ORMOSIA MACRODISCA* *Bak.*

Add to localities:—SINGAPORE; *Ridley!*

4. *ORMOSIA GLAUCA* *Wall.*

Add to localities:—SIKKIM; Sivoke Hills, 2500 feet, *Gamble* 7555!

Add to description of *F. B. I.*:—*Pod* hard, thick, 2–3 in. long,

1.25 in. broad, the valves blackish, rugose externally, slightly swollen opposite the ripe seeds, each thickened into a distinct rib along the upper suture; seeds 2-4, bright scarlet, small (.35 in. long, .25 in. wide), separated by partitions of the tawny suberous lining in which they are embedded, without any trace of arillus.

3b. *ORMOSIA GRACILIS* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 148; leaflets 7-9, ovate-lanceolate, pale grey-green, flowers in terminal racemes, pedicels shorter than calyx, pod rather small, irregularly orbicular with compressed thick valves.

PERAK; Larut, *Scortechini! Kunstler! Wray!*

A graceful tree with brown glabrous branches. *Leaflets* chartaceous, tips caudate-acuminate, 2.5-3 in. long, the veins immersed. *Racemes* in lax terminal panicles; bracts and bracteoles, especially the latter, minute but persisting. *Calyx* .25 in., finely silky, teeth rather longer than tube except the upper 2. *Corolla* pale-yellow, .35 in. long. *Ovary* ovate-lanceolate; ovules 2. *Pod* hard, thick, covered with a bluish-grey bloom, 1.5 in. long, 1.25 in. wide. *Seed* usually solitary, oblong, .75 in. long, with a black adnate smooth aril.

A very fine and distinct species.

4b. *ORMOSIA NITIDA* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 149; leaflets 7, obovate or elliptic very dark-green, shining above, flowers in terminal panicles, pedicels shorter than calyx, pod subcompressed with thin valves, seeds oval compressed bright-red, without arillus.

PERAK; Goping, *Kunstler!*

A tree 30-50 feet high, with rusty-brown glabrescent branches. *Leaflets* very rigidly coriaceous, apex rounded abruptly cuspidate, glossy deep-green, 2.5-4 in. long, 1.5-2 in. wide, veins numerous slender. *Flowers* in fastigate panicles. *Calyx* .2 in. long. *Corolla* unknown. *Pod* irregularly oblong, 1 in. long, .75 in. across, thinly woody, rigid, quite glabrous, black externally, shortly stipitate. *Seed* usually, if not always, solitary, .35 in. long, .3 in. wide.

##### 5. *ORMOSIA MICROSPERMA* Bak.

Add to synonyms:—*O. coarctata* Kurz, *Journ. As. Soc. Beng.* xlii. 2. 71, *hardly of Jackson.* Add to localities:—PERAK; *Kunstler!*

Mr. Kurz's reduction of *Chænolobium* Miq., to *Ormosia* is certainly just, but his further reduction of *C. septemjugum* and of *C. decemjugum* to each other and then to the species under review, seems somewhat premature; for the present Miquel's plants should be known as *Ormosia septemjuga* and *O. decemjuga*. They appear to be more nearly related to the next species than to *O. microsperma* but seem at the same time quite distinct from each other as well as from both *O. microsperma* and *O. sumatrana*. Like many of Dr. Miquel's species, these two were based on very inadequate material, certainly much too incomplete to have justified the foundation of a genus.

Add also as a new variety:—

VAR. *Ridleyi* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 151; pedicels distinct, pods more persistently pubescent.

SINGAPORE; Selitar, *Ridley* 5574!



The pods of this are not quite ripe. Mr. Ridley's field-note says they are hairy; should they prove to be quite persistently so it will probably be necessary to recognise in this plant still another species to be named *Ormosia Ridleyi*.

5b. *ORMOSIA SUMATRANA* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 150; leaflets 7-9 (rarely 5), short-stalked, veinlets beneath slender raised, pedicels shorter than calyx, pod subcompressed with thin valves, seed oblong; racemes in lax spreading panicles.

MALACCA; Brisu, *Holmberg!* DISTRIB. Sumatra.

A very great tree, with thinnish branches, grey-silky at length glabrescent. *Leaflets* ovate, or ovate-elliptic or obovate, 2-4 in. long, nerves spreading but prominent below, pale-green glabrous and glossy above, puberulous at length glabrescent beneath, rounded at base. *Branches* of panicle laxly spreading, tawny-silky. *Calyx* 2 in. long. *Corolla* pinkish-white with lilac-purple markings, 35 in. long. *Ovary* densely-puberulous almost always 3-ovuled. *Pod* irregularly orbicular if 1-seeded, oblong if 2-seeded, 1 in. across, 1-1.7 in. long, lineate between the seeds; valves thin woody rigid black glabrescent. *Seed* 4 in. long, .35 in. wide, bright-red, without arillus.

Closely related to *O. microsperma* but very distinct by its more lax inflorescence, smaller flowers, larger seeds and different leaves and bracts.

6. *ORMOSIA PARVIFOLIA* Bak.

Add to localities:—SINGAPORE; *Ridley!* PAHANG; *Ridley!* DISTRIB. Banka; Borneo.

## 96. CÆSALPINIA LINN.

SUBGEN. 1. *GUILANDINIA* Linn.

2b. *CÆSALPINIA MINAX* Hance, *Journ. Bot.* xxii. 365; VAR. *BURMANICA* Prain; leaves stipulate, leaflets small, bracts very large enveloping the young flowers in a strobilate head; bristles of pod subadpressed and pubescent.

BURMA; Shan States, Fort Stedman and Saga, *King's Collectors!*

DISTRIB. China (VAR. *typica.*)

Shrubby diffuse, branches at first downy at length glabrescent, with numerous straight or slightly hooked hard prickles. *Leaves* 1 foot long or more, pinnæ 10-12, leaflets 6-10 pairs sessile elliptic or oblong, setaceous apiculate; stipules subulate rigid 2-3-fid. *Racemes* long-peduncled many-flowered, simple sparingly branched near base; bracts large oblong-acuminate, tomentose, 75 in. long, 5 in. wide, pedicels 6 in. long, (in fruit becoming 1.25 in. long). *Calyx* 75 in. long. *Petals* obovate white, 1 in. long. *Pods* hardly stipitate, 4 in. long, nearly 2 in. wide, elliptic-oblong, compressed, apex obtuse and beaked near lower corner. *Seeds* 6-7, 75 in. long, .35 in. wide, almost cylindrical, testa black.

There being no specimen of the true *Cæsalpinia minax* at Calcutta with which to compare the Shan Hill plant above described, a specimen was sent to London for comparison with the type of Mr. Hance's species which is preserved in the British (Natural History) Museum collection. The comparison has been most kindly made by Mr. E. G. Baker and Mr. Britten; Mr. Baker has supplied the following note:—

"The Burmese plant is certainly very closely allied to *C. minax* Hance but differs "in the following points. The legume of *C. minax* is shorter by about  $\frac{1}{4}$  in., the

“bristles stand *erect* from the pod and are glabrous; the apiculus at the end of the “pod in the Burmese plant is longer and at the base *more bristly* than in *C. minax*. “The leaves not being in the same state in the two specimens cannot be quite definitely compared. The bracts of the inflorescence of *C. minax* have a narrow “white margin and the head is more broadly conical than in the Burmese plant.”

Both Mr. Baker and Mr. Britten think therefore that the Burmese plant cannot be considered typical *C. minax*. One other difference may be mentioned; the flowers are noted as “white” in the Shan Hill specimens, Mr. Hance mentions “purple” in connection with the Chinese one. As a temporary measure it is treated here as only a variety of *C. minax* but it may ultimately be necessary to recognise in it a distinct species, to be known as *Cæsalpinia burmanica*.\*

#### SUBGEN. 2. NUGARIA DC.

##### 3. CÆSALPINIA NUGA Ait.

The species that is most nearly allied to *C. Nuga* is *Mezoneuron sinense* Hemsl. which, with the habit of *C. Nuga*, has also pods that are very similar in shape and in consistence and differ only in being narrowly winged down the upper suture. Perhaps the most convenient and at the same time most natural arrangement would be to remove *M. sinense* from *Mezoneuron* and at the same time to take *C. Nuga* out of *Cæsalpinia* treating them as congeneric and as types of a genus *Nugaria* equally related to, but equally distinct from, both *Cæsalpinia* and *Mezoneuron*. Still the mere fact of having pods slightly winged along the upper suture hardly prevents the Chinese species from being treated as a *Cæsalpinia*, since *C. sepiaria* presents in SUBGEN. *Eucæsalpinia*, though not so markedly, the same peculiarity. The Chinese plant certainly must be removed from *Mezoneuron*.

4b. CÆSALPINIA PARVIFLORA Prain, *Journ. As. Soc. Beng.* lxi. 2. 230; puberulous, pinnæ 18–24, leaflets 30–36, usually small, oblique, the lower corner auriculately produced, stamens little exerted, pod oblique 3–4-seeded; leaves stipulate; flowers very small and numerous.

VAR. *typica*; leaflets not exceeding .5 in., stipules lanceolate, deciduous.

PERAK; at low elevations, *Kunstler! Wray!*

VAR. ? *stipularis* Prain, *loc. cit.*; leaflets exceeding .75 in., stipules ovate-oblong, persisting.

PERAK; in the plains, *Wray!*

A climber, or sometimes arborescent; prickles small and few. *Leaflets* rachis 8–10 in. long; leaflets close sessile subcoriaceous, attached in middle of base but with lower corner auriculately produced. *Panicles* very long, and usually again branching, the young branches rusty-pubescent; bracts small linear or lanceolate, deciduous; pedicels .25 in. *Calyx* .25 in., puberulous. *Filaments* densely woolly in the lower half. *Ovary* sparsely puberulous. *Pod* 1 in. long, .5 in. wide, like that of a miniature *C. Sappan*.

This *Cæsalpinia* in foliage resembles *C. tortuosa* and *C. microphylla* but its pod is that of a small *C. Sappan*; by its very small greenish-yellow flowers it is quite distinct from all the other Indian ones. The variety may prove a distinct species.

\* Since this was written the Calcutta Garden has succeeded in obtaining seeds of this very interesting species from the Shan Hills, and these have been distributed to the leading Botanic Gardens in both Hemispheres.

9. *CÆSALPINIA MICROPHYLLA* Ham. in *Wall. Cat.* 5826. *C. cinclidocarpa* Bak. in *Flor. Brit. Ind.* ii. 256.

The species described as *C. cinclidocarpa* in the *Flora of British India* differs from the plant described by Dr. Miquel in having a glabrous calyx. There is no specimen of genuine *C. cinclidocarpa* at Calcutta for comparison with the Assam plant; but even if the two should prove to be identical, there is no reason why Dr. Buchanan-Hamilton's much older name should give place to Dr. Miquel's more recent one.

The species is also very common in Sikkim and Western Bhutan.

10. *CÆSALPINIA TORTUOSA* Roxb.

Add to localities of *F. B. I.*:—PENANG; Rengra Bukit, 700 feet, *Curtis!*

Mr. Kurz proposes to reduce to this species, as a variety (*var. latifolia*), Dr. Miquel's *C. acanthobotrya* from Sumatra; an examination of an authentic specimen of Dr. Miquel's plant (*Diepenhorst* 2240, from Sumatra) leads the writer to believe that it is much better to treat the two as distinct species.

## 97. PELTOPHORUM VOG.

There are, in Herb. Calcutta, specimens of a very distinct species of this genus from Sumatra with flowers white, tinged with pink;\* the generic diagnosis has therefore to be altered slightly in order to admit of its inclusion.

## 98. MEZONEURON DESF.

2. *MEZONEURON FURFURACEUM* Prain. *M. glabrum* Bak. in *Flor. Brit. Ind.* ii. 258 not of Desf. *M. enneaphyllum* Thw. *Enum.* 414; *Trimen, Fl. Ceylon* ii. 102 not of W. & A. *Cæsalpinia furfuracea* Wall. *Cat.* 5835.

MARTABAN; Attran river, *Wallich* 5835! PEGU; Makhoye Hill, *King's Collectors!* CEYLON; *Thwaites* 3601!

The locality of Dr. Wallich's specimens is given as Tenasserim in the *F. B. I.*; the species has not, however, been as yet collected farther south than Martaban. This most certainly is not *M. glabrum* Desf. for it has always opposite leaflets whereas those of *M. glabrum* are alternate; also it has pods with few remote seeds in place of having them numerous and close together as in *M. glabrum*. The leaflets of this species are more remote and fewer in number, they are also more broadly ovate, with obtuse

\* The following diagnosis of this species may be given:—

*PELTOPHORUM GRANDE* Prain; flowering pedicels slightly exceeding the calyx, petals white with flush of pink.

SUMATRA; on hills near Napal Litjin, R. Rawas, at 2500 feet, *Forbes* 3163!

A very large tree, stem 7 feet in circumference at 6 feet from ground, young branches rusty-puberulous. *Leaves* distinctly petioled, 6 in. to 1 foot long; pinnæ opposite 14–16, 3–6 in. long; leaflets 20–24, somewhat remote, ligulate, sessile, rounded, slightly unequal-sided, base cuneate, rigidly subcoriaceous, faintly adpressed-puberulous below. *Racemes* simple, rusty-puberulous as are the pedicels .3 in. long, and the calyx; bracts very sinuate caducous. *Calyx* 2 in. deep. *Pod* not seen.

A very distinct species.

tips and unequal bases, than are the leaflets of *M. enneaphyllum* which have rounded tips and equal bases. But the most striking difference is in the pod which is much larger, and has a much broader wing than that of *M. enneaphyllum*; it is besides rather prominently widely reticulated throughout while the pod of *M. enneaphyllum* is smooth. Dr. Thwaites' misidentification of the Ceylon plant with *M. enneaphyllum* in place of *M. furfuraceum*, has unfortunately found its way both into the *Flora of British India* and the *Handbook of the Ceylon Flora*.

Dr. Trimen suggests that *M. pubescens* may be included in this species; in this he follows Mr. Kurz who united (*Journ. As. Soc. Beng.* xlv. pt. 2, 293), *M. glabrum*, *M. enneaphyllum*, and *M. pubescens*. The recent accession of large suites of specimens shows, however, that Mr. Kurz's proposition is altogether untenable and proves, moreover, that neither *M. glabrum* nor *M. pubescens* occurs in India.

### 3. MEZONEURON ENNEAPHYLLUM *W. & A.*

Delete from localities:—CEYLON. Add to localities:—ANDAMANS; Great Coco, *Prain!*

4. MEZONEURON HYMENOCARPUM *W. & A. Prodr.* 283. *M. pubescens* *Bak.* in *Flor. Brit. Ind.* ii. 259 *not of Desf.* *Cæsalpinia* *Glenniei* *Thw. Enum.* 414 *in part.* *C. hymenocarpa* *Wall. Cat.* 5832.

BURMA; Taong-Doung, *Wallich* 5832! *Meiktila, Collett* 839! *Prome, Kurz* 2568! *Shan States, King's Collectors!* *Bhamo, King's Collector!* ANDAMANS; very common. CEYLON; *Thwaites* 3815 *in part!*

This has alternate leaflets, much fewer in number than those of *M. pubescens* to which it bears something of the relationship that *M. glabrum* bears to *M. furfuraceum*; it is, however, just as distinct from *M. pubescens* as these two species are from each other.

Somewhat similar to this, but equally distinct, is a species from Tonkin (*Balansa* 2149). The leaflets resemble those of *M. hymenocarpum*, but are more densely pubescent; the pods, too, are very different, being firm and rigid. The calyx of *M. Balansæ* likewise differs considerably from that of this species and resembles the calyx of *M. sulphureum*.

4b. MEZONEURON KUNSTLERI *Prain, Journ. As. Soc. Beng.* lxvi. 2. 233; leaflets 7–9, medium, rigid ovate-acute, glabrous, stamens much exceeding the calyx.

PERAK; *Kunstler* 895!

A large climber, all parts glabrous. *Pinnæ* 8, leaflets 1.5 in. long, .75 in. wide, subcoriaceous. *Racemes* laxly paniced, pedicels patent. *Flowers* bright-yellow, calyx quite glabrous. *Pod* only seen young.

4c. MEZONEURON ANDAMANICUM *Prain, Journ. As. Soc. Beng.* lxi. 2. 131. (*Nov. Ind.* v. 60).

### 5. MEZONEURON SUMATRANUM *W. & A.*

Add to localities of *F. B. I.*:—PERAK; *Thaipeng, Scortechini* 1766! *Simput, Ridley* 3083!

## 99. PTEROLOBIUM R. BR.

The three varieties of *P. indicum* distinguished in the *F. B. I.* form in reality three very distinct species.

1. *PTEROLOBIUM INDICUM* A. Rich.

Specimens of this have been collected by Dr. King in Dehra Dun and by Col. Beddome in the Godavery Jungles or the Circars, thus proving a considerably more extensive distribution northward and eastward in India than has been suspected hitherto; the majority of the specimens previously collected had been obtained in the Nilghiris or the Pulney Hills.

2. *PTEROLOBIUM DENSIFLORUM* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 236; racemes with thick rachis and very close set pedicels not exceeding the calyx, in fastigiate panicles. *P. microphyllum* Kurz, *Journ. As. Soc. Beng.* xlii. 2. 71 not of Miq. *P. indicum* var. *microphyllum* Bak. in *Flor. Brit. Ind.* ii. 259 at least in part.

PENANG; Govt. Hill, 2500 feet, Curtis 3093! MALACCA; Maingay 535! TENASSERIM; Helfer (fide Baker).

A large climber, very strongly armed, somewhat resembling *P. indicum*. Leaves 4-8 in. long, pinnæ 4-8 pairs, leaflets 8-10 pairs, subcoriaceous, glabrous, 6 in. long, .25 in. wide. Pedicels .25 in. long, racemes 150-200-fld. Pod 2 in. long, with an obtuse or obliquely acute wing 1.25-1.5 in. long, .5-7 in. wide.

Maingay n. 535 which is *P. microphyllum* Kurz, and is in part *P. indicum* var. *microphyllum*, Bak., is represented in Herb., Calcutta by a specimen of which the leaf has only 7 pairs of pinnæ. Curtis n. 3093 from Penang is the same plant; its leaves have 4-8 pairs of pinnæ; its leaflets are as described above. Obviously then it cannot be *P. microphyllum* Miq., which has linear leaflets 40-44 in number upon 14-16 pairs of pinnæ. The Tenasserim plant mentioned in the *F. B. I.* is not at Calcutta; all our Burmese and Andamans specimens belong to the next species.

3. *PTEROLOBIUM MACROPTERUM* Kurz, *Journ. As. Soc. Beng.* xlii. 2. 71; racemes with thin rachis and lax pedicels much exceeding the calyx, in spreading panicles. *P. indicum* var. *macropterum* Bak. in *Flor. Brit. Ind.* ii. 259.

BURMA; common. ANDAMANS; very common.

A large climber; very weakly prickly, otherwise like *P. indicum*. Leaves 6-9 in. long, pinnæ 7-8 pairs, leaflets 7-10 pairs, papery, .45 in. long, .25 in. wide. Pedicels .4-5 in. long, racemes 20-30-fld. Pod 2.5-2.75 in. long, with an obtuse wing 2 in. long, .7-8 in. wide.

The leaflets of this are rather larger and firmer than those of *P. indicum* but are neither so large nor so firm as those of *P. densiflorum* (*P. microphyllum* Kurz, not Miq.). The plant is much less formidably prickly than either of these; from the first it differs most markedly in pod, from the second most markedly in inflorescence. Mr. Kurz describes the flowers as white.

## 103. CASSIA LINN.

## 1. CASSIA FISTULA Linn.

It should be noted that in Herb. Calcutta there is a gathering of *Cassia Fistula*, the well-known *Amaltás* or "Indian Laburnum," from Chittagong, which is reported by one of our native collectors as having had pink flowers. It would be interesting if any of the members of the Society were able to confirm this report. The statement is not impossible since at least one other species of this section has both pink and

yellow flowers; but, if true, it is remarkable that a pink-flowered form of *Amaltás* should not have found its way into Bengal gardens.

2b. *CASSIA JAVANICA* Linn.

This species, which had not (*see F. B. I. ii. 267*) up to 1878 been reported from within the British area, has recently been sent by Mr. Wray from Perak. Mr. Wray gives "*Sibusoo*" as the native name of the tree; this name is usually applied to *P. nodosa* which is very plentiful in the Malay Peninsula. But, as Mr. Baker points out, the two species are very closely related and that they should bear the same Malay name is not therefore a matter for surprise.

4. *CASSIA RENIGERA* Wall.

Very many gatherings of this species have been received in Herb. Calcutta since Mr. Baker's description was written in 1878. At that time the flowers were still unknown; the following description of them is therefore necessary.

*Flowers* in showy corymbs, solitary or in pairs, from old nodes, on softly pubescent peduncles 1-1.5 in. long, bracts large puberulous, ovate-cordate, long-acuminate .75 in. long, .5 in. across, lower pedicels 2 in. long, pubescent; calyx 5-partite to the base segments ovate softly velvety; petals oblong-obtuse clawed, .8-1 in. long; the 3 lower stamens longer than the rest with larger anthers and with nodose filaments.

The most puzzling feature about these specimens is that of the gatherings where the colour of the flower has been noted, some are said to be pink-flowered and just as many are said to be yellow-flowered; yet there is no character in the inflorescence, bracts, sepals or petals, whereby the two may be distinguished. The attention of members of the Society, resident in Burma, is therefore directed to the point and their assistance in clearing up the matter will be very gratefully received by Indian botanists. It may be added that all the specimens noted as pink-fl. are from Pegu; all the yellow-flowered ones come from the Shan Hills.

5. *CASSIA OCCIDENTALIS* Linn.

This does not appear ever to have the pale-lilac flowers described in the *F. B. I.*; the petals are pale-yellow faintly veined with orange.

6b. *CASSIA HIRSUTA* Linn. *Sp. Pl.* 378. Mentioned in the *F. B. I.* under *C. tomentosa*: appears now to be quite naturalized in many parts of our area. The species in general habit most resembles *C. occidentalis*; like that species and like *C. Sophera* its leaves have a single large gland near the base of the petiole: it is, however, readily distinguished from both plants by its dense pubescence. In inflorescence it resembles *C. Tora* as its flowers are in subsessile pairs in the leaf-axils. Outwardly too its pods resemble those of *C. Tora* except that they are densely villous; the dissepiments however are transverse, not oblique, and the seeds are broadly ovate as in *C. occidentalis* not rhombohedral as in *C. Tora*. The following are localities from which specimens growing in a 'wild' state have been sent to Herb. Calcutta.

MYSORE; Bababooduu Hills, *Talbot* 2343! MADRAS; St. Thomé, *Pillay*! ASSAM; Nowgong, *Simons*! SINGAPORE; common, *Anderson* 44! *Hullett* 75! *Kunstler* 317!

## 7. CASSIA TORA Linn.

As defined in the *F. B. I.* this name covers two very distinct species:—1. CASSIA TORA, with leaves glaucous or glaucescent beneath, very fœtid; with short pedicels and smaller flowers, the pedicels in fruit not exceeding .35 in.; and with two glands on the leaf-rachis, one between each of the two lower pairs of leaflets.

2. CASSIA OBTUSIFOLIA Linn. (*C. toroides* Roxb.) with leaves green beneath, not fœtid; with long pedicels and much larger flowers, the pedicels even in flower reaching 1 in.; and with one gland only on the leaf-rachis, situated between the leaflets of the lower pair.

*C. Tora* is common everywhere throughout our area; it is a native of the Eastern Hemisphere and may, as is sometimes stated, have become introduced in America; the writer has never, however, seen an American example; all the specimens bearing the name *C. Tora* that have been sent to Calcutta from America are *C. obtusifolia*. *C. obtusifolia* is common in some parts of our area, notably in Western India from Kanara northwards; in Scinde, Panjab and Rajputana, and in the Western Himalayas from Hazara to Garhwal and Dehra Dun; there are also some specimens from Behar and from Burma and it is quite common in Singapore. Elsewhere in India, if it occurs at all, it is very rare. It is an American species comparatively recently introduced to the Eastern Hemisphere.

The two plants differ so constantly and so markedly in such a number of particulars that they must be separated as species. The fœtid small, strongly veined glaucous leaves, and short pedicels of *C. Tora* always accompany the existence of 2 glands to the leaf-rachis and, even on the most cursory examination, distinguish it from *C. obtusifolia* with its green leaves less prominently nerved, its long pedicels with very much larger flowers—characters always associated with the presence of but one gland on the leaf-rachis.

The confusion between the two plants goes back to Linnæus who referred to *C. Tora* (which he defines as having leaves with 2 glands) the plant figured by Dillenius in *Hort. Eltham.* as t. 63, f. 73. That figure shows no glands. But Linnæus is probably right in identifying it with the plant here described as *C. Tora*; at all events it has the strong nerves, the short pedicels and the quadrate pods of that species.

As *C. obtusifolia*, Linnæus has quoted the figure by Dillenius in *Hort. Eltham.* t. 62, f. 72. This is likewise figured without glands, and since in diagnosing the species Linnæus omits all allusion to glands, one is tempted to suppose that the name *C. obtusifolia* was based on this Dillenian figure. But this cannot be the case; M. De Candolle mentions having actually seen a specimen of *C. obtusifolia* Linn., and he defines the species as having leaves with a single gland. This sets the question at rest once for all, and makes it clear that so far as the plant itself is concerned, *C. obtusifolia* Linn. is the species that was later on more fully described and more accurately characterised by Roxburgh than it had been by Linnæus, under the name *Senna toroides*.

All authors have agreed that the figure of *Gallinaria rotundifolia* Rumph., cited by Linnæus as his *C. obtusifolia*, is without a doubt *C. Tora*; it has not been so generally noted that the figure in Dillenius (t. 62, f. 72), by its very name "*fœtida*," by its pronounced nerves, and by its short pedicels would appear to differ from the real *C. obtusifolia* and would seem to be only another form of the plant shown in t. 63, f. 73, and therefore to be likewise *C. Tora*. In fact the only Linnean reference

that probably *does* go with the actual plant is that to Sloane's *Hist. of Jamaica*; this, oddly enough, Linnæus refers only tentatively to his species.

Wight and Arnott have disposed of the difficulty by recognising the plant with one gland as distinct from that with two; they treat the former as a mere variety of *C. Tora* however, and they complicate matters still further by identifying with it Rheede's *Tagera* (*Hort. Malab.* ii. t. 53). Rheede's figure shows no glands at all any more than do the two figures of Dillenius. But its strongly veined leaves, its short pedicels and its short pods make it certain that it represents *C. Tora* and not *C. obtusifolia*.

Miquel deals with the two plants themselves exactly as Wight and Arnott do, but has been unable to resist the temptation of still keeping up a *C. obtusifolia* Linn., apart from either. For this he cites Plumier's *Plantæ Americanæ* (Ed. Burmann) t. 76, f. 2, again a figure showing no glands; the plant itself Burmann describes as having a gland at the base of each pair of leaflets. This may mean that Miquel doubts the accuracy of M. De Candolle's statement that Linnæus' specimen of *C. obtusifolia* has but one gland, or may imply that he prefers to follow Linnæus as to his citations but not as to his plant. Plumier's figure is what constitutes VAR.  $\beta$  of Linnæus' *Cassia Tora*; it has, according to Royen and to Burmann, but one gland. Miquel cites the Plumierian plate under VAR. *a* of his *C. obtusifolia* and VAR. *a* he describes as having two glands, while Linnæus' name for the Plumierian plate he refers to his own VAR.  $\beta$ ., which he says has one gland.

Mr. Baker proposes to unite the two species and it would have been very convenient had this been possible. But the differences between them are too marked and too constant to admit of this being done.

8b. *CASSIA LÆVIGATA* Willd. *Enum. Hort. Ber.* 401 is another species that, since Mr. Baker's account of the genus in the *F. B. I.* was published, has proved to be thoroughly naturalised in various parts of India, *e.g.*, in the Nilghiris near Ootacamund, in Sikkim, and notably in the Khasia Hills near Shillong, at Cherrapunji and elsewhere.

In general appearance it resembles *C. occidentalis* but it has larger flowers and may further be at once recognised by its leaf-rachis having a gland between each pair of leaflets except the terminal pair. When mature it is very easily distinguished by its fruits which are short turgid cylindric obtuse and distinctly stipitate below, obtuse and apiculate at the tip, 2.5–3 in. long, .6 in. in diam., finely transversely striate. *Seeds* smooth broadly ovate, compressed, greenish-brown, shining, .2 in. long, .15 in. wide, .08 in. thick.

9b. *CASSIA HOLOSERICEA* Fresen. in *Flora* xxii. i. 54; stipules triangular reflexed rigid spinescent persistent; leaflets 10–16, velvety-pubescent, racemes narrow, pod flat oblong little recurved not crested in the middle, velvety-pubescent.

SCINDE; *Stocks!* *Dalzell!* *Talbot!* *DISTRIB.* Westward to Abyssinia.

This very closely resembles *C. obovata*, for which indeed it is usually taken, but can be at once distinguished by its pubescent more numerous leaflets and by its pubescent less recurved, uncrested pods. In habit and in the dimensions of all its parts it agrees with *C. obovata*.



12. *CASSIA MONTANA Heyne.*

Add to synonyms of *F. B. I.*:—*Senna glauca Roxb. Fl. Ind. ii. 351.*

13. *CASSIA TIMORIENSIS DC.*

Add to synonyms of *F. B. I.*:—*C. xanthocoma Miq. Anal. Ind. i. 10.*

Add to localities:—WESTERN INDIA; Kanara, *Talbot!* MALAY PENINSULA; Kedah, *Curtis!* Perak; *Kunstler! Scortechini!*

14. *CASSIA GLAUCA Lamk.*

No collector has ever sent to Calcutta a specimen that could be said to accord with the description of *C. fastigiata* Vahl, reduced here in the *F. B. I.* Perhaps, as Wight and Arnott suggest, Vahl may have made some mistake as to the number of glands. In any case Vahl's description is such that if *C. fastigiata* has to be reduced to *C. glauca*, it is under VAR. *suffruticosa* and not under the typical *C. glauca* that it must be placed.

18. *CASSIA MIMOSOIDES Linn.*

VAR. 1. *dimidiata* is *C. dimidiata* Roxb., a very distinct species with 5 stamens of which not infrequently the uppermost is smaller than the others and is sometimes even replaced by a staminode.

VAR. 2. *Wallichiana* as to citation consists of two very distinct plants, both of which, as it happens, are mixed under *Wall. Cat. 5320.*

One of these is the same plant as *C. myriophylla* Wall. Cat. 5326—and is no doubt a mere variety of *C. mimosoides* distinguishable, with difficulty in many cases, by its rather longer leaflets. Like the type it has small flowers with apparently always 10 stamens and has the petiolar gland deeply embedded in the leaf stalk.

The other is the plant described by Mr. Baker as VAR. *Wallichiana*, easily distinguished by its larger flowers: in this plant often only nine, sometimes only seven, of the stamens are perfect and the petiolar gland, though not stalked, protrudes distinctly above the upper surface of the leaf-stalk. The best name for the species is *C. Leschenaultiana* DC.

VAR. 3. *auricoma* is only a more hirsute condition of the preceding. It is equivalent to *C. Macræi*, but it should not be separated as more than a variety from *C. Leschenaultiana.*

19. *CASSIA NIGRICANS Vahl. Symb. i. 30;* gland of petiole sessile obscure, stamens 10, all perfect or 1-3 rudimentary, seeds 7-11. *DC. Prodr. ii. 498; Oliv. Flor. Trop. Afr. ii. 280. C. micrantha Guill. & Perr. Pl. Seneg. i. 262.*

WESTERN INDIA; N. Canara, *Stocks! Talbot! Woodrow!*

An undershrub or shrub sometimes 5 feet high, sparsely pilose. *Leaves* distichous 2-4 in. long, with an obscure sessile gland below the lowest of the 8-18 pairs of oval-oblong obtuse mucronate leaflets .5-1 in. long. *Stipules* persistent lanceolate-subulate. *Flowers* small .25-.35 in. across, solitary or 2-5 together in short supra-axillary pedicels. *Sepals* .2 in long, outer acute, inner obtuse, apiculate. *Pods* erect nearly straight, flat, dehiscent, shortly pubescent, 7-11-seeded; fruiting pedicels stout, .15 in. long.

This species is said by Talbot to be common in North Canara. It is most like *C. mimosoides* VAR. *Wallichiana* but is readily recognised by its large leaflets, which dry black, and by its smaller flowers and fewer-seeded pods.

## 104. CYNOMETRA LINN.

## 1. CYNOMETRA RAMIFLORA Linn.

SUBSP. *genuina*; leaflets 1-jugate. *Rumph. Herb. Amboin.* i. t. 63; *Lamk, Ill.* 331. f. 2.

MALAYA ARCHIPELAGO; Java, *Horsfield!* Amboina, *Teysmann!* Ceram, *Teysmann!*

This subspecies has never been collected in Indian territory; it may be necessary to restrict the name *C. ramiflora* to this and recognise in the next subspecies a distinct plant.

SUBSP. *bijuga*; leaflets 2-jugate. *C. bijuga* *Span. Linnæa* xv. 201.

VAR. 1. *mimosoides* Bak.; the end-leaflets obtuse hardly larger than the basal pair. *C. mimosoides* *Wall. Cat.* 5817. *Rheede Hort. Malab.* iv. t. 31.

BENGAL; Sundribuns, common, *Heinig!* S. INDIA; Malabar, *Rheede (ic.)!* CEYLON; at Trincomalee, *Rottler* (part of *Wall. Cat.* 5816C)! BURMA; Arracan, *Kurz!* Martaban, *Wallich* 5817 A! *Kurz!* Tenasserim, *Wallich* 5817C! *Proudlock!* ANDAMANS; very common everywhere on the coasts.

VAR. 2. *heterophylla* Thw., *Enum.* 97; the end leaflets acute much larger than the basal pair. *C. bijuga* *Miq. Flor. Ind. Bat.* i. 78. *C. ramiflora* *Bedd. Fl. Sylvat.* t. 315 not of Linn. *C. polyandra* *Miq. Anal. Bot. Ind.* i. 11, not of *Roxb.*

CEYLON; sea-coast, *Walker!* ANDAMANS; Coco Group, and S. Andaman, very rare. MALAY PENINSULA; Johore, *King!* Perak, *Wray* 2503! Singapore, *Ridley* 5891. DISTRIB. Malay Archipelago.

There are many intermediates between these two varieties, but there are no forms linking either of them with subspecies *genuina*. In a monograph of the genus it will probably be found advisable to recognise SUBSP. *bijuga* as specifically distinct and in that case it will be necessary to restore Wallich's name *C. mimosoides* (which is older than the name *C. bijuga*) to designate it. But it will always be well to keep the two varieties of SUBSP. *bijuga* apart as such.

*Wall. Cat.* 5816 is exceedingly confused—the following are the plants included under it in the Herb. Calcutta series of Wallich's specimens:—

5816 A. Herb. Madras = *C. cauliflora* L.

5816 B. Herb. Heyne = *C. cauliflora* L.

5816 ? C. { Herb. Madras = *C. polyandra* *Roxb.* VAR. *typica*.  
Trincomalee = *C. ramiflora* (*C. bijuga*) VAR. *mimosoides*.

5816 ? D. Herb. Wight = *C. ramiflora* L. VAR. *mimosoides*.

5816 E. Penang = *C. polyandra* *Roxb.* VAR. *Kurzii*.

2b. CYNOMETRA BEDDOMEI *Prain*; leaflets 6, flowers in rather lax oblong sessile solitary axillary racemes.

S. INDIA; S. Kanara, *Beddome*; Wynaad, at Tambacheri Ghat, 2800 feet, *Beddome!*

A tree, leaflets thinly subcoriaceous, glabrous, oblique obovate-oblong, the lowest pair the smallest 2-3 in. long. *Flowers* in rather lax, few-fl'd. racemes, 1 in. long, outer bracts ovate-acute .25 in. long, pedicels faintly puberulous .5 in. long. *Sepals* .2 in. long, reflexed. *Filaments* twice the calyx. *Ovary* puberulous except along the side whence the style arises, which is quite glabrous. Ripe *Pods* not seen.

This species is mentioned by Col. Beddome under t. 316 of the *Flora Sylvatica* and again by Mr. Baker under *C. inaequalifolia* in the *Flora of British India* ii. 268, apropos of S. Kanara specimens which the writer has not seen. In 1880 Col. Beddome sent to Dr. King from the Wynaad two specimens with the note :—"Cynometra n. sp. This is mentioned at tab. 316, *Fl. Sylvatica*." They are in flower and in very young fruit, and the above diagnosis is made from them. The plant, as Mr. Baker suggests, is nearest *C. inaequalifolia* but is abundantly distinct from that species.

#### 4. CYNOMETRA CAULIFLORA Linn.

The expanded filaments of this species make its flowers very readily distinguishable from those of *C. ramiflora* L. SUBSP. *genuina* which it much resembles in leaves.

It is a purely garden species without the slightest right to be considered indigenous in India.

#### 5. CYNOMETRA POLYANDRA Roxb.

VAR? *Kurzii* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 200; leaflets large, pods very rugose. *C. cauliflora* Wall. *Cat.* 5816 (E only).

PENANG; *Jack* (Wall. *Cat.* 5816 E)! *Kurz!* on Govt. Hill "Apl 1890" and "May 1893," *Curtis!* PERAK; *Scortechini!*

This has the puberulous leaf-rachis of typical *C. polyandra* but its very different pod makes the writer believe that it may be necessary to recognise in it a distinct species, *C. Kurzii*. Up till now only leaf specimens of this have been obtained by *Jack*, *Curtis* and *Scortechini*, with a solitary fruiting specimen obtained by *Kurz*. There are no specimens of *C. polyandra* proper from Penang or from Malacca in the Calcutta Herbarium.

### 105. SINDORA MIQ.

This genus has been long known but apparently usually little understood. First described by Rumphius under the name "Caju Galedupa" and quite unmistakably depicted in *Herb. Amboin.* ii. t. 13, it thus forms as to citation a part of the genus *Galedupa* Lamk. (*Encycl. Meth.* ii. 594 [1786]); the description there given applies, however, only to the "Pungam" of Rheede (*Hort. Malab.* vi. t. 3) which is the basis of the genus named *Pongam* by Adanson (*Fam.* ii. 322 [1763]) and which is still known under a less barbarous form of this name (*Pongamia*) proposed in 1803 by Ventenat; the form *Pungamia* proposed by Lamarck in 1797 on his discovery of the error of his identification of 1786, has not, for some reason, been generally accepted.

Willdenow (*Sp. Pl.* iii. 902 [1799]) in pointing out that his *Dalbergia arborea* is the plant described by Lamarck as *Galedupa indica* has been careful to exclude the Rumphian synonym. And Buchanan-Hamilton, one of the ablest critical botanists of his day, suggested the affinity of Rumphius' plant with *Copaiifera*, to which it is indeed exceedingly closely allied. But in opposition to the sound judgment of Willdenow and in spite of the very happy suggestion of Hamilton, Wight and Arnott

have taken the unfortunate, and for them quite unusual, view of supposing that Rumphius had made a mistake as to the number and position of the leaflets in his figure. It has, however, been left to Kuntze (*Rev. Gen. Pl.* i. 167) to revert to the error of Lamarck's early work and to propose the use of a part of Rumphius name, not for the tree that Rumphius describes and figures but for one that he has accurately figured and described in another volume under the name *Malaparivus*.

Miquel in 1860 (*Flor. Ind. Bat. Suppl.* 286) founded on fruiting specimens of a species nearly allied to Rumphius' *Galedupa* the genus *Sindora*, while Bentham in 1865 founded on flowering specimens of a third species the genus *Echinocalyx* (*Gen. Pl.* i. 584); Mr. Bentham expressed, however, a presentiment that the two plants *Sindora* and *Echinocalyx* might prove congeneric. The discovery of other specimens in the Wallichian Herbarium, where they had been treated by Graham as belonging to *Guilandina*, completely confirmed Mr. Bentham's surmise that *Sindora* and *Echinocalyx* are congeneric and led to his publishing in Hooker's *Icones Plantarum* a fuller account (*Icones Plantarum* xi. 11, t. 1017, 1018 [1867]) of the plants in question. The two plates, however, do not, as Mr. Bentham for the moment believed, represent the flowers and the fruit of one species. Plate 1018, representing the fruit of this composite species, being a figure of *Guilandina Wallichiana* Grah. can alone therefore be cited as *Sindora Wallichii* Benth. The plant figured on Plate 1017, being a different species, will have to be cited as *Sindora Echinocalyx*.

Mr. Baker has reduced to this already composite species two others that are equally distinct, viz. :—*S. siamensis* Teysm. and *S. intermedia* Bak. (as a variety); Mr. Baker has also established a valid new species (*S. velutina*). Still another species, which Mr. Baker seems for the moment to have overlooked, occurs in Cochin-China, while Mr. Baker has himself tentatively referred yet another to the genus *Azelia*.

The only modification that it is necessary to make in Mr. Baker's generic definition is to note that the pod is not necessarily armed with prickles on the face.

In the Key that follows, the opportunity has been taken of showing the relationship to one another of all the known species of *Sindora*; to the Key is appended a list of the citations that concern each. In drawing up the Key it has been somewhat difficult to present the species in a natural sequence, owing to the incompleteness of the specimens as regards particular characters. The stipules, for example, in *S. velutina* are unknown, so is the fruit; the flowers on the other hand are unknown both in *Sindora sumatrana* and *S. Galedupa*. The position of *S. velutina* in the Key and list may therefore be subject to revision when the missing parts are reported; the character of presence or absence of prickles on the calyx-lobes cannot be used satisfactorily.

#### *Key to the known species of Sindora.*

Pod armed on the face with strong straight prickles,

(unknown in *S. velutina*):—

Pods subeqally rounded at base—the stipe and beak at opposite ends of its long axis:—

Stipules large foliaceous ... .. 1. *S. Wallichiana*.

Stipules inconspicuous:—

Calyx lobes densely echinulate, leaflets small oval,

obtuse ... .. 2. *S. Echinocalyx*.

- Calyx with only a few spinules near tips of lobes ;  
 leaflets large obovate retuse ... .. 3. *S. siamensis*.
- Pods obliquely rounded at base—beak projecting later-  
 ally at right angles to direction of stalk :—
- Stipules large foliaceous (calyx-lobes not echinulate ;  
 pod under 1·5 in. ; leaflets 3-jugate) ... .. 4. *S. cochinchinensis*.
- Stipules inconspicuous :—
- Leaflets 3-jugate :—
- Pods under 1·5 in., leaflets glabrous, calyx un-  
 known ... .. 5. *S. sumatrana*.
- Pods over 2·5 in., leaflets pubescent beneath,  
 calyx echinulate ... .. 6. *S. intermedia*.
- Leaflets 5-jugate, calyx not echinulate ; pod unknown 7. *S. velutina*.
- Pod unarmed on the face (leaflets 4-jugate, glabrous ;  
 stipe and beak at opposite ends of pod) :—
- Pod over 3 in. long ... .. 8. *S. coriacea*.
- Pod under 2 in. long ... .. 9. *S. Galedupa*.

1. *SINDORA WALLICHIANA* Benth. ex Prain, *Journ. As. Soc. Beng.* lxvi. 2. 203. *S. Wallichii* Benth. in Hook. *Icon. Plant. t.* 1018 (in part and excluding t. 1017) ; Bak. in *Flor. Brit. Ind.* ii. 263 (exclud. the syn. *Echinocalyx* and both varieties). *Guilandina Wallichiana* R. Grak. in Wall. *Cat.* 5805. *Galedupa Wallichiana*.

SINGAPORE ; Wallich 5805 ! T. Anderson 41 ! Kurz ! MALACCA ; Griffith !

The Griffithian specimens cited belonged to the collection of Dr. McClelland and are quite distinct from other Griffithian specimens issued as "*Dialium* sp." [K. D. 1848]. In the field Griffith referred the specimens to "*Cassia* ;" in Herb. Calcutta, however, Dr. T. Thomson has marked them "*Schotia* ! sp." which much more nearly indicates their true position.

2. *SINDORA ECHINOCALYX* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 204. *S. Wallichii* Benth. *Icon. Plant. t.* 1017 (not t. 1018 and not *Guilandina Wallichiana* R. Grak.) *Echinocalyx* Benth. in *Gen. Pl.* i. 584. *S. Wallichii* VAR. *ovalifolia* Maingay MSS. *Galedupa Echinocalyx*.

MALACCA ; Griffith 1848 ! Maingay 562/1 !

The inconspicuous stipules, smaller leaflets and very densely spinescent smaller calyx amply distinguish this from *S. Wallichiana*. It will be observed that in the field Dr. Maingay had already detected the difference between this plant and the original *Guilandina Wallichiana* ; it differs, however, the writer believes, more than merely varietally.

3. *SINDORA SIAMENSIS* Teysm. ex Miq. *Ann. Mus. Bot. Lugd.-Bat.* iii. 86 ; Kurz, *For. Flor. Brit. Burm.* i. 413. *S. Wallichii* VAR. *siamensis* Bak. in *Flor. Brit. Ind.* ii. 268. *Galedupa siamensis*.

SIAM ; at Rad-boerie, Teysmann 6050 !

This cannot possibly be reduced to *S. Wallichiana* ; it differs in leaves and in flowers and to a less extent in fruit. Mr. Baker says it has leaves with 6 leaflets

but in almost every leaf on Teysmann's original examples there are 4 pairs of leaflets.

The native name is given by Teysmann as "May-sak."

4. *SINDORA COCHINCHINENSIS* *Buill.*, *Adansonia* x. 104. *Grandiera cochinchinensis* *Lefèvre MSS. ex Buill.* *Galedupa cochinchinensis.*

COCHIN-CHINA; at Tay-ninh and Thy-daù-mot, *Lefèvre.*

The native name of this is given as "Caï-go;" it is said to be a fine tree 100 feet high.

5. *SINDORA SUMATRANA* *Miq. Flor. Ind. Bat. Suppl.* 288. *Galedupa sumatrana.*

SUMATRA; at Meranjat in Palembang, *Teymann* 3753! *MOLUCCAS*; Bawean, where it is grown in gardens, *Teymann* (Hort. Bog. 1766)!

Mr. Teysmann notes the Sumatra name for this as "Sindoor," but gives the name in Bawean as "Saparantu."

6. *SINDORA INTERMEDIA* *Bak. in Flor. Brit. Ind.* ii. 268 (as a VAR.); *Prain, Journ. As. Soc. Beng.* lxxvi. 2. 204. *Sindora Wallichii Scortechini MSS. not of Benth.* *Galedupa intermedia.*

MALACCA; *Maingay* 562! *PANGKORE*; *Scortechini* 1064! *Curtis* 1630! *PERAK*; *Scortechini*!

*Scortechini* describes this as a tree 100 feet high. *Curtis* notes its native name as "Sapëtir" in Pangkore. The pods of this are obliquely rounded at the base so that the long axis of the pod is at right angles to the stalk; this alone makes it very easy to distinguish the species from *S. Wallichiana* and *S. Echinocalyx*.

7. *SINDORA VELUTINA* *Bak. in Flor. Brit. Ind.* ii. 269. *Galedupa velutina.*

MALACCA; *Maingay* 607!

The writer has seen a specimen kindly lent by the Director of the Royal Gardens, Kew, to the Superintendent, Royal Botanic Garden. It is clearly a very distinct species, nearest apparently to *S. cochinchinensis* and *S. intermedia*; its fruits have not, however, been yet reported, and its position in the key will depend on whether the long axis of the pod be found to be continuous with that of the stipe or at right angles to it.

8. *SINDORA CORIACEA* *Prain, Journ. As. Soc. Beng.* lxxvi. 2. 206. *Azelia? coriacea* *Bak. in Flor. Brit. Ind.* ii. 275. *Intsia coriacea* *Maingay MSS.* *Galedupa coriacea.*

MALACCA; *Maingay*! *Ridley* 2328! *PENANG*; *Curtis* 430!

The Malacca name given by Mr. Ridley is "Sapëtir;" this is the name used in Pangkore for *S. intermedia*. In Penang the name used is "Mirbau," which is used on the Mainland for *Azelia palembanica*.

This has exactly the pod of the other *Sindoras*, differing only from that of *S. Wallichiana* and *S. Echinocalyx* in being unarmed on the valves. From the next species it chiefly differs in the size of the fruits.

9. *SINDORA GALEDUPA* Prain. *Caju Galedupa Rumph.* in *Herb. Amboin.* ii. 59, t. 13. *Galedupa indica Lamk. Encyc. Meth.* ii. 594 (as to the citation *Galedupa* but excluding the plant described.) *S. sumatrana* var. *javanica* Koord. & Val. *Bijdr.* ii. 45 (possibly).

MALAYAN ARCHIPELAGO.

This species agrees with the preceding in number of leaflets and style of leaves as well as in having pods that are unarmed. It has smaller pods than any of the other species except *S. sumatrana*, from which it differs only in the absence of spines from the pods and in the long axis of the pod not being at right angles to the direction of the stalk. The reference of this plant by some writers to *Pongamia glabra*, in spite of its equally-pinnate leaves and its arillate funiculus, must be admitted to be incomprehensible.

The writer has examined a leaf specimen of *S. sumatrana* var. *javanica* Koord. & Val. The 4 pairs of leaflets suggest that it differs from *S. sumatrana*; the leaflets themselves seem to the writer to differ materially from those of *S. sumatrana* or indeed of any of the species represented in the Calcutta Herbarium. Neither flowers nor fruits are yet reported but it is highly probable that Messrs. Koorders and Valeton's plant either is an undescribed species, or—what would be even more interesting—is the long-lost *Galedupa* of Rumphius; the fact that its leaflets are in 4 pairs largely helps to strengthen the latter suggestion.

106. *DIALIUM* LINN.

1. *DIALIUM OVOIDEUM* Thw.

Add to localities of *F. B. I.*:—TRAVANCORE?; *Lawson!*

The specimens from Travancore seen by the writer consist of fruits only, and it is not absolutely certain that they belong to this species because they are decidedly gibbous at the base which those of the Ceylon plant at Calcutta are not. At the same time they much more closely resemble the fruits of *D. ovoideum* than they do those of *D. indum*, the true Malay *Kranji*. They may possibly prove to belong to a lost species, *Dialium coromandelianum* Houtt., and it is to be hoped that members of the Society in Southern India will help to clear up the difficulty.

1b. *DIALIUM INDUM* Linn. *Mantiss.* i. 24; leaflets 5–9, all cuneate at the base, branches of the panicle ascending, pedicels shorter than the calyx, pod not velvety. *Benn. Pl. Jav. Rar.* 136, t. 30; *Miq. Flor. Ind. Bat.* i. 79; *Prain, Journ. As. Soc. Beng.* lxvi. 2. 169.

PAHANG; Pijai, *Ridley* 2627! PENANG; Ayer Etam, *Curtis!* DISTRIB. Malay Archipelago.

A tree 60–70 feet high, leaflets alternate, chartaceous, glabrous on both surfaces, finely reticulately-veined, 3–4 in. long, 1–1.5 in. wide, gradually narrowed from the middle to apex, base more abruptly cuneate. *Panicle* ample with slender finely grey-downy branches. *Buds* elliptic. *Sepals* ovate-obtuse, thinly grey-downy, .1 in. long. *Filament* much shorter than anther. *Pod* suborbicular slightly compressed, .9 in. across, dark-purple not velvety.

This is the earliest reported Asiatic species of the genus, and it has become usual to assign to it in particular the Malay name *Kranji*, first made known to us by Bontius. As a matter of fact, however, the name *Kranji* appears to be generic in its significance,

and to be applied to most, if not all the Malayan species of *Dialium*. Thus while, according to Bontius and Rheede, the name *Kranji* signifies *D. indum*, the field notes on specimens in Herb. Calcutta show that it may be applied to *D. laurinum* (Ridley 6437) to a form of *D. platysepalum* (Holmberg 821) to *D. Maingayi* (Curtis 440) and to what seems to be a form of *D. ambiguum* from Malacca (Derry 510 of 1892).\*

According to Mr. Baker *D. indum* was not known from the Malay Peninsula up to 1878. Perhaps Mr. Ridley's Pahang specimens are from wild trees, his field-notes and his references in the account of the *Flora of Pahang*, (*Trans. Linn. Soc. n. s. vol. iii*) do not make the point clear. Mr. Curtis' Penang ones are pretty evidently from an introduced tree since they are noted as being from "Ayer Etam in Miller's compound" and since he gives besides two alternative Malay names, *Krangi Burong* and *Kranji Padie*. The latter term is not used for any other specimen at Calcutta, but the name *Kranji Burong* accompanies a Malacca form of *D. platysepalum* (Holmberg 855) with clavate pods. Another specimen for which alternative names are given is one of *D. Maingayi* (Goodenough 1533) from Malacca, which is cited as *Kranji ambot* or *Kranji s'kellat*. No other specimen has the name *Kranji ambot* but the name *Kranji s'kellat* is used (Derry 89; Goodenough 1693) for two Malacca gatherings of the round-fruited form of *D. platysepalum* with somewhat congested panicles. The name *Kranji papan* is used (Goodenough 1321) for *D. laurinum* but this name is also twice employed by the same collector (Goodenough 1225; 1553) for that form of the totally dissimilar *D. platysepalum* that has rather flattened pods.

It has been occasionally said that Malay native names are more exactly applied than is usual in India. The above will perhaps show that even within the limits of so marked a group of species as the various *Kranji* trees, the incidence of Malay names may be as vague and as unreliable as the incidence of Hindi names can be.

1c. *DIALIUM KUNSTLERI* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 168; leaflets 3-5, cuneate at base, pod very large umbonate at tip.

PERAK; Goping, *Kunstler* 4415!

A tree 100-130 feet high. *Leaflets* alternate or subopposite, ovate-lanceolate narrowly acuminate, apex entire, base cuneate, 4-5 in. long, 1.25-1.5 in. broad, coriaceous, rather dark-green shining above, dull and pale-green beneath, glabrous on both surfaces; petiolules short. *Panicles* terminal and axillary, 4 in. long. *Pod* subspherical, hardly compressed, oblique, prominently umbonate at tip, firm, 1.5 in. long, 1.35 in. wide, black. *Seed* solitary, subrotund, smooth, dark-brown, dull, .6 in. long, .5 in. wide, .2 in. thick. *Flowers* not seen.

2. *DIALIUM MAINGAYI* Bak.

Add to localities of *F. B. I.*:—PERAK; *Scortechini* 2052! *Wray* 3407! 3767! PENANG; *Curtis* 440! 3031! MALACCA; *Goodenough* 1533!

3. *DIALIUM LAURINUM* Bak.

Add to localities of *F. B. I.*:—SINGAPORE; *Krangi*, *Ridley* 6437! PAHANG; *Ridley*.

4. *DIALIUM PATENS* Bak.

Add to localities of *F. B. I.*:—PERAK; *Larut*, *Kunstler* 5551! 5577! *DISTRIB.* Borneo.

\* Derry 510 of 1890 is not the same plant; it is undoubtedly a form of *D. platysepalum*; it bears the native name *Sepan*, not *Kranji*. This is an excellent instance of the undesirability of giving the same number to two different gatherings.



Substitute for description of fruit and seed in *F. B. I.*:—*Pod* ovoid slightly compressed, apex not apiculate, fragile, black with a thin grey pubescence, .5 in. long, .35 in. wide, .3 in. thick. *Seed* solitary, nearly regularly oblong with angles rounded, .3 in. long, .25 in. wide, .15 in. thick, dark-maroon, slightly shining, neither striate nor reticulate.

5. *DIALIUM PLATYSEPLUM* Bak.

Add to localities of *F. B. I.*:—PERAK; Larut, *Wray!* JOHORE; Machap, *Goodenough!*

5b. *DIALIUM AMBIGUUM* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 172; leaflets 7 opposite or subopposite, rounded at base, faintly puberulous beneath.

PERAK; Goping, *Kunstler* 6142! MALACCA; *Derry!*

A tree 40–50 feet high, *leaflets* oblong rather abruptly shortly caudate-acuminate, apex obtuse entire, 4–5 in. long, 1.5–1.75 in. wide, very rigidly coriaceous, bright-green glossy and glabrous above, dull and faintly puberulous beneath. *Panicles* terminal and axillary, deltoid, slightly spreading, 5–8 in. long, 4–8 in. wide, pedicels .15 in. long. *Calyx-tube* obsolete, .15 in. long, ovoid in bud, segments subequal much imbricate, reflexed after flowering, densely brown-velvety on both surfaces. *Pod* unknown.

A species very nearly related to *D. platysepalum* but differing in having a silky-grey instead of dark-brown ovary, and in having opposite leaflets which are only very faintly puberulous beneath.

6. *DIALIUM WALLICHII* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 174.  
D. *platysepalum* VAR. *Wallichii* Bak. in *Flor. Brit. Ind.* ii. 270.

Besides differing in the points noted by Mr. Baker, *D. Wallichii* is unlike *D. platysepalum* in having the sepals glabrous within and the pod distinctly stipitate. It seems better therefore to treat it as specifically rather than as merely varietally distinct.

7. *DIALIUM KINGII* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 175; leaflets 13–15 opposite, oblong subobtusate or obtuse, branches of the very large panicle erecto-patent, pods velvety.

PERAK; Larut, *Kunstler* 4627! 8187!

A tree 100–150 feet high; leaflets opposite except the terminal one, oblong-lanceolate, apex abruptly cuneate or rounded with an obtuse or retuse tip, base cuneate or rounded, 2–2.5 in. long, .6–.8 in. wide, very rigidly coriaceous, deep-green glabrous and shining above, rusty-pubescent beneath. *Panicles* terminal and axillary, deltoid, 6–8 in. long, 8–10 in. across. *Calyx* ovoid in bud, tube obsolete, segments subequal broadly ovate-obtusate; externally densely brown-pubescent, internally waxy white, closely puberulous. *Pod* irregularly spherical, .9 in. long, .75 in. across, velvety-black. *Seed* solitary, subquadrate, warm-brown, faintly longitudinally striate, .4 in. long, .4 in. wide, .2 in. thick.

106.\* *KOOMPASSIA* MAINGAY.

Very tall erect trees. *Leaves* odd-pinnate with alternate leaflets. *Flowers* copious small obscure, in ample terminal panicles, bracts small

caducous. *Calyx-tube* very short conical, or none; sepals 5 lanceolate subequal, very slightly imbricated. *Petals* 5 subequal, their margins not meeting. *Stamens* 5, filaments short or very short; anthers equal basifixed, dehiscing by two apical pores. *Ovary* sessile, subglobose or slightly elongated, 1-ovuled; style short acute, stigma small, terminal. *Pod* oblong, compressed, winged throughout its circumference, narrowed and somewhat twisted at the base, indehiscent. *Seed* solitary situated near the middle of the pod, compressed, exalbuminous; cotyledons leafy, radicle short straight. Species 4, Malayan.

1. *KOOMPASSIA MALACCENSIS* *Maingay* ex *Benth.* in *Hook. Ic. Pl.* t. 1164; leaflets 7-9 green, faintly adpressed rusty-puberulous beneath; panicles rusty-pubescent; petals rather larger than sepals and much exceeding stamens; anthers short, widely triangular; ovary subglobose, densely rusty-pubescent. *Taubert* in *Engl. Natürl. Pflanzenfam.* iii. 3. 156; *Prain, Journ. As. Soc. Beng.* lxxvi. 2. 166.

PERAK; *Kunstler!* *Wray!* *Scortechini!* MALACCA; *Maingay!* *Derry!* *Holmberg!* *Goodenough!* SINGAPORE; *Ridley!* PENANG; *Curtis!* DISTRICT. Sumatra.

A timber-tree 80-100 feet high, 3-4 feet in diam. *Leaves* 5-8 in. long; leaflets ovate-lanceolate or oblong-acuminate with obtuse slightly emarginate tip, coriaceous, 2-3 in. long, .8-1.25 in. wide. *Calyx-tube* obsolete, sepals ovate-acute, densely rusty externally. *Petals* oblong-obtuse, white, .15 in. long, slightly exceeding sepals, two and a half times as long as stamens. *Pod* oblong, compressed, 4-5 in. long, 1.25-1.5 in. wide, reticulately wide-veined opposite the seed. *Seed* solitary 1.5 in. long, .65 in. wide, cotyledons foliaceous, cordate, 5-nerved at base; nerves conspicuous.

This is the well-known Malay timber-tree known as *Kumpang*.

2. *KOOMPASSIA PARVIFOLIA* *Prain, Journ. As. Soc. Beng.* lxxvi. 2. 166; leaflets 9-11 glaucescent, closely pubescent beneath; panicles grey-silky; petals much shorter than sepals and stamens; anthers long, lanceolate; ovary subcompressed, nearly glabrous.

PERAK; *Goping, Scortechini!*

A timber-tree 80-100 feet high. *Leaves* 3-4 in. long, leaflets elliptic-lanceolate with obtuse slightly emarginate tip, chartaceous, 1-1.25 in. long, .25-.35 in. wide. *Calyx-tube* short conical, sepals ovate-lanceolate grey-silky externally. *Petals* elliptic, white, one-third as long as sepals, half as long as stamens. *Pod* not seen.

This is the timber-tree known to the Malays as *Tualang*; its wood is much used for building purposes.

## 108. CRUDIA SCHREB.

There are about 12 species of this genus in Malaya. The oldest name for the genus is *Touchiroa* Aubl.; this name applies, however, more particularly to those species (the original *Touchiroa aromatica*, also *Crudia bantamensis*, *C. gracilis* and *C. Wrayi*) that have only 3 or fewer than 3 leaflets; the remaining species form the group or section *Crudia* proper.

1. *CRUDIA ZEYLANICA* *Bth.*

2. *CRUDIA GLAUCA* Prain, *Journ. As. Soc. Beng.* lxi. 2. 221; leaflets papery 7-8, glaucous, glabrous on the nerves elsewhere puberulous beneath, petioles and innovations glabrous. *Touchiroa glauca* Prain MSS.

PERAK; Goping, *Kunstler* 8175!

A tree 50-70 feet high, stem 1.5-2.5 feet thick. *Leaflets* oblanceolate-oblong, base slightly obliquely rounded, apex rounded and abruptly obtusely cuspidate, 2.5-4 in. long, 1.25-1.75 in. wide, dark-green glabrous above, very glaucous beneath. *Racemes* dense. *Pod* oblong tapering at both ends, beaked, closely shortly puberulous, 4 in. long, 2 in. wide, .6 in. thick. *Seed* solitary, large oblong, 1.5 in. long, 1.2 in. across, .4 in. thick.

Nearest of all the Malayan species to *C. zeylanica* Bth., the only Indian species described in the *F. B. I.*

3. *CRUDIA CURTISII* Prain, *Journ. As. Soc. Beng.* lxi. 2. 220; leaflets papery 7-9, uniformly puberulous beneath, petioles and innovations grey-pubescent. *Touchiroa Curtisii* Prain MSS.

PENANG; Govt. Hill, *Curtis* 3007! MALACCA; Bukit Sadanan, *Derry* 1164! PERAK; common, *Kunstler*!

A tall tree 80-150 feet high, stem 2-3 feet thick. *Leaflets* obovate to oblong, base slightly obliquely rounded or cuneate, apex rounded and abruptly obtusely cuspidate, 2-3.5 in. long, 1-1.5 in. wide, green glabrous above, grey-puberulous beneath. *Racemes* rather lax; pedicels slender, .6 in. long, buds oblong, .15 in. long. *Calyx-lobes* pubescent externally, glabrous within. *Pod* oblong obliquely rounded at base, subequally rounded apiculate at tip, closely shortly puberulous, 3 in. long, 2 in. wide, .5 in. thick.

VAR. ? *Wallichii* Prain, *Journ. As. Soc. Beng.* lxi. 2. 221; leaflets papery 7-9, uniformly densely softly velvety beneath, leaflets acute not cuspidate or caudate at apex. *Leguminosa* Wall. *Cat.* 5983. *Ignota* Wall. *Cat.* 8089. *Touchiroa Wallichii* Prain MSS.

PENANG; *Porter*! *Wallich*!

*C. Curtisii* is known in Malacca as "*Kumpas ruman*." The plant here tentatively treated as var. ? *Wallichii* will probably, when flowers are reported, turn out to be a distinct species.

4. *CRUDIA SPECIOSA* Prain, *Journ. As. Soc. Beng.* lxi. 2. 222; leaflets papery 5, rarely 3, quite glabrous on both surfaces, petiolules glabrous, innovations glabrescent. *Touchiroa speciosa* Prain MSS.

PUNGAH; "growing in the Rajah's Garden," *Curtis* 2955!

A handsome tree with slender pendulous glabrous branches. *Leaflets* oblong, base unequally rounded or truncate, apex abruptly tapering to a short acutely caudate tip, 2-2.5 in. long, 1-1.5 in. wide, dark-green above, paler beneath. *Racemes* rather dense; pedicels slender .35 in. long, glabrous as is the rachis, bracteolate below the middle. *Calyx-lobes* very sparsely puberulous externally, glabrous within. *Pod* not seen.

Nearest to *C. Curtisii* and *C. glauca*, but amply distinct from both.

5. *CRUDIA SCORTECHINII* Prain, *Journ. As. Soc. Beng.* lxi. 2. 220; leaflets papery, 11–13, uniformly tawny-puberulous beneath, petioles and innovations tawny-pubescent, pod rusty-tomentose. *Touchiroa Scortechinii* Prain MSS.

PERAK; Goping, *Scortechini* 2029!

A tree 80–90 feet high. *Leaflets* lanceolate, base slightly unequally rounded, apex acuminate, 2–3 in. long, 1 in. wide, dark-green. *Racemes* rather lax, pedicels slender 4 in. long, tawny-pubescent like the angular rachis, bracteolate about the middle. *Calyx-lobes* sparsely-pubescent on both surfaces. *Pod* oblong, obliquely rounded at both ends, rugulose, 2.5 in. long, 1.5 in. across, flat. *Seed* 1 with a long funiculus.

6. *CRUDIA CAUDATA* Prain, *Journ. As. Soc. Beng.* lxi. 2. 219; leaflets coriaceous, 5–7, very long caudate-acuminate, leaf-rachis prolonged beyond ultimate leaflet, innovations and petioles densely rusty-pubescent. *Touchiroa caudata* Prain MSS.

JOHORE; Ridley 6399! *DISTRIB.* Borneo.

A small tree. *Leaflets* oblanceolate, base rounded or deltoid, 2.5–4 in. long, 1 in. wide, the narrow tip .75 in. long, dark-green shining above, dull and rusty-pubescent on the nerves beneath. *Calyx-lobes* densely rusty externally, glabrous within. *Pod* (young) linear oblong, obliquely rounded at base, obtuse apiculate at opposite end, compressed; 2 in. long, .75 in. wide, valves densely, shortly, subscabridly rusty-pubescent. *Seed* solitary.

An exceedingly distinct species.

7. *CRUDIA WRAYI* Prain, *Journ. As. Soc. Beng.* lxi. 2. 222; leaflets small 3, thinly papery, oblanceolate, racemes dense, rachis puberulous, flowers pedicelled. *Touchiroa Wrayi* Prain MSS.

PERAK; Sungei, Larut, *Wray* 2974!

A small tree with slender glabrous branches. *Leaflets* cuneate at base, rounded and shortly abruptly acuminate at apex, 1.5–2.5 in. long, .5–1 in., wide, quite glabrous on both surfaces. *Racemes* dense 4–8 in. long, rachis angular puberulous, pedicels slender .2 in. long, bracteolate in middle, buds .15 in. long. *Calyx-lobes* faintly puberulous externally. *Pod* unknown.

A member of the group of species to which the original species *Touchiroa aromatica* belongs, which is further represented in the east by the species *C. bantamensis* and *C. gracilis*. It is easily distinguished from all three by its much smaller leaves, and is further distinguished from the two Malayan species by its longer pedicels; from the American species it is distinguished by its larger racemes.

8. *CRUDIA GRACILIS* Prain, *Journ. As. Soc. Beng.* lxi. 2. 223; leaflets large 3, firmly papery, ovate-oblong to oblong-lanceolate, spikes slender sparse strict, rachis glabrous. *Touchiroa gracilis* Prain MSS.

PERAK; Thaiping, "in low wet ground in dense forest, rare," *Kunstler* 8468!

A slender shrub 6–8 feet high, young branches glabrous. *Leaflets* cuneate or slightly unequally rounded at base, shortly caudate-acuminate at apex, glabrous on

both surfaces, 4.5-6 in. long, 2-3 in. across. *Flowers* sessile, buds oblong, .15 in. long. *Calyx-lobes* quite glabrous on both sides. *Pod* not seen.

This is the nearest, of the Peninsular species, to *C. bantamensis* (*Touchiroa bantamensis* Hassk.) from Bantam. It differs in having quite sessile glabrous flowers and a sparsely flowered, glabrous rachis.

## 109. SARACA LINN.

### 1. SARACA INDICA Linn.

After a prolonged study of the material in the Calcutta Herbarium, the writer can find no evidence that *Saraca indica* extends, as a wild species, to the east of the Irrawaddy. There are no specimens here from the Malay Peninsula, and those seen by Mr. Baker from Malacca must in all probability have been from planted trees. In Canara occurs a variety (*VAR. puberula*) with peduncles, pedicels, leaf-rachis, and petiolar aspect of stipules all puberulous to pubescent; Chittagong and Arracan specimens always have very much broader and larger leaflets than the normal plant though they are, like it, everywhere glabrous; they seem to constitute a distinguishable variety (*VAR. latifolia*). *S. minor* and *S. Zollingeriana* are probably best treated as distinct species.

*1b. SARACA ZOLLINGERIANA* *Miq. Flor. Ind. Bat. i. 84*; leaflets 6, petiolules short, bracteoles persistent ascending, sepals not half as long as calyx-tube, stamens 7. *S. indica* *Wall. Cat. 5822 (F only) not of Linn.*

MARTABAN; *Wallich!* *DISTRIB.*; Java.

A low erect tree. *Leaves* sessile or subsessile, lanceolate-oblong or lanceolate-acuminate to an obtuse tip, 6-8 in. long, 1.5-2 in. wide, less rigid than in *S. indica*. *Corymbs* dense 2-3 in. broad, pedicels glabrous very slender, .25 in. long below the small ovate acute ascending bracteoles. *Sepals* .2 in. long, orbicular, under one-third the length of calyx-tube. *Filaments* 3 times as long as the sepals, anthers much smaller than in *S. indica*. *Pod* as in *S. indica*.

Dr. King has noted of the plants of this species cultivated in *Hort Calcutta*, received from Java:—"Differs from *S. indica* in having only 3 pairs of leaflets, "in having narrower sepals, in flowering later, and in having the smell of ripening "pears."

*1c. SARACA MINOR* *Miq. Flor. Ind. Bat. i. 84*; leaflets 2-6, petiolules short, bracteoles persistent spreading, sepals half as long as calyx-tube, stamens 8.

*VAR. typica*; leaflets 6; bracteoles acuminate. JAVA.

*VAR. bijuga*; leaflets 4 or very often only 2, bracteoles obtuse. *S. bijuga* *Prain, Journ. As. Soc. Beng. lxxvi. 2. 214.*

PERAK; very common.

A tree 30-40 feet high. *Leaves* sessile, leaflets oblong-lanceolate acute, 10 in. long, 2.5 in. wide; in texture much thinner than those of *S. indica*. *Corymbs* rather lax, 4 in. long, 3 in. wide, pedicels very slender glabrous, .5-.75 in. long below the large spreading oblong, obtuse bracteoles. *Sepals* .35 in., obovate-oblong. *Filaments* 3 times as long as sepals, anthers very small. *Pod* smooth, reddish-yellow, 8-10 in. long, 2.5 in. wide, obliquely cuneate at base, obliquely acute at apex.

This description applies only to the Perak plant which might perhaps with equal propriety be considered a distinct species, *Saraca bijuga*. Among Malayan species it most closely resembles *S. triandra* Baker, which also is very common in Perak and also as a rule has 2-jugate leaflets. But it is at once distinguished in flower by its glabrous peduncles and pedicels and its 8 stamens, and in fruit by its smoother larger pods not so oblique at the base or so obtuse at the tip.

## 2. *SARACA CAULIFLORA* Bak.

Add to description of *F. B. I.*:—*Pod* 12 in. long, 2 in. wide, with a stout beak .75 in. long.

Add to localities:—PERAK; *Scortechini*!

This appears to be rather a rare species in the Peninsula. There are 2 lanceolate bracteoles .35 in. long, but they are extremely deciduous; the bracts, which are also very deciduous, are large oblong, 1 in. long.

2b. *SARACA DECLINATA* *Miq. Flor. Ind. Bat.* i. 84; leaflets 12–16 (usually 14), petiolules long, bracteoles deciduous, corymbs rather dense, usually from thick old branches, sepals less than half as long as the calyx-tube, stamens 4. *Jonesia declinata* *Jack.* in *Malay. Miscell.* ii. 7. 74; *Walp. Rep.* i. 844.

PERAK; very common. PAHANG; *Ridley*! SELANGOR; *Curtis*! MALACCA; *Goodenough*! *Ridley*! DISTRIB. Sumatra; Java.

Extremely like *S. cauliflora* Baker, and when in flower only to be satisfactorily distinguished by analysis. Still the writer believes Mr. Baker's species to be, as species go in *Saraca*, a fairly separable one; not only is the character of 4 stamens always associated with shorter sepals, the pods are also distinguishable. Those of *S. declinata* are usually rather longer than those of *S. cauliflora*, being often 15 in. long; they never appear to be beaked as those of *S. cauliflora* are.

2c. *SARACA THAIPINGENSIS* *Cantley ex Prain, Journ. As. Soc. Beng.* lxvi. 2. 211; leaflets 14–16, petiolules long, bracteoles deciduous, corymbs very short dense and subsimple from thick old branches, sepals nearly as long as calyx-tube, stamens 4.

PERAK; very common. MALACCA; *Derry*!

This again in foliage and habit very closely resembles the two preceding species, but may be separated by its shorter denser corymbs on which many of the lower bracts persist for a considerably longer time; by the larger flowers, with much longer sepals, and by the much broader pods. In the two preceding species the pods are 2 in. across; in this they are always over 3 in. wide, and are besides rather thinner in texture. The corymbs are not over 3 in. across; the stamens appear to be always 4 only.

## 3. *SARACA LOBBIANA* Bak.

Add to description:—*Pod* 12 in. long, 2.25 in. wide.

The pod is almost exactly like that of *S. declinata* in shape, *i.e.*, it has not got a persistent beak; in size it is more like that of *S. cauliflora*. It differs, however, from both in having a longer stipe, 1.25 in. in length. In none of the flowers examined by the writer have more than 6 stamens been found, in a few of the flowers only 5 are present.

There is a species from Borneo as yet undescribed that approaches this very closely but that differs in having shorter racemes (springing in the same way from slender leafless branches), flowers with persistent bracteoles, only 4 stamens, and a more shortly stipitate pod. It has been distributed by Mr. Haviland with the mark *d. u. e. d.*; being one of Haviland's plants, the writer is precluded from describing it.

3b. *SARACA KUNSTLERI* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 213; leaflets 4-6, petiolules long, bracteoles caducous, corymbs in very long sparse terminal panicles, sepals about as long as calyx-tube, stamens 7.

PERAK; Gunong Batu Pateh, 1500-2000 feet, *Kunstler* 8048!

*Tree* 20-40 feet high; branchlets zigzag glabrous. *Leaf-rachis* 5-10 in. long, glabrous, leaflets large diminishing downwards, ovate-acuminate base cuneate, distal 8-10 in. long, 3.5-4 in. wide, basal if 2 pairs and central if 3 pairs 4-5 in. long, 2.25-2.5 in. wide, basal if 3 pairs 3.5-4 in. long, 2-2.25 in. wide; all papery glabrous on both surfaces, dark-green above paler beneath, main-nerves 6-9 pairs ascending, more prominent beneath. *Peduncles* glabrous 8-12 in. long, branches 1-2 in. long. *Pedicels* and calyx-tube very short, calyx-lobes ovate-oblong .2 in. long, glabrous. *Filaments* 7, anthers not seen. *Pod* falcate 4-6 in. long, 1.5 in. wide, glabrous. *Seeds* 5-6 transversely ovate, .5 in. long, .7 in. across, .25 in. thick, testa black, smooth shining crustaceous.

A very distinct species apparently nearest *S. Lobbiana* Baker. Unfortunately good flowers are not available for description.

3c. *SARACA GRIFFITHIANA* Prain; leaflets 8-12, petiolules short, bracteoles persistent ascending, sepals about half as long as calyx-tube, stamens 4, rarely 5 or 3.

UPPER BURMA; Poneline, *J. Anderson*!

A low tree. *Leaves* sessile or subsessile; leaflets oblong-lanceolate acute, 6-8 in. long, 1.5-2 in. wide, subcoriaceous. *Corymbs* dense 3-4 in. broad; pedicels stoutish .25-.35 in. long, pubescent as are the peduncles; bracteoles small acute ascending amplexicaul. *Sepals* .25-.3 in. long, obovate-oblong. *Filaments* three times as long as the sepals. *Pod* not seen.

This species has been long known in the Calcutta Herbarium where it is marked "*Saraca* species in H. B. C. from Griffith's collections." Most probably therefore they had been obtained from plants raised from seeds brought by Dr. Griffith from his Ava journey, as it is only from Upper Burma that specimens have since been received.

The facies of the plant is that of typical *S. indica* but the peduncles and pedicels are pubescent as in *S. palembanica* and *S. triandra* and in *S. indica* var. *puberula*; the bracteoles too are here very much smaller, as in *S. Zollingeriana*; the stamens moreover are almost always 4, in several flowers 3 have been found, in one flower 5. With *S. Zollingeriana* it agrees in consistence of leaves and as to bracteoles, but it differs in having the pedicels pubescent and in not having 8 stamens. The species it most nearly resembles is *S. palembanica* but while it agrees in foliage, pubescence and number of stamens with that species, it has much larger anthers and stouter pedicels, and has altogether different bracteoles as well as a much larger calyx.

3c. *SARACA MACROPTERA* *Miq. Flor. Ind. Bat.* i. 1080; leaflets 8–12, petiolules short, bracteoles spreading persistent, peduncles and pedicels quite glabrous, stamens 4.

VAR. *typica*; leaflets cuneate at base, corymbs lax, 3–4 in. long and broad.

SUMATRA; BORNEO.

VAR. *parviflora*; leaflets truncate at base, corymbs dense, 1 in. long, usually in rings on thick old branches, flowers much smaller than in

VAR. *typica*.

PERAK; *Kunstler!*

A tree 30–40 feet high, stem 4–6 in. thick. *Leaflets* lanceolate acute 6–10 in. long, 1·5–2·5 in. across. *Corymbs* densely clustered, bracts persistent spreading or reflexed; bracteoles obovate, 2 in. long, spreading. *Sepals* 1·5 in. long. *Filaments* three times as long as sepals, anthers very small. *Pod* not seen.

This comes nearest a Bornean species (*S. Hullettii*) of which a description is appended.\*

3d. *SARACA PALEMBANICA* *Miq. Flor. Ind. Bat. Suppl.* 291; leaflets 10–14, petiolules short, bracteoles spreading persistent, stamens 4; peduncles and pedicels pubescent.

PERAK; *Scortechini!* PENANG; *Curtis* 647! 1386! DINDINGS; *Bryant!* *DISTRIB.* Sumatra.

A slender tree. *Leaflets* oblong-lanceolate acute, 8–12 in. long. *Corymbs* sessile from old nodes on thick old branches, dense, 2–3 in. long, bracts persistent spreading. *Flowers* as in *S. triandra*. *Pod* not seen.

Except in the shape of the more numerous leaflets, and in the denser shorter corymbs, this species does not appear to the writer to differ specifically from *S. triandra*, an opinion which, judging from a note left by him in Herb. Calcutta, the late Father Scortechini appears to have been inclined to entertain.

4. *SARACA TRIANDRA* *Bak.*

Add to description of *F. B. I.*:—Peduncles and pedicels pubescent.

\* *SARACA HULLETTII* *Prain*; leaflets 4–6, petiolules distinct, bracteoles large spreading or reflexed, persistent, sepals longer than the calyx-tube, stamens 4.

BORNEO; Sarawak, planted, *Hullett* 312! near Kuching, *Haviland!*

A tree. *Petiolules* 2·5 in. long; *leaflets* thin shining on both surfaces, ovate to ovate-lanceolate acute, corymbs short-peduncled, peduncles and pedicels quite glabrous, 3–4 in. long and broad. *Bracts* persistent spreading or reflexed; bracteoles ovate 2·5 in. long. *Sepals* 2·5 in., calyx-tube 2 in. *Filaments* 3–4 times as long as sepals. *Pod* oblong very oblique at both ends, 3 in. long, 1·5 in. wide, distinctly beaked; stipe slender 5 in. long.

With this appears to agree *Beccari*, P. B. 916, of which there are, however, only flowers at Calcutta. The species is evidently very closely related to *S. macroptera*, of which it has quite the flowers; the leaves with fewer shining leaflets are, however, very different from those of *S. macroptera*. To avoid the possibility of future confusion of the two species this diagnosis is given.



This species is extremely common in Perak as well as in Malacca. It has also been once obtained in the Dindings (by *Bryant*), and once in Penang (by *Curtis*, n. 163!). There is besides a specimen at Calcutta from Sumatra (*Teysmann* 3638!), named "*Jonesia palembanica* var. ?" which, while not precisely Miquel's *J. palembanica*, is not distinguishable from Mr. Baker's species; it may be necessary hereafter in monographing *Saraca* to treat *S. triandra* as only a variety of *S. palembanica*.

The synonym *Jonesia triandra* Roxb. must be deleted, for Roxburgh's *Jonesia triandra* is *Azelia bijuga*. And, though it is not at all clear what *Jonesia scandens* Roxb. may have been, there is every reason to believe that it too belongs to some other genus. The fact that it was 'scandent,' for Roxburgh having said so enables that to be taken for granted, most certainly precludes its citation under *S. declinata* as Miquel, or under *S. triandra*, as Baker would suggest.

5. *SARACA LATISTIPULATA* Prain, *Journ. As. Soc. Beng.* lxi. 2. 217; leaflets 12, *stipellate*, short-petiololed, bracteoles ascending amplexicaul persistent, stamens 2; stipules large, foliaceous, only connate at their bases between the petiole and the stem.

PERAK; *Ridley*!

*Petiolules* .15 in., twice as long as the subulate firm persistent stipels; leaflets very firmly coriaceous, ovate-lanceolate acute or acuminate, bases almost equally rounded, 5 in. long; 1.5 in. wide, dark-green dull glabrous above, finely puberulous on the midrib beneath as also on the margins, the petiolules, leaf-rachis and stipels; stipules foliaceous sometimes 1.5 in. long, each with bold midrib, obliquely cordate, the outer free margin of each auriculate, the inner margins cuneate and connate throughout their lower third between petiole and stem. *Corymbs* very few-flowered (sometimes flowers subsolitary), clustered on warted nodes along thick branches hardly .75 in. long; pedicels puberulous; bracts persistent, bracteoles triangular puberulous. *Sepals* under .25 in. long. *Filaments* about twice as long as sepals. *Pod* oblong, 2 in. long, .8 in. wide.

A most remarkable species, which deserves perhaps to be treated as the type of a distinct section.

## 112. HUMBOLDTIA VAHL.

5. *HUMBOLDTIA DECURRENS* *Bedd. ex Oliv. in Hook. Ic. Plant.* xxiv. t. 2368; branches hollow, nodes constricted, spur of stipule large ovate subacute, leaves distinctly petioled, *rachis winged*, leaflets 8-12, petiolules 0; petals 5.

S. INDIA; Travancore, *Beddome, Bourdillon*!

A tree 40-50 feet high, trunk 1 foot in diam., branchlets cinnamon-brown tomentose. *Stipules* obliquely lanceolate or ovate-lanceolate, 1.5-2.5 in. long, below the point of attachment obliquely ovate or reniform, leaf-rachis a foot long, leaflets elongate-lanceolate, 6-15 in. long, the lower shorter than the others, thinly coriaceous, base obtuse, apex acuminate. *Racemes* short axillary, solitary or paired, often hardly exceeding the stipules, bracteoles and sepals downy on the back, the latter .5 in. long. *Petals* oblanceolate or oval, as long as the sepals. *Pod* 3.5-5 in. long, 1-1.5 in. wide near the tip, tomentose.

This is at once distinguished from other species of *Humboldtia* by its alate rachis.

## 113. AFZELIA SMITH.

1. AFZELIA RETUSA *Kurz.*

Add to localities of *F. B. I.*:—BENGAL; Sundribuns, *Ellis!*

This has often a branched inflorescence and often also has acute leaflets, so that the only character left to distinguish it from *A. bijuga* is the absence of pubescence from its pedicels and calyx. It might be as well to treat it as only a variety of *A. bijuga*.

2. AFZELIA BIJUGA *A. Gray.*

Add to synonyms of *F. B. I.*:—*Jonesia triandra Roxb. Flor. Ind.*  
ii. 220.

3. AFZELIA PALEMBANICA *Bak.*

The synonym *Intsia palembanica* Miq. must be deleted because Miquel's plant, though near this, has very different, much larger bracts. It will be necessary for whoever may monograph the genus *Afzelia* to re-name this species *A. Bakeri*.

4. AFZELIA ? CORIACEA is a *Sindora*.

## 113b. PAHUDIA MIQ.

Erect unarmed trees. *Leaves* abruptly pinnate with few pairs of opposite leaflets. *Flowers* racemose in sessile or peduncled terminal panicles. *Calyx* with a disc produced to the top of its somewhat elongated tube; sepals 4 much imbricated slightly unequal. Developed *petal* one, orbicular, short-clawed, the lower ones rudimentary or wanting. *Stamens* 7 declinate united high up into a slit sheath, the filaments unequal and free at the summit, and with 2 small staminodes at the base of the staminal tube; anthers small oblong dehiscing longitudinally. *Ovary* stalked few-ovuled, style filiform with a small terminal stigma. *Pod* large oblong, thick and woody, 2-valved, dehiscing, smooth. *Seeds* with a large basal arillate funiculus. Species 2, one Malayan, one Indo-Chinese.

1. PAHUDIA XYLOCARPA *Kurz* in *For. Flor. Brit. Burm.* i. 413.

SHAN HILLS; *Dr. King's Collector* 134! **DISTRIB.** Siam.

A tree with puberulous and pruinose branchlets. *Leaves* short-petioled, leaflets 2-3-paired, with distinct petiolules, ovate, rounded at base, slightly acuminate at tip, thinly papery, glabrous shining above, glaucescent beneath, 3-3.5 in. long. *Flowers* in a grey-pubescent terminal panicle, the individual racemes few-fl'd.; pedicels short thick; sepals grey-velvety obovate, concave, the outer pair about .25 in., the inner pair .2 in. long. *Pods* rhomboid oblong, thick-valved and somewhat turgid, 4-5 in. long. *Seeds* 2, compressed, orbicular, enclosed in a medullary endocarp, about 1.25 in. across, resting on a horny, arillate, much expanded funiculus.

A very interesting addition to the Burmese Flora. The species was first collected in Siam by Mr. Teysmann, and has recently been sent from the southern Shan Hills by one of the collectors of the Calcutta Botanic Garden.

## 114. BAUHINIA LINN.

1. BAUHINIA TOMENTOSA *Linn.*

Also in the Andamans, but possibly introduced.

2. BAUHINIA BRACHYCARPA *Wall.*

This still remains a doubtful plant. There is no example of *Wall. Cat.* 5786 at Calcutta, and the sheets here named *B. brachycarpa* by Dr. Wallich himself have been reduced by Mr. Kurz to *B. acuminata*; in making this reduction Mr. Kurz is certainly right.

3. BAUHINIA POLYCARPA *Wall.*

Add to description of *F. B. I.* :—*Petals* white, .35 in. long.

All dubiety has now been removed from this plant which is a very distinct species and has been recently reported from Makana in Tenasserim, at 2000 feet elev., and from many localities in the Shan Hills.

Its nearest ally is evidently *B. timorana* Decaisne (*Nouv. Ann. Mus.* iii. 446) which, apparently by a *lapsus calami*, has been written *B. timoriensis* and reduced to *B. racemosa* in the *F. B. I.* and again in the *Index Kewensis*. A perusal of Decaisne's description shows that his plant has little in common with *B. racemosa* beyond that both are *Bauhinias*. Decaisne gives no collector's name and no exact locality in Timor. There are, however, examples in Herb. Calcutta of a species collected at Coepang in Timor by R. Brown in 1803 which agree exactly with Decaisne's description. Brown's plant is extremely closely related to *B. polycarpa*, its somewhat different bracts and denser racemes alone satisfactorily distinguishing it from Dr. Wallich's plant; it does not, supposing it to be *B. timorana*, in any way recall or resemble *B. racemosa*.

VAR. *Kurzii* Prain; leaves larger, 6 in. long, 8 in. across; pods rather longer (3.5 in.) and broader (.5 in.); seeds about 10.

PEGU; Yomah, in high teak forest, *Kurz* 1783 *bis*!

This Mr. Kurz at first attributed to *B. acuminata*; its leaves much resemble those of that species but its pods are extremely unlike and resemble, on a larger scale, those of *B. polycarpa* to which Mr. Kurz has finally referred it. It appears to the writer highly probable that it will turn out, when more fully represented, to be a distinct species.

6. BAUHINIA MALABARICA *Roxb.*

The leaves of this species are not deeply bifid in any Calcutta specimen. *Bauhinia acida* Reinw. (*Flora* xxxi. 578) does not differ even as a variety. This species extends as far south as Tenasserim in the Eastern Peninsula, but has not as yet been reported from the Andamans or from the Malay Peninsula; it recurs, however, in Java and in Timor.

7/1. BAUHINIA TORTUOSA *Coll. & Hemsl. Journ. Linn. Soc.* xxviii. 52, t. 8; erect or semi-scandent, leaves 7-9-nerved, slightly cordate, shallowly bifid, flowers in small dense lateral racemes, bracts small, linear, pedicels a little longer than calyx, calyx-limb with broadly ovate lobes; style very short or 0.

UPPER BURMA; Koni, *Collett* 561! *Prazer*! Shan Hills; *King's Collectors*!

A small tree or subscandent bush. *Leaves* shortly petioled subcoriaceous, shortly bilobed, lobes slightly angular at the apex, base cordate-rounded, broader than long, 1·5–2 in. across, glabrous above, tomentose beneath, the nerves rusty as are the petioles, the tomentum mixed with pellucid glands; petioles 3–4·5 in. long. *Racemes* small dense 75–1·25 in. long; flowers 5 in. across, pedicels rusty-tomentose 2 in. long, bracts 1 in. long. *Calyx-lobes* rusty externally, broadly ovate-obtuse, spreading. *Petals* subequal obovate-spathulate one-third longer than calyx-limb, white. *Stamens* 10 perfect, alternately short and long. *Ovary* subsessile, densely villous, 2–3-ovuled, style almost absent. *Pod* dehiscent with woody valves, subfalcate, narrowed gradually to base, apex obliquely acute, 2 in. long, 4 in. wide, glabrous and brown externally, rufous-tomentose within except opposite the 1–3 seeds, ovate, compressed, 35 in. long, 25 in. across, their long axis set obliquely backwards across the pod; testa smooth, shining, reddish-brown.

Near *B. malabarica* Roxb., *B. Faberi* Oliv., and the next species.

7/2. *BAUHINIA ENIGMATICA* Prain; erect, leaves 11–13-nerved, slightly cordate, shallowly bifid, flowers in small rather lax lateral corymbs, bracts subulate, pedicels much longer than calyx, calyx-limb with broadly triangular lobes; style very short or none.

UPPER BURMA; Maymyo, *King's Collector!* Shan Hills at Fort Stedman, *King's Collectors!*

A small tree. *Leaves* shortly petioled, subcoriaceous, shortly 2-lobed, lobes rounded, sinus wide, base cordate-rounded, broader than long, 4 in. across, glabrous above, faintly puberulous beneath and pellucidly gland-dotted, petioles 75–1 in. long. *Racemes* corymbose 1·5–2 in. long; flowers 75 in. across, pedicels puberulous very slender the lowest 5–6 in. long, bracts puberulous 25 in. long, subulate. *Calyx-lobes* puberulous, broadly ovate-acute, spreading. *Petals* subequal oblanceolate-acute, twice as long as calyx-limb, pale-yellow or white. *Stamens* 10, perfect subequal. *Ovary* sessile, small, densely villous, 1-ovuled, style 0. *Pod* not seen.

At first the writer was inclined to consider this only a large leafed form of *B. tortuosa* to which it is obviously closely related, but the longer more slender pedicels, longer bracts, acute calyx-lobes and narrow pointed petals as well as the solitary ovules, forbid this treatment.

#### 8. *BAUHINIA FOVEOLATA* Dalz.

Recently collected specimens from Canara, sent by Mr. Talbot, are all diæcious. They do not in any other respect appear to differ from *B. Lawii* Benth. which name should therefore be sunk.

#### 11. *BAUHINIA CORNIFOLIA* Bak.

Add to localities of *F. B. I.*:—MALACCA; *Maingay* 545! PERAK; *Kunstler* 6261!

Add to description:—*Pod* oblong, woody, 4 in. long, 2 in. wide, externally finely adpressed rusty-pubescent; seeds about 4, much compressed, 1 in. long, 7 in. across.

This species is extremely closely related to *B. bidentata* and differs chiefly in having larger flowers, leaves slightly pubescent beneath, and glabrescent pods. The character to be derived from the apex of the leaf, which is relied upon in separating species 11, 12 and 13 of the *F. B. I.* from species 14, 15 and 16 of that work, is not to

be absolutely depended upon; in the three first, as the very large suites of specimens in Herb. Calcutta show, the leaves are often bifid, in the three last they are as often entire at the tip.

12. *BAUHINIA FINLAYSONIANA* *Grah.*

PENANG; *Curtis* 295! PERAK; *Kunstler* 3589! *Scortechini* 247! 1463! *Wray* 2300!

*Pods* small black glabrous linear-oblong, 2 in. long, '6 in. across.

*Bauhinia Kockiana* Reinw. (*Verh. Nat. Geschied.* 87, t. 10) is very closely related to this species and to *B. cornifolia* but is quite distinct from both. It resembles *B. Finlaysoniana* in leaf and in pod, but differs in having a much longer calyx-tube, as in *B. cornifolia*; its pods and foliage, however, are quite unlike those of the latter species.

13. *BAUHINIA LUCIDA* *Wall. Cat.* 5779 A.

The *F. B. I.* has identified this with *Bauhinia emarginata* Jack, from Sumatra. Dr. Wallich's original note reads as follows:—" *Bauhinia emarginata* Jack, in Malay Miscel. App. 6. 75? Perhaps different by its long racemes which may render it a new species (*B. lucida* Wall.)"

Jack's plant, by the original description, has more nerves (7-9) than the present plant which has 5-7 only, has long pedicels, and has tomentose ovaries; it is therefore clear that the Sumatra plant in question is distinct from the present one. In any case the use of the name *B. emarginata* should be avoided since it was already employed for a Mexican species (*B. emarginata* *Mill. Dict.* ed. viii. n. 5) when Jack's description was published.

Mr. Baker suggests that this may be *B. cordifolia* Roxb. and is not alone in this belief, for specimens from Hort. Bogor. show that *B. lucida* is, or was, in cultivation there under the name *B. cordifolia*. But Roxburgh's description, though perhaps too meagre to enable us to identify his plant, is sufficient to exclude the present one, since *B. cordifolia* is described as being smooth in every part.

13/1. *BAUHINIA WRAYI* *Prain, Journ. As. Soc. Beng.* lxxvi. 2. 191; leaf rather longer than broad, gradually acutely pointed, calyx very small, limb as long as tube, petals broadly oblanceolate margin crenulate-sinuate distinctly clawed.

PERAK; *Kunstler*! *Scortechini*! *Wray*! SELANGOR; *Kunstler*!

A shrubby cirrhose climber 15-30 feet long. *Leaves* flexible glabrous above, glaucescent and sometimes sparsely pubescent on nerves beneath, 2-3 in. long, 1'25-1'75 in. across, 5-nerved, base truncate, petiole '5-'6 in. long. *Flowers* in dense close-fld. terminal and axillary racemes 2'5-4 in. long, 2'5 in. across; pedicels spreading, 1'25 in. long, sparsely puberulous. *Calyx* glabrous, tube very slender cylindrical '1 in. long, lobes '1 in. long spatulate. *Petals* pale-yellow or white becoming pinkish, '6 in. long, externally pubescent. *Ovary* glabrous stalked, style distinct. *Pod* obovate to oblong-obtuse, stalk '2 in. long, 2-3 in. long, 1 in. across. *Seeds* 1-2, rarely 3, broadly ovate much flattened, '5 in. long, '4 in. across.

A very distinct species apparently connecting the sections *Phanera* and *Lasiobema*. It cannot be confounded with any other Indian species but comes extremely near a Bornean plant (*Mottley* 376; *Haviland* 95) which differs in having cordate leaves, larger almost glabrous though similarly crenulated petals and quite

glabrous pedicels. It is not impossible that the Borneo plant may be the true *B. cordifolia* Roxb., which came originally from the Moluccas.

14. *BAUHINIA RETUSA* Ham.

Add to localities of *F. B. I.*:—NEPAL; *Maries!* CHOTA NAGPUR; very common, *T. Thomson!* *Kurz!* *Gamble!* *Wood!* *C. B. Clarke!* *Prain!*

15. *BAUHINIA INTEGRIFOLIA* Roxb.

Add to localities of *F. B. I.*:—PERAK; Prov. WELLESLEY and PAHANG, very common. DISTRIB. Sumatra.

16. *BAUHINIA BIDENTATA* Jack.

Add to description of *F. B. I.*:—*Pod* oblong woody, 4–5 in. long, 1·5 in. wide, externally quite glabrous, stipe ·25 in. long. *Seeds* 4–5, much compressed, ·5 in. long, ·35 in. wide.

Add to localities:—PERAK; common. SELANGOR; *Ridley!* JOHORE; *King!* *Hullett!* DISTRIB. Sumatra.

The Malacca specimens referred here in the *F. B. I.* agree with *B. cornifolia* Bak. except in having bifid leaves with an extra pair of nerves; they have therefore been referred to that species rather than to *B. bidentata* from which their pubescent pods alone suffice to exclude them.

16/1. *BAUHINIA KINGII* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 189; scandent, cirrhose, pubescence ferruginous, calyx-tube equalling the limb, ovary silky along the sutures, long stalked.

PERAK; *Scortechini!* *Wray!* SELANGOR; *Kelsall!* DISTRIB. Borneo?

*Leaves* deeply cordate, often slightly subpeltate, narrowed gradually to an emarginate rarely entire often deeply 2-fid tip; nerves 5, pubescent beneath branching outwards; rigidly coriaceous, 3·5–4 in. long, 2·5–3 in. wide; shining above. *Flowers* in lax lateral and terminal corymbs 3 in. long, 2·5 in. wide, sometimes forming large loose leafy zigzag panicles 6 in. across, often over a foot long. *Buds* pubescent; pedicels puberulous, the longest 1·25 in., spreading. *Calyx*-limb splitting into subequal ovate very shortly acuminate lobes, ·25 in. long, ·2 in. across; tube narrowly infundibuliform, ·25 in. long. *Petals* subequal, bright-red (*Wray*), oblanceolate-obtuse, long-clawed, ·8 in. long, ·25 in. wide, externally rusty-pubescent. *Ovary* pubescent along sutures, stalk ultimately ·2 in. long, style ·25 in. long, curved, pubescent. *Pod* woody glabrous tapering to both ends, 2 in. long, ·8 in. wide. *Seeds* 1–2, ovate, compressed, ·3 in. long, ·2 in. across.

A very distinct species. *Beccari* n. 835, from Borneo, is perhaps the same.

16/2. *BAUHINIA SCORTECHINII* Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 188; leaf rather longer than broad, suddenly tapering in upper third to a deeply 2-fid tip; calyx-limb as long as tube; *leaves densely-pubescent beneath.*

PERAK; *Scortechini!*

A cirrhose twiner with glabrescent branches. *Leaves* rigidly coriaceous, 3·5–4 in. long, 2–2·5 in. wide, 9- (rarely 7-) nerved, shallowly cordate or truncate. *Flowers* in short lax terminal racemes under 2 in. long, pedicels erecto-patent, lower not exceed-

ing .5 in., densely brown-tomentose like the calyx. *Calyx-tube* cylindric, .25 in. long, limb .25 in., lobes ovate. *Petals* densely silky externally. *Ovary* tomentose, style distinct. *Pod* not seen.

Very nearly related to *B. lucida* Wall., but at once distinguished by its deeply bifid leaves which are tomentose beneath, and by its shorter, few-flowered racemes.

18. *BAUHINIA KURZII* Prain. (*B. rosea* Kurz, not Miq.)

Add to localities:—TENASSERIM; on Taepo, at 5000 feet, *Gallatly!*

When Mr. Kurz published his description of *B. rosea* in 1873 he overlooked the fact that Dr. Miquel had already given the name (in 1844) to a quite different species from Dutch Guiana.

19. *BAUHINIA RUFa* Grak.

Add to synonyms of *F. B. I.*:—*B. Vahlia* Kurz, *Journ. As. Soc. Beng.* xlv. 2. 289; *For. Flor. Brit. Burma*, i. 401, not of W. & A.

Add to localities:—PEGU; Hills East of Tounghoo, at 2000 feet, *Brandis!* TENASSERIM; near Moulmein, *J. Anderson!*

Calcutta Garden Collectors have also quite recently obtained it in the Assam valley, as well as in Silhet. Sir Dietrich Brandis has noted that the flowers are "white, fragrant."

Mr. Kurz reduced *B. rufa* to *B. Vahlia*, a somewhat unusual step to take seeing that, if the two had been conspecific, *B. rufa* was the older and therefore the preferable name. But as Mr. Baker has shown, the two species are perfectly distinct. *B. Vahlia* has never been found in Burma: both occur in Assam so that the areas which the two occupy overlap to some extent, but in a general sense *B. rufa* may be considered the eastern representative of the more widely distributed and much commoner *B. Vahlia*.

21. *BAUHINIA SEMIBIFIDA* Roeb.

Add to synonyms of *F. B. I.*:—*Bauhinia ferruginea* var. *excelsa* Bak. in *Flor. Brit. Ind.* ii. 283 not *Phanera excelsa* Bl. *Phanera sumatrana* Miq. *Flor. Ind. Bat.* i. 1078.

Add to localities:—SINGAPORE; very common. **DISTRIB.** Sumatra; Borneo.

It should be noted that the original examples of *B. semibifida* came from Sumatra. This plant is usually much confused in herbaria with *B. ferruginea*. The species is not ecirrhose; the flowers, when the plant is grown so far north as Calcutta, as a reference to Wallich's specimens or to Roxburgh's figure (reproduced by Wight) will show, are somewhat smaller than when the specimens come from Singapore, Sumatra or Borneo.

22. *BAUHINIA MOLLISSIMA* Wall.

Add to localities:—PERAK; very common. **KEDAH**; *Ridley!* **MALACCA**; *Maingay!*

As this name is considerably older than the name *B. elongata* Korth, one or other of our priority-hunters will be certain one of these days to propose its adoption; it may therefore be as well to alter it now. But it is obviously very undesirable that an insistence on the observation of this rule regarding priority should enable a

naked name like Wallich's to displace the name given by Korthals along with a full description and an excellent plate. *B. Pottsii* G. Don, *Gen. Syst.* ii. 462 is much better referred here than to *B. ferruginea*.

25. *BAUHINIA PIPERIFOLIA* Roxb. *Flor. Ind.* ii. 327; *Bak. in Flor. Brit. Ind.* ii. 285. *Phanera glabrifolia* Benth. *Pl. Jungh.* 263. *Bauhinia glabrifolia* Bak. in *Flor. Brit. Ind.* ii. 281 (as to description and as to synonyms, but excluding the plant from Tenasserim). *B. lucida* Wall. *Cat.* 5779B, not 5779A.

ASSAM; *Simons!* SILHET; *fide* Roxburgh.

It has been a standing puzzle for many years to Indian botanists why Mr. Bentham, whose judgment, in all matters relating to Leguminosæ, deserves perhaps greater attention than that of any other author, should have decided that the plant cultivated in the Calcutta garden as *B. piperifolia* could not be Roxburgh's plant. Roxburgh's description is extremely meagre if it is true, but the only apparent discrepancy lies in the number of nerves (given by Bentham as 4 for each lobe and therefore 9 for the whole leaf, by Roxburgh as 5-7) and the shape of the leaves, (given by Roxburgh as entire by Bentham as shortly bifid at the apex). These are not really discrepancies; the upper leaves on twigs are most usually 5-7-nerved and entire; those below are most usually, though not always, 2-fid and 7-9-nerved. One point which both Roxburgh's and Bentham's diagnoses omit to note is that the leaves on root-shoots and on young plants may be completely 2-lobed to the very base exactly as in a species of the section *Lysiphyllum*. The plant is not cirrhose.

25/b. *BAUHINIA GLABRIFOLIA* Bak. in *Flor. Brit. Ind.* ii. 281 excluding description and synonyms; cirrhose, leaves 9-nerved, pubescence thin grey, pedicels rather short, flowers small, calyx-tube turbinate, limb rather exceeding the tube, petals little exerted. *B. piperifolia* Kurz, *Journ. As. Soc. Beng.* xlv. 2. 288 not of Roxb. *B. anguina* Kurz, *Journ. As. Soc. Beng.* xlv. 2. 288 not of Roxb. *Phanera diptera*, *Miq. Flor. Ind. Bat.* i. 70. *Bauhinia diptera* Bl. ex *Miq. Anal. Ind.* i. 12.

PEGU; Kurz! TENASSERIM; *Helfer* 1879! 1880! PERAK; *Scortechini* 316! 1512! *Wray* 3960! *Kunstler* 4311! 4511! 6170! PENANG; *Curtis* 801! 1541!

*Branchlets* slender at first finely silky. *Leaves* shallowly to deeply cordate, rigidly subcoriaceous, glabrous shining above, moderately large, quite entire or with 2 acute lobes reaching  $\frac{1}{2}$ — $\frac{1}{4}$  down; leaves on root shoots and on young plants quite bilobed to the base (as in § *Lysiphyllum*). *Flowers* in panicles of dense many-flowered short-peduncled corymbs; bracts long lanceolate persistent; pedicels slender ascending; never exceeding .5 in., usually only .3-35 in., clothed like calyx with grey-silky pubescence. *Calyx-tube* .5 in.; bud globose; limb usually not fully 5-cleft. *Petals* obovate clawed, densely silky on the back. *Ovary* densely silky, short-stalked; style produced, stigma small.

This plant was considered by Mr. Kurz as well as by Mr. Baker to be the same as *B. piperifolia*. An examination of Mr. Kurz's specimens, which form the basis of his descriptions in the *Forest Flora* and in his other papers, shows that what he has treated as *B. anguina* is in every case the present species. *B. anguina* does occur in Burma but all the specimens of that species have been treated by Mr.



Kurz as *B. macrostachya* Wall! The present species is extremely closely related to *B. piperifolia* but can be at once distinguished by its shorter pedicels, its much larger bracts, and its pubescent ovaries.

The name here adopted calls for explanation. This is evidently the same plant as the species somewhat rashly described by Miquel (from leaf specimens only) as *Phanera diptera*, which Miquel says had received from Blume the tentative MSS. name *Bauhinia diptera* Bl. But these dipterous leaves occur only on seedlings and root-shoots, and the name, being singularly inappropriate for the species as a whole, is better neglected. The species described in the *F. B. I.* as *B. glabrifolia* is really *B. piperifolia* Roxb. but as Mr. Baker has cited along with *B. piperifolia* specimens of the present one under his *B. glabrifolia*, the latter name has been retained for this plant; it must, however, be recollected that this is done to the complete exclusion of the plant described and the synonyms cited by Baker.

An incidental advantage of neglecting the name *Bauhinia diptera* Bl. is that it becomes thus unnecessary to alter the name of a very distinct species from Upper Burma described by Sir H. Collett and Mr. Hemsley as *B. diptera*, these authors having for the moment overlooked the fact that their name was preoccupied.

30/1. *BAUHINIA TENUIFLORA* Watt ex Clarke in *Journ. Linn. Soc.* xxv. 18; cirrhose, pubescence thin ferruginous, leaves 9-nerved not cleft to the middle, pedicels moderately long, calyx-limb very much shorter than the much elongated cylindrical tube, petals sparsely pubescent externally.

KHASIA HILLS; *Hooker and Thomson.* NAGA HILLS; Watt 6915! MANIPUR; *Clarke!*

*Leaves* shortly bilobed, lobes obtuse, about 3 in. wide. *Corymbs* many-fl., rusty tomentose, peduncles 1-2 in. long, pedicels rusty-pubescent the lowest 1.5 in. long. *Calyx-tube* linear 1 in. long, lobes lanceolate .25 in. *Petals* white, margin wavy, back sparsely pubescent; .6 in. long, oblong, long-clawed. Fertile *stamens* 3, filaments longer than petals, glabrous. *Ovary* glabrous. *Pod* 8-9 in. long, 1.75 in. wide, much compressed, thin, glabrous. *Seeds* 15-20, oval, .5 in. long, .3 in. across.

Very near *B. corymbosa* but with longer, less divided leaves and broader pods; also near *B. glauca* but with leaves less divided and calyx-tube very much longer.

30/2. *BAUHINIA DIPTERA* Coll. & Hemsl. *Journ. Linn. Soc.* xxviii. 53; cirrhose, glabrous, leaflets distinct, small, 3-4-nerved, pedicels long, calyx-limb 2-3-lobed, longer than the cylindrical tube, petals glabrous exerted.

BURMA; Shan hills, at Koni, *Collett!* Prager! Ywanguyen, *Collett!*

*Branchlets* slender glabrous; tendrils small few. *Leaves* very small and quite 2-lobed (as in § *Lysiphyllum*), leaflets sessile submembranous oval-elliptic .75-1 in. long, rounded at both ends, rather pale beneath; stipules minute early deciduous. *Flowers* in lax subcorymbose 5-11-fl. racemes, lower pedicels .75 in. long, *Calyx-lobes* .35 in. long, apiculate, tube .25 in. long. *Petals* unequal narrowly spatulate, margins wavy, longest .75 in. long. *Stamens* 3 fertile, filaments far exceeding the corolla-lobes, 1.5 in. long. *Ovary* long-stalked, about 12-ovuled, glabrous, style .5 in. long, stigma small. *Pod* 2.5 in. long, linear-oblong, .5 in. wide, glabrous, slightly transversely impressed between the seeds, narrowed to an acute beak; stipe .3 in.

long. *Seeds* 8-10, much compressed, wide-ovate, .25 in. long, .2 in. wide, pale-brown, testa shining.

A very distinct species not nearly related to any hitherto known form. The name *B. diptera* is, as has already been explained under *B. glabrifolia*, preoccupied. Owing, however, to its inapplicability to the more usual form of the species it was intended to designate, the original name *B. diptera* Bl. should be allowed to lapse. In the event, however, of our bibliographers being permitted to substitute the name *B. diptera* Bl. for the name *B. glabrifolia* Bak., it will be necessary to use, instead of *B. diptera* Coll. & Hemsl., the name *B. Collettii* for the present plant.

### 31. BAUHINIA FERRUGINEA Roxb.

Delete both varieties; also delete from the synonyms:—*Korth. Nat. Verh. Geschied. Bot. t. 23*: *B. Pottsii* *G. Don, Gen. Syst. ii. 462.*

The only point wherein the *F. B. I.* description is inapplicable to the plant described and figured by Roxburgh and issued by Wallich as *B. ferruginea* and again described by Bentham as *Phanera ferruginea*, is as regards the length of the pedicels; these do not, even in fruit, reach half-an-inch in length. Korthal's plant is certainly not Wallich's and Roxburgh's and therefore is not *B. ferruginea* Roxb. As it happens, it forms the basis of *Phanera excelsa* Miq., which is quoted as a synonym of *B. ferruginea* var. *excelsa* and is thus apparently accounted for in two places in the *F. B. I.* As a matter of fact, however, the specimens from Malacca that form the basis of var. *excelsa* do not belong to *Phanera excelsa* Miq. (*B. excelsa* Bl.=*B. ferruginea* Korth. not Roxb.) Nor do they belong to *B. ferruginea*; they have petals almost glabrous externally and have long pedicels, and are the same as *Phanera sumatrana* Miq. which, in turn, is identical with *B. semibifida* Roxb.

*Bauhinia Pottsii* *G. Don*, by its description cannot possibly be *B. ferruginea* because of its having pubescent pods. There is nothing in *Don's* short description to separate it from *B. mollissima* Wall. (*B. elongata* Korth.) and it should be referred as a synonym to that species.

31/1. BAUHINIA RIDLEYI Prain, *Journ. As. Soc. Beng. lxi. 2. 185*; cirrhose, pubescence very densely silky-ferrugineous, leaves 9-11-nerved cleft one-third down, pedicels very short, calyx-limb 5-cleft rather exceeding the ampullaeform tube, petals not exerted densely silky.

PERAK; *Scortechini!* *Kunstler!* PENANG; *Ridley! Curtis!* JOHORE; *King and Hullett!*

Branchlets persistently tomentose. *Leaves* strigose above, densely tomentose beneath, lobes subacute, 2.5-4 in. long. *Flowers* in very dense terminal corymbs, 2 in. long and broad; densely softly rusty-silky bracts large ovate. *Calyx-tube* .3 in. long. *Petals* oblong obtuse. *Stamens* 3. *Style* stout .5 in. long. *Pod* unknown.

Near *B. ferruginea* but with denser pubescence and distinctly pubescent leaves; the very dense corymbs and short petals at once distinguish it from the other members of its group.

31/2. BAUHINIA GRIFFITHIANA Prain, *Journ. As. Soc. Beng. lxi. 2. 183*; cirrhose, pubescence bright-ferrugineous, leaves 9-11-nerved cleft one-third down, stipules large orbicular persistent, calyx-limb 5-cleft rather exceeding the ampullaeform tube, petals exerted densely silky.

*Phanera Griffithiana* Benth. *Pl. Jungh.* 263. *B. ferruginea* VAR. *Griffithiana* Bak. in *Flor. Brit. Ind.* ii. 283.

MALACCA; *Griffith!* *Maingay!* *Hervey!* *Derry!* *Holmberg!* PERAK; *Scortechini!* PAHANG; *Ridley* 2606!

Very nearly related to the true *B. ferruginea* and differing mainly in having large orbicular persistent stipules  $\frac{7}{8}$  in. across, in having yellow instead of white flowers, and in having inflated instead of uniform fertile filaments.

31/3. BAUHINIA HULLETTII *Prain, Journ. As. Soc. Beng.* lxxi. 2. 183; cirrhose, pubescence bright ferruginous, leaves 9–11-nerved cleft one-third down, stipules large, persistent, pedicels long, calyx-limb 5-cleft rather exceeding the ampullaeform tube, petals far exerted densely silky.

PENANG; *Curtis!* *Scott!* *Kunstler!* PERAK; *Wray!* MALACCA; *Holmberg!*

Very nearly related to *B. Griffithiana* and with similar stipules which are however smaller (only  $\frac{5}{8}$  in. across) and hirsute; the leaves are also persistently pubescent and the corymbs are few-fl., the flowers are long-pedicelled (the pedicels 1.25–1.5 in. long), the calyx and petals rose-red.

32/1. BAUHINIA ALBO-LUTEA *Prain, Journ. As. Soc. Beng.* lxxi. 2. 181; cirrhose, pubescence usually thin, rusty, leaves 9–11-nerved cleft one-third down, pedicels long, calyx-limb 5-cleft rather exceeding the ampullaeform tube, petals exerted glabrous except for a few hairs on the midrib externally. *B. ferruginea* *Kurz, Journ. As. Soc. Beng.* xlv. 2. 128 and 289, not of *Roxb.* *Phanera albo-lutea* *Miq. Flor. Ind. Bat.* i. 1079.

BURMA; *Pegu, Kurz* 1680! *Tenasserim, Gally!* NICOBARS; Great Nicobar, *Jelinek!* *DISTRIB.* Sumatra.

A slender shrubby climber, tendrils circinate glabrous. *Leaves* rigidly subcoriaceous, cordate, 2.5–4 in. long, lobes subacute, glabrous above, persistently puberulous to pubescent beneath; stipules persistent rather large. *Flowers* in terminal corymbs, 3–4 in. long, lax-fl., pedicels 1.5–1.75 in. long; bracts lanceolate deciduous. *Calyx-tube*  $\frac{4}{5}$  in. long, sepals narrowly lanceolate coriaceous, distinct. *Petals* oblanceolate subacute clawed. *Stamens* 3. *Ovary* sparsely puberulous, style long slender glabrous, stigma rather small. *Pod* thin, oblong, glabrous, woody. *Seeds* 2.

Resembles *B. nervosa* in foliage and stipules and *B. semibifida* in petals.

36. BAUHINIA ANGUINA *Roxb.*

Leaves thin glabrous beneath, ovary glabrous, pod short oval 1–2-seeded, glabrous; calyx-tube very short, limb 5-fid.

36/1. BAUHINIA CHAMPIONII *Benth., Fl. Hong-Kong.* 99; leaves thin adpressed-pubescent beneath; ovary pubescent, pod oblong, 3–5-seeded, glabrescent; calyx-tube very short, limb 5-fid.

SIKKIM; *Tista Valley*, common, *King!* *Kurz!* etc. ASSAM; *Brahma-kund, Masters!* *DISTRIB.* China.

A woody climber, branchlets hoary-pubescent. *Leaves* broadly cordate, 5-7-nerved, 2.5-4 in. long, 2-3 in. broad, upper leaves often entire, the others divided at the tip into two broad obtuse or deltoid lobes. *Racemes* paniculate at end of branches, rarely simple; bracts minute linear; pedicels .35 in. *Calyx-tube* very short, lobes linear-lanceolate .24 in. long. *Petals* white similar oblanceolate, .25 in. long, sparsely pubescent externally. *Stamens* 3 fertile, .4 in. long. *Pod* 3 in. long, 1 in. wide; stipe .2 in. long.

Mr. Bentham refers this to § *Phanera*, but its floral structure is exactly that of § *Lasiobema*; indeed, it is only the presence of the very different pods that makes its specific separation from *B. (Lasiobema) anguina* possible.

36/2. *BAUHINIA CURTISII* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 195; leaves thin glabrous beneath; ovary glabrous; pod oblong, 3-5-seeded, glabrous, calyx-tube very short, limb 5-fid.

KEDAH; *Curtis* 1682! 2619!

A woody climber, branchlets very faintly puberulous. *Leaves* ovate-oblong, 5-7-nerved, 2.5-4 in. long, 2-2.5 in. wide, upper sometimes entire, the others divided at the tip into two short slightly diverging deltoid lobes. *Racemes* simple or paniculate at end of branches, bracts minute linear; pedicels .5 in. *Calyx-tube* very short, lobes ovate-lanceolate, .15 in. long. *Petals* white similar spatulate, clawed, glabrous, .25 in. long. *Stamens* 3 fertile, .35 in. long. *Pod* 2.5 in. long, .75 in. wide; stipe .1 in. long.

Very near *B. Championii* Benth., but with longer pedicels, smaller buds, shorter calyx-lobes, and much shorter stipe to ovary and pod. The ovary too is quite glabrous as are the leaves beneath.

36/3. *BAUHINIA STRYCHNOIDEA* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 195; leaves thickly coriaceous quite glabrous polished shining; pod broadly oblong 2-4-seeded, densely pubescent, calyx-tube very short, limb large campanulate entire truncate with 5 minute projections on margin.

PERAK; *Scortechini!* *Kunstler!* SELANGOR; Kwala Lampar, *Kelsall!*

A woody climber 50-60 feet long; branches glabrous. *Leaves* ovate-acute, 5-nerved, the inner pair almost as strong as the pinnately branching midrib and often partly conjoined with its base; 3.5 in. long, 2 in. wide. *Racemes* simple or paniculate at end of branches, bracts minute linear, pedicels .75 in. *Calyx-tube* very short, limb entire wide-campanulate, .2 in. long and broad. *Petals* red, the upper ovate slightly longer than the rest, the others spatulate obtuse, .35 in. long, all quite glabrous externally, slightly puberulous on midrib within. *Stamens* 3 fertile not exerted. *Pod* 4-6 in. long, 2 in. wide, densely pubescent externally. *Seeds* ovate, compressed, 1 in. long; .6 in. wide, dark-brown.

This very remarkable species at first sight seems to deserve being treated as the type of a new section because of its curiously veined leaves, which have the nervation of a *Strychnos* rather than of a *Bauhinia*; its cupular entire calyx-limb is also quite different from that of any other Indian species of the genus. But the facies is so completely that of a thick-leaved *Lasiobema* that it is no doubt better to incorporate it in that section. Mr. Bentham in the *Genera Plantarum* has restricted to *Lasiobema* a solitary species, *B. anguina*; the species *B. Championii* is, however, so obviously a member of the same group, in spite of its longer pods, that

the writer without hesitation has widened the limits of the section so as to admit it. When *B. Championii* and the allied *B. Curtisii* are included there is nothing in the pods of *B. strychnoidea* to warrant its exclusion; the only differential character left is the entire calyx-limb, and that taken by itself seems barely sufficient to warrant the establishment of a new section.

### 37. BAUHINIA MONANDRA Kurz.

The oldest name for this species is *B. Richardiana* Wall. in Voigt. *Hort. Suburb.* 255 (1845) not of DC. The original *B. Richardiana* DC. (*Prodr.* ii. 517) from Guiana, which Dr. Wallich seems for the moment to have overlooked, has cordate entire leaves and therefore, though it is in other respects a doubtful species, cannot be this plant.

That this species is not (as Mr. Kurz and Mr. Baker have treated it) a native of India is beyond dispute; what its original country may be is, however, somewhat doubtful. The history of its introduction may be best given by transcribing *verbatim* the passage in Dr. Wallich's MSS. Catalogue of the Calcutta Garden (Vol. i, p. 542), whence Voigt obtained the name. This passage runs as follows:—

"*Bauhinia Richardiana* Wall. 'A tree.' No doubt a distinct species, with "large round-cordate two-lobed leaves smooth except a little pubescence on the nerves "and veins on the glaucous under surface, opaque above; 13-nerved; petioles "shortish; stipules lanceolate very small, as well as the young parts a little villous. "It is now (see date) in flower and a most beautiful plant. It is of the section "*Casperea*; large ovate, pointed, shortish but distinctly clawed pale-pink petals with "crispate margins and with very conspicuous darker-coloured dots; lip crimson and "spotted within, oblong and slightly three-lobed, channelled and pubescent at the "margins below.

"Madagascar; Mons. Richard, 16 May, 1840; germinated, 21st, same month; "August 22, 1841, it flowered; pod ripened, 6th December, 1841."

The time between receipt of seed and flowering seems remarkably short!

The subsequent history of the species in India may be briefly given. Specimens in the Calcutta Herbarium show that about 1855 it had become confused in the Royal Botanic Garden with *Bauhinia (Phanera) variegata*; and in the Serampore garden (though not in the Calcutta one) with *Bauhinia aurantiaca*, a species with 6 fertile stamens, which was first sent to India from the western shores of Madagascar by M. Gereve in 1835 and was again sent along with our present plant by M. Richard on 16th May, 1840, on that occasion flowering on the 22nd March, 1841.

It had also found its way to Southern and to Western India; the gardeners in Madras confuse it to this day with *B. variegata*; those of Bombay had examined it more closely, for specimens from the herbaria of Stocks and of Dalzell are named *B. latifolia*. They have thus placed it in the true section, since *B. latifolia* Cav. is a *Casperea*; an examination of Cavanille's original figure shows, however, that this is quite distinct from his plant.

At present the species seems to have altogether disappeared from gardens in Bengal, but it lingers in Martaban; doubtless, judging from Kurz's two quoted names (*Shway-doh*, and *Shway-ton*), in temple gardens. It has also been recently sent from Poona and from Chittagong.

It would be interesting to learn if the species be really a native of Madagascar or if it had been originally introduced to that island from elsewhere. The writer has failed to trace it in any work dealing either with African or American botany: one thing only is quite certain—it is not a native of India or of South-Eastern Asia at all

## 122. PARKIA R. BR.

2b. *PARKIA SPECIOSA* Hassk. *Flora* xxv. 2, *Beibl.* 55; gland of petiole solitary, leaflets linear-ligulate, 50–70 to a pinna, obtuse at the tip. *Hassk. Cat. Hort. Bog.* 289; *Pl. Jav. Rav.* 414; *Miq. Flor. Ind. Bat.* i. 53. *P. macrocarpa* *Miq. Flor. Ind. Bat. Suppl.* 284. *Acacia graveolens* *Jack, Mal. Misc.* ii. 7. 78.

PENANG; cult., *Curtis!* PERAK; Thaiping, *Scortechini!* Larut, *Kunstler!* DISTRIB. Sumatra; Java, cult. (*Hasskarl!*)

A tree 80–100 feet high. *Leaf-rachis* 8–10 in. long, pubescent; pinnæ subalternate, 10–16 pairs, leaflets 50–70, .25 in. long, .1 in. wide, the secondary veins as well as the midrib distinct beneath. *Peduncle* 16–20 in., flowers in clavate heads 2 in. long, .75 in. in diam. *Calyx* .25 in. long; tube cylindric glabrous; lobes pilose. *Pod* 18–20 in. long, 2–2.5 in. wide, narrowed into a stalk 2–5 in. long.

A very distinct species; the *Pete* or *Pethek* of the Malays.\*

## 125. MIMOSA LINN.\*

## 1. MIMOSA PUDICA Linn.

In this species, the stamens are always 4 in number, *i.e.* equal to and *not*, as the *F. B. I.* implies, twice the number of the petals.

## 126. ACROCARPUS W. &amp; A.

## 1. ACROCARPUS FRAXINIFOLIUS Wight.

Add to localities of *F. B. I.*:—CHITTAGONG; *Lister!* PEGU; *Kurz!*

## 127. ACACIA WILLD.

## 2. ACACIA PLANIFRONS W. &amp; A.

To this Mr. Baker has reduced *A. Roxburghii* W. & A. Wight and Arnott based their species on Roxburgh's figure of the tree he took to be *A. eburnea*, which certainly is not that species. Unless Dr. Roxburgh made a mistake in his drawing, a thing that is highly improbable, the *F. B. I.* reduction is clearly impossible, for *A. planifrons* has a terete pod and *A. Roxburghii* has a flat one. There are, as a matter of fact, two species that have been frequently reported from Southern India to the Calcutta Herbarium under the name *A. planifrons*; these are certainly exceedingly similar, still they can be separated by their leaves alone. The first, which has terete pods, has leaflets exactly like those of the types of *A. planifrons* W. & A. The second, which has leaflets exactly like those of Roxburgh's figure of "*Mimosa eburnea*," has never yet been reported in fruit; till its pods are available, the difficulty as regards these two forms cannot be satisfactorily settled.

6b. *ACACIA KINGII* Prain; pinnæ short, crowded, 18–20, leaflets 22–28, heads axillary; pedicels with a whorl of bractlets.

SHAN HILLS; *King's Collector!*

\* *Mimosa niamensis* Roxb. is given in the *Index Kewensis* as an altogether doubtful synonym. By a *lapsus calami* the species is said to be African; it was from America, Roxburgh states, that the plant was received (*Hort. Beng.* 41) and the plant cultivated under this name in *Hort. Calcutta* has always been a form, hardly a variety, of *Desmanthus brachylobus* (*Mimosa brachyloba*), which was also received by Roxburgh from that continent.

A tree 30–40 feet high, with slender black slightly zig-zag glabrescent branches. *Spines* stipular only, very small and weak, always under  $\cdot 2$  in. long. *Leaf-rachis* sparsely pubescent, 2–3 in. long with a large flat petiolar gland just below the first pair of pinnæ; pinnæ 1 in. long, leaflets ovate-oblong crowded,  $\cdot 2$  in. long,  $\cdot 1$  in. across, subcoriaceous, *Peduncles* crowded in the axils of full grown leaves,  $\cdot 75$  in. long, with ring of bracts above the middle. *Heads*  $\cdot 4$  in. in diam. *Calyx* campanulate minute. *Corolla* thrice the calyx, teeth short subacute. *Staminal-tube* much shorter than that of corolla.

This species and the next are somewhat unlike any of the other Indian *Acacias*. The flower-head are exactly those of species of *Acacia* of the *Farnesiana* or the *arabica* groups, but the connate filaments suggest that they are not *Acacias*. They do not bear much resemblance to any of the *Albizzias* or *Pithecolobiums*; in foliage, however, both plants recall some of the American species of *Calliandra*. The amount of union of filaments is not in the present plant very great, the staminal tube being hardly longer than the stipe of the ovary and, had there been no other to deal with, the writer would have felt but few misgivings about referring it to *Acacia*.

6c. ACACIA ? INOPINATA Prain; pinnæ long, distant, 12–14, leaflets 20–22, heads in lax panicles; pedicels with a whorl of bracts.

SHAN HILLS; King's Collector!

A tree? with slender black straight glabrous branches. *Spines* 0. *Leaf-rachis* glabrous, 8–10 in. long, with two large flat petiolar glands below the bases of the 2 distal pairs of pinnæ; pinnæ 2 in. long; leaflets linear-oblong,  $\cdot 35$  in. long,  $\cdot 15$  in. wide, subcoriaceous. *Peduncles* in fascicles of 3–4, on the branches of a lax, twice branching terminal panicle 1–1.5 feet long, secondary branches 6–8 in. long, tertiary branches 3 in. long, pedicels  $\cdot 6$  in. long, slender, puberulous, with a ring of bracts just below the middle. *Heads*  $\cdot 4$  in. in diam. *Calyx* campanulate minute. *Corolla* thrice the calyx-teeth, short subacute. *Staminal tube* almost equalling that of corolla.

A remarkable plant, evidently congeneric with and nearly related to the last species, but at the same time very distinct by reason of its staminal tube, formed by the more or less regular union of the filaments throughout their lower two-thirds to three-fourths. The writer was at first inclined to treat these two plants tentatively as *Calliandras* and indeed issued specimens as such. His friends on the Kew staff, however, suggest that both should be treated as *Acacias*; in deference to their opinion this course is here adopted; it will be noted that the location of the present plant in *Acacia* violates the one character on which the existence, not merely of the genus *Acacia*, but of the tribe *Acacieae* depends.

#### 7. ACACIA LEUCOPHLOEA Willd.

Under VAR. *microcephala* (Grah.), Mr. Baker places both *A. microcephala* Wall. Cat. 5263 and *A. densa* Wall. Cat. 5262. The last mentioned is a form that is of frequent occurrence in the Shan Hills, it has fruits exactly like typical *A. leucophloea* and the writer agrees with Mr. Baker in reducing it to Willdenow's species. *A. microcephala* Grah., however, has very different pods, never under 5 in. long or  $\cdot 5$  in. wide and always glabrous; it is therefore, in the writer's opinion, not only necessary to distinguish it from *A. leucophloea* VAR. *densa*, but preferable to consider it, as Graham did, a distinct species.

8. ACACIA SUMA *Buch.-Ham. in Wall. Cat. 5227 C. ; Voigt, Hort. Suburb. 260 ; Kurz ex Brand. For. Fl. 187.*

Why Kurz should be quoted as the authority for this species is not clear; he himself (see *For. Flor. Brit. Burm. i. 421*) attributes the authorship to Buchanan-Hamilton. The *Index Kewensis* gives the citation in such a manner as to make it appear that *A. Suma* Ham. and *A. Suma* Kurz are different plants; it permits the latter to stand and reduces the former to *A. Sundra*. However, the citation in the *Index* shows that it is "*A. Sundra* Wall.," not *A. Sundra* DC. to which *A. Suma* Ham. is equivalent, and as it immediately afterwards reduces "*A. Sundra* Wall." to *A. Suma*, the *Index* corrects itself. Obviously, however, the authority to be cited is Hamilton, not Kurz.

Mr. Baker's diagnosis of the species is very effective and settles once for all the identity and the specific rank of "*Suma*" as opposed to what may be termed the "*Khairs*."

9. ACACIA CATECHU *Willd.*

10. ACACIA SUNDRAL *DC.*

There has always been some difficulty in deciding how many different forms of *Kutch* or *Khair* occur in India. Wight and Arnott seem to recognise only two, *A. Catechu* and *A. Sundra*. But their *A. Catechu* is *A. Suma* (the true *A. Catechu* apparently does not occur in South India at all, and there are certainly no specimens of it in Wight's herbarium); *Suma* is not a *Khair*, so that in reality Wight and Arnott only deal with one *Khair*. *A. Suma*, as Mr. Baker has clearly shown, cannot be confused with any of the "*Khairs*;" it has white bark and white flowers, and has petals hardly longer than the downy calyx; it may then be once for all definitely separated from the others.

Of these others Roxburgh recognised three, *A. Catechu*, *A. catechuoides*, and *A. Sundra*; Baker, reducing *A. catechuoides* to *A. Catechu* and retaining *A. Sundra* as a species, recognises two; Kurz (*For. Flor. Brit. Burma i. 422*), recognises but one species, *A. Catechu*, though he divides it into two varieties which he terms *Catechu proper* and *Sundra*; these varieties correspond exactly to the two species given by Mr. Baker, for under *Catechu proper* Kurz mixes the *A. Catechu* and the *A. catechuoides* of Roxburgh. That Roxburgh was right is, however, very apparent when large suites of specimens, such as are preserved in the Calcutta Herbarium, are available for study. There are three equally distinct and very easily separable forms, exactly as Roxburgh pointed out, and though the writer, following Kurz, is only able to see in them different forms of one species, or at most three species of secondary rank, he is quite satisfied that all three are entitled to equal consideration.

The diagnosis of these forms is as follows:—

- |   |                                     |
|---|-------------------------------------|
| Bark white, calyx downy, not much shorter than  |                                     |
| petals ... ..   | 1. <i>A. Suma</i> Ham.              |
| Bark brown, calyx less than half as long as   |                                     |
| petals ... ..   | 2. <i>A. Catechu</i> Willd. : Kurz. |
| a. Calyx, petals and rachis covered with spreading hairs (= <i>A. Catechu</i> Willd). |                                     |
| b. Calyx and petals glabrous, rachis puberulous (= <i>A. catechuoides</i> Bth).       |                                     |
| c. Calyx, petals and rachis all glabrous (= <i>A. Sundra</i> DC).                     |                                     |



The distribution of the "Suma" and the three "Khairs" is as follows:—

ACACIA SUMA *Ham.*

SOUTH INDIA; very common everywhere on the eastern side of the Peninsula from the Carnatic and Mysore to Orissa and Behar; (never reported as yet from Central India, the Western Deccan, the Concan, Rajputana, or the Panjab.) ASSAM; very common in the Brahmaputra Valley and also in Silhet; (never recorded from Burma.)

ACACIA CATECHU *Willd.*

NORTHERN PANJAB; Hooshiarpur, *Aitchison!* NORTH WEST HIMALAYA, up to 3,000 feet; from Hazara, *Stewart* 400 bis! to Kangra, *Clarke* 24641! Sirmoor, *Vicary!* Simla, *Griffith!* Garhwal, at Srinagar, *Thomson!* on the Mussoorie range, *King!* CENTRAL INDIA; Saugor, *Vicary!* Goona, *King!* Gwalior, *Maries!* BEHAR; common; *Hooker!* *Clarke* 17311! *Kurz!* *Gamble* 8887! *Prain!* GANJAM; *Gamble*, 13810! 13983! BURMA; Pegu, very rare, *Kurz!* (This has never been reported from Rajputana, from the Concan, or from the Deccan; on the Eastern side of the Peninsula it has never been found south of Ganjam; it has never been found in the Eastern Himalaya or in Assam; in Burma it has only been found in Pegu; *Kurz* notes its name there as "Sha.")

ACACIA CATECHUOIDES *Benth.*

BENGAL; at Morung and Bangka, near Monghir, *Hamilton* (in *Wall. Cat.* 5228 B)! Pabna, among village bushes, *Kurz!* SIKKIM TERAI; *Hooker!* *Gamble* 4084! *Clarke* 26522! *Heawood* 28! ASSAM; common, *Griffith* 1918! *Jenkins!* *Masters!* *Simons!* BURMA; Irrawaday Valley, *Wallich* 5228 D! Pegu, *Eyre!* *Kurz* 1749! 2580! 2581! Amarapura, *King's Collector!* (Though apparently quite common in Pegu and Prome this has neither been collected in the Shan Hills nor in Upper Burma to the north of Ava). TENASSERIM; Tavoy, *Gomez* (*Wall. Cat.* 5228E); (this last is only in fruit and it is a little doubtful if it be *A. catechuoides*).

ACACIA SUNDRA *DC.*

SOUTH INDIA; very common from Coimbatore northwards to the Deccan, equally common in Kanara and the Concan. KATTIWAR; at Rajkote, *McNaghten!* RAJPUTANA; Mt. Abu, *King!* BURMA; Segain, *Wallich!* Mandalay, *J. Anderson!* Meiktila, *Collett* 854! Shan Hills, common. (This species in India has never been reported from Orissa, Central India, Behar or from any locality to the east of these areas; in Burma, where it recurs, it seems to be common to the north and east of Pegu and Prome, but has never been recorded from either of these districts.)

This record of distribution, which is based on an examination of over 100 gather-

ings, shows that the 3 forms of "Khair" hardly overlap but appear rather to be representative one of another in tolerably well-defined areas. The fact that *A. Sundra* should fill the area to the south-west of that occupied by *A. Catechu* and should again recur in an indistinguishable form to the east of that occupied by *A. catechuoides* is perhaps as good a proof as any that all three are but manifestations of one species. It is interesting to note that the area occupied by *A. Suma* crosses that occupied by this amplified *A. Catechu* almost at right angles, and that though it is in Mysore intimately associated with *A. Sundra*, in Orissa and Behar with *A. Catechu* proper, and in Assam with *A. catechuoides*, it nowhere shows the least tendency to pass into any of these forms. In this, the writer believes, we have a very strong confirmation of the justice of Mr. Baker's treatment as opposed to that of Dr. Wight.

12. ACACIA SENEGAL Willd.

Add to localities of *F. B. I.*:—

RAJPUTANA; very common everywhere, *King! Brandis! Moir! Duthie!* PANJAB; at Rhotak, *Bailey!*

17. ACACIA INTSIA Willd.

The writer quite thinks with Mr. Baker that *A. oxyphylla* Grah. is only a variety of *A. Intsia*.

*A. Caesia*, however, the writer agrees with Wight and Arnott and with Kurz in keeping separate. The crowded leaflets, always hairy beneath, make it very easy to recognise *A. Caesia*, even in the herbarium, and apart from the fact that its general facies is quite different from that of *A. Intsia* and that no one dreams of confounding the two as they grow. But *A. pseudo-Intsia*, referred to *A. Caesia* in the *F. B. I.*, is a very distinct species that, though resembling *A. Caesia* in externals, is in reality more nearly allied to *A. pennata* than it is either to *A. Intsia* or to *A. Caesia*.

18. ACACIA PENNATA Willd.

1. VAR. *canescens* seems certainly a distinct species, easily separated from *A. pennata* by its longer pedicels and its pale, differently shaped pods. Very nearly related to this is another form from Burma, like *A. canescens* Grah. in other respects but with rather larger leaflets and with much larger pods; they have, however, the slightly thickened sutures that are found in the pods of true *A. canescens*. This large fruited form must be known as *A. pennata* VAR. *macrocarpa* or *A. canescens* VAR. *macrocarpa* according to the view that is adopted regarding *A. canescens*.

Typical *A. canescens* is common in Burma and also occurs frequently in Western India from Canara to Travancore; it appears never to have been collected in India to the east of the Western Ghauts.

2. VAR. *arrophula* also appears to the writer to deserve specific rank. The stipular gland is, however, quite the same as in true *A. pennata* and there are some specimens regarding which it is not easy to decide in the herbarium whether they should be referred to VAR. *typica* or to VAR. *arrophula*. The most satisfactory diagnostic characters seem to be the pubescent rachis never prickly beneath (typical *A. pennata*) and the glabrous rachis prickly beneath (*A. arrophula* Don.), but sometimes the rachis in *A. arrophula* is *pubescent* and prickly, sometimes glabrous and *unarmed*. No one could possibly confound the two in the field.

3. VAR. *pluricapitata* would also certainly be better considered a distinct

species. The petiolar gland is totally unlike that of typical *A. pennata* or that of *A. arrophula*.

19. *ACACIA PRUINESCENS* Kurz, *Journ. As. Soc. Beng.* xlv. 2. 298; *For. Flor. Brit. Burm.* i. 424; pinnae 16–30, leaflets 80–120, rigidly coriaceous dimidiate-linear densely crowded, bracts large lanceolate; branches and branchlets usually covered with a waxy bloom.

ASSAM; Talap, Lakhimpur, *G. Gammie* 160! MANIPUR; Nong Shong Khong, *Watt* 6266! BURMA; Hukung Valley, *Griffith* 1930! Poneshee, *J. Anderson*! Pegu, Yomah, *Kurz* 1744! (the last with rather larger leaflets and without bloom.)

A large woody climber, armed with recurved thorns, stems thick, the young branches almost always pruinose; leaves up to 10 in. long, petiole short with a very large gland 1 in. above the base; leaflets sessile, up to 5 in. long, blunt, glabrous or with ciliate margins; heads 5 in. across, ovary glabrous. *Pod* unknown.

A very distinct species; the Pegu specimen above mentioned has been named *VAR. laevis* by Mr. Kurz and seems deserving of varietal rank. The pods described by Mr. Kurz as those of his plant belong, however, as his specimens show, to the quite different plant which must be treated as *VAR. macrocarpa* of *A. canescens* Grah., (*A. pennata* *VAR. canescens* Baker.)

20. *ACACIA PSEUDO-INTSIA* *Miq. Flor. Ind. Bat.* i. 12; pinnae 12–16, leaflets 40–60 ligulate-oblong, rigidly subcoriaceous crowded, apex rounded not cusped, bracts large ovate-acute. *Prain, Journ. As. Soc. Beng.* lxvi. 2. 249.

*VAR. typica*; leaflets minutely adpressed-puberulous beneath.

SINGAPORE; *Hullett* 835! *Ridley* 3631! 6177! *DISTRIB.* Sumatra, Java.

*VAR. ambigua* *Prain, loc. cit.*; leaflets quite glabrous beneath.

ANDAMANS; very common.

*Prickles* numerous, short, straight or recurved. *Branchlets* and leaf-rachises faintly puberulous, the latter with a very large gland near base of petiole and with 2–3 similar but smaller glands between the bases of the distal pairs of pinnae. *Pinnae* 3–4 in. long; leaflets subcoriaceous 5 in. long, 15 in. wide, dark-green above, grey beneath, quite glabrous above, faintly adpressed-puberulous beneath in *VAR. typica*, glabrous beneath in *VAR. ambigua*. *Peduncles* 2–4-nate very rarely solitary, 5 in. long (in type) to 75 in. long (in *VAR. ambigua*), bracts large ovate-acute, puberulous or (*VAR. ambigua*) glabrous; heads yellow, 4 in. in diam. *Corolla* yellow. *Pod* not seen.

A distinct species, much resembling in externals *A. Intsia* and *A. Cæsia* but easily distinguished from both by its much larger bracts.

## 128. ALBIZZIA DURAZZ.

1b. *ALBIZZIA KALKORA* *Prain*; leaflets 24–32, obtuse, heads not panicked, calyx pedicellate funnel-shaped. *Mimosa Kalkora Roxb. Hort. Beng.* 40; *Flor. Ind.* ii. 547. *Albizzia Lebbek Forbes & Hemsl. Ind. Sinens.* i. 216 in part, not of *Benth.*

KHASIA HILLS; 3-4000 feet, *Mann* 388! NAGA HILLS; *Giesselieri*!  
DISTRIB. S. China (*Henry* 6203).

A tall tree without prickles. *Leaves* glabrous with large gland near base of petiole and another between bases of last pair of pinnæ; pinnæ 6-12 (rarely 4), leaflets short-stalked rigidly subcoriaceous, main-nerve parallel with and slightly nearer the upper margin, 1-1.5 in. long, glabrous. *Heads* many-fl., peduncles 1-3 in axils of upper leaves, slightly puberulous, 2-2.5 in. long. *Calyx* .15 in., faintly puberulous. *Corolla* yellowish, silky externally, teeth long lanceolate. *Stamens* pink. *Pod* strap-shaped, firm, dark-brown, 6 in. long, 1 in. wide, 6-10-seeded, with a stalk .35 in. long.

Nearest to *A. Lebbek*; the long stalked-pod is, however, alone sufficient to separate it.

1c. *ALBIZZIA LITTORALIS* *Teysm. & Rinnend. Nat. Tijds. Ned.-Ind.* xxix. 259; leaflets 6-8, obtuse; heads in a terminal corymbose panicle, calyx pedicellate funnel-shaped. *Kurz, Journ. As. Soc. Beng.* xlv. 2. 129; *Prain, Journ. As. Soc. Beng.* lxi. 2. 257.

PENANG; Pulo Jungah, *Curtis*! NICOBARS; common, *Jelinek*! *King's Collectors*! DISTRIB. Malay Archipelago.

An unarmed tree 30-40 feet high. *Leaves* with glabrous rachis, with a large sessile gland near its base; pinnæ 4-8, leaflets subsessile submembranous oblique, .75-1.25 in. long, pale-green glabrous above, glaucescent faintly puberulous beneath. *Heads* few-fl., peduncles short slender, the longest 1.5 in., corymbose on branches 1-3 in. long which are themselves corymbosely paniced. *Calyx* .1 in. long, hardly toothed, pubescent. *Corolla* white, twice the calyx, the teeth ovate lanceolate, uniformly densely silky outside. *Stamens* pink. *Pod* strap-shaped, firm, greenish-brown, dull, tapering to both ends, 6-7 in. long, 1 in. wide, 12-16-seeded.

2. *ALBIZZIA PEDICELLATA* *Baker.*

Add to localities of *F. B. I.* :—

PERAK; common, *Kunstler* 4474! 7988! 10436! PENANG; *Curtis* 1921! SINGAPORE; *Ridley* 6297!

2b. *ALBIZZIA ELEGANS* *Kurz, Pegu Rep. App.* B. 47; leaflets 40-50, acute; few-fl. heads not paniced, calyx pedicellate, funnel-shaped. *Kurz, Journ. As. Soc. Beng.* xlv. 2. 299; *For. Flor. Brit. Burm.* i. 427. *A. lebbekoides* *Kurz, ex Bak. in Flor. Brit. Ind.* ii. 299 not of *Benth.*

BURMA; Pegu; Bookee ridges and on banks of Swa-choung, *Kurz*! no locality, *Wallich*! DISTRIB. Bangka.

An evergreen tree without prickles, 80-100 feet high. *Leaves* with puberulous rachis with a large gland far above the base; pinnæ 14-28; leaflets sessile, sub-falcate, membranous acute glabrous, .6 in. long, .2 in. wide, main nerve almost median. *Heads* many-flowered, peduncles puberulous .5-.75 in. long, 2-4 together in axils of upper leaves. *Calyx* .1 in., rather shorter than the puberulous pedicels, teeth very short. *Corolla* twice the calyx, externally pubescent. *Pod* unknown.

Mr. *Kurz* adopted the unusual course of describing this species without having seen either flowers or fruit. There was, however, a flowering example of the same plant in the Calcutta Herbarium, collected by Dr. *Wallich*, perhaps in Burma

though the exact locality is not noted; this specimen Mr. Kurz seems to have overlooked. Dr. Wallich's specimen shows that *A. elegans* is not at all nearly related, as Kurz suggests, to *A. stipulata*, but that its true affinity is with *A. pedicellata* Bak.

3b. *ALBIZZIA LEBBEKOIDES* Benth. *Hook. Lond. Journ. Bot.* iii. 89; leaflets 50–60 sessile obtuse very oblique, heads copiously paniced, calyx sessile minute campanulate, corolla-tube much narrower and leaflets much smaller than in *A. odoratissima*. *Miq. Flor. Ind. Bat.* i. 23. *Acacia lebbekoides* DC. *Prodr.* ii. 467.

BURMA; very common. **DISTRIB.** Siam (*Teysmann*); Java.

A medium-sized tree, 30–50 feet high. *Leaf-rachis* glabrous or pubescent, with a gland far above the base and 2 or more between bases of distal pinnæ; pinnæ 8–12; leaflets obliquely oblong, articulated on the rachis, coriaceous shining dark-green above, paler, not glaucous beneath, '35 in. long, '15 in. wide, the midrib parallel with the upper edge and shortly removed from it. *Heads* small few-flowered very numerous, arranged as in *A. odoratissima*. *Calyx* as in *A. odoratissima*. *Corolla* very narrowly tubular. *Pod* firm flexible smooth glossy, 6–8 in. long, 1 in. wide, 8–12-seeded.

This is certainly, as Mr. Baker points out, very nearly related to *A. odoratissima* but is quite distinct by reason of its more numerous small leaflets and its narrower corolla. The name is most unfortunate, for the species bears very little resemblance to *A. Lebbek*. Though quite common in Burma, Mr. Kurz did not collect it there, and the species mentioned under that name on Kurz' authority in *F. B. I.* ii. 299 is the tree afterwards published as *A. elegans* Kurz.

#### 4. *ALBIZZIA PROCERA* Benth.

**VAR. *elata*** Bak. is not separable as a variety. It is distinguished by having smaller leaflets less oblique at the base than in the type. Leaves with leaflets of this shape are common in *A. procera* but they are not smaller than in typical *A. procera*. It is true that in Roxburgh's original coloured drawing of "*Mimosa elata*" the leaflets are shown small, but then Roxburgh has himself written on this drawing:—" *Mimosa elata* considerably less than natural size." A more serious objection to the recognition of a **VAR. *elata***, as apart from *A. procera*, is the fact that leaves with leaflets of both kinds, and consequently that both "varieties," may be collected from different parts of the same tree.

The chief necessity for pointing out the non-existence of **VAR. *elata*** is the fact that, from omitting to attend to Roxburgh's MSS. note on the drawing, Mr. Kurz and others have taken *A. Millettii* to be Roxburgh's *Mimosa elata*. The spurred pulvinus of *A. Millettii*, however, at once separates it from Roxburgh's plant.

5b. *ALBIZZIA GAMBLEI* Prain; leaflets of distal pinnæ 10–14 sub-acute or acute, heads paniced, calyx campanulate, shortly pedicelled, *A. Lebbek Gamble, Trees, Shrubs, etc., of Darjeeling Dist., 33 not of Benth.* *A. procera* C. B. Clarke, *Journ. Linn. Soc.* xxv. 18 *not of Benth.*

**EASTERN HIMALAYA**; Sikkim, *Gamble* 161! 7486! 9661! **NAGA HILLS**; Kohima, C. B. Clarke 41480!

A tree 50 feet high. *Leaves* 2-pinnate; pinnæ 4–6 with a large gland '25 in. above base of main-rachis and with large projecting glands on each secondary rachis at the bases of the distal pairs of leaflets; leaflets ovate-lanceolate 10–14 on the distal,

6-8 on the proximal pinnæ, in all cases decreasing downwards, apex acute, base cuneate from the middle, '75-2'25 in. long, '4-1 in. wide, pale-green above, glaucescent beneath, sparsely adpressed-puberulous on both surfaces; stipules minute. Ultimate branches of *panicle* umbellate. *Calyx* '1 in. long, puberulous externally, teeth minute, pedicels '05 in. *Corolla* twice the calyx, teeth lanceolate. *Pod* 6-8 in. long, 1-1'25 in. wide, thin, rather firm, strap-shaped, the base narrow-cuneate, the tip blunt; pale straw-coloured, very faintly reticulate; seeds 8-10.

This extremely distinct species bears no very close affinity to either of the species to which it has been referred. It agrees with *A. Lebbek* for which Mr. Gamble has taken it, in colour of pod and in having pedicelled flowers, but its leaves and leaflets are totally different. With *A. procera*, to which Mr. Clarke has referred it, it agrees in having the secondary rachises glandular as well as the main-rachis but the leaflets are quite different in shape and in colour, while its flowers and its pods in no way resemble those of *A. procera*.

The nearest Indian ally of the species is *A. lucida* from which, however, it differs markedly in size of leaves and leaflets and in having shortly pedicelled florets. Its nearest ally in the genus is *A. tomentella* Miq. (*Flor. Ind. Bat.* i. 20) which has leaflets similar in shape, size and disposition, but which differs in having the leaflets densely pubescent beneath and not glaucescent, in having several glands (instead of one only) on the secondary rachises, and in having a broader, brown pod with a very different reticulation.

#### 6. *ALBIZZIA GLOMERIFLORA* Kurz.

This species must be deleted. When Mr. Kurz published it as an *Albizzia* he was treating *Pithecolobium*, to which the tree really belongs, as a section of *Albizzia*. The true name of the species is *Pithecolobium glomeriflorum* Kurz (*For. Flor. Brit. Burm.* i. 430).

#### 7. *ALBIZZIA JULIBRISSIN* Durazz.

This species must also be deleted. There has always been some doubt as to the occurrence of this tree in India. In the *Flora of British India* two varieties are indicated, *viz.*, typical *Julibrissin* said to extend from Hazara to Sikkim and *VAR. mollis* (*Acaciu mollis* Wall.; *Albizzia mollis* Boiv.) extending from Simla to Nepal.

There seems, however, to be no such thing as *A. Julibrissin* in India, in a wild state, and the writer doubts if it be even cultivated. Certainly no one has ever sent specimens of *A. Julibrissin* to Calcutta; all the specimens received with this name prove on examination to be either *A. mollis* or, much more frequently, misidentified *A. stipulata*.

(7.) *ALBIZZIA MOLLIS* Boiv. *Encyc.* xix. *Siècle* ii. 33. *A. Julibrissin* *VAR. mollis* Benth.; *Bak.* in *Flor. Brit. Ind.* ii. 300.

This is quite entitled to specific rank. Add to localities:—  
ASSAM; *Simons!* MANIPUR; *Watt!*

Though recurring again to the east of the Brahmaputra without having been reported from anywhere between Nepal and the Assam Range, the tree shows no more tendency to resemble specimens of *A. Julibrissin* from China and Japan than does the North-West Himalayan form to resemble specimens of *A. Julibrissin* from the Oriental region.

8. *ALBIZZIA STIPULATA* Boiv.

Add to localities of *F. B. I.* :—

ANDAMANS ; *E. H. Man* ! NICOBARS ; *Kurz* !

Two varieties may be easily distinguished in the field, viz., *VAR. typica* with large stipules, and *VAR. Smithiana* (*Mimosa Smithiana* Roxb.) with small stipules. They cannot easily be separated in the herbarium as the stipules are somewhat deciduous in both ; as they grow the two trees are wonderfully unlike and it would not be a matter for surprise to find that Roxburgh was justified in separating them. The typical *A. stipulata* is well known as the *Sao* in Assam and in Sikkim.

9. *ALBIZZIA MYRIOPHYLLA* Benth.

Add to localities of *F. B. I.* :—

KEDAH ; *Curtis* ! PENANG ; *Curtis* ! *Kunstler* ! PERAK ; *Scortechini* !

This species is perhaps most easily recognised by the pulvinus enlarging into a recurved hook just below the leaf-base ; it is always a climber.

Another species which has a similarly enlarged pulvinus is the Chinese *Albizzia Millettii* Bth. the oldest name for which is *Mimosa corniculata* Lour. (*Fl. Cochinchin.* 800). Why it deserves our attention here is because of its having been introduced to India and of its having been long cultivated in gardens under the name "*Acacia Careyana* Hort." Mr. Kurz in a manuscript note in the Calcutta Herbarium, by way of criticism of the *F. B. I.*, has expressed the opinion that *Acacia Careyana* is the true "*Mimosa elata*" of Roxburgh. This is not the case ; Roxburgh has left a coloured drawing of his *M. elata* which shows that his tree does not have the pulvinus developed into a spur. Moreover Roxburgh has with his own hand written on the drawing "*Mimosa elata* considerably less than natural size" ; consequently, the leaflets of *Acacia Careyana*, which are the size of those in the drawing, are considerably less than those of *Mimosa elata*. As has already been explained under *A. procera*, the writer is not only convinced that Mr. Baker is right in referring *Mimosa elata* to *Albizzia procera*, but is strongly of opinion that there is no variety "*elata*" really distinguishable from *A. procera* proper, the leaflets are not smaller in the variety than in the type and both kinds of leaflets (consequently both "*varieties*") can be collected from the same tree.

*A. Millettii* has been collected in Tonkin by Balansa (nn. 1283 and 1290, both issued as *A. procera*) and recurs in Borneo whence it has been sent by Haviland, (nn. 57 and 2909).

Mr. Kurz has described in the Society's *Journal* xlv. 2. 299 and again in *For. Flor. Brit. Burm.* i. 428 a Siamese tree under the name *Albizzia Teysmanni*. This has alternate leaflets and has no glands on the rachis and does not bear much resemblance to any *Albizzia*. Most probably it belongs to the suborder *Caesalpinieæ* ; his only specimen is in such a condition that Kurz was not justified even in suggesting a genus for it.

## 131. PITHECOLOBIUM MART.

4. PITHECOLOBIUM BIGEMINUM *Mart.* in *Flora* xx. 2. *Beibl.* 115 in *obs.*

5. PITHECOLOBIUM AFFINE *Bak.*

Add to localities of *F. B. I.* :—BURMA ; Hills east of Tonghoo, *Brandis* ! PERAK ; *Kunstler* ! SINGAPORE ; *Ridley* ! *DISTRIB.* Borneo.

The pod is given as  $\frac{1}{4}$  in. wide in the *F. B. I.* This is probably a misprint for  $1\frac{1}{4}$  in. wide which is about the true size; Bentham in originally describing the pod states that it is as large as that of *P. fasciculatum*, which is about  $1\frac{1}{4}$  -  $1\frac{1}{2}$  in. across.

6. *PITHECOLOBIUM CONFERTUM* *Benth.*

Add to synonyms of *F. B. I.*:—*Albizzia splendens* *Miq. Flor. Ind. Bat. Suppl.* 280. Add:—DISTRIB. Sumatra (*Teysmann* 4228 !)

Mr. Kurz has already pointed out (*Journ. As. Soc. Beng.* xlv. 2. 129) that the species described by Mr. Bentham as *Pithecolobium confertum* in 1874, had been described by Dr. Miquel as *Albizzia splendens* 14 years before. It is therefore probable that Mr. Bentham never saw Dr. Miquel's plant, the identity of which with *P. confertum* is undoubted. But as Miquel drew up his description from leaf specimens only, it seems neither to be necessary nor just to propose, according to what are said to be the essential rules of bibliography, to rename the species *Pithecolobium splendens*.

6/2. *PITHECOLOBIUM NICOBARICUM* *Prain, Journ. As. Soc. Beng.* lxvi. 2. 267; branchlets glabrous, pinnæ 2, leaflets 4, rarely 6, leaves with a gland near the middle of main-rachis only, calyx campanulate, pod not lobed. *Albizzia bubalina* (*Pithecolobium bubalinum*) *Kurz, Journ. As. Soc. Beng.* xlv. 2. 129 *not of Benth.* *P. oppositum* *Kurz l. c. not of Miq.*

NICOBARS; Nancowry, *Jelinek*; Kamorta, *Kurz*!

*Leaflets* papery rather rigid, ovate-lanceolate, glabrous, acute, distal 3-4 by 1.4-1.8 in., proximal 1-2.5 by .5-1.25 in., petiolules distinct .1 in. long. *Heads* racemose. *Calyx* .05 in., pubescent, teeth deltoid. *Corolla* and *filaments* not seen. *Pod* dehiscent along upper suture, 5-6 in. long, .75 in. wide, spirally twisted, valves thickly coriaceous, glabrous, dull purplish-red. *Seeds* 8-10, orbicular-ovate, somewhat compressed, .4 in. long, .5 in. wide, .25 in. thick, testa thin crustaceous, dark-purple, smooth, shining; arillus 0.

The Nicobarese name is "*Kawas*." Mr. Kurz does not seem to have seen a specimen of *P. bubalinum* when he referred this tree to that species, or when he referred to that species *P. oppositum* *Miq.* This is at once distinguished from *P. bubalinum* by its different fruits, and from *P. oppositum* by its leaf-rachises being glabrous not puberulous and by its pinnæ being 1-jugate not 2-jugate.

8. *PITHECOLOBIUM MICROCARPUM* *Benth.*

Add to localities of *F. B. I.*:—PERAK, very common. SINGAPORE; *T. Anderson*! *Kurz*! *Ridley*! DISTRIB. Sumatra (*fide* *Miquel*); Borneo.

*P. oppositum* *Miq.* is very near this. Its leaflets are not distinguishable but it differs in having puberulous petiolules and 2-jugate pinnæ, so that it is to be hoped that it is truly specifically separable. Should it, however, prove to be identical with *P. microcarpum* then *Miquel's*, though the prior name, surely ought not to be used, since that author described leaf-specimens only.

9. *PITHECOLOBIUM ELLIPTICUM* *Hassk. Retzia*, i. 225. *Inga elliptica* *Bl. Cat. Buitenz.* 88. *Albizzia fasciculata* *Kurz, Journ. As. Soc. Beng.* xlv. 2. 129, *excl. syn.* *Pithecolobium macrophyllum* *T. & B.*



It is not absolutely certain that *P. fasciculatum* Benth. is the same as *P. ellipticum* Hassk., though it is probable that the two are one species. If this be so, however, it is preferable, even then, to use Hasskarl's name, because Bentham's description does not so well accord with the characters of the plant and because Hasskarl's name has the advantage of preserving the oldest specific epithet.

By a *lapsus calami* the *Index Kewensis* gives *Inga elliptica* Bl. as the name, and *Pithecolobium ellipticum* Hassk. as a synonym for this species; the reverse is the actual state of affairs.

Mr. Kurz identifies with this a species issued from Buitenzorg as *Pithecolobium macrophyllum* Teysm. & Binnend., of which Kurz's notice appears to be the earliest mention. The identification proposed cannot, however, be sustained; though the leaves of *P. macrophyllum* resemble those of *P. fasciculatum*, the pods are altogether different and are deeply lobed as in *P. lobatum*. As Mr. Kurz's mention dates from 1876 and as an American *P. macrophyllum* Spruce, was published in 1875, it is necessary to rename Teysmann's plant *P. Teysmanni*.

#### 10. PITHECOLOBIUM LOBATUM Benth.

Add to synonyms of *F. B. I.*:—*Inga Jiringa* Jack, *Mal. Miscell.* ii. 7. 78. *Acacia Kaeringa* Royle, *Ill. Him. Pl.* 183. *Mimosa Djiringa* Roxb. *Hort. Beng.* 93.

Add to localities:—PENANG; common. PERAK; common. SINGAPORE; *Kunstler!* *Hullett!*

It is not quite clear that *Mimosa Kaeringa* Roxb. and *M. Djiringa* Roxb. are the same. Roxburgh describes the former as having seeds enveloped in an edible pulp; Jack says the latter has seeds without arillus; Koorders and Valetton say the seeds themselves are eaten.

10/2. PITHECOLOBIUM GLOMERIFLORUM Kurz, *For. Flor. Brit. Burm.* i. 430. *Albizia glomeriflora* Kurz ex Bak. in *Flor. Brit. Ind.* ii. 300.

Being a *Pithecolobium* and not an *Albizia* this species must be transferred to the present position.

10/3. PITHECOLOBIUM KUNSTLERI Prain, *Journ. As. Soc. Beng.* lxxvi. 2. 271; branchlets slightly pubescent, pinnæ 2-4, leaflets 6, leaves with glands on the rachis below the bases of pinnæ and leaflets, calyx tubular, pod not lobed.

PERAK; *Kunstler!* *Scortechini!* JOHORE; *Lake & Kelsall!* DISTRIB. Borneo.

A low spreading tree with stem 8-12 in. thick; bark brown. *Leaflets* paleish-green, glabrous above, puberulous beneath, ovate with rounded bases and caudate-acuminate tips, distal 3-4.5 in. long, 1-2 in. wide; lowest 1-2 in. long, .5-1 in. wide; rachis of terminal pinnæ 4 in. long, of small basal pair, when present, .5 in. long only. *Heads* 4-8-fl., .5-.75 in. wide, pedicels short puberulous, arranged in lax terminal panicles. *Calyx* with spatulate pubescent bracteole, tubular, densely pubescent, .15 in. long, teeth short triangular. *Corolla* white, .5 in. long, densely silky externally, tube narrowly funnel-shaped, teeth lanceolate .12 in. long. *Pod* with a puberulous stipe .75 in. long, spirally twisted, dehiscent along lower suture, 8-10 in.

long. '6 in. wide; valves thinly coriaceous puberulous, not sinuate between the 8-10 ovate seeds which have long axes parallel with sutures, '7 in. long, '4 in. wide, compressed; testa thin crustaceous.

A very distinct species, nearly related to *P. bigeminum* Mart., but with much larger flowers and with a pod that differs markedly in being long stalked.

## ADDENDA.

## 24. CARAGANA LAMK.

5b. CARAGANA DECORTICANS *Hemsl.* in *Hook. Icon. Plant.* t. 1725.

When arranging the *Caraganas* of the Calcutta Herbarium the writer unfortunately overlooked the fact that his friend Mr. Hemsley had already detected Dr. Aitchison's misidentification of this plant with *C. ambigua* and had published a description and figure of it under the above name, which must therefore replace the name *Caragana Aitchisoni*, used on page 372.

## 75. PACHYRRHIZUS RICH.

PACHYRRHIZUS ANGULATUS *Rich.*

Professor Oliver has recently given an excellent figure and description of this well-known plant (*Hook. Icon. Plant.* t. 1842). In the same work (t. 1843) is also given a figure and description of the S. American and W. Indian *P. tuberosus* Lamk., which is closely related to *P. angulatus* and is best distinguished by its almost entire leaflets and its larger broader pods. It has recently been introduced to Ceylon; its pods make an excellent vegetable; its seeds are poisonous.

*P. tuberosus* is related to *P. angulatus* exactly as *Phaseolus Mungo* is to *P. radiatus* and as *Dolichos lignosus* is to *D. Lablab*.

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 Noviciæ Indicæ XVI. *More additional species of LABIATÆ.*—By

D. PRAIN.

[Received May 26th; Read June 2nd, 1897.]

Since the writer presented descriptions of some additional species of this natural order to the Society, six and a half years ago, a few others have come to light that are additions to the Indian flora; descriptions of these, drawn up after the style of the *Flora of British India* are accordingly offered in the hope that they may be of use to members who use that work in the field.

## 12. POGOSTEMON DESF.

6. POGOSTEMON PARVIFLORUS *Benth.*

Add to localities of *F. B. I.*:—ANDAMANS; common, *King's Collectors!*

9. *POGOSTEMON PATCHOULI* Pelletier.

Granting that Pelletier's plant is specifically the same as *P. Heyneanus* Benth., which is what is contended in the *F. B. I.* iv. 633, then Bentham's name, dating as it does from 1830, cannot very well be supplanted by that of Pelletier which only dates from 1845. It may well be that the Patchouli plant, *P. Patchouli* Pelletier, is no more than a cultivated state of *P. Heyneanus*; the latter, however, is a common wild species without the Patchouli smell and with somewhat different leaves. The Patchouli is by no means a "common" garden plant in India; where its cultivation is attended to, it is said to be carefully grown along with *Piper Betle*. This cultivation is apparently confined to the Indian Peninsula; the plant flowers freely and profusely.

VAR. *suavis* Hook. fil. This, which is *Pogostemon Patchouli* of Sir W. Hooker as opposed to that of M. Pelletier, is also the *Pogostemon suavis* of Tenore; it has, as Sir Joseph Hooker points out, a close affinity with *P. parviflorus*,—a wild plant that does not have the Patchouli smell. It bears in fact to *P. parviflorus* exactly the relationship that *P. Patchouli* bears to *P. Heyneanus*, and unless *P. Heyneanus* and *P. parviflorus* be themselves no more than forms of one species, a view in favour of which something might be said, it seems for the present better to keep *P. suavis* specifically apart from *P. Patchouli*. The writer, however, cannot find any character to separate *P. suavis* Ten. (*P. Patchouli* Hook. not of Pelletier) from *P. Cablin* Benth., of the Philippines.

The *Flora of British India* is careful to exclude from Sir William Hooker's *P. Patchouli* the citation *Pucha-pat* of Wallich in *Kew Journ.* i. 22; the place which *Pucha-pat* is to occupy is not noted. The point is of importance, because Wallich's *Pucha-pat*, which is quite distinct from the Indian *P. Patchouli* Pelletier, is the plant that mainly yields the Patchouli and the Patchouli products of commerce; to this end it is assiduously cultivated on a considerable scale by Chinese colonists throughout the Malay countries. It is not clear that it is grown in China itself or indeed that the plant is known there; on the contrary there is much to favour the belief that it is in China replaced by one or more plants yielding the same odour. Unlike *P. Patchouli*, the *Pucha-pat* of Wallich is very shy of flowering, if indeed it ever does flower. Plants for example that were introduced to the Royal Botanic Gardens at Calcutta in 1834 and that have been freely propagated by other means than by seed from that period onwards have never once flowered, though a succession of the ablest gardeners in India have during the past 60 years made the flowering of the Malayan *Patchouli* one of the objects of their lives.

Familiar acquaintance with the living *Pucha-pat* and a careful examination of the specimen of Sir William Hooker's plant in Herb. Kew, has convinced the writer that Sir William Hooker was absolutely right and that Wallich's *Pucha-pat* is only, at best, a cultivated race of Sir William's *P. Patchouli* which is, however, merely Tenore's *P. suavis* and is certainly not Pelletier's *P. Patchouli*.

The Patchouli smell is not confined to these two plants or even to the genus *Pogostemon*. Among Indian genera it is shared by *Mesona*, and in China it is associated with at least two species of the genus *Microtoena*, one of which, *M. robusta*, is employed on this account much as the Indian, or true, *Patchouli* is. That the other, *M. cymosa*, is so used has not been made clear; this latter plant occurs in Indo-China and in most cases is only doubtfully wild. It is not *always* Patchouli-scented, but when it is so scented it is apt, though it flowers freely, to produce only abortive fruits.

## 7. ORTHOSIPHON BENTH.

\* \* *Calyx-throat naked ; stamens included.*

## 6. ORTHOSIPHON RUBICUNDUS Benth.

VAR. ? *macrocarpa* VAR. *nov.* ; leaves petioled, lamina very large 25–30 cm. long, 12–16 cm. across, calyx in fruit 15 mm. long, 7 mm. wide ; petioles 5–7 cm. long.

BURMA ; Attaran, *Brandis* 856 !

This is almost certainly specifically distinct, though it is evidently most nearly related to *O. rubicundus* VAR. *rigida*. The flowers in the specimens seen are not good and it is inadvisable for the present to give the plant a specific status. The writer feels inclined to restore to VAR. *rigida* the specific rank claimed for it by Hamilton.

\* \* \* *Calyx-throat naked ; stamens far exerted.*

9b. ORTHOSIPHON WATTII Prain ; leafy-stem puberulous 4-angled short, the portion above leaves elongated, glabrescent subterete ; leaves decussately paired, pairs 4, the lowest small usually evanescent the second pair very large long-petioled much exceeding the 2 upper pairs, lamina irregularly cordate with subacuminate apex and irregularly crenate-serrate and acutely lobed margin, rather thick, sparsely puberulous above with adpressed brown hairs, beneath more faintly puberulous only along the nerves, racemes simple or subpaniculate at the end of leafless stem, bracts broadly cordate-acuminate, in young inflorescences overlapping to form a narrow strobilate spike, much exceeding pedicels ; *calyx* puberulous campanulate, 2 lower teeth subulate ; *corolla*-tube slender not twice as long as calyx, lower lip concave, upper 3-fid., filaments naked  $2\frac{1}{2}$  times as long as corolla ; *nublets* not seen. Orthosiphon sp. Prain, *Journ. As. Soc. Beng.* lix. 2. 296.

ASSAM ; Manipur, Watt n. 7188 ! Naga Hills, at Konom, Watt n. 11558 !

*Rootstock* woody ; leafy stem 6–10 cm. long with short branches in the axils of the 3 upper pairs of leaves, internodes about 1.5–4 cm., petioles of the large pair of leaves 8–10 cm., laminae 45 cm. long, 30 cm. across, of other pairs much smaller ; stem between leaves and flowers 20–25 cm. long ; racemes simple terminal 6–10 cm. long or with 1–2 pairs of similar lateral racemes in axils of larger bracts at intervals of 1–3 cm. below base of terminal raceme ; whorls 6-fid., only .05 cm. apart, bracts 7 mm. long, 8.5 mm. wide, puberulous externally, glabrous above, margins not ciliate, pedicels 1 mm. long ; *calyx* 5 mm. long ; *corolla* tube 7–9 mm. long uniformly pubescent externally as are the lips, filaments inserted below apex of tube, 25 mm. long, stigma clavate subcapitate slightly notched.

Dr. Watt, who originally collected this very fine species, has again met with it in the Naga Hills and has presented an excellent flowering specimen to the Calcutta Herbarium from which it has been possible at last to make a complete description of the plant.

Though belonging to the group that includes *O. scapiger*, *O. stamineus* and *O. Parishii* it is, as the description will indicate, remarkably distinct from all three. It has somewhat the *facies* of a *Coleus* but the stamens are quite free and the stigma is not bifid.

## 8. PLECTRANTHUS L'HERIT.

### § COLEOIDES (*F. B. I.* iv. 621).

28b. *PLECTRANTHUS KUNSTLERI* Prain; rather stout, everywhere finely puberulous, leaves pale-green, large, petioled, ovate-acute with entire cuneate base and short entire sub-acuminate tip, margin elsewhere regularly crenate, cymes in stout branched panicles, corolla-tube exceeding the narrow lower lip, fruiting calyx rather large, two lower teeth subulate, two lateral ovate-acute, upper orbicular-ovate, nutlets oblong brown with darker tips, hardly shining.

PERAK; Kwala Dipong, *Kunstler* n. 8240!

A shrubby plant 2-3 feet high. *Leaves* pale-green especially beneath and there sparsely glandular puberulous, darker and similarly faintly puberulous above, laminae 8-12 cm. long, 4-5 cm. wide, petiole 4-5 cm. long. *Panicle* large, branches ascending, flowers racemed. *Fruiting calyx* 5 mm. long, gland-dotted. *Corolla* pale-green faintly dotted, 10 mm. long, tube decurved and gibbous at base, one and a half times as long as boat shaped lower-lip; upper-lip rather short. *Filaments* free from each other from the point at which they are free from the corolla tube.

A very distinct species though nearest, on the whole, to *P. urticifolius*.

30b. *PLECTRANTHUS FULVESCENS* Prain; erect, branched, the inflorescence hirsutely fulvous-tomentose elsewhere glabrescent, leaves lanceolate margin finely crenate except at the narrow-cuneate base decurrent on the longish petiole, flowers whorled in long slender narrow racemes, corolla tube slender, longer than the lower lip, fruiting calyx densely fulvous with spreading hairs, two lower teeth acute, two lateral ovate faintly serrate, upper entire broad rounded, nutlets oblong, brown, shining. *Coleus fulvescens* Kurz MSS. in *Herb. Calcutta*.

BURMA; Attran, *Brandis* 811!

*Stem* 4-angled glabrous below. *Leaves* faintly puberulous above, glabrous beneath, pale-green, membranous 10-15 cm. long, 4 cm. wide, tapering from the middle to an acuminate tip and a narrow cuneate base passing into a petiole 1-3 cm. long. *Racemes* 10-16 cm. long, 2 cm. in diam., leafless, rather dense-fl., rachis very hirsute with spreading tawny hairs, whorls 6-fl., flowers pedicelled. *Fruiting calyx* 6 mm. long slightly contracted above the nutlets. *Corolla* 8 mm., tube declinate, curved, apparently white, lips pale-blue.

The whorls of flowers somewhat resemble those of *Coleus spicatus* but they are more distant. Mr. Kurz has placed this in *Coleus* but the filaments are quite free from each other from the point where they are free from the corolla tube. The arrangement, however, below this point is such as to strongly support the view expressed by Sir Joseph Hooker (*F. B. I.* iv. 616) that at least all the species of

§ *Coleoides* might with advantage be merged in *Coleus*. This, to judge from his proposed treatment of the species, must have been the view of Mr. Kurz also.

### 9. COLEUS LOUR.

#### 1. COLEUS SPICATUS *Benth.*

Add to localities of *F. B. I.*:—BURMA; Shan Hills, common, *Collett ! King's Collectors !*

#### 6. COLEUS ATROPURPUREUS *Benth.*

Add to localities of *F. B. I.*:—PERAK; Jenah, 200–300 feet, *Wray 1759!*

### 10.\* HYPTIS JACQ.

3. HYPTIS PECTINATA *Poit. Ann. Mus. Par.* vii. 474; erect; *stem* glabrous or pubescent; *leaves* petioled ovate crenate-serrate, base rounded, tomentose beneath; *cymes* many-fl. paniculate, in flower laxly subcapitate, later elongated secund pectinate incurved, bracts laxly setaceous hardly as long as calyx; *calyx* tubular, hoary-tomentose, mouth truncate, throat villous within, teeth setaceous subrigid, shorter than tube. *Benth.* in *DC. Prodr.* xii. 127. *Bysteropogon pectinatum L'Her. Sert. Angl.* 19. *Mentha perilloides Linn. Syst.* ed. xii. 736. *Nepeta aristata Rich. Act. Soc. Hist. Nat. Par.* 110. *Brotera persica Spr. Trans. Linn. Soc.* vi. 151, t. 4.

MADRAS; BENGAL; and ASSAM. Introduced; though not so frequently met with as *H. suaveolens*, where it does occur it is just as plentiful and spreads as readily.

*Stem* rigid below, branches erect 60–100 cm.; *leaves* very variable from 2–8 cm. long acute or acuminate, margins sometimes serrate more often crenate-serrate, sometimes rather widely crenate, usually densely tomentose below sparsely above but at times glabrous on both sides. *Racemes* secund densely congested towards apex, interrupted below, simple or paniculately branched. *Cymes* 5–30-fl., at first capitate, bracts and subulate calyx-teeth crinite. *Corolla* small pale-purple, or yellowish-white with the lips purple spotted. *Nutlets* small, oblong, smooth, black.

The reason for the introduction of the species of this American genus is in every case the same; they are planted like the *Tulsis* (*Ocimum* spp.) in the precincts of sacred buildings and are usually to be found spreading from the neighbourhood of shrines and temples. Up till now *H. brevipes*, *H. capitata*, *H. suaveolens* and *H. pectinata* are the only forms that have established themselves in India but the naturalisation of other species is no doubt merely a matter of time.

### 55. CYMARIA BENTH.

#### 1. CYMARIA DICHOTOMA *Benth.*

Add to localities of *F. B. I.*:—SHAN HILLS; Fort Stedman, etc., common. PERAK; *Scortechini!*



*On some noteworthy Indian Birds.*—By F. FINN, B.A., F.Z.S., Deputy Superintendent of the Indian Museum.

[Received April 1st, Read April 7th, 1897.]

In the present paper I deal with a few occurrences of Indian birds noteworthy either on account of the rarity of the species, or by reason of their presence outside their usual limits. Most of the specimens alluded to are in the collection of the Indian Museum.

I follow the nomenclature and arrangement of the British Museum Catalogue of Birds.

*Rhytidoceros narcondami.*

When at the Andamans in April, 1896, I obtained, through the kindness of Majors Temple and Graham, and Lieutenant E. C. Doughty, four specimens of this rare species, which had been recently obtained on Narcondam. The skins had been only roughly prepared, and not sexed, but the plumage and dimensions show them to be those of two males and two females. They are all moulting.

The colouring corresponds well with that given by Mr. Blanford (*Fauna of British India*, Birds, Vol. iii, p. 149), and Mr. W. R. Ogilvie Grant (*Cat. Birds Brit. Mus.*, Vol. xviii, p. 386). The tails are dirty, this no doubt being the grey stain noted in the British Museum catalogue description.

I take this opportunity of expressing my obligation to the Andaman residents for the kind hospitality and assistance afforded me on my visit to the Islands.

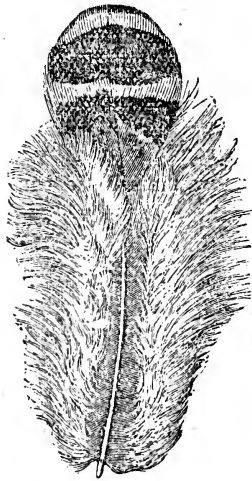
*Phasianus himiæ.*

In December last Lieutenant-Colonel H. St. P. Maxwell, of the Indian Staff Corps, very kindly presented to the Museum a skin of this rare Pheasant, which he had obtained in the preceding month at Kairong in Manipur.

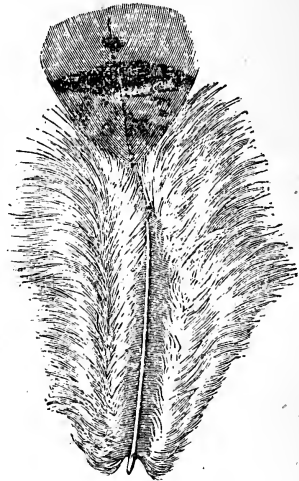
The specimen, which is in the plumage of the adult male, agrees very well with the description in the British Museum Catalogue of Birds, Vol. xxii, p. 336, and with Mr. Hume's original description (*Stray Feathers*, Vol. ix, p. 461), except in that the longer upper tail-coverts are not plain grey, but are crossed by narrow dull chestnut bars.

Colonel Maxwell's specimen differs much more from a fine male from the Ruby Mines, the only other example of this species which the Museum possesses, being that mentioned by Mr. W. L. Sclater (see *Ibis*, 1891, p. 152).

In this latter the white fringing of the lower back and rump feathers is so extended that the general appearance of these parts is silver-white, irregularly mottled with black where the more basal colouring of the feathers appears, whereas the other bird's plumage shows here a beautiful scaled effect. Moreover the webs of these feathers in the Ruby Mines specimen are looser, and they are squarer at the tip. The difference in the individual feathers is shown in the accompanying woodcut, (which, however, much exaggerates the slight black terminal fringe in that of the Manipur bird.)



Manipur specimen.



Ruby Mines specimen.

Also in the Ruby Mines specimen the white shoulder-patch is larger and almost devoid of dark markings at the tips of the feathers. In this specimen also the longer upper tail-coverts, and to a less degree the grey part of the tail itself are of a lighter grey than the same parts in the Manipur bird.

Seen together with Colonel Maxwell's bird, the Ruby Mines specimen seems worthy of specific separation, that is to say, as species are reckoned in the genus *Phasianus*. With a larger series of *P. humix* however, the points I have mentioned would very possibly be found variable, and hence I content myself with drawing attention to the peculiarities of this bird, in hopes that other naturalists may be led to investigate the subject.



*Limnocyptes gallinula.*

We are indebted to Major F. Graham for a specimen of the Jack-Snipe from the Andamans. The bird was shot, according to Major Graham, near Aberdeen on the South Andaman Island, on November 25th, 1896, by Lieutenant H. Turner of the Suffolk Regiment.

Jack-Snipe were unusually abundant in the Provision Bazaar this cold weather, and the Messrs. Dods inform me that they also found them singularly plentiful when out shooting in the vicinity of Calcutta.

*Anas boschas.*

In February, 1895, Mr. R. G. Hanland, of Gauhati, Assam, sent to the Editor of the *Asian* newspaper a Mallard which had been shot by Mr. Truninger at Gohpur near Behali Mukh, North Luckimpur, in Assam, on the 17th of that month. The bird was sent to me, and I was able to confirm Mr. Hanland's identification of it. It was in adult male plumage, but not having been properly cured, the skin began to come to pieces, and I therefore did not preserve it, as the species was unmistakable.

*Eunetta falcata.*

A bird-dealer from the Bazaar brought me a male of this species on January 3rd of the present year. It was in full plumage with the exception of the long tertials, which were only just sprouting, and not noticeable unless looked for.

As it was not in very good bodily condition, I had it killed for the Museum collection. It had the bill black; iris dark brown; feet dull grey, with black webs. The testes were small, and the windpipe much resembled that of the common Teal as figured in Yarrell's *British Birds*, Fourth Edition, Vol. IV, p. 391.

*Nyroca baeri.*

*Fuligula baeri.* Finn, P. A. S. B., April 1896, p. 61.

This Pochard again occurred in the Provision Bazaar here during the present cold weather, but in far greater numbers than on the previous occasion, when all I saw, to the number of eleven, were obtained, as recorded *loc. cit.* This time the earliest date on which I observed any was November 25th, 1896, and I continued to note their presence pretty constantly till January 5th, after which I have no record of their occurrence. For a few days, not long after their first appearance, they were quite one of the common ducks of the Bazaar, being as numerous as White-eyes (*N. africana*). Out of perhaps twice that number seen, I bought in all twenty-nine specimens, twelve of which were transferred (not all immediately, however,) to the Museum collection; while three, a male and two females, remain at large on the

tank in the Museum compound, and a pair are still living in the Duck House at the Alipore Zoological Gardens, where several seem to have died, as I sent more there at different times.\* Some birds were lost in various ways. Most of the birds observed were in immature plumage; I saw a few full-plumaged females, but no full-plumaged male.

The immature female is very like *N. africana* of the same age and sex, but differs from it in the dusky crown, and the absence of any rusty hue about the head except on the face. The size usually furnishes a better distinction, but I have seen some unusually small, though apparently clean-moulted, females, one of which is among our series obtained on this occasion. This bird is not larger than adults of *N. africana*, but is at once distinguishable by the above-noted limitation of the rusty hue, and the generally dusky blackish head and neck, whereon, however, are only faint indications of a green gloss.

All the males I saw had white irides, with the exception of one in which they were of a pale cloudy greenish-yellow. The white eye appears early, for I have noted it in specimens which were only just beginning to change the immature plumage for that of the adult. The young male appears (I have no preserved specimen of a *very* immature male) to have the same plumage as the young female. The bird on the Museum tank was pinioned and turned out there on December 13th, 1896, when only just beginning to change, and when caught on February 26th, 1897, was in full plumage, or nearly so; so also were two females caught with him, which were preserved, while the male was again released. Unfortunately I do not know exactly at what stage these females were turned out, but I am sure they were not in full plumage.

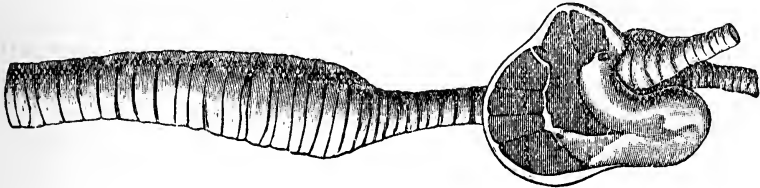
In all the females I saw the irides were brown, with the exception of two, which had the irides grey, and a mixture of brown and white, respectively.

The bills of the males are dark grey or greyish black, with a black nail and a grey patch at the tip: in the female the bill is darker, with the grey patch less distinct. The feet in both sexes are grey, with dark joints and black webs.

As to the habits of this duck I have little to say. In general appearance it is lighter and less "dumpy" than its near ally *N. africana*; the head and neck and general shape are less Fuliguline than in that species, and recall a Mallard somewhat. It of course swims

\* These are now dead; the species does not bear confinement in an aviary well, unlike *N. africana*, which thrives better than any other Pochard. *N. baeri* is also more restless on the water when on a tank, judging from the three birds I still possess. From the male of these and the bird that recently died in the Zoological Gardens, it appears that the male in summer assumes the rusty facial patch of the female, and both become duller.

and dives excellently, and is a less clumsy walker than the common White-eye. The male has a curious habit of contracting its neck and jerking it backwards in a curve—no doubt a pairing-gesture. The lower part of the windpipe of the male is shown below, of about natural size.



*Erismatura leucocephala.*

Two birds, an immature male and a female, of this species, were obtained in the Bazaar during the late cold season. The female was in a dying state when seen, and died by the time the bargain for it was concluded.

The male, for securing which I am indebted to our taxidermist, Mr. C. Swaries, lived for three days, but one of its legs was hopelessly injured, and it either could not or would not eat, although I tried it with several different kinds of food, in the hope of studying alive so interesting a species. Ultimately I reluctantly had it killed and preserved.

It was about the tamest bird I ever saw, continuing to dress its plumage even when being handled; in fact, its remarkable freedom from fear and its care of its feathers reminded me strikingly of a Grebe, (several of which I have also had) just as its habits when at large reminded Caon Tristram (*vide Dresser, Birds of Europe*) of those birds. From the attempts it made, despite its injuries, to stand up, I have no doubt that it is able to do so, and probably to walk also, though doubtless it is not active on land. It floated low in the water, but not submerged, and the tail was kept more or less raised above the level of the back. This male had the throat entirely white and the black on the front and sides of the neck below, this finely vermiculated with white; the back plumage is very pale, almost creamy in ground-tint, with chestnut feathers showing up here and there. The female was very much darker above, as well as more rufous. Her bill was black, while the male's was dull grey, somewhat greenish at the base. In both specimens the feet were grey with black webs, and the irides very dark brown. The windpipe of the male is expanded in the middle and narrowed towards the ends, but has no *bullæ ossea*.

*Merganser comatus.*

A specimen of a Goosander, in very bad condition, sent to me in March of the present year by the Editor of the *Asian*, with the information that it was shot at Myitkiyana, Burmah, appears to me to be referable to the Eastern form. It is a female or young male.

*Merganser serrator.*

There is in the Museum collection an excellent specimen of this bird, not sexed, but by plumage a female or young male, obtained in the Calcutta Provision Bazaar on December 17th, 1889.

*Contributions to the Theory of Warning Colours and Mimicry. No. III.*  
*Experiments with a Tupaia and a Frog.*—By F. FINN, B.A., F.Z.S.,  
 Deputy Superintendent in the Indian Museum.

[Received April 29th, Read May 5th, 1897.]

The only other animals, besides birds and *Calotes* lizards, with which I have systematically experimented, are a Tupaia or Tree-Shrew (*Tupaia ferruginea*), and a Bull-frog (*Rana tigrina*); in each case a single individual only being used.

This being the case I have thought it as well to give the experiments on this Mammal and Amphibian together in one short paper, before dealing with the rest of the birds, my notes upon which much exceed in bulk all those I have hitherto published taken together.

## EXPERIMENTS WITH A TUPAIA.

The Tupaia used in these experiments was bought in the Bird Bazaar, in July, 1895, and kept for most of the time in the aviary which I had used for birds: it was fed on boiled rice, fruit (plantain) and cooked meat. It used its fore-paws to hold the insects it ate, after the manner of a squirrel, and from its tameness and keenness after insects was a very satisfactory subject to observe. With it I made the following experiments, in 1895, about the time at which some of my experiments with *Calotes* (*J. A. S. B.*, 1896, *Part II*, p. 42) were made.

July 15th. The animal being hungry, I offered it a *Danaï. genutia*, which it took, but refused, apparently disliking the taste. I then gave it three non-warningly-coloured butterflies, which it was even less inclined to eat. All these insects were dead and rather dry however.

The animal had an hour or so before eaten cockroaches (*Periplaneta americana*) and plantain with relish.

Shortly after I could not find two of the non-warningly-coloured butterflies I had put in its cage, as above mentioned. In the evening, after having meanwhile given the Tupaia some meat and rice, the former of which it had some time ago eaten, (the latter it seemed not to like) I found the *D. genutia* still uneaten in the cage. The last non-warningly-coloured butterfly, a *Catopsilia*, I found outside the small cage in which the Tupaia at present was kept. I put it in the netting, but the animal would not take it.

I then offered it a *Danais limniace* and another *Catopsilia*, fresh specimens. These it smelt and would not eat.

Next I put in a live *Catopsilia*, which the Tupaia eagerly pursued, seized and ate. I then put in live specimens of *D. genutia* and *limniace*, one each, neither of which it would take. Then I gave successively a non-warningly-coloured butterfly much like those it had refused when dead, in the morning, and five *Catopsilias*, all these being alive; all were eaten, and the animal smelt about for more, while the two *Danais* recently given were still alive. It then readily ate a glossy green Muscid fly.

It then ate the *Catopsilia* which it had previously refused (see above), while within two inches of the living *D. limniace*.

Once or twice, in chasing butterflies, it grabbed at one or both *Danais*, but did not bite them.

*July 16th.* The two *Danais* put in the cage last night were still alive and unhurt, though the wings of the *D. genutia* were torn and rubbed. I had noticed the animal smelling this more attentively last night, and it was more inclined to seize it. The *D. limniace* was quite untouched. The Tupaia ate a piece of plantain, and later a cockroach, readily. I then took out these two butterflies, and offered them to Lizards (see *Experiments with a Lizard*, under this date, *J. A. S. B.*, 1896, *Part II*, p. 46.)

I offered the animal to-day two plain-coloured caterpillars of a species living in stick cases, which it ate, but rubbed them first on the ground, and did not gobble them up immediately like the winged insects. It seemed to have no idea of getting them out of the cases for itself, though I saw it afterwards nibbling at one of these.

In the evening, the animal being now in the aviary, where there was plenty of meat, rice, and plantain, I put in with it a disabled *Euploea*, which it smelt and refused; then a disabled *Junonia* and another non-warningly-coloured specimen; these it ate readily. Then I gave it a disabled *Danais genutia*, which was also examined and refused. Two non-warningly-coloured specimens like the preceding were then eaten, wings and all, as usual. I then took out the *Euploea*, and offered it to a Lizard (see *Experiments with a Lizard*, *loc. cit.*)

July 17th. I put in the Tupaia's aviary, where there was still meat and fruit left over from yesterday, disabled specimens of *Danaïs genutia* and *limniace*, and *Euploea*, the last-named being that which I had removed on the preceding night. The animal smelt at, but did not take them, and an hour or so after they were still alive. I took out the *Euploea* and *Danaïs*, using the former again for Lizards (see *Experiments with a Lizard*, under this date *loc. cit.*) and returning the two latter later, after the Tupaia had had a fresh allowance of meat. They were both now dead; the *D. limniace* had been wounded and the *D. genutia* had lost two legs, but my notes do not state what had done this. At all events I now took them away finally.

July 18th. I gave the Tupaia in the morning a *Neptis kamarupa* (uninjured) which it readily seized and ate. Some of the meat given the animal yesterday was still at hand.

July 20th. Being unwell to-day, I was indebted to Mr. R. D. Oldham, of the Geological Survey, for making some observations. He gave the Tupaia (which was eager for insects, at any rate) a *Papilio aristolochiæ*, which the animal attacked and killed, eating its head. However, it was not eager for it, and left it to greedily devour a non-warningly-coloured specimen.

In the evening, though there was still some meat, Mr. Oldham found the Tupaia had apparently eaten the body of the *P. aristolochiæ*; it then greedily ate a non-mimetic specimen of *P. polites*, and another non-warningly-coloured specimen.

Two *Danaïs genutia* were then hunted by the animal; one was killed, but not eaten, and the other not even killed.

On the 22nd I found a *D. genutia* dead and uneaten, but being attacked by ants, in the Tupaia's cage, where there was also some meat and rice.

July 24th. I gave the Tupaia a disabled *Danaïs genutia*, which it smelt at and pawed, but left unhurt.

I then put in a disabled *Papilio demoleus*, which it ate, leaving most of the wings.

A large *Catopsilia* was then eaten more eagerly and entire. The animal had some meat left from yesterday.

The Tupaia then ate two or three other non-warningly-coloured butterflies (one of which had been offered to *Calotes* (see *Experiments with a Lizard*, under this date, *loc. cit.* line 30).

In the evening I gave the Tupaia (which had now only rice available) a larva of *Polytela gloriosæ*. This it did not seem to relish, as I saw it once flung aside and once dropped; but all, or nearly all, of it was eaten. These larvae are conspicuously coloured red, black and white, feed exposed, and do not appear to be touched by wild birds.

Another specimen was taken and dropped two or three times, and then left, still alive.

The Tupaia shortly vomited freely, and then ate a *Papilio eurypylus* I had just put in. I saw it vomit when being brought from the Bazaar in a "gharry" however, probably from fear.

Soon after I gave it a *Papilio demoleus*, which it ate greedily. I gave disabled specimens of *Danaïs genutia* and a non-warningly-coloured species, previously offered to Lizards (*Experiments with a Lizard*, under this date, *loc. cit.*, line 32) to the Tupaia, which ate the latter and smelt and left the *D. genutia*, which I used again for a Lizard (*loc. cit.* line 36). The *Polytela* larva which it had tried, and which had been crawling about the cage, was now not to be seen.

*July 25th.* In the evening I gave the Tupaia another *Polytela gloriosæ* larva, which it ate with less signs of dislike. It was seemingly hungry, and it did not vomit afterwards, but then I did not watch for this.

*July 26th.* I enticed the Tupaia, which was hungry, into its small cage with a living *Catopsilia*, which it ate.

I then put in two dead *Catopsilias*, and a *Danaïs genutia* and *D. limniace* alive. One *Catopsilia* was soon eaten, and the animal then smelt attentively at the *D. limniace*, but did not touch it. It then found and seized the other *Catopsilia*, but only ate the head, if anything.

I then put in a living *Euploea*, which the Tupaia smelt at and left.

Shortly afterwards, I found this and the two *Danaïs* still unhurt, while the *Catopsilia* left before had apparently been eaten, and another, put in alive, was also devoured.

About an hour afterwards the two *Danaïs* and the *Euploea* were still unhurt, though the Tupaia had had no food, and readily ate a cockroach.

After this I sent the animal to the Zoological Gardens at Alipore, where it was placed in a netted cage with another. Here I made a few more experiments with it a few days later.

*August 3rd.* I offered to the Tupaia (there was food, hard-boiled egg, in the cage) a *Papilio demoleus*, which it took and partly ate.

Then I put in a non-mimetic *Papilio polites*, which it ate all but the fore-wings and a piece of the hind-wings; it then ate all the rest of the *P. demoleus* except the fore-wings.

*P. aristolochiæ* was then taken, killed, and left. Then the head was eaten, and the body again left.

Three specimens of *P. demoleus* were then readily eaten in succession.

The body and hind-wings of the *P. aristolochiæ* soon disappeared, but I think I saw it under the sleeping-box in the cage, where no doubt

it had been taken by the other Tupaia. This was in fear of my animal, and had had none of the butterflies.

I put in another *P. aristolochiæ*, which was smelt at by both the Tupaias, but not killed, though my animal then ate a *Catopsilia* given it.

Some time later I found this *P. aristolochiæ* dead, and slightly bitten, but quite whole, having evidently been rejected.

It is obvious that this animal has a very strong objection to the "protected" *Danainæ* and *Papilio aristolochiæ*, as it so constantly refused them, and that in the case of the former absolutely, unlike the Babblers dealt with in my first paper (*J. A. S. B.* 1895, Pt. II, p. 344), which birds, caged under much the same conditions, generally showed their dislike of the *Danainæ* merely by preferring other species.

#### EXPERIMENTS ON A BULL-FROG.

My experiments on this amphibian, which Dr. Alcock had been keeping for a little time for use in the Museum, and which he kindly allowed me to test upon this subject, were few and not long continued. But such as they are, I have thought well to insert them, if only for completeness. The experiments were made soon after I came to India, in 1894.

*November 2nd.* Offered a *Danaï chrysippus* to the frog, which was being regularly fed on cockroaches; the butterfly was not touched.

*November 10th.* I put into the cage of the frog, instead of its usual meal of about a dozen and a half of cockroaches (*Periplaneta americana*), one cockroach only, and a *Delias eucharis*. Before long both insects had disappeared.

I then put in another *D. eucharis*, a *Danaï chrysippus*, and a smaller non-warningly-coloured butterfly. Later on I found the *Danaï* was gone. The others apparently remained.

*November 11th.* No butterflies left in the frog's cage.

*November 12th.* I put in the frog's cage a *Terias*, three *Delias eucharis*, and three cockroaches.

*November 13th.* To-day there were no insects in the cage, and about five cockroaches were put in by Dr. Alcock, and a *Danaï chrysippus* by myself.

*November 14th.* The *Danaï chrysippus* given to the frog yesterday was still there, alive; I saw none of the cockroaches, but did not specially look for them. I took out the *Danaï*.

*November 15th.* To-day I put a female *Hypolimnas misippus* and a cockroach in the frog's cage; there were also two or three more cockroaches. I did not note what happened next day.

*November 17th.* No insects left in the frog's cage. I now put in



two cockroaches, but did not note when they were eaten, nor did I make any more experiments with this frog.

These experiments are hardly sufficient to form any conclusion as to the tastes of this Amphibian; but it would appear, if anything, to object to *Danais chrysippus* more than to *Delias eucharis*, and not very seriously to either. But sufficient opportunity for choice was not given.

A toad (*Bufo melanostictus*) which was also being fed on cockroaches, and had one in its cage at the time, did not touch a *D. chrysippus* put in on November 4th. But one such experiment is practically useless.\*

A tree-frog did not eat some Skippers put in, but then as far as I saw it did not feed at all while I observed it.

\* I note on August 24th, 1895, offering a large "glow-worm" to a small toad at Dehra Dun. The insect was followed about but left; and another small toad behaved in the same way. In this case the insect was probably too big; but subsequently a smaller one offered to a toad was not noticed. The toads were at liberty.

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*Description of Neptis praslini, Boisduval, and some species allied to*

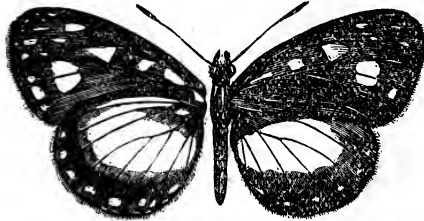
*it.*—By LIONEL DE NICÉVILLE, F.E.S., C.M.Z.S., &c.

[Received May 11th;—Read June 2nd, 1897.]

*Neptis praslini*, Boisduval, and its allies form a very interesting little group of the large genus *Neptis*. They appear to be confined to the Moluccas, the Papuan group of islands, the Bismarck Archipelago, and Northern Australia. So long ago as 1832, Dr. Boisduval noted the very strong superficial resemblance of *Neptis (Limenitis) brebissonii*, Boisduval, from New Guinea, which is one of the species referred to in this note, to the butterflies of the genus *Tellervo*,† Kirby (*Hamadryas*, Boisduval, nec *Hamadryas*, Hübner, the type of the latter being *Papilio (Vanessa) io*, Linnæus). The mimicry in this case by the brittle-winged edible *Neptis* of the leathery-winged unpalatable *Tellervo* is one of the most remarkable and complete in the entire range of the *Rhopalocera*. The sexes probably in all the species of the group here dealt with are well marked, the male having the inner margin of the forewing on the underside and the costal margin of the hindwing on the upperside broadly furnished with closely-packed shining grey scales which are wanting in the female. Both wings of the female also are somewhat broader and more rounded than in the male. Several authors have placed "*Limenitis*" *praslini* and its allies in the genus *Athyma*, which is certainly incorrect; they are all true *Neptes*.

† *Tellervo*, Kirby, Allen's Naturalist's Library, New Edition, Lepidoptera, part i. Butterflies, vol. i, p. 28 (1894).

## 1. NEPTIS PRASLINI, Boisduval.



*Limenitis praslini*, Boisduval, Voy. l'Astrolabe, Ent., part i, p. 131, n. 2 (1832): d., Staudinger, Ex. Schmett., p. 146, pl. 1, female [nec male] (1886).

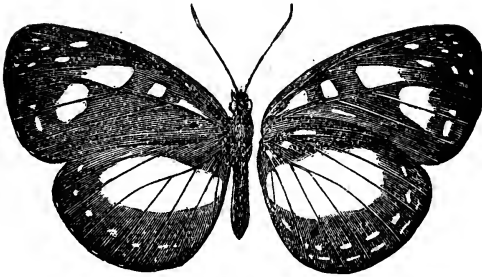
HABITAT: New Ireland (the Neu-Mechlenburg of the Germans) (*Boisduval*); Cooktown, Queensland, N.-E. Australia (*Staudinger*).

EXPANSE: ♂, ♀, 1.45 inches.

Dr. O. Staudinger has figured a female of *N. praslini* from Cooktown in N.-E. Australia, and says that the male hardly differs, but has a broad shining grey costal margin on the upperside of the hindwing, which is wanting in the female. I propose to consider Dr. Staudinger's figure as typical of the species. He goes on to say that "A somewhat larger but very similar species is the *N. brebissonii* of Boisduval from New Guinea, which I have received from Dr. Platen from Waigeu. This differs chiefly in the larger white spots, and in having a broad black costal margin on the underside of the hindwing. How it happens that these and several other similar species stand in Kirby under *Athyma*, I cannot say, as both species are so extremely similar to one another, and in this case it can hardly be considered to be mimicry." I am doubtful if Dr. Staudinger has correctly identified "*Limenitis*" *brebissonii*, described from New Guinea, as Boisduval makes no mention of the three prominent white spots in the discoidal cell of the forewing present in all the species of the group of *N. praslini*. I possess a single pair of this species from Cooktown kindly sent to me by Dr. O. Staudinger. It is of course possible that these specimens represent a species distinct from true *N. praslini*, but in the absence of New Ireland examples it is impossible for me to say. Boisduval's original description of this species from New Ireland is very short, the specific definition being contained in the words "hindwing crossed at the middle by a large white band."

This species mimics *Tellervo zoilus*, Fabricius. In life the eyes of both species are bright yellow. The specimen figured is a male.

## 2. NEPTIS LACTARIA, Butler.



*Athyma lactaria*, Butler, Ann. and Mag. of Nat. Hist., third series, vol. xvii, p. 98, n. 1 (1866); id., Godman and Salvin, Proc. Zool. Soc. Lond., 1878, p. 647; *Neptis praslini*, Kirsch [nec Boisduval], Mitth. Mus. Dresden, vol. i, p. 125, n. 94 (1877); id., Godman and Salvin, Proc. Zool. Soc. Lond., 1879, p. 158, n. 27; id., Oberthür, Ann. Mus. Civ. Genova, vol. xv, p. 503, n. 121 (1880); *Athyma* [sic] *praslina* [sic], Tryon, Second Ann. Report Adm. Brit. New Guinea, App. v, p. 118 n. 57 (1890); *Neptis papua*, Oberthür, Ann. Mus. Civ. Genova, vol. xii, p. 460, n. 40 (1878); id., Grose Smith, Nov. Zool., vol. i, p. 352, n. 110 (1894).

HABITAT: Aru Isles; var. 1 *a*, Dory (*Butler*); Rubi, N.-W. New Guinea; Mysore and Jobi Islands (*Kirsch*); New Ireland; mainland of New Guinea (*Godman* and *Salvin*); Vaigheu and Mount Epa in southern New Guinea; Doreï in New Guinea; Ceram (*Oberthür*); Mansinam and Humboldt Bay, N.-W. New Guinea (*Grose Smith*); Ké Isles; Stephansort and Constantinhafen, German New Guinea; Waigiou or Waygiou (*coll. de Nicéville*).

EXPANSE: ♂, 2.4 to 2.5; ♀, 2.5 to 2.8 inches.

DESCRIPTION: MALE and FEMALE. UNDERSIDE, *hindwing* differs from typical *N. praslini*, Boisduval, from Cooktown, N.-E. Australia, in having the large discal white area of lesser size, not continued as far as the costal nervure and joined to the short basal streak in the subcostal interspace as it is in that species, in *N. lactaria* the basal streak is quite isolated from the discal white area. In other respects the two species, as far as my specimens go, do not differ.

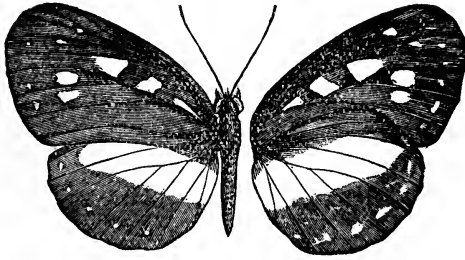
Dr. A. G. Butler gives an excellent description of the species (except that he does not say what sex he is describing) as *Athyma lactaria* from the Aru Islands, and a var. 1 *a*: "with a narrower band on the hindwing" from Dory, the latter probably being the Dorey or Dorei of N.-W. New Guinea. Messrs. Godman and Salvin also record *A. lactaria* from the mainland of New Guinea. Herr Th. Kirsch records it as *N. praslini* from Rubi on the mainland of N.-W. New Guinea, and from the neighbouring islands of Mysore and Jobi. He says: "In

the specimens collected in the first two localities [Kordo and Ansus] (on the islands Mysore and Jobi) the white marking is excessive, as the outermost of the three existing spots of the elongated band [*i. e.*, the large triangular spot at the end of the discoidal cell of the forewing] is lengthened towards the outer margin, and runs into the [submarginal] row of spots. In the single specimen taken in Rubi on the mainland of New Guinea the white markings are, on the other hand, reduced to such an extent that the linear row of marginal spots on the underside of the hindwing is altogether wanting, and the inner row is formed of much smaller spots." Messrs. Godman and Salvin record *N. praslini* from New Ireland without remark. M. Oberthür records *N. praslini* from Vaigheu and Mount Epa in southern New Guinea. He notes that the description of the species by Boisduval is very short, and would apply equally well to many closely-allied species of the same group, and that he considers it better to sink the *Neptis papua* described by himself to *N. praslini*. Mr. Henry Tryon records *N. praslini* as *Athyma praslina* from Milne Bay in British New Guinea. M. Oberthür again described the species as *Neptis papua*, Boisduval MS., from Doreï in New Guinea and from Ceram. As noted above, he has sunk this name under *N. praslini*. Mr. Grose Smith records a long series of both sexes of *N. papua* from Mansinam and Humboldt Bay, N.-W. New Guinea, and says that "The white band which crosses the hindwing is of variable width, especially in the male."

Of *N. lactaria*, as identified by me, I possess three pairs from the Ké Isles, two females from Stephansort, and one pair from Constantinhafen, both in German New Guinea, and two females from Waigiou. They are characterised by having the discal white band of the hindwing broad, occupying seven interspaces on the upperside, eight on the underside, broadest in the discoidal interspace, regularly tapering from thence to the abdominal margin, which it does not quite reach. The additional portion on the underside lies in the subcostal interspace. On the underside of the hindwing there are two marginal series of white spots, the anterior one consisting of eight large rounded spots, the posterior one of a similar number of smaller linear spots.

This species mimics *Tellervo zoilus*, Fabricius. The specimen figured is a female from New Guinea.

## 3. NEPTIS NAUSICAA, n. sp.



HABITAT: Stephansort, German New Guinea.

EXPANSE: ♂, 2.4; ♀, 2.5 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black, with shining pearly-white markings. *Forewing* with a short clavate streak towards the base, a quadrate spot at the middle, and a large triangular spot beyond the end of the discoidal cell; two small outwardly-obliquely-placed subapical spots; two much larger, the upper the larger of the two, well-separated rounded discal spots divided by the second median nervule; three widely-separated submarginal dots. *Hindwing* with a broad even-edged discal band, of equal width throughout, occupying seven interspaces, commencing on the inner margin and ending on the subcostal nervule; a submarginal series of five small round spots. UNDERSIDE, *forewing* as on the upperside, but the four spots on the disc a little larger; the submarginal series consisting of six spots. *Hindwing* with a short streak towards the base of the wing in the subcostal interspace; the discal band a little broader than on the upperside, and with a small additional portion in the subcostal interspace; an obsolete series of elongated spots between the discal band and the submarginal series of spots; the latter consisting of eight spots, which are larger than on the upperside. FEMALE. UPPERSIDE, *forewing* differs from the male in the submarginal series of spots being six in number instead of three. *Hindwing* has the discal band extended by an additional portion in the subcostal interspace in one specimen, but not in the other; the posterior edge of the discal band irregular, in the male it is even. UNDERSIDE, *forewing* as in the male. *Hindwing* with the additional portion of the discal band in the subcostal interspace much larger than in the male.

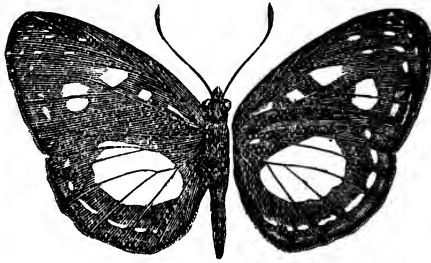
*N. nausicaa* differs from *N. lactaria*, Butler, in the *forewing* in having the two discal spots divided by the second median nervule much smaller and consequently well separated, in *N. lactaria* they are conjoined; in the *hindwing* in having the discal band of the same width throughout and reaching the abdominal margin, in *N. lactaria*

it is of great width anteriorly, rapidly narrowing to the abdominal margin, which it does not quite reach; the anterior end of the discal band in *N. nausicaa* reaching much closer to the outer margin than in *N. lactaria*. On the underside of the hindwing there is a single subcostal streak, in *N. lactaria* this streak is much shorter, with an additional round spot placed posterior to it close to the base of the wing; and in *N. lactaria* there is a marginal series of eight linear spots, which are entirely wanting in *N. nausicaa*.

I am indebted to Mr. Henley Grose Smith for the gift of the specimens described.

This species mimics *Tellervo zoilus*, Fabricius. The specimen figured is a male.

#### 4. NEPTIS NEMEUS, n. sp.



HABITAT: New Britain.

EXPANSE: ♂, 2.2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black, with shining pearly-white markings. *Forewing* with a rather long clavate streak reaching to the base, a rather rounded spot at the middle, and a triangular spot beyond the end of the discoidal cell; three small outwardly-obliquely-placed subapical spots; two much larger, the upper the larger of the two, almost conjoined discal spots divided by the second median nervule; a submarginal series of six small spots, the series broken in the middle; a barely traceable marginal series of dots; an elongated bluish-white streak on the middle of the sutural area. *Hindwing* with the middle occupied by an oval patch consisting of five portions; a submarginal series of six linear spots. UNDERSIDE, *forewing* with a pale streak defining the basal half of the subcostal nervule; all the spots on the disc more prominent than on the upperside, particularly the marginal linear series. *Hindwing* with the oval quinquelpartite discal area as on the upperside; anterior to which there is a small round basal spot, and a lengthened pale subcostal streak; the submarginal spots

more prominent than above ; with an additional marginal linear series of eight spots.

Apart from other characters, the oval white patch confined to the middle of the hindwing will at once serve to distinguish this species from *N. lactaria*, Butler, and *N. nausicaa*, de Nicéville.

Described from a single example which I have received from Mr. Henley Grose Smith.

This species mimics *Tellervo æquicinctus*, Godman and Salvin, or *T. hiero*, Godman and Salvin.

#### 5. NEPTIS DORCAS, Grose Smith.

*N. dorcas*, Grose Smith, Nov. Zool., vol. i, p. 354, n. 115 (1894) ; id., Grose Smith and Kirby, Rhop. Ex., pl. *Neptis* i, figs. 7, 8 (1895).

HABITAT : Biak Island, N.-W. New Guinea (*Grose Smith*).

This species is quite distinct from all those previously mentioned. It may be known from *N. lactaria*, Butler, as identified by me, by the extreme irregularity of the outer edge of the discal white band of the hindwing, that portion of the band lying in the discoidal interspace being outwardly greatly lengthened and projecting far beyond the line of the other portions. The sex of the two specimens described is not stated, but they are probably females.

In describing this species Mr. Henley Grose Smith refers twice to the "white oval patch" of the hindwing in *N. praslini* from New Ireland. From this I gather that Mr. Grose Smith identifies *N. praslini* with the species I have described as *N. nemeus*, though my specimen is from a different island, and may be distinct from the New Ireland form, and that he calls the species I identify as *N. lactaria*—*N. papua*. I have given my reasons above for preferring to apply Boisduval's name to the species which Dr. Staudinger has figured, and M. Oberthür has described as *N. papua*, and which the latter writer says is probably the true *N. praslini*.

This species mimics *Tellervo evages*, Godman and Salvin,\* or *T. mysoriensis*,† Staudinger.

#### 6. NEPTIS SATINA, Grose Smith.

*N. satina*, Grose Smith, Nov. Zool., vol. i, p. 352, n. 111, pl. xii, fig. 3, ? male (1894).

HABITAT : Humboldt Bay, N.-W. New Guinea (*Grose Smith*).

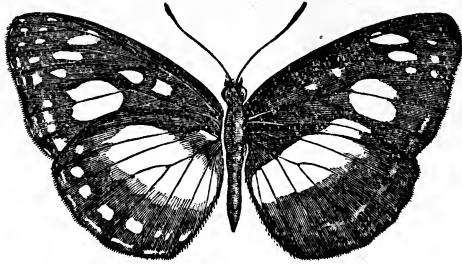
This species differs from all those previously named in having no

\* This name is printed *ovages* by Kirby in Allen's Naturalist's Library, vol. i, p. 29 (1894).

† Spelt *misoriensis* on p. 28 and pl. vi of the same work.

streaks in the discoidal cell or triangular spot beyond the cell on the upperside of the forewing, though they are present on the underside. On the upperside of the hindwing the submarginal series of white spots is also absent.

7. NEPTIS BREBISSONII, Boisduval.



*Limenitis brebissonii*, Boisduval, Voy. l'Astrolabe, Ent., part i, p. 132, n. 3 (1832).

HABITAT: New Guinea (*Boisduval*); Waigiou.

EXPANSE: ♀, 2·5 inches.


DESCRIPTION: FEMALE. UPPERSIDE, *both wings* black. *Forewing* with a small rounded spot just beyond the middle and a rather larger one at the end of the discoidal cell, both indistinct, white, irrorated with black scales; a subapical, outwardly oblique, well separated series of four white spots, the anteriormost very small, the second elongated and the largest, the third also elongated, rather smaller than the second, the fourth round, a little larger than the first; two large white spots on the disc, divided only by the second median nervule; two elongated white spots on the middle of the inner margin, divided only by the submedian nervure; a submarginal series of six small white spots, the four anterior ones round and pure white, the two posterior ones elongated, somewhat sullied with black scales. *Hindwing* with a broad discal white band, divided into eight portions by the crossing veins, not quite reaching the abdominal margin, ending anteriorly on the first subcostal nervule, the inner edge of the band straight, the outer edge somewhat irregular; a barely traceable submarginal series of whitish spots between the veins. UNDERSIDE, *both wings* black. *Forewing* with a prominent quadrate spot just beyond the middle, a triangular spot beyond the end of the discoidal cell; the subapical and discal spots as on the upperside; a submarginal series of eight prominent quadrate white spots, the series broken in the middle, as there is only a small (instead of a large) spot in the second median interspace; an

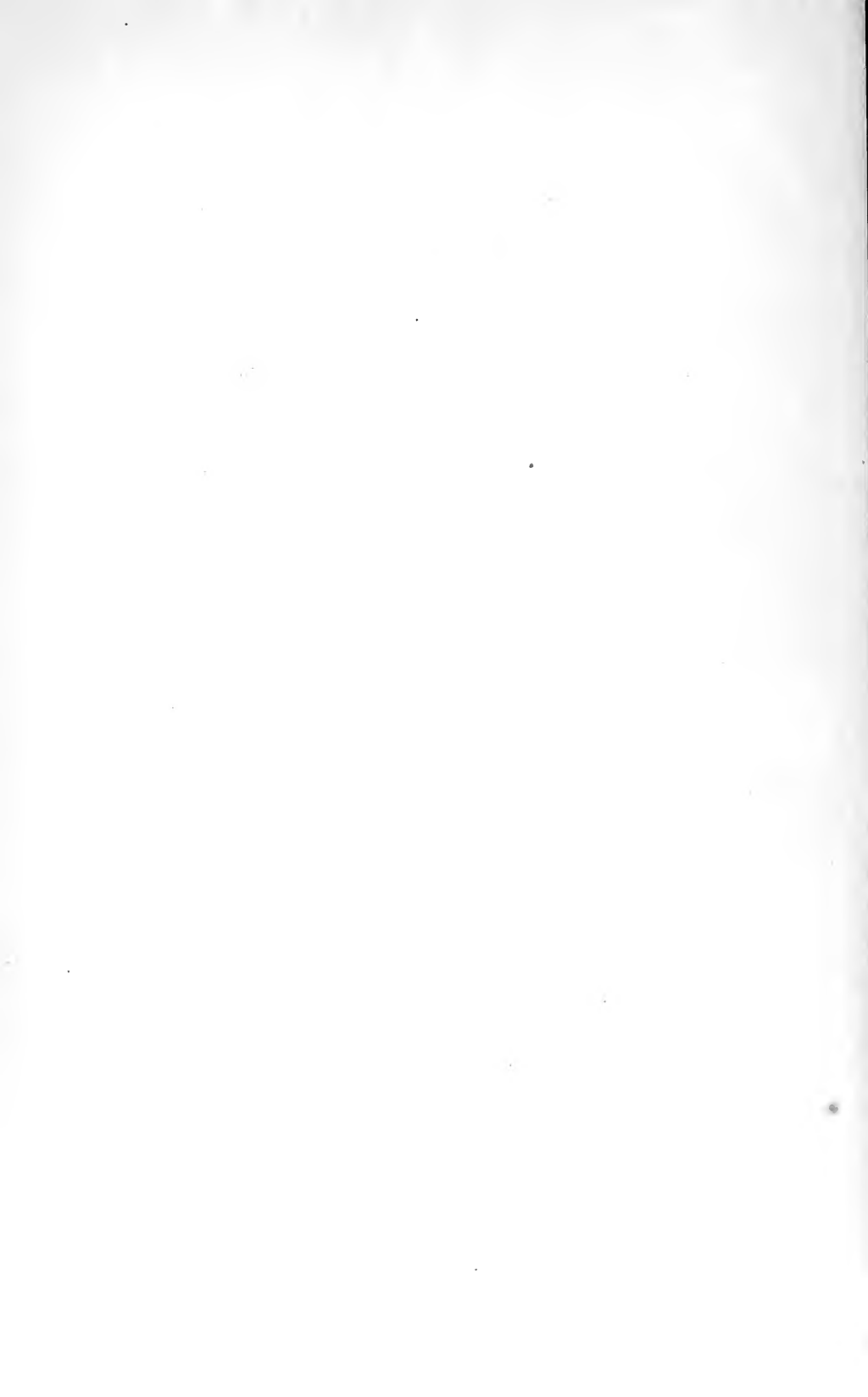


obscure marginal series of elongated white spots between the veins. *Hindwing* with a short white streak on the costa at the extreme base of the wing; posterior to which is another short white streak; the discal band as above but wider on both edges; a prominent submarginal series of eight quadrate white spots; beyond which is a marginal series of six elongated white spots.

This is a very distinct species, differing from *N. praslini*, Boisduval, *N. lactaria*, Butler, *N. nausicaa*, de Nicéville, *N. nemeus*, de Nicéville, *N. dorcas*, Grose Smith, and *N. satina*, Grose Smith, in having two white spots on both sides of the forewing on the sutural area, these spots being absent in all the species mentioned above. Dr. Boisduval's description of it is very short, but as far as it goes it agrees with my specimen described above.

Described from a single example sent to me by Dr. O. Staudinger.





Plates I, II, III, and IV, illustrating Mr. de Nicéville's paper, are being prepared in Europe, and will be issued with a subsequent number of the Journal.

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## ASIATIC SOCIETY OF BENGAL.



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No. III.—1897.

*On New or Little-Known Butterflies from the Indo- and Austro-Malayan Regions.*—By LIONEL DE NICÉVILLE, F.E.S., C.M.Z.S., &c.

(With Plates I, II, III and IV.)

[Received May 20th ;—Read July 7th, 1897.]

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

1. *EUPLŒA (Vadebra) ELWESIANA*, n. sp., Plate I, Fig. 4, ♂.

HABITAT: Bali ; Lombok ; Sambawa (*Doherty*).

EXPANSE: ♂, 3·0 to 3·2 ; ♀, 2·9 to 3·0 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* deep pitchy-brown colour. *Forewing* with the outer margin broadly pale brown, its inner margin even, broadest at the apex, slightly narrowing to the anal angle. *Hindwing* with the outer margin broader and paler than in the forewing, dirty-white in the middle ; the costa broadly pale fuscous. UNDERSIDE, *both wings* pale brown. *Forewing* dark pitchy-brown in the middle ; a rather large reniform pale violet spot at the lower outer end of the discoidal cell ; beyond which are three pale violet spots, the anterior one in the lower discoidal interspace linear, the one posterior to this oval, the posteriormost one the largest and oval ; three or four submarginal white dots. *Hindwing* with a broad marginal white area not quite reaching the outer margin or the apex of the

wing; a spot at the end of the cell, and five just beyond the cell, all of nearly equal size, small, rounded, pale violet; a submarginal apical series of three small rounded white spots; and a marginal apical series of five small round white dots. FEMALE, differs only from the male in sexual characters, the inner margin of the *forewing* is straight instead of being slightly outwardly bowed; with, on the underside, a white streak in the middle of the submedian interspace.

Mr. Doherty\* thus refers to this species under *Euploea* (*Crastia* or *Vadebra*) *palmedo*, Doherty:—"An allied form occurs in Sambawa, with the margins broadly whitish as in *E.* [*Vadebra*] *climena*, Cramer [from Amboina and Ceram], and without the conspicuous subapical white band of the forewing" of *E. palmedo*. The species is nearest to *Vadebra macleari*, Butler,† from which it appears to differ in having the outer margin of the hindwing on the upperside much less broadly white, and of a dirty-white instead of "snow-white" shade, with no apical white spots, in *E. macleari* there are seven spots in two series, two and five; on the underside the outer white area differs as above. From *Vadebra sepulchralis*, Butler,‡ it appears to differ in having on the underside of the hindwing a continuous dirty-white marginal area, in that species this area is broken up into narrow elongated white spots between the veins. *E. sobrina*, Röber, from Goram, and *E. neptis*, Röber, from Flores (Tijd. voor Ent., vol. xxxiv, p. 297 (1891), are probably allied species, but in the absence of figures it is impossible to say if this is so with certainty from the short descriptions given of them.

Described from a male taken by Mr. W. Doherty in the low country of Bali in April, 1896, and two pairs captured by Herr H. Fruhstorfer at 2,000 feet elevation at Sapit in Lombok in May and June, 1896. The specimen figured is from Bali.

#### Subfamily SATYRINÆ.

##### 2. LETHE (*Kerrata*) LYNCUS, n. sp., Plate I, Fig. 8, ♂.

HABITAT: Native Sikkim.

EXPANSE: ♂, 2.2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* hair-brown, with a strong silky ochreous-bronzy gloss; a submarginal deep brown fascia. *Forewing* has the discoidal cell crossed by two dark brown bars, one at the middle, the other towards the end; a discal irregular dark brown

\* Journ. A. S. B., vol. lx, pt. 2, p. 162 (1891).

† Proc. Zool. Soc. Lond., 1887, p. 522, woodcut fig. 4, *male*, from Christmas Island.

‡ Proc. Zool. Soc. Lond., 1866, p. 282, n. 46, woodcut fig. 2, page '283, *male*, from Java.

band from the costa to the submedian nervure, anteriorly broad and touching the disco-cellular nervules inwardly, posteriorly narrow, between the first median nervule and the submedian nervure inwardly oblique; a short subapical pale ochreous bar within the submarginal fascia reaching from the costa to the upper discoidal nervule. *Hindwing* with an indistinct irregular discal dark brown fascia; beyond which are five round dark brown spots decreasing in size from anteriorly backwards. *UNDERSIDE*, both wings shining pale ochreous, with the markings darker ochreous. *Forewing* has the two discoidal bars as on the upper side, the inner one broad, the outer one narrow, the space between them yellow; the discal fascia is broader and more prominent than above, its outer edge sharply defined; the discal area beyond is yellow becoming darker till it is almost lost in the submarginal fascia; the subapical spots as on the upperside three in number and white; the margin is somewhat broadly pale, bisected by a narrow straight brown line. *Hindwing* has a basal irregular dark fascia outwardly defined by a narrow yellow line; beyond which is a dark line from the costa to the submedian nervure where it ends between the points of origin of the first and second median nervules; a dark fusiform bar defines the disco-cellular nervules; a broad highly irregular discal fascia from the costa to the abdominal margin; a submarginal series of six black ocelli with white pupils, yellow iris, outer dark ring, with an outermost pale violet ring, the anal ocellus twinned, all the ocelli of nearly equal size, the first and fifth slightly larger than the others; the margin bears a somewhat broad ochreous line, defined on both sides by a dark brown thread, inwardly again with a pale violet line, somewhat dilated at the anal angle. *Cilia* cinereous throughout.

In India this species is nearest allied to *L. tristigmata*, Elwes, also from Sikkim, but it is smaller, the "male-mark" on the upperside of the forewing on the disc is barely traceable, on the underside of that wing the four (sometimes five) discal pale violet spots are wanting being replaced by a short subapical bar, with some other minor differences. It is still nearer to *L. ocellata*, Poujade,\* from Mou-Pin in Eastern Thibet, and Omei-shan and Pu-tsu-fong in Western China, of which *L. simulans*, Leech, is a synonym, from which it appears to differ on the upperside of the forewing in the presence of the short subapical pale bar; the ground-colour of the underside is pale ochreous instead of "greyish-brown," and the discal dark bands of the hindwing seem also to be somewhat differently placed. It is also apparently

\* *Debis ocellata*, Poujade, Bull. Soc. Ent. France, sixth series, vol. v, p. x (1885); *Lethe ocellata*, Leech, Butt. from China, Japan, and Corea, p. 34, pl. iii, fig. 3, male (1892).

allied to *L. armandina*, Oberthür,\* from Moupin and Western China, from which it differs in the discal fascia of the forewing on the upperside not being "bordered outwardly with yellowish," and the bands of the hindwing on the underside not being "violet-grey."

Described from a male taken in Native Sikkim at 10,000 feet, in August, 1895, kindly given to me by Mr. G. C. Dudgeon; and another in Mr. Dudgeon's collection from Gantok, also in Native Sikkim, taken at 7,000 feet in July, 1895.

3. *YPTHIMA MEGALIA*, n. sp., Plate I, Fig. 5, ♂.

HABITAT: North Shan States, Upper Burma.

EXPANSE: ♂, 1.9 inches.

DESCRIPTION: MALE. UPPERSIDE, both wings shining hair-brown, with an indistinct submarginal fuscous fascia. *Cilia* cinereous. *Forewing* with the usual subapical deep black ocellus bipupilled with silver, outwardly defined with a dull yellow ring. *Hindwing* with a similar unipupilled subanal small ocellus. UNDERSIDE, *forewing* pale brown, finely and evenly striolated throughout (except narrowly along the inner margin) with white and ochreous of a curious shade; the ocellus as above but larger, with the pupils metallic pale blue, and the outer yellow ring wider than on the upperside. *Hindwing* with no trace of ocelli; striolated as in the forewing, but the white and yellow striolæ not so much intermixed, there being an ill-defined broad yellow fascia across the disc from the middle of the costa to the middle of the abdominal margin, followed by a still broader but equally ill-defined whitish fascia, which is broken into broadly on the middle of the outer margin by a large triangular patch of the yellow striolation.

*Y. megalia* comes into Group IX of Elwes' Revision of the genus *Ypthima*, Trans. Ent. Soc. Lond., 1893, p. 44, and is nearly allied to *Y. megalomma*, Butler, and *Y. insolita*, Leech, both from China. From the former (as figured by Leech in Butt. China, p. 86, pl. ix, fig. 2, male) it differs in its more elongate (less broad and rounded) wings, and the ocelli of both wings on the upperside very considerably smaller, half the size in fact. The ocelli in *Y. megalomma* appear to be variable as regards numbers, Mr. Leech's figure shews them as in *Y. megalia*, but in the type and in two others in Mr. Leech's collection there is an extra ocellus in the forewing on the underside in the first median interspace. *Y. megalia* differs from *Y. insolita*, l. c., pl. ix, fig. 1, male, in also having the ocelli much smaller; that species on both surfaces has a second ocellus in the first median interspace on the forewing, and three ocelli (one apical and two anal) on the underside of the hindwing.

\* *Debis armandina*, Oberthür, Études d'Ent., vol. vi, p. 16, n. 8, pl. vii, fig. 6, male (1881); *Zophoessa armandina*, Leech, Butt. from China, Japan, and Corea, p. 43 (1892).



Described from a single example for which I am indebted to Major F. B. Longe, R. E., captured in the Kokang State, 5,500 feet, North Shan States, on the Chinese frontier east of Bhamo, on 6th April, 1895.

Subfamily NYMPHALINÆ.

4. *CYNTHIA CYONIA*, n. sp., Plate III, Figs. 19, ♂ ; 20, ♀.

HABITAT: Ké Islands.

EXPANSE: ♂, 3·4; ♀, 3·6 to 3·8 inches.

DESCRIPTION: MALE. UPPERSIDE, *forewing* differs from *C. orahilia*, Kheil,\* from Nias Island, in the discal black line just beyond the discoidal cell being straighter and thereby more continuous; beyond this there is a series of six black lunules crossing the middle of the disc, the anteriormost one developed into a rounded spot, the posteriormost one W-shaped; beyond this again there are five small round black spots placed between the veins (one being wanting in the lower discoidal interspace), in *C. orahilia* there are never more than four, and usually three or two; the interior of the two submarginal black lines is more lunulated in *C. cyonia*; and the anteciliary black thread is narrower. *Hindwing* has the interior submarginal black line also more lunulated, and the anteciliary black thread also inconspicuous, in *C. orahilia* it is very prominent. UNDERSIDE, *both wings* of a rich red-orange colour instead of ochreous; the discal black line almost perfectly straight instead of being irregular; the interior submarginal line more irregular; the markings otherwise similar. In outline *C. cyonia* has the forewing more produced at the apex, the outer margin consequently more deeply excavated; and the tail of the hindwing is rather longer. FEMALE. UPPERSIDE, *both wings* dark ochreous, sprinkled throughout (except a broad discal paler ochreous area) with fuscous, in the male the ground-colour is rich dark red-orange; the markings almost precisely similar to those of the male, differing only in the *forewing* in the discal black line just beyond the discoidal cell being broader and lunulated instead of being almost straight; and the five discal round black spots are considerably larger. UNDERSIDE, *both wings* differ from the male in being ochreous instead of red-orange; the markings similar. The female differs markedly from the same sex of *C. orahilia* as figured by Herr Gustav Weymer in having the discal area of both sides of both wings rich ochreous instead of pure white; the markings, however, are very similar.

As far as I am aware this is the only species of *Cynthia* which has

\* *Cynthia orahilia*, Kheil, Rhop. Nias, p. 21, n. 36, pl. ii, fig. 9; *male* (1884); id., Weymer, Stet. Ent. Zeit., vol. xlvi, p. 262 (1885); idem, id., l.c., vol. xlviii, p. 5, n. 2, pl. ii, fig. 3, *female* (1887).

the opposite sexes very similarly coloured, usually the male is tawny and the female green, with a broad discal white area: in the female of *C. cyenia* there is no trace of either of these colours. In fact, as far as coloration goes, the female is very similar to the male of *C. saloma*, de Nicéville.

Described from two males and two females received from Herr Georg Semper and Herr Heinrich Kühn.

*P. S.*—Since the above was put into type, I have received a pair of *C. erota austrosunda*, Fruhstorfer (*vide* Berl. Ent. Zeitsch., vol. xlii, p. (1897), from Lambok, to which species *C. cyenia* is very nearly allied. The male differs from that species in having the narrow discal black line on the underside of the forewing quite straight instead of irregular; and the female differs in having the discal band on the forewing considerably broader.

5. *APATURA PAGENSTECHERII*, n. sp.

*A. parvata*, Pagenstecher (*nec* Moore), in Kükenthal's *Ergeb. Zool. Forsch. Molukken und Borneo*, p. 402, n. 181, pl. xx, fig. 3, *female* (1897).

HABITAT: Celebes (Donggola).

EXPANSE: ♀, 2·6 inches.

DESCRIPTION: FEMALE. I propose to rename after Dr. Arnold Pagenstecher the species of *Apatura* he has identified and figured from Celebes in the work cited above. *A. parvata*, Moore, was described from "N. India," and a male was figured. It occurs somewhat rarely in Sikkim, Bhutan, and the Khasi Hills, while Mr. Henley Grose Smith has recorded it, probably erroneously, from Sumatra. The female of *A. pagenstecherii* differs from the same sex of *A. parvata* in its considerably larger size, all the markings being much more conspicuous, especially the discal band across both wings, which is pure white as figured in *A. pagenstecherii* and ferruginous in *A. parvata*; in the former there is a submarginal series of fuscous lunules, placed outwardly against a whitish submarginal line, in the latter the lunules are replaced by oval spots, and the whitish submarginal line is entirely absent. Superficially *A. pagenstecherii* is more similar to *A. (Rohana) nakula*, Moore, from Java and Bali, but a comparison between Dr. Pagenstecher's and my figures\* will disclose at once the many points in which they differ.

6. *NEPTIS (Phædyma) NECTENS*, n. sp., Plate I, Fig. 3, ♀.

HABITAT: Ké Islands.

EXPANSE: ♀, 2·7 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* deep black, with brilliant pure white markings. *Forewing* with a clavate streak in the

\* *Journ. Bomb. Nat. Hist. Soc.*, vol. ix, p. 262, pl. N, fig. 6, *female* (1895).

discoidal cell well separated from an almost quadrate spot beyond the cell; seven discal spots, arranged three, two, and two, the anteriormost spot very narrow and on the costa, the second elongated, well separated from the third, which is oblong with rounded ends; the two middle spots divided only by the second median nervule the largest, with rounded ends; the sixth spot small, placed just anterior to the submedian nervure; the seventh spot elongated, placed on the sutural area; two marginal series of spots, the inner one consisting of eight small rounded spots, the outer one incomplete, five only in number, and somewhat elongated. *Hindwing* with a very broad discal band, broadest in the middle, tapering to either end, extending from the abdominal margin to the first subcostal nervule, consisting of eight portions, its inner edge straight, its outer edge rather irregular, being cut into by the black ground-colour where the veins cross the band; obsolete submarginal and marginal series of whitish spots, the inner series towards the costa only being plainly visible. **UNDERSIDE**, *both wings* black, but of a more dusky tint than on the upperside. *Forewing* with the markings as above, but there is an additional fine lunulated line between the discal and marginal series of spots; the two marginal series of spots much more prominent and larger than above; the inner margin as far as the submedian nervure and first median nervule pale fuscous; the base of the costa orange. *Hindwing* with a short white streak at the base of the costa, posterior to this is a broader streak from the base to beyond the middle of the wing; the discal fascia as above, but broader, followed first by a fine narrow white line, second by a series of eight more or less lunular and prominent white spots, and third by two prominent disconnected marginal white lines, which are sullied with black between the second and third median nervules. *Cilia* black, here and there white. *Body* above black, beneath white.

Near to *N. shepherdii*, Moore, from New South Wales, Australia (Moore), and North-West New Guinea (*Grose Smith*), from the figure of which it differs in having the discal spots on the upperside of the forewing larger, and an additional spot anterior to the submedian nervure; the discal band of the hindwing being much broader; and from the description (as also my solitary specimen from New Guinea) in having the underside black, in *N. shepherdii* it is "ferruginous-brown, suffused in parts with paler brown." It is probably also near to *Phædyia heliopolis*, Felder, from Dodinga in Halmaheira (Gilolo) (*Felder*), and North-West New Guinea (*Grose Smith*), a species I have not seen.

Described from a single female in very fine condition received from Herr Heinrich Kühn.

7. CALINAGA CERCYON, n. sp., Plate II, Fig. 9, ♂.

HABITAT: The road between Tâ-Tsien-Loû and Mou-Pin, and the neighbourhood of Tâ-Tsien-Loû, Western China (May, 1895).

EXPANSE: ♂, 3.2 inches.

DESCRIPTION: MALE. Allied to *C. davidis*, Oberthür, from Moupin, Kouy-Tchéou, Tsé-Kou, Tâ-Tsien-Loû, Oua-Se, Yu-Tong, and Kitchang-Kou (*Oberthür*), Wa-ssu-kow, and Chow-pin-sa, Western China, and Chang-yang, Central China (*Leech*), differing therefrom on both surfaces in the ground-colour of both wings being pale straw-yellow instead of pale greenish-gray, and all the markings clear and unsullied, in *C. davidis* many of them are sullied with dusky scales, this is particularly noticeable in the discoidal cell of the forewing which has no dusky irrorations whatever except a very small outwardly oblique blackish bar beyond the middle; the pale streaks beyond the cell at the base of the median interspaces, and the very large one in the submedian interspace similarly have no dusky irrorations whatever; the outwardly-obliquely-placed discal series of spots from the costa to the third median nervule, and the submarginal series of seven rounded spots are also considerably larger. In the hindwing the discoidal cell has no markings whatever, in *C. davidis* there is usually a narrow outwardly bifurcated dusky streak, and the cell is always heavily bordered by dusky scales; all the spots on the disc are also much larger in the present species than they are in *C. davidis*; the submedian interspace also is at the base entirely free of dusky irrorations, while in *C. davidis* the anterior half between the internervular fold and the median nervure and first median nervule is dusky. It differs from *C. buddha*, Moore, in the ground-colour being pale straw-yellow instead of chalky-white, all the markings larger, especially those on the hindwing, the discoidal cell of the forewing being free of dusky irrorations, in *C. buddha* it is as dusky as in *C. davidis*, and it is also a much smaller insect.

M. Oberthür says that his original type specimen of *C. davidis* was a male, but from the figure I should say that it must certainly be a female. Mr. Leech in "The Butterflies of China, Japan, and Corea" has beautifully figured an undoubted male on plate xx, fig. 1. He notes on page 119 that *C. davidis* has two forms, the one from Moupin, Wa-ssu-kow and Chow-pin-sa in Western China being typical, while the one from Chang-yang in Central China, where it is common and "is the sole representative of the species, but also occurs sparingly in Western China, is greyish with the whitish markings well defined; the streaks and spots are often confluent, giving the appearance of a whitish insect with greyish marginal border and blackish venation." This description

apparently applies to *C. cercyon*, and as my specimens are distinguishable at a glance from typical *C. davidis*, both species being apparently constant (Mr. Leech does not hint at any intermediate form occurring), I have ventured to describe it. M. Oberthür (*Études d'Ent.*, vol. xviii, p. 14 (1893), also apparently refers to this species in speaking of *C. davidis*, and says: "The whitish spots are often confluent, which gives these specimens a less grey and less dark appearance."

I am indebted to M. Charles Oberthür for the gift of two specimens of *C. cercyon*, and five males and one female of *C. davidis*, the latter specimens shewing no variation whatever. A comparison between the figures of *C. davidis* and *C. cercyon* will make it apparent at once in what respects the two species differ. At present there are five species known of this interesting genus:—

(1) *Calinaga buddha*, Moore, Horsfield and Moore, *Cat. Lep. Mus. E. I. C.*, vol. i, p. 163, n. 336, pl. iiiia, fig. 5, *male* (1857); *id.*, de Nicéville, *Butt. Ind.*, vol. ii, p. 143, n. 435, Frontispiece fig. 122, *male* (1886); *id.*, Standinger, *Ex. Schmett.*, p. 138, pl. xlvii, *male* (1886); *C. brahma*, Butler, *Ann. and Mag. of Nat. Hist.*, fifth series, vol. xvi, p. 309, n. 63 (1885).

HABITAT: Himalayas; Assam.

(2) *Calinaga davidis*, Oberthür, *Études d'Ent.*, vol. iv, p. 107, (1879); *id.*, Leech, *Butt. China*, vol. i, p. 118, pl. xx, fig. 1, *male* (1894); *C. buddha*, Oberthür (*nec* Moore), *l. c.*, vol. vi, p. 11, n. 1, pl. viii, fig. 6, *female* (*nec* male) (1881).

HABITAT: Western China.

(3) *Calinaga sudassana*, Melvill, *Trans. Ent. Soc. Lond.*, 1893, p. 121, pl. vii, figs. 1, 2, *female* (? *male*).

HABITAT: Mountainous regions about 100 miles N.-W. of Cheing Mai, Siam; Kunlon, Salwin Riven, N. Shan States, Upper Burma.

Mr. J. C. Melvill says that his type specimens (three) are females. To judge from the example in my collection from Upper Burma and from the figure I should say that all the known specimens are males.

(4) *Calinaga lhatso*, Oberthür, *Études d'Ent.*, vol. xviii, p. 13, pl. vi, fig. 81, *male* (1893); *id.*, Leech, *Butt. China*, p. 652 (1894).

HABITAT: Tsé-kou, Thibet.

M. Oberthür notes that at Tsé-kou are found *C. davidis*, *C. buddha*, and *C. lhatso*.

(5) *Calinaga cercyon*, de Nicéville.

HABITAT: The road between Tâ-Tsien-Loû and Mou-Piu, and the neighbourhood of Tâ-Tsien-Loû, in Western China.

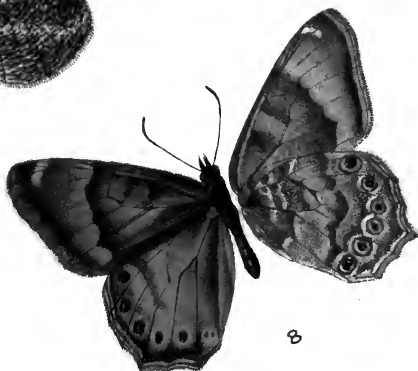
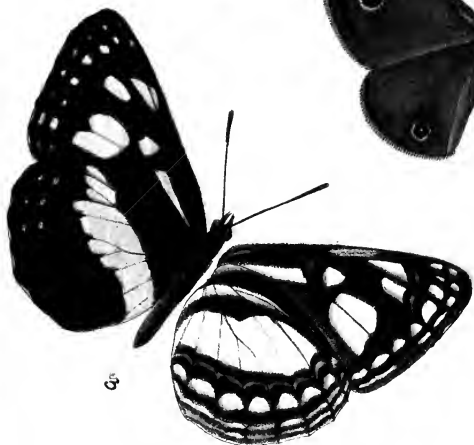
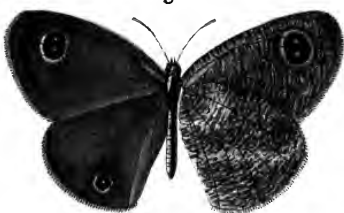
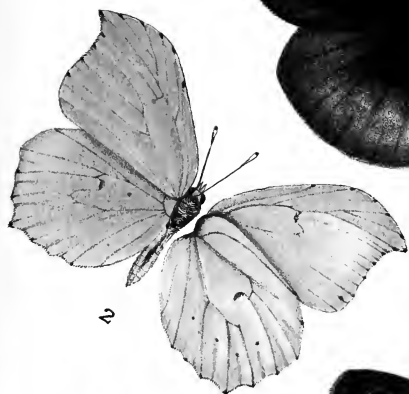
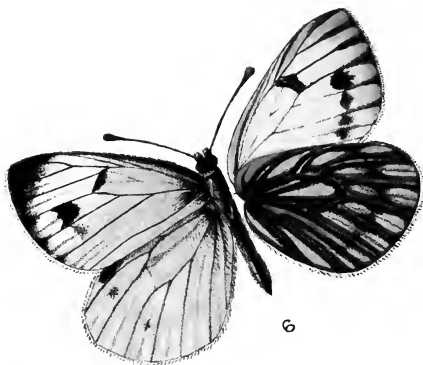
8. *CHARAXES (Haridra) ARISTOGITON*, Felder, Plate II, Figs. 11, 12 gynandromorphous example.

*C. aristogiton*, Felder, Reise Novara, Lep., vol. iii, p. 445, n. 727 (1867); id., Butler, Trans. Ent. Soc. Lond., 1870, p. 121, n. 18 [err. 88]; idem, id., Journ., Linn. Soc. Lond., Zoology, vol. xxv, p. 397, n. 139 (1896); id., de Nicéville, Butt. India, vol. ii, p. 282, n. 573 (1886); idem, id., Journ. Bomb. Nat. Hist. Soc., vol. v, p. 296, n. 50 (1890); id., Adamson, Cat. Butt. Burmah, p. 20, n. 207 (1889); *C. (Haridra) aristogiton*, de Nicéville, Sikhim Gazetteer, p. 148, n. 236 (1894); id., de Nicéville and Martin, Journ. A. S. B., vol. lxiv, pt. 2, p. 438, n. 264 (1895); *Haridra aristogiton*, Moore, Lep. Ind., vol. ii, p. 236, pl. clxxiii, figs. 1, 1a, male (1895); *Charaxes aristogiton* [sic], Elwes, Trans. Ent. Soc. Lond., 1888, p. 368, n. 214; *Haridra aristogiton* [sic], Swinhoe, Trans. Ent. Soc. Lond., 1893, p. 289, n. 196; *Charaxes desa*, Moore, Proc. Zool. Soc. Lond., 1878, p. 832; id., de Nicéville, Butt. India, vol. ii, p. 283, n. 574 (1886); *Haridra desa*, Moore, Lep. Ind., vol. ii, p. 235; pl. clxxii, figs. 1, 1a, male; 1b, 1c [err. e], female (1895); *Haridra adamsoni*, Moore, Lep. Ind., vol. ii, p. 236, pl. clxxiii, figs. 2, 2a, male (1895).

HABITAT: Sikkim, Bhutan, Assam, Burma, the Malay Peninsula, Sumatra.

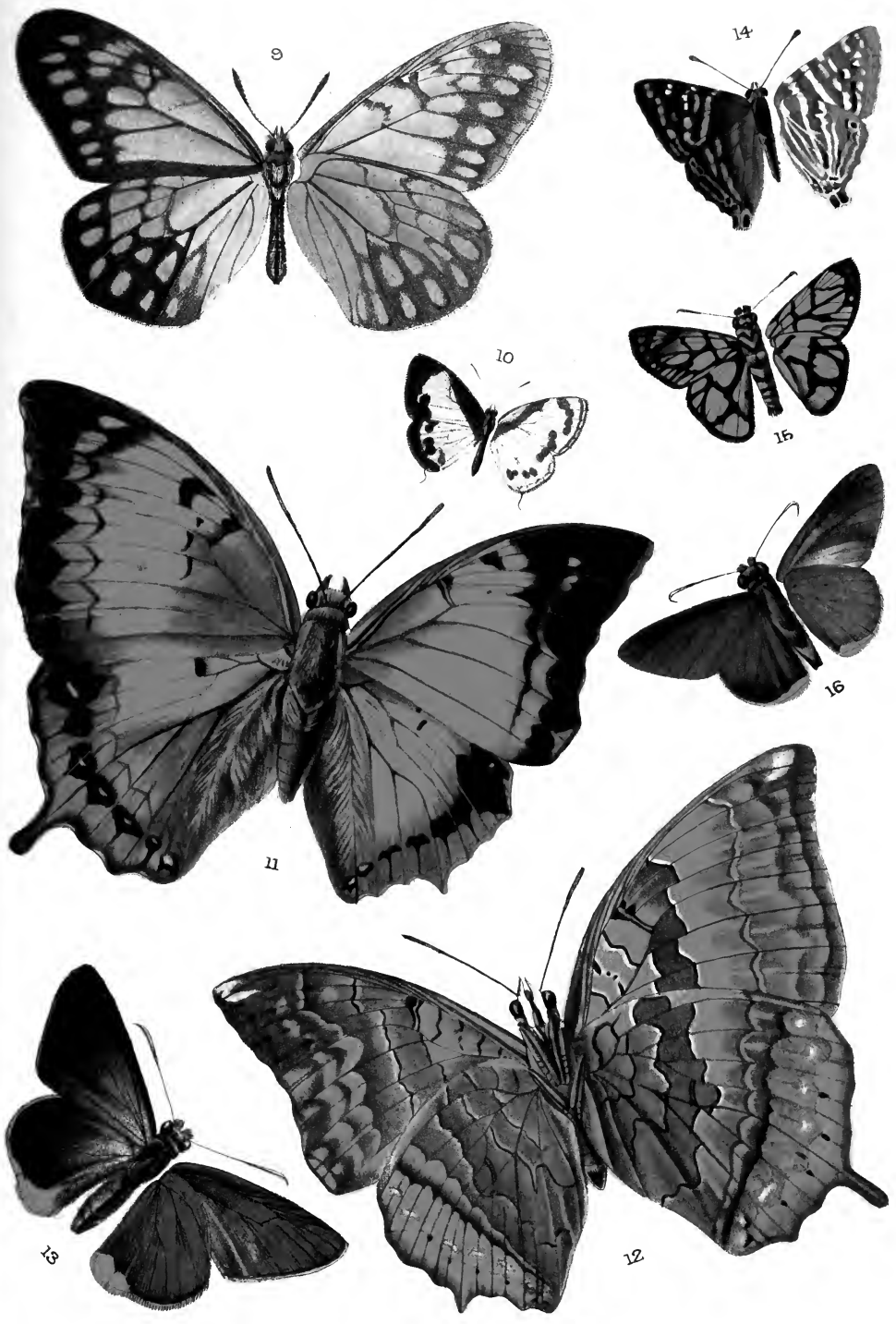
The gynandromorphous specimen of *C. aristogiton*, Felder, here figured, has been kindly lent to me by Herr Paul Möwis, who obtained it from a native collector at Darjiling in Sikkim. The true female of this species has not hitherto been known, though that of *C. desa*, Moore, which Dr. A. G. Butler and I consider to be the same species, is described and figured in Mr. Moore's "Lepidoptera Indica." I take this opportunity to state my opinion, in which Captain E. Y. Watson joins, than whom no one knows the butterflies of Burma better, that besides *C. desa*, which Mr. Moore restricts to Upper Tenasserim, *C. adamsoni*, Moore, from the same locality, is also synonymous with *C. aristogiton*. The species, as are all the tawny *Charaxes*, is variable, no two specimens in my collection being precisely alike, so that there is no gain to science (nor does it give expression to a real fact in nature) to pick out extreme individual varieties and give them distinctive specific names, more especially when, as in the present case, these varieties are not restricted to well-defined geographical areas.

In the Journ. A. S. B., vol. lxiii, pt. 2, p. 8, n. 7 (1894), I described and figured on pl. iii, figs. 1, 2, a gynandromorphous example of *Argynnis niphe*, Linnæus, from Behar, and gave a list of four specimens of other Asiatic species known to me. Mr. Möwis informs me that he once purchased from a soldier at Deolali, Nasik, Bombay Presidency, a specimen of a *Curetis* now in Colonel Swinhoe's collection, which was very conspicuous, as the male side was copper-coloured, the female side white. He also obtained a specimen of *Appias hippo*, Cramer = *A. hippoides*, Moore, from Sikkim, which he parted with to Herr A. Böttcher of Berlin. I have come across other references to these monstrosities





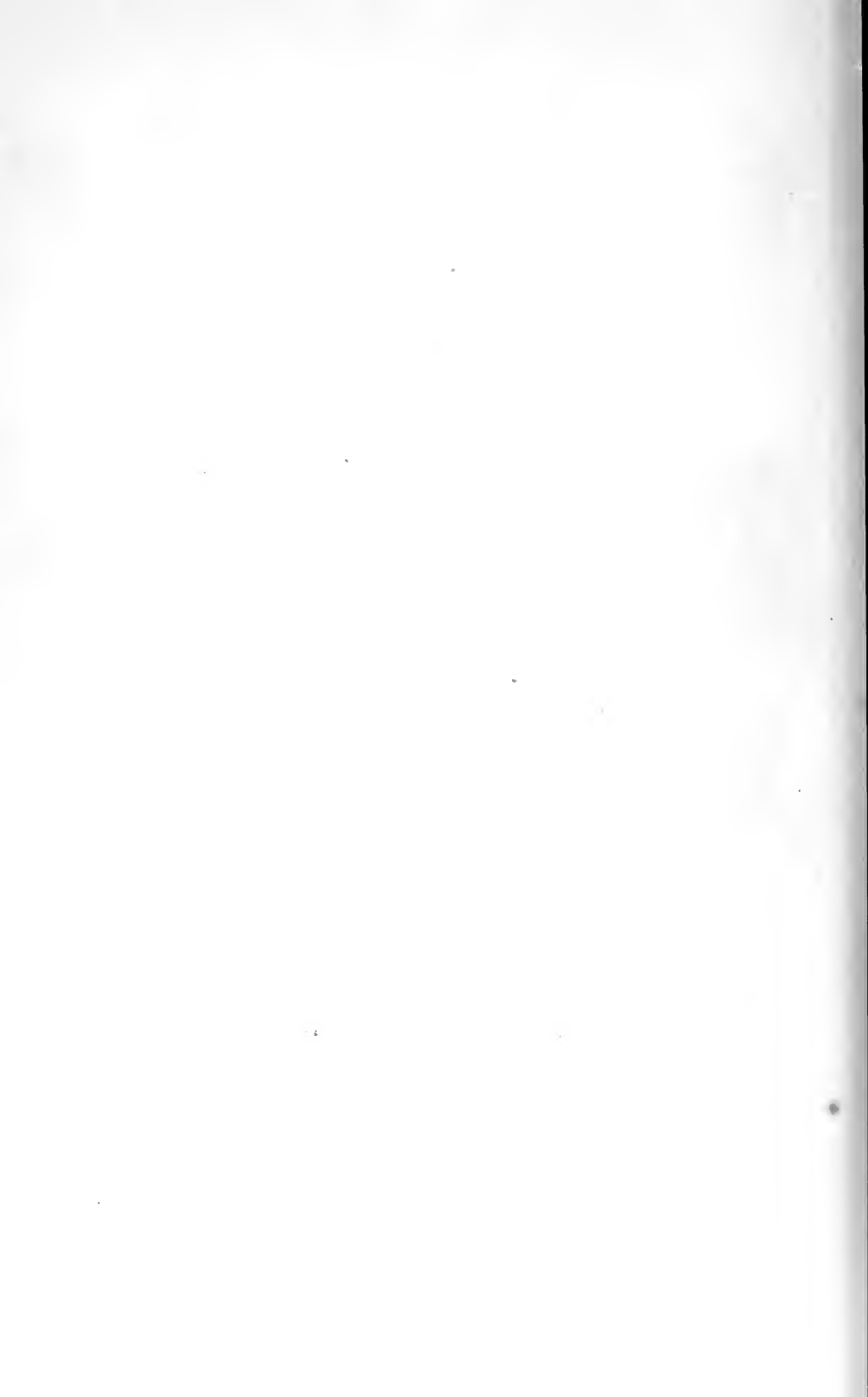


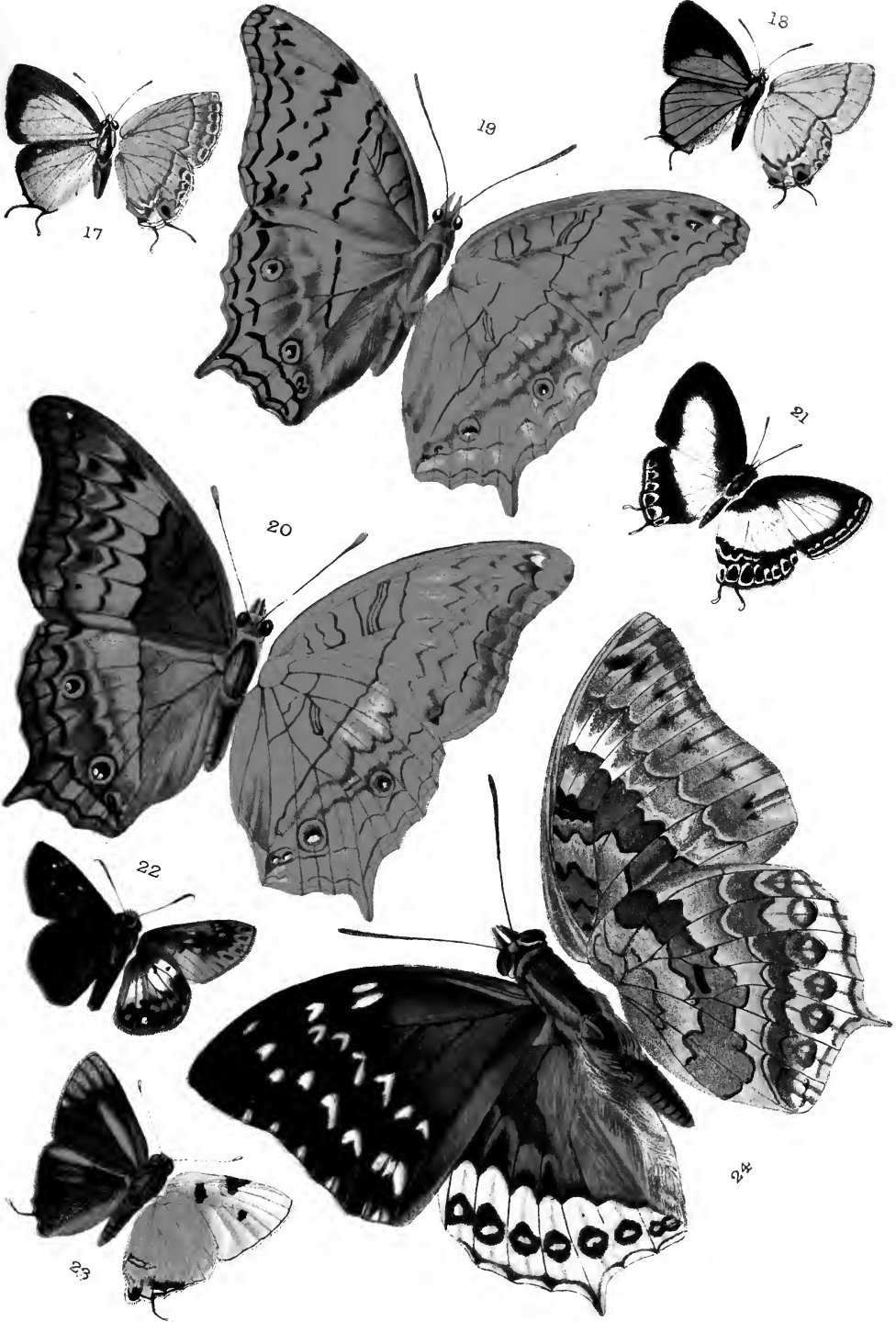


B.L. D'os del.

West, Newman chromo.

INDO-AND AUSTRO-MALAYAN BUTTERFLIES



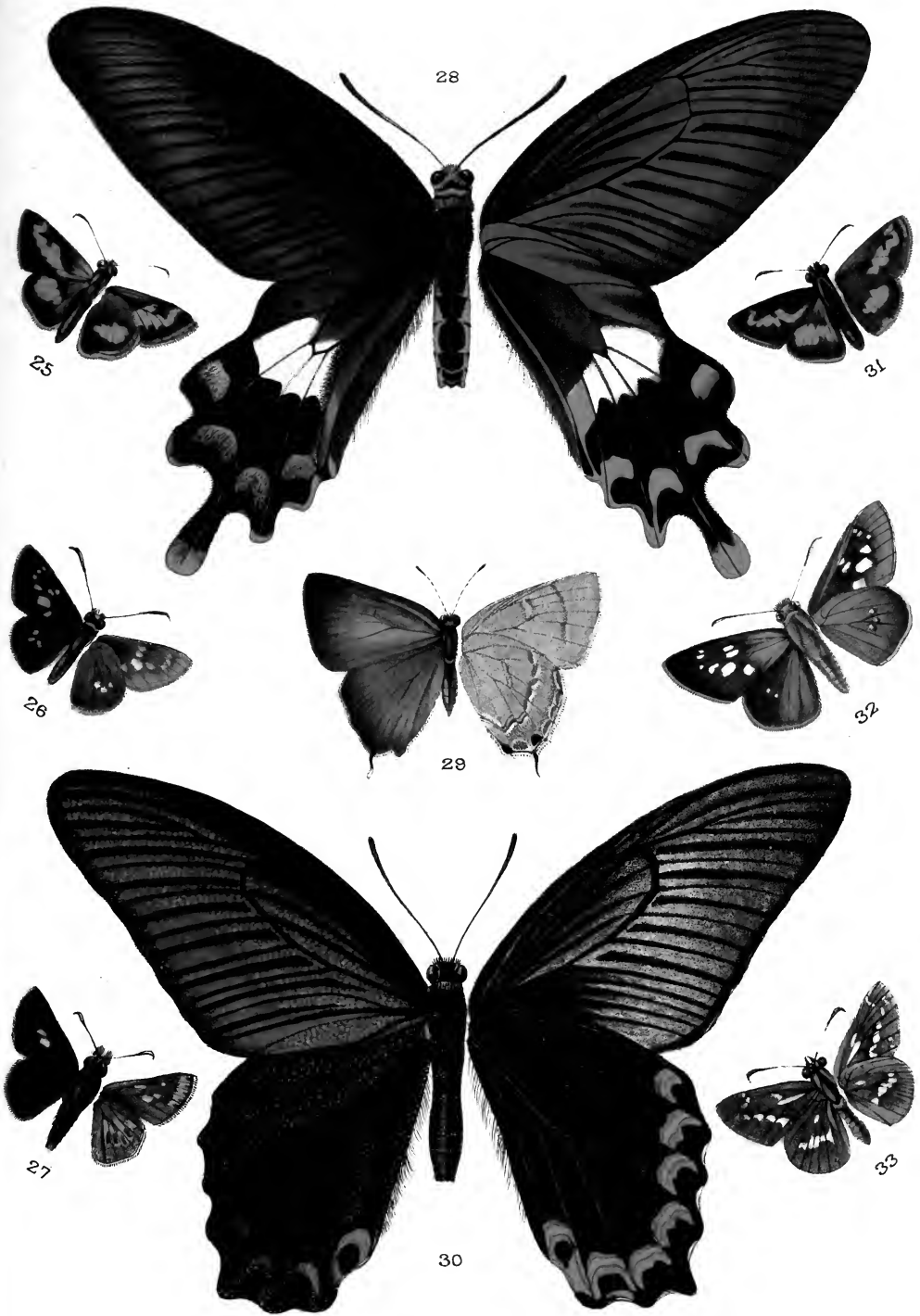


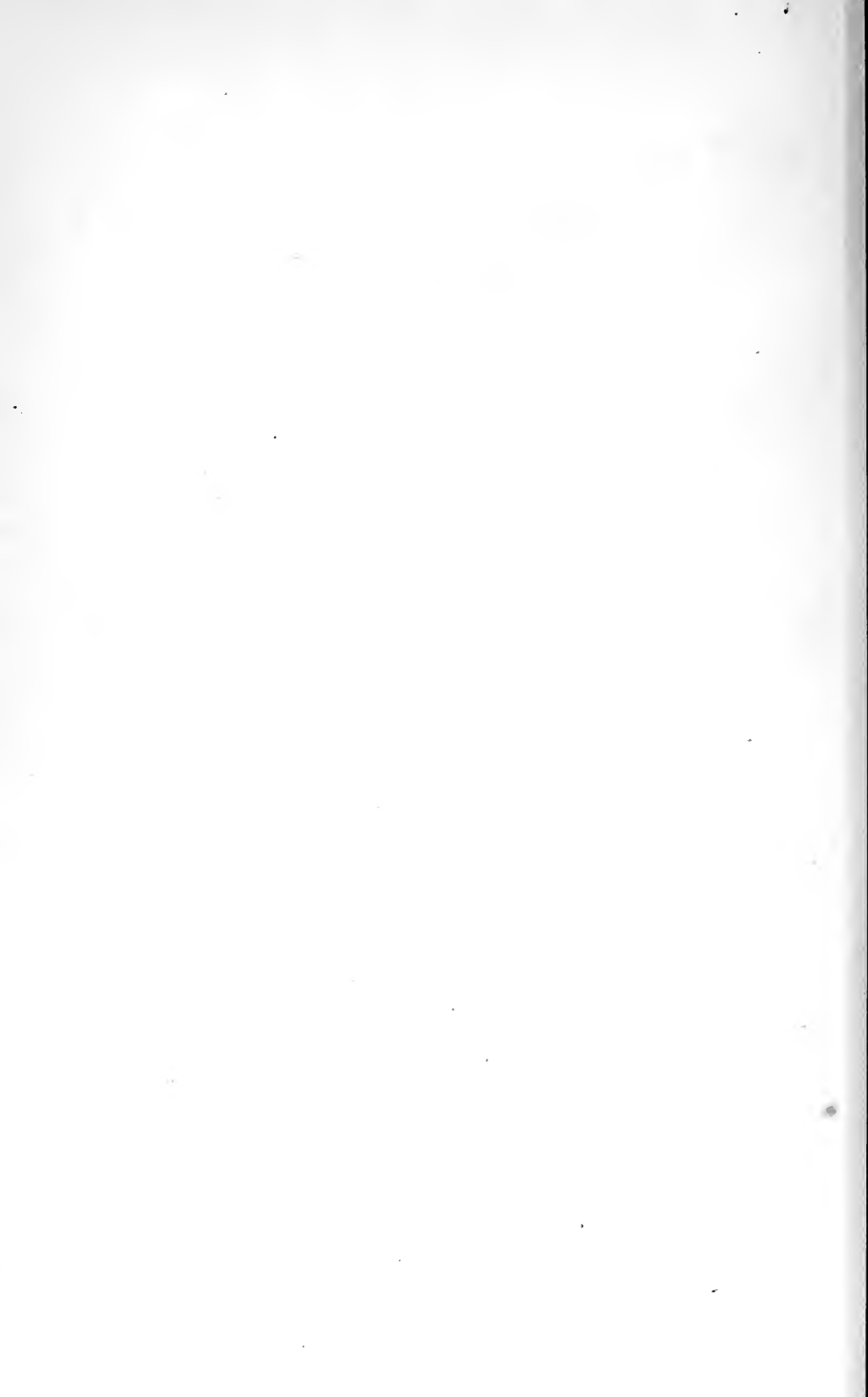
E.L.D. del.

West, Newman chromo.

INDO-AND AUSTRO-MALAYAN BUTTERFLIES







from Asia. In Horsfield and Moore's Cat. Lep. Mus. E. I. C., vol. i, p. 158, n. 327 (1857), a "hermaphrodite" specimen of *Diadema* [*Hypolimnas*] *bolina*, Linnæus, is recorded from Canara in South India. Dr. A. G. Butler in Proc. Zool. Soc. Lond., 1866, p. 172, woodcut n. 1, p. 173, describes and figures a "hermaphrodite" *Danaïs* (*Nasuma*) *ismare*, Cramer, the left-hand side being a male (*D. ismare*), the right-hand side being a female (*D. ismareola*, Butler). Mr. H. J. Elwes in Trans. Ent. Soc. Lond., 1888, p. 408, n. 357, records a gynandromorphous specimen of *Delias descombesi*, Boisduval, from Sikkim. Dr. E. Haase in Iris, vol. i, p. 36, pl. iii, fig. 2 (1888), describes and figures a hermaphrodite specimen of *Danaïs* (*Nasuma*) *ismare*, Cramer, from Ceram. Herr Eduard G. Honrath in Berl. Ent. Zeitsch., vol. xxxii, p. 499, woodcut fig. A (1888), figures from Minahassa (Celebes), *Charaxis affinis*, Butler, the left-hand side being a male (*C. affinis*), and the right-hand side a female (*C. wallacei*, Butler). This specimen is referred to in Dr. Staudinger's Ex. Schmett., p. 168 (1886). Mr. J. H. Leech in Butt. from China, Japan, and Corea, p. 436, pl. xxxiv, fig. 14 (1893), describes and figures a partially gynandrous example of *Colias hyale*, Linnæus, from Japan; and at page 441, pl. xxxv, fig. 4, of the same work, a gynandrous *Gonepteryx rhamni*, Linnæus, from Wa-shan in Western China. Finally, Herr Egon Kretschmar in Iris, vol. vi, p. 160 (1893), records a hermaphrodite specimen of *Lethe mekara*, Moore, from "Hindostan."

#### 9. CHARAXES (*Haridra*) STAUDINGERI, Rothschild.

*C. staudingeri*, Rothschild, Iris, vol. vi, p. 349, n. 2 (1894); idem, id., Nov. Zool., vol. ii, pl. viii, fig. 2, *male* (1895); id., Butler, Journ. Linn. Soc. Lond., Zoology, vol. xxv, p. 389, n. 113 (1896); *C. durnfordi staudingeri*, Fruhstorfer, Ent. Nach., vol. xxiii, p. 236 (1897).

HABITAT: Java (*Rothschild, Butler, Fruhstorfer, and coll. de Nicéville*).

EXPANSE: ♂, 3.5 to 4.0 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* differ from Messrs. Grose Smith and Kirby's\* and Mr. Moore's† figures of the same sex of *C. nicholii*, Grose Smith, from East Pegu, Burma, in having the ground-colour throughout dark ferruginous-brown, instead of dark brown at the base only with the outer half of the forewing blue-black. *Forewing* has both series of lunular discal white spots smaller, the inner series more or less obsolete save the two anteriormost spots; the yellowish-white longitudinal band extending nearly half-way along the inner margin in *C. nicholii* is reduced in *C. staudingeri* to a comma-shaped white spot in continuation of the outer discal series of spots; and there are no

\* Rhopalocera Exotica, pl. *Charaxes* ii, figs. 1, 2, *male* (1887).

† Lepidoptera Indica, p. 246, vol. ii, pl. clxxxii, fig. 2, *male* (1895).

white marks on the margin. *Hindwing* differs in having the outer-third of the wing pure white instead of creamy-white, this area being of much less extent than in *C. nicholii*, with its inner edge nearly straight instead of deeply indented; the series of eight diamond-shaped, black, white-centered spots on the band twice as large and very conspicuous; the marginal line much more prominent. **UNDERSIDE**, *both wings* agree almost precisely with the figure of the male of *C. durnfordi*, Distant,\* from Sungei Ujong in the Malay Peninsula; but the dark discal band of the *forewing* is broader in *C. staudingeri*.

Described from three specimens kindly sent to me by Herr G. Hoppenstedt, captured in the Preanger district, a mountainous region near Batavia in North-Western Java; and one from Mount Gede, Western Java, 4,000 ft., captured by Herr H. Fruhstorfer, and kindly sent to me by him. He has quite recently described the hitherto unknown female.

10. **CHARAXES** (*Haridra*) **CONNECTENS**, n. sp., Plate III, Fig. 24, ♂.

*Charaxes* (*Haridra*) *durnfordi*, de Nicéville and Martin [*nec* Distant], Journ. A. S. B., vol. lxiv, pt. 2, p. 437, n. 262 (1895).

**HABITAT**: N.-E. Sumatra.

**EXPANSE**: ♂, 4.1 inches.

**DESCRIPTION**: **MALE**. **UPPERSIDE**, *forewing* agrees with Messrs. Grose Smith and Moore's figures of the same sex of *C. nicholii*, Grose Smith, in having the basal area of the same shade of "dark brown" (dark castaneous), but is of greater extent, occupying the whole of the discoidal cell, and reaching nearly as far as the interior of the two discal series of white spots; differs also in having two additional elongated white spots forming a commencement to a third series just behind the costa, divided by the upper discoidal nervule; both discal series of white spots are also smaller, the spots apparently further apart owing to their smaller size; and the longitudinal band on the sutural area at the outer angle almost obsolete: differs from Mr. Distant's figure of *C. durnfordi* in having the basal area very much darker, being dark castaneous instead of "dark brownish-ochraceous;" in that species also the outer angle extending some distance along the outer and inner margins is pure white, in the present species the outer angle is only obsoletely sordid white: differs from *C. staudingeri*, Rothschild, described above, in having the basal area of a distinctly lighter shade than the outer portion of the wing (which is black), in that species it is dark ferruginous-brown throughout; and in having the inner discal series of white spots complete, in *C. staudingeri* the inner series is obsolete except the two anteriormost spots; and that species does not

\* *Rhopalocera Malayana*, p. 432, n. 9, pl. xl, fig. 8, *male* (1886).



possess the two spots of the third innermost series. *Hindwing* differs from *C. nicholii* in having the dark castaneous basal area of greater extent, therein agreeing with *C. durnfordi* and *C. staudingeri*, thereby reducing the breadth of the outer white area, which is pure white as it is in *C. durnfordi* and *C. staudingeri*, instead of creamy-white as in *C. nicholii*; the inner edge of the white band very uneven as it is in *C. nicholii* and *C. durnfordi*, in *C. staudingeri* it is nearly straight; the eight white-centered submarginal black spots of the same size as in *C. durnfordi* and *C. staudingeri*, but much larger than in *C. nicholii*; the marginal dark line prominent as in *C. durnfordi* and *C. staudingeri*, in *C. nicholii* it is obsolete. **UNDERSIDE**, both wings with the ground-colour similar to that of *C. durnfordi* and *C. staudingeri*, but much lighter than in *C. nicholii*. *Forewing* has the dark discal band as broad as in *C. staudingeri*, therefore much broader than in *C. durnfordi*; in *C. nicholii* the ground-colour and markings are very obscure. *C. everetti*, Rothschild, *Iris*, vol. vi, p. 348, n. 1 (1894), and *Nov. Zool.*, vol. ii, pl. viii, fig. 1, male (1895), from the Barram River, British North Borneo, is quite distinct from *C. connectens*, the upperside of the forewing has the white markings many times larger, as also are the submarginal black white-centered spots on the hindwing, while the ground-colour of both wings on the upperside is much paler, of a much less rich chestnut or ferruginous shade.

Described from a single example in my collection. Hofrath Dr. L. Martin possessed four males and a female of this species from N.-E. Sumatra, these specimens have probably passed into the possession of the Hon. Walter Rothschild. Burma, the Malay Peninsula, Sumatra, Java, and Borneo each has a local representative of this very distinct group of the genus.

### Family LEMONIIDÆ.

#### Subfamily NEMEOBIINÆ.

#### 11. DODONA DRACON, n. sp., Plate II, Fig. 14, ♂.

**HABITAT**: North Shan States, Upper Burma.

**EXPANSE**: ♂, 1.5 inches.

**DESCRIPTION**: **MALE**. **UPPERSIDE**, both wings glossy hair-brown. *Forewing* bears on the disc numerous pale ferruginous spots, those towards the costa being whitish. *Hindwing* bears on the outer half four somewhat obscure macular pale ferruginous bands; the anal lobe is black, bisected longitudinally by an ochreous line, which line is continued along the submedian nervure almost to the base of the wing. **UNDERSIDE**, both wings clear brownish-ochreous, with pure white

markings; two subbasal decreasing white bands, commencing broadly on the forewing at the costa, ending on the submedian nervure, commencing again on the hindwing at the costa, near the anal angle approaching each other and becoming very narrow, recurved to the abdominal margin. *Forewing* with two short parallel white lines at the end of the discoidal cell; placed anteriorly midway between these two lines is a trifold white spot which reaches the costa, and posteriorly are two other spots also placed midway between the cell lines, the anterior one in the first median interspace, the posterior one placed a little outwardly as regards the spot anterior to it in the submedian interspace; beyond these two last-named spots are three other spots, the uppermost is white and is in the second median interspace, the other two are black and placed posterior to it; a trifold subapical spot from the costa to the upper discoidal nervule; a submarginal series of small white spots; and a fine white marginal line. *Hindwing* with a short narrow white line on the middle of the disc from the second subcostal to the second median nervule; two fine submarginal white lines; the anal lobe black, bisected as above by an ochreous line, the lobe anteriorly defined by a white line, anterior to this again is a fine black zigzag line extending from the abdominal margin to the second median nervule; the abdominal margin bears three fine parallel white lines, the innermost on the extreme margin. *Antennæ* black. *Thorax* and *abdomen* above black, beneath whitish. *Cilia* whitish.

Near to *D. dipœa*, Hewitson, which occurs in the Himalayas from Mussoorie to Sikkim, and again in the Naga Hills; differs therefrom in its smaller size, the clearer ochreous shade of the ground-colour on the underside, all the bands and spots being pure white instead of more or less ochreous or silvery, and the anal lobe being bisected by an ochreous line. *D. dracon* agrees very closely with the two specimens of a *Dodona* probably from Western Yunan referred to in the last paragraph of the description of *D. dipœa* in Butt. of India, vol. ii, p. 311, but those specimens are larger, the ground-colour on the underside is of a more reddish shade, and all the markings are not of so pure a white colour, nor are they quite so clearly defined.

Described from a single example taken at Kangmong in Hsenwi, North Shan States, on 9th March, 1895, by Major F. B. Longe, R. E., who has generously presented the specimen to me.

#### Family LYCÆNIDÆ.

##### 12. CASTALIUS ROXANA, de Nicéville, Plate II, Fig. 10, ♂.

*C. roxana*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 633, n. 1 (1897); id., Watson, l. c., p. 661, n. 165.

HABITAT: North Shan States and North Chin Hills, Upper Burma.

EXPANSE: ♂, 1.0 inch.

DESCRIPTION: MALE. UPPERSIDE, both wings white. Forewing with a broad basal black area which is reduced at the middle of the costa to a fine line, and gives off a small black tooth at the end of the discoidal cell; the outer margin broadly but decreasingly black; from the second median nervule to the inner margin are two conjoined round black spots, the upper the smaller, the lower joined posteriorly to the outer black margin. Hindwing with a submarginal series of six round black spots placed in pairs; the outer margin narrowly black. UNDERSIDE, both wings white. Forewing with an oblique basal black band which reaches the costa at about its middle; a submarginal series of conjoined rounded black spots, the series broken at the second median nervule, the portion posterior to that veinlet being shifted well towards the base of the wing; the outer margin narrowly black, bearing an obscure very fine macular white line. Hindwing with the base narrowly black; the three submarginal pairs of black spots as on the upperside; the margin narrowly black, including a series of small white spots. Cilia black.

Allied to *C. roxus*, Godart, differing therefrom (as figured by Horsfield in Cat. Lep. Mus. E. I. Co., pl. ii, figs. 4, 4a (1828), from Java), in having the white area on the upperside of the forewing somewhat larger; in the hindwing the white area is twice as extensive, permitting the appearance of the three pairs of black spots near the margin which in *C. roxus* are lost in the outer black area occupying nearly half the surface; on the hindwing on the underside there are two black spots only in the middle of the submarginal series, in *C. roxus* there are three; and the marginal series of white spots on both wings are far more prominent in *C. roxus* than in *C. roxana*. Dr. O. Staudinger in Iris, vol. ii, pp. 95, 96 (1889), has described "*Lycena*" *roxus*, var. *angustior* from Palawan in the Philippines; *L. roxus*, var. *celebensis*, from Celebes; and *L. roxus*, var. *cohærens* from New Guinea, Timor, and Wetter. None of these varieties agree with the present form.

Described from a single example kindly given to me by Major F. B. Longe, R. E., which was captured by the donor in the Kokang State in the North Shan States on the Chinese frontier east of Bhamo, at 5,500 feet elevation. Capt. E. Y. Watson possesses another specimen from the Upper Chindwin Valley in Upper Burma, taken in March, 1893, and Colonel C. H. E. Adamson probably possesses a third specimen from Burma taken at Aloungdan Kathapa, in the Lower Chindwin District, in January.

13. *HYPOLYCÆNA DANISOIDES*, n. sp., Plate III, Fig. 21, ♀.

HABITAT: Ké Islands. [? Mansinam and Ceram, *Groese Smith*.]

EXPANSE: ♀, 1·4 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* differ from the figure of "*Myrina*" *danis*, Felder, *Reise Novara*, Lep., vol. ii, p. 240, n. 273, pl. xxx, figs. 12, 13, *female* (1865), from Halmaheira (Gilolo), in having the discal white band fully twice as broad, with straighter edges, thereby greatly reducing the extent of the plumbeous ground-colour. UNDERSIDE, *both wings* have the discal white band of the same breadth as in "*M.*" *danis*, but that species as figured has its outer edge tinted with yellow, there being no trace of this colour in the species here described. MALE (also of *M. danis*) unknown.

The lunular markings on the upperside of the hindwing are most gorgeously iridescent, varying in different lights from dull leaden-blue to brilliant purple and then to emerald-green. On the underside these markings are metallic (not iridescent) pale silvery-blue.

Described from a single specimen received from Herr Heinrich Kühn. It has only two subcostal nervules to the forewing, and appears to be a true *Hypolycæna*. This is probably the species referred to by Mr. Henley Grose Smith in *Novitates Zoologicæ*, vol. i, p. 583, n. 267 (1894), under the name of *Sithon danis*, Felder, thus:—"One example from Mansinam [? Dutch N.-W. New Guinea]. The white area is more extended on both wings than in Felder's type, but I have specimens in my collection from Ceram, captured by Mr. Wallace, which agree with Mr. Doherty's specimen. Possibly it may be a distinct species." Mr. Hamilton H. Druce in *Ann. and Mag. of Nat. Hist*, sixth series, vol. xiii, p. 252 (1894) notes:—" *Myrina danis*, Felder, cannot, in my opinion, be placed in this genus [*Hypochlorosis*, Röber = *Pseudonotis*, H. H. Druce] as, besides possessing two tails and a distinct lobe to the anal angle, it presents a somewhat different arrangement of the nervules in the forewing, the costal nervure and the first subcostal nervule being bent towards each other and running side by side for some short distance. The palpi, as pointed out by Dr. Felder, are different, the third joint being longer and the second shorter; the eyes also are hairy. It is closely allied to *Hypolycæna*."

Genus BULLIS, nov.

Very close to *Britomartis*, mihi, *Journ. Bomb. Nat. Hist. Soc.*, vol. ix, p. 304 (1895), from which it differs only in the absence in the male of a large patch of androconia on the upperside of the forewing occupying the outer three-fourths of the discoidal cell, and extending into the discoidal and median interspaces; the apex of the forewing

is more produced, the outer margin consequently straighter; the second subcostal nervule arises nearer to the first than to the apex of the discoidal cell, in *Britomartis* it arises nearer to the end of the discoidal cell than to the first subcostal nervule; no third subcostal nervule. The eyes are naked. Type, *Britomartis buto*, de Nicéville, l. c., p. 308, n. 29, pl. P, fig. 41, *male* (*nec* female).

(1) BULLIS BUTO, de Nicéville.

*Britomartis buto*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 308, n. 29, pl. P, fig. 41, *male* (*nec* female) (1895).

HABITAT: Ataran Valley and Daunat Range, Tenasserim, Burma; N.-E. Sumatra.

14. (2) BULLIS VALENTIA, Swinhoe, Plate III, Figs. 18, ♂; 17, ♀.

*Tajuria valentia*, Swinhoe, Ann. and Mag. of Nat. Hist., sixth series, vol. xvii, p. 358 (1896.)

HABITAT: Cherra Punji (*Swinhoe*); Khasi Hills, Assam.

EXPANSE: ♂, 1.20; ♀, 1.15 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* differ only from *B. buto*, de Nicéville, in having the blue coloration of a slightly richer and deeper shade and not turning to emerald-green in any light as it does in *B. buto*. UNDERSIDE, *both wings* have the ground-colour of a darker, more plumbeous, shade. *Forewing* has the narrow discal macular band or line straight, not slightly outwardly curved; it is also more irregular and broken. *Hindwing* has the marginal black spot in the first median interspace less broadly crowned with yellow of a darker shade; and the short yellow band anterior to the anal lobe is half as broad and therefore further removed from the discal line, and of a deeper shade of yellow. FEMALE. UPPERSIDE, *both wings* dull fuscous; *cilia* cinereous. *Forewing* has the discoidal cell, the base of the wing, and the disc as far as the inner margin dull blue. *Hindwing* has the costa only broadly plumbeous or dull fuscous; the abdominal margin whitish; the rest of the surface dull blue; a small obscure round marginal black spot in the first median interspace; a marginal black thread inwardly defined with a still narrower white thread extending from the anal angle as far as the blue area reaches; the anal lobe small and black, bearing outwardly a few dull blue scales. UNDERSIDE, *both wings* as in the male.

Described from nine males and one female kindly sent to me by the Rev. Walter A. Hamilton. The acquisition of both sexes of *B. valentia* makes it clear that the specimens of *B. buto* described by me are males and not females. The absence of the "male-mark" which is so conspicuous in *Britomartis cleoboides*, Elwes, led me to conclude

that my specimens were females, though the shape of the wings should have enlightened me as to their true sex. A closely allied species appears to be the "*Tajuria*" *dominus* from Kina Balu, Borneo, described by Mr. H. H. Druce in Proc. Zool. Soc. Lond., 1895, p. 600, pl. xxxiii, fig. 12, *male*, but that species has the "sexual mark" on the upperside of the forewing in the male more isolated, being outwardly bounded by a streak of the blue ground-colour, the apex of the hindwing is more broadly black; and on the underside the anal area of the hindwing is much more broadly yellow, the two patches being confluent instead of well separated. The shape of the hindwing also differs, it being much more produced at the apex in *T. dominus* than in *B. valentia*. As Mr. Druce has placed *dominus* in the genus *Tajuria* it is presumed that it has three subcostal nervules to the forewing unlike *valentia*, which has only two, though Colonel Swinhoe overlooked that fact. I had described this species as new before Colonel Swinhoe's description of it was published. I have, however, since received a specimen of his species from him, and find that the two are synonymous, so my MS. name is of course suppressed.

15. HYSUDRA (?) HADES, de Nicéville, Plate IV, Fig. 29, ♀.

*H.* (?) *hades*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 318, n. 34, pl. P, fig. 46, *male* (1895).

HABITAT: Daunat Range, Tenasserim, Burma.

EXPANSE: ♀, 1.5 and 1.7 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* hair-brown with a distinct gloss in some lights. *Cilia* cinereous. *Forewing* somewhat paler on the disc. *Hindwing* with the costal and abdominal margins somewhat paler than the rest of the surface; the anal lobe bearing a small obscure black and dull ochreous spot. UNDERSIDE, *both wings* grey, of a paler shade than in the male, but all the markings precisely the same.

Described from two examples in my collection.

16. RAPALA ALBAPEX, n. sp., Plate III, Fig. 23, ♂.

*Deudorix domitia*, H. Druce (*nec* Hewitson), Proc. Zool. Soc. Lond., 1873, p. 353, n. 1; *Rapala domitia*, H. H. Druce, l. c., 1895, p. 624.

HABITAT: Borneo (*H. Druce*); Labuan (*H. H. Druce*); Sandakan, North Borneo.

EXPANSE: ♂, 1.65 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* bronzy shining brown. *Forewing* with an elongated fusiform discal pale yellow streak, highly attenuated at both ends, occupying the posterior half of the discoidal cell but not reaching the base, extending beyond the cell into the lower discoidal interspace; the apex broadly dusted with white scales,

this white area ending in the middle of the first median interspace. *Hindwing* with the costa as far as the subcostal nervure and the second subcostal nervule pale yellow, with two somewhat indistinct similar streaks in the subcostal and discoidal interspaces; the apex narrowly pale yellow; the abdominal margin broadly pale yellow; the anal lobe pale yellow, outwardly with a crescent of black scales; a white anteciliary line from the anal angle to just beyond the root of the tail; *tail* black with a white tip. *Cilia* of the forewing from the apex as far as the first median nervule white, with a prominent anteciliary black thread, posteriorly black; of the hindwing pale yellow at the apex, thence to the anal angle black. **UNDERSIDE, both wings** pale yellow. *Forewing* with the inner margin whitish centred with fuscous; a large prominent black spot crossing the middle of the discoidal cell; a similar wedge-shaped one at the middle of the costa; and a smaller round one in the second median interspace; a prominent anteciliary black thread; the sexual tuft of hairs from the inner margin near the base of the wing turned under and forwards rather small and deep black. *Hindwing* with an elongated oval marking anterior to the anal angle commencing from the internal nervure, consisting of a pale yellow centre, bounded by a black line, and then an equally broad bluish-white line, this ring-spot gives off outwardly a short black line, which is posteriorly defined by a bluish-white line; a marginal black fascia, commencing very narrowly at the lower subcostal nervule, increasing in width till it reaches the third median nervule; in the submedian interspace a little removed from the margin is a clump of irrorated black scales; the anal lobe is black, crowned with a clump of pale silvery-greenish scales. *Cilia* of the forewing anteriorly whitish, posteriorly black; of the hindwing anteriorly as far as the lower subcostal nervule pale yellow, thence to the second median nervule black, thence to the anal angle white tipped with black. *Antennæ* black, but the base of the club white. *Frons* and *palpi* pale yellow; a pale yellow line surrounding the eyes. *Body* above dark brown, beneath and *legs* pale yellow.

Mr. H. H. Druce has (l. c.) given a short description of this species, but did not name it. It can at a glance be distinguished from "*Deudoria*" *domitia*, Hewitson, from Malacca (*Butler* and *Staudinger*), Singapore (*Hewitson*), Sumatra (*Grose Smith*), Kepran, N.-E. Sumatra (*de Nicéville* and *Martin*), and Billiton Island (*Snellen*), by the pale yellow markings of both wings on the upperside, and by the apical white patch on the forewing; on the underside the ground-colour is of a much paler shade of yellow.

Described from a single example kindly given to me by Mr. E. F. Skertchly, who captured it at Sandakan on the 10th May, 1888.

## Family PAPILIONIDÆ.

## Subfamily PIERINÆ.

17. DELIAS DIVES, n. sp., Plate I, Fig. 1, ♂.

HABITAT: Penang.

EXPANSE: ♂, 2.6 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* chalky-white, all the veins black. *Forewing* with the discoidal cell, especially outwardly, slightly dusted with black scales; the outer margin black, this black border extending along the veins for a short distance, the area between this black border and the end of the cell heavily sprinkled with black scales. *Hindwing* unmarked, except that the outer margin is narrowly black. UNDERSIDE, *forewing* white; the costa broadly extending into the discoidal cell and all the veins heavily bordered with black, so that the ground-colour is reduced to narrow streaks between the veins; a subapical series of five prominent cordate white spots from the costa to the second median interspace, the first spot small, the second the largest, the rest decreasing in size, these spots shew through faintly on the upperside. *Hindwing* chrome-yellow; all the veins narrowly but prominently defined with black; the outer margin narrowly black inwardly defined by white spots between the veins.

Allied to *D. agostina*, Hewitson, from Sikkim, Bhutan, Assam and Upper Burma, from the same sex of which it differs on the upperside in having the forewing heavily infuscated on the outer half, on the underside of that wing in having the series of subapical spots smaller and fewer in number, the second spot of *D. agostina* being absent in *D. dives*; on the hindwing in having all the veins conspicuously defined with black, and with no submarginal black line inwardly defining the series of marginal white spots as there is in *D. agostina*. Other more distantly allied species are *D. themis*, Hewitson, from the Philippines, *D. cathara*, Grose Smith, from Kina Balu mountain in North Borneo, and *D. agoranis*, Grose Smith, from Burma. The *D. singhapura* of Wallace, from Singapore, Sumatra and North Borneo, is also closely allied, but the apex of the forewing as figured—the male by Wallace and the female by Grose Smith and Kirby—is greatly produced, and the black border to the hindwing on the underside is twice as broad, and encloses a row of six paired whitish spots between the veins. Herr H. Fruhstorfer has recently briefly described in "Societas Entomologica," p. (1897), *Delias singhapura*, subspecies *distincta*, from the Province Amuntai in South Borneo, which probably is another allied species, but without a figure it is difficult to make out exactly what it is like, especially as nothing is said about its outline.

Described from a single example in my collection.



18. *PARAPIERIS*\* *CHUMBIENSIS*, n. sp., Plate I, Fig. 6, ♂.

*Pieris* (*Aporia*?) *marshalli*, Elwes, MS., ? = *dubernardi* [sic], Oberthür, Nature, vol. xxxiv, p. 597 (1886); *Pieris dubernardi*, Elwes (nec Oberthür), Trans. Ent. Soc. Lond., 1888, p. 415, n. 375.

HABITAT: Chumbi Valley, Eastern Thibet.

EXPANSE: ♂, 2·2 inches.

DESCRIPTION: MALE. UPPERSIDE, both wings pure dead chalky-white; the base thickly sprinkled with black scales. Forewing with a small black spot on the lower disco-cellular nervule; the costa very narrowly black; the apex widely black, this black colour rapidly decreasing on the outer margin till at the termination of the first median nervule it entirely disappears, the black colour extending narrowly along the veins on to the disc of the wing; a large round black spot on the middle of the second median interspace bounded by the veins; posterior to this spot is a small clump of black scales. Hindwing with the veins sometimes very narrowly black; a large round apical black spot placed between the subcostal nervules; with sometimes three discal small round black spots in the middle of each interspace posterior to the subapical spot. UNDERSIDE, forewing with the ground-colour pure dead chalky-white; all the veins narrowly black, the disco-cellular spot larger than on the upperside, covering both the disco-cellular nervules; the apex and outer margin narrowly and decreasingly ochreous; all the veins black, that colour widening out on the veins as they reach the outer margin; the round black spot in the second median interspace as on the upperside; in continuation of which to the submedian nervure is a narrow streak of powdery black scales. Hindwing with the base of the costa rich chrome-yellow; the rest of the wing ochreous; all the veins broadly defined with black; with a powdery rather indistinct curved discal black band, the bifurcated streak in the submedian interspace as far as the discal band only rich chrome-yellow. Cilia throughout white. FEMALE unknown.

Differs from the same sex of *Pieris dubernardi*, Oberthür, † (to judge from his figure only, I have not seen a specimen) on the upperside of the forewing in the costa being less black, there is a line of the white ground-

\* The genus *Parapieris* I propose for *Papilio callidice*, Esper (the type), and its allies. A full description of it will appear in vol. iv of "The Butterflies of India, Burmah and Ceylon" by myself. *P. chumbiensis* doubtfully belongs to the genus *Parapieris*, but I do not know any described genus in which it could be more appropriately placed.

† *Pieris dubernardi*, Oberthür, Études d'Entomologie, vol. ix, p. 13, pl. i, fig. 6, male (1884); *Aporia dubernardi*, Leech, Butt. from China, p. 467, pl. xxxvi, fig. 8, female (1894).

colour between the black costa and subcostal nervure, in *P. dubernardi* the costa is entirely black as far as that vein; the discal black spots are smaller and isolated, in *P. dubernardi* they are conjoined; on the hindwing the discal spots are all smaller, in the type the apical one is alone present; on the underside of the forewing the black spot at the end of the discoidal cell is larger and much more prominent, the discal black spots are much smaller and all isolated instead of being conjoined into a broad black fascia; the ground-colour of the apex of the forewing and the entire hindwing is of a different shade of yellow, in *P. chumbiensis* it is ochreous, in *P. dubernardi* it is "canary and nankin yellow;" and lastly the shape of the wings is quite different, being much shorter in the present insect, giving it a much more "chubby" appearance, in *P. chumbiensis* the forewing measures 26 mm., in *P. dubernardi* 31 mm., while the breadth of the wings is the same in both species.

"This species is only known to me from some eight or nine specimens, which were brought by a native employed by the late Capt. Harman, R. E., in surveying the Tibetan frontier, and may not occur on this side of the passes. It agrees very well with Oberthür's figure and description, taken from two specimens obtained at Tsekou, in Eastern Thibet, which, like my own, were all males." (*Elwes*, l.c., in *Trans. Ent. Soc. Lond.*) From these eight or nine specimens mentioned above Mr. Elwes has presented two to the Indian Museum, Calcutta, and they constitute the types. The species does not seem to have been met with again, and its exact habitat is not known, but as this side of the passes has been well explored entomologically the butterfly probably does not occur in British territory but in the Chumbi Valley, just across the dividing pass between Native Sikkim and Thibet. *P. dubernardi* is found in Tsékou, Ta-chien-lu, Ni-tou, Wa-ssu-kow, and Chow-pin-sa, in Western China.

19. GONEPTERYX ZANEKOIDES, n. sp., Plate I, Figs. 2, ♂; 7, ♀.

HABITAT: South Chin Hills, Upper Burma.

EXPANSE: ♂, ♀, 2.1 inches.

DESCRIPTION: Very near to *G. zaneka*, Moore, from the Western Himalayas. MALE. Differs from the same sex of that species in having the forewing markedly broader, the costal margin not constricted at half its length\* but straight, the apex not so produced. Hindwing distinctly broader than in *G. zaneka*, almost of the same shade of brimstone as the forewing, the outer slightly paler than the basal half of the wing, in *G. zaneka* it is pale cream-colour of a uniform shade. FEMALE. Forewing agrees in shape with that of the male, consequently differs from the

\* Mr. Moore says that this is so in *G. zaneka*, by which I presume he means that the costa is slightly excavated in the middle, which is the fact.

same sex of *G. zaneka* in being broader, with a straight instead of excavated costa, and the apex less produced. *Hindwing* also broader than in *G. zaneka*. Otherwise similar to *G. zaneka*. The highly dentate hindwing in both sexes will distinguish *G. zaneka* and *G. zanekoides* from *G. aspasia*, Ménétriès.

Mr. Moore's figure of *G. zaneka* (Proc. Zool. Soc. Lond., 1865, p. 493, n. 35, pl. xxxi, fig. 18) is very bad; though the sexes are so different, I am unable to say which sex he has figured, and he does not furnish the information. Mr. Leech (Butt. China, p. 444 (1894) says that *G. zaneka* "Is probably only a local race" of *G. aspasia*, while it is with extreme doubt he allows the latter species specific rank, but says that it is probably a variety only of *G. rhamni*, Linnæus. As far as India goes, however, *G. zaneka* and *G. rhamni* are absolutely distinct species, the male of the former can instantly be detected by its small size, difference in the colour of the wings, and the highly scalloped hindwing; while the female is markedly smaller, and also has the hindwing scalloped.

I am indebted to Capt. E. Y. Watson for a pair of this species, which were captured by Mr. L. A. Thruston at 7,000 feet elevation in the Southern Chin Hills during the rains. Capt. Watson has a second male specimen in his collection. Geographically *G. zaneka* and *G. zanekoides* are widely separated, and it is highly improbable that any species linking them together will be found in the mountains which lie between the Western Himalayas and Upper Burma.

#### Subfamily PAPILIONINÆ.

#### 20. PAPILIO (*Byasa*) POLLA, de Nicéville, Plate IV, Fig. 28, ♂.

*P. (Byasa) polla*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 633, n. 2 (1897); id., Watson, l. c., p. 671, n. 235.

HABITAT: North Shan States; North Chin Hills, 5,000 feet.

EXPANSE: ♂, 5·0 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining black. *Forewing* with the usual three deep black longitudinal streaks in the discoidal cell, and similar ones between the veins on the disc. *Hindwing* with a large discal pinkish-white patch, the patch occupying the outer end of the cell, anteriorly bounded by the second subcostal, posteriorly by the first median nervule, the inner half of the portion in the first median interspace being heavily sprinkled with black scales, the outer edge of the patch is scalloped; four large submarginal carmine lunules all irrorated with black scales, the anterior one in the subcostal interspace whitish; *tail* broadly tipped with carmine; the posterior end of the abdominal fold and the two tooth-like projections of the wing-membrane between it and the tail, as well as the first

projection beyond the tail, somewhat broadly edged with carmine. **UNDERSIDE**, both wings as above but of a duller shade of black. *Forewing* as on the upperside. *Hindwing* with the discal pinkish-white patch extending quite up to the cell but not invading its outer end, the patch is inwardly continued from the first median nervule to the submedian nervure by a carmine spot; the submarginal lunules as above but of a pure rich carmine, the two interior ones continued to the outer marginal carmine edging to the wing, which latter is broader than on the upperside, as also is the carmine tip to the tail. *Palpi, orbits, head, and thorax* anteriorly carmine; *thorax* posteriorly and *abdomen* above black; *thorax* and *abdomen* beneath carmine; *anal valves* carmine; *antennæ* and *legs* black.

Very near to *P. (Byasa) latreillei*, Donovan (= *P. minereus*, Gray), of which I have good series of males from Tehri Garhwal and Sikkim; differing therefrom on the upperside of the hindwing in the discal white patch being larger (placed further from the outer margin), extending into the discoidal cell instead of ending (as a rule) considerably before the end, and occupying anteriorly an additional interspace, in *P. latreillei* the patch is bounded in front by the discoidal nervule, in *P. polla* it reaches the second subcostal nervule; by the outer margin and the end of the tail being broadly edged with carmine instead of having black cilia only; on the underside of the hindwing in *P. latreillei* there is invariably a small white marginal spot in the subcostal interspace which is wanting in *P. polla*; sometimes in *P. latreillei* there are two small white spots, sometimes one only, usually none, in the discoidal interspace in continuation of the discal white patch, these in *P. polla* being developed into a very large quadrate white spot, which is, in fact, much the largest spot of the four forming the patch; the broad carmine margin is also very distinctive of *P. polla*, being wholly absent in the allied species.

Described from a single male for which I am indebted to Major F. B. Longe, R. E., captured in the Kokang State, 3,500 feet, in the North Shan States, on the Chinese frontier east of Bhamo, on 5th April, 1895, also from an exceedingly worn and faded female in Captain E. Y. Watson's collection caught in the North Chin Hills of Upper Burma at 5,000 feet elevation in the rains. The latter appears to differ only from the male on the upperside of the hindwing in the white patch being continued posteriorly to the abdominal margin, or nearly so, and not reaching into the end of the cell.

21. *PAPILIO (Sarbaria) DODDSI*, Janet, Plate IV, Fig. 30, ♂.

*Papilio doddsi*, Janet, Bull. Soc. Ent. France, 1896, pp. 186, 215.

**HABITAT**: Tonkin (Janet); South Shan States.

EXPANSE: ♂, 5.1 to 5.5 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black. *Forewing* a little transparent, somewhat sparsely sprinkled throughout (except narrowly along the outer margin) with rich deep green scales which are highly deciduous and easily removed; the usual three longitudinal deep black streaks in the discoidal cell, and similar streaks on the disc between the veins; the outer two-thirds of the submedian nervure, the first and second median nervules, and a similar streak in the submedian interspace bearing feather-like lengthened scales which are certainly a male secondary sexual character. *Hindwing* with the anterior half rich dark purple sprinkled as in the forewing with green scales; the outer half of the wing also similarly but more thickly sprinkled; an anal deep red ocellus with a large black centre in the submedian interspace, bearing in the middle of the red portion anteriorly an obscure violet line; an exactly similar lunule on the margin in the first median interspace; and traces of similar lunules in the second median and discoidal interspaces. UNDERSIDE, *forewing* with the base black, the outer two-thirds whitish, becoming black again narrowly on the outer margin and widely at the apex; four prominent black streaks in the cell, with similar streaks between the veins on the disc. *Hindwing* deep black, the base and abdominal margin sparsely sprinkled with dull green scales; a prominent complete series of seven submarginal deep red lunules, each bearing anteriorly a violet line, the two anal ones developed into ocelli with large round black centres. *Cilia* black, but the internervular incisions white. *Head, thorax* and *body* above black, sprinkled with green.

Superficially resembling *P. (Pangeranopsis) elephenor*, Doubleday, of which I possess specimens from Jorehât and Cachar in the Assam province, and from Manipur, from which *P. doddsi* differs in the hindwing being one-third broader, the wing-membrane being produced into a very short and blunt tail-like projection at the termination of the second median nervule, in *P. elephenor* the hindwing is quadridentate; on the underside of the hindwing in having a complete series of submarginal red lunules, in *P. elephenor* the lunule in the second median interspace is entirely absent (*vide* Westwood's figure in *Cab. Or. Ent.*, pl. xxxi, fig. 2\*, *male*) or obsolete; and, most important of all, *P. elephenor* has the palpi, the orbits and the head beneath dark ochreous, and the abdomen at the base beneath and broadly along each side paler ochreous, while all these parts in *P. doddsi* are black. *P. doddsi* is almost precisely similar to *P. dialis*, Leech, from Western China, *Butt. China*, p. 532, pl. xxxii, fig. 4, *male* (1894), but that species has a long spatulate tail which in *P. doddsi* is reduced to a mere tooth. Though

superficially this species is nearest to *P. elephenor*, it is probably biologically more closely allied to *P. bianor*, Cramer, from China and Japan, and its allies, all of which have long tails.

I possess a single male of this very beautiful and interesting butterfly which I owe to the kindness of Col. Woodthorpe, R. E., who captured it near the Siamese frontier when with the Anglo-French Boundary Commission.

Since the above was written I find that this species has been described by M. Armand Janet, who quite correctly points out that it is probably a tailless form of *P. (Sarbaria) bianor*. It has, however, the sexual cottony streaks far smaller and very inconspicuous instead of large and striking. Major F. B. Longe, R. E., has also very kindly given me a single male of *Euplœamima (Zethera, Janet) noirei*, Janet, from the Nam Lim Valley, in the South Shan States, 2,500 feet, also captured by the officers of the above-named boundary commission and described in the same paper as *P. doddsi* (p. 216).

22. PAPILIO (*Paranticopsis*) POLYNICES, n. sp.

HABITAT: Sikkim; Upper Burma (*Rothschild*).

EXPANSE: ♂, 3·4; ♀, 3·8 inches.

DESCRIPTION: MALE. Does not differ from the same sex of *P. indicus* Rothschild.\* FEMALE. UPPERSIDE, *forewing* differs from that sex of *P. indicus* in being like its own male; *i.e.*, in having all the normal hyaline markings present, in the female of *P. indicus* the submarginal series of nine rounded spots only are present, the rest of the wing being fuliginous. *Hindwing* has the hyaline markings rather broader than in *P. indicus*. UNDERSIDE, *forewing* as on the upperside. *Hindwing* as on the upperside has the castaneous-fuscous ground-colour less extensive, the hyaline markings therefore being broader.

This species (or subspecies according to Mr. Rothschild's views) is based on the female sex, which I have from Sikkim only. Mr. Rothschild records a female from Upper Burma received from Mr. H. Fruhstorfer; this locality requires confirmation I think before it is finally accepted. Of *P. indicus* I have females from the Khasi Hills only, but none from Burma, where the males are common.

23. PAPILIO (*Paranticopsis*) PHRONTIS, n. sp.

HABITAT: Sikkim; Bhutan.

EXPANSE: ♂, 2·8 to 4·2; ♀, 4·5 to 4·6 inches.

DESCRIPTION: MALE. Does not differ from the same sex of *P. xenocles*, Doubleday. FEMALE. UPPERSIDE, *forewing* differs from the same sex of *P. xenocles* in being like its own male; *i.e.*, in having all

\* *P. macareus indicus*, Rothschild, Nov. Zool., vol. ii, p. 457 (1895); vol. iii, p. 68, n. 202 (b) (1896).

the normal hyaline markings present and large, in *P. xenocles* they are smaller, and those in the discoidal cell and the four rounded spots immediately beyond it are sometimes nearly obliterated, though in some specimens they are all, or nearly all, fully developed; moreover in *P. xenocles* the ground-colour is browner, less fuscous, than in *P. phrontis*, and usually has a bluish tint or gloss which it never has in the latter. *Hindwing* differs in having the ground-colour of a more castaneous, less fuscous, colour, the anal chrome-yellow spot about four times as large, with all the hyaline markings more extensive, the one in the discoidal cell usually entire instead of being prominently divided into two markings. **UNDERSIDE**, *both wings* have the ground-colour paler, and the hyaline markings larger, and all more fully developed, instead of being more or less obliterated as they are in *P. xenocles*. *Hindwing* has the anal chrome-yellow spot many times larger.

Mr. Rothschild in Nov. Zool., vol. ii, p. 458, n. 203 (1895) notes that "If the Assam [and Burma] females are all of the dark colour, and the Sikkim and Bhutan females of the light colour, *P. xenocles* must be divided into two local races, of which the Assamese [and Burmese] one would be typical." I possess three females from Sikkim of *P. phrontis*, and eight females from the Khasi Hills and Tenasserim of *P. xenocles*, all of which appear to be quite constant to their respective regions, so that I am of opinion that they represent two distinct species or local races, rather than that the females are dimorphic, of which latter view of the facts there appears to be no evidence, though Mr. Rothschild says that the female of *P. xenocles* "is dimorphic."

#### Family HESPERIIDÆ.

24. ODINA ORTYGIA, de Nicéville, Plate II, Fig. 15, ♂.

*O. ortygia*, de Nicéville, Journ. A. S. B., vol. lxiv, pt. 2, p. 531 (1896).

**HABITAT**: Daunat Range, Tenasserim, Burma.

**EXPANSE**: ♂, 1.45 inches.

**DESCRIPTION**: **MALE**. **UPPERSIDE**, *both wings* rich orange with black markings. *Forewing* with most of the veins outlined in black; the costa narrowly black, the apex widely black, the outer margin narrowly black; the inner margin still more narrowly black; the rest of the wing broken up by narrow black lines into spots of the ground-colour of various sizes and shapes. *Hindwing* with the costal, outer and abdominal margins all narrowly black, the rest of the surface broken up into irregular tessellations by intervening black lines. **UNDERSIDE**, *both wings* marked precisely as on the upperside. *Antennæ* black, the club (all except the whip-like point) almost entirely shining white beneath. *Palpi* black above, orange beneath. *Head* orange, but with a

narrow black line connecting the bases of the antennæ. *Thorax* orange, but streaked and barred with black. *Abdomen* orange, ringed above with black, the apex black. *Legs* mixed orange and black.

This species is probably the one recorded from India by Capt. E. Y. Watson as *Odina hieroglyphica*, Butler, in Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 422 (1895), on the authority of a specimen so named in Colonel C. H. E. Adamson's MS. list of his collection from Tounggya Sekkan, Upper Tenasserim, captured in February, 1881. *O. ortygia* is nearest to the specimen figured by Distant in Rhop. Malay., p. 470, n. 2, pl. xlv, fig. 25 (1886), as "*Plastingia*" *hieroglyphica*, Butler, from Perak, but that figure shews the black bands on the wings on both surfaces twice as wide. It is more distantly allied to the true "*Plastingia*" *hieroglyphica*, Butler, from Sarawak (Borneo), from which it differs on both sides in all the black markings being even more greatly reduced than in the Malayan Peninsula form, all the orange markings therefore greatly enlarged. It may be said (to judge from Mr. Butler's figure of that species) that it is a black insect with yellow spots, while *O. ortygia* is a yellow insect with narrow black lines dividing the surface into irregular orange tessellations. Dr. Martin and I have recorded *O. hieroglyphica* from a single specimen from N.-E. Sumatra, but that specimen is not available to me for comparison, being now in the collection of the Hon. Walter Rothschild. Lastly, Herr Georg Semper in Schmett. Philipp., p. 314, n. 472, pl. xlix, fig. 11, *male* (1892), has described "*Plastingia*" *cuneiformis* from a single male from Mindoro in the Philippine Isles, which differs from *O. ortygia* in having the black areas still more largely developed even than in the Bornean *O. hieroglyphica*. All the species of this group seem to be excessively rare, I know of only six recorded examples. The type of the genus is *Odina chrysomelæna*, Mabille, Bull. Soc. Ent. Belgique, vol. xxxv, p. cxiii (1891), from Mangkassar (Macassar) in Celebes, which is probably quite distinct from the other described species, though it is difficult to say how it differs from them as M. Mabille's description is very short and is non-comparative.

Described from a single example in my collection.

#### Genus INESSA, nov.

MALE. FOREWING, *costa* very straight, if anything very slightly emarginate in the middle; *apex* acute; *outer margin* convex; *inner angle* acute; *inner margin* straight; *costal nervure* short, ending on the *costa* long before the upper end of the discoidal cell; *subcostal nervules* arising at progressively decreasing distances apart; *discoidal cell* narrow, short, extending to beyond the middle of the wing; *upper disco-cellular*



*nervule* strongly outwardly oblique; *middle* disco-cellular long, strongly inwardly oblique; *lower* disco-cellular short, upright; *lower discoidal* nervule arising much nearer to the third median than to the upper discoidal nervule; *third median* nervule arising at the lower end of the cell; *second* median arising well before the lower end of the cell; *first* median arising about twice as far from the second as the second does from the third; *submedian nervure* straight; *secondary sexual character* consists of an indistinct oblique discal streak of black modified scales arising about the middle of the submedian nervure and ending on the third median nervule near its origin, thus crossing three interspaces. HIND-WING, considerably longer than broad; *costa* well arched throughout; *apex* rounded; *outer margin* rounded; *anal angle* rather acute; *abdominal margin* slightly convex; *costal nervure* slightly curved only, ending at the apex of the wing; *first subcostal nervule* arising well before the upper end of the cell; *second* subcostal arising at the end of the cell; *disco-cellular* nervules straight, outwardly oblique; *discoidal* nervule wanting; *third median* nervule arising at the lower end of the cell; *second* median arising just before its end; *first* median arising about twice as far from the second as the second does from the third—all the median nervules arising close to the lower end of the cell; *submedian* and *internal nervures* straight. ANTENNÆ long, more than half but less than two-thirds as long as the costa of the forewing, with an elongated, well-formed club, the terminal crook (which is at right-angles to the shaft) about as long as the broadest part of the club. PALPI wanting. THORAX moderately stout. ABDOMEN slender, reaching a little beyond the outer margin of the hindwing. LEGS, foreleg, tibia with an epiphysis; hindleg, tibia with terminal and medial pairs of spurs. Type, *Inessa ilion*, de Nicéville.

This genus would appear to come near to *Isoteimon*, Felder, *Idmon*, de Nicéville, *Arnetta*, Watson, *Itys*, de Nicéville, *Zographetus*, Watson, and *Isma*, Distant,\* but the loss of the palpi in the type makes it difficult to exactly locate it; the secondary sexual character will distinguish it from them all however.

25. *INESSA ILION*, n. sp., Plate IV, Fig. 33, ♂.

HABITAT: Lombok.

EXPANSE: ♂, 1.3 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining fuscous, in

\* Mr. Osbert Salvin writes to me that the unique type of the genus *Isma* (*obscura*, Distant), "Has a small tuft of hair on the upperside of the hindwing placed on the subcostal nervure along the upper edge of the discoidal cell; on the underside of the forewing near the middle of the inner margin in another tuft; the anal angle of the hindwing is very distinctly fringed as in the genus *Lophoides*, Watson."

some lights the whole surface of a beautiful vinous colour; the markings translucent and colourless. *Forewing* with an elongated streak in the discoidal cell not reaching the base, inwardly ending in a fine point, outwardly broad, lying along the median nervure, its outer end touching a much smaller spot which reaches the subcostal nervure; three conjoined subapical dots, the middle one out of line with the rest, nearer the base of the wing; a series of four small discal spots placed in a straight inwardly-oblique line, the anteriormost the smallest, placed in the lower discoidal interspace, the next two increasingly larger in the median interspaces placed outwardly against the black sexual brand, the lowermost also placed outwardly against the brand, in the submedian interspace, touching that vein, small; an opaque ochreous streak along the basal half of the sutural area. *Hindwing* with a small spot in the middle of the discoidal cell; a very irregular discal band, formed of four portions, divided only from one another by the crossing veins; the anteriormost portion in the lower discoidal interspace somewhat quadrate; the two following portions elongated, out of line with the rest, projected towards the base of the wing, the anterior of the two rather the longer; the posteriormost portion in the submedian interspace somewhat hour-glass shaped, that is to say constricted in the middle on both sides, but that portion nearer the abdominal margin is larger than that portion touching the first median nervule. **UNDERSIDE**, *both wings* fuscous, without any purple gloss. *Forewing* marked as on the upperside, except that the opaque streak in the sutural area is absent. *Hindwing* as on the upperside.

Described from a single example kindly given to me by Herr H. Fruhstorfer, and captured by him in the eastern province of Lombok at 2,000 feet elevation in April, 1896.

26. ISMA IDYALIS, n. sp., Plate IV, Figs. 26, ♂; 32, ♀.

HABITAT: Burma; Java.

EXPANSE: ♂, 1.2 to 1.3; ♀, 1.6 inches.

DESCRIPTION: MALE. **UPPERSIDE**, *both wings* fuscous with a vinous gloss; and with subhyaline lustrous pale ochreous spots. *Forewing* with two elongated spots towards the outer end of the discoidal cell, the lower immediately below the upper and about twice as large; two or three subapical dots, the lower when present nearer the outer margin than the other two (which are immediately one above the other), and the smallest; three increasing discal spots; the uppermost in the lower discoidal interspace a mere dot; the middle one much larger, triangular, filling the base of the second median interspace; the lowermost very large, quadrate, in the lower median interspace, its outer edge concave, its inner edge convex; a rounded spot in the middle of the submedian

interspace, touching the submedian nervure. *Hindwing* with three conjugated spots in the middle of the disc, the middle one nearest the outer margin, the innermost one the largest. **UNDERSIDE**, *both wings* fuscous, thickly irrorated or overlaid with ochreous scales. *Forewing* with the inner margin extending broadly on to the disc fuscous; the spots as on the upperside, except that the one in the submedian interspace is larger with diffused edges. *Hindwing* as on the upperside. *Cilia* pale ochreous-fuscous throughout. *Antennæ* black, the tip of the club, excluding the whip-like tip, shining white beneath. **FEMALE**. **UPPERSIDE**, *both wings* fuscous, lacking altogether the vinous gloss of the male, the base irrorated with ochreous scales. Otherwise as in the male.

Near to *Isma bononia*, Hewitson, described from Singapore, in my collection from Perak and N.-E. Sumatra, but that species has typically no spots in the discoidal cell of the forewing. Also near to *Isma inarime*, de Nicéville, from Perak, N.-E. Sumatra, Java, and Pulo Laut, but the spots on the hindwing are smaller and differently shaped; they are also more numerous in that species. Also near to *Isma feralia*, Hewitson, described from Java, occurs also in N.-E. Sumatra and Pulo Laut, but in that species all the spots are pure translucent white instead of lustrous pale ochreous, and the spot in the submedian interspace of the forewing is quadrate and extends right across the space instead of being round and touching the submedian nervure, reaching only to the middle of the interspace. Also probably near to *Isma obscura*, Distant, from Singapore, but that species has one spot only in the discoidal cell of the forewing, and none on the hindwing on the disc. Also near to *Isma submaculata*, Staudinger, described from Palawan in the Philippine Isles, but in my collection from Karwar, North Kanara, Bombay Presidency; Cachar in Assam; Daunat Range, Tenasserim, Burma; Perak in the Malay Peninsula; N.-E. Sumatra; and Pulo Laut, but that species has no translucent spots whatever on the hindwing. The only other species of the genus known to me is *Isma corissa*, Hewitson = *Isoteimon indrasana*, Elwes and de Nicéville, from Burma, N.-E. Sumatra, Java, and Pulo Laut, which is altogether a differently-coloured and marked species from the rest of the genus.\*

Described from three males from Tounghoo and one from the Daunat Range, both in Burma, and two females from Java. The type is from Burma. I have not received both sexes from one locality, and it may be that the Javan is distinct from the Burmese species, the former having

\* See footnote on p. 571 *ante*. None of the species here mentioned of the genus *Isma* have male secondary sexual characters, and are therefore probably generically distinct.

the two spots in the discoidal cell of the forewing placed nearer the base of the wing, the inner edge of the discal spot in the first median interspace being much nearer the outer than the inner edge of the spots in the cell than in the Burmese specimens, in the latter they are more immediately anterior to the large discal spot, the inner edge of the three spots being almost in a straight line and perpendicular to the inner margin.

27. *PIRDANA DISTANTI*, Staudinger, Plate II, Figs. 16, ♂; 13, ♀.

*P. (Hesperia) distanti*, Staudinger, *Iris*, vol. ii, p. 141 (1889); *P. pavona*, de Nicéville, *Journ. A. S. B.*, vol. lxiv, pt. 2, p. 540, n. 683 (1896); ? *P. rudolphei* [sic] Elwes, *Proc. Zool. Soc. Lond.*, 1892, p. 648.

HABITAT: Malacca; North Borneo (*Staudinger*); Karen Hills; Perak (*Elwes*); Perak, Malay Peninsula; N.-E. Sumatra; Java.

I have described this species very fully in the paper above quoted, so it is unnecessary to redescribe it here, but I take the opportunity to figure it now.

Dr. O. Staudinger in *Iris*, vol. ii, p. 141 (1889), describes a *Pirdana (Hesperia) distanti* from a female from Malacca, which is the same specimen which was identified by Hewitson as *Hesperia ismene*, Felder, and by Distant as the male (probably) of *Pirdana hyela*, Hewitson. From Staudinger's description of this specimen *P. distanti* differs from *P. pavona* in having the upperside "dull dark smoke-brown, consequently quite different from the black, and green in the basal area, of *P. hyela*." But the male of *P. pavona* (not the female) agrees with this description, the female *P. pavona* agreeing with the same sex of all the species of the genus known to me in having the basal areas of both wings on the upperside glossed with deep shining steel bluish-green. I should say therefore that Distant was right in considering the type of *P. distanti* to be a male and not a female as Staudinger says it is; if Distant is right my *P. pavona* will sink as a synonym of *P. distanti*. But should the type of *P. distanti* be a female, my species will stand, as the female of *P. pavona* is quite distinct from the female of *P. distanti*.

P.S. Since the above was in type, Dr. Staudinger has most kindly sent me a coloured drawing of the type of his species, which proves to be the MALE of my *P. pavona*, the latter name therefore sinking as a synonym. He writes to me that he has another specimen from North Borneo exactly like the type, and one other from Preanger, West Java, which is a little different.

28. *PADRAONA PARAGOLA*, de Nicéville, Plate IV, Figs. 25, ♂; 31, ♀.

*P. paragola*, de Nicéville, *Journ. A. S. B.*, vol. lxiv, pt. 2, p. 546, n. 715 (1896).

HABITAT: N.-E. Sumatra.

Having described this species very fully in the paper quoted above

I will not repeat the description here, but take this opportunity to figure both sexes.

29. HALPE HYRTACUS, n. sp., Plate III, Fig. 22, ♂.

HABITAT: Wynaad; North Kanara—both in South India.

EXPANSE: ♂, 1.3 to 1.5; ♀, 1.6 inches.

DESCRIPTION: MALE. UPPERSIDE, both wings and cilia shining dark hair-brown. Forewing with two dots placed obliquely outwards towards the end of the discoidal cell, one or both sometimes absent; three conjugated subapical dots, and two on the disc at the bases of the median interspaces, all these dots colourless and transparent; the "male-mark" shining deep black and narrow. Hindwing immaculate. UNDERSIDE, both wings dull fuscous. Forewing with the transparent dots as on the upperside; the inner margin very broadly white crossed in the middle by the "male-mark;" the costa outwardly tinted with ochreous; the apex bearing some obscure elongated dark dashes outwardly bordered with ochreous. Hindwing bearing a broad discal pure white band, broadest on the abdominal margin, not reaching the costa, anteriorly marked with one or two dark brown dots, sometimes with two or three in the middle; the outer dark half of the wing bearing some obscure ochreous spots. Palpi above, thorax and abdomen concolorous with the wings, beneath and legs yellowish-white. FEMALE. UPPERSIDE, both wings as in the male, but the ground-colour paler. Forewing with no "male-mark." UNDERSIDE, both wings as in the male.

Nearest to *Halpe brunnea*, Moore, Lep. Cey., vol. i, p. 174, pl. lxx, figs. 4, 4a, female (1881), with which it agrees closely on the upperside except that the transparent dots are even smaller than in the same sex of that species; the "male-mark" is quite the same; differing, however, on the underside by the presence of the large white area on the inner margin of the forewing, and the broad discal white band on the hindwing. *H. hyrtacus* is a very distinct species, and cannot be confounded with any other.

Described from a single example kindly given to me by Mr. V. S. Fellowes Wilson, who captured it at Pandalur in the Wynaad District on the 2nd September, 1895. Also from three males and a female in the collection of Mr. T. R. Bell, who bred them at Tarimpur in the North Kanara District in February and March, 1895. The transformations of the species will be found described in Journ. Bomb. Nat. Hist. Soc., vol. xi, p. 49, n. 212 (1897).

30. HALPE HAZIS, n. sp., Plate IV, Fig. 27, ♂.

HABITAT: Nias Island.

EXPANSE: ♂, 1.15 inches.

DESCRIPTION: MALE. UPPERSIDE, both wings hair-brown; cilia

ochreous. *Forewing* with a translucent ochreous dot in the subcostal interspace; two similar spots placed inwardly obliquely in the median interspaces, the upper the smaller and elongated, the lower quadrate. *Hindwing* immaculate. **UNDERSIDE**, both wings ochreous-brown; all the markings tawny or deep ochreous. *Forewing* with a small oblong spot in the discoidal cell at the origin of the second subcostal nervule; the dot in the subcostal interspace as on the upperside, with a minute dot immediately anterior to it, divided from it by the subcostal nervure; the median spots as on the upperside; a submarginal series of five quadrate spots divided by the veins, the uppermost posterior to the fifth subcostal nervule rather larger than the others, the posterior-most in the upper median interspace. *Hindwing* with an irregular discal series of spots from the apex to near the middle of the abdominal margin, the middle spot quadrate and much larger than the others; an outer discal series of five crescentic spots, the concavity of each directed forwards, commencing just posterior to the second spot of the discal series and ending anterior to the submedian nervure, the posteriormost spot much larger than the others. *Antennæ* dark brown, the club posterior to the whip-like apex ferruginous. *Head* and *body* above dark brown. *Abdomen* beneath pale brown.

This species seems nearest allied to *Halpe moorei*, Watson, and is, as far as I know, the only species of *Halpe* occurring in the island, except *H. zema*, Hewitson, of which *Hesperia ormenes*, Weymer, is a synonym. *H. hazis* differs from *H. moorei* in lacking entirely the sexual brand of that species on the forewing, in that wing there are only three spots on the upperside instead of at least six, usually seven, and the spots are ochreous instead of white; the cilia is not checkered as it is in *H. moorei*; the markings of the underside are very similar, but there are fewer of them in the present species, and they are deep ochreous rather than whitish.

Described from a single example kindly sent to me by Herr H. Fruhstorfer.

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## EXPLANATION OF THE PLATES.

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 ,, 31. *Padraona paragola*, de Nicéville, ♀, p. 574.  
 ,, 32. *Isma idyalis*, n. sp., ♀, p. 572.  
 ,, 33. *Inessa ilion*, n. sp., ♂, p. 571.

*Some new Indo-Malayan Orchids.*—By G. KING and R. PANTLING.

In two papers recently read before the Society we gave descriptions of about sixty new species of *Orchidaceæ* from the Sikkim-Himalaya. In the present paper we offer descriptions of forty-six species from other parts of the Indian Empire which we believe to be hitherto undescribed. In order to assure ourselves of their novelty we sent either a specimen or a careful drawing of each of them to the Royal Herbarium at Kew for comparison. And to Mr. W. T. Thiselton Dyer, F.R.S., C.M.G., Director of that Institution, our thanks are due for his courtesy in having the comparisons most promptly and carefully made by Mr. R. A. Rolfe of the Royal Herbarium, who for many years has made Orchids a special study.

**MALAXIDEÆ.**

*OBERONIA GAMMIEI*, n. spec. *Stems* very short, not tufted. *Leaves* ensiform, obliquely acuminate, slightly falcate. *Inflorescence* slender, decurved from the middle, longer than the leaves; the peduncle winged in its lower half, ebracteate, or with very few bracts near the raceme; the raceme sparsely-flowered, its rachis more slender than the peduncle; floral bract equalling the stalked ovary, oblong, blunt, erose. *Flowers* .05 in. long, brown, with pale margins. *Sepals* ovate, acute, entire. *Petals* ovate-lanceolate, erose, reflexed and lying on the ovary like the sepals. *Lip* slightly exceeding the sepals in length, broadly ovate in general outline, deeply concave, 3-lobed; lateral lobes long, narrow, coarsely serrate, their apices acute and pointing forwards; the terminal lobe rather small, transversely oblong, sub-entire; its apex truncate, divided into two short incurved sub-quadrate lobules by a sub-quadrate sinus. *Clinandrium* much wider than the anther. *Pollinia* elongate, obovoid.

In the Sunderbans; Lower Bengal; on trees; G. A. Gammie and R. L. Heinig, No. 92. At Rangamatia in the Chittagong Hill Tracts; Gamble, No. 6833; in flower from December to March.

This species is allied to *O. iridifolia*, Lindl., and to *O. recurva*, Lindl. It has, however, a much fewer-flowered raceme than *O. iridifolia*; the lip of this is concave, more distinctly three-lobed than in *O. iridifolia*, while the lateral lobes in this are serrate, not pectinate, and the terminal lobe is sub-quadrate with (except for the apical sinus) almost entire edges. This is a much larger plant than *O. recurva*, from which it also differs in the lip, which in that species is flat with large rounded crenate side lobes; while the terminal lobe is rather deeply divided into two oblong blunt lobules.



*OBBERONIA SUBNAVICULARIS*, n. spec. *Stems* very short, tufted. *Leaves* unequal, ensiform, obliquely acuminate, length .75 to 6 in., breadth .25 to .5 in. *Inflorescence* scarcely so long as the leaves; its peduncle erect, terete, ebracteate; raceme much longer than the peduncle, slightly decurved, densely flowered, thick at the base and tapering to the apex; floral bract small, only half encircling the thick ovary, lanceolate, erose. *Flowers* about .05 in. long. *Sepals* broadly ovate, blunt, entire, reflexed on the ovary. *Petals* narrowly oblong, truncate, entire, also reflexed. *Lip* about as long as the sepals, broad, very concave from base to apex, entire, the edges coarsely retroserrate; the apex blunt, emarginate and with a broad tooth in the sinus; upper surface with a large depressed cordate nectary near the base. *Lip* of the *anther* acute.

Perak; Scortechini, No. 1202; in flower in August.

In externals this resembles *O. iridifolia*, Lindl.; but this differs in having a terete wingless peduncle, a small floral bract which only half encircles the ovary, linear-oblong blunt petals, and a very concave (not lobed) retroserrate lip with a large nectary near its base. The late Father Scortechini collected only three specimens of it, and of one of these he made a drawing which is now in the Calcutta Herbarium.

*OBBERONIA RITAI*, n. spec. *Stems* very short, tufted. *Leaves* linear-ensiform, acuminate, 1 to 5 in. long and .2 to .35 in. broad. *Inflorescence* decurved from about the middle, rather longer than the leaves; the peduncle short, terete, bracteate; the *raceme* densely-flowered; floral bract lanceolate, acuminate, erose, longer than the stalked ovary. *Flowers* .06 in. across, pale-green, sub-verticillate. *Sepals* and *petals* sub-equal, ovate, blunt, spreading, the latter with sub-crenate margins. *Lip* slightly longer than the sepals, and broader at the apex, 3-lobed, the basal lobes large, erect or slightly incurved, rounded or pointed, their bases connected by a deep semi-lunar nectary; terminal lobe large, ob-reniform, the apical sinus broad and with a broad triangular process at its apex. *Capsule* ovoid, ribbed, pedicelled.

Khasia Hills; at Jowai; elevat. 2000 to 3000 feet; S. E. Rita; Mann, G. A. Gammie; in flower in August.

A species belonging to the group to which belong *O. myriantha*, *O. recurva*, *O. demissa* and *O. micrantha*; but distinguished from all these by the large erect entire basal lobes of the lip and by its broad obreniform terminal lobe. We have named it after Mr. S. E. Rita of the Assam Commission, to whom we are indebted for much generous help in the collection of the orchids of the Khasia Hills.

*OBBERONIA INTERMEDIA*, n. spec. *Caulescent*; stems 1 to 3.5 in. long, tufted. *Leaves* equitant, acute, subfalcate, 1 to 2.25 in. long

and .25 to .35 in. broad. *Inflorescence* slender, decurved, about 4.5 in. long; the peduncle short and ebracteate, adnate to the uppermost and reduced leaf; the raceme many-flowered. *Flowers* about .05 in. long, verticillate; floral bract lanceolate, shorter than the ovary. *Sepals* subequal, ovate, acute, spreading. *Petals* linear-oblong, acute, spreading. *Lip* larger than the sepals and petals, broadly oblong in general outline, 3-lobed; the basal lobes rounded; apical lobe sub-rotund, somewhat contracted at the base, the apex broad and erose, otherwise entire.

Perak: Scortechini No. 1516 (with drawing).

A species allied to *O. demissa*, Lindl. and to *O. micrantha*, King and Pantling; but differing from both in having linear-oblong acute petals, and also in the shape of the basal lobes of the lip which in *O. demissa* are blunt and erose, in *O. micrantha* broad rounded and subentire, while in this they are oblong and entire. The apical lobe of the lip of this is also slightly different from that of the other two, being in outline more orbicular, and erose only at the apex. The leaves of this are moreover longer than those of *O. micrantha*, while the raceme differs from that of *O. demissa* in not being truncate.

OBERONIA PROUDLOCKII, n. spec. Whole plant six inches in height, or less. *Stems* very short, tufted. *Leaves* ensiform, acute, not falcate or only slightly so, fleshy but with thin edges, 1 to 2.5 in. long and .25 to .5 in. broad. *Inflorescence* about twice as long as the leaves, erect below but slightly decurved above; the peduncle about as long as the spike, fleshy, 2-winged, ebracteate; rachis of the spike thick, fleshy, terete. *Flowers* numerous, reddish-brown, .05 in. long, sunk singly in pits in the rachis, the perianth adpressed to its surface; floral bract covering the flower-buds, longer than the sub-sessile ovary, ovate-rotund, fleshy in the middle but with broad membranous lacinate margins. *Sepals* reflexed, ovate, acute, entire. *Petals* ovate-lanceolate, entire, reflexed on the ovary like the sepals. *Lip* broader but hardly longer than the sepals, convex, sub-quadrate; the base truncate and with an obscure rounded auricle at each extremity, slightly narrowed to the broad sub-truncate apex, the margins slightly and obscurely erose but not lobed; nectary small, elliptic-rotund, deep, situated at the base just under the column.

Nilgiri Hills; near Gudalur, Mr. R. L. Proudlock; in flower in September.

A species allied to *O. pachyrachis*, Reichb. fil., and *O. orbicularis*, Hook. fil., and still more closely to the Sikhim species *O. pachyphylla*, K. & P.; but differing from them all by its reflexed sepals and differently shaped lip.

*OBERONIA CAUDATA*, n. spec. Caulescent; stems about 1·5 in. long, tufted. *Leaves* four or five, distant, linear-ensiform, acuminate, falcate, ·75 to 2 in. long, and ·15 in. broad. *Inflorescence* adnate to the uppermost and reduced leaf, much decurved, about as long as the longest leaf; its peduncle short, ebracteate; the raceme laxly-flowered. *Flowers* solitary, about ·05 in. long; floral bract ovate, entire, longer than the stalked ovary. *Sepals* subequal, ovate-oblong, acute, pale red, slightly reflexed. *Petals* linear-lanceolate, acuminate, reflexed, paler and more hyaline than the sepals. *Lip* much longer than the sepals or petals, 3-lobed; basal lobes ovate, acuminate, spreading; terminal lobe narrow, deeply divided into two caudate acuminate wavy divergent lobules.

Perak: Scortechini No. 315b.

A species allied to *O. caulescens*, Lindl., but differing by the adnate peduncle, the much narrower petals which are moreover acuminate, and also by the lip which in this has narrower basal lobes which also are acuminate. The apical lobules of this are moreover longer than in the lip of *O. caulescens*, and they are undulate.

*OBERONIA ROLFANA*, n. spec. *Stems* about an inch long, tufted. *Leaves* ensiform, acute, falcate, rather thin, ·75 to 1 in. long and about ·25 in. broad. *Inflorescence* three or four times as long as the leaves, slender, decurved, puberulous; the peduncle shorter than the leaves, bracteate; raceme rather sparsely flowered for the genus; floral bract oblong, blunt, with erose hyaline edges, shorter than the glandular-hairy stalked ovary. *Flowers* ·05 in. long, orange-coloured. *Sepals* subequal, ovate, obtuse, sub-coriaceous, entire, spreading. *Petals* linear, sub-acute, entire, spreading. *Lip* longer than the sepals and petals, broad and concave towards the base; basal lobes rounded, erect, entire, terminal lobe narrow, shortly bilobed at the recurved apex, its edges entire.

Perak: Scortechini No. 2193.

A species collected only once by the late Father Scortechini who made a drawing of it. The species is apt to be confused with *O. ciliolata*, Hook. fil., which it much resembles in general appearance, and in having a glandular-pubescent inflorescence; but it differs from that species in its lip, the terminal lobe of which in *O. ciliolata* is much broader than long and has fimbriate edges.

*OBERONIA BERTOLDI*, n. spec. *Stems* very short, tufted. *Leaves* coriaceous, narrowly lanceolate, acuminate; length ·5 to 1·25 in., breadth ·2 to ·25 in. *Peduncle* of the *inflorescence* about as long as the leaves, slender, ebracteate; the spike rather longer than the leaves, many-flowered. *Flowers* ·05 in. long, in verticels of about 6; floral

bract about as long as the ovary, lanceolate, erose-serrate. *Sepals* elliptic-oblong, sub-acute, entire, revolute. *Petals* lanceolate, coarsely serrate, spreading, the apices slightly incurved. *Lip* longer than the petals, ovate-elliptic, not lobed, the base rounded and entire, the sides with one or two irregular teeth; the apex deeply bifid, the lobules irregularly and coarsely toothed.

Perak; Scortechini No. 1525.

A species closely allied to *O. Prainiana*, King and Pantling, which was collected by Scortechini in Perak, but which has also been found at the base of the Sikkim-Himalaya. The lip of *O. Prainiana*, K. and P., differs from the lip of this in not being bifid, and in being irregularly lobulate-erose from base to apex; the petals also are longer. Named in honour of its discoverer, the late Father Bertold Scortechini.

*MICROSTYLIS ANDAMANICA*, n. spec. *Stem* about 2.5 in. long, covered by 2 or 3 loose sheaths with acute apices. *Leaves* three or four, membranous and plicate, broadly ovate-lanceolate, oblique, acute or shortly acuminate, rather abruptly and obliquely narrowed at the base to the sheathing petiole; length 3 to 5 in., breadth 1.5 to 2 in., petiole about 1 in. long. *Inflorescence* about twice as long as the leaves; the peduncle ribbed, ebracteolate; the raceme rather laxly-flowered; the floral bract lanceolate, acuminate, shorter than the slender stalked ovary, reflexed. *Flowers* dull purple, .4 in. long. *Dorsal sepal* lanceolate, obtuse; the laterals oblong, obliquely acuminate. *Petals* linear, blunt, shorter than the dorsal sepal. *Lip* flat, ovate, tapering to each end; the apex pointed, entire; the base with two rather short falcate acute converging lateral lobes, their tips often touching or overlapping.

South Andaman Island; King's Collectors.

The nearest ally of this is no doubt *M. Wallichii*, Lindl., to which species Sir Joseph Hooker tentatively refers it as a form (Ann. Bot. Gard. Calcutta, Vol. V, Pt. 1, t. 2, fig. E, and Fl. Br. Ind. V, 686). Sir Joseph however expresses the belief that it will turn out to be a distinct species. Ample materials recently received from the Andamans show that this is really the case. The flowers are larger than those of *M. Wallichii*; they are uniformly of a dull purple colour, the apex of the lip being entire and acute, and the basal auricles falcate acute and converging, while both sepals and petals have recurved margins. In *M. Wallichii*, on the other hand, the apex of the lip is blunt and notched; the basal auricles are lanceolate, their inner edges straight and parallel, and their apices not converging.

*LIPARIS PRAZERI*, n. spec. Terrestrial; pseudo-bulb narrowly ovoid, pointed, about one inch long, enveloped by one or two loose scarious sheaths, and bearing near its apex two sub-opposite leaves. *Leaves*

membranous, ovate, acuminate; the base rounded and passing abruptly into the short loose sheath, 7- to 9- nerved; length 3·5 to 5·5 in., breadth 2·25 to 2·75 in. *Inflorescence* much longer than the leaves, slender, striate; *raceme* as long as the ebracteate peduncle, few-flowered; floral bract lanceolate, shorter than the slender pedicelled ovary, reflexed. *Flowers* 4 in. long, pale-green with a shade of yellow, (*vide* collector) their ovaries nearly 5 in. long. *Sepals* lanceolate, reflexed, the dorsal narrower than the lateral pair. *Petals* linear; their margins, like those of the sepals, revolute. Lip deflexed from the very base, flat, broadly obovate, the margins entire, the base with two small rounded calli. *Column* almost straight, not winged at the apex and not dilated at the base.

The nearest ally of this appears to be the North-West Himalayan species *L. rostrata*, Reichb. fil., from which this however differs in having an entire lip with two calli at its base, a more elongated pseudo-bulb and almost sessile leaves. It also resembles *L. deflexa*, Hook. fil., but differs from that in having nearly sessile broader leaves and an entire lip. It belongs to the section *Mollifoliæ*.

Upper Burma; at Kendat; Calcutta Botanic Garden Collector; flowering in August; Kurz (without flower) No. 345.

*DENDROBIUM RITAEANUM*, n. spec. *Stems* slender, formed of chains of slender pseudo-bulbs with fibrous remains of old sheaths at the joints, branching; the branches consisting of sessile sub-cylindric pseudo-bulbs about 1·25 in. long and 25 in. thick. *Leaf* solitary, from the apex of the pseudo-bulb, lanceolate-oblong, sub-acute, 2·25 to 3·5 in. long, and 5 in. wide. *Flowers* 5 in. across, solitary on a very short peduncle; floral bract minute, triangular. *Dorsal sepal* ovate-lanceolate; the lateral pair falcate, sub-acute. *Petals* oblong, shorter than the sepals. *Lip* in general outline spathulate; the lateral lobes small, projecting, obliquely obtuse; terminal lobe deeply divided by a blunt apical sinus into two broadly elliptic blunt lobules; the disc between the lateral lobes occupied by a thickened purple area sub-spathulate in shape and having a slightly raised mesial line. *Column* and its foot rather long; mentum short, wide. *Clinandrium* lacinate; lip of anther 2-lobed.

Khasia Hills; elevation 3-4000 feet; collected by Mr. Rita, after whom it has been named.

A species belonging to the Section *Cadetia* and allied to *D. Macraei*, Lindl.; but with pale yellow, instead of white, flowers and with much smaller leaves; also having a very different lip from that species and more slender pseudo-bulbs.

*DENDROBIUM SORDIDUM*, n. spec. *Stems* erect, branching; pseudo-  
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bulbs 2 to 3 in. long, springing from the sides of stem, oblong, slightly sigmoid, wrinkled. *Leaf* solitary from the apex of each pseudo-bulb, narrowly oblong, blunt, entire, 3 to 3.5 in. long and about .5 to .75 in. broad. *Flowers* .75 in. across, solitary from a short minutely bracteate pedicel from the apex of the pseudo-bulb with the leaf. *Sepals* subequal, oblong, sub-acute, the dorsal rather wider. *Petals* narrowly oblong, acute, spreading and slightly reflexed like the sepals. *Lip* longer than the sepals in general outline, oblong-obovate; the side-lobes narrow with acute apices; the terminal lobe large, fleshy, sub-reniform, divided at the apex into two broad lobules separated by a rather wide blunt apical sinus, and the base of each lobule boldly undulate-crenulate; the disc between the side-lobes with two ridges straight at the base but much crisped and curved upwards. *Column* broad, its foot short, both deeply concave. *Clinandrium* dentate; lip of anther erose.

Burma; received at the Botanic Garden, Calcutta, from Mr. Peché, of Moulmain; flowering in June.

The petals and sepals are of a pale yellow colour, flushed with brown outside. The basal half of the lip is pale yellow spotted with brown; the terminal half is deep yellow. This species belongs to the Section *Cadetia* and is nearly allied to *D. Macraei*, Lindl., but differs from that species in having shrunken sub-sigmoidal pseudo-bulbs, and shorter leaves; and in having the mid-lobe of the lip more fleshy and the side lobes acute at the apex, while the face of the column and its foot are deeply concave. The species in the Herbarium is probably confused with *D. Macraei*.

*DENDROBIUM GAMBLEI*, n. spec. *Stems* pendulous, slender, 18 to 24 in. long, with short scarios sheaths at the joints. *Leaves* unknown. *Flowers* .75 in. across, in pairs from the joints of the leafless stem. *Sepals* and *petals* subequal, lanceolate, acuminate, with reflexed tips; the edges of the petals sub-undulate. *Lip* broadly elliptic when flattened out, not lobed, convolute throughout its entire length, the apex blunt, the edges fimbriate-serrate, the base entire and narrowed into a long claw; the upper surface with a broad central band from base to apex, glabrous and with two grooves in its basal half, densely villous in its apical half. *Column* much broader than its elongated narrow foot, with a lacinate nectary at its lower extremity; mentum elongate, slightly curved, spur-like. Lip of *anther* denticulate.

Dehra Dun: Mr. J. S. Gamble, after whom it is named; collected only once; in flower in July.

The sepals and petals of this species are pale greenish-yellow; the lip is pink except the villous band near its apex which is yellow. The flowers are inodorous. The species belongs to the section *Eudendro-*

*bium*, and its nearest ally appears to be the Ceylon species *D. macrostachyum*, Lindl.; but in that species the margins of the lip are slightly erose, not deeply fimbriate-serrate as in this; the disc is naked in that, or has only a few scattered hairs; the nectary and anther are entire in *D. macrostachyum*, and the flowers, which are sweet-scented, are in racemes.

**BULBOPHYLLUM DEPRESSUM**, n. spec. *Pseudo-bulbs* obliquely depressed-ovoid, .25 in. long, produced at distances of .2 in. on a filiform rhizome. *Leaf* sessile, broadly ovate, acute, the apex shortly aristate, length .4 in. *Flowers* .2 in. long, solitary, from the bases of the pseudo-bulbs; the ovary slender, about as long as the flower; floral bract ovate, acute, shorter than the sessile ovary. *Sepals* equal, linear-oblong, acuminate, connivent. *Petals* fleshy, less than half as long as the sepals, oblong, slightly ob-lanceolate, acute. *Lip* shorter than the sepals, decurved from the middle; oblong, 3-lobed; the lateral lobes erect, large, broadly oblong, oblique, their edges irregularly dentate-serrate; apical lobe fleshy, blunt, entire, its base much thickened. *Column* very short, only about half the length of the foot, without teeth. *Pollinia* very unequal.

Khasia Hills; in wooded hollows between Jowai and Jhorain; Jaintia Hills; elevation 3000 feet; Pantling No. 627.

The sepals of this interesting little plant are greenish, shading towards the middle into dull purple: the petals and lip are of a uniform dull purple. The species is closely allied to *B. Listeri*, a species described in a former number of this *Journal* (Vol. LXIV, Pt. 2, page 334). But that has a lip with no lobes, and its column has long subulate apical processes; its lip moreover is linear-oblong. It is also allied in habit to *B. Epicrianthes*, Hook. fil., which has however totally different petals, being thread-like and pendulous.

**BULBOPHYLLUM COLLETTI**, n. spec. King and Pantling. *Pseudo-bulbs* oblong, .75 to 1 in. long, situated an inch and a half apart on a wiry rhizome. *Leaf* solitary, elliptic-oblong, blunt, suddenly contracted at the base, sessile; length 1.5 to 2 in., breadth .4 to .6 in. *Scape* not longer than the pseudo-bulb, bearing several sheaths and also 3 or 4 spathaceous bracts just under the 2- to 6-flowered terminal umbel. *Flowers* pale yellow, .3 in. across; floral bract spathaceous, lanceolate, as long as the shortly stalked ovary. *Sepals* sub-equal, linear, acuminate, the dorsal rather shorter. *Petals* lanceolate, finely acuminate, slightly shorter than the dorsal sepal. *Lip* oblong-ovate, fleshy, with a broad shallow triangular groove extending from the base nearly to the apex. *Column* stout, the apex with two long subulate teeth; stigmatic surface large and excavated; the foot as long as the column,

much curved. *Anther* with a triangular concave lip; *pollinia* very unequal, the inner pair very narrow.

Assam; collected by Mr. G. E. Rita and also by Sir Henry Collett, K.C.B., lately commanding the troops in Assam.

A species allied to *B. cauliflorum*, Hook. fil., which is, however, a much larger plant with slightly different sepals and petals. The habit of growth of the two is moreover different, for this species grows in dense masses, whereas *B. cauliflorum* is very straggling, and there is a difference of two months between the seasons of flowering of the two. This is allied also to *B. protractum*, Hook. fil., but has longer and more numerous flowers than that species, and the petals are lanceolate-acuminate; whereas *B. protractum* has narrowly elliptic sub-acute petals and it has also narrower pseudo-bulbs.

**BULBOPHYLLUM OBLANCEOLATUM**, n. spec. *Pseudo-bulbs* none; rhizome stout, densely clothed with coarse fibres and roots. *Leaves* rising singly from the rhizome, ob-lanceolate, sub-acute, tapering in the lower half to the stout plano-convex petiole; length of blade 6 to 8 in., breadth 1·15 to 1·4 in., length of petiole 2 to 2·75 in. *Raceme* from the rhizome near a leaf, with its peduncle as long as or rather shorter than the leaf; the peduncle forming one-third and bearing several lax membranous sheaths each ·5 in. long. *Flowers* numerous but not crowded, ·3 in. across; floral bract lanceolate, about as long as the stalked ovary. *Sepals* spreading widely, linear-lanceolate, finely acuminate, 1-nerved, the dorsal smaller than the lateral pair and gibbous at the base; the lateral pair subfalcate. *Petals* one-third of the length of the dorsal sepal, linear, acuminate, 1-nerved. *Lip* half as long as the dorsal sepal, curved from the base, 3-lobed; the side-lobes erect, rounded, gradually merging in front with the narrowly oblong sub-acute fleshy apical lobe. *Column* very short; the apical teeth small, sharp, erect.

Perak; on Gunong Batu Pateh, at an elevation of 3400 feet, Wray, No. 980.

The flowers are said by Mr. Wray to be of a pale straw colour. The species is allied to *B. apodum*, Hook. fil., but has a longer raceme and larger flowers than that species; moreover the petals in this are much shorter in proportion to the dorsal sepal, and the lip has very different side lobes.

**BULBOPHYLLUM LINEARIFOLIUM**, n. spec. *Rhizome* ·15 in., thickly clothed with short scariosus sheaths; *pseudo-bulbs* none. *Leaves* solitary, about ·5 in. apart, linear, slightly curved, acute, narrowed at the base to a petiole 1 to 2 in. long; length of blade 4 to 6 in., breadth ·3 to ·5 in. *Inflorescence* very slender, erect, subflexuose, about half as long as the



leaves; the peduncle about 1 in. long, clothed with tubular scarious sheaths. *Raceme* 3 or 4 times as long as the peduncle; many-flowered but not crowded. *Flowers* .125 in. long; floral bract lanceolate, acuminate, as long as the slenderly stalked tumid ovary. *Sepals* equal in length, blunt, oblong, spreading, the lateral pair broader than the dorsal and very falcate. *Petals* only half as long as the sepals and much narrower, linear, blunt, 1-nerved, spreading. *Lip* oblong, acute, slightly decurved from the base to the acute apex, without side lobes, the upper surface grooved from the base to near the apex. *Column* very short; its teeth small, blunt.

Perak; Scortechini (without a number).

A species near *B. suavissimum*, Rolfe, but with much smaller flowers and entire not erose petals. The leaves of this differ also from those of that species in being linear and not at all ob-lanceolate.

*BULBOPHYLLUM SHANICAM*, n. spec. *Pseudo-bulbs* turbinate, minutely rugulose, .3 or .4 in. in diam. *Leaves* in pairs, coriaceous, narrowly oblong, blunt, abruptly narrowed at the sessile base; length 1.5 to 2.25 in., breadth .3 to .45 in. *Scape* from the base of the pseudo-bulb, erect, twice as long as the leaves; the peduncle with a few small scattered sheaths; *raceme* lax, about 12-flowered. *Flowers* .15 in. long, white; floral bract broadly lanceolate, acute, shorter than the stalked ovary. Dorsal *sepal* ovate-oblong, blunt; the lateral pair oblong, sub-falcate, obtuse, blunt. *Petals* as long as the sepals but much narrower, lanceolate, obtuse, entire in the upper half and minutely erose in the lower. *Lip* as long as the sepals, oblong, obtuse, without lobes or auricles, pubescent on both surfaces. *Column* stout, with broad shallow wings about the middle, the apical processes bidentate; foot long, not much curved. *Anther* with the anterior lip pressed inward, the apex mammillate.

Shan Hills, in Upper Burmah; in flower during November; Calcutta Botanic Garden Collectors.

A species of which the nearest ally is probably *B. suavissimum*, Rolfe. This however has two leaves, whereas the leaf in that is solitary. The flowers of this are moreover smaller than those of *B. suavissimum*.

*BULBOPHYLLUM VANESSA*, n. spec. *Rhizome* slender, wire-like; pseudo-bulbs ovoid-conic, closely approximate, 1 in. in length and .7 in. in diam. at the base. *Leaf* solitary, sessile, very coriaceous, narrowly elliptic-oblong, the apex acute and minutely bifid, the base much narrowed and convolute; length 8 to 10 in., breadth 1.5 in. *Scape* slender, erect, 10 to 12 in. long, with one or two tubular sheaths in the lower fourth, otherwise naked, 1-3-flowered. *Flowers* expanding singly, 3.25 in. across; floral bract membranous, lanceolate, acuminate, .25 in.

long, shorter than the sessile ovary. *Sepals* subequal, lanceolate, finely acuminate; the lateral pair slightly falcate, 1·5 in. long, widely spreading, many-nerved. *Petals* very small, broadly ovate, obtuse, only about ·12 in. long. *Lip* rather thin in texture, nearly as long as the sepals, lanceolate, acuminate, narrowed to the minutely auricled base; the upper surface with a central furrow in its basal half and a shallow lamina at each margin of the furrow. *Column* semi-terete, about three times as long as the petals; its foot slender, longer than and at right angles to itself. *Anther-lip* acute.

Perak; by the Batong Padang river; Mr. Ayre.

This belongs to a section of the large genus *Bulbophyllum* founded by Mr. H. N. Ridley, Director of the Botanic Garden, Singapore, under the name *Intervallatæ* (Journ. Linn. Soc. XXXI, 276) for the reception of a small group of species remarkable for possessing "a tall stiff scape ending in a many-flowered raceme, the flowers of which expand one by one at long intervals of time, the rachis slowly elongating as they expand, so that, though in one species as many as eighty flowers are eventually borne on the raceme, no two are open at one time, and many weeks elapse between the opening of the first and last flowers." A similar method of flowering occurs in Blume's genus *Dendrocolla*, also in the well-known *Oncidium Papilio*, Lindl., and in some other orchids. This species is intermediate between *B. tardiflorens*, Ridl. and *B. stella*, Ridl. (Journ. Linn. Soc. XXXI, 276, 277), but differs sufficiently from both to merit specific rank. A single specimen of it, accompanied by a pencil drawing numbered 434, was given to one of us by the late Father Scortechini many years ago, and as it appears to remain still undescribed, we now publish it.

The sepals of this are greenish-yellow with reddish markings, and the lip is of a dull carnation colour. The flower is a very striking one from its great size.

CIRRHOPE TALUM PROUDLOCKII, n. spec. Leafless at flowering-time. *Pseudo-bulbs* crowded, broadly ovoid, sometimes almost hemispheric, polished, ·5 in. long, and about as broad at the base. *Inflorescence* 1·75 in. long; the peduncle erect, filiform, naked; the raceme decurved, ·5 in. long, bearing 6 to 10 flowers each ·5 in. long and of a pale straw colour; floral bract lanceolate, much shorter than the slenderly stalked funnel-shaped ovary. *Dorsal sepal* lying parallel with the column, oblong; its apex sub-acute, and slightly reflexed; the lateral pair twice as long, oblong, blunt, lying close together under the lip, touching by their inner surfaces but not connate, their apices somewhat everted; edges of all entire. *Petals* as long as the column and much shorter than the dorsal sepal, triangular, entire, the apices aristate. *Lip* as long as

the dorsal sepal, oblong-elliptic, blunt, concave specially at the base, tumid. Teeth of the *column* erect, triangular, sharply pointed. *Anther* papillose at the summit; *pollinia* in two free pairs, the inner of each pair much reduced. *Stigma* transversely oblong.

Nilgiri Hills; at Ootacamund, Mr. R. L. Proudlock.

A species which might be placed either in *Bulbophyllum* or in *Cirrhopetalum*. Its nearest ally is probably *C. viridiflorum*. It has been collected only by Mr. R. L. Proudlock, late Curator of the Botanic Garden, Calcutta, now Superintendent of the Government Garden at Ootacamund, who kindly sent specimens; Pantling's drawing No. 615.

### EPIDENDREÆ.

*ERIA BRANDISII*, n. spec. Leafless at flowering-time. *Pseudo-bulbs* turbinate, slightly apiculate, smooth, shrunken when in flower, .4 in. in diam. *Scape* from the apex of the pseudo-bulb, erect, filiform, 2 to 3 in. long, with a loose scarious short sheath at the base, otherwise naked. *Raceme* about .75 in. long, with 6 to 8 flowers about .2 in. long; floral bract ovate, acute, scarious, longer than the thin pedicel of the ovary. *Sepals* sub-equal, erecto-patent, lanceolate, acute; the lateral pair sub-falcate. *Petals* shorter than the sepals, oblong, sub-falcate, tapered to the blunt apex. *Lip* lanceolate with a broad base and very short broad claw, without side lobes, the apex obtuse; upper surface with an oval callus near the base and with an obscurely thickened line proceeding from it to the apex. *Column* short, winged near the apex; the foot of about the same length, narrow. *Anther* broad; *pollinia* elliptic.

Burma; at Pym Kyoon, on an old tree; Sir D. Brandis; in flower during March.

Leaves of this are unknown. It belongs to the Griffithian genus *Bryobium*, which has justly been reduced to a section of *Eria* by Mr. Benthham and Sir Joseph Hooker.

Its nearest allies in the section are *E. Dalzelli*, Lindl., *E. nana*, A. Rich., and *E. muscicola*, Lindl., from which it differs in having larger flowers with which the leaves are contemporaneous.

*ERIA SHANENSIS*, n. spec. *Pseudo-bulbs* ovoid, 1 to 1.5 in. long. *Leaves* 2 or 3, membranous, narrowly oblong, absent at flowering time. *Racemes* one or two, from the axils of the undeveloped leaves, 2 in. long, few-flowered; the peduncle, short, naked. *Flowers* .35 in. long, white; floral bract broadly lanceolate, reflexed, about as long as the slenderly pedicelled pubescent ovary. *Dorsal sepal* linear-lanceolate; the lateral pair twice as broad, falcate, acute. *Petals* narrowly oblanceolate, sub-

acute, sub-falcate, all boldly nerved. *Lip* as long as the sepals, broad, sub-quadrate; the side lobes large, rounded; the end lobe small, triangular, acute, and with numerous small conical calli on its upper surface; the disc with two small oblong calli near the base and a central thickened line running from the base to the calli of the middle lobule of the apex. *Column* short, stout, the foot very short.

Shan Hills; Burma; collectors of Botanic Garden, Calcutta.

A species belonging to the Section *Hymeneria* and allied to *E. myristiformis*, Hook., which has however a different lip with distinct lateral lobes, two ridges on the disc, and ridges instead of conical calli on the terminal lobe. The pseudo-bulbs of this are moreover longer and the racemes shorter than those of *E. myristiciformis*.

PHOLIDOTA WATTI, n. spec. *Pseudo-bulbs* about 5 in. long, fusiform, much narrowed at the base, rising about an inch apart from a stout woody rhizome clothed with dark cinereous scarious sheaths. *Leaves* 2, narrowly elliptic, acuminate, much narrowed at the base to the short petioles; length about 6 inches, breadth 1.75 in. (probably often much larger). *Inflorescence* about 6 in. long; the peduncle sub-erect, 2 in. long, almost entirely clothed with stout imbricate unequal bracts; the raceme much decurved, 4 in. long. *Flowers* secund, distichous, somewhat crowded, .75 in. in diam.; floral bract broadly ovate, sub-acute, cymbiform, longer than the stalked ovary. *Sepals* somewhat unequal, all spreading; the dorsal broadly elliptic, blunt; the lateral pair narrower, subacute. *Petals* linear, acuminate, 1-nerved, spreading, about as long as the sepals. *Lip* 3-lobed; the lower part deeply saccate and with 3 shallow lamellae, its edges bearing the erect rounded narrow side-lobes, and with a small fold near their bases; apical lobe transversely oblong, entire, much recurved, its disc quite smooth. *Column* stout, slightly winged near the apex. *Anther* convex, with a truncate lip lying immediately on the upper margin of the dilated stigma, and bearing on the middle of its upper surface a small viscid mass which is attached to the attenuated apices of the 4 clavate pollinia.

The sepals and petals are straw-coloured with a dash of pale green. The side lobes of the lip are pale brown, the apical lobe being of the same tint as the petals. The column is also pale brown. The curious viscus borne on the edge of the lip of the anther serves to attach to each other the narrow ends of the clavate pollinia.

Assam; collected by Dr. George Watt, C.I.E., in whose honour we have named it.

A species allied to the Burmese *P. advena*, Reichb. fil., but differing from that species in having linear petals, and in the apical lobe of the lip being entire and cearunculate.

## VANDEÆ.

*PHALENOPSIS MASTERSII*, n. spec. Roots abundant. *Leaves* oblong-ovate, the apices bluntly apiculate, the bases narrowed, length 1·25 in., breadth ·75 in. *Raceme* three times as long as the leaves, sparsely-flowered. *Flowers* about ·5 in. across; floral bract small, much shorter than the filiform stalked ovary. *Sepals* oblong; the dorsal with recurved margins; the lateral pair flat, sub-acute, strongly reflexed, their surfaces touching below. *Petals* falcately oblanceolate, much and irregularly undulate. *Lip* small, much shorter than the sepals or petals; the side lobes triangular, acute, erect, the disc between them bearing a fleshy 3-crested callus; the apical lobe oblong, blunt, much decurved, entire. *Column* with two erect conical teeth near its base. *Pollinia* sub-globular, the caudicle oblanceolate, the gland large.

At the Nambur Falls in Assam; Masters, February, 1845.

A species allied to *P. Esmeralda*, Reichb. fil., but a much smaller plant and with flowers one-half the size of those of that species. This is described from a specimen in the Calcutta Herbarium which has been hitherto overlooked. The species has not, so far as we are aware, been collected since Masters' visit to the Nambur Falls fifty-two years ago.

BIERMANNIA, *new genus.*

Epiphytal; stem very short. *Leaves* three or four, fleshy, linear. *Raceme* about as long as the leaves. *Sepals* sub-equal, ovate-lanceolate, the lateral pair attached to the base of the column. *Petals* shorter than the sepals. *Column* straight, with a short foot at right angles to itself. *Lip* attached at right angles to the foot of the column, as long as the petals, concave, fleshy, lobed or not; the disc with two or more calli; apex broad or sub-acute. *Stigma* large, orbicular. *Anther* depressed, apiculate, shortly beaked in front; *pollinia* 2, oval, attached by a subulate caudicle to a small gland. *Capsule* cylindric, ribbed, narrow. Two species, one in the Khasia Hills and the other in the Sikkim-Himalaya.

A genus allied to *Doritis*, but distinguished from it by the absence of forked appendages on the disc.

*BIERMANNIA QUINQUECALLOSA*, n. spec. A small plant with erect stem scarcely one inch in length. *Leaves* fleshy, narrowly oblong, the apex minutely bifid, somewhat narrowed to the base, length about 1 in., breadth ·25 in.; flowering-peduncle axillary, about as long as the leaves, bearing at the apex one or two flowers about ·3 in. across; floral bract minute, much shorter than the cylindric sub-sessile ovary. *Sepals* and *petals* sub-equal, oblong, sub-acute; the dorsal free from the lateral

pair at its base. *Lip* inserted on the short foot of the column, nearly as long as the sepals and petals, ovate when flattened out; the margins entire and involute, the apex blunt, erose; the upper surface with a large erect conical mealy callus near the base and, towards the apex, four smaller globular calli arranged in a transverse row. *Column* stout, bearing the stigma low down. *Anther* with a broad truncate lip; pollinia 2, globose, colourless, slightly cleft behind; caudicle dilated near the pollinia, the gland elliptical. *Capsule* 1.5 in. long.

Jaintia Hills; growing on a tree of *Pinus Khasiana* at Jowai, at an elevation of about 4000 feet; Pantling No. 631; in flower during July.

This species is allied to *B. bimaculata*, King and Pantling (in Ann. Botanical Garden ined.) but is a smaller plant and its lip has side-lobes. The flowers are white, the lip alone being yellow. They appear singly and last for only half a day.

*SACCOLABIUM COLLETTIANUM*, n. spec. *Stem* very stout, clothed in sheaths of fallen leaves. *Leaves* very coriaceous, flat with prominent midrib, narrowly oblong; bifid at the apex, the lobules blunt and unequal; the base not narrowed where jointed to the rather wide sheath; length 12 to 14 in.; breadth 1.25 to 1.4. *Panicle* slightly supra-axillary, rigid, shorter than the leaves; the branches few, spreading, few-flowered. *Flowers* .4 in. long; bract lanceolate, much shorter than the stalked ovary. *Sepals* broadly elliptic, blunt, spreading. *Petals* smaller, sub-acute, spreading. *Lip* two and a half times longer than the sepals and somewhat longer than the ovary, consisting chiefly of a long narrowly infundibuliform slightly curved spur without a septum, but slightly contracted in two places near the tip; the mouth of the lip wavy, side-lobes none; apical lobe a minute triangular protuberance from the mouth of the spur. *Column* short. *Anther* depressed, with a short truncate beak; *pollinia* 2, obliquely obovoid, bifid, diverging, attached by the cylindric caudicle to the large cuneately quadrate-cordate gland.

Shan Hills, in Upper Burma; Collectors of Calcutta Bot. Garden; in flower during July.

The flowers of this are rose-coloured, the tint towards the mouth of the spur being darker than elsewhere.

A species in habit much resembling *S. ochraceum*, Lindl., and *S. longifolium*, Hook. fil. (of the section *Acampe*). The flowers, however, are similar to those of *S. ampullaceum*, Lindl. (of Sir Joseph Hooker's section *Speciosæ*) but have a lip with a minute terminal lobe, whereas the terminal lobe of the lip of *S. ampullaceum* is large.

*SACCOLABIUM COARCTATUM*, n. spec. *Stem* slender, pendulous, 2 to 4 in. long and .25 in. thick. *Leaves* pendulous, narrowly oblong, tapering

to the oblique but not bifid apex, narrowed to the base, sessile; length 6 to 8 in., breadth about 1 in. *Racemes* less than .5 in. long, short, extra-axillary, few-flowered. *Flowers* opening only one at a time, fugaceous, .5 in. long. *Sepals* narrowly elliptic, sub-acute. *Petals* shorter than the sepals, ob-lanceolate, acute. *Lip* rather shorter than the sepals, laterally compressed, sub-rhomboid when viewed from the side, chiefly consisting of a funnel-shaped blunt pouch, with straight upper edges, and a short horizontally-projecting bluntly-triangular, fleshy, smooth apical lobe. *Column* short, thick. *Anther* apical, horizontal, the lip trilobulate; *pollinia* 2, globose, the caudicle ligulate, the gland obovate.

Jaintia Hills at Amwee, elevation 3,000 feet; Pantling No. 625; flowering in June.

This species was collected by Mr. Pantling during the cold season of the present year. It flowered in cultivation in June. The flowers are white with purplish-brown markings on the column, and with small spots of the same tint on the sepals, petals, and lip. The apical lobe of the lip is of a bright yellow. This differs from all Indian species of the genus hitherto described by its curious pouched lip much compressed laterally. The flowers resemble those of the plant figured in the fifth volume of the *Annals of the Calcutta Bot. Garden* under the name *Sarcophilus brachyglottis*, Hook. fil. The lip of the present species has however no calli or septum inside it, and it is perfectly smooth; and the pollinia also are quite those of *Saccolabium*, being globose and not partite, and the column is without a foot.

*SACCOLABIUM CRASSILABRE*, n. spec. Pendulous; stem 2 or 3 in. long. *Leaves* coriaceous, flat, oblong; the apices sub-acute, entire, length 3.5 to 5 in., breadth about 1 in. *Inflorescence* from the stem below the leaves; the peduncle 1.5 to 2 in. long, slender, bearing a single short bract about the middle and, at the apex, 3 or 4 sub-umbellate flowers about .75 in. in diam.; floral bract ovate, acute, about one-fifth of the length of the stalked ovary. *Sepals* unequal, spreading; the dorsal elliptic, acute; the lateral pair larger, ovate-elliptic, acute. *Petals* slightly shorter and much narrower than the sepals, sub-spathulate, blunt, spreading. *Lip* attached to the sides of the column for its whole length, consisting of a deep wide pouched sac bearing two minute falcate side-lobes, the apical lobe reduced to a fleshy thickening of the apex of the sac, bearing a projecting callus inside near its base; the sac septeate, but with a few stiff glandular hairs near the bottom of its anterior wall. *Column* short, with a cluster of papillæ at its lower extremity extending into the sac of the lip. *Lip* of anther truncate; *rostellum* short, straight. *Pollinia* 2, colourless, deeply bipartite, attached in pairs to the small gland.

Khasia Hills; at an elevation of 3,000 feet; Pantling drawing No. 628; in flower during July.

The sepals and petals are of a dull yellow, the lip being white with irregular rose-coloured spots.

The characters of the flower in this plant are more those of *Saccolabium* than of any other Indian genus. The wide pouched lip, adhering to the column from its apex downwards, and expanding below its base into a wide septate sac, is a character which brings this into alliance with the group of species in *Saccolabium* of which *S. calceolare* is the type. There is, however, in this no distinct apical lobe, but only a great thickening of the anterior extremity of the mouth of the wide sac of which the lip practically consists, and in this respect it differs from *S. calceolare* and its immediate allies.

*SARCANTHUS ROLFEANUS*, n. spec. *Stems* slender, pendulous. *Leaves* terete, 2 to 4 in. long, and about .12 in. thick. *Racemes* pendulous, 2.5 in. long, few-flowered. *Flowers* .33 in. across; floral bract minute, slender, subsessile. *Sepals* unequal; the dorsal ovate, concave, erect; the lateral pair oblong, very blunt, reflexed. *Petals* much narrower and somewhat shorter than the sepals, linear, blunt, reflexed. *Lip* about as long as the petals; side lobes large, oblong, blunt, entire; their apices oblique, subacute, directed forwards and slightly converging; apical lobe fleshy, triangular, its upper surface with a small antrorse tooth; spur short, horizontal, much shorter than the ovary, dorsally compressed, imperfectly septate, the posterior wall near the mouth with a broadly saggitate callus with a straight line of short stiff hairs in front of it. *Anther-lip* acute; *pollinia* 2, each completely bipartite, the caudicle broad; the gland triangular, orange-coloured.

Moulmein; Burmah; ? Peché.

This plant, which flowered in the Botanic Garden, Calcutta, last June is believed to have been received from Mr. Peché, Moulmein. The sepals and petals are of a dark purplish-brown, and the lip is white or pale pink. The species is allied to *S. appendiculatus*, Hook. fil., but is more slender, has smaller flowers, with a shorter spur, the structure of which differs greatly from that of *S. appendiculatus*. The latter species moreover has not the peculiar saggitate callus on the column which is so conspicuous in this.

*SARCANTHUS KUNSTLERI*, n. spec. *Stem* erect, rigid, often branching, 4 to 6 in. long. *Leaves* terete, fleshy, stout, horizontal or slightly decurved, 2.5 to 3 in. long, and about .25 in. in diam. *Inflorescence* more than twice as long as the leaves, spreading or erect; the peduncle with one sheath at the base and a few shorter scattered along its length; bearing above a raceme or panicle with thickened rachis. *Flowers*



numerous, not crowded, .25 in. across; floral bract ovate, acuminate, minute. *Sepals* subequal, elliptic, obtuse, reflexed. *Petals* smaller, oblong, blunt. *Lip* fleshy, its base with a short wide slightly curved sub-horizontal spur; the lateral lobes at the mouth of the spur erect, broadly oblong, subfalcate, obtuse; apical lobe ovate, acute, concave; the interior of the spur with an imperfect septum directed backwards from its front wall and a large callus from the back wall almost touching the former. *Column* stout, papillose, with a short thick foot and a small rounded callus on each side of the depressed anther; lip of *anther* truncate in front; *pollinia* subglobose, grooved.

Perak; Kunstler.

This species was sent some years ago from Perak by the late Mr. Kunstler, who collected there for the Calcutta Botanic Garden. It flowered recently, and is now described as new. Its nearest ally appears to be *S. Williamsoni*, Reichb. fil. The septum of the spur characteristic of this genus is in this species incomplete, as it extends only about half way across the cavity. At the same time it is prominent, being thick and solid. On the back wall, right opposite it, there is a faint ridge corresponding to it, so that a slight extension would make the septum complete.

*SARCANTHUS SAGITTATUS*, n. spec. *Stem* short, 1 to 2 in. long. *Leaves* two or three, linear-oblong, the apex blunt and obscurely bilobed, narrowed to the base; length 6 in., breadth .75 in. *Peduncle* as long as the leaves, slender, bearing at its apex a short raceme of about 12 rather distant flowers .25 in. in diam.; floral bract minute, much shorter than the slender cylindric stalked ovary. *Sepals* subequal, elliptic, blunt, the dorsal erect, the lateral pair reflexed. *Petals* shorter than the sepals, oblong, blunt, reflexed. *Lip* with large triangular acuminate forward-pointing side-lobes; the apical lobe saggitate, its point curving upwards; the spur longer than the sepals, narrowly infundibuliform, septate to near its bifid apex. *Column* stout, bearing near its base a large smooth 2-lobed callus with two curved divergent horns at its apex; the rostellum with two deflexed plates. *Anther-lip* truncate, ciliolate; *pollinia* oblong, attached at a right angle to the very broad tapering caudicle, the gland ovate.

Khasia Hills, probably at Teria Ghat; Pantling, No. 629; flowering in June.

A very distinct species, with flowers somewhat resembling those of *S. Kunstleri*, K. & P., but with very different habit and leaves.

*STEREOCHILUS WATTII*, n. spec. *Roots* hairy. *Stem* very short. *Leaves* horizontal, linear-oblong, flat, fleshy, unequally and bluntly bifid at the apex, not contracted at the base; length 3 to 4 in., breadth

·5 to ·75 in. *Racemes* slender, glabrous, pendulous, bearing 4 to 9 flowers, ·8 in. in diam.; floral bract minute. *Sepals* oblong, blunt, the *petals* smaller and subfalcate, all reflexed on the slender stalked ovary. *Lip* adnate to the base of the column; the hypochile directed backwards almost parallel to the ovary forming an infundibuliform fleshy spur, its mouth with shallow side-lobes having acute apices directed forwards; the spur with a large 2-ribbed callus at its mouth just below the column septate at its extremity, sub-quadrate, its base produced into small auricles, its apex blunt but with a minute apiculus, its upper surface with a mesial triangular thickening. *Column* long; *rostellum* very long and pointed. *Anther* depressed; *pollinia* 4, planoconvex, attached by pairs to a very long thin caudicle bearing a small broadly ovate gland on the outer side.

Assam; on the Dikku river, elevation 1000 feet. Dr. G. Watt field No. 542.

The genus *Stereochilus* was founded by Lindley to receive a species from Khasia and Burma which he named *S. hirtus*. He considered the genus to be allied to *Camarotis*. Both these genera were reduced to *Sarcochilus*, R. Br., by Mr. Bentham (Gen. Plantar. III, 576). Sir Joseph Hooker, in treating the genus *Sarcochilus*, as Mr. Bentham understood it, (enlarged as it had been by the absorption, besides the two just mentioned, of the genera *Pteroceras*, *Micropera*, *Chiloschista*, *Fornicaria*, *Cylindrochilus* and *Cuculla*), remarks "a polymorphous genus no doubt to be dismembered when better known." Encouraged by this remark, we are led to re-establish STEREOCHILUS, relying as head-marks for the genus on the structure of the lip, on the very long beak of the rostellum, and on the length of the caudicle of the anticous pollinia.

CLEISOSTOMA TENUICAULE, n. spec. *Stems* slender, pendulous, about 12 in. long. *Leaves* thickly coriaceous, somewhat twisted, borne about half an inch apart on the younger part of the stem, linear-oblong; their apices acute, not notched, slightly recurved. *Flowers* solitary, leaf-opposed, ·5 in. across, on a slender pedicel; floral bract very minute. *Sepals* and *petals* fleshy, subequal, spreading, oblong-oblancheolate, blunt; the lateral sepals slightly falcate. *Lip* fleshy, equalling or slightly exceeding the lateral sepals in length, narrowly oblong, tapering to the acute emarginate apex, deflexed from near the base, 5-lobed; the lowest pair of lobes near the base small and tooth-like, blunt; the pair at the base of the terminal lobe larger, conical, fleshy, pointing outwards; disc between the teeth sparsely pubescent; spur about one-third of the length of the stalked ovary and about as long as the sepals, horizontal, cylindrical, tapering somewhat to the apex. *Column* short, bearing a linear callus on its anterior surface, curved upwards and hairy. *Anther* broad; *pollinia* 4 in 2 pairs, each pair globose and attached to a narrow caudicle with inflexed margins in its upper part; gland oblong, half as long as the caudicle, its upper end truncate.

Perak; collected by the late H. H. Kunstler. Pantling's drawing, No. 575.

A species allied to *C. bipunctatum*, Hook. fil. The sepals and petals are of a pale orange colour, with bold transverse blotches of purplish-brown, the lip is pale yellow. The species, originally sent from Perak by the late H. H. Kunstler, has flowered in the Botanic Garden, Calcutta, for several years in succession.

### NEOTTIÆ.

*POGONIA PARISHIANA*, n. spec. Whole plant 2 to 4 in. high, leafless when flowering. Flowering *scapes* one and a half to three inches in height, each enveloped at its base by a lax wide-mouthed sheath .5 to 1 in. long, and bearing about its middle a smaller narrower one. *Flowers* 1 to 3, each about 1 in. in length and of a pink colour; floral bract linear, longer than the pedicelled tumid ovary. *Sepals* and *petals* subequal, linear-lanceolate, acuminate. *Lip* a little longer than the sepals, elongated-rhomboid in general outline, 3-lobed in its anterior half; side-lobes small, bluntly triangular, their apices directed outwards, the disc between them sparsely pubescent, convolute round the column, apical lobe not convolute, much larger than the lateral lobes, triangular with a very broad base and sub-acute apex, the edges minutely undulate and the upper surface densely hairy.

Upper Burma; at Fort Stedman; Abdul Khalil, Collector for the Botanic Garden, Calcutta.

The leaves of this are unknown. The flowers somewhat resemble those of *P. biflora*, Wight; but in that species the terminal lobe of the lip is quite glabrous and emarginate, whereas in this it is sub-acute and pubescent in the upper surface. This also resembles the species referred to by Sir Joseph Hooker in the Flora of Br. India (VI, 119) of which Mr. Parish gave a drawing (but no specimen) to the Kew Herbarium, under the name *P. cuprea*, Parish MSS.

*POGONIA KHASIANA*, n. spec. *Leaf* sub-rotund, 5-angled, green, about 1.75 in. in diam., cordate at the base, petiole 1 in. long. Flowering *scape* 3 in. high, with a single terminal flower, and two linear-oblong acuminate bracts, one at the base, the other at the middle. *Flower* .75 in. long; its bract ovate-lanceolate, acute, concave, shorter than the shortly stalked rather stout ovary. *Sepals* linear-oblong, acuminate. *Petals* of the same shape but smaller, all connivent. *Lip* somewhat shorter than the sepals, the basal portion clasping the column; the side-lobes triangular, their apices slightly up-turned, the apical lobe oblong-rhomboid, flat or slightly deflexed near the apex, its upper surface smooth and with a thickened line down the middle. *Column* slender, the apex dilated.

Jaintia Hills, near Jharain, south of Jawai, at an elevation of 3,000 feet; Pantling, No. 626, flowering in June.

A species near *P. macroglossa*, Hook. fil., but with smaller flowers and a lip with much larger side-lobes and a much broader apical lobe. The sepals and petals are of a pale olivaceous colour with brown stripes: the lip is greenish at the base, the side-lobes are white tinged with pink, and the apical lobe is white with bold rose-coloured spots.

*POGONIA FOLIOSA*, n. spec. Whole plant a span in height. *Leaves* 2 to 4, appearing with the flowers, elliptic-lanceolate, acuminate, many-nerved, unequal, clustered at the base of the short stem, their bases sheathed by a wide loose tubular acute sheath. *Scape* 6 or 7 in. long, rising from among the leaves, erect, smooth, slender, with a closely fitting bract 1 in. long at the base and another half as long about the middle. *Raceme* 3- or 4-flowered. *Flowers* .65 in. long; floral bract lanceolate, acute, shorter than the slenderly-stalked ovary. *Sepals* membranous, subequal, free, linear-lanceolate, acute. *Petals* slightly shorter, ob-lanceolate, acute. *Lip* about equal to the sepals in length, obovate in general outline, convolute round the column, 3-lobed at the apex; the side-lobes triangular, entire, their apices acute, directed forwards and equalling the apical lobe in length; apical lobe much broader, rounded, its edges undulate-erose; the disc with three glabrous lamellæ running from the base to near the apex, smooth in their lower two-thirds but pectinate in the upper third. *Column* slender, slightly dilated at the apex. *Anther* terminal, 2-celled, its lip 2-lobed; *pollinia* 2, coarsely granular.

Upper Burma; at Fort Stedman; Abdul Khalil, Native Collector of Bot. Garden, Calcutta.

A very distinct species of *Pogonia* belonging to the section of the genus which has the leaves contemporaneous with the flowers.

The few specimens known have leaves as described. But, with age, it is probable that the leaves become petiolate. The leaves and habit are those of a *Cephalanthera*, but the column is that of the genus to which we have referred it.

*CEPHALANTHERA CHARTACEA*, n. spec. Height of the entire plant 12 to 15 in. *Stem* short, stout, .3 in. thick at the base and enveloped by 2 unequal wide blunt foliaceous sheaths. *Leaves* 3 to 5, the sheath of the lowest leaf the largest and embracing those of the higher leaves. *Leaves* crowded, sessile, shortly sheathed, narrowly elliptic-oblong, acuminate, many-nerved, 4 to 9 in. long, and .35 to 1.15 in. broad. *Inflorescence* terminal; the peduncle longer than the leaves, naked, or with a single sheathing lanceolate bract 1 in. long close to the raceme, angled. *Raceme* short, few-flowered; floral bract ovate-

lanceolate, chartaceous, .75 in. long. *Sepals* subequal, lanceolate, acute, the petals rather narrower. *Lip* sessile on the base of the column, 3-lobed; the lateral lobes small, bluntly triangular; the apical lobe ovate, blunt; the disc with 5 vertical smooth parallel raised lines running from base to apex. *Column* short, stout, winged near the apex opposite the large concave stigma. *Anther* terminal, erect, 2-celled; *pollinia* 2, narrowly elongate, deeply bipartite.

Upper Burma, in the Southern Shan States, at Taungyi; Native Collector of Calcutta Botanic Garden.

Only two specimens of this are known, and the flowers of both are in bud. The description of the flower above given may therefore have to be modified in some of its details when fully developed flowers are collected. The clustered leaves form a pseudo-stem by their sheathing bases, an arrangement which gives this plant a very different *facies* from either of the two Indian species already described. The specific name has been given on account of the chartaceous nature of the floral bracts.

### GOODYEREÆ.

*ZEUXINE ANDAMANICA*, n. spec. Whole plant 12 to 18 inches high; stem stout in its lower half, rooting at the base. *Leaves* 4 to 10, scattered over the lower half of the stem, lanceolate, acute; the petiole very short and expanding into a short wide scarious sheath; length 1.25 to 2 in., breadth .6 to .8 in., petiole about .1 in. Peduncle of the *spike* slender, elongate, with sparse thin hairs, and bearing 3 or 4 distant scarious narrowly tubular bracts about .5 in. in length. *Spike* 3 to 6 in. long, many - but rather laxly-flowered. *Flowers* .2 or .25 in. long; floral bract sparsely puberulous, about as long as the puberulous ovary, broadly ovate, 1-nerved, its edges erose, with a long acuminate apex. *Dorsal sepal* broadly ovate-elliptic, concave, subacute; the lateral pair narrower, acute, not spreading. *Petals* narrower than the sepals, dimidiately elliptic, subacute, connivent with the dorsal sepal to form a hood covering the column. *Lip* longer than the sepals; the hypochile globularly saccate and having a prominent incurved tooth near the base within each margin; mesochile constricted; epichile deeply divided into two broadly-oblong diverging lobes with truncate minutely erose apices, the broad sinus with a minute point in its apex.

Andaman Islands; Calcutta Botanic Garden Collectors.

A species near *Z. moulmeinensis*, Hook. fil., but having a longer denser spike, smaller flowers, narrower non-aristate petals, a lip-sac without septa, and much shorter petioles.

*ZEUXINE ROLFIANA*, n. spec. Whole plant 15 to 18 in. high; stem sheathed at the base, 2 to 3 in. long. *Leaves* 3 or 4, alternate, close

together in the upper part of the stem, lanceolate to ovate-lanceolate, acute or subacute, the bases rounded, petiole .5 to .65 in. long, expanding into a short broad lax sheath at the base; length 1.75 to 3 in., breadth .7 to 1.2 in. *Peduncle* three times as long as the stem, slender, bearing 3 or 4 distant lanceolate bracts; *spike* 2 to 3 in. long, the flowers numerous, after expansion rather distant, .2 in. across; floral bract lanceolate, acuminate, as long as the pubescent ovary. *Sepals* subequal, broadly triangular, acute. *Petals* as long as the sepals, broadly triangular, falcate, acute. *Lip* longer than the sepals and petals cymbiformly saccate in its lower half, the sac containing on each side three retroflexed short cylindric pointed processes; the anterior part with two horizontally divergent oblong lobes with truncate erose apices; the upper surface smooth in the living state. *Column* short, broad, the apex acuminate; its front with two vertical plates nearly touching by their margins, and a second and smaller pair situated obliquely at their bases. *Stigmas* 2, elliptic and somewhat oblique.

S. Andaman; at Dhani Kheri: G. King.

A species near *Z. moulmeinensis*, Hook. fil., but having smaller flowers, differently shaped sepals and petals, and three calli instead of a single callus on the interior of the lip on each side. In the living state the lip is glabrous; but when dry it has the appearance of being puberulous, from the contraction of some of the epidermal cells.

### OPHRYDEÆ.

ORCHIS SUB-ROTUNDA, n. spec. Height of entire plant 7 to 9 in.; tuber oblong, entire, hairy. *Leaf* radical, solitary, sub-coriaceous, elliptic-ovate to sub-rotund, blunt or subacute; the base rounded, not narrowed but abruptly joining the short scarious tubular sheath; length 4 in., breadth 3 to 4 in. *Peduncle* 3 to 4.5 in. long, smooth, bearing at distant intervals 2 or 3 linear-lanceolate acuminate bracts .5 to .75 in. long. *Raceme* 3 to 4 in. long, bearing many but not crowded purple flowers each measuring about .5 in. across; floral bract ovate-lanceolate, acuminate, as long as the straight smooth ovary. *Dorsal sepal* broadly ovate, conniving with the petals to form a hood over the column, all ciliate; lateral pair inserted partly on the spur, broadly-elliptic, falcate, subacute, reflexed. *Petals* elliptic with broad bases, subfalcate, subacute, nearly as long as the dorsal sepal. *Lip* orbicular, a little longer than the sepals, slightly narrowed at the base, the margins undulate, the upper surface densely and shortly hispid especially towards the middle, the base with 2 very short parallel thickened smooth ridges just above its junction with the foot of the column; spur subcylindric, nearly straight, parallel with but less than half as long as the ovary, as long as the reflexed lateral

sepals. *Column* short. *Anther-cells* close together, parallel; *pollinia* elliptic, somewhat compressed; the caudicles twice as long as the pollinia, thick, tapering to the broad ovate fleshy glands; glands covered by membranous pouches; *staminodes* small, rugulose, attached to the outside of the anther-cells. *Stigmas* 2, conjoined to form a narrow transverse band across the column between the anther-cells and their pollinia, and separated from the cells by a large erect ovate subacute tongue-like lamella.

Upper Burma; at Fort Stedman; Abdul Khalil, Collector of the Botanic Garden, Calcutta.

The flowers are purple throughout.

An extremely interesting species; remarkable for the large erect process interposed between the base of the anther-cells and the conjoined stigmas. The long caudicles pass outside this process, and emerge below the stigmatic surface where their glands are partially covered by membranous flaps from the sides of the column. In *Habenaria secundiflora* there is a resemblance to the structure here described in the two erect processes which form flaps in front of the pollinar glands.

*HABENARIA MASSONIANA*, n. spec. Whole plant about a span in height. *Stem* slender, with two or three blunt lax wide sheaths at the base. *Leaves* 2 or 3, rising very near the base of the stem, narrowly oblong-ob lanceolate, acute or sub-acute, much narrowed to the sheathing base; length 2 to 4 inches, breadth .25 to .5 in.; stem above the leaves long, bearing at intervals 2 or 3 lanceolate acuminate bracts. *Raceme* 1.5 to 3 in. long, sparsely-flowered. *Flowers* .45 in. wide at the mouth; floral bract linear, acuminate, half as long as the slender shortly-stalked obscurely-beaked ovary. *Sepals* unequal; the dorsal broadly ovate or almost rotund, blunt; the lateral pair ovate-lanceolate, subacute. *Petals* linear, acute or subacute, about as long as the sepals. *Lip* longer than the sepals and petals, 3-partite almost to the base; the middle lobe linear, straight; the lateral lobes filiform, rather longer than the middle lobe, curved and diverging, also decurved; spur rather shorter than the ovary, slightly clavate towards the apex, very little curved. *Column* blunt. *Anther-cells* parallel, close together. *Stigmas* 2, oblong-pyriform, diverging, situated under the mouth of the spur.

Upper Burma; at Fort Stedman; Calcutta Bot. Garden Native Collector.

A species allied to *H. viridiflora*, R. Br., but that species has smaller flowers, differently shaped leaves, narrower petals and a longer more slender spur. It is also allied to *H. Khasiana*, Hook. fil. (but is a larger plant with much broader leaves), and to *H. ditricha*, Hook. fil.; all members of the section *Trimeroglossa*. We have dedicated

this species to [the memory of the late Rev. Dr. Masson, for many years a Missionary in Burma, who wrote an excellent book on the economic condition, agriculture and natural products of that country. The colour of its flowers is unknown. As we have seen only dried specimens we are unable to give accurate details of the pollinia and their appendages, or of the staminodes.

*HABENARIA PRAZERI*, n. spec. Height of the whole plant about 20 to 24 inches, the stem rather slender. *Leaves* clustered towards the base of the stem, linear-lanceolate, acuminate, 3 to 5 in. long and .75 to 1.15 in. broad; peduncle of the inflorescence with 10 to 14 equidistant linear bracts .75 to 1.5 in. long. *Raceme* about 7 in. long, rather sparsely-flowered. *Flowers* .4 in. across; floral bract linear, finely acuminate, thin in texture, as long as or longer than the shortly-stalked obscurely beaked, ovary. *Sepals* unequal; the dorsal broadly ovate, blunt: the lateral pair slightly longer and narrower, acute. *Petals* smaller than the dorsal sepal, ovate-lanceolate, acute, very slightly falcate. *Lip* equalling the lateral sepals in length, its basal half transversely elliptic, slightly concave; its apical half fleshy, linear; the spur stout, half as long as the ovary, cylindrical, incurved. *Anther-cells* placed close together, parallel, their tubes up-turned.

Upper Burma, Prazer.

This is known only by a single dried specimen from an examination of which it has been impossible to make out with certainty the form of the pollinia and their glands, of the staminodes or stigmas. No account of them is therefore ventured upon. As Upper Burma gets better known, specimens of this will no doubt be forthcoming; and it is believed, that by the preceding description, this plant may be identified. The species is clearly allied to *H. latilabris*, Hook. fil., and to *H. densa*, Wall., but it differs considerably from both in lip, spur, ovary, and in the clustered leaves. Like these species, it belongs to the section *Hologlossa*. It agrees with nothing in the Kew Herbarium.

*HABENARIA LINEARIS*, n. spec. Height of whole plant fifteen to twenty-seven inches. *Stem* slender, with several blunt tubular sheaths near the base. *Leaves* scattered along the whole stem from nearly the base, diminishing in size upward and passing into bracts towards the raceme, linear, acuminate, 2 to 4 in. long and .2 to .4 in. wide; the bracts smaller and somewhat lanceolate. *Raceme* 1.5 to 2 in. long, 3- to 6-flowered. *Flowers* white, about .75 in. across at the mouth; floral bract linear, finely acuminate, ciliolate, longer than the very slender, long-beaked sub-sessile ovary. *Sepals* sub-equal, lanceolate, the dorsal conduplicate; the lateral pair falcate, spreading. *Petals* somewhat shorter than the sepals, narrowly oblong, tapering slightly to the blunt apex.



*Lip* slightly exceeding the sepals in length, lanceolate, the base with<sup>n</sup> a slender claw, the apex blunt; the edges entire, decurved; the lower surface with a strong central keel from base to apex; spur clavate, incurved, slightly exceeding the ovary in length.

Upper Burma; at Saga; in the Southern Shan States; Collectors of Botanic Garden, Calcutta.

In habit this somewhat resembles *H. commiliniifolia*. Wall., but the structure of the flowers is wholly different. This belongs to Sir Joseph Hooker's section *Hologlossa*. It is known only from dried specimens, hence no attempt is made to describe the column and the organs situated on it.

*HABENARIA HAWKESIANA*, n. spec. Height of entire plant about nine inches; tubers small, ellipsoid. *Leaves* whorled at the base of the stem, two or three, ovate-elliptic or elliptic, acute, slightly narrowed to the short wide sheath; upper part of the stem bearing 3 to 5 lax lanceolate scarious nearly equal bracts about .75 to 1 in. long. *Raceme* 2- to 4-flowered. *Flowers* large, white, rather, distant, 1.5 in. wide at the mouth; floral bract linear, acuminate, as long as the sessile shortly-beaked ovary. *Sepals* unequal; the dorsal ovate, acuminate; the lateral pair rather longer. *Petals* lanceolate, slightly falcate, membranous and many-nerved like the sepals. *Lip* a little shorter than the lateral sepals, entire, triangular, blunt, puberulous; spur two or three times longer than the ovary, incurved. *Anther-cells* wide apart, their tubes rather long; *pollinia* with caudicles nearly twice as long as themselves, triquetrous in the upper half, curved, the glands small. *Stigmas* confluent, occupying the whole width of the column above the very wide mouth of the spur.

Upper Burma; Prazer.

Collected only once by Mr. Prazer who secured only a few specimens. He describes the flowers as white, with the exception of the lip which is saffron-yellow. The species has been named in honour of Colonel H. P. Hawkes, C. B., late Commissary General in Burma, an ardent horticulturalist, and an excellent authority on Indian and particularly on Burmese, artistic metal work. It appears to be allied to *H. plantaginea* Lindl., but this has an entire lip, while the lip of that and of the section (*Platyglossa*) to which it belongs is characterised by being 3-lobed.

*HABENARIA NEGLECTA*, n. spec. Entire plant 12 to 15 inches high. *Stem* clothed in its lower part by several unequal lax scarious sheaths. *Leaves* 3 to 6, scattered along the stem, unequal in size, those in the middle being the largest, narrowly oblong, acute, not narrowed to the sheathing base, length 1.25 to 3 in., breadth .25 to .6 in.; stem above

the leaves slender, bearing 2 or 3 distant linear acuminate bracts. *Spike* 2 or 3 in. long, sparsely-flowered. *Flowers* .25 in. across; floral bract lanceolate, acuminate, entire, slightly longer than the sessile beakless ovary. *Sepals* oblong-lanceolate, blunt, keeled. *Petals* as long as the sepals but narrower, blunt. *Lip* fleshy, not longer than the sepals, adnate to the base of the column by the narrow claw, divided down to the claw into 3 very narrow lobes; the side-lobes longer and narrower than the middle one, linear, sub-acute, very slightly curved and spreading almost horizontally; the middle-lobe narrowly oblong, blunt, very fleshy; spur longer than the sepals and nearly as long as the ovary, almost straight and very slightly clavate. *Peristylus*, No. 13 Herb. Ind. Or. Hook. fil. and Thomson.

“Malabar and the Concan. Stocks, Law and others” in Herb. Ind. Or. Hook. fil. and Thomson.

This differs from typical *Habenaria aristata*, Hook. fil. (figured by Wight under the name *Peristylus exilis*, Wight, Ic. No. 1698) in having the lateral lobes of the lip much shorter, the sepals and petals narrower and not all ovate, the spur longer and very slightly inflated towards the apex, and the floral bract longer than the ovary.

*HABENARIA MAINGAYI*, n. spec. Entire plant 4 to 6 in. high; roots thickly fibrous, some of them expanding into small oblong tubers. *Stem* bearing a short sheath near the base. *Leaves* 3 or 4, sessile, crowded near the base of the stem, oblong-lanceolate, acute, .5 to 1.75 in. long and .15 to .4 in. broad; *Peduncle* of spike bearing 4 or 5 distant lanceolate finely acuminate bracts. *Spike* 1 to 1.5 in. long, 6- to 12-flowered, rather lax. *Flowers* .15 in. across; floral bract oblong-lanceolate, acute, as long as the slender sessile ovary. *Sepals* subequal, oblong-lanceolate, subacute, the *petals* slightly narrower. *Lip* as long as the petals, adherent by a short claw to the base of the column, 3-lobed; the lateral lobes broadly oblong, blunt, diverging, broader than the blunt mid-lobe, the margins entire; upper surface with a single small triangular tooth at the bases of the side-lobes; spur much shorter than the sepals, obovoid-globose.

Singapore; Maingay, Herb. prop. 3354 (Kew distrib. No. 1663).

This species differs from *H. tentaculata*, Reichb. fil. (*H. lacertifera*, Benth.), to which it has been referred, in having much narrower and more numerous leaves, flowers twice as large, and a lip with broader lobes.

#### NOTE.

We take this opportunity of giving a description, drawn up from a living specimen, of *Dendrobium parviflorum*, Reichb. fil., a species originally published in 1845, by Griffith (under the name of *Aporum*

*Jenkinsii*) in the Calcutta Journal of Natural History, Vol. V, 367, t. 25. This species, owing to the reduction of the genus *Aporum* to *Dendrobium*, was named in manuscript *Dendrobium parciflorum* by Reichenbach filius, and under that name was published, without description, by Lindley in the Journal of the Linnean Society, Vol. III, (1859) p. 4; and this name was adopted by Sir Joseph Hooker in the Flora of British India, (Vol. V, 725). No specimen of this plant had been seen either by Lindley or Hooker, and none existed in the Calcutta Herbarium until last year when a living plant, collected by himself in Assam, was contributed by Mr. Giesslière. Mr. Giesslière's plant was described and was figured by Mr. Pantling, and the description is now published.

The specific name *Jenkinsii* to which, as a member of a genus reduced to *Dendrobium*, this plant has by the law of priority a secondary claim, was given in 1839 by Wallich to *D. Jenkinsii*, a plant now usually regarded as a form of *D. aggregatum*, Roxb.; and also by the late Dr. T. Anderson to a plant which turned out to be *D. cumulatum*, Wall.

DENDROBIUM PARCIFLORUM, Reichb. fil. MSS. ex Lindley in Journ. Linn. Soc. III, 4. *Stems* tufted, slightly flattened, 6 to 10 in. long and .2 in. broad. *Leaves* linear-lanceolate, acute or sub-acute, very fleshy, 1 to 1.75 in. long and .25 in. broad. *Flowers* white, single or in pairs from the apex of the stems, 1.25 in. long; floral bract minute, lanceolate, stalked ovary 1 in. long. *Dorsal sepal* ovate, oblong, blunt; the lateral pair much larger and broader; *mentum* large, elongate, curved. *Petals* about as long as the dorsal sepal, oblong, blunt. *Lip* oblong-elliptic with a slightly expanded apex, not lobed, slightly narrowed to the base; the apex broad, crisped, divided into two lobules by a minute triangular sinus; the upper surface quite smooth, white but with a yellow blotch near the apex. *Column* much shorter than its elongate much-curved 3-furrowed foot; *mentum* large, wide, curved in front. *Anther* with an entire truncate lip. Hook. fil. Fl. Br. Ind. V, 725. *Aporum Jenkinsii*, Griff. in Calc. Journ. Nat. Hist. V, 367, t. 25.

Assam; the exact locality unknown; collected once about 1845 by Griffith, and once in 1896 by Mr. Giesslière: flowered in the Calcutta Bot. Garden.

A species of the section *Aporum*, but with unusually large flowers allied to *D. terminale*, Par. and Reichb. fil.

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*Notes on some Butterflies from Myingyan, Central Burma.*—By CAPT. E. Y. WATSON, INDIAN STAFF CORPS, F. Z. S.

[ Received June 15th;—Read July 7th, 1897. ]

Myingyan, as well as the rest of Central Burma, upsets one's preconceived ideas of Burma, which is generally looked upon as a land of heavy jungle and marsh and as reeking of fever. This last attribute may be considered as more or less mythical as regards the whole of Burma, in which there is no more fever than in Central or North-Eastern India, while where it exists it is almost entirely confined to the "terai" country at the foot of the hill ranges.

In Myingyan, however, not only is the fever a negligible quantity but the forest is non-existent, and the marsh or paddy-land is restricted to very limited areas flooded by the river; in fact the general appearance of the country is more like that of the Deccan than of the traditional Burma, and there are many points of resemblance between Myingyan and a place such as Ahmednagar. What jungle there is consists of low thorny scrub; while the chief crops cultivated are jowari, cotton, and oil-seed (gingelly), the soil being what is known as "black cotton" or a very fair imitation of it. Myingyan may be taken as fairly typical of what may be conveniently termed "Central Burma," which may be said to extend from Mambu northwards for some 150 miles; still further north the rainfall and general characteristics of the country again change and are very similar to those of Lower Burma and Tenasserim.

In Central Burma butterflies are comparatively scarce, and probably not more than 100 species would be found within ten miles of Myingyan as contrasted with some 300 odd which occur round Rangoon. The following notes are founded on a collection made by me from October to March, *i. e.*, practically the dry-season, though as the total rainfall is something under 30 inches it is doubtful whether the district would have proved much more prolific during the rains. Several species of interest were met with, one of which has recently been described as new, from Myingyan specimens.

No *Euplaeas* were observed, though probably *E. godartii*, Lucas, and *E. linnæi*, Moore, occur at the beginning of the rains; *Danaüs chrysippus*, Linnæus, and *D. plexippus*, Linnæus, [= *D. genutia*, Cramer], occurred commonly, and *D. limniace*, Cramer, more rarely.

A single *Mycalis* was observed, probably a *Calysisme*, but the species is doubtful, as the insect was not caught; *Melanitis ismene*, Cramer, was not seen but doubtless occurs, *Lethe europa*, Fabricius,

was represented by a single specimen and is probably rare. The most interesting satyrid was the *Ypthima* which I have recently named *Y. cerealis*; this was the only species of the genus met with, and it occurred in great numbers but only within very restricted areas, owing no doubt to the unequal distribution of its food-plant; one of its favourite haunts was among the low bushes which grow on the bunds of the paddy-fields at the bend of the river, but it also occurred some miles away from these fields on high bare ground where the bushes were few and scattered.

Among the *Nymphalinxæ* there is not much of interest to record, the only species met with being *Ergolis ariadne*, Linnæus, *A. phalantha*, Drury, *Junonia leonias*, Linnæus, *J. almana*, Linnæus, *J. hierta*, Fabricius, and *J. orithyia*, Linnæus; *Neptis leucothoë*, Cramer (form *eurymene*, Butler); *Hypolimnas bolina*, Linnæus, and *H. missippus*, Linnæus, of these the last species is rare in Burma, and to the best of my knowledge is only found in the more arid tracts, and I have no record of its occurrence south of Mambu on the Irrawaddy.

Some sixteen species of *Lycænidæ* were met with; the dry-season form of *Chilades laius*, Cramer, occurred commonly, also *C. trochilus*, Freyer; *Zizera lysimon*, Hübner, was fairly common, and did not appear to differ from Indian specimens; *Z. otis*, Fabricius, of which *Z. sangra*, Moore, is a synonym, occurred in great numbers, this species in all its forms is quite distinct from *Z. indica*, Murray, originally described from Allahabad, which occurs commonly in Southern India. The difference between the two species does not lie in the shade of blue or extent of the black margins on the upperside as some writers have tried to make out, since these characters vary seasonally, there is, however, a well-marked and constant difference in the discal row of spots on the underside of the forewing, in *Z. indica* these spots are invariably prominent and black, encircled with white, in *Z. otis* they are brown, hardly darker than the ground-colour of the wing, and are encircled with grey, so that they do not stand out at all conspicuously, this difference will be found to be absolutely constant in all the seasonal forms, and can be readily recognised if Burmese and Southern Indian specimens be compared, though I am unable to say if the two species meet and occur together in any localities; if good series are compared other slight differences will be noticed in the marginal markings and disposition of the spots on the underside of the hindwing. *Azanus jesous*, Guérin, (the oldest name for *A. gamra*, Lederer), occurred rarely among *Acacia* bushes; Burmese specimens do not differ perceptibly from Indian ones. This is a rare species in Burma, and is only found in the arid tracts. A single specimen only of *Lycænesthes lycænina*,

Felder, was met with, though it is probably not uncommon; *Talicauda nyseus*, Guérin, which as far as Burma is concerned only occurs in the drier districts, was excessively common; Colonel Swinhoe has recently described the Khasia Hill race of this species as distinct from the typical South Indian race under the name *T. khasiana*, the only point of difference being that in *T. khasiana* the rows of white spots on the underside of the forewing are more pronounced than in typical *T. nyseus*, so that in the Burmese race one would expect these spots to be still more developed. This however is far from being the case, as in the Burmese specimens the spots are as a rule even smaller than in typical Southern Indian ones, while in many cases the spots are almost absent, the outer half of the wing being entirely black, with a few faint greyish irrorations in place of spots, so that in this respect the Burmese race is nearer to the Southern Indian one than to the Khasi Hill one, which seems rather to suggest that the character taken by Colonel Swinhoe is not specific; Burmese specimens however differ from Southern Indian ones in having rather less red on the upperside of the hindwing, and in the chequering of the fringe being obsolescent instead of very pronounced, none of the differences however seem to warrant the Burmese race receiving a separate name. No *Nacaduba* or *Lampides* was observed. *Catochrysops strabo*, Fabricius, with its unnamed dwarf form, occurred commonly, also *C. pandava*, Horsfield, with its dwarf form *C. contracta*, Butler. I have recently been able to examine the type specimen of the last-named form, and find that it is not as suggested in "Butterflies of India, &c.," the dwarf form of *C. cnejus*, Fabricius, but of *C. pandava*, and has two seasonal races precisely similar to those of the larger race; *C. cnejus*, the dwarf form of which has been named *C. hapalina*, Butler, was not met with. Attention does not appear to have been previously drawn to the fact that all the three common species of *Catochrysops* which occur in India have corresponding dwarf forms, these dwarf forms are commoner in dry than in wet districts, and in arid tracts like Sind probably exceed the larger race in numbers. Of other named *Catochrysops*, *C. theseus*, Swinhoe, is a "sport" of *C. cnejus*, and the type of *C. nicola*, Swinhoe, is a female of *C. pandava*, somewhat intermediate between the two seasonal forms. *Tarucus plinius*, Fabricius, occurred commonly, also *T. callinara*, Butler, the two seasonal forms of the last species differ slightly in the tone of the dark markings on the underside, which in the rainy-season form are almost black and in the dry-season form are rusty-brown, the position, size and shape of the markings do not appear to differ in the two races, nor is there any perceptible difference in the shade of blue or breadth of the margins on the upperside.

*T. callinara* is a quite distinct species from one I have in my collection from the Deccan, the latter being the *T. extricatus* of Butler, which has the markings on the underside much more linear and run together than in *T. callinara*, in which they are rounded and well separated. The correct synonymy of the species of this genus is doubtful as neither *T. nara*, Kollar, nor *T. theophrastus*, Fabricius, can be identified with any certainty without an examination of the type specimens. *T. callinara* is I think without doubt identical with *T. theophrastus* as identified in "Butterflies of India," though not with the *T. theophrastus* of the British Museum, which includes several distinct species, and Mr. Butler informs me he does not now consider his *T. extricatus* to be distinct from *T. nara* as identified by him. *T. callinara* within Burmese limits is strictly confined to the dry tracts of Central Burma. *T. alteratus*, Moore, and *T. venosus*, Moore, both appear to be perfectly distinct species. I therefore recognise five species of this genus as occurring within Indian limits: *T. plinius*, which is found throughout the Indian region from Ceylon all over Peninsula India to Assam and Burma; *T. callinara*, which probably sinks to *T. theophrastus*, and is as widely distributed as *T. plinius* but affects drier localities; *T. extricatus*, which probably sinks to *T. nara*, and is confined to the dry regions of Western and North-Western India and the Western Himalayas; *T. alteratus*, confined to the North-West Himalayas; and *T. venosus*, confined to the North-West Himalayas and the plains of North-West India. *Castalius rosimon*, Fabricius, and *Polyommatus bœticus*, Linnæus, occurred commonly, and a single specimen of *Amblypodia anita*, Hewitson, was obtained. I have recently been able to examine the types of most of the described species of *Amblypodia*, and find that the common purple species which occurs in Burma is certainly the *A. anita* of Hewitson described from Siam, and that *A. darana*, Moore, and *A. naradoïdes*, Moore, are also synonymous with it, the males of the three named forms appear quite inseparable, while the females in Southern India and Ceylon are dimorphic, *i.e.*, either blue or purple on the upperside, one form being almost as common as the other; in Burma, however, the purple female is the prevailing form and the blue female is excessively rare. This species occurs in Siam, the Andamans and throughout the greater part of India. *A. narada*, Horsfield, the type of which is in the British Museum and which was originally described from Java, is a quite distinct species, the male is much more blue than *A. anita*, and the female, which is purple, has a large extent of purple on the upperside of the hindwing. *A. andersonii*, Moore, is, as stated in the "Butterflies of India," almost without doubt identical with *A. narada*. A third species of the genus is the *A. erichsonii* of

Felder, the male of which is very brilliant blue with a broad black border to the forewing narrowing to the outer angle, this species is in the British Museum from the Philippines and Borneo. *A. taoana*, Moore, of which the type is in the British Museum, appears to be identical with *A. erichsonii*. *A. arracana*, Grose Smith, is also probably referable to the same species. *Aphæus syama*, Horsfield, occurred rather rarely, and a second species which I identify as *A. schistaceus*, Moore, was slightly more common. This latter species belongs to the *vulcanus* group of the genus, and is the only one of the group recorded from Burma.

Among the *Pierinæ*—*Catopsilia catilla*, Cramer, *C. crocale*, Cramer, and *C. gnoma*, Fabricius, were common, this last is probably the dry-season form of *C. pyranthe*, Linnæus, and has many other names, but I am unable to say which is the oldest. *Nychitona viphia*, Fabricius, and *Nepheronia hippia*, Fabricius, (= *gæa*, Felder), occurred commonly, and *Delias descombesi*, Boisduval, and *D. hierte*, Hübner, rather rarely. A single male of *Appias vacans*, Butler (the dry-season form of *A. hippo*, Cramer) was obtained in December. *Appias zelmira*, Cramer, and *Huphina dapha*, Moore, were exceedingly common; the extreme rainy-season race was not met with, all the specimens obtained from November to March being either of the typical dry-season race or forms intermediate between the two races. *Terias hecabe*, Linnæus, occurred commonly in its typical form during November and December, but almost invariably in bad condition, the dry-season form, *T. excavata*, Moore, occurred commonly from November to January, and was replaced during February and March by the extreme dry-season form, *T. swinhoei*, Butler. Yellow forms of *Ixias* occurred in the utmost profusion, and showed the usual seasonal variation in the breadth of the dark margins on the upperside, and in the tone and markings of the underside; most of the specimens caught were typical *I. moulmeinensis*, Moore, though several were typical *I. pyrene*, Linnæus, and a few typical *I. pirenassa*, Wallace, while there were many intermediates between the three forms.

The only *Papilio* noticed was *P. demoleus*, Linnæus (= *P. erithonius*, Cramer), which was excessively common.

Among the *Hesperiidæ* no species could be said to occur commonly, but a few specimens were obtained of *Baoris (Chapra) mathias*, Fabricius, *Baoris (Parnara) bada*, Moore, *Telicota augias*, Linnæus, and *Hesperia galba*, Fabricius. A single sex was obtained of *Taractrocera ziclea*, Plötz, a species recently found to occur in Burma; also a few specimens of a *Padraona* which I identify as *P. mæssoides*, Butler, as well as of a second species which I believe is undescribed.



## NOTE BY LIONEL DE NICÉVILLE.

As regards the distinctness of *Zizera indica*, Murray, from *Z. otis*, Fabricius, I wrote in "The Butterflies of India, Burma and Ceylon," vol. ii, p. 121 (1890) that "There is no doubt that the former is strictly synonymous with *Z. sangra*, Moore [which Capt. Watson admits], which again is a synonym of *Z. otis*, Fabricius." The only authors who have referred to *Z. indica* are Mr. Murray who described it from Allahabad at the instigation of Mr. Moore, Mr. Moore who records it from Ceylon and the N.-W. Himalayas, Mr. Butler from Mhow and Formosa, Col. Swinhoe from Poona and Ahmednugger in the Bombay Presidency, and Dr. O. Staudinger with a query from Palawan in the Philippine Islands. I have a very long series of specimens of *Z. otis* from almost throughout India, Burma, Sumatra, Java, Celebes, &c. I have tried my utmost to separate these specimens into two species by the character of the spots on the underside of the forewing by which test Capt. Watson says they can be differentiated, but have failed, as though in some specimens the spots are "brown," (or more correctly pale fuscous) with grey borders, while others are deep black with prominent white borders, I have many specimens which are strictly intermediate. I gather that Capt. Watson restricts *Z. indica* to Burma and South India, but it must be held to occur in the N.-W. Provinces, from whence it was originally described. But Capt. Watson does not say where he considers *Z. otis* to occur. I consider *Z. otis* to inhabit all India and across Southern Asia to Hongkong, Burma, the Malay Peninsula, the Philippine Islands, and probably most of the islands of the Malay Archipelago, from many of which it has been recorded, chiefly by the German and Dutch writers, as *Z. lysizone*, Snellen.

With regard to *Tarucus theophrastus*, Fabricius, which Capt. Watson splits up into four distinct species in India, I am prepared to admit tentatively that the *T. venosus*, Moore, may be a distinct species; but that *T. callinara*, Butler (? typical *T. theophrastus*), *T. extricatus*, Butler (? *T. nara*, Kollar), and *T. alteratus*, Moore, are also distinct I greatly doubt. In this connection the notes by Dr. N. Manders in Ent. Month. Mag., vol. xxviii, p. 130 (1892) on the seasonal forms of *T. alteratus* and *T. theophrastus* found at Rawal Pindi in the Punjab may be studied with advantage.

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*Contributions to the Theory of Warning Colours and Mimicry. No. IV.  
Experiments with various Birds. Summary and conclusions.—By  
F. FINN, B.A., F.Z.S., Deputy Superintendent of the Indian Museum.*

[Received May 27th; Read June 2nd, 1897].

### Introduction.

In accordance with the intention implied in previous papers of this series, (*J. A. S. B. LXIV, Pt. II, 1895 p. 344; LXV, Pt. II, 1896, p. 42; LXVI, Pt. II, 1897, p. 528*). I give in this, the final paper thereof, an account of my experiments with birds other than the Babblers (*Crateropus canorus*) to which my first paper was devoted, together with a general summary and conclusions.

Some of the experiments herein detailed had already been made when my paper on the Babblers was published, and I have made many others since.

Most of these have been made with birds of the Passerine order, the largest and most important of all the groups of birds commonly regarded as of ordinal value. And among these I have paid particular attention to the birds of the Babbler group\* generally, that being cre

\* Unfortunately great difference of opinion prevails among ornithologists as to the extent and limits of this group of birds, the "family" *Crateropodidæ* or *Timeliidæ* of authors.

For the purposes of this enquiry I restrict the term "Babbler" to species belonging to Mr. Oates' (*Fauna of British India, Birds, Vol. I*), "sub-families" *Crateropodinæ*, *Timeliinæ*, *Sibiinæ*, and *Liotrichinæ*. I have experimented with none of the *Brachypteryginæ*; and though inclined with Mr. Oates to rank the

in which I am specially interested, so that I was led to keep many of the species in order to observe them in life.

In fact, the experiments in this paper are often not very systematic, since experimenting on this subject was not always my main object in keeping birds at all.

The keeping of many specimens of one or several groups of birds together is not the best possible way at arriving at experimental results, and many of the present experiments were made under these conditions, especially those in which Babblers of different kinds were concerned. And for this I feel some apology is due to investigators.

Considering, however, the largely arboreal habits of many Babblers, and their abundance in this Oriental region, I do not think that any great harm will result from the particular attention I have given to their tastes in the matter of insects.

### SECTION I.

#### MISCELLANEOUS EXPERIMENTS WITH VARIOUS BIRDS, MOSTLY BELONGING TO THE BABBLER AND BULBUL GROUPS, AND KEPT TOGETHER. SERIES A.

I commenced this series of experiments in 1895, soon after releasing the Babblers dealt with in my first paper, *J. A. S. B. LXIV, Pt. II, 1895, p. 344.* The birds used were kept in the aviary vacated by these, and were fed on seed and fruit.

The insectivorous birds at first put in were four Red-whiskered Bulbuls (*Otocompsa emeria*) and five Liothrix (*Liothrix luteus*); but before long one of the former and two of the latter escaped. Other birds were put in afterwards, as noted below, including another species of Bulbul.

Bulbuls live largely on fruit, but also devour insects, in doing which they do not use their feet to hold their prey, but depend entirely on their beaks; they have considerable swallowing power. Many species are found in the African and Oriental regions.

The Liothrix uses its foot to grasp its prey, like *Crateropus canorus*, which it resembles in many of its habits. This bird is very active and intelligent, and feeds on fruit and seed as well as insects. It is well-known to amateurs of birds in England as the Pekin Robin; and has a certain resemblance in size, &c., to the true Robin. It is common in the Himalayas and extends into China.

*Brachypodinx* or Bulbuls with the more typical members of the Babbler group I here treat of them as a separate one, that being the position assigned to them by several ornithologists.

They are less active on their legs and more so on their wings than the Babblers proper, a very practical distinction in habits for those considering the relations of birds to insects.

The experiments were usually on consecutive days.

I. Put into the aviary an insect-cage containing a number of non-warningly-coloured butterflies (*Papilio demoleus*, *Catopsilia* and *Junonia*), with one *Delias eucharis*\* and four *Danais chrysippus*. Two *Catopsilias* were taken when they came out by *Liothrix*, while a *D. chrysippus* was not. I then took out the butterflies and put them into the aviary through the netting. Presently a Bulbul deliberately took a *D. chrysippus* and ate it whole, though it might have had other butterflies.

I then saw another *D. chrysippus* eaten whole by a Bulbul. The *Liothrix* did not seem to attack them, though they took *Junonias*. I saw a *Liothrix* take a *Catopsilia* after rejecting a *D. chrysippus*. It then left this and took a *Junonia*, which it ate nearly whole.

I then saw a Bulbul take a *D. chrysippus* (the only butterfly near it) which it prepared to swallow, but dropped accidentally; what happened next I did not see.

II. Put into the aviary a number of non-warningly-coloured butterflies and two *D. chrysippus*; the latter were not attacked by the *Liothrix*, but eaten whole by two Bultuls, being the first butterflies attacked (they were nearest) by these birds, which did not, at any rate immediately, eat others. Both sexes of *Elymnias undularis* were among the insects put in, and I saw the females were not avoided by the *Liothrix*, but seized.

III. Put in a number of non-warningly-coloured butterflies and four *Danais chrysippus*. One *Danais* was eaten by a Bulbul, and one taken and left by a *Liothrix*, these birds attacking other butterflies.

Another Bulbul took a non-warningly-coloured butterfly, and a third a *Papilio demoleus*, which seemed to give it much trouble, and it did not eat it. A Bulbul then flew down and took and ate a *D. chrysippus*, though there were other butterflies on the floor. (I have seen a *Liothrix* peck the wings of a *Catopsilia* and then leave it).

Neither *Liothrix* nor Bultuls offered to touch a *Delias eucharis* even when it fluttered close to them.

Two *D. chrysippus* and some other butterflies were uneaten, and the birds were going to roost, when I put in a number of *Danais chrysippus*, and some *D. limniace* and *Euplœa*. None were attacked as far as I saw. The Bultuls should have been hungry, as there was no fruit in the cage at the time, though I then put in some.

\* Another specimen of this species was the only butterfly that remained uneaten from the previous day, when I had given many butterflies and seen both warningly-coloured and harmless species attacked, before regularly taking these notes.

IV. The *Delias eucharis* put in the previous day was still alive and not much torn, while of the other butterflies I found only wings left. There was no fruit in the cage but a partly eaten orange which I had put in at the same time as the butterflies. I put in some cockroaches, which, like the *D. eucharis*, were not attacked. Later on in the day I found the *D. eucharis* dead, but uneaten. The cockroaches got away under the drinking vessel.

I put into the aviary a large insect-cage containing various butterflies, mostly warningly-coloured ones; a *Limnitis* and two *Danais* (*chrysippus* and *genutia*) first came out, and the former was seized by a *Liothrix*, which could just as easily have taken a *Danais*. The *Liothrix* did not take any insects from the cage, but one then caught, tore, and apparently ate the *D. genutia* which had come out. They tried, however, to get at the insects through the glass, and then one came to the entrance and took a non-warningly-coloured butterfly.

I then took out the cage and put its contents into the aviary. I did not see the *Liothrix* eat any more *Danais*—on the contrary, I several times saw them take a non-warningly-coloured butterfly when they could easily have had one of these.

I saw a Bulbul swallow a *D. chrysippus*, and two *D. chrysippus* and a *D. limniace* taken, beaten, and dropped by this species. There was plenty of fruit in the cage.

When the birds were going to roost the only non-warningly-coloured butterflies left out of about a dozen were one *Elymnias undularis* ♂ (dead), and a *Nepheronia hippia* ♂. These two I took out and reserved, with two *Danais chrysippus*. (I could not find them, however, when I wanted them next day).

V. The *Delias eucharis* mentioned in the account of the experiments of the previous day, was still uneaten, though the other butterflies seemed to have been devoured.

I put in some more butterflies, and saw that though the *Liothrix* readily attacked *Danais* at first, they took non-warningly-coloured butterflies when they had the choice.

I now added to the collection two common Buleuls (*Molpastes bengalensis*), and four Button-Quails (*Turnix taigoor*), and put in some more butterflies, including a *Papilio aristolochiæ*.

This time again the non-warningly-coloured species were obviously preferred by the *Liothrix*.

At some time or other to-day I saw a *D. chrysippus* swallowed whole by a Red-whiskered Bulbul, and another eaten by a *Liothrix*, which species also ate a *Danais limniace*. I also saw a common Bulbul reject a *D. chrysippus*, many of which species had been given.

Next day all the butterflies were gone (I did not notice the *Delias eucharis*) but the *Papilio aristolochiæ*, which was not even hurt till the afternoon, when a Bulbul killed it, and some bird, I think, afterwards ate the abdomen. Yet the birds had no insects to-day. The *Liothrix* often pecked at the wings lying about.

VI. I put into the aviary a number of butterflies, the non-warningly and warningly-coloured species being fairly equal in number, the former comprising *Catopsilia*, *Junonia*, &c., and the latter being chiefly *Danais chrysippus*.

The *Liothrix* only attacked non-warningly-coloured species at first, as far as I could see, and the Button-quails also seemed to like these best, for I saw one swallow a *Catopsilia*, and they eagerly pursued *Liothrix* which had one of these or another non-warningly-coloured butterfly in their possession. On the other hand, I saw a *D. chrysippus* worried by one, but I am not sure that it was eaten.

The Common Bulbuls made no attempt to eat any butterflies but one *D. chrysippus*, which was taken and I think eaten by this species, even with other butterflies about. I saw the Red-whiskered Bulbuls eat two *D. chrysippus*; I forget whether at this particular time there were non-warningly-coloured butterflies about, but when there were these birds made no attempt to eat them.

The *Liothrix* afterwards attacked and ate some of the warningly-coloured kinds; I saw an *Euplæa* and a *D. genutia* taken and eaten even when two *Elymnias undularis* ♂ were in the aviary. I had put in two males of this species and one female (in bad condition and much torn) with their upper surface displayed; but the first bird that came (a Button-Quail) chose the female first.

The Bulbuls had had no food for two hours at least, and ravenously devoured part of a plantain put in. When the birds went to roost the only butterflies unhurt were a *Papilio aristolochiæ* and some *D. chrysippus*; a *P. demoleus* lay dead.

A *P. polites* was soon killed, though I did not see it done, and I think a Button-Quail ate it.

VII. Next morning all the butterflies appeared to have been eaten but the *Papilio aristolochiæ*, which was still alive, though in the afternoon I found it dead, but uneaten.

About 5 P.M. I put in first a *Delias eucharis*, which was attacked and devoured whole by a Button-quail, which had yet not eaten the *P. aristolochiæ*.

I then put in another *P. aristolochiæ* and a *P. polites*, together. The latter was almost immediately attacked by the *Liothrix*, and I think partly eaten, while a Button-Quail swallowed the remainder. The

former was not molested by either kind of bird, though they looked at it. Having given a *Liothrix* a *Huphina phryne* in my fingers from outside, I then offered, one in each hand, a *Hypolimnas misippus* ♀ and a *Junonia*. The latter was taken, but it was nearest the bird; immediately afterwards another *Liothrix* tried to take the *Junonia*.

I repeated the experiment with this mimic and a *Catopsilia*; this time the bird chose the *Catopsilia*, though not nearest.

I repeated the experiment with the mimic and another *Junonia*; the bird crossed over from the perch nearest the *Hypolimnas* to that nearest the *Junonia*, and took this.

I repeated the experiment with the *Hypolimnas* and a *Huphina phryne*; the birds were timid, but both insects were approached, and the head of the *Hypolimnas* snatched off; but when I left both stuck in the netting, a *Liothrix* took the *Huphina*; it was taken from it by a Button-Quail. I stuck the mimic and a small ferruginous butterfly in the netting; the first *Liothrix* chose the latter.

I put in a *Danais chrysippus*, which a *Liothrix* immediately seized; and I saw it at least partly eaten, I suppose by the same bird.

I offered a *D. chrysippus* to the Button-Quail, which took and killed it, but it was taken from them and eaten by a *Liothrix*.

I put in two *P. demoleus* and two *D. chrysippus*; one of the former was taken and rejected by a Red-whiskered Bulbul. I saw one *Papilio* eaten by a Button-Quail, and I think the other was. Of the *D. chrysippus* one was swallowed whole by a common Bulbul, and one killed by a Button-Quail, which lost it to a *Liothrix*, which ate it.

I put in then six *D. chrysippus*, which were attacked by the *Liothrix* and Red-whiskered Bulebuls, and I saw two swallowed by the latter birds. While some of these *Danais* were alive, I put in three more, and saw two worried and partly at least eaten by Button-Quails.

As the birds were now going to roost, I ceased experimenting, leaving three *D. chrysippus* and a *P. aristolochiæ*, alive, and another of the latter species dead, in the aviary. There was still a little fruit left, and there was always seed in the cage.

The Bulebuls had no chance at any non-warningly coloured butterflies.

VIII. Next day, no butterflies visible in the morning but the two *Papilio aristolochiæ*, that left living still alive, though injured. I put in specimens of *Danais genutia*, *D. chrysippus*, and *D. limniace*, and *Euplæa*, which were attacked readily by the birds. I saw a Button-Quail swallow an *Euplæa*, and a *Liothrix* drop one. This I have seen *Liothrix* do before, but I believe it will eat this species.

There was no fruit in the cage. All the butterflies soon disappeared. I put in some fruit, which the Bulebuls ate ravenously.



IX. Next day there was no trace of the two *Papilio aristolochiæ* but a wing.

I put in first a *Delias eucharis*, which a Button-Quail ate. Then I put in a *Danais chrysippus*, which was soon seized by a Liothrix.

I then put in three non-warningly-coloured butterflies, and one each of *D. chrysippus*, *D. genutia*, and *D. limniace*. The Liothrix first took two of the non-warningly-coloured specimens, then one took the *D. genutia*, and then another the third non-warningly-coloured specimen. The *D. genutia* ultimately fell mostly to the share of a Button-Quail, and the *D. limniace* appeared to be eaten by a Liothrix.

While the *D. chrysippus* was still alive in the aviary, I put in one specimen each of *D. genutia* and *D. limniace*, and also a *Catopsilia* and a *Junonia*. The latter was seized by a Liothrix, and a Button-Quail attacked all three *Danais*, but finished by eating the *Catopsilia*. A Liothrix then ate the *D. genutia*.

While these still were in the cage *D. limniace* (alive) and *D. chrysippus* (dead), I put in three fresh specimens of *D. genutia* and *D. chrysippus*, and *Euplœa*, and several non-warningly-coloured specimens. These last were soon attacked by the Liothrix, and the Button-Quails ate some, though the former *D. chrysippus* lay there dead.

A Liothrix, seizing by accident a *D. limniace* and a non-warningly-coloured butterfly together, let the *Danais* drop and retained the other.

While the *Danais* only were still noticeable in the aviary, I put in a *Junonia*, which was soon seized by a Liothrix, obviously by choice, as the others were mostly close by.

One *D. chrysippus* was then attacked by a Button-Quail, and part at least eaten by a Red-whiskered Bulbul. The non-warningly-coloured butterflies were now all gone; two Button-Quails swallowed the *Euplœa* and a *D. chrysippus*, which a Red-whiskered Bulbul (weakly) had tried to eat. The *D. limniace* had also by this time disappeared (I think eaten by a Liothrix after the non-warningly-coloured butterflies were gone); the *D. genutia* was still alive.

I then put in one specimen each of *P. polites*, *P. demoleus*, *D. chrysippus*, *D. limniace*, and *Euplœa*.

The birds now mostly wanted to rest, but the Button-Quails (assisted perhaps by a Red-whiskered Bulbul) soon finished all but a *D. genutia* and a *D. limniace*, and these were soon dead and mangled.

I then put in a number of *D. chrysippus*, two or three *D. genutia* and two *Euplœas*, a *Junonia*, and an *Elymnias undularis* ♀.

The *Junonia* was unmistakably singled out for attack and seized by Liothrix, which next attacked the two *Euplœas*, and I saw one eaten, and have no doubt the other was.

I saw *D. chrysippus* attacked both by this species and by Red-whiskered Bulbul, and then left off watching, being convinced already that *Liothrix* preferred the non-warningly-coloured butterflies. I was not so sure about the Buleuls, which I saw this time neglected all butterflies, when both sorts were together, and yet they eat warningly-coloured ones.

The birds had had a good meal of fruit before I began experimenting. The fate of the *Elymnias undularis* ♀ I did not see, but I expect that, like *P. polites*, it was not a good enough mimic to escapes as I have seen it before seized by *Liothrix*. The rest of the butterflies were soon eaten.

#### EXPERIMENTS WITH VARIOUS BIRDS. SERIES B.

About this time I released all the Buleuls. A day or two afterwards I noticed a bit of a *Papilio aristolochiæ* on the floor. For several days now the birds had practically no insects but those they could catch casually. I gave them, however, two *Euproctis* moths one day. One was eaten by a Button-Quail the other by a *Liothrix*, which latter did not seem to relish it much. Wild birds do not seem to eat this species, though helpless by day at any rate and easy to see. I then commenced another series of experiments.

I. I offered a *Nepheronia hippia* ♀ with a *Danaïs limniace*, a *Catopsilia*, and two other non-warningly-coloured butterflies. These last three were seized by the three *Liothrix*, and a Button-Quail disabled the mimic, which I took out.

I offered the *N. hippia* with a non-warningly-coloured species, and the *N. hippia* was taken first, by a *Liothrix* (it was nearest). *D. limniace* was as yet untouched.

I put in *Euplœa*, *D. chrysippus*, and two non-warningly-coloured species, one a *Huphina phryne*. The former was taken by a *Liothrix*, but the bird hardly had a fair choice.

I put in *Euplœa*, *D. chrysippus*, *D. limniace*, and a *P. polites*; none were taken at once, but a *Liothrix* found and took a non-warningly-coloured one. Then *Euplœa* was taken.

I put in several *D. chrysippus*, with a *P. demoleus* and a *P. polites*, and a non-warningly-coloured specimen, which was picked out by a *Liothrix*.

A Button-Quail turned away from a *D. chrysippus* and ate the *H. phryne* previously put in, as mentioned above, and I suppose dropped by *Liothrix*. Soon after this I saw a *Liothrix* eat an *Euplœa*; and soon after I saw another eat a *D. limniace*, and another take a *D. chrysippus* which had been refused by a Button-Quail. The *Papilios* were still alive, as also one *D. limniace*, one *Euplœa*, and several *D. chrysippus*.

II. Next day, the only butterfly not torn was *Papilio demoleus*, and it soon disappeared.

I put in three *Atella phalanta* and one each of *Danaüs genutia*, *D. chrysippus*, and *Euplœa*.

Two *Atellas* were seized by two *Liothrix*; the third *Liothrix* took the *Euplœa*.

A Button-Quail ate the *D. genutia*, and then an *Atella*, which I don't think the birds saw at first.

The *D. chrysippus* was soon seized by a *Liothrix*.

I put in *Euplœa*, *D. chrysippus*, and two non-warningly-coloured butterflies. The latter were taken by *Liothrix*, one, an *Elymnias undularis* ♂, being obviously chosen in preference to *D. chrysippus*. While the *Euplœa* and *D. chrysippus* were untouched, I put in one *D. chrysippus*, one *D. genutia*, and two *Catopsilias*. The *Catopsilias* were chosen by *Liothrix*.

While two *D. chrysippus*, a *D. genutia*, and an *Euplœa* were in the aviary, I put in a *Huphina phryne*, which was taken by a *Liothrix*. I put two more in, but they were in a corner, and the birds did not seem to see them.

I put in then, the two *D. chrysippus* and a *D. genutia* and *Euplœa* being still alive, two *Papilio demoleus*, and two *P. polites*. One of the last fell to the ground and was swallowed whole by a Button-Quail; none of the other butterflies were attacked, not even the two *H. phryne*, which I picked out and put on a box. Here the *Liothrix* looked at them and one picked them up. Yet at this time a *Liothrix* caught mosquitoes.

The female Button-Quail (which had eaten the *P. polites*), now after many attempts swallowed the *D. genutia*, which was obviously too big for her. She had previously attempted to swallow an *Euplœa*, which when she left it was long pecked at by the male, and pulled to pieces, but little if any was eaten.

I put the two *Huphina phryne* on the floor, and a *Liothrix* pulled one about, but hardly touched it, though these birds took the remains of the *Euplœa* and picked at them.

However, a *Liothrix* soon after ate one of the *H. phryne*, while there were two *P. demoleus*, two *D. chrysippus*, and a *P. polites* in the aviary. I then put in a *Neptis leucothoë*, which was seized by a *Liothrix*, which dropped it, and another carried it up on to a box at the top of the aviary, where I did not see what happened further. I then took out and reserved the two *D. chrysippus* and *P. demoleus*, and the *P. polites*, (a mimetic specimen), and reserved them, all unhurt. Part of a *H. phryne* still lay on the floor of the cage.

When I put in the butterflies I had reserved, the *Danais* was first attacked, then the *P. polites*; the *P. demoleus* was left a little time, then it disappeared, as the other two species had done.

III. I put in two *Danais chrysippus* and one *D. genutia* and three non-warningly coloured butterflies. The *Liothrix* took the latter first; then one took the *D. genutia*. The female Button-Quail apparently ate the two *D. chrysippus*, but she had no fair chance at the others.

A *Papilio aristolochiæ* put in was not touched by any of the birds. But a few hours after only a wing was left.

I put in one *D. chrysippus* and *Euplœa* and two or three non-warningly-coloured ones. These were taken first.

I put in a female of *N. hippia*, which was eaten by a Button-Quail.

I put in some *Danais* with *Huphina phryne* and other non-warningly-coloured specimens where the Button-Quails could have a choice; they did not seem eager for any, and certainly did not pick out the non-warningly-coloured ones. A *Liothrix* went on tearing a *Euplœa* even among these, and I think ate it.

Soon the Button-Quail ate a greyish butterfly, and a *Liothrix* took one of the *H. phryne*, while two *D. chrysippus* were still left.

An *Elymnias undularis* ♂ was in a corner, so I put it between the two *D. chrysippus*, whence a *Liothrix* took it.

In the evening I put in one each of *D. chrysippus*, *D. genutia*, *D. limniace*, and *Euplœa*, with a similar number of non-warningly-coloured butterflies. The *Liothrix* deliberately picked out three of these; I did not see whether they got the fourth. The Button-Quail swallowed the *D. chrysippus*. Then a *Liothrix* took the *Euplœa*.

IV. Next day, the *Danais limniace* put in yesterday had been eaten. I put in an *Euplœa* with two *Nepheronia hippia* ♂. A *Liothrix* took the *Euplœa* first, before I was fairly out of the aviary. Only the undersides of the *N. hippia* were visible.

When all these were eaten, I put in two *Papilio demoleus*, two *P. polites* (not much like *P. aristolochiæ*), and two *D. chrysippus*. A *P. demoleus* was first taken, by a *Liothrix*. *P. polites* seemed to be looked at by these birds with some suspicion; yet one was soon taken, and another seized, pecked, and left, by them. This specimen, however, and both the *P. demoleus* (one of which I think was swallowed by the female Button-Quail) disappeared before one *Danais* did. This, however, afterwards disappeared.

V. Next day, I put in one each *Danais chrysippus*, *D. genutia* and *Euplœa*, with three non-warningly-coloured butterflies. The *Liothrix* took at the first attack the *Euplœa* and two of the non-warn-

ingly-coloured butterflies, while next one took the third, a *Catopsilia*, in distinct preference to the *D. genutia*. The *D. chrysippus* was swallowed by the female Button-Quail. I then saw an *Elymnias undularis* ♂ and a *Huphina phryne*, (which I put in) both taken by *Liothrix*, when there was another *D. chrysippus* in the aviary; but I doubt if they properly saw the latter. I then put in four *Papilio demoleus* and two *D. chrysippus* (one of the latter species being in the aviary still). A *P. demoleus* was first seized, by a *Liothrix*. The female Button-Quail took a *D. chrysippus*, but neglected the *P. demoleus*. A *Liothrix* then attacked the other *P. demoleus* but did not kill it; nor did the Button-Quails notice it, as it fluttered on the floor. I then turned in some small young cockroaches, which were greedily eaten by the Button-Quails, and also taken by *Liothrix*, (as, indeed, happened yesterday). Yet on that occasion I saw a *Liothrix* leave a cockroach, after having butterflies as now.

I saw the male Button-Quail look at and leave *P. demoleus*. Some hours afterwards all these butterflies were gone, and I put in two male *Hypolimnas* and two *Euplœas*. The first *Liothrix* took an *Euplœa*, the second a *Hypolimnas*, a Button-Quail the other *Hypolimnas*, and *Liothrix* the other *Euplœa*. All were eaten as far as I could see, but I don't think by their original captors exclusively.

I put in two more *Euplœas*, and two *Junonias* of different species; the first *Liothrix* took an *Euplœa*, the second a *Junonia*. A Button-quail got the other *Junonia*. One *Euplœa* was still in the cage when I put in a small *Lycænid*, which was eaten whole by a *Liothrix*. It was still there when I put in a *Huphina phryne*. This was not attacked at once; I blew it down, and a Button-quail ate it. The last *Euplœa* was then eaten by a *Liothrix*.

I put in a protective *Satyrid* and a *D. chrysippus*. A Button-quail ate the former. The *D. chrysippus* was still untouched when I put in several more, with one *D. genutia*, one *D. limniace*, and three *P. polites*. The *Liothrix* attacked none at once. A Button-quail pecked at *P. polites* and swallowed a *D. chrysippus* whole.

VI. The male Button-quail was now lost.

I put in three *Junonias* and one each of *Danaïs chrysippus*, *D. limniace* and *Euplœa*. The female Button-quail got one *Junonia*, and a *Liothrix* took the *Euplœa*, while a second *Junonia* was in a corner. I blew it out, when a *Liothrix* distinctly chose it before the two *Danaïs*. I think the Button-quail got the third *Junonia*.

While the two *Danaïs* were in the cage, I put in two *Junonias*. A *Liothrix* distinctly chose one before the *D. chrysippus*; the Button-quail got the other.

I put in another *Junonia* which was soon taken by *Liothrix*, though the *Danaïs* were still there. However, a *Liothrix* which had got part of the *Euplœa*, did not leave it for the *Junonia*.

I then put in several non-warningly-coloured and "protected" butterflies; the former nearly all disappeared first.

VII. I put in two *Catopsilias* and two *Delias eucharis*. The former were seized by *Liothrix*.

I put in four *Euplœas* and four non-warningly-coloured butterflies. An *Euplœa* was first taken by a *Liothrix*; then the rest of the non-warningly-coloured specimens disappeared. I saw two taken before *Euplœas* by the *Liothrix*. While three *Euplœas* were left, I put in another non-warningly-coloured butterfly, which was immediately seized by a *Liothrix*.

I then put in some more butterflies, including *Danaïs chrysippus*, *D. genutia*, *Papilio aristolochiæ* and a blue and black species, two *Huphina phryne* and *P. demoleus*. I put in one *H. phryne* before the other, but a *Liothrix* looked at and did not take it, and one of these birds took one of the *Euplœas*. All this time the Button-Quail did not attempt to eat the *Delias eucharis*, while it swallowed two *D. genutia*. The blue and black *Papilio* was killed and left by a *Liothrix*, swallowed by the Button-Quail. The *H. phryne* were eaten, by *Liothrix* I think, while some other butterflies yet remained untouched.

At the end of the afternoon only the two *Delias eucharis* were left, dead but uneaten, on the floor.

I then put in two or three non-warningly-coloured butterflies and three *Euplœas*; the *Liothrix* preferred the former. While one *Euplœa* remained untouched, I put in a *D. chrysippus* (a *Liothrix* had just taken one of the species) and three non-warningly-coloured butterflies, all of which latter were taken by the three *Liothrix*. This in spite of two of them, *Atella phalanta*, being tawny like the *Danaïs*.

While the *Danaïs* and one *Euplœa* were untouched (a *Liothrix* was eating another *Euplœa*) I put in another non-warningly-coloured butterfly. The first *Liothrix* was regarding it closely, when another took it.

I then put in six *D. chrysippus*, two *P. demoleus*, one *P. polites*, one *D. limniæ*, and one *Nepheronia hippia* ♂. This last was the first seized by a *Liothrix*, which left it. It was, however, ultimately eaten by a bird of this species. But they seemed less keen on butterflies than previously.

VIII. Next day in the morning I found only the two *Delias eucharis* and a *Papilio aristolochiæ* left. In the evening they still lay there.

I put in two *P. polites*. The first, a non-mimetic one, was looked

at, but not touched, by the first *Liothrix* and the Button-Quail; the second, though much more like *P. aristolochiæ*, was very soon taken by a *Liothrix*.

I then put in some *Danais chrysippus*, *D. genutia*, *D. limniace*, and *Euplœa*. The Button-Quail swallowed two *D. chrysippus* at least. I think the *Euplœas* disappeared first.

IX. In the afternoon, next day, all the butterflies were gone, but the two *Delias eucharis* and the *Papilio aristolochiæ* left before. The aviary was now cleaned out, and I put in two *P. aristolochiæ* and a *P. polites* (not much like the protected species). The latter was at once seized by a *Liothrix*. One of these birds and the Button-Quail looked at but did not touch, the others. I put in an *Euplœa* and three *Junonias*. Two at least of the latter were taken by *Liothrix* in obvious preference to the former. I put in five more non-warningly-coloured specimens. One was seized by a *Liothrix*, the *Euplœa* being still there. A *Liothrix* then took one from the Button-Quail, as had happened with one of the three *Junonias* above-mentioned.

Another *Junonia* was put in, and seized by a *Liothrix*. All the five non-warningly-coloured butterflies were eaten before the *Euplœa*, or any of half-a-dozen *Danais chrysippus* and a *D. genutia* which I had now put in.

X. I put into the aviary two *Papilio aristolochiæ* and two mimetic specimens of *P. polites*. The first one, put in together with the two *P. aristolochiæ*, was deliberately looked at and taken by a *Liothrix*. Then I put in the second, dead, on the floor. The Button-Quail immediately attacked it, but a *Liothrix* took it away twice; for the former bird left it at first, after knocking a bit off. The *Liothrix* evidently observed the difference in these two species. I then put in some *Danais chrysippus*, and one each of *D. limniace*, *Euplœa*, and *P. demoleus*. The Button-Quail attacked the last, and the *Liothrix* ate part of it, and then one took the *Euplœa*, but with no great eagerness. I saw none of the *D. chrysippus* eaten, and the *P. aristolochiæ* were not killed.

XI. Next day, no butterflies left but the two *Papilio aristolochiæ*, which were able to fly away.

I added two common Bulbuls (*Molpastes bengalensis*) to the aviary.

I then put in the evening three *Danais chrysippus*, an *Euplœa*, and several non-warningly-coloured butterflies, including some *Papilio polites* and a *P. demoleus*. The *Danais* and *Euplœa* were not taken by the *Liothrix* as long as any others remained.

The Bulbuls showed no distinct tastes, but were very wild.

XII. I put in, in the morning, several non-warningly-coloured butterflies, with some *Danais chrysippus* and an *Euplœa*. The former

all disappeared before the *Danaïnæ*, most being taken by the *Liothrix*, but one large specimen by a *Bulbul*. The latter birds were hungry. I saw a *Liothrix* take a *Junonia* when close to the *Euplœa*.

I then put in two *Papilio polites*, one of which was immediately attacked by a *Liothrix*, *D. chrysippus* being at hand. A *P. demoleus* was eaten before the other butterflies, which had, however, disappeared in the evening, when I put in some more, mostly *D. chrysippus* and *Euplœa*, with two *Delias eucharis*. I did not see these taken. A solitary *Junonia* given was seized with obvious preference by a *Liothrix*.

#### EXPERIMENTS WITH VARIOUS BIRDS. SERIES C.

The present series was conducted with one of these *Liothrix* only,\* but several *Bulbuls* were used; the two *Molpastes bengalensis* noted a few lines above, and two each of the Red-whiskered (*Otocompsa emeria*) Yellow-vented (*Molpastes leucotis*) and White-crested (*Pycnonotus sinensis*) species (not Indian). The Button-Quail had been removed.

I. I put in four *Danaïs chrysippus* and about six non-warningly-coloured butterflies. The *Liothrix* took one of the latter, and the Common *Bulbuls* ate two *D. chrysippus*. I also saw this species taken by one Yellow-vented *Bulbul*; the other took a non-warningly-coloured butterfly. A bird of this species then ate readily a *Delias eucharis* given, though they had had non-warningly-coloured butterflies, and there was also fruit.

When all the butterflies put in were gone, I introduced six or seven *Papilio polites* and a *D. limniace*, and three *Huphina phryne*. A White-crested *Bulbul* ate one of the *P. polites*, and one tried at the *D. limniace*, and I think ate the head, but a Common *Bulbul* took the butterfly away and swallowed it. The *Liothrix* took a *P. polites*.

Two *Huphina phryne* were the last butterflies I saw eaten, one by a Yellow-vented *Bulbul* and one by a White-crested.

II. Next day I put in three *Papilio aristolochiæ* and two *P. polites*. I saw the *Liothrix* with one of the latter, and a Common *Bulbul* eat readily a *P. aristolochiæ*. And as all the insects soon disappeared, the *Bulbuls* must have eaten the others also.

III. Next day I put in nine non-warningly-coloured butterflies, two *Euplœas*, two *Danaïs limniace* and a *D. chrysippus*. The last was taken by a Common *Bulbul*, though there were plenty of other butterflies, and eaten as far as I saw, and this bird then took a non-warn-

\* But all were together with these *Bulbuls* a little while, and at this time one day I put in a number of butterflies, mostly "protected" kinds. I thought the *Bulbuls* did not much relish them, but all soon disappeared. I think I saw a Common *Bulbul* drop an *Euplœa*.



ingly-coloured specimen. A Red-whiskered Bulbul made its first attempt on a *D. limniace*, though non-warningly-coloured butterflies were at hand. The Liothrix took two of these latter. The White-crested Buleuls took some non-warningly-coloured butterflies, and pecked and left *Euplœa* and *D. limniace*, the only Danaids I saw them try; this when the other butterflies were gone.

The Yellow-vented Buleuls ate only non-warningly-coloured butterflies as far as I saw.

The last two butterflies left were an *Euplœa* and a *D. limniace*. But a Red-whiskered Bulbul took and swallowed the *Danaid*, and the White-crested Buleuls, after much battering of it, apparently disposed of the *Euplœa*, which they evidently did not relish. One of these latter birds had eaten a *Papilio polites* I put in readily enough, and two *P. demoleus* disappeared, I suppose eaten by the Buleuls. There was very little fruit left, and the birds appeared to be hungry.

In the evening I put in a *P. aristolochiæ*, which was seized and killed by a White-crested Bulbul; this bird did not appear to relish it much, and seemed inclined to abandon it, when it was snatched away by a Yellow-vented Bulbul. After this bird had knocked off all the wings, a Red-whiskered Bulbul got the body but soon dropped it. Then one White-crested Bulbul took and dropped it; then the other bird of this species manipulated it for a time till it was snatched away and ultimately eaten by one of the Yellow-vented species!

IV. I put in some *Euplœas* and *Danaid chrysippus* and one or two *D. genutia*, with a few other butterflies.

The Liothrix took a *Junonia*, a Yellow-vented Bulbul a *D. chrysippus*. I saw a White-crested Bulbul take and drop a *D. chrysippus*; nevertheless one of these birds ate one, the other an *Euplœa*. I then saw a White-crested Bulbul take and drop an *Euplœa* with apparent distaste.

All the butterflies were soon taken, the few non-warningly-coloured ones disappearing first. These were smaller. A female *Elymnias undularis* was eaten, I do not know by what bird, but it did not seem to be avoided.

In the evening I offered the Liothrix the choice of *Nepheronia hippia* ♀, and a rather larger non-warningly-coloured species. After some hesitation he took the latter, and a Yellow-vented Bulbul immediately seized the *Nepheronia*, but I took this away.

I then offered it again to the Liothrix with a male of the same species, and he took it (the female). But he was perhaps in fear of a Common Bulbul which approached. However, he dropped it accidentally when I scared him off to try again fairly, but I found the Buleuls made this impossible, so I allowed them to get both specimens.

I then put in a number of butterflies, mostly *Papilio polites* and *P. demoleus*, with several *Euplœas*, one or two *D. genutia* and *D. chrysippus*, and one *P. eurypylus* and two or three other non-warningly-coloured butterflies.

A Yellow-vented Bulbul attacked first one of the last-named. A White-crested Bulbul took and rejected an *Euplœa*, but I saw one of these birds swallow a *P. polites*, and one eagerly pursue a *Junonia*, which was ultimately taken by a common Bulbul, I think because it was nearest; at any rate the bird left it, and took a *P. demoleus*. Then the Liothrix, which had had a *P. polites*, took this *Junonia*.

I saw one of the White-crested Bubluls flick away a *P. demoleus* as if distasteful, but I also saw a specimen of this butterfly manipulated by a bird of this species.

While *P. polites* and *P. demoleus* were still available, a male *Elymnias undularis*, which had escaped from a White-crested Bulbul early in the progress of this experiment, was alive in a corner apparently unnoticed. I blew it out, and it settled further up, when after a little time a Red-whiskered Bulbul took and ate it.

One White-crested Bulbul then after long manipulation swallowed a *P. demoleus*, not appearing to relish it.

The *P. eurypylus* was attacked by a Yellow-vented Bulbul, but I found it later, apparently unhurt save for the loss of a wing. Yet a little while afterwards it had disappeared, while a *P. polites* and *P. demoleus* were still left alive when the birds roosted. There was fruit in the cage.

V. Next day, both these butterflies left overnight had disappeared.

At the end of the afternoon (there being fruit in the cage) I put in eight *Danaïs chrysippus*, and a similar number of non-warningly-coloured butterflies, and a hawk-moth. I placed these on the ground, decapitated, instead of offering them alive as usual.

I saw Bubluls of the Yellow-vented, White-crested, and common species eat *D. chrysippus*, and these were all gone before the other butterflies, which were inconspicuous on the sand. But the Liothrix saw and selected the latter, and did not eat any *Danaïs*, though he had been eating their heads with those of other butterflies as I picked them off. I saw one White-crested Bulbul eat a *Danaïs* and then a *Junonia*, while its fellow was engaged with a non-warningly-coloured species. The Yellow-vented Bulbul I saw eat a *Danaïs* did not seem to like it much. I then put in a *D. genutia*, an *Euplœa* (dry and without abdomen) and a male *Nepheronia hippia*, dead. A Common Bulbul ate the *D. genutia*, and a White-crested one the *Nepheronia*. I put in

then a live *Euthalia lubentina*, which was eagerly chased; a Yellow-vented Bulbul either lost it or let it escape, and a Common Bulbul swallowed it. I have seen the common *Euthalia* eaten on this occasion and before. Even the *Euplœa* soon disappeared.

VI. About this time I put in a number of "protected" butterflies of several species with a *Papilio demoleus*, which the Liothrix took. I saw a White-crested Bulbul swallow a *Danaïs chrysippus*.

VII. I put into the aviary three *Danaïs chrysippus* and seven non-warningly-coloured butterflies. I did not see what the Liothrix took.

The Yellow-vented Bubluls took non-warningly-coloured ones, one Common Bulbul a *Danaïs chrysippus*, and the other a non-warningly-coloured species.

I saw a White-crested Bulbul reject a *D. chrysippus*, and both of them reject non-warningly-coloured specimens. All the *D. chrysippus* were eaten by the common Bubluls, except part of one which a Red-whiskered Bulbul took (other butterflies all gone apparently) and a Common Bulbul snatched away.

The White-crested Bubluls did not seem eager for any butterflies. There was fruit in the cage at the time.

I then put in some *Papilio polites*, some mimetic, but most not so, with one *P. aristolochiæ*.

The Liothrix did not take any. I saw a White-crested Bulbul with one of the mimicking specimens; the other also had a *P. polites*, and one bird at least appeared to eat its prey. The common Bubluls swallowed one at any rate. All of this species soon disappeared. But the *P. aristolochiæ* was looked at by the Liothrix, and pecked by both the White-crested Bubluls, which afterwards cleaned their beaks with evident disgust; one of these birds had I think disabled the insect at the first attack.

I then put in two *Neptis kamarupa*, with a *D. limniace*, three *P. demoleus*, and a *Delias eucharis*. One of the *Neptis* was swallowed by one White-crested Bulbul, while the other bird of this species took a *P. demoleus*; I did not see whether it ate it. One pecked and left the *D. eucharis*. I saw one try at the *D. limniace* at first, but it escaped. I also saw this butterfly get away from a Common Bulbul, but a Red-whiskered Bulbul seized it, and it soon disappeared. Soon the *P. aristolochiæ* and the *D. eucharis* were the only butterflies left. The Liothrix took none of these butterflies, though eating fruit and the head of something.

This same individual again took part in a further series of experiments, which I record below. Three more Liothrix were added, the other birds used now being a *Chloropsis* (*Chloropsis aurifrons* or

*malabarica*) some Zosterops and two Yellow-vented (one new) and one Red-whiskered Bulbul only. The Chloropsis is a leaf-hunting bird, arboreal in habit, and also capturing insects on the wing. It does not use its foot in manipulating its prey, and swallows large insects with difficulty. The genus is widely distributed in the Oriental region. The Zosterops are very small birds, and of little or no importance in this connection.

#### EXPERIMENTS WITH VARIOUS BIRDS (ON PLAIN DIET) SERIES D.

I. Offered the Chloropsis heads of different butterflies; he ate those of non-warningly-coloured species readily, but refused heads of *Danais chrysippus*, wiping his beak after trying these. I put a number of live *Euplœas* and a *D. chrysippus* into the aviary, and one of the former was seized by a Yellow-vented Bulbul, while a Liothrix soon after took another, which I did not see it eat. In fact, I soon afterwards saw one of these birds take and drop one. I offered the Chloropsis a *Papilio polites*, and while he was looking at it a Liothrix (the original bird) took it away, and proceeded to eat it, while there were plenty of *Euplœas* about. The birds had had very few insects for several days.

I then pulled off the wings of a *P. polites* and offered the body to the Chloropsis, which he took very readily, but dropped it (after some manipulation), as also did two Liothrix in succession.

The other day the Chloropsis had readily seized a large non-warningly-coloured butterfly, but it was snatched from him.

I then put in specimens of *D. limniace*, *genutia*, and *chrysippus*, and *P. demoleus*, none of which I saw taken, though I saw a Liothrix catch a *D. genutia* (I think) and let it go again, and the Chloropsis flew at some butterfly but did not catch it.

The Yellow-vented Bulbul apparently ate the *Euplœa* which, as stated above, it attacked, and I saw a bird of this kind attacking another *Euplœa*.

I offered the Chloropsis a male *Elymnias undularis*. He took it immediately, and manipulated it till he lost it by accident, and a Liothrix (the original bird) took it. I cannot say whether this bird ate it, as I saw a Yellow-vented Bulbul with part. Just then another Liothrix had an *Euplœa*. While watching the Chloropsis I saw a Liothrix take and drop a *D. genutia*.

The Chloropsis then readily took and with some trouble ate a *Junonia*. He readily eats small moths and flies.

I left the Liothrix at night attacking *Euplœas*, but they were not eager. Next day all the butterflies were gone.

I now released one of the Yellow-vented Bulbuls, which was weakly, and added a Red-whiskered Bulbul. I must also have put in another of the former species, though my notes do not say so (see *infra*).

II. I gave an *Acræa violæ* to the birds; a Liothrix took it, but a Yellow-vented Bulbul snatched it and after much mumbling, ate it. Removed the Red-whiskered Bulbul again.

III. Put in in the morning several "protected" butterflies, mostly *Euplæas*, with one *Delias eucharis*. The birds were not keen, except one of the Yellow-vented Bulbuls; the butterflies, however, were all gone later on.

I offered the head of an *Acræa* to the Chloropsis, but I am not quite sure what he did with it. He took and dropped the head of a *Papilio nomius*; but ate two heads of *P. demoleus*, and several heads of non-warningly coloured species. I then put in three *Junonias* and a male *Hypolimnas* with two *P. demoleus*. One Yellow-vented Bulbul immediately attacked the *P. demoleus* and ate one; a Liothrix got the other, and at the same time Liothrix got most of the non-warningly-coloured butterflies; I saw the last taken as the Bulbul finished eating its prey.

I then put in a *Junonia*, another non-warningly-coloured butterfly, and two *Acræas*. The *Junonia* was soon seized, I think, by a Liothrix, and a Yellow-vented Bulbul then took the second non-warningly-coloured one, which it apparently ate. It then ate in succession the two *Acræas*, apparently with no great relish; but this Bulbul, owing I think to its small bill, is not good at eating butterflies.

One of the *Acræus* had been tried and left by a Liothrix, and another was trying it, but left it quite readily on the Bulbul's approach.

The keenness of the Liothrix for the *Junonias* contrasted strongly with their indifference to the *Euplæas*.

I then put in the *P. nomius*, which was before long seized by a Liothrix. A Bulbul also appeared anxious to obtain it. Presently it was dropped,—how, I did not see—but soon taken again by another Liothrix. A Zosterops took it from him, and commenced to eat it, when a Bulbul snatched it, then a Liothrix got it again, and I think it was eaten by one of the last named. I have seen the Chloropsis with bits of wing in his bill, once of *D. genutia*, and just now he swallowed a bit of an *Euplæa's* wing.

I now (next day) commenced to give the birds a daily supply of live maggots, a man coming for the purpose, who also gave grass-hoppers. As this alters the conditions of the experiments somewhat, I commence here a new series, begun next day.

## EXPERIMENTS WITH VARIOUS BIRDS (ON MORE LIBERAL DIET) SERIES E.

I. I offered two *Terias* to the birds; a *Liothrix* took and left one, then, with no great relish, apparently, ate the other. Meanwhile another *Liothrix* took and left the first specimen. This was not eaten immediately at any rate, but next morning I did not see it.

II. I put many "protected" butterflies into the aviary, mostly *Euplœa* and *Danaïs limniace*, but also a *D. chrysippus* or two and a *Papilio aristolochiæ*. The *Liothrix* soon attacked the *Euplœas*, and a Yellow-vented Bulbul took a *D. limniace*, which it ultimately swallowed, I believe, after much trouble. I also saw it with an *Euplœa*, and (I believe the same bird) with another *D. limniace*.

I put in a *Catopsilia*, which was soon taken, though (as above stated) there were many other butterflies, by a *Liothrix*, which was tearing it to pieces, when her own mate forcibly drove her off, and after pecking at the butterfly with no great relish, left it. I saw an abandoned *Euplœa* close by, and this morning I have seen *Liothrix* eating these.

A *Zosterops* took an *Euplœa*, and picked it a bit but then dropped it.

The *Chloropsis* attacked the butterflies, but did not seem able to manage them. But later in the day I saw him swallow with some trouble the body of an *Euplœa*. Only a few butterflies were now left; of these an *Euplœa* and a *D. chrysippus* were feeding on the birds' fruit. The *Catopsilia* was now gone.

I saw a *Liothrix* leave the body of an *Euplœa* after stripping off the wings.

Later on, towards evening, I gave the *Chloropsis* a very small non-warningly-coloured butterfly, which he ate, and after that a *Terias*, which he also ate.

I offered him two heads of *D. chrysippus*, the first of which he flicked away, and the second he only just touched once. He then immediately took and ate the head of a *Catopsilia*. I could not get him to touch the heads of two *Euplœas*, but it was near roosting-time.

One *Euplœa* and the *P. aristolochiæ* were still uneaten. I took out the *Euplœa* and put in a *Catopsilia*, which was soon taken and disposed of by *Liothrix*, apparently with no great relish.

III. Next day in the morning while there were still maggots in the cage, gave the *Chloropsis* a skipper, which he ate with difficulty, getting it the wrong way at first. In the evening, the *Papilio aristolochiæ* put in yesterday had its wings pulled off, but was still uneaten. I put in another, and several non-mimetic *P. polites*. The birds did not seem eager for them, although a *Liothrix* had taken a non-warningly-coloured butterfly readily, before they were put in.

I put in three *Terias* and a *Huphina phryne*, which were all eaten by the *Liothrix* in preference to *P. polites* and *aristolochiæ*, but with no great relish, as I saw one bird leave a *Terias*.

A *Liothrix* picked off part of the abdomen of a *P. polites* and left it, still living, with signs of (apparent) dislike. However, one of these birds (I do not know whether the same) returned to the attack, and most, if not all, of the insect was eaten. I saw a *Liothrix* take up and drop the body of yesterday's *P. aristolochiæ*; to-day's specimen had not been molested as yet.

When the birds went to roost, three *P. polites* and the *aristolochiæ* were left.

IV. Next day in the morning, all the *Papilio polites* had been eaten, but the *P. aristolochiæ* had not, the last specimen not being even torn. Later on I saw the dried body of the earlier specimen lying about, and some wings, presumably of the other. I put in one specimen each of *Euplœa*, *Danaïs genutia*, *chrysippus* and *limniacæ*, with about an equal number of non-warningly-coloured butterflies. The *Liothrix* and one or both Yellow-vented Bulbuls attacked the latter and consumed them all before the *Danaïs* were touched; the first insect taken being one of the non-warningly-coloured ones, by a Bulbul, which bird however swallows even smallish species with difficulty (*see above*).

The *Chloropsis* swallowed pieces of wing from the non-warningly-coloured species, but I did not see if this was by preference. (This morning the birds had had no maggots so far as I knew). A *Liothrix* attacked the *D. genutia*, but did not eat it all, and the three other "protected" butterflies were still alive when I put in, shortly after, another *D. genutia* and *chrysippus* and a non-warningly-coloured specimen. The last was soon taken by a *Liothrix*.

A *D. chrysippus* was then pecked and left, at the same time that another *Liothrix* was eating a *D. genutia*. I then put in a *Neptis kama-rupa*, which was looked at by one *Liothrix*, taken and eaten, after rather tentative pecking, by another.

Meanwhile the *Chloropsis* attacked the *Euplœa*, but did not capture it. This *Euplœa*, the *D. limniacæ* and *genutia* and two *D. chrysippus* were still uneaten when I put in a dead and rather dry specimen of *Papilio demoleus*, which the *Chloropsis* seized, but when he had battered off most of the wings, he lost it to a *Liothrix*, which in turn appeared to have lost the body to a Bulbul, which bird ate it.

I saw the *Chloropsis* look at the *Euplœa*, and then take a piece of dead wing. When I left the birds a *Liothrix* was eating *D. genutia*, and another attacked and left *D. chrysippus*.

When all the above butterflies seemed to have been eaten, in the

evening, I put in about twenty *Euplœas* and a male *Hypolimnas*. This last was singled out for persecution by the *Liothrix* and a Yellow-vented Bulbul, and though its size and activity gave trouble, it was at last, falling in the water vessel, caught firmly by one of the former birds, and eaten by a bird of this species, which threw up the body once, but eagerly took it again.

Meanwhile the other Yellow-vented Bulbul was worrying an *Euplœa*, which I suppose it ate. I saw no other *Euplœas* eaten at the time, and both the unoccupied Bulbul and the other *Liothrix*, wanted to get the *Hypolimnas* from its owner. I saw *Euplœas* taken and relinquished by *Liothrix* at least twice, though they ate rice and milk (for the last few days I have been giving them sweetened sop made thus or with bread, which seems much to their taste and probably lessens their readiness for butterflies).

The dry body of one *aristolochiæ* was still about. At night about a dozen *Euplœas* were still left in the cage.

V. Next morning some of the *Euplœas* put in over-night were gone, but two or three remained alive. In the evening all were eaten. I then put in a male *Hypolimnas* and a female *Nepheronia hippia*. The former was first attacked by a *Liothrix*, but before it succeeded in catching it, another seized the mimic, which had settled with its wings closed while the other was being chased.

I saw a Bulbul in possession of both, but the *Hypolimnas* was snatched from it by a *Liothrix* just as it had nearly got rid of the wings.

I put in five *Papilio aristolochiæ* and two non-mimetic specimens of *P. polites*. One of the latter was soon knocked into the water, and another taken and torn by a *Liothrix*, which (or another of the same species) was about to eat the body, when a Bulbul snatched it and appeared to eat part.

I found the bodies of four *Euplœas* in the cage, as well as the old *P. aristolochiæ*, though the birds had much fewer maggots this morning than usual.

I took the first *P. polites*, still living, out of the water and laid it on the ground. But both it and the *P. aristolochiæ* were untouched when the birds roosted.

To-day they ate none of the plantain supplied, seeming to prefer the rice and milk. For a day or two I have noticed little plantain was eaten.

VI. Next day the *P. polites* was not to be seen, but none of the five *P. aristolochiæ* had been eaten, and two at least were still alive.

I then put in five *Danaïd chrysippus* and three *D. limniacæ*, which were not touched.



I put in then an *Atella phalanta* and a *Huphina phryne*. The former was soon taken by a *Liothrix* and discussed by these birds, but they left the body, and the *Chloropsis*, to which I offered it, soon dropped it.

The *Huphina* was then taken by a *Liothrix*, but he somehow dropped it, and the *Chloropsis* took it, and after much manipulation swallowed it.

There were maggots in the cage at the time, besides fruit.

I then put in a dead specimen of *Papilio demoleus*, which was taken by a *Liothrix*, but not eaten. However, another *Liothrix* soon took and began to tear it, but I next saw it in the possession of a *Bulbul*, from which a *Liothrix* took it when the *Bulbul* had nearly got rid of the wings (which the *Yellow-vented* species seems to find it necessary to do), and part was eaten by one of these birds, which did not seem eager for it.

Just after the *P. demoleus*, I put in a dead *D. limniace*, which no bird touched.

I then took away the maggots.

An hour or so later the *D. limniace* were all dead, but not eaten, while all the *D. chrysippus* were gone. The *P. aristolochiæ* were also intact, and the four bodies of *Eupleas* noticed yesterday still lay about.

Towards evening I put in a *Catopsilia*, a female *Elymnias undularis*, a male *Hypolimnas*, and some *Danais genutia* and *D. chrysippus*.

First a *Liothrix* attacked the *Catopsilia*, then another the *Hypolimnas*, which escaped. Before it was captured (as it lay in the water) a *Liothrix* took the *E. undularis*.

I took the *Hypolimnas* out of the water, with the *Catopsilia*, which, partly eaten, had fallen into it; while doing this I let a *D. genutia* escape.

The *Chloropsis* had been hotly pursuing the possessor of the *Catopsilia*.

I also found the *E. undularis* uneaten, except the head.

The birds were not eating much plantain even, apparently preferring the sop.

There were now one *D. genutia* and three *D. chrysippus* in the cage.

However, the *Chloropsis* soon took the *Catopsilia*, and I think finished it, for it disappeared. Meanwhile a *Liothrix* pulled to pieces the *Elymnias* and rejected it.

During this the *Hypolimnas* was again attacked by *Liothrix*, but remained alive, though its wings were much torn.

Then one seized it and took it upon a box in the cage.

I offered the rejected abdomen of the *Elymnias* to the *Chloropsis*, which carefully crushed and then ate it.

I then saw the *Hypolimnas* being discussed on the floor by a *Liothrix*, but another of these birds snatched and I suppose ate it, for on looking it was not to be found.

I then took out the five *P. aristolochiæ* and three of the *D. limniace*, none of which had been eaten, though all of the latter and two of the former were headless. One of the *P. aristolochiæ* was still alive. I offered its head to the *Chloropsis*, which took and rejected it.

While looking for these I found a *D. chrysippus* not quite dead. As it was rather dry I suppose it was not one of the last lot put in, all of which were unhurt and also the *D. genutia*; I threw all these *Danais* out, and all but the nearly-dead one flew away.

VII. After a live *Danais limniace* had been for some time in the cage, and there were maggots there, I put in a dead *Catopsilia*, and single live specimens of *Junonia*, male *Hypolimnas*, and female *Elymnias*.

The *Chloropsis* immediately took the *Catopsilia*, and the *Junonia* was next taken, I think, by a *Liothrix*.

I then killed the *Elymnias* and placed it so as to show its mimetic upper surface, and it was attacked and left by a *Liothrix*, then attacked again, and finally I think eaten by one of these birds, which did not seem to relish it much, as I saw the body on the floor, though this was soon taken.

The *Hypolimnas* was in a corner and was taken last of all, not till I stirred it up, when it was taken by a *Liothrix*, close to where the maggots were kept, and I think one of these birds ate it.

I then put in a live *Euploea* and two *Danais chrysippus*, one of which latter was soon killed or disabled.

Yet in the evening none had been eaten, not even the *D. limniace* mentioned above, and a *D. genutia* I put in was only attacked by the *Chloropsis*, and not with determination by that bird, which, however, pursued quite eagerly a non-warningly-coloured specimen then put in, as also did a *Liothrix*, but it escaped them, apparently, as I found it behind the water-vessel. On throwing it out, a *Liothrix* soon took it, and I think it was eaten by this species, as I saw one tearing it, and could find no body.

I offered an *Acræa* to the *Chloropsis*, which took, chewed, and dropped it; I did not see what happened to it afterwards. I then gave this bird a *Terias*, which he ate.

I took out one of the *D. chrysippus*, which could fly, leaving one other of this species, a *D. genutia*, *D. limniace*, and *Euploea* in the cage.

To-day and yesterday the birds had a double allowance of maggots.

To-day they had rice and milk, but not, I believe, yesterday. Even when they have this sop they eat papaya, though not caring for plantain.

Early next morning I found all the butterflies left over-night still uneaten. The birds had neither butterflies nor sop on this day.

VIII. I put in in the morning, while the birds had plenty of maggots, single specimens of *Euplœa*, *Danais limniace* and *chrysippus*, *Acræa*, *Neptis*, and *Papilio demoleus*, two *P. polites* (non-mimetic), one *P. clytia* and several non-warningly-coloured butterflies including another small *Papilio* (I think *P. eurypylus*). Most of these were living.

The Chloropsis first attacked, a *Catopsilia*; then a Yellow-vented Bulbul, a small non-warningly-coloured specimen, which I think it dropped.

Then I saw a *Liothrix* and a Bulbul with a non-warningly-coloured one. The Bulbul left the body of this; but the bird is not healthy.

I do not think the Chloropsis managed to swallow his prey. I saw him try and leave the *Neptis*, which a *Liothrix* took, and picked off the wings at any rate, while there were non-warningly-coloured butterflies about. But at this time I saw a *Liothrix* eating plantain.

Here I took out the sickly Bulbul to release it, and meanwhile a *Liothrix* got out; while keeping the door open to let it in again, one *P. polites* got away, but no other butterflies as far as I saw.

The small *Papilio* was now attacked by a *Liothrix*, but only the head was eaten.

Lately I saw a *Zosterops* seize a partly eaten non-warningly-coloured butterfly and peck at a *Catopsilia* in the water. I did not see any eaten. I saw a *Liothrix* drop a *Catopsilia* and make no attempt to recover it.

I then saw a *Liothrix* take the rejected small *Papilio*, and afterwards found of it only wings and a bit of the thorax.

I saw a *Liothrix* peck and leave a *Catopsilia*, of which six lay about, uneaten or nearly so.

I found the body of the *Neptis* outside, and put it in, when it was taken and dropped by a *Liothrix*.

I saw one of these birds eat the body of, I think, a large non-warningly-coloured butterfly, which body I had seen lying about. There were also a bit of thorax and wings of a non-warningly-coloured butterfly outside; this I gave to the Chloropsis, but did not see what he did with it.

When I left the *Catopsilias* were being attacked.

An hour or more afterwards I found that the mimic had been torn, and its head eaten—not the body. The *D. chrysippus*, *D. limniace*, and *Euplœa* were intact and alive.

The head of the *Acræa* had been pulled off, but lay near, and the body was quite intact, and wings nearly so.

All the other butterflies had been eaten, even *P. demoleus* and *P. polites*, which had not been attacked when I left.

There were still plenty of maggots. These were gone in the evening, but the *D. chrysippus* and *Euplœa* were still intact; however, earlier in the day I found the mimic gone, and the *D. limniace* minus wings and head.

IX. Next day, I found the *D. chrysippus* and *Euplœa* still remaining, and took them out.

I then added one Common Bulbul and one of the Red-whiskered species. The former I shortly removed for a few days.

Soon after putting these birds in, I put in some *Danaïs genutia*, *D. chrysippus*, and *Euplœa*, with some *Catopsilias*.

These last were devoured first by the *Liothrix* and partly by the *Chloropsis*. The Red-whiskered Bulbul beat off the wings of an *Euplœa* and swallowed the body. Yet all day, as far as I saw, a *D. chrysippus* and *Euplœa* remained uneaten; there were also plenty of maggots in the cage.

X. In the evening I offered the *Chloropsis* a large grey fly, which it ate readily as usual. Then I gave two glossy-green flies, which it chewed and dropped; but these were eaten readily by *Liothrix*. The *Chloropsis* then ate another grey fly. There were maggots and fruit in the cage, besides seed.

XI. Next day the maggots in the aviary being all eaten, I put in, in the evening, one specimen each of *Danaïs chrysippus*, *D. genutia*, and *D. limniace*, one *Euplœa*, and three *Catopsilias*.

The *Chloropsis* immediately attacked the last and battered one for some time, till a *Liothrix* took it away.

Another *Liothrix* got a second specimen, but these birds did not attack as readily or as soon as the *Chloropsis*. I saw one make a flight at the *Euplœa* when *Catopsilia* was available; it did not catch it.

As the last *Catopsilia* had been killed by a *Liothrix*, I put in a male *Hypolimnas*. At this time all the "protected" species were unhurt, and part of a *Catopsilia* lay about, which a *Liothrix* then ate. Meanwhile another snapped at the *D. genutia*. I then turned out the *Hypolimnas*, which had got behind a tin. It was not attacked at once, but looking after dark I found only a wing or two of it left, while the three *Danaïs* and the *Euplœa* were roosting unharmed in the aviary. There was still fruit to be had.

XII. Next day, when I first looked at the birds early in the morning all the four butterflies, (*Danaïs* and *Euplœa*) left last night were still unhurt, though soon after I found the latter dead. They remained untouched even though the birds had had no maggots yet, and also after

these were given, and I then took them out; before which was done, I saw the *D. genutia* flutter unharmed before the very bill of a Liothrix.

XIII. I first gave the Chloropsis a *Catopsilia*. I put into the aviary one each of *Danais chrysippus*, *genutia*, and *limniace*, *Euplœa*, *Papilio aristolochiæ*, and *Neptis*, all unhurt. I saw none attacked except the last, and the Liothrix which attacked it did not follow up the attempt. When, however, I put in two non-warningly coloured butterflies, they were attacked and eaten by these birds. There was now no sign of the *Catopsilia* just put in. The *Neptis* disappeared, but may have got out, as I have seen one do once, which I caught.

There were no maggots in the cage, and only a little fruit. The Chloropsis to-day seemed not much to relish a small grey fly given him and lost it without much concern.

After dark I looked in the aviary and found the three *Danais*, *Euplœa*, and *P. aristolochiæ* roosting unhurt.

XIV. Next day, the five "protected" butterflies left last night were all unhurt this morning, yet when I put in a male *Hypolimnas*, it was soon taken by a Liothrix, and the Red-whiskered Bulbul ate some fruit.

I put the Common Bulbul in again.

After some time I saw a Liothrix tearing the *Danais limniace*. No maggots had been given yet, and I could not find the body of the *D. limniace*, so I presume the bird ate it. Soon after I found the *D. genutia* had been eaten, and the *Euplœa* had disappeared, though there were now maggots in the cage; and about an hour later the *D. chrysippus* had been eaten.

I put into the aviary later (where there was fruit and rice-and-milk) one specimen each of *D. chrysippus*, *D. genutia*, and *D. limniace*, *Papilio demoleus*, *Euplœa*, and male *Hypolimnas* and *Elymnias*, also *P. polites*, one mimetic and one not. These were not all put in exactly at once, and the *P. demoleus* was first attacked, but not killed, by a Liothrix. It was, however, eaten by the Red-whiskered Bulbul, while a Liothrix was tearing the non-mimetic *P. polites*. The abdomen of this specimen was eaten, after much fuss, by another Liothrix. The *Elymnias* next disappeared, taken, I think, by the Common Bulbul. This bird next attacked the *Hypolimnas* and ate it whole, apparently.

The *Papilio aristolochiæ* left in last night I found at mid-day, minus its head, and in the evening I saw its crushed but uneaten body. Danaids and *Euplœa* not eaten to-day.

Next day, I found early in the morning the three *Danais* and *Euplœa* still uneaten, and two, *D. chrysippus* and *genutia*, apparently unhurt. There was fruit in the cage. Only the wings of the mimetic

*P. polites* remained, but in such a position that I suspected ants might have eaten them.

I think the Danaids and *Euploea* were all eaten later on.

XV. I put in three *Catopsilia*, and one specimen each of *Danais chrysippus* and *limniace* and *Euploea*. All were dead and rather dry. But although maggots and fruit were available, the Chloropsis immediately, and the Liothrix soon after, attacked the *Catopsilias*. I think part of them was eaten, but afterwards I found one body, and saw the Chloropsis drop its prey or part of it, which the Red-whiskered Bulbul seized, but also dropped, I think, for I found a dry crushed thorax. None of the Danaines were eaten at present.

The Chloropsis was apparently eating the rejected body of the *Catopsilia* when a Liothrix took it.

XVI. Next day, there being plenty of maggots, fruit, and bread-and-milk in the aviary, I put in nine non-warningly-coloured butterflies, and one specimen each of *Danais chrysippus*, *genutia*, and *limniace*, *Euploea*, and *Acræa*, all dead or disabled.

They were not touched immediately, but before long a Liothrix took a non-warningly-coloured one, and then another did the same. The latter dropped its prey, and I found the abdomen on the floor, which the Chloropsis ate when offered, after much pinching.

The Red-whiskered (apparently) and Common Bultuls then each took a non-warningly-coloured specimen and ate it. The former bird rejected one non-warningly-coloured specimen which was rather dry, but then ate another. I then saw a Liothrix eat part of a non-warningly-coloured specimen.

The Common Bulbul then ate the *D. genutia*, when it might have taken a *Catopsilia*. This last specimen, the small dried one, and an *Elymnias undularis* ♂ were the only non-warningly-coloured ones left. The Liothrix on this occasion behaved much as I have seen done with "protected" butterflies, pecking their prey about much. The Red-whiskered Bulbul pecked and refused the *Acræa*, which specimen had been also refused by the Liothrix which had refused the small dry non-warningly-coloured specimen.

The Common Bulbul descended and ate the *Catopsilia*, which had been dropped by the Chloropsis, which in turn had got it after a Liothrix. The same Bulbul then flew down and pecked the *Elymnias*, which I had moved nearer the "protected" specimens, but then flew up, perhaps frightened. This *Elymnias* was now apparently the only non-warningly-coloured specimen left. I now saw it pecked and left by the Red-whiskered Bulbul, which had previously been eating some fruit near it. Then a Liothrix took and tore it, and then dropped it,

whereupon the Red-whiskered Bulbul again got it and ate part; perhaps the Liothrix might have also eaten some. But from their marked lack of eagerness one might infer they did not relish it much. The Red-whiskered Bulbul then took and dropped the *D. limniace*.

Later on in the day the Danaines and *Acræa* had apparently been eaten; I saw the wings of the latter; yet there were still maggots left.

I then put in two *Catopsilias*, a *Junonia*, and one specimen each of *Euplœa*, *D. genutia* and *chrysippus*, all alive. A Liothrix seized the *Junonia*, and the Yellow-vented Bulbul attacked a *Catopsilia*, but failed to secure it. However, the Common Bulbul got and swallowed one of these, while the Yellow-vented again attacked the other, which was also persecuted by the Chloropsis. Then the Yellow-vented Bulbul got a good hold of the *Catopsilia*, and was worrying it, when the Red-whiskered snatched it and swallowed it after much battering.

None of the Danaines had been attacked yet, though the Chloropsis tentatively pecked the *D. genutia*. The *D. chrysippus*, however, was soon attacked by the Liothrix and Red-whiskered Bulbul, the latter bird at least eating part of it, though apparently with no great relish. I then saw the *Euplœa* pecked at by a Liothrix and then by the Red-whiskered Bulbul, which wiped its beak afterwards; this bird soon afterwards returned to the attack, beat off two of the *Euplœa's* wings and swallowed it. Meanwhile a Liothrix pecked at the remains of the *D. chrysippus*. Not long afterwards the *D. genutia* had disappeared entirely. There were plenty of maggots still left.

XVII. A few days after, I put into the aviary in the morning (there being fruit and maggots there) one specimen each of *Danaïs chrysippus*, *genutia*, and *limniace*, *Euplœa*, *Acræa*, and *Neptis*, with several non-warningly-coloured butterflies, *Catopsilia*, &c. A Liothrix took first and dropped the *Acræa*. The Chloropsis attacked a non-warningly-coloured butterfly, but missed it. Then a Liothrix pecked and left a non-warningly-coloured one, which the Red-whiskered Bulbul took and ate. Meanwhile the Chloropsis took a *Catopsilia*, part of which he apparently swallowed. A Liothrix took another non-warningly coloured butterfly, but dropped it. The Red-whiskered Bulbul then descended and took a *Catopsilia* which it battered and then left for an *Elymnias*; then it left this and returned to its original prey, and swallowed this after much trouble. The first insect eaten by the Common Bulbul was this *Elymnias*. A Liothrix pecked at the body of a large non-warningly-coloured butterfly, which it or another had stripped of the wings, and I think ate it. About this time I saw a *Zosterops* beating the body of a small non-warningly-coloured specimen on the perch. The Red-whisker-

ed Bulbul soon after attacked another *Catopsilia*, but allowed the Chloropsis (which had previously been attacking these) to take it. The Red-whiskered Bulbul then attacked a male *Hypolimnas*, and ate it with less trouble than the *Catopsilia*. It then attacked another *Catopsilia*, which a *Liothrix* somehow got, and the Common Bulbul also wanted it. The *Liothrix* did not seem eager, and another of these birds got the insect, and afterwards the Chloropsis had it.

Then the Common Bulbul ate a bit of a *Catopsilia*. It then made two or three flights to where the *D. limniace* and *Euplœa* were sitting uninjured on the wire-netting, but did not take either. However, it took and ate whole the *D. chrysippus*, the first "protected" butterfly eaten on this occasion. But the *Catopsilia* in the possession of the Chloropsis was now the only non-warningly-coloured butterfly visible.

The *Neptis* and *Acrœa* had also disappeared, but I saw no wings about, nor did I see them eaten; probably they got through the netting. The Chloropsis now succeeded, apparently, in eating the body of the *Catopsilia*. There were plenty of maggots.

About an hour afterwards the remaining butterflies (*Euplœa*, *D. genutia*, and *limniace*) were gone, some wings only of the *D. limniace* remaining.

In the evening I put into the aviary (where there was plenty of fruit, but no maggots, these having been taken out) one specimen each of *Neptis*, *Euplœa*, *D. genutia* and *limniace*, and several non-warningly-coloured butterflies.

The Chloropsis soon took a *Catopsilia*, which it ultimately ate, I think. A *Liothrix* took the *Neptis* (the wings only of which I found afterwards), and the Red-whiskered Bulbul a *Catopsilia*, which it apparently swallowed. The Common Bulbul took a male *Hypolimnas*, which escaped, but the bird caught it again and with difficulty swallowed it. A *Liothrix* took and picked a *Catopsilia*, which I think it ate; I found no body.

While one *Catopsilia*, the two *Danaï*s and the *Euplœa* were still left, I put in another *Neptis*, which a *Liothrix* took at once.

The Yellow-vented Bulbul seized a *Catopsilia*; which escaped; this was the first butterfly touched by it to-day. Ultimately a *Liothrix* ate nearly the whole of this specimen. Before this also the second *Neptis* had apparently been eaten.

When the birds had roosted the *D. genutia*, *D. limniace*, and *Euplœa* still clung uninjured to the netting.

XVIII. Next morning, only the *Danaï*s *limniace* was uneaten, of the butterflies left over-night, and this was headless; later on the body also had apparently been devoured.



In the evening, maggots and fruit being available, I put in a small plain-coloured dragon-fly, which was looked at by the *Chloropsis*, and seized by a *Liothrix*.

Then I introduced two specimens of *Danaïs limniace* and one each of *D. chrysippus*, *Papilio eurypylus* and a mimetic *P. polites*, with four non-warningly-coloured specimens.

A *Liothrix* soon took and ate whole one of the last named, a small one. The *Chloropsis* took another, which apparently escaped. A *Liothrix* then took the *P. eurypylus*, which was taken from it by the Common Bulbul and swallowed either by that bird or the Red-whiskered species.

I now took out one *D. limniace* and put in an *Euploea*.

A *Liothrix* now attacked with no great zest a non-warningly-coloured butterfly, which another *Liothrix* took. I had put two of these butterflies into a more prominent position.

The last non-warningly-coloured specimen, a *Catopsilia*, had got behind a dish, whence the Common Bulbul seemed to wish to take it, so I threw it out. The *Chloropsis*, however, got it, but it escaped twice from this bird, which at last swallowed it with great difficulty.

The two *Danaïs* and *Euploea* with the *P. polites* were still unhurt. Next morning, all these were still alive, and the two *Danaïs* not even hurt; but some maggots also remained from the previous day. I thereupon released all, and all could fly, except the *P. polites*, which was weak and had been in the water.

XIX. The Red-whiskered Bulbul having been released, I offered to the birds (which at this time had had no butterflies for about a fortnight, but had plenty of maggots and other food) a *Junonia* and a *Danaïs limniace*. Neither insect was attacked at once, though the *Chloropsis* and *Liothrix* paid some attention to the former.

I then put in a male and female of *Hypolimnas bolina*, while the other two butterflies had not as yet been touched; neither were these *Hypolimnas* at once. Presently, however, a *Liothrix* seized the male, but it got away easily, and was not pursued. Shortly after I found the *Junonia* missing, and the body of the male *Hypolimnas*, minus head and nearly the whole of the wings, on the floor. The *Chloropsis* soon took, beat, and at last swallowed it.

The birds may not have been very eager for insects, since twice today during these experiments I saw the common grey house-flies unmolested in the cage.

Next morning I found the female *Hypolimnas* being torn by a *Liothrix*; it seemed to be already dead. The *D. limniace* had not even been killed, and was, I think, removed when the aviary was cleared.

The birds now had no butterflies for several days, and I commenced a new series of experiments, having considerably changed the *personnel* of the aviary, which now contained only three *Liothrix* and two *Zosterops*, the *Chloropsis* and Yellow-vented Bulbul, and a *Sibia* (*Lioptila capistrata*) and *Mesia* (*Mesia argentauris*). The last two species resemble *Liothrix* in their feeding habits, and the latter is a very close ally of that bird. This occasion was the first on which these two birds had butterflies from me, having been newly introduced.

With these I made the following experiments, of which I give the dates.

#### EXPERIMENTS WITH VARIOUS BIRDS (ON LIBERAL DIET) SERIES F.

*April 30th.* I put in two male *Hypolimnas*, one *Euplœa*, one *Papilio panope*, all decapitated. A *Liothrix* got one *Hypolimnas*, and the *Mesia* the other, but the *Sibia* took the insect away from the latter bird. I then put in four more non-warningly-coloured butterflies, all decapitated. The *Chloropsis* soon had one. While one was still left, I saw the *Mesia* peck the *Euplœa*, but the bird was frightened off. I put in another decapitated non-warningly-coloured specimen.

I noticed a non-warningly-coloured specimen (which I may have overlooked before) in the food-vessel, which the *Sibia* soon seized. There were plenty of maggots in the cage, as always lately. I saw the *Mesia* eat part of a non-warningly-coloured specimen close by the *Euplœa*.

The birds were more eager for butterflies to-day. Nevertheless a *Liothrix* which had attacked the last non-warningly-coloured specimen, abandoned it, to be soon attacked and apparently eaten by the *Sibia*.

Only the *P. panope* and *Euplœa* were now remaining, and I put in three females and one male of *Elymnias undularis*. But when I left the birds none of these had been eaten, though a wing had been pulled off from one female. One had got turned underside up before this.

I put in a *Nepheronia hippia* with its wings closed. The *Sibia* took and dropped it. I then took out the three female *Elymnias*. I saw the *Chloropsis* at least once drop the head of a non-warningly-coloured butterfly.

*May 1st.* On looking early this morning I found that the *Euplœa* appeared to have been devoured with the exception of the thorax and three wings. The other butterflies left overnight, the male *Elymnias*, the *Papilio panope* and *N. hippia*, were uneaten, though the head of the latter was missing. I took out the *P. panope*. Early in the day I took away nearly all the maggots, but there was other food in the cage when, in the evening, I put in decapitated specimens of *P. panope*, *Euplœa*, and six non-warningly-coloured specimens, one of them a *Catopsilia*. Almost

immediately the Sibia and a *Liothrix* had each taken one of the non-warningly-coloured ones, and soon another *Liothrix* had a third, the *Catopsilia*. I then saw the Sibia take another close by this insect, which it swallowed whole, though as big as *Pontia rapæ*. This bird then took a third non-warningly-coloured butterfly, but a *Liothrix* took this away after it had partly picked off the wings; however, as I found what appeared to be this specimen on the floor afterwards, I suppose the *Liothrix* dropped it.

In fact, the *Liothrix* now, being probably pampered, seem to behave with non-warningly-coloured insects much as the larger Babbler used to do with Danaids.

I think the Sibia finished up the last two non-warningly-coloured butterflies, including one which had been apparently dropped. The *Euplæa* and its mimic *P. panope* remained untouched.

May 2nd. Early in the morning *Euplæa* and *P. panope* were still untouched by the birds, even before maggots were given. Later, after the birds had received their ration of these insects, I found that the *P. panope* had disappeared all but one wing, while even by evening the *Euplæa* was untouched.

There had been maggots and other food in the cage all day, and I now put in three male *Elymnias undularis*, and one each of *Papilio eurypylus*, *P. panope*, *P. demoleus*, *Danais genutia*, *D. limniace*, and *Catopsilia*, all decapitated, and a live *P. aristolochiæ*.

The Sibia first took an *Elymnias*, which the Mesia snatched; the former bird then ate the *Catopsilia*. Then it took another *Elymnias*, but after pulling off part of the wings, dropped it and wiped its beak on the perch. Then it took and dropped the *P. eurypylus*, wiping its beak slightly.

I think the Mesia ate the first *Elymnias*.

A *Liothrix* then took the *Elymnias* which the Sibia had rejected and ate it, apparently with no great relish. Both from the conduct of this bird and that of the Sibia one might have thought the insect unpalatable.

The Sibia then took the third *Elymnias*, but soon dropped it, whole, and wiped its beak. Yet it evidently wished for more butterflies. I then saw the Mesia with this specimen.

I next put in three non-warningly-coloured butterflies; immediately the Sibia seized one, and had torn off much of its wings, when a *Liothrix* took it. However, the former bird soon took another, tore off its wings, and apparently ate some. Meanwhile the *Elymnias* taken by the Mesia had disappeared.

The Sibia then ate the *P. eurypylus*, with some slight signs of

disgust, as I thought. I then found the body and part of the wings of a non-warningly-coloured butterfly beneath the Sibia's last perch; but the bird soon ate this body, which it had possibly dropped previously.

Afterwards I saw the Sibia eat another non-warningly-coloured butterfly. The *P. demoleus*, *panope* and *aristolochiæ*, the *D. genutia* and *limniace*, and the *Euplæa* which had been there all day, were still left when the birds went to roost.

*May 3rd.* In the morning all the butterflies left over-night remained for some time. Later on the *Papilio panope* had been devoured, and the *P. demoleus* had disappeared.

I then released the *P. aristolochiæ*, which now seemed slightly injured, but flew away. Later still the *Danais genutia* and *D. limniace* had apparently been eaten, as I only found wings about; and subsequently to this the *Euplæa* had disappeared, a small bit of wing only being left.

In the evening, there being plenty of maggots and other food in the cage, I put in a *Neptis*, which was seized by a *Liothrix*; this bird was pursued by the Sibia, which took the butterfly, but soon rejected it, when it was swallowed whole by the Yellow-vented Bulbul.

I then put in one specimen each of *D. chrysippus*, *D. genutia*, and *D. limniace*, *Euplæa*, *P. demoleus*, and a much worn *P. panope*, with a male *Hypolimnas*. This last was soon seized by the Sibia, which ate it after tearing off the wings, not without trouble, partly on account of its toughness, and partly by reason of the other birds; one *Liothrix* tried to snatch the prey, even hanging from it for a moment. Another *Liothrix* then took the *P. demoleus*, but dropped it and wiped its beak. The *Euplæa* was then taken by that *Liothrix* which had tried to rob the Sibia of its prey. The Mesia, however, snatched it from this bird, but let it go, and it flew freely about in spite of this treatment.

The *P. panope* soon appeared to be injured, perhaps by *Liothrix*, but I did not see any bird touch it; it was much rubbed, and hardly recognizable.

*May 4th.* This morning all the butterflies (*Euplæa*, *Danais chrysippus*, *genutia*, and *limniace*, *Papilio panope* and *demoleus*) left over-night were uneaten. The *D. genutia* had got behind a vessel, so I took it out, and soon after found it minus some of its wings, but uneaten; while of the *P. panope* only the two fore-wings and the thorax remained. The insects had obviously been tried by the birds. The *D. chrysippus* had also been mauled, and a little later I found it minus its head, by which time the abdomen of the *D. genutia* had also disappeared; I think I had noticed previously that its head was gone.

Some time later I saw the *Euplæa*, *D. limniace*, and *P. demoleus*

still untouched. The *D. chrysippus* was no more torn, but was behind a dish. This, and the *Euplœa* remained a long time, but at last the latter appeared to have been eaten, and I found the *D. chrysippus*, rather dry, behind a vessel. There were still maggots and a little other food in the aviary.

I made only two more experiments with these birds. On another day, later, seeing one or two *Liothrix* peck at a *Danaïa genutia* (which I had let out) on the outside of the aviary, I put in a nearly-dead specimen of that species, but it was not attacked. The birds had maggots and other food. On a second occasion I noted that the *Chloropsis* twice took and refused a very harmless-looking small fly, which *Liothrix* ate readily.

I omit some other experiments made with *Mesias* and *Bulbuls*, the general tastes of the latter birds having been made manifest in those already given, and the former showing the same tastes as *Liothrix*.

I have noticed a keenness for butterflies in other captive birds of the Babbler group, the White-crested Jay-thrush (*Garrulax leucolophus*), the Yellow-eyed Babbler (*Pyctorhis sinensis*), the Orange-bellied *Chloropsis* (*Chloropsis hardwickii*), &c., and I think all of them probably devour these insects when at large.

## SECTION II.

I pass now to the consideration of some insectivorous birds of other groups, with which I have experimented singly, a more satisfactory method. The birds were mostly kept in cages with upright bars, and therefore the butterflies given them were in most cases killed to prevent their escape. My most important experiments under these conditions were made with *Drongo-Shrikes*, representing a well-marked and very characteristic and abundant group of Passerine birds in the Oriental region. They are birds of fair size and take their prey commonly on the wing, either swallowing it whole, or holding it in one foot while picking off the wings, &c.

I have used two species, the *Bhimraj* or *Racket-tailed Drongo* (*Dissemurus paradiseus*), about the size of a Magpie and apparently, from its habits in captivity, more or less omnivorous, and the smaller and much commoner *King-Crow* (*Dicrurus ater*) which is more strictly insectivorous. I had several *Bhimrajs*, but only give my experiments with the healthiest bird. It was fed on meat, fruit, and insects, with satoo (meal) made up into paste.

I am indebted to Drs. Alcock and Anderson for taking care of this bird and others during an absence from Calcutta on my part. The experiments were made at the close of 1896.

## EXPERIMENTS WITH BHIMRAJ.

*November 10th.*—Gave the Bhimraj several butterflies. It ate, with persuasion, two *P. aristolochiæ* and a *P. polites* (a mimetic specimen) pulling off the head of the first of the former species. It ate several *Danais chrysippus* and three *D. genutia*, all of them (except about two of the former) without persuasion, the insects being simply put to its bill.

There were maggots available.

*November 11th.*—The Bhimraj readily ate all the butterflies given it, including *Papilio aristolochiæ*, *P. polites*, *P. demoleus*, *Catopsilia*, *Danais chrysippus*, *D. genutia*, and *D. limniace*, of which last two one specimen only was given, of the rest two or more. Persuasion was only needed with the *D. genutia* and the last *D. chrysippus* when the bird, rather hungry at first, was becoming satiated.

*November 12th.*—The bird, when it had no food in the early morning, ate a *Junonia* and took and refused a *Papilio aristolochiæ*. The latter remained uneaten all day. Meat and grasshoppers had been given. In the evening the bird ate a *P. demoleus*, and two *P. polites*. At first it ate only half of the last specimen of *P. polites*, then trying and rejecting the *P. aristolochiæ*, and then eating the other half of the *polites* when offered. It then ate two specimens each of *Euplæa*, *Danais limniace*, and *D. genutia*.

*November 13th.*—The first food given to the Bhimraj to-day was three *Catopsilias* and three *Danais chrysippus*. It ate a *Catopsilia* first, and ate all of these before eating any of the *Danais*, though it picked up and rejected one of them. Afterwards it ate two of these *D. chrysippus*, and I put in two more. In the afternoon the Bhimraj ate a *Junonia*, though the three *Danais* and yesterday's *P. aristolochiæ* were in the cage uneaten, (one *Danais* was minus its head).

*November 16th.*—The Bhimraj having had no butterflies for two days, I gave it a *Danais chrysippus*, which it was careless with, and allowed it to escape. Then I offered a *Papilio aristolochiæ*, which was several times taken and rejected. Then I gave the bird a mimetic specimen of *P. polites*, which it ate, without persuasion. It then refused a *D. genutia*, and ate, with pressing, a *D. chrysippus*; then, readily enough, a *Catopsilia*. I could not induce it to eat a second *D. chrysippus*.

The *P. aristolochiæ* was not dead when taken out, though its wings were torn.

*November 17th.*—In the morning I gave the Bhimraj (which had no fresh food by it) a *Danais chrysippus* and a *Papilio aristolochiæ*, neither of which it would eat, though it tried them. Soon after it ate grasshoppers.

In the evening it ate a non-mimetic *P. polites*. Then it tried and refused a *Euplœa*, then readily ate a *Catopsilia*. Next, though pressed, it refused a *Danaïs genutia*, but ate two *Catopsilias* readily, and after again rejecting this *Danaïs*, ate four more *Catopsilias*.

November 18th.—The *Danaïs genutia* left overnight was gone this morning, but the "sweeper" might have removed it from the cage. I gave the bird first a *Delias eucharis* and then a *Catopsilia*, both of which it ate with equal readiness. Then I gave it a *D. chrysippus*, which it tried more than once, eating a bit of wing, but finally rejected. This insect, then flew away, in spite of having been taken hold of both with bill and foot by the bird. Then I gave a *D. genutia*, which was tried and refused at first, but eaten whole when offered again. Then a *Catopsilia* was given, and eaten at once. The bird then ate one each of *D. genutia* and *D. chrysippus*, but would not eat a second specimen of the latter, which I accordingly took out.

November 20th.—I gave the Bhimraj, which was not hungry, a *Delias eucharis*, which it tried and refused, repeating the refusal when the insect was again offered. It did not even touch a *Papilio aristolochiæ*, put on the floor, but ate two *P. demoleus*, one immediately, and the other when picked up and offered to it. It then ate two *Catopsilias*, but not a third, though eating a locust.

November 21st.—In the morning I saw the Bhimraj look at, but not touch, the *Delias eucharis* and *Papilio aristolochiæ* which had been left in its cage from yesterday. I then gave it a *Catopsilia* and a *Danaïs chrysippus* on the floor of its cage. It looked at the *Danaïs*, and took and ate the *Catopsilia*. I then put in a *D. limniace*, which the bird did not notice much, if at all, and certainly did not touch. Then it refused even to try a fresh *P. aristolochiæ*, but ate with persuasion a mimetic *P. polites*. I left the two *P. aristolochiæ*, the *D. eucharis*, and *D. limniace* in the cage, and put in three *D. chrysippus*.

After the butterflies left had been taken away, I then gave the bird, which was hungry, two specimens each of *Junonia*, *Catopsilia*, and *D. chrysippus* on the floor of the cage. It picked up and ate first the *Catopsilias* and then the *Junonias*, though it picked up and dropped one of the *Danaïs* before eating the second of the latter. Then, leaving the two *D. chrysippus* in the cage, I put in two *Papilio demoleus* and a *D. genutia*; the bird did not eat these, though eagerly eating meat, and they remained uneaten all day, and were left in at night.

November 22nd.—The butterflies left overnight were all uneaten this morning, and the bird, though pressed, refused to eat a fresh *Papilio demoleus*, so I took all out.

November 24th.—I gave the Bhimraj a *Papilio demoleus*, which it

tried carefully and rejected. *Danais chrysippus* was also tried and rejected, and *Delias eucharis* barely touched even, while *Junonia*, *Atella phalanta*, and another non-warningly-coloured species were readily eaten as also was a *Catopsilia*. The bird tried to catch a *D. limniuce* and one or two *D. chrysippus*, which escaped. The sweeper removed the *D. chrysippus* and *D. eucharis*.

In the evening the bird ate, with persuasion, two *Junonias*, but would not eat *Papilio polites* (non-mimetic) nor *Euplœa*. Finally just at dusk it ate with persuasion a *Huphina phryne*. It had food with it on both occasions, but the meat was stale in the morning.

November 25th.—In the morning the *Papilio polites* left overnight was gone, the *Euplœa* being left. There was food in the cage.

I gave the bird two more *P. polites* on the floor of the cage, one mimetic, and one not. It took the non-mimetic specimen first, and ate it, then the mimic, but showed no great eagerness in either case. I then put in a *P. aristolochiæ*, which was tried and rejected. Then I put in four *Junonias* and one specimen each of *Delias eucharis*, *Danais genutia* and *chrysippus*; the *Euplœa* and *P. aristolochiæ* still remained there. One *Junonia* was eaten at once; then the *D. eucharis* was picked up and dropped; then two more *Junonias* were eaten, and the fourth taken up and dropped. This action the bird apparently repeated once or twice (judging from the insect's varying position in the cage), but it finally ate it when offered by hand.

To-day it seemed not very eager for any butterflies.

In the evening, when the bird was hungry, I gave it (having transferred it to the aviary) dead specimens of both the mimetic and ordinary forms of *P. polites*. It took the non-mimetic form first and ate it, and then took and ate the mimic. I then put in one specimen each of *Euplœa*, *Danais chrysippus*, *D. genutia*, and three *Papilio demoleus*, all alive.

The bird took and dropped the *Euplœa*, and took and mauled, but did not kill, a *P. demoleus*. Later, when the bird had gone to roost, I missed this specimen, but found all the rest untouched, and removed them. From appearances next morning I think ants ate the *P. demoleus*.

November 26th.—The bird was not hungry when I gave it, in the afternoon, two *Catopsilias*, and one each of *Papilio demoleus*, *Euplœa*, and *Danais chrysippus*, all dead, the *Euplœa* and *P. demoleus* being the specimens I had taken out last night. One *Catopsilia* first disappeared; I saw the bird attacking these. Then the bird ate some meat and left the other butterflies. It would not eat the other *Catopsilia*, even when pressed, nor the *D. chrysippus*, which I also pressed on it. I then again pressed it to eat the *Catopsilia*, which this time it consented to do. I



let the bird out for a time, leaving the *Euplœa*, *Danaïs*, and *P. demoleus* in the aviary. But all three were uneaten when the bird went to roost, and also when I looked next morning.

After this the bird was transferred to the Alipore Zoological Gardens, where it still is.

#### EXPERIMENTS WITH KING-CROW.

The first bird of this species I got was sickly and soon died. Not however, before it had rejected a *Danaïs chrysippus* after tearing off the wings, and eaten a *Terias* whole.

The next bird, with which I experimented more than two years after, was healthier and older, but did not do well in captivity. In fact, when I ultimately released it, it was so weak as to fall a prey to a kite, a bird it would naturally attack and tease. It was kept part of the time in a small, and part in a large cage, both with upright wires, and fed on maggots and grasshoppers. I performed with it the following experiments, also towards the end of 1896.

*November 16th.*—I gave the bird two *Papilio demoleus* and a *Danaïs limniace*. The *Papilio*s were very soon eaten, though the bird was wild, (and hungry too, I think); the *D. limniace* was not eaten. I then put in another *P. demoleus* and one each of *Danaïs genutia* and *D. chrysippus*. The bird tore off the wings of the *P. demoleus*, but left the body; it did not touch the *Danaïds*. I then put in a *Junonia* and a *Catopsilia*; the latter was eaten at once, but the former soon disappeared also and not long after the body of the *P. demoleus* also, the *Danaïds* being untouched. I left these in the cage, as night came on.

*November 17th.*—The *Danaïds* left overnight were gone to-day, but I do not know whether the bird ate or the sweeper removed them. I gave the bird in the morning, when it was hungry, a *Danaïs genutia* and a *D. chrysippus*; it immediately took the *genutia* and tried to swallow it whole. It must have eaten both, for they disappeared, and I saw it swallow a body after picking off the wings. I then put in three *D. chrysippus*, one of which had been refused by the Bhimraj (see Bhimraj under this date) and the *Papilio aristolochiæ* also refused by that bird. I soon saw the King-crow eat one *D. chrysippus*, and not long after found only one left out of the three, with torn wings. The *P. aristolochiæ* was uneaten. Yet the bird soon after ate grasshoppers when given.

By the evening only the *P. aristolochiæ* was left, with more torn wings than before. I then gave the King-crow, which should have been hungry, a non-mimetic specimen of *P. polites*, which it at once ate, nearly whole. I then put in a *Delias eucharis* and a *Catopsilia*, the latter

of which it at once took and ate. I then put in one specimen each of *D. genutia* and *chrysippus*, and three smaller *Catopsilias*, two of which last were soon eaten. Next I put in the *Euplœa* refused by the Bhimraj (see Bhimraj under this date). It was not taken by the King-crow, though soon after the third *Catopsilia* disappeared from the cage. I put in two more *Catopsilias*, one of which was eaten at once. The other remained till dusk, and I took it out with the *Euplœa*, *D. genutia* and *chrysippus*, and *P. aristolochiæ*, which last I threw away. But the *D. eucharis* had disappeared, though I did not see the bird eat this, and at any rate it had eaten four or five *Catopsilias* before it could have done so.

November 18th.—I offered the King-crow the *Euplœa*, the two *Danaïs*, and *Catopsilia* taken out last night. It ate first the *Catopsilia*, and then the *D. genutia*, quite readily. Then I put in four *Catopsilias*, three of which were eaten immediately, and not long after the other disappeared, the *D. chrysippus* and *Euplœa* remaining. Quite soon after, the *D. chrysippus* was eaten. Soon after this the bird took the *Euplœa*; pulled off the wings and swallowed the body, but threw this up again and left it. But some time after this also was gone.

In the evening I gave the bird a *Delias eucharis* and three *Catopsilias*; it picked up and ate all of the latter immediately, then picked up and dropped the *Delias*. Soon after, while this *D. eucharis* was still left, I put in specimens of *Papilio aristolochiæ* and *demoleus*, *Junonia*, and *Danaïs chrysippus*. The *P. demoleus* was taken first, and next *Junonia* disappeared. Then the *D. chrysippus*, which had been refused by Bhimraj (see Bhimraj under this date) was eaten quite readily, as was usually the case when this bird ate "protected" species, so far as I saw.

November 19th.—In the morning, the *Delias eucharis* (with part of wings torn off) and *Papilio aristolochiæ* left in the cage overnight, still remained. I put in three *Danaïs chrysippus*, two of which were immediately swallowed whole, and the third eaten after the wings had been pecked off a little. I then gave the bird two more *D. chrysippus*, one of which it took, and I left it holding the insect in its foot. This disappeared, the other specimen and the *D. eucharis* and *P. aristolochiæ* being still left, but soon after the wings of this second *Danaïs* were plucked off and it was eaten. Some little time afterwards I gave the bird a *Junonia* which it did not touch as far as I saw, though it had been recently eating maggots, of which it had lately but short allowance. I gave it plenty of these now, and by evening nearly all were gone, but the three butterflies (*Junonia*, *D. eucharis*, *P. aristolochiæ*) were still uneaten. I put in a female of *Elymnias undularis*

a *Junonia* (of another species), and a *Catopsilia*, of which the last was immediately eaten. I put in another *Catopsilia*, which the bird ate after plucking off the wings.

I then took out the two *Junonias*, *Elymnias*, *P. aristolochiæ* and *D. eucharis* from the cage, as it was getting dark, and threw away the last, which was very dry.

November 20th.—I gave the King-crow, which was hungry, the two *Junonias*, the *Elymnias* (with its wings closed, as indeed before) and a *Danais chrysippus*. One *Junonia* was soon taken, but the bird, after tearing off a bit of wing, rejected the insect, possibly because it was dry. But soon after all I had put in were gone. I then put in two *Catopsilias* and two *Delias eucharis*; the former were eaten immediately, the latter not touched. I then gave the bird a *Papilio demoleus*, which it took, and pecked at the wings, and the insect soon disappeared, though I did not see it swallowed. I then put in the *P. aristolochiæ* which I had taken out the previous night, with a non-mimetic *P. polites*. Before long I saw the bird pluck off the wings of the *P. polites* and eat it. The two *Delias eucharis* and the *P. aristolochiæ* were still untouched. I then put in a *P. demoleus*, and a *Danais chrysippus* and *genutia*; almost immediately the bird plucked the wings from the *Papilio* and ate it, and soon after did the same with the *D. genutia*. Soon after this maggots were given to the bird. Some time after these and the *D. chrysippus* were gone, while the two *D. eucharis* and the *P. aristolochiæ* were left; and long after this, in the evening, these butterflies still remained, though one *Delias* was minus the head and one hind-wing, and the other also torn. A locust given to the bird had disappeared. I then put in three *P. polites*, two of the mimetic, and one of the non-mimetic form, and also a *P. demoleus*. This last, which was not put in quite simultaneously with the others, was almost immediately seized by the bird, which a little after, took and ate in my sight the non-mimetic *P. polites*. I then put another *P. aristolochiæ* in the cage. Then I saw the bird pick up one of the remaining *P. polites* by the wing and drop it. I put in a *Catopsilia*, and a locust; the bird took the butterfly. Later, at dusk, I saw it eating the locust.

I afterwards took out the two *P. polites* and the fresh *P. aristolochiæ*.

November 21st.—In the morning, the bird being hungry, I put in the two mimetic *Papilio polites*, with a *Danais limniace* and *chrysippus*. The *D. limniace* was immediately taken and eaten.

Soon after I took out the two *Delias eucharis* and the one *Papilio aristolochiæ*, which had remained in the cage all yesterday, and up to now, and threw them away, putting in instead the second *P. aristolochiæ* which

I had taken out last night, with two more *D. chrysippus*. Soon after one of the *P. polites* had disappeared, although the other, with the three *D. chrysippus* and the *P. aristolochiæ* were left. This I observed after I had let the bird out, unfortunately to meet the fate above described.

About this time I also experimented with a Shama (*Kittacincla macrura*) one of the smaller or Robin-like members of the great Thrush group. These birds, as every observer knows, peck their prey to pieces, and do not use their feet to hold it, thus differing widely from their relatives the Babblers, which are a more tropical group. The Shama, however, and many other Thrush-like birds inhabit the Oriental region. This bird was hand-reared and very tame, and I experimented with it in a cage, feeding it on maggots, meal-paste, and small green (dried) insects.

With regard to the probability of birds of this group attacking butterflies, I may say I have seen a Redstart (*Ruticilla sp. ?*), in nature, at Dehra Dun, seize a very large *Catopsilia* I put out for it, decapitated, and apparently it satisfactorily disposed of it.

#### EXPERIMENTS WITH SHAMA.

*November 26th.*—I put in the Shama's cage a *Catopsilia*, and afterwards another non-warningly-coloured butterfly, a small greyish species. Both disappeared and were doubtless eaten by the bird.

*November 27th.*—I put in the cage of the Shama (which was not hungry) a *Catopsilia* and a *Danais chrysippus*. The bird was soon pecking at the former, which shortly disappeared; the *Danais* had also been pecked. A moment after the bird was attacking this, but the body remained uneaten, though most of the wings were picked off. I soon after put in a *Delias eucharis* and a *Junonia*, the latter of which was immediately pecked about and eaten, while the *Delias* was pecked once or twice and left. I then put in another *D. chrysippus*, which the bird pecked to pieces, but did not eat; it then pecked about and ate a male *Nepheronia hippia* which I put in. A little time after this, I found that the abdomen of the second *Danais* given had disappeared; I put in a third specimen and two *Catopsilias*, both of which latter the bird pecked, and then started to attack one, disregarding the *Danais*, and soon ate it. Then it began upon the other, which soon disappeared. The (body of the) first *Danais* given, and the third, with the *D. eucharis* remained uneaten. However the bird soon attacked this third *Danais*, but did not eat it. I then put in four *Catopsilias*, which were immediately attacked, and soon disappeared, the three "protected" specimens being still left. I then put in two *Papilio demoleus*. These were attacked, but less eagerly, but ultimately part of one was apparently eaten, and most of the wings stripped from the

other, while *D. chrysippus* and *D. eucharis* still remained. Later I found, lying in a dry state outside the cage, part of the body of one of these *P. demoleus*, and dried bodies or parts of two *D. chrysippus*. The *D. eucharis* disappeared, I did not notice at what exact time.

In the evening I gave the bird, which was not hungry, but had no butterflies in its cage, three *P. demoleus* and a *D. chrysippus*. It attacked one of the former, but did not persevere, but took and pecked at the *Danais*, and then left it, having apparently eaten its abdomen. I then took out the *Papilio*s and put in a *Junonia* and a *Delias eucharis*; the *Junonia* was immediately seized, and soon devoured. I then put in a *Catopsilia*, which was at once seized, and soon disappeared. I then again offered a *P. demoleus*, which the bird pecked at and left. The *D. eucharis* was not touched, and as the bird was about to roost, I took out both it and the *P. demoleus* and threw them away.

November 28th.—In the morning, the Shama not being hungry, I put in two of the *Papilio demoleus* taken away yesterday, together with a *Danais genutia*. The bird pecked first at a *P. demoleus*, then at the *Danais*; it picked this about a good deal, but nevertheless I left it attacking a *demoleus*, and soon found that one of these had disappeared, and the other was much torn, while the *Danais* was intact. I then put in four *Catopsilias*, all of which disappeared, while the *P. demoleus* and *D. genutia* were uneaten; the bird, however, pecked at all, I think, of these *Catopsilias* before eating any; also it picked up and dropped the *D. chrysippus* (left from yesterday) before it had eaten one, and pecked the *genutia* about while a *Catopsilia's* abdomen still remained. Some time after the *D. genutia* had been pecked quite to pieces and its abdomen was gone; the bodies of the *D. chrysippus* and *P. demoleus* were left.

They were still there in the afternoon, and the bird was not hungry. I put in one specimen each of *Junonia*, *Catopsilia* and *D. chrysippus*. The bird did not show much eagerness. First I saw it hold the *Junonia* for some time; then I was put in time to see the *Catopsilia* swallowed, the *Junonia* having meanwhile disappeared; then it began to peck the *D. chrysippus*, and I put in a *P. demoleus* of which the wings were already largely torn away. Very shortly after I found only its forewings, while the *D. chrysippus* was untouched. I then put in another *P. demoleus*, intact, and a *D. genutia*. Soon after I found outside the separated thorax and abdomen with part of the wings, of the *D. genutia*, and the *P. demoleus* minus one wing. I put both back, and the bird pecked the *P. demoleus* and ate the body. The *D. chrysippus* more recently put in was still untouched; I took out the body of the specimen that had remained all day, also that of the *P. demoleus* mentioned *supra* as remaining with it; these were dry.

November 29th.—In the morning, the bird not being hungry, I found the *Danais chrysippus* left overnight in the cage still whole, and the abdomen of the *D. genutia*. I put in another *D. chrysippus*, and a *Papilio demoleus*, of which the latter was first taken, pecked about, and eaten, and the bird was pecking the *Danais* when I put in a non-mimetic *P. polites*. The bird left the *Danais* and pecked off one of the wings of the *P. polites*, and then remained quiet for a little. Soon after I found the *P. polites* had been pecked to pieces, and its body was gone. The head of the *D. chrysippus* put in was also missing. After the bird had been pecking at this insect, I put in a *D. limniace* and a *P. demoleus*. The bird attacked the *Danais* first, pecked off the wings, and ate the abdomen; it then attacked the *D. demoleus*, not very eagerly. Some time after I found the body of the latter, stripped of the wings, outside. I put it in the cage, and the abdomen at all events disappeared, though there were the body of one *D. chrysippus*, and the thorax and wings of another, still there. On emptying the cage, I found the abdomen of some large butterfly behind the tray, and some heads, and bits of thorax there and in the tray itself.

Later on, the bird being still not hungry, I put in two *D. chrysippus* and a *P. demoleus*. The bird pecked at all three, and left them for a while. The *Papilio* was the first attacked, so far as I saw, but a *Danais* was more pecked. Then the *P. demoleus* was again attacked. I was now away for some time, and on returning in the evening found all three butterflies uneaten, and threw them away.

December 1st.—I put in in the morning, the bird not being hungry, two *Danais limniace* and a *Papilio demoleus*. The Shama first attacked a *limniace*, but ate none.

Some hours later, I put in one specimen each of *Junonia*, *Atella phalanta*, and *D. chrysippus*.

The Shama first ate the *Atella*, and then attacked the *Junonia*, which soon disappeared. I put in one non-mimetic *Papilio polites* and two *P. aristolochiæ*. One of the latter was first attacked, but two or three hours afterwards I found it outside, with its wings much torn; the other was almost intact, while the *P. polites* had been pecked to pieces and its body was gone. The *P. demoleus* and the two *D. limniace*, put in early, were still there, the latter having been more attacked than the former, if indeed this *Papilio* had been touched at all. The *D. chrysippus* was untouched. At night, after the bird had gone to roost, I examined the cage and found one *D. limniace*, the *D. chrysippus* and *P. demoleus* uneaten; the other butterflies were not to be found.

December 2nd.—I removed from the Shama's cage, early, the three butterflies (*D. limniace* and *chrysippus*, *P. demoleus*) left overnight; and

later gave the bird (which was not hungry) one male *Nepheronia hippia*, and two *Danaïs genutia*. First it pecked a *D. genutia*, then attacked the *Nepheronia*, battered off its wings, and ate it, though I did not witness the actual swallowing. Some hours later I found one *D. genutia* in a mangled state outside (and also an abdomen of this species), and the other not at all. I put that which I had found in again, and some hours later found it also gone.

*December 4th.*—I offered the Shama two non-mimetic specimens of *Papilio polites*, and a *P. aristolochiæ*. The two former were torn up, and their bodies not to be seen; this happened in the case of one very soon, and in that of the other after some time; the *P. aristolochiæ* was not eaten. The bodies of two large non-warningly-coloured butterflies (one a *Euthalia*) disappeared, while one *P. polites* still remained.

I then put in two *P. demoleus* and a female *Nepheronia hippia*. Some time after I found the latter pecked to bits, and its body mostly gone; the same was the case with one of the *P. demoleus*; of the other I found the body outside. I offered it again, and found this time the abdomen outside; this I put in again. The *P. aristolochiæ* still remained uneaten, as did the heads of the *P. demoleus*.

Afterwards I found the *P. demoleus* abdomen gone, and then gave the bird two *Huphina phryne*, and one *Delias eucharis*, the former of which it immediately ate. Very soon also I found the *Delias eucharis* had been pecked to pieces, and its body was gone. I then put in a *P. demoleus*, which at night had disappeared. The *P. aristolochiæ* was still left, though it had been pecked.

*December 5th.*—I put into the Shama's cage a *Papilio aristolochiæ* and a mimetic *P. polites*; the latter was eaten, or at any rate disappeared, and I put in a *P. demoleus*, which was soon attacked, the *P. aristolochiæ* being untouched or nearly so. About this time I took out the other *P. aristolochiæ* (left from yesterday). The *P. demoleus* was soon disposed of, and its body disappeared; some little time after this also happened with the *P. aristolochiæ*. The bird only had "meal-paste" by way of food, and this was also the case early yesterday. I now put in a *Danaïs genutia* and a *Catopsilia* of about its size; the latter was taken at once and swallowed almost whole; and a male *Nepheronia hippia* nearly as big had its wings battered off and body eaten. I then put in a *Huphina phryne*, two *Atella phalanta*, and one (smaller) *Catopsilia*, all of which were eaten in the order named; I saw most of them swallowed, all but the *Catopsilia* whole; a *Delias eucharis* put in with them remained untouched like the *D. genutia* previously put in. But immediately after, the bird attacked this *Danaïs*, whereupon I put in a *P. demoleus*; this however, was not attacked,

the bird preferring to attack both the *Danais* and the *Delias*. Some time after, (maggots having meanwhile been given) the *P. demoleus* had evidently been eaten and the *D. genutia* was gone. I put in two *P. demoleus* and another *D. genutia*; the latter was attacked. Not long after the two *P. demoleus* had been pecked to pieces, and mostly eaten; the wings of the *D. genutia* had been pecked, but the body was intact; the *Delias eucharis*, which I had noticed as having been pecked when I put in this last lot, was also intact, all but the head. But some time later both the *Danais* and *Delias* had apparently been treated like the *P. demoleus*.

*December 6th.*—In the morning I gave the Shama a non-mimetic *Papilio polites* and a male *Nepheronia hippia*; the latter was attacked first, and both were apparently eaten, as I could not find them later.

*December 7th.*—I gave the Shama, which was not hungry and had had insects given it, a *Huphina phryne*, a *Delias eucharis*, and two small *Catopsilias*. Some time after all had evidently been eaten; I did not see which had been taken first.

I then put in one *D. eucharis*, one *D. chrysippus*, one *Catopsilia*, and three *Junonias*. Not long after I found that all had been eaten except *D. eucharis* and *D. chrysippus*, the former of which was minus its head. While these were left I put in two *Papilio demoleus* and two *D. genutia*. Soon after one of the latter had disappeared, leaving no trace. The others remained for some time with the butterflies previously left, but at night the other *D. genutia* had evidently been eaten, and the wings of the *D. chrysippus* had been picked off. But its body was left, as also were the *D. eucharis* and one *P. demoleus*.

*December 8th.*—The butterflies left last night were still in the cage this morning, almost all of the wings of the *P. demoleus* having been picked off. I put in a non-mimetic *P. polites*, and soon found that it had been pecked to pieces and the body was gone. I then took out the others. Even most of the wings of the *P. polites* seemed later to have been eaten. I put in, before the bird had yet had any insects, a *P. demoleus*; some little time after I found this also with its wings pecked, but not eaten. I took out the bird and put it into another cage.

*December 9th.*—I put into the cage of the Shama, in the morning, when it had insects, a male *Elymnias undularis*. A little later the bird had evidently eaten this.

I then put in the cage a non-mimetic *Papilio polites*, and two *P. aristolochiæ*. Looking afterwards, I found the bird had apparently eaten one *P. aristolochiæ*, a small specimen, the other and the *P. polites* being left. Afterwards I saw the bird attacking the latter, and later found it had eaten both. Some time afterwards I found the head of the *P. aristolochiæ*.



*December 10th.*—I put in the Shama's cage two *Papilio aristolochiæ* and a non-mimetic *P. polites*, but they were not eaten. I left them there, and found, about an hour later, that the bird had pecked to bits and apparently eaten the *P. polites* and one of the *P. aristolochiæ*, the second *P. aristolochiæ* still remaining; but afterwards I found that this also had apparently been eaten.

*December 12th.*—The Shama being hungry, I put in its cage a *Papilio aristolochiæ* and *P. demoleus*. The bird pecked the *P. demoleus* to pieces and apparently ate the body. I put in another. After it had attacked this, I put in two *Atella phalanta*, which after a little time disappeared, all but bits of wing. At roosting-time the second *P. demoleus* had apparently been eaten, and the body of the *P. aristolochiæ* lay outside the cage.

*December 13th.*—I must have put back the body of the *P. aristolochiæ* found outside last night, for I note only the abdomen left this morning. The bird had received food (green insects) overnight.

*December 16th.*—I put into the Shama's cage a *Euplœa* and a large non-warningly-coloured specimen. The bird first went for the *Euplœa*, but before long attacked and pecked about the other, which I just missed seeing swallowed whole.

Later, I gave the bird an *Euthalia* and another *Euplœa*; the former was attacked first, but afterwards dropped and the *Euplœa* picked up; but the *Euthalia* was taken again, its wings battered off, and the body apparently eaten; I did not see it. I put in then a *Junonia* and a *Papilio demoleus*, and not long after both had disappeared except part of the wings of the latter. The *Euplœas* were still uneaten.

I put in a *Huphina phryne*, which was immediately seized, and swallowed nearly whole.

At night the *Euplœas* were still uneaten though when I looked in in the afternoon the bird had no food; I gave it some green insects then.

*December 17th.*—The bird had some of the green insects left in its cage this morning, and also the butterflies left overnight. I put in a non-mimetic *Papilio polites* and a small *P. aristolochiæ*. The bird did not attack at once, but soon I found bits of wing only left of the *P. polites*, and the *P. aristolochiæ* untouched, or only slightly torn as to the wings. I put in a *P. demoleus* which the bird attacked before very long, and soon it disappeared, all but one wing; the *P. aristolochiæ* still remaining.

I then put in a small "Blue," a *Terias*, and a *Junonia*. The bird first took and swallowed the last of these; then it appeared to eat some bugs; then it pecked the wing of the *P. aristolochiæ*, and then took the *Terias*. This soon disappeared, all but two bits of wing; I did not see it swallowed. The bird then pecked the *P. aristolochiæ* again.

I then put in a *Junonia*, which was attacked and swallowed; then another *P. demoleus*, which the bird at once attacked, but left to eat the "Blue" with less readiness than I should have expected. It soon attacked the *P. demoleus* again, and the insect disappeared, all but parts of wings, whereupon I put in another.

I now had the cage cleaned, taking out this *P. demoleus* and *P. aristolochiæ*, and also the two *Euplœas*, which had remained, all this time, and which I now threw away.

Later, after the bird had had no food for two hours or so, I put in again these two *Papilios*, together with two *Junonias* of different species; these latter almost immediately disappeared, all but some pieces of wing, and I then saw the bird batter the *P. demoleus* and eat the body. *P. aristolochiæ* left.

December 18th.—The *P. aristolochiæ* was still uneaten to-day; the bird had food by it.

I put in the Shama's cage another *P. aristolochiæ*, and one specimen each of *Papilio demoleus*, *Danais genutia* and *D. limniace*. The bird attacked, first *D. genutia*, *P. demoleus*, and *D. limniace*, then *D. genutia* again, then *D. limniace* again, then it attacked *D. genutia* a third time, and then attacked *P. demoleus*, pecked off the wings, and ate the body. I noticed that with the *Danaids* it attacked the end of the abdomen—not so with the *P. demoleus*. It then pecked the *D. limniace*, and then apparently (for the insect seemed to have been moved) for the first time the *P. aristolochiæ*.

Some time after (maggots having been given in the meantime) I found the *D. limniace* pecked to pieces, but not eaten, except probably the head, which was missing. The *D. genutia* was missing, but next day I found it behind the water-tin. The *P. aristolochiæ* was still there; its wings had been pecked. There were green insects as well as maggots in the cage.

Two hours or so after this, the Shama, though there were still green insects in its cage, had apparently eaten both the *D. limniace* and *P. aristolochiæ*.

This ended the experiments with this species, as on the next day I released the bird, which disappeared.

I also made a considerable number of experiments at this time with a Starling, the Indian *Sturnus menzbieri* probably, a bird practically identical with the common European species. Starlings are omnivorous and feed largely on the ground, like Thrushes, and so are probably less important as enemies to butterflies than some other birds. They do not use their feet in feeding, but this species at any rate can dispose of a large prey easily enough by swallowing it whole.

## EXPERIMENTS WITH STARLING.

*December 8th.*—The Starling having been put into a cage in which was a specimen of *Papilio demoleus*, soon apparently ate the insect; and also I think a *Catopsilia* and another (brown) non-warningly-coloured butterfly.

*December 9th.*—I put in the cage of the Starling, which was, I think, hungry, a specimen each of *Junonia*, *Danais chrysippus*, *Delias eucharis*, and *Catopsilia*. The bird ate the *Junonia* and then the *Catopsilia*, whole. I then put in a *Junonia* of another species, which was also eaten whole. Very soon after I found the *D. eucharis* and *D. chrysippus* also gone. Later on I put in a *Junonia* and a *Huphina phryne*, together with another *D. chrysippus* and *D. eucharis*. The bird ate first the *Junonia*, then the *Huphina*, and then the *D. eucharis*. I left the *D. chrysippus*, which had not yet been touched, in the cage, and soon after found it outside. I put it in again, with a *D. genutia* and *D. limniace*, and gave the bird at the same time a tin of bread-and-milk. Very soon I saw it energetically attack the *D. limniace* and swallow it, though the biggest butterfly given. Later I found the *D. genutia* untouched, though the *D. chrysippus* had long disappeared and the bird ate maggots; and in the evening, though the bird had eaten up all these and also the artificial food, this *D. genutia* was still untouched. A young cockroach given in the afternoon had soon disappeared.

*December 10th.*—I put in the Starling's cage, where the *Danais genutia* given yesterday still remained, torn but uneaten, the body, in two pieces, of a large yellow-underwinged moth; it soon disappeared.

Later, when there was no food in the cage, I put in one specimen each of *Atella*, *Euthalia*, *Papilio demoleus*, and *Euplœa*. The *Euthalia* was eaten immediately, but though the bird picked up the *P. demoleus* and touched the *Euplœa*, it did not seem inclined to eat them or the *Atella*. Yet it ate green insects (*Iassidæ*) readily when given. I took out the *Euplœa*, *P. demoleus*, and *Atella*, leaving in the *D. genutia*. Later on I put them in again, with a *Junonia* and a *Catopsilia*.

The *Catopsilia* only disappeared, and I left the rest, putting in another *Atella* and a *Delias eucharis*. An hour or two later one *Atella* and the *Junonia* lay outside; none had been eaten. I put back those found outside, and added another *D. eucharis*.

After the bird had roosted I examined the cage and found none of these butterflies eaten.

*December 11th.*—Although there was no food in the Starling's cage, the butterflies left overnight (two each *Atella phalantha* and *Delias eucharis*, one *P. demoleus*, *Junonia*, and *Euplœa* with the old *D. genutia*) were uneaten in the morning, at first. Later, first the *P. demoleus* dis-

appeared, and afterwards I saw the bird eat part of the *Junonia* (I had put in part I found outside). The other butterflies were not eaten for some time, though they had been pecked, and the bird ate maggots (which had been given) readily. It also greedily ate a green tree-cricket. I put in another *P. demoleus*, and an hour or two later found one of this species nearly intact, but with much pecked wings, and part of another, outside. I put them in, and the fragmentary one soon disappeared. Of one *D. eucharis* also only a bit was left; the others had not been eaten. The bird had now no other food but these butterflies and I put in a third *A. phalantha*.

An hour or so after, the bird had apparently eaten only a bit of one of the previously-given *Atellas*, and the bit of *D. eucharis*; however I now saw it attack the *P. demoleus*, and eat some, leaving only a little.

At roosting-time it had done no more.

*December 12th.*—The state of things in the Starling's cage was still the same. I found a piece of a butterfly outside, which I put in, and saw there was another fragment inside too, one of which was part of a *P. demoleus*, and the other might have been this or *D. eucharis*. I took both out, and also the two *Atellas*, the *Delias eucharis*, *Danais genutia*, and *Euplœa*. Later, the bird being hungry, as there was no food in the cage, I put in a *D. genutia* and two *Junonias* and an *Atella*. The bird immediately devoured the two *Junonias*, and pecked and rejected *Atella*. However, this butterfly soon disappeared, and I put in another with a *Papilio demoleus*, *D. limniace*, and *Euplœa*. The bird picked out and swallowed the *Atella*, then pecked at the *P. demoleus*, which it apparently ate, as I only found bits of wing. Then, after pecking at a *D. chrysippus*, and perhaps at others, it swallowed the *Euplœa*.

I then put in a *Huphina phryne* and four *Junonia*, all of which the bird ate at once. It then shortly pecked and ate the *D. limniace*, and by roosting-time both the *D. genutia* and *D. chrysippus* had also disappeared. I have not noted when the last named was put in.

I then put food, green insects, into the cage.

*December 13th.* The Starling in the morning, though not hungry, ate the abdomen of a *Papilio aristolochiæ* from the Shama's cage.

I put in two *Danais chrysippus*, and some time after they were still uneaten, though one or both were minus heads; when, however, I put in a *Junonia*, the bird immediately ate it, though it had plenty of green insects. These two *D. chrysippus* remained uneaten all day in the Starling's cage. Next day by evening one had apparently been eaten, the other not. The bird had both green insects and bread-and-milk as food.

December 16th.—I put in the cage of the Starling, which was not hungry, several small butterflies, *Terias*, *Huphina phryne*, a *Catopsilia*, an *Atella phalantha*, and a small brown non-warningly-coloured species. All but *Atella* were soon eaten. The *Danais chrysippus* left two days ago was still in the cage. I then put in a *Danais limniace*, *Delias eucharis*, and two *Papilio demoleus*, and soon after found all these gone but the *Delias eucharis*, a wing or so of the *D. limniace*, and the head of one *P. demoleus*. The *Atella* had also disappeared, all but a bit of wing, but the old stale *D. chrysippus* still remained.

At night, though at one period in the afternoon I found no food in the cage, when I gave the bird some green insects, this *D. chrysippus* and *D. eucharis* were still uneaten.

December 17th.—The two butterflies left overnight, and some green insects, were still in the bird's cage when I put in a fine large *Papilio aristolochiæ* and a *P. demoleus*. Immediately the bird attacked the *P. aristolochiæ* and greedily swallowed it whole, and very soon after the *P. demoleus* also.

I then put in a *Danais limniace* and three *P. demoleus*. The bird attacked the *Danais* first, but left it and took and swallowed a *P. demoleus*; then it again attacked the *Danais* (possibly because it fluttered, not being quite dead), and left it to eat a *Papilio*; the third *P. demoleus* then disappeared, evidently swallowed like the others.

After having given another *P. demoleus* to the Starling, I gave it two *Junonias* of different species; these soon disappeared.

The Starling certainly attacked the last *P. demoleus* before the *D. limniace* I had put in earlier, and apparently ate part of it. I saw it attacking the *Danais*, however and it apparently ate part of it. But I found part of it, and also parts of three *P. demoleus*, so that all could not have been eaten whole as I thought.

The *D. chrysippus* which had been so long in the cage was also broken up, but the *D. eucharis* remained.

I now had the cage cleaned, and the butterflies removed.

December 18th.—I gave the Starling, which had food by it, a *Papilio aristolochiæ*, together with a *P. demoleus*. The bird looked at the *P. aristolochiæ* and took and swallowed the other.

I then put in a fresh *P. aristolochiæ* and an *Atella phalantha*. The bird at once ate the *Atella* without noticing the *P. aristolochiæ*, and then merely looked at the latter.

I then offered a *Neptis* and a *P. demoleus*. The Starling timidly advanced, seized, and swallowed the *Neptis*. It seemed to fear the *Papilio*, which was not quite dead, and lay with its wings spread facing the bird, which however seized and ate it as soon as it had swallowed the other.

I then gave the Starling a *Huphina phryne*, and another non-warningly-coloured butterfly, both of which it ate at once, as also an *Atella* which I then gave it.

I took out the second *P. aristolochiæ*.

I put in then *Euplœa*, *D. chrysippus*, and *D. genutia*. The bird at once ate the *Euplœa*.

Some time after, maggots having been given to the bird in the meantime and eaten, I found in the Starling's cage the one *P. aristolochiæ* left there untouched, also the *D. chrysippus*; the *D. genutia* had been pecked to pieces, but not eaten, except perhaps the head. The bird had now no food but a little fruit, so I gave it some green insects.

Two hours or so after, the Starling, in whose cage some insects still remained, had not eaten the butterflies above-mentioned (*P. aristolochiæ*, *D. chrysippus* and *D. genutia*); nor were they eaten when I looked next morning. After this I ceased experimenting, and took the bird to the Zoological Gardens.

#### EXPERIMENTS WITH MYNAH.

I also made at different times a few experiments with a close ally of the Starling, the Common Mynah (*Acridotheres tristis*) with birds at liberty.

*July 9th, 1895.*—I gave a *Papilio demoleus* to a wild Mynah which I had seen trying to get at some butterflies in an insect-cage. The bird knocked off most part of this butterfly's wings and flew off with the body.

*July 11th.*—I put a disabled *Danaïs genutia* in the compound, when a Mynah, which was on a building, came down almost at once, seized and battered the insect, and ate most of it; I found the head and a bit of thorax (attacked by ants) and some wings on the ground.

I then put out another, and a *Catopsilia*; but they remained unnoticed by the Mynahs for some time.

*July 17th.*—I put a disabled *Catopsilia* and *D. limniace* in view of two Mynahs. One of them took first the *Catopsilia*, which was nearest, then the *Danaïs*, beat them on the ground, singly and together, knocking off a fore-wing of each; it then flew with them to a high building, where I did not see what followed.

*November 2nd.*—I put out a disabled *Papilio aristolochiæ* and *P. demoleus* on a lawn. Two Mynahs came near, and one ran to the *P. demoleus* and pecked it about, while the other, after looking on and possibly pecking the insect also, went up to the *P. aristolochiæ*, which it pecked, but left almost immediately.

On going up to the spot, I found the *P. demoleus* uneaten, but minus its head, and the other intact, though motionless.

## EXPERIMENTS WITH HORNBILL.

With these birds also my experiments have been few, but interesting results were got from some of them.

The species was the common Black and White Hornbill (*Anthracoceros*) and I experimented with two specimens, but the first bird, which was allowed to go about the compound with clipped wings was unfortunately soon stolen, and the second did not care about insects at all. The following, therefore, applies to one bird only.

*December 8th, 1896.*—Hornbill, though not eating table-scrap and fruit very well, ate a Skipper, and ravenously devoured two grasshoppers.

*December 12th.*—I offered the Hornbill some dry dead butterflies from other birds' cages. It readily ate *Catopsilias*, *Atellas*, a bit of *Papilio demoleus* and of some other butterfly; also a *Delias eucharis*, after rubbing this last. It took, rubbed, and refused *Danais chrysippus* and *D. genutia* and *Euplœa*.

I then offered it more butterflies, many of them dead and dry. It ate several *Catopsilias*, one *Huphina phryne*, and several *Junonias*, although it was not without trouble that I got the bird to eat one of these last, and another it would not eat at all. It also refused one *P. demoleus*, though eating another of this species.

It would not eat *D. chrysippus* and *genutia*, nor *Papilio aristolochiæ*, though the two former were fresh, and it afterwards ate many dried grasshoppers.

*December 13th.*—Offered the Hornbill, which had had some fruit, two *Catopsilias* and two *Danais chrysippus*.

It ate the *Catopsilias*, but took and refused the *D. chrysippus*. Also on another occasion to-day it refused a *D. chrysippus*. It ate, when pressed, a protectively-coloured moth.

## SECTION III.

## SUMMARY AND CONCLUSIONS.

I have nothing to add to what I said concerning Mammals and Reptiles, &c., in the papers devoted to them (J. A. S. B., LXV., Pt. II, 1896, p. 42; LXVI., Pt. II, 1897, p. 528), for I do not intend to compare them with Birds, since my experiments with the former were limited to one species of each class. I shall therefore confine these remarks to Birds only.

The common Babblers (*Crateropus canorus*) dealt with in my first paper (J. A. S. B., LXIV., Pt. II, 1895, p. 344) ate the Danaine butterflies readily enough in the absence of others, but when offered a choice showed their dislike of these "protected" forms by avoiding

them. This avoidance was much more marked when the birds were at liberty, though even so a few of the objectionable butterflies were eaten.

*Delias eucharis* and *Papilio aristolochiæ* were also disliked by this bird, more especially the latter.

Although I did not experiment on any of them at liberty, my experience with the Liothrix (*Liothrix luteus*), Mesia (*Mesia argentauris*), Bhimraj (*Dissemurus paradiseus*), King-crow (*Dicrurus ater*), Starling (*Sturnus menzbieri*) and Shama (*Kittacincla macrura*) was similar, in that all of these birds objected to the *Danainæ*, *Delias eucharis*,\* and *Papilio aristolochiæ*, (especially, as a rule, to the last) in comparison with other butterflies, or absolutely.

I never saw the Chloropsis (*Chloropsis aurifrons* or *malabarica*) or the Sibia (*Malacias capistrata*) eat any "nauseous" butterfly, except that in the case of the former, one *Euplœa* body and a few bits of wing were eaten.

The latter bird refused with apparent dislike the male of *Elymnias undularis*, which should be palatable, and was as a matter of fact usually liked by the birds to which I offered it. Another mimetic species, *Papilio polites*, was not very generally popular with birds, but much preferred to its model, *P. aristolochiæ*.

The Hornbill refused *Danainæ* and *Papilio aristolochiæ* absolutely, but ate the only *Delias eucharis* given.

In several cases I saw the birds apparently deceived by mimicking butterflies. The Common Babbler was deceived by *Nepheronia hippia* and Liothrix by *Hypolimnas misippus*. The latter bird saw through the disguise of the mimetic *Papilio polites*, which, however, was sufficient to deceive the Bhimraj and King-crow.

I doubt if any bird was impressed by the mimetic appearance of the female *Elymnias undularis*. But this is not a first-rate imitation, and a mimic is put to a very severe test when offered to a bird in a cage or aviary.

Young hand-reared birds, like the Shama and Bhimraj, had no instinctive knowledge of the "nauseous" forms, and ate them quite readily at first, but soon gained experience. Birds caught when old, when watched from the first, like the Sibia, first Mesia and Starling, appeared to know and avoid unpalatable species. The latter bird's action in greedily devouring the first whole *Papilio aristolochiæ* given, and then avoiding this species, seems to show it did not know this insect, and had no general prejudice against Warning Colours.

So far the results of these experiments on the whole bear out the

\* The first Mesia had not this species offered to it, but those subsequently kept had, and evidently disliked it.



accepted theory, but certain birds, like the Lizards, were more indiscriminate in their tastes.

The two Red-vented species of Bulbuls (*Molpastes bengalensis* and *Otocompsa emeria*) when they would eat butterflies at all (some were very reluctant to do this) showed little discrimination, and often devoured the *Danainæ* as readily as other kinds. The contrast in this respect between these birds and *Liothrix*, when kept under the same conditions, was very noticeable.

The Yellow-vented species (*Molpastes leucotis*) though the only bird by which I saw *Acræa* eaten, was rather more discriminating on the whole towards the *Danainæ*, and all three agreed in objecting, as a general rule, to *Delias eucharis* and *Papilio aristolochiæ*.

With the White-crested Bulbul the experiments were too few to be of much use, but it does not seem to be very discriminating.

The Button-Quail (*Turnix taigoor*) was also very ready to eat the *Danainæ*, and objected to the other two protected forms above specified. But I do not consider the tastes of this little ground-bird of any importance, and in fact did not keep it for experiment.

The Bulbuls offer a more serious difficulty, as they are very common birds, and undoubtedly do eat butterflies in a wild state. I have myself seen a wild individual of one of the Red-vented forms eat a white butterfly. Experiments should be made by those who have the opportunity with wild Bulbuls getting their own food.

Mynahs (*Acridotheres tristis*) in the few experiments made, cared little for butterflies, or showed no great discrimination when taking them, though at liberty.

Though most birds which are at all insectivorous with which I experimented, captive or wild, showed more or less desire for butterflies, some would not eat them at all, Crows (*Corvus splendens*) for instance.

I conclude from these experiments—

1. That there is a general appetite for butterflies among insectivorous birds, even though they are rarely seen when wild to attack them.

2. That many, probably most species, dislike, if not intensely, at any rate in comparison with other butterflies, the "warningly-coloured" *Danainæ*, *Acræa violæ*, *Delias eucharis*, and *Papilio aristolochiæ*; of these the last being the most distasteful, and the *Danainæ* the least so.

3. That the mimics of these are at any rate relatively palatable, and that the mimicry is commonly effectual under natural conditions.

4. That each bird has to separately acquire its experience, and well remembers what it has learned.

That therefore on the whole, the theory of Wallace and Bates is

supported by the facts detailed in this and my former papers, so far as they deal with Birds (and with the one Mammal used). Professor Poulton's suggestion that animals may be forced by hunger to eat unpalatable forms is also more than confirmed, as the unpalatable forms were commonly eaten without the stimulus of actual hunger—generally, also, I may add, without signs of dislike.

To future experimenters I would offer the following hints derived from my experiences as detailed in this series of papers.

1. Use animals at liberty for experimenting with if possible.
2. If these are not available, confine your subjects singly, and feed them well and *naturally*, letting them be neither hungry nor pampered. Cages should be of portable size (about two feet every way) and made (for birds) of half-inch mesh wire netting with plain wooden floor without a tray. This is to prevent insects getting out or being concealed.
3. Use wild-caught specimens in preference to hand-reared ones.
4. Remember that the best and often the only way to determine an animal's tastes is to offer it a choice.

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*A List of the Butterflies of Bali, Lombok, Sambawa and Sumba.*—By  
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The Islands of Bali, Lombok and Sambawa in the Malayan or Eastern Archipelago extend almost in a straight line from Java on the west to Flores on the east; Sumba or Sandalwood Island lies to the south of Flores; all the islands are adjacent, with narrow straits between them. In continuation of this line of islands from west to east are Flores, Adanara, Ombai and Wetter, with Timor, the largest island of them all, lying to the south of the two latter. Herr J. Röber in *Tijd. voor Ent.*, vol. xxxiv, pp. 261-322 (1891), has written a paper on the butterflies of Flores, Wetter, and Timor; while Mynheer P. C. T. Snellen has in the same periodical, vols. xxxiii, p. 98 (1890), and xxxiv, p. 229 (1891), described the butterflies of Flores. Unfortunately neither of the present writers possesses any considerable collections of butterflies from any of these islands, but which should certainly be compared with those given in this paper. As far as possible we have brought together

the names of all the species recorded from the islands dealt with. This paper is mainly based on the collections made by Mr. William Doherty in Bali, Lombok, Sambawa and Sumba in Elwes' possession, while Herr H. Fruhstorfer has kindly sent de Nicéville some seventy-nine species collected by himself in Lombok. All species recorded from any of the islands taken together considered herein not seen from any one of them by the writers are indicated by an asterisk (\*) prefixed to their names. The number of species recorded from each island in this paper is as follows:—

|              |  |               |
|--------------|--|---------------|
| Bali, 201.   |  | Sambawa, 181. |
| Lombok, 189. |  | Sumba, 158.   |

These numbers are remarkably even, but they shew a steady diminution as one proceeds from west to east. Java has at least 500 distinct species of butterflies, Sumatra still more.

Mr. Doherty records about 135 species from Sambawa, several of which, however, he could not name as he had lost the specimens. For instance, at the end of his paper he writes: "My Sumbanese *Hesperiidae* have suffered more than any other family, and I have been compelled to omit a number of species, a *Halpe*, two *Parnaras*, a *Parata*, etc." On page 157 of his paper he says he obtained about 140 species from Sambawa and Sumba.

Mr. Doherty numbered the species he obtained from Sumba, the total being 130, but of these one species, *Stictoplaea lacordairei*, Moore, was inadvertently entered as from Sumba, while it really was obtained in Sambawa. In counting up the number of species he mentions, the total is 140 (omitting the *Euplaea*), so that there were eleven species he was unable to name for want of specimens when writing his paper.

Dr. Pagenstecher in his first paper on the butterflies of Sumba records 34 species only as received by him, but several of these are not included in Mr. Doherty's list.

Dr. Pagenstecher in his second paper records 57 species from Sambawa, and 88 species from Sumba, many of these being new records. His total from both islands is 110 species.

Mr. Fruhstorfer names 176 species from Lombok, and a "*Narathura*" and two *Arrhopalae* are unnamed, a total of 179 species.

Mr. Fruhstorfer gives 28 species from Bali, of which he described three as new.

Between the islands of Bali and Lombok is found the deep depression in the sea-floor which is generally known as "Wallace's Line," and is supposed to faunistically divide the Indo-Malayan and Austro-Malayan regions. In the three islands of Lombok, Sambawa and Sumba dealt with in this paper which lie to the east of this line, there

is hardly any trace of an Australian element, the butterflies being almost entirely of Indo-Malayan types. The most conspicuous butterflies of an Austro-Malayan type are *Melanitis constantia*, Cramer, from Sambawa and Sumba, *Acræa andromacha*, Fabricius, from Sumba, *Junonia villida*, Fabricius, from Sumba, *Charaxes jovis*, Staudinger, from Sambawa and Sumba, *Charaxes ocellatus*, Fruhstorfer, from Lombok, *Huphina temena*, Hewitson, from Lombok, Sambawa, and Sumba, and *Papilio canopus*, Westwood, var. *umbrosus*, Rothschild, from Sambawa, and var. *sumbanus*, Rothschild, from Sumba.

The only papers relating to Sumba and Sambawa are:—

1. "The Butterflies of Sumba and Sambawa, with some account of the Island of Sumba," by William Doherty, Journ. A. S. B., vol. lx, pt. 2, pp. 141–197, pl. ii (1891).

2. "Über einige Schmetterlinge von der Insel Sumba," by Dr. Arnold Pagenstecher, Jahr. des Nass. Vereins für Natur., vol. xlvii, pp. 52–58 (1894).

3. "Über die Lepidopteren von Sumba und Sambawa," by Dr. Arnold Pagenstecher, Jahr. des Nass. Vereins für Natur., vol. xlix, pp. 95–170, pls. i, ii, and iii (1896).

Mr. H. Fruhstorfer has recently published a paper on the butterflies of Lombok in the Berl. Ent. Zeitsch., vol. xlii, pp. 1–14 (1897), entitled "Aufzählung der von mir auf der Insel Lombok im Jahre 1896 gefangenen Rhopaloceren;" another on the butterflies of Bali in Stet. Ent. Zeitung, vol. lviii, p. (1897), entitled "Liste von Rhopaloceren der Insel Bali;" and lastly "Rhopalocera Lombokiana," in Berl. Ent. Zeitsch., vol. xlii, p. 119 (1897).

## Family NYMPHALIDÆ.

### Subfamily DANAINÆ.

This subfamily has been arranged in the order given by Mr. F. Moore in "A Monograph of the *Limnaina* and *Euplœina*" in the Proceedings of the Zoological Society of London for 1883, pp. 201–324. It is a little remarkable that no species of *Nectaria*, *Hestia*, *Gamana*, and *Ideopsis* appear to occur in the islands dealt with here.

#### 1. DANAIS (Radena) VULGARIS, Butler.

Sambawa (*Doherty*). Mr. Doherty says that a *Radena* occurring in Sambawa "Appears to be a representative of *R. vulgaris*, and is common everywhere. I have now no specimens, and am unable to compare it with its allies." On a subsequent visit to the island, Doherty obtained it again, and there are two pairs in Elwes' collection, who notes that

"They have the markings paler and on the hindwing broader than in Javan specimens."

2. DAN AIS (Radena) JUVENTA, Cramer.

Bali (*Doherty*), Lombok (*Moore, Doherty and Fruhstorfer*), Sambawa? (*Doherty*). Doherty records a *Radena* from Sambawa, and says it "Is very close to the Javanese *R. juvena*, and is confined to the higher country, though I have taken it as low as 1,500 feet. I have now no specimens, and am unable to compare it with its allies." In Elwes' collection there are specimens of this species from Bali, Lombok and Sambawa collected by Doherty, and Fruhstorfer also records it from Sumbawa.

3. \*DANAIS (Radena) OBERTHEURII, Doherty.

Sumbawa (*Pagenstecher*), Sumba (*Doherty and Pagenstecher*).

4. \*DANAIS (Radena) KAMBERA, Doherty.

Sumba (*Doherty*).

5. DAN AIS (Tirumala) LIMNIAE, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Fruhstorfer records three species of the subgenus *Tirumala* from Lombok—*D. (T.) melissa hamata*, MacLeay, *D. (T.) limniace conjuncta*, Moore, and *D. (T.) limniace donia*, Fruhstorfer. As regards the first of these it has always been held that it is confined to Australia. Its coloration is very deep blue, and it is a well-marked species. Mr. Fruhstorfer's identification is probably erroneous. The second species is restricted by the describer to Java, but is in our opinion an absolute synonym of *D. limniace*; Mr. Moore not admitting that the last-named species is found in Java. The third species is described in Berl. Ent. Zeitsch., vol. xlii, p. 120 (1897). All our specimens of *Tirumala* from Lombok are certainly *D. limniace*. Mr. Fruhstorfer gives both *D. hamata* and *D. limniace* from Sumbawa, and *D. hamata*, *D. limniace* and *D. donia* from Sumba.

6. \*DANAIS (Tirumala) MELISSA, Cramer.

Sambawa and Sumba (*Doherty*). Dr. Pagenstecher in his first paper records this species under the name of *D. hamata*, Macleay, from Sumba. Mr. Moore restricts this species to Java.

7. \*DANAIS (Tirumala) GAUTAMA, Moore.

Sumba? (*Doherty*). Mr. Doherty notes, "I also recorded a form of *D. gautama* in Sumba, but no specimens have turned up."

## 8. DANAIS (Tirumala) SEPTENTRIONIS, Butler.

Lombok (*Fruhstorfer*). Fruhstorfer does not record this species from Lombok, though it certainly is found there. Perhaps he has identified it as *D. melissa hamata*, MacLeay.

## 9. \*DANAIS (Nasuma) HARUHASA, Doherty.

Lombok (*Fruhstorfer*), Sambawa (*Doherty* and *Fruhstorfer*). Fruhstorfer says that *D. erebus*, Röber, from Ceram, Goram and Flores, described in the same year as *D. haruhasa*, is the same species.

## 10. \*DANAIS (Nasuma) TAIMANU, Doherty.

Sumba (*Doherty*).

## 11. DANAIS (Limnas) CHRYSIPPUS, Linnæus.

Lombok (*Moore*), Sambawa, Sumba (*Doherty*). Mr. Doherty notes that his specimens are somewhat intermediate between typical *D. chrysippus* and *D. bataviana*, Moore. Mr. Elwes says that of five specimens from Sambawa in his collection, four are dark-coloured like those from Bali and Lombok, and one female is paler, so that he considers *D. bataviana* to be an inconstant variety of *D. chrysippus*. All the specimens of this species in de Nicéville's collection from Lombok are quite constant and are typical *D. bataviana*.

## 12. DANAIS (Limnas) BATAVIANA, Moore.

Bali (*Doherty*), Bali, Lombok (*Fruhstorfer*). This species can typically be recognised by the dark ferruginous colour of the ground on the upperside of both wings in both sexes. The markings are quite as inconstant as are those in *D. chrysippus*, Linnæus. Mr. Moore restricts it to Java.

## 13. \*DANAIS (Salatura) PLEXIPPUS, Linnæus.

Sambawa, Sumba (*Doherty* as *D. genutia*, Cramer). Mr. Doherty says his specimens are intermediate between typical *D. genutia*, Cramer (*plexippus*), and *D. intensa*, Moore. We think it highly improbable that typical *D. plexippus* is found in these islands.

## 14. DANAIS (Salatura) INTENSA, Moore.

Lombok (*Moore* and *Fruhstorfer*). We have very numerous specimens of this species from Lombok which are quite typical *D. intensa*. It is, we think, almost certain that the Sambawa and Sumba species (see above) are also *D. intensa* rather than *D. plexippus*. Mr. Fruhstorfer describes a *D. (Salatura) genutia partita*, from Lombok and Sambawa,

in Berl. Ent. Zeitsch., vol. xlii, pp. 119, 121 (1897), but our Lombok specimens do not appear to us to differ from typical *D. intensa*, from Java, Lombok and Borneo (*Moore*).

15. DANAI (Salatura) LITORALIS, Doherty.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Fruhstorfer places this species in one paper as a synonym of *D. affinis*, Fabricius, var. *a. hegesippinus*, Röber, from Bonerate and Kisser Islands, described in the same year as Doherty's species, in his last paper he restricts *D. hegesippinus* to Lombok and Sambawa, and records *D. litoralis* from Sumba. Mr. Elwes notes that he possesses one specimen only, but does not say from what island, while de Nicéville has never seen it.

16. DANAI (Ravadeba) PHILO, Grose Smith.

*Ravadebra* [sic] *philo*, Grose Smith, Nov. Zool., vol. ii, p. 77 (1895); *Ravadeba philo*, Grose Smith and Kirby, Rhop. Ex., pl. *Ravadeba* i, figs. 7, 8, female (1896).

Sambawa (*Doherty* and *Grose Smith*). There are two pairs of this species in Elwes' collection, and a single female (the type) is in the collection of Hon. Walter Rothschild.

17. DANAI (Bahora) PHILOMELA, Zinken-Sommer.

Bali (*Doherty*).

18. DANAI (Chittira) ORIENTIS, Doherty.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty* and *Fruhstorfer*). Mr. Doherty says that this species appear to belong to Mr. Moore's genus *Badacara*, though he places it in *Chittira*. Mr. Elwes says it is very near to *D. (Badacara) nilgiriensis*, Moore, but he is unable to follow the minutiae of Mr. Moore's "genera," so cannot say whether it is a *Chittira* or a *Badacara*. Mr. Fruhstorfer places it in the subgenus *Cuduga*. Without seeing a specimen de Nicéville is unable to say to which subgenus it should properly belong.

19. EUPLŒA (Vadebra) ELWESIANA, de Nicéville.

*E. (Vadebra) elwesiana*, de Nicéville, Journ. A. S. B., vol. lxvi, pt. 2, p. 543, n. 1, pl. i, fig. 4, male (1897).

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty* and *Fruhstorfer*). Mr. Fruhstorfer records this species from Lombok and Sambawa as *E. (Vadebra) sepulchralis*, Butler, and *in litt.* to de Nicéville says that *E. elwesiana* and *E. neptis*, Röber, from Flores, are both synonyms of that species, which was originally described from

Java. We have no specimens of *E. sepulchralis* with which to compare *E. elwesiana*, but as Mr. Butler's description and figure of his species differ from de Nicéville's of *E. elwesiana*, we have kept them distinct.

*P. S.*—Since the above was written, Mr. Fruhstorfer has recorded *E. sepulchralis* from Lombok and Sambawa.

20. EUPLŒA (Menama) DEHEERII, Doherty.

Lombok (*Fruhstorfer*), Sambawa (*Doherty* and *Fruhstorfer*). If we have correctly identified the hitherto undescribed female of this species, it differs considerably from the male, the upperside of the forewing being strongly instead of slightly glossed with iridescent violet colour, though this character is rather variable; the submarginal series of spots are very much larger and more numerous, the series being usually complete from the costa to the anal angle, though one specimen has two spots only and another four, these spots being white in the middle, broadly surrounded with pale violet, and there are six marginal white dots in pairs between the veins from the submedian internervular fold to the lower discoidal internervular fold; in some specimens these dots are wanting; on the hindwing the marginal series of dots is usually complete, and the submarginal series consists of from two to eight decreasing spots, while the male has two or three only. The underside presents much the same differences as on the upperside, except that in the forewing the submarginal series of spots form an even curve instead of being highly irregular in position as they are in the male, in the latter sex the spot in the second median interspace is far removed inwardly from the line of the others, and the spot in the first median interspace is also out of line, though less so than the spot anterior to it. The species is a very variable one in both sexes.

21. \*EUPLŒA (Menama) SUAVISSIMA, Fruhstorfer.

*E. (Menama) suavissima*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlii, p. 122 (1897).

Lombok (*Fruhstorfer*). It is unusual for two species of the same subgenus of *Euplœa* to occur together; perhaps this species is one of the numerous varieties of the last named.

22. \*EUPLŒA (Tronga) SP.

Sambawa? (*Doherty*). Mr. Doherty obtained a species probably of this subgenus in Sambawa, but the specimens were lost before he could identify them.

23. EUPLŒA (Tronga) CRAMERI, Lucas.

Bali (*Doherty*). These specimens appear to be typical, having the



marginal and submarginal series of dots on the upperside of the forewing very small, almost obsolete. *E. bremeri*, Felder, has them large and conspicuous. In all other respects the two species agree exactly.

24. EUPLŒA (Penoa) GEYERI, Felder.

Lombok (*Fruhstorfer*). A single much torn male has been received by de Nicéville, who has so identified the specimen but with great doubt. It has the sexual brand broad, and thirteen mm. in length; the double marginal series of white spots on the upperside of the hindwing pure white and prominent; it is certainly distinct from the two species which follow. It was originally described from Java.

25. \*EUPLŒA (Penoa) PINWILLI, Butler.

Lombok (*Fruhstorfer*). This may be the species last named, but de Nicéville's specimen differs greatly from typical *E. pinwilli* from the Malay Peninsula and Sumatra.

26. \*EUPLŒA (Penoa) EYNDHOVII, Felder.

Lombok and Sambawa (*Fruhstorfer* as *E. eindthoveni*, sic!). We presume Mr. Fruhstorfer refers to this species, though he alters the spelling of its name in four particulars. We would again remark that it is unlikely that three species of the same subgenus are found together in one small island. As far as we are aware, *E. eyndhovii* is confined to Java.

27. \*EUPLŒA (Penoa) SP.

Sambawa (*Doherty*). Mr. Elwes notes that his Bali and Sambawa *Penoas* are *E. eyndhovii*, Felder, = *E. menetriesii*, Felder, the latter name having priority, and differ only from Perak specimens in having the marginal spots on the hindwing shorter and whiter. Mr. de Nicéville has seen no *Penoa* from Bali. Perhaps Elwes' specimens are what de Nicéville has called *E. geyeri*, Felder.

28. \*EUPLŒA (Crastia) ATOSSA, Pagenstecher.

Lombok (*Fruhstorfer*), Sambawa (*Pagenstecher* and *Fruhstorfer*). We are unable to identify this species from the description and figure in *Jahr. des Nass. Ver. für Natur.*, vol. xlix, p. 132, n. 53, pl. iii, fig. 2, *male* (1896) with anything in our collections. Mr. Fruhstorfer transfers it doubtless correctly to the subgenus *Isamia*.

29. \*EUPLŒA (Crastia or Vadebra) PALMEDO, Doherty.

Sumba (*Doherty* and *Fruhstorfer*). Recorded by Dr. Pagenstecher in his first paper as *E. palmeda* [sic].

## 30. \*EUPLEA (Rasuma ?) LEWA, Doherty.

Sumba (*Doherty and Fruhstorfer*).

## 31. EUPLEA (Trepnichrois) CLAUDIUS, Fabricius.

Bali (*Doherty and Fruhstorfer*).

## 32. EUPLEA (Trepnichrois) GELDERI, Snellen.

*E. gelderi*, Snellen, *Tijd. voor Ent.*, vol. xxxiii, p. 98 (1890); vol. xxxiv, p. 232, n. 2, pl. xiv, fig. 1, *male* (1891); *E. (Trepnichrois) dongo*, Doherty, *Journ. A. S. B.*, vol. lx, pt. 2, p. 160 (1891).

Lombok (*Fruhstorfer*), Sambawa (*Doherty and Fruhstorfer*). Originally described from Flores. A very distinct species.

## 33. \*EUPLEA (Trepnichrois) ELWESII, Doherty.

Sumba (*Doherty and Fruhstorfer*).

## 34. \*EUPLEA EUCALA, Staudinger.

*E. eucala*, Staudinger, *Iris*, vol. viii, p. 373, pl. vii, fig. 4, *male* (1895).

Sambawa (*Staudinger and Fruhstorfer*). Referred to by Dr. Pagenstecher in his second paper as *E. eucalle* [sic]; the reference also is incorrect. Mr. Fruhstorfer also spells the name erroneously.

## 35. EUPLEA GYLLENHALII, Lucas.

Bali (*Doherty and Fruhstorfer*).

## 36. EUPLEA (Calliploea) SAMBAYANA, Doherty.

Lombok (*Fruhstorfer as sambawana, sic!*), Sambawa (*Doherty and Fruhstorfer*). Mr. Elwes notes that the male from Sambawa has the upperside of the forewing of a deeper colour than in *E. mazares*, Moore, but that the markings are similar to those of the latter species from Java and Bali, and that at best *E. sambawana* is only a local race of *E. mazares*.

## 37. EUPLEA (Calliploea) MAZARES, Moore.

Bali (*Doherty and Fruhstorfer*). Mr. Fruhstorfer quite incorrectly transfers this species to the subgenus *Selinda*.

## 38. \*EUPLEA (Calliploea) SUMBANA, Doherty.

Sumba (*Doherty and Fruhstorfer*).

## 39. EUPLEA (Selinda) ELEUSINA, Cramer.

Bali (*Doherty*), Lombok and Sambawa (*Fruhstorfer*), Sambawa, Sumba—stated by Elwes to be in his collection (*Doherty*).

40. *EUPLEA* (*Salpinx*) *MEIZON*, Doherty.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty* and *Fruhstorfer*).

41. *EUPLEA* (*Salpinx*) *LEUCOSTICTOS*, Gmelin.

Bali (*Doherty*).

42. *EUPLEA* (*Isamia*) *SP.*

Sambawa (*Doherty*). Mr. Doherty notes that "An undescribed *Isamia* occurs in Sambawa." Mr. Elwes has three males and one female of this, and notes that it is allied to *E. chloë*, Guérin, but as a separate description is required for each specimen owing to the great variability of the species, he cannot name it on this material. See No. 28 *ante*.

43. *EUPLEA* (*Stictopleæ*) *LACORDAIREI*, Moore.

Lombok (*Fruhstorfer* as *lucordairi*, sic!), Sambawa (*Doherty* and *Fruhstorfer*). Recorded from Sumba by Doherty, but he informed de Nicéville that this was a mistake, Sambawa being meant. There is a male from Sambawa in de Nicéville's collection.

44. *EUPLEA* (*Stictopleæ*) *MELOLO*, Doherty.

Sumba (*Doherty* and *Fruhstorfer*). Recorded by Dr. Pagenstecher in both his papers as *E. melelo* [sic]. There is one male in de Nicéville collection.

## Subfamily SATYRINÆ.

45. *MYCALESIS* (*Orsotriæna*) *MEDUS*, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

46. *MYCALESIS* (*Calysisme*) *PERSEUS*, Fabricius.

Bali, Sambawa, Sumba (*Doherty*).

47. *MYCALESIS* (*Jatana*) *WAYEWA*, Doherty.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). The *Mycalesis merops*, Grose Smith, Nov. Zool., vol. ii, p. 80, n. 11 (1895), recorded from Sambawa by Mr. Grose Smith, Sumba by Dr. Pagenstecher, and Lombok by Mr. Fruhstorfer, is almost certainly a synonym of *M. wayewa*. Mr. Grose Smith described *M. merops* from Sambawa, Adonara and Pura.

48. *MYCALESIS* (*Martanda*) *JANARDANA*, Moore.

Bali (*Doherty*), Lombok (*Fruhstorfer*).

## 49. MYCALESIS (Loesa) OROATIS, Hewitson.

Bali (*Doherty*).

## 50. LETHE (Nemetis) MINERVA, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*).

## 51. LETHE (Debis) MANTHARA, Felder.

Bali (*Doherty*). Mynheer P. C. T. Snellen in *Tijd. voor Ent.*, vol. xxxv, p. 4, n. 4 (1892), says that *Debis manthara*, Felder, is the same as *Debis mekara*, Moore; but this is incorrect, they are abundantly distinct in the female sex, on the upperside the ground-colour of both wings in *D. mekara* is ferruginous, in *D. manthara* it is dull ochreous; *D. mekara* has the discal macular band of the forewing pure white and highly angled, with a duplicated subapical white spot, while *D. manthara* has the discal band inconspicuous, curved (instead of angled), and pale ochreous, with no subapical white spot; while on the hindwing the five submarginal black spots are much larger in *D. manthara* than in *D. mekara*. The males of the two species are very similar, though *D. manthara* is much the paler on the upperside of both wings.

## 52. LETHE EUROPA, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

## 53. LETHE DYRTA, Felder.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*).54. YPTHIMA LEUCE, *Doherty*.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. *Doherty* describes the sex-mark of the male of this species as "whitish," but it is in this species, as in all the species of *Ypthima* in which it is present, more or less black. This is the species from Flores given by Mynheer P. C. T. Snellen in *Tijd. voor Ent.*, vol. xxxiv, p. 236, n. 12, pl. xv, fig. 1, female (1891), as *Y. baldus*, Fabricius.

## 55. YPTHIMA HORSFIELDII, Moore.

Bali (*Doherty*). Originally described from Java.

## 56. YPTHIMA PHILOMELA, Johanssen.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sumba (*Pagenstecher* as *Y. baldus*, Fabricius). This is the *Y. baldus* of Mr. Elwes' monograph of the genus (*Trans. Ent. Soc. Lond.*, 1893, p. 14, n. 10, pl. i, figs. 15, 16, *clasp and œdeagus of the male*). See also the late

Capt. E. Y. Watson's remarks on these species in Journ. Bomb. Nat. Hist. Soc., vol. x, p. 644, n. 40 (1897), with which de Nicéville agrees.

57. \**YPTHIMA HUEBNERI*, Kirby.

Sumba (*Pagenstecher*). This record requires confirmation we think, as the species has never before been obtained out of the continent of Asia except in Borneo. Dr. Pagenstecher gives the *Y. philomela* of Hübner from Java as a synonym, a species with six ocelli in pairs, while *Y. huebneri* has only four ocelli, arranged one and three. He also gives the *Y. florensis* of Snellen, from Flores, as another synonym, but this surely is an absolutely distinct species from either of the others, as it has only two very large ocelli on the underside of the hindwing, as figured in Tijd. voor. Ent., vol. xxxiv, p. 235, n. 11, pl. xiv, fig. 3, *male* (1891). Dr. Pagenstecher makes three mistakes in the reference to this species, the page is 235 not 225, the plate is 14 not 4, and the figure is 3 not 3a. In de Nicéville's opinion *Y. florensis* is a synonym of *Y. asterope*, Klug.

58. \**YPTHIMA ASTEROPE*, Klug.

Sumba (*Doherty*).

59. *ERITES MEDURA*, Horsfield.

Bali (*Doherty*).

60. *MELANITIS ISMENE*, Cramer.

Bali, Lombok, Sambawa, Sumba (*Doherty*). Mr. Doherty and Dr. Pagenstecher record this species under the name of *M. leda*, Linnæus, but according to Dr. A. G. Butler, that species is confined to Amboina (*Ent. Month. Mag.*, vol. xxi, p. 246 (1885)). Mr. Fruhstorfer records both *M. ismene* and *M. leda* from Lombok. This is probably a mistake. The species is markedly affected by dry and wet weather, probably Mr. Fruhstorfer keeps distinct the ocellated and non-ocellated forms, which de Nicéville has bred the one from eggs laid by the other.

61. \**MELANITIS CRUENTULA*, Fruhstorfer.

Lombok (*Fruhstorfer*). From the figure of this species in Berl. Ent. Zeitsch., vol. xli, p. 386, pl. ix, fig. 5, *female* (1897), it appears to be quite a distinct species from *M. ismene*. Mr. Fruhstorfer says it is a local race of *M. belinda*, Grose Smith, Nov. Zool., vol. ii, p. 79, n. 10 (1895), from Adonara. It is more than probable in de Nicéville's opinion that Grose Smith's name will stand for the species.

62. \*MELANITIS CONSTANTIA, Cramer.

Sambawa, Sumba (*Doherty*).

Subfamily ELYMNIINÆ.

63. ELYMNIAS PROTOGENIA, Cramer.

Bali, Sambawa (*Doherty*), Sumba (*Pagenstecher*), Bali (*Fruhstorfer* as *E. protogenia baliensis*, *Fruhstorfer*). *Doherty* records this species from Sambawa as *E. undularis*, *Drury*, and says that no *Elymnia*s is known from Sumba (but *Dr. Pagenstecher* has since recorded it from thence as *E. undularis*) or Timor (but in *de Nicéville's* collection is an *Elymnia*s from Timor received from *Dr. Staudinger* with the MS. name *E. undularis*, var. *timorensis*). *E. protogenia* was originally described from Java, and differs but slightly from the *E. undularis* of *Drury*, which has precedence. *Mr. H. Fruhstorfer* in "*Societas Entomologica*," 1896, describes the Bali local race as *E. protogenia baliensis*, but it is, as far as our specimens of both sexes show, identical with typical *E. protogenia*. The paper in which this species is described is simply peppered over with misprints. *Dr. Staudinger* has issued the Sambawa form with the MS. name of *E. sambawana*, which has in the male the outer margin of the hindwing on the upperside of a somewhat deeper ferruginous colour than in typical specimens from Java and Bali, but does not otherwise differ.

64. ELYMNIAS NIGRESCENS, Butler.

Bali, Lombok (*Doherty*), Lombok (*Fruhstorfer* as *E. nigrescens meliophila* and *melitophila*). The male is barely distinguishable from the same sex of *E. protogenia*, *Cramer*, the female is of course abundantly distinct from the same sex of that species. Even as a local race we do not think that *E. meliophila* can stand. Our single female from Lombok is brown on the upperside of the forewing with little or none of the purple gloss shown in females from Perak. This brown form occurs also in Sumatra with the more common purple form.

65. ELYMNIAS DARA, Distant.

Bali (*Doherty*). *E. dara* was described from Borneo, *E. albofasciata*, *Staudinger*, from Palawan in the Philippines. The former name has priority. *Mr. Moore* in *Lep. Indica*, vol. ii, p. 156, keeps them distinct, but it is doubtful if specimens from the typical localities have ever been compared together. They are probably one and the same species.

66. ELYMNIAS (Melynia) PRÆTEXTATA, *Fruhstorfer*.

Bali (*Doherty*), Lombok (*Fruhstorfer*). Recently described in

“*Societas Entomologica*” by Mr. H. Fruhstorfer from Lombok as *E. casiphone prætextata*.

67. \*ELYMNIAS (*Melynius*) KAMARA, Moore.

Lombok (*Fruhstorfer*). Originally described from Java. The species which follows differs from it only in having on the upperside of the hindwing a single series of narrow ochreous-white spots instead of a second and third series anterior to the first extending towards the base of the wing.

68. ELYMNIAS (*Melynius*) EXCLUSA, de Nicéville, n. sp.

HABITAT: Bali, 2,000 to 4,000 feet, March, 1896 (*Doherty*).

EXPANSE: ♂, 3·0 inches.

DESCRIPTION: MALE. Differs from the same sex of *E. casiphone prætextata*, *Fruhstorfer*, from the low country of Bali and from Lombok, in having the UPPERSIDE of the forewing entirely deep uniform velvety black, without markings, in that species the ground-colour is fuscous becoming outwardly much paler, with a submarginal series of six bluish-white spots. Hindwing differs also in having the ground-colour much darker, with a submarginal series of four prominent elongated ochreous-white spots placed between the veins, these being obsolete in that species; it is heavily clothed on the disc with long black hairs. UNDERSIDE, both wings much as in that species. Differs from *E. erinyes*, de Nicéville, from the Battak mountains of North-East Sumatra, in the forewing being shorter, less elongated, and on the upperside of the hindwing in not having a series of elongated pale streaks between the veins. FEMALE unknown.

Mr. de Nicéville will figure this species in a later paper. In de Nicéville and Elwes' collections are single males.

Subfamily AMATHUSIINÆ.

69. AMATHUSIA PHIDIPPUS, Johanssen.

Bali (*Doherty*), Lombok (*Doherty* and *Fruhstorfer*).

70. DISCOPHORA CELINDE, Stoll.

Bali (*Doherty*).

71. \*DISCOPHORA TIMORA, Doubleday and Hewitson.

Lombok (*Fruhstorfer*). Messrs. *Doherty* and *Fruhstorfer* credit this species erroneously to Wallace.

72. DISCOPHORA SONDAICA, Boisduval.

Bali (*Doherty*).

73. ZEUXIDIA LUXERII, Hübner.

Bali (*Doherty*).

74. CLEROME ARCESILAUS, Fabricius.

Bali (*Doherty*).

Subfamily ACRÆINÆ.

75. \*ACRÆA ANDROMACHA, Fabricius.

Sumba (*Pagenstecher*).

76. PAREBA VESTA, Fabricius.

Bali (*Doherty*).

Subfamily NYMPHALINÆ.

77. ERGOLIS ARIADNE, Linnæus.

Bali, Lombok (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

78. \*ERGOLIS MERIONE, Cramer.

Mr. Doherty writes: "I believe *E. merione* also occurs in Sambawa."

79. EURIPUS HALITHESES, Doubleday and Hewitson.

Bali (*Doherty*). The female is of the form "*Diadema*" *nyctelius*, Doubleday (= *E. cinnamomeus*, Wood-Mason), the upperside having the forewing purplish, and the hindwing brown.

80. CUPHA ERYMANTHIS, Drury.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

81. ATELLA PHALANTHA, Drury.

Bali, Lombok, Sambawa, Sumba (*Doherty*), Lombok (*Fruhstorfer*).

82. \*ATELLA SINHA, Kollar.

Sambawa, Sumba (*Doherty*). Dr. Pagenstecher in his second paper records this species from Sumba as *A. egista*, Cramer. That species is entirely different from *A. sinha*; de Nicéville has it from the Ké Islands



and Cairns in Northern Australia. *A. propinqua*, Miskin, described from Australia, is a synonym of *A. egista*.

83. CETHOSIA PENTHESILEA, Cramer.

*C. penthesilea exsanguis*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xli, p. 382 (1897).

Bali, Sambawa, Sumba (*Doherty*), Lombok (*Fruhstorfer*). Mr. de Nicéville has this from Bali, Lombok and Sumba only. A single male of *A. penthesilea exsanguis*, Fruhstorfer, received from Mr. Fruhstorfer and taken by him at Ekas, Lombok, in May, 1896, is practically inseparable from two male specimens from Sumba, also received from the same gentleman, and the typical form from Java. Cramer's figure appears to be slightly exaggerated, the white subapical band on the upperside of the forewing being rather wider than in any Javan specimens in our collections.

84. CETHOSIA NARMADA, Fruhstorfer.

*Cetosa* [sic] *narmada*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xli, p. 380, pl. ix, fig. 2, male (1897).

Lombok, Sambawa (*Fruhstorfer*).

85. CETHOSIA NARMADOIDES, de Nicéville, n. sp.

HABITAT: Bali (*Doherty*).

EXPANSE: ♂, 2·9 and 3·2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* differ from the same sex of *C. narmada*, Fruhstorfer, from Lombok, in having the outer marginal black areas much narrower, thus leaving the discal and basal red areas much larger, occupying the whole of the discoidal cell in the forewing instead of the posterior half only; and in the hindwing leaving quite free the outer discal series of round black spots, instead of extending right up to and more or less including them. *Forewing* has the subapical oblique series of markings reddish-ochreous instead of whitish, much larger and more numerous than in *C. narmada*, in the latter the anterior of the three subapical spots is widely separated from the two posterior ones. UNDERSIDE, *both wings* have the ground-colour much paler, in *C. narmada* it is heavily suffused with black; the discal pale ochreous band is much broader in the present species. FEMALE unknown.

The figure of *C. narmada* does not agree with the specimens of that species in de Nicéville's collection received from and named by Fruhstorfer. Instead of having on the upperside of the forewing three subapical spots only, there is a nearly complete series as in *C. narmadoides*;

and on the hindwing the outer discal series of black spots is free of the marginal black band, thereby agreeing with *C. narmadoides*, instead of being absorbed in the band. Mr. de Nicéville will figure the species in a later paper. It is described from two male specimens taken by Mr. W. Doherty in the low country of Bali in April, 1896. Mr. Fruhstorfer writes to de Nicéville that he has "Just received from Sambawa a typical *C. narmada*, and that it is found in that island with *C. tambora*, Doherty, while Lombok has only one species. *C. cyane*, var. *sambawa*, Pagenstecher, from Sumba, is very distinct on both surfaces from either of the above-named species. I have it also from Kalao, the small island near Tanah-Djampea between Celebes and Flores. *C. sambana* has on the upperside of the forewing a very large subapical band instead of a small one as in *C. tambora* and a narrow one in *C. narmada*, and has on the underside of the hindwing a submarginal orange-yellow band instead of a black one in *C. tambora* and a brownish one in *C. narmada*." In the absence of specimens or good coloured figures of all these species, it is exceedingly difficult to identify them.

#### 86. CETHOSIA TAMBORA, Doherty.

Sambawa, and doubtfully from Sumba (*Doherty*). In Dr. Pagenstecher's first paper he records this species and gives a very full description of it as *C. cyane*, Drury, var. *sumbana*, from Sumba. In his second paper, p. 137, n. 62, he records it from Sumba and Sambawa correctly as *C. tambora*, and figures a female (not a male, as stated by him), the sex described by Doherty. Males of *C. tambora* from Sambawa in our collections differ from this figure in having the subapical ochreous band on the upperside of the forewing narrower, and the marginal black band on the upperside of the hindwing also much narrower. *C. tambora* is a very distinct species, the blue-black and ochreous-white coloration of the underside being quite remarkable. We have seen no specimens from Sumba. Should that local race be distinct, Dr. Pagenstecher's name *C. sumbana* can be applied to it. See No. 85 *ante*.

#### 87. \*CYNTHIA DEJONE, Erichson.

Sambawa, Sumba (*Doherty* as *C. deione*, sic!). This is probably a wrong identification, as far as we know *C. dejone* is confined to the Philippine Isles. Mr. Doherty has the following note regarding this species: "A single male, Sumba, interior. Common in Sambawa, where the females vary to a remarkable extent, some being as red as the male, while others are dark green insects like *Parthenos*. Intermediate forms are common." Dr. Pagenstecher in his second paper records the species as *C. arsinooë*, Cramer, which is quite a distinct species from the Moluccas and New Guinea. See the next species, No. 88.

## 88. CYNTHIA AUSTROSUNDANA, Fruhstorfer.

Lombok, West Sambawa, Sumba (*Fruhstorfer*). We have a pair of this species from Lombok, three males from Sambawa, and two males from Sumba; it seems to be a very distinct species. Mr. Fruhstorfer describes it in "Societas Entomologica," No. 7, for July, 1897, as a subspecies of *C. erota*, Fabricius. In the Berl. Ent. Zeitsch., vol. xlii, p. 4 (1897), Mr. Fruhstorfer changes the name to *C. austrosunda*!

## 89. \*HELCYRA CHIONIPPE, Felder.

Sumba (*Doherty*).

## 90. APATURA (Rohana) NAKULA, Moore.

Bali (*Doherty*). One female only obtained. As far as we are aware, this is only the second specimen known of this sex, the type of the species, also a female, from Java, is unique in the British Museum, and has been figured by de Nicéville in Journ. Bomb. Nat. Hist. Soc., vol. ix, pl. N, fig. 6, *female* (1895).

## 91. HERONA PRINGONDANI, Fruhstorfer.

Bali (*Doherty*). This species has been figured by de Nicéville from Java in Journ. A. S. B., vol. lxiii, pt. 2, p. 4, n. 3, pl. iii, figs. 5, *male*; 4, *female* (1894). Bali specimens are quite the same.

## 92. PRECIS IDA, Cramer.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

## 93. PRECIS IPHITA, Cramer.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

## 94. \*JUNONIA ATLITES, Johanssen.

Lombok (*Fruhstorfer* as *J. laomedea*), Sambawa, Sumba (*Doherty*). Recorded by Dr. Pagenstecher in his first paper as *J. laomedea*, Linnæus.

## 95. JUNONIA ALMANA, Linnæus.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). As *J. almana* and *J. asterie*, Linnæus, are unquestionably one and the same species, the former being the dry-season, the latter the wet-season form, and the former name having priority, it must be used for the species, though the wet-season form probably alone occurs in the above-named islands. The Sambawa and Sumba form has been named by Doherty

*J. asterie*, var. *sumbæ*. It differs but slightly from the typical form. The Bali specimens also are var. *sumbæ*, as are probably also the Lombok ones, which we have not seen.

96. \**JUNONIA VILLIDA*, Fabricius.

Sumba (*Doherty*). Originally described from Australia, and in de Nicéville's collection from thence, and from the Ké Isles, German New Guinea and the Solomon Isles. Mr. Doherty spells the name "*vellida*" incorrectly.

97. *JUNONIA ERIGONE*, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Messrs. Doherty and Fruhstorfer record this species under the older name *J. aonis*, Linnæus, the former remarking that "The species is certainly very close to the Javanese *J. erigone*." As, however, *J. aonis* cannot be identified with certainty, though it is probably an older name for the Indian and Chinese *J. lemonias*, Linnæus (*confer* Aurivillius, p. 169), we have thought it better to follow Dr. Pagenstecher in his second paper in identifying the species under Cramer's name. We have specimens of *J. erigone* from Java, Bali, Kalao, and Sumba which are indistinguishable.

98. *JUNONIA TIMORENSIS*, Wallace.

Sumba (*Doherty*). Mr. de Nicéville possesses a single male from Sumba given to him by Mr. Doherty.

99. \**JUNONIA OCTALE*, Hübner.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Doherty records this species as *J. orithyia*, Linnæus, but the form occurring in the above-named islands is more likely to be Hübner's local race than the typical form from China. Dr. Pagenstecher also records it as *J. "orithya"* and *orithyia* from Sumba in both his papers.

100. *NEPTIS (Rahinda) HORDONIA*, Stoll.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

101. *NEPTIS BATARA*, Moore.

Bali (*Doherty*).

102. *NEPTIS VIKASI*, Horsfield.

Bali (*Doherty*).

## 103. NEPTIS LEUCOTHOË, Cramer.

Bali, Lombok, Sambawa (*Doherty*), Lombok (*Fruhstorfer*).

## 104. NEPTIS SUMBA, Doherty.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). We have one male from Sambawa and both sexes from Lombok which we identify with this species, described by Doherty as *N. nandina* [= *soma*], var. *sumba*. He says that a somewhat different form from the typical Sumba one occurs in Sambawa.

## 105. NEPTIS SUSRUTA, Moore.

Bali (*Doherty*). Bali specimens agree absolutely with Sumatran specimens.

## 106. \*NEPTIS ACERIS, Lepechin.

Bali (*Fruhstorfer*), Sumba (*Pagenstecher*). Mr. Fruhstorfer credits this species to Esper. It is probable that our *N. susruta*, Moore, is the same species as Fruhstorfer's *N. aceris*. The latter is usually held to be restricted to Europe, Central and Northern Asia and Japan. Dr. Pagenstecher's specimens also are probably *N. susruta*.

## 107. NEPTIS (Phædyma) COLUMELLA, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). It is a little remarkable we think that no species of *Cirrhochroa* appears to occur in any of the islands treated in this paper, as at least four species are found in Java.

## 108. \*HYPOLIMNAS MISIPPUS, Linnæus.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

## 109. HYPOLIMNAS BOLINA, Linnæus.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

## 110. \*HYPOLIMNAS SAUNDERSI, Wallace.

Sumba? (*Doherty*). It was originally described from Timor.

## 111. HYPOLIMNAS ANOMALA, Wallace.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa? (*Doherty*).

## 112. LEBADEA MARTHA, Fabricius.

Bali (*Doherty*).

## 113. LIMENITIS PROCRIS, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Elwes notes that the Bali form differs in having smaller apical spots to the forewing, and a shorter band to the hindwing; the ground-colour of both wings being rather darker; but a Sambawa specimen is intermediate. Mr. H. Fruhstorfer in *Ent. Nach.*, vol. xxiii, p. 59 (1897), has recently described *L. procris neutra* from Java and Lombok. Mr. de Nicéville has only seen specimens from Java, and these are inseparable from the typical form which was described from China. Mr. Fruhstorfer calls the form from Malacca, Sumatra and Borneo *L. procris agnata*. See also his remarks on both these local races in *Berl. Ent. Zeitsch.*, vol. xli, p. 311 (1896).

## 114. LIMENITIS HOLLANDII, Doherty.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*).

## 115. \*ATHYMA PERIUS, Linnæus.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

## 116. \*ATHYMA SP.

Lombok (*Fruhstorfer*). Mr. Fruhstorfer records a new species of *Athyma* near *A. amhara*, Druce, from Lombok.

## 117. \*ATHYMA KARITA, Doherty.

Sumba (*Doherty*). Mr. Doherty says that this "Species seems intermediate between *A. venilia* and *A. amhara*." But the former species is a *Neptis* and not an *Athyma*, and was described by Linnæus.

## 118. ATHYMA NEFTE, Cramer.

Bali, Sambawa (*Doherty*). This is probably the species recorded from Sambawa by Dr. Pagenstecher in his second paper as *A. selesophora*, Kollar.

## 119. \*EUTHALIA (Adolias) ÆGLE, Doherty.

Sumba (*Doherty*).

## 120. EUTHALIA (Tanaëcia) STYGIANA, Fruhstorfer.

Bali (*Doherty*, *Fruhstorfer*), Lombok (*Fruhstorfer*). This species has been recently described by Mr. Fruhstorfer in *Berl. Ent. Zeitsch.*, vol. xli, p. 385 (1897), from Lombok. It is very near to *E. pelea*, Fabricius, from Java, of which "*Adolias*" *palguna* of Moore, also described from Java, is a synonym, but may be known by the ground-colour of both

sides of both wings in both sexes being darker, and the discal white band of the forewing on both sides in both sexes being anteriorly more completely divided into two portions by a broader band of the ground-colour.

121. *EUTHALIA* (Tanaëcia) SINGORADJA, Fruhstorfer.

Bali (*Doherty*), Singoradja Island near Lombok (*Fruhstorfer*). If we have correctly identified this species, it bears the same relation to *E. trigerta*, Moore, from Java, as *E. stygiana*, Fruhstorfer, does to *E. pelea*, Fabricius. A description of it will be found in Berl. Ent. Zeitsch., vol. xli, p. 385 (1897). The ground-colour of both wings on both surfaces is much darker than in *E. trigerta*, and there are some differences also in the details of the markings, especially on the underside.

122. \**EUTHALIA* (Nora) OBSOLETA, Fruhstorfer.

*E. obsoleta*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xli, p. 383, pl. ix, fig. 3, male (1897).

Lombok (*Fruhstorfer*). Only two specimens obtained by Mr. Fruhstorfer, one he has kept, the other is now in the collection of the Hon. Walter Rothschild.

123. *EUTHALIA NIVEPICTA*, Fruhstorfer.

Lombok (*Doherty* and *Fruhstorfer*). Described by Mr. Fruhstorfer in Berl. Ent. Zeitsch., vol. xli, p. 384 (1897), from Lombok. Our single female from that island has the discal whitish band on the upperside of both wings more strongly developed than in typical *E. aconthea*, Cramer, from Java; otherwise all the markings are similar in both species.

124. *EUTHALIA* SP.

Sumba? (*Doherty*). Mr. Doherty notes "An *Euthalia*, dark like *E. garuda*, Moore, seems also to inhabit Sumba, but none were taken."

125. *EUTHALIA ANOSIA*, Moore.

Bali (*Doherty*).

126. \**EUTHALIA ADONIA*, Cramer.

Lombok (*Fruhstorfer*).

127. \**PYRAMEIS CARDUI*, Linnæus.

Sumba (*Doherty*).

128. \*PYRAMEIS DEJEANII, Godart.

Lombok (*Fruhstorfer*).

129. SYMBRENTHIA HIPPOCLUS, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*). The white form of the female is found in Lombok, it is not known if the yellow form also occurs in that island, or what form or forms occur in Bali; both forms fly together in Java.

130. SYMBRENTHIA HYPSELIS, Godart.

Bali (*Doherty*). Agrees exactly with Javan specimens.

131. RHINOPALPA ELPINICE, Felder.

Bali (*Doherty*).

132. YOMA SABINA, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

133. CYRESTIS NIVEA, Zinken-Sommer.

Bali, Sambawa (*Doherty*).

134. CYRESTIS NAIS, Wallace.

Lombok (*Fruhstorfer*), Sambawa (*ex Staudinger*), Sumba (*Doherty*).

135. CYRESTIS FRUHSTORFERI, Röber.

*C. fruhstorferi*, Röber, Ent. Nach., vol. xxii, p. 305 (1896).

Lombok (*Fruhstorfer*).

136. CYRESTIS LUTEA, Zinken-Sommer.

Bali (*Doherty*).

137. CYRESTIS PERIANDER, Fabricius.

Bali, Sambawa (*Doherty*).

138. CYRESTIS (Chersonesia) RAHRIA, Moore.

Bali (*Doherty*).

139. CYRESTIS (Chersonesia) PERAKA, Distant.

Bali (*Doherty*).

140. DOLESCHALLIA BISALTIDE, Cramer.

Bali, Lombok, Sumba? (*Doherty*), Lombok (*Fruhstorfer*). In de Nicéville's collection there are two females of this species (= *D. pratipa*,



Felder) from Lombok. It has the ground-colour of the upperside of both wings much paler than in *D. polibete*, Cramer, the ochreous areas in the forewing are larger, consequently the black band at the end of the discoidal cell is narrower, with only one subapical white dot.

141. DOLESCHALLIA POLIBETE, Cramer.

Lombok (*Fruhstorfer*). In de Nicéville's collection there is a single female of this species. It has the ground-colour of the upperside of both wings much deeper ferruginous than in *D. bisaltide*, Cramer, the black band at the end of the discoidal cell of the forewing broader, the tawny band beyond narrower, with four subapical white dots; the wing is also much more falcate, and the apex more produced than in *D. bisaltide*. The hindwing is very deep ferruginous (castaneous) coloured instead of fulvous. We possess no males of either species from Lombok.

142. \*CHARAXES (Eulepis) ATHAMAS, Drury.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Fruhstorfer records *C. phrixus*, Röber, from Lombok, a species considered by Dr. A. G. Butler to be a synonym of *C. athamas* (Journ. Linn. Soc. Lond., Zoology, vol. xxv, p. 383, n. 92 (1896)).

143. \*CHARAXES (Eulepis) BATAVIANUS, Fruhstorfer.

Lombok (*Fruhstorfer*). Mr. Fruhstorfer writes to de Nicéville that he intends shortly to describe this local race of *C. athamas*, Drury, in Ent. Nach., vol. xxiv (1898), from West Java and Lombok.

144. \*CHARAXES (Eulepis) ALPHIUS, Staudinger.

Lombok (*Fruhstorfer*), Sambawa (*Butler*). Mr. Fruhstorfer records this species from Lombok as *C. athamas alphius*. Dr. Butler gives it full specific rank.

145. \*CHARAXES (Eulepis) FALLAX, Röber.

Lombok (*Fruhstorfer*). Mr. Fruhstorfer records this species from Lombok as *C. attalus*, Felder, and places *C. fallax*, Röber, as a synonym of it. Dr. Butler gives *C. fallax* full specific rank (l. c., p. 385, n. 95), and places *C. attalus*, Felder, as var. 5 of *C. athamas*, Drury. Mr. Fruhstorfer writes to de Nicéville that he intends to describe in Ent. Nach., vol. xxiv (1898) the species he records as *C. attalus* as *C. attalusombokianus*, that he has seen the type of *C. attalus*, and that *C. fallax* is a synonym of it.

## 146. CHARAXES (Eulepis) MOORI, Distant.

Bali (*Doherty*), Sumba (*Pagenstecher*). Dr. Pagenstecher spells this name "moorei" incorrectly in both his papers, as also does Dr. Butler (l. c., p. 385, n. 96).

## 147. CHARAXES (Eulepis) HEBE, Butler.

Bali (*Doherty*).

## 148. \*CHARAXES (Murwareda) EUDAMIPPUS, Doubleday.

Sambawa? Sumba? (*Doherty*). Mr. Doherty says he saw a very large *Charaxes* in the above-named islands apparently of the *eudamippus* group.

## 149. \*CHARAXES (Murwareda) JOVIS, Staudinger.

*C. jovis*, Staudinger, *Iris*, vol. vii, p. 357 (1895); id., Pagenstecher, *Jahr. des Nass. Ver. für Natur.*, vol. xlix, p. 144, n. 85, pl. ii, fig. 6, male (1896).

Sambawa (*Staudinger*), Sambawa, Sumba (*Pagenstecher*). This is probably the species Mr. Doherty saw in Sumba but failed to capture, which he says was something like *C. pyrrhus*, Linnæus, from Amboina.

## 150. \*CHARAXES ( ——— ) OCELLATUS, Fruhstorfer.

*C. ocellatus*, Fruhstorfer, *Berl. Ent. Zeitsch.*, vol. xli, p. 388, pl. ix, fig. 4, female (1897).

Lombok (*Fruhstorfer*). This species is said to be allied to *C. orilus*, Butler, from Timor, the male of which is figured, and differs very greatly from the female of *C. ocellatus* figured by Mr. Fruhstorfer.

## 151. CHARAXES (Haridra) BAYA, Moore.

Bali (*Doherty*).

## 152. PROTHOE FRANCKII, Godart.

Bali (*Doherty*).

## Family LEMONIIDÆ.

## Subfamily LIBYTHÆINÆ.

## 153. \*LIBYTHEA GEOFFROYI, Godart.

Lombok (*Fruhstorfer*), Sumba (*Doherty*).

## 154. \*LIBYTHEA NARINA, Godart.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

155. LIBYTHEA MYRRHA, Godart.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*).

Subfamily NEMEOBIINÆ.

156. ZEMEROS FLEGYAS, Cramer.

Bali (*Doherty*). Mr. Doherty spells this name "*phlegyas*," which is classically more correct.

157. ZEMEROS RETIARIUS, Grose Smith.

*Z. retarius*, Grose Smith, Nov. Zool., vol. ii, p. 505, n. 13 (1895); *Z. strigatus* Pagenstecher, Jahr. des Nass. Ver. für Natur., vol. xlix, p. 149, n. 88, pl. iii, fig. 5, male (1896).

Lombok (*Fruhstorfer*), Sambawa (*Grose Smith* and *Doherty*), Sumba (*Pagenstecher*). Mr. Doherty recorded this species from Sambawa as *Z. phlegyas*, but it was the present species he obtained, *Z. retarius* at that date (1891) not having been described.

158. ABISARA ECHERIUS, Stoll.

Bali (*Doherty*).

Family LYCÆNIDÆ.

159. GERYDUS SYMETHUS, Cramer.

Bali, Lombok (*Doherty*), Lombok (*Fruhstorfer*). Mr. Elwes notes that a male from Lombok has less white coloration on the upperside of both wings than a male from Bali, which latter has less white again than in specimens from Java. The females from all three islands are similar.

160. \*GERYDUS TEOS, Doherty.

Sambawa, Sumba (*Doherty*).

161. GERYDUS BOISDUVALI, Moore.

Lombok (*Fruhstorfer*).

162. GERYDUS ACRAGAS, Doherty.

Bali, Sambawa, Sumba (*Doherty* as a var. of *G. boisduvali*, Moore). Mr. Elwes notes that he has carefully considered Doherty's remarks on this subspecies, and he would ignore the var. *acragas*. He has both sexes of *G. boisduvali* from Perak, Java, Bali, Pulo Laut and Sambawa, all of which are the same. He believes that *G. irroratus*, Druce, and *G. irroratus*, var. *assamensis*, Doherty, are synonyms. Mr. H. H. Druce says that *G. irroratus* is inseparable from *G. boisduvali*, Moore.

## 163. PARAGERYDUS HORSFIELDI, Moore.

Bali (*Doherty*), Lombok (*Fruhstorfer*). Mr. Elwes notes that two pairs of this species in his collection from Bali agree better with Mr. H. H. Druce's figures of *P. moorei* (Proc. Zool. Soc. Lond., 1895, p. 562, pl. xxxi, figs. 5, *male*; 6, *female*), from Kina Balu mountain in North Borneo, than with any of his (Elwes') Malayan *P. horsfieldi*, but as the type of this is probably the Javan form, and one in his collection from Java is *P. moorei* rather than *P. horsfieldi*, it seems to him that if they are distinct, which he doubts, it is the peninsular form and not the island one which wants a new name.

Mr. Elwes wishes this note to remain as written, but de Nicéville would point out that Mr. H. H. Druce says that *P. horsfieldi* occurs in Malacca, Sumatra, Java and Borneo, that the underside of *P. moorei* is "pure white," which is not the case in *P. horsfieldi*, and that specimens from Bali in de Nicéville's collection are *P. horsfieldi* and not *P. moorei*.

## 164. LOGANIA SP.

Sambawa (*Doherty*). The specimens received, so Mr. Elwes notes, are not quite the same as *L. marmorata*, Moore, *L. sriwa*, Distaut, *L. massalia*, Doherty, or *L. lahomius*, Kheil, but he thinks it is impossible to decide what it is without a thorough study of the whole group, and the genitalia compared. Mr. de Nicéville has not seen these specimens from Sambawa.

## 165. ZARONA JASODA, de Nicéville.

Bali (*Doherty*). One pair only received. Mr. Elwes notes that they agree on the underside with Burmese specimens, the male, however, is rather green than blue on the upperside. The female is so like the figure of *Z. zanella*, de Nicéville, that whether these are the same species or not, he has now but little doubt that *Z. zanella* is the female of *Z. jasoda*.

## 166. PITHECOPS HYLAX, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*).

## 167. NEOPITHECOPS ZALMORA, Butler.

Bali, Sambawa, Sumba (*Doherty*).

## 168. SPALGIS EPIUS, Westwood.

Bali, Sambawa, Sumba (*Doherty*).

## 169. MEGISBA MALAYA, Horsfield.

Bali, Sambawa, Sumba (*Doherty*). The tailed form only obtained

by us. Doherty does not say anything regarding the tails of the specimens he captured.

170. *CHILADES TROCHILUS*, Freyer.

Bali, Sambawa, Sumba (*Doherty*).

171. *CYANIRIS AKASA*, Horsfield.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*).

172. *CYANIRIS PUSPA*, Horsfield.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

173. *CYANIRIS MUSINA*, Snellen.

Lombok (*Fruhstorfer*). Identical with Sumatran specimens.

174. *CYANIRIS HUEGELII*, Moore.

Lombok (*Fruhstorfer*). Identical with specimens from Java.

175. *CYANIRIS PLACIDA*, de Nicéville.

Lombok (*Fruhstorfer*). This species is found also in Java and Sumatra.

176. \**ZIZERA GAIKA*, Trimen.

Sambawa, Sumba (*Doherty*). Mr. Doherty records this species under its synonym, *Z. pygmæa*, Snellen.

177. *ZIZERA OTIS*, Fabricius.

Bali, Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Doherty records this species under its synonym, *Z. lysizone*, Snellen.

178. \**ZIZERA LYSIMON*, Hübner.

Sumba? (*Doherty*). Mr. Doherty records a third species of the genus from Sumba, which can only be this we believe.

179. *LYCÆNESTHES LYCÆNINA*, Felder.

Lombok (*Fruhstorfer*).

180. \**NIPHANDA TESSELLATA*, Moore.

Bali (*Fruhstorfer*). Mr. Fruhstorfer spells the name "*tessellata*."

181. *EVERES ARGIADES*, Pallas.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Doherty records this species under its synonym, *E. parvhasius*, Fabricius.

182. *NACADUBA MACROPHTHALMA*, Felder.

Bali, Sambawa, Sumba (*Doherty*).

183. *NACADUBA HERMUS*, Felder.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

184. *NACADUBA LAURA*, Doherty.

Bali (*Doherty*), Lombok (*Doherty* and *Fruhstorfer*), Sambawa (*Fruhstorfer*), Sumba (*Doherty*). Mr. Fruhstorfer found this species very commonly in Lombok. The female type specimen from Sumba is in de Nicéville's collection. The references to the figure given by Doherty in the text of his paper, p. 182, n. 79 and p. 197 are incorrect, the figure is n. 11, not 9, as stated by him.

185. \**NACADUBA SUBPERUSIA*, Snellen.

*Lycæna subperusia*, Snellen, Tijds. voor Ent., vol. xxxix, p. 93, n. 2 (1896).

Sambawa (*Snellen*). Mynheer P. C. T. Snellen has described this species in Dutch from Java and Sambawa. We are unable to recognise it, not knowing that language, and it has not been figured. As he compares it with *Nacaduba perusia*, Felder, from Amboina (*Felder*), Amboina, Celebes and Java (*Snellen*), we have placed it in that genus. *N. perusia* is very close to *N. laura*, Doherty, the figure of the male of the former almost entirely agrees with our specimens of the male of the latter. Mr. de Nicéville thinks it probable that *L. subperusia* is the same species as *N. laura*, Doherty, which certainly occurs in Sambawa.

186. *NACADUBA NOREIA*, Felder.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). We have both the tailed and tailless forms from Bali, the Lombok form is tailed, both forms are found in Sambawa, and we have no specimens from Sumba, so cannot say whether the form occurring in that island is tailed or tailless or both. Mr. Doherty records it under its synonym, *N. ardates*, Moore, without remark.

187. *NACADUBA ATRATA*, Horsfield.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*).

188. \**NACADUBA DANA*, de Nicéville.

Sambawa, Sumba (*Doherty*).

189. *NACADUBA ANCYRA*, Felder.

Lombok (*Fruhstorfer*), Sumba (*Doherty*). Described by Doherty as

a new species from S.-E. Borneo, Java and Engano as *N. pseustis*, and from Sumba as *N. gaura*. Other synonyms are *N. aberrans*, Elwes, *Plebeius subfestivus*, Röber, *Cupido almora*, Druce, *N. amauro*, H. H. Druce, and *N. mariana*, H. H. Druce. The species has an immense range, from the Malay Peninsula to Australia and the Western Pacific. It is apparently nowhere common, and but few specimens exist in collections, which is probably the reason why various authors having obtained a single example or so from a new locality have jumped to the conclusion that it is a new species, and described and named it at once.

190. JAMIDES BOCHUS, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). From Mr. Doherty's notes it would appear that the Sumba form is distinct from the Sambawa one.

191. \*JAMIDES NICOBARICUS, Wood-Mason and de Nicéville.

Lombok (*Fruhstorfer*). It is a most unusual thing for two species of *Jamides* to occur on one island, and we think that Mr. Fruhstorfer's identification of the present species must be incorrect.

192. LAMPIDES ARATUS, Cramer.

Sumba (*Doherty* and *Pagenstecher*). Mr. Doherty described and figured this species as *L. masu*, the type, a male, being in de Nicéville's collection. Mr. Doherty's references to the figure of this species are incorrect in the text of his paper, p. 184, n. 86, and p. 197, the figure is n. 9, not 11 as stated. In his description Mr. Doherty does not say from whence his specimens came, but the type male ticketed by Doherty is from Sumba. He has written on the ticket "Probably=*L. aratus*, Cramer." The type female is probably lost. Other synonyms are *Plebeius lucianus*, Röber, *Lampides cærulina*, Mathew, and *Lampides ætherialis*, Butler.

193. LAMPIDES MARGARITA, Martin.

Lombok (*Fruhstorfer*), Sambawa (*Doherty*). The Lombok female and the Sambawa specimens (one pair) agree almost absolutely with typical Sumatran ones (two pairs) in de Nicéville's collection.

194. LAMPIDES CELENO, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Doherty spells this name "*celæno*."

195. LAMPIDES ELPIS, Godart.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

196. \*LAMPIDES ANOPS, Doherty.

Sumba (*Doherty*).

197. \*LAMPIDES SCHÄTZI, Röber.

Sambawa (*Pagenstecher*). Dr. Pagenstecher's reference to the plate on which this species is figured is incorrect, it should be pl. iv, not pl. x. It was originally described from Batjan. Herr Röber has sent de Nicéville a female example from Goram.

198. \*LAMPIDES CLEODUS, Felder.

Sumba (*Pagenstecher*).

199. \*LAMPIDES SAPERTI, Fruhstorfer.

Lombok (*Fruhstorfer*). The description of this species has not reached us.

200. \*LAMPIDES PATINKA, Fruhstorfer.

Lombok (*Fruhstorfer*). We have seen no description of this species.

201. CATOCHRYSOPS STRABO, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

202. CATOCHRYSOPS CNEJUS, Fabricius.

Lombok (*Fruhstorfer*), Sumba (*Doherty*). Mr. Doherty spells this name "cneius."

203. CATOCHRYSOPS PANDAFA, Horsfield.

Bali, Sumba (*Doherty*).

204. \*TARUCUS THEOPHRASTUS, Fabricius.

Sumba (*Doherty*).

205. TARUCUS TELICANUS, Lang.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). "*Papilio*" *telicanus* was described in 1789, "*Hesperia*" *plinius*, Fabricius, which is the same species, in 1793, so the former name has four years' priority. "*Lampides*" *cassioides* and *pseudocassius*, Murray, is usually considered by Australian entomologists to be a distinct species, but it is another synonym. The butterfly has a very wide range, occurring in Central and Southern Europe, almost throughout Africa, Southern Asia, Formosa, Australia, and the Pacific Islands. Mr. Roland Trimen, F. R. S., agrees with de Nicéville in considering *T. telicanus* and *T. plinius* to be synonymous.



206. *CASTALIUS ROSIMON*, Fabricius.  
Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).
207. *CASTALIUS ETHION*, Doubleday and Hewitson.  
Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).
208. *CASTALIUS ROXUS*, Godart.  
Bali, Sambawa, Sumba (*Doherty*).
209. *POLYOMMATUS BÆTICUS*, Linnæus.  
Bali, Lombok, Sambawa, Sumba (*Doherty*). Bali, Lombok (*Fruhstorfer*). Mr. Doherty spells this name "*bæticus*."
210. \**AMBLYPODIA NARADA*, Horsfield.  
Sumba (*Pagenstecher*).
211. \**IRAOTA TIMOLEON*, Stoll.  
Sambawa (*Doherty*).
212. \**SURENDRA QUERCETORUM*, Moore.  
Sambawa (*Doherty*).
213. *SURENDRA VIVARNA*, Horsfield.  
Bali (*Doherty*):
214. \**ARRHOPALA ARAXES*, Felder.  
Sumba (*Doherty*). Dr. Pagenstecher in his second paper records the species under *A. amantes*, Hewitson. We must await Mr. Bethune-Baker's monograph of this and allied genera before arriving at a final identification of the Sumba form.
215. *ARRHOPALA AMANTES*, Hewitson.  
Bali (*Doherty*). Mr. Elwes notes that the blue coloration on the upperside of the hindwing extends more nearly to the outer margin than in typical Indian specimens, thereby reducing the width of the outer black border.
216. \**ARRHOPALA PSEUDOCENTAURUS*, Doubleday.  
Lombok (*Fruhstorfer*).
217. *ARRHOPALA APIDANUS*, Cramer.  
Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*). Mr. Doherty records this species as a "var." from Sambawa, and gives

Hewitson the credit of describing it. Doherty's genus *Flos* cannot stand. Mr. G. T. Bethune-Baker informs us that the only species of the genus *Arrhopala* he possesses from these Islands is the ordinary form of *A. apidanus* from Sambawa.

Mr. Fruhstorfer records two unnamed species of *Arrhopala*, and a third unnamed species under the synonymic genus *Narathura*, all from Lombok.

218. *CURETIS THETIS*, Drury.

Bali, Sambawa, Sumba (*Doherty*). Mr. Doherty describes the species from Sambawa and Sumba as *C. malayica*, Felder, var. *kiritana*, Doherty. Females from Bali are fulvous and black on the upperside, the white and black females appear to be confined to India, though fulvous females are also found occasionally on the continent; fulvous females alone are found in the Malayan Archipelago.

219. \**CURETIS INSULARIS*, Horsfield.

Lombok (*Fruhstorfer*).

220. *ILERDA EPICLES*, Godart.

Bali (*Doherty*). Both sexes agree with the typical form from Java, and are quite distinct from the Sumatran form, *I. ila*, de Nicéville, and the Indian and Western China form, which may perhaps stand as *I. phœnicoparyphus*, Holland, described from Hainan Island, though that species cannot be identified under that name from the description and rough figure alone, and we have seen no Hainan specimens. The type is probably a female, not a male as stated.

221. *APHNÆUS LOHITA*, Horsfield.

Bali (*Doherty*).

222. *TAJURIA TRAVANA*, Hewitson.

Bali, Sambawa (*Doherty*).

223. \**TAJURIA LONGINUS*, Fabricius.

Lombok (*Fruhstorfer*).

224. \**TAJURIA DISCALIS*, Fruhstorfer.

Lombok (*Fruhstorfer*). Mr. Fruhstorfer in describing this species in *Societas Entomologica*, n. 7, July, 1897, gives no indication as to what species it is allied.

225. *HYPOLYCÆNA SIPYLUS*, Felder.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). This species is apparently very common in Lombok.

226. *HYPOLYCÆNA ERYLUS*, Godart.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Pagenstecher*).

227. *CHLIARIA* SP.

Bali (*Doherty*). A single male specimen received. Mr. Elwes notes that the blue coloration on the upperside of the forewing reaches the outer margin and comes nearer to the apex of the wing than in any other species of the genus possessed by him, and that it is perhaps a race distinct from *C. othona*, Hewitson.

228. *ZELTUS ETOLUS*, Fabricius.

Bali (*Doherty*).

229. *CHERITRA FREJA*, Fabricius.

Bali (*Doherty*).

230. *HORAGA PRIVIGNA*, Fruhstorfer.

*H. privigna*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlii, p. 113 (1897).

Bali (*Doherty*), Lombok (*Fruhstorfer*).

231. \**HORAGA BELLULA*, Fruhstorfer.

*H. bellula*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlii, p. 114 (1897).

Sambawa (*Doherty* and *Fruhstorfer*).

232. *MARMESSUS RAVINDRA*, Horsfield.

Bali (*Doherty*).

233. *LOXURA ATYMNUS*, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Doherty credits this species to Linnæus.

234. *ARAOTES LAPITHIS*, Moore.

Bali (*Doherty*).

235. *DEUDORIX EPIJARBAS*, Moore.

Bali (*Doherty*), Lombok (*Fruhstorfer*). Mr. Fruhstorfer spells this genus "*Deudoryx*."

## 236. RAPALA VARUNA, Horsfield.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. H. H. Druce has recently shewn that *R. orseis*, Hewitson, is a synonym of *R. varuna*, Horsfield. Mr. Doherty records both species in his paper, a pair of *R. orseis* from Sambawa, and *R. varuna* from Sambawa and Sumba. Whether or no he obtained two distinct species of *Rapala* of this group in Sambawa it is impossible to say without seeing his specimens.

## 237. RAPALA SCHISTACEA, Moore.

Bali (*Doherty*), Lombok (*Fruhstorfer*).

## 238. RAPALA PHERETIMA, Hewitson.

Bali (*Doherty*).

## 239. RAPALA SUFFUSA, Moore.

Bali (*Doherty*). A single male obtained at 3,000 ft. elevation.

## 240. RAPALA JARBAS, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Doherty spells this name "*iarbas*," which is classically more correct.

## 241. RAPALA DELIOCHUS, Hewitson.

Lombok (*Fruhstorfer*).

## 242. SINTHUSA AMBA, Kirby.

Bali, Sambawa? (*Doherty*). Mr. Doherty says he obtained a species of *Sinthusa* in Sambawa, which was probably the above-named species, though it may have been *S. malika*, Horsfield, = *S. amata*, Distant.

## Family PAPILIONIDÆ.

## Subfamily PIERINÆ.

## 243. LEPTOSIA XIPHIA, Fabricius.

Bali (*Wallace* as *Pontia nina*, Fabricius), Bali, Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Fruhstorfer refers to this species from Lombok as *L. xiphia chlorographa*, Hübner. This latter species appears to us to be a pure synonym of *L. xiphia*. In his Bali paper he spells the name "*xiphia*."

## 244. \*DELIAS AGLAIA, Linnæus.

Sambawa (*Doherty*). Mr. Doherty says that he saw two specimens

of *D. pasithoë*, Linnæus, var. (which species according to Heinrich Ritter von Mitis, who has monographed the genus, is a synonym of *D. aglaia*), on Mount Haruhasa in Sambawa at nearly 5,000 feet elevation.

245. DELIAS ORAIA, Doherty.

Lombok (*Fruhstorfer*), Sambawa (*Doherty*). This species has been figured by Grose Smith and Kirby in Rhop. Ex., pl. *Delias* iii, figs. 5, 6, male; 7, female (1893), and by Dr. Pagenstecher in Jahr. des Nass. Ver. für Natur., vol. xlix, p. 123, n. 30, pl. ii, fig. 8, female (1896). Von Mitis and Pagenstecher both treat this species as a var. of *D. descombesi*, Boisduval, but in our opinion it is quite distinct. Dr. Pagenstecher's reference to Messrs. Grose Smith and Kirby's plate is incorrect, it is pl. iii, not pl. iv.

246. DELIAS GLAUCE, Butler.

Bali (*Doherty*). Agrees exactly with specimens in our collections from Sumatra, except that the black border on the upperside of the hindwing in the male is a little narrower. It was originally described from Borneo.

247. DELIAS HYPARETE, Linnæus.

Bali (*Doherty* and *Mitis*), Lombok (*Mitis*), *D. hyparete* varietas? Sumba (*Pagenstecher*). We have not seen specimens of this species from Lombok. Our Bali examples agree with Cramer's figure of *D. autonöë* in having on the underside of the hindwing a complete series of seven vermilion spots placed between the veins in the middle of the marginal black band.

248. \*DELIAS FASCIATA, Rothschild.

*D. fasciata*, Rothschild, Nov. Zool., vol. i, p. 662, n. 4 (1894); id., Grose Smith and Kirby, Rhop. Ex., pl. *Delias* iv, fig. 1, female (1895); id., Pagenstecher, Jahr. des Nass. Ver. für Natur., vol. xlix, p. 124, n. 31, pl. iii, fig. 3, male (1896); *D. hyparete*, Linnæus, varietas?, Pagenstecher, Jahr. des Nass. Ver. für Natur., vol. xlvii, p. 56 (1894).

Sumba (*Rothschild*, *Grose Smith* and *Kirby*, *Pagenstecher*). Dr. Pagenstecher in his second paper says that he named this species *D. hyparete* var. *sumbana* in his first paper, but we cannot find any reference to that name therein, though he describes *D. hyparete*, varietas?, see n. 247 above. In his reference to his figure, p. 170, he gives Grose Smith instead of Rothschild the credit of having first described *D. fasciata*. The species does not appear to be in any way allied to *D. hyparete*, as stated by Pagenstecher in his first paper. Messrs.

Grose Smith and Kirby suggest that *D. fasciata* is the female, and *D. sambawana*, Rothschild, is the male of one and the same species. But their figure of the female of *D. fasciata* is very different from Rothschild's figure of the female of *D. sambawana*.

249. *DELIAS SAMBAWANA*, Rothschild.

*D. sambawana*, Rothschild, Nov. Zool., vol. i, p. 662, n. 5 (1894); vol. ii, pl. viii, fig. 5, female (1895); id., Grose Smith and Kirby, Rhop. Ex., pl. *Delias* iv, figs. 2, 3, male (1895).

Sambawa (*Doherty*, Rothschild, Grose Smith and Kirby).

250. \**DELIAS PAGENSTECHEI*, Fruhstorfer.

*D. pagenstecheri*, Fruhstorfer, Soc. Ent., n. 14 (1896); idem, id., Berl. Ent. Zeitsch., vol. xli, p. 398 (1897); *D. peribœa* [sic], Pagenstecher (*nec* Godart), Jahr. des Nass. Ver. für Natur., vol. xlix, p. 122, n. 29, pl. i, fig. 4, male (1896).

Sambawa (*Fruhstorfer* and *Pagenstecher* as *D. peribœa*, sic!) From Dr. Pagenstecher's figure of this species it appears to be quite distinct. In the text, p. 123, he says that he has figured a female, but at p. 170 he says a male; the latter is probably correct.

251. *DELIAS MINERVA*, Fruhstorfer.

*D. minerva*, Fruhstorfer, Soc. Ent., n. 14 (1896); idem, id., Berl. Ent. Zeitsch., vol. xli, p. 395, pl. ix, fig. 10, female (1897); *D. sambawana minerva*, id., Berl. Ent. Zeitsch., vol. xlii, p. 8 (1897).

Lombok (*Fruhstorfer*). Mr. de Nicéville has a pair of this species only from Lombok. The female agrees precisely, except in being smaller, with the figure of the same sex of *D. sambawana*, Rothschild; the male, however, differs from the figure of the same sex of that species on the underside of the hindwing in having the ground-colour of a paler yellow, less orange, shade, the black band within the submarginal series of vermilion lunules and the marginal black band both much broader, and the submarginal series of vermilion lunules half as broad.

252. \**DELIAS LIVIA*, Fruhstorfer.

*D. peribœa* [sic] *livia*, Fruhstorfer, Soc. Ent., n. 14, p. 115 (1896); idem, id., Berl. Ent. Zeitsch., vol. xli, p. 396 (1897); idem, id., Berl. Ent. Zeitsch., vol. xlii, p. 8 (1897).

Lombok (*Fruhstorfer*). We have not seen this species, nor has it been figured. As *D. minerva*, Fruhstorfer, as well as *D. livia*, are at best but local forms of *D. peribœa*, Godart, from Java, we think it somewhat improbable that both should occur in one small island and be distinct species.

Mr. Fruhstorfer refers to *D. wallacei*, Rothschild, from Bali. The species was originally described from Celebes, and Mr. Fruhstorfer probably meant that island when referring to it. Dr. A. G. Butler in his revision of the genus, *Ann. and Mag. of Nat. Hist.*, sixth series, vol. xx, p. 153, n. 35 (1897), sinks *D. wallacei* under *D. peribæa*.

Von Mitis records *D. egialea*, Cramer, from Bali and Lombok with a query. We have seen no specimen of this species from either island, and doubt its occurrence there.

253. CATOPSILIA CROCALE, Cramer.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Neither Doherty nor Fruhstorfer obtained the species in Bali, though it certainly must occur there. We consider *C. crocale* and *C. catilla*, Cramer, which are usually kept distinct, to represent one and the same species. Wallace records it from Lombok as *Callidryas hilaria*, Cramer, which is another synonym. Mynheer M. C. Piepers in his latest paper on the Migrations of Butterflies (*Nat. Tijd. voor Ned.-Indië*, vol. I, pp. 198–253 (1897) says on page 219 that "*Papilio*" *pomona*, Fabricius, is the oldest name for this butterfly. Both *P. pomona* and *P. crocale* were described in 1775, but as Cramer alone figured it, we prefer to use his name.

254. CATOPSILIA SCYLLA, Linnæus.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer* and *Wallace*), Sambawa and Sumba (*Doherty*). Mr. Doherty credits this species to Boisduval.

255. CATOPSILIA PYRANTHE, Linnæus.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*). Dr. Pagenstecher records this species in his second paper as *C. chryseis*, Drury, which is a synonym we believe of *C. pyranthe*. Hitherto it has not been recorded from Sumba, though it almost certainly occurs in that island.

256. TERIAS HECABE, Linnæus.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). In Dr. A. G. Butler's recent revision of the genus *Terias* from the Old World (*Ann. and Mag. of Nat. Hist.*, seventh series, vol. i, pp. 56–82 (1898), no species is given from the islands treated on in this paper. Our numerous specimens of the *T. hecabe* group from Lombok agree so exactly with examples taken by de Nicéville in Hongkong of the wet-season form that no words can convey any impression as to the slight

almost imperceptible, differences that exist between them. But Dr. Butler restricts *T. hecabe* to Hainan Island, and to Southern China from Hongkong Island to Tonkin, so he would probably give another name to our specimens from the Lesser Sunda Islands. In our opinion wet-season *T. hecabe* from South China agrees with and is indistinguishable from the only form of *T. hecabe*, which is the rainy-season one, found in Lombok, and doubtless also in Bali, Sambawa and Sumba.

257. \**TERIAS BLANDA*, Boisduval.

Lombok (*Fruhstorfer*), Sambawa (*Pagenstecher*). Mr. Doherty says he obtained "several varieties" of *T. hecabe*, Linnæus, in Sambawa and Sumba, which may include this species, but we have failed to recognise it from the description.

Dr. A. G. Butler places *T. blanda* as a synonym of true *T. hecabe*, which, as noted above, he restricts to Hainan, South China and Tonkin. But he keeps *T. anemone*, Felder, (with *T. mandarina*, De Lorza, *T. mariesii*, Butler, *T. hybrida*, Butler, and *T. connexiva*, Butler, as synonyms), as a distinct species from Japan, Chusan Island, and round the south-eastern coast of China from Shanghai to Hongkong. The dry-season form of the Hongkong *T. hecabe* is undoubtedly *T. mandarina*, and de Nicéville in Hongkong and Japan has caught every intergrade between it and the broadly black-bordered *T. hecabe*. Therefore de Nicéville thinks that Dr. Butler's *T. anemone* is undoubtedly the same species as true *T. hecabe*.

258. *TERIAS SILHETANA*, Wallace.

Lombok (*Fruhstorfer*). We have three females of this easily recognised species from Lombok. Dr. Butler says that *T. tecmessa*, de Nicéville, is a dry-season form of *T. silhetana*, Wallace. This is not so, if anything, it is a wet-season form with broad black borders. But in North-Eastern Sumatra, from whence the types of *T. tecmessa* came, no dry-season forms of *Terias* occur, as the seasons are practically wet ones all the year round.

259. \**TERIAS VALLIVOLANS*, Butler.

Bali (*Fruhstorfer* as "*Eurema*" *vallivolans*), Lombok (*Fruhstorfer* as *Terias vallivolans*). This species was described by Butler in Ann. and Mag. of Nat. Hist., fifth series, vol. xi, p. 420, n. 71 (1883), from Mindanao in the Philippine Isles. Mr. Distant in Rhop. Malay., p. 306, n. 4, pl. xxvi, fig. 17, *male* (1885), describes and figures it from Singapore, and says that he "Considers it probable that this is but another variety of *T. hecabe*." Since the above was in type Dr. Butler has placed *T. vallivolans* under *T. silhetana*, Wallace.



260. \*TERIAS SARI, Horsfield.

Sambawa, Sumba (*Doherty*).

261. TERIAS TILAHA, Horsfield.

Bali (*Doherty*).

262. \*TERIAS LOMBOKIANA, Fruhstorfer.

Lombok (*Fruhstorfer*). Compared with *T. tominia*, Vollenhoven, which latter is allied to the last-named species.

263. TERIAS DIVERSA, Wallace.

Bali (*Doherty*). We have a single female only, which has the ground-colour white, by which character Dr. A. R. Wallace has differentiated the female of this species. It is probably only an occasional aberration of *T. hecabe*, Linnæus, in which species such "sports" are not very rare. Dr. Butler restricts this species to the Philippines, though Dr. Wallace gave seven distinct localities for it.

264. TERIAS SP.

Sambawa (*Doherty*). A single male in Elwes' collection. It is allied to *T. andersonii*, Moore, and as in that species has black cilia, but has all the markings on the underside fewer in number than usual. It may be that species, but from a single example it is difficult to say. Dr. Butler places *T. andersonii* as a synonym of *T. suava*, Boisduval, which latter is, in his opinion, the Indian representative to *T. hecabe*, Linnæus. In Watson's and de Nicéville's opinion *T. andersonii* is a very distinct species.

265. \*TERIAS VAGANS, Wallace.

Lombok (*Fruhstorfer*). Originally described from Formosa and North India. This species appears to be nothing but *T. læta*, Boisduval, the underside "yellow." Capt. E. Y. Watson in his revision of the Indian species of *Terias* was unable to recognise it with certainty. In de Nicéville's collection are specimens from Dehra Dun in N.-W. India, which agree very well with the original description, and are only a seasonal form of *T. læta*. Dr. Butler places it as synonym of *T. læta*.

266. TERIAS LIBYTHEA, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*). Recorded by Doherty from Sambawa as *T. drona*, Horsfield, which is a synonym.

267. \*TERIAS HARINA, Horsfield.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

268. IXIAS REINWARDTII, Vollenhoven.

Bali (*Doherty* and *Wallace*), Lombok (*Wallace* and *Fruhstorfer*), Sambawa (*Doherty*), Sumba (*Pagenstecher*). Mr. Elwes notes:—"I have this species from Bali, Lombok, Sambawa and Flores. The males vary but little. The female, however, from Sambawa is small, with some orange coloration on the forewing and a trace of yellow on the hindwing on the upperside, whilst those from Bali are orange-lemon or white on the forewing, without any suffusion on the hindwing. The name of *I. kühni*, Röber, is given in the British Museum collection to specimens from Bali, but I consider *I. kühni* to be a synonym of *I. reinwardtii*. [With reference to this last remark, both sexes of *I. kuehni* are figured from Wetter; it is an excellent species, and quite distinct from *I. reinwardtii*.—*L. de N.*] *I. venilia*, Godart, is probably [certainly—*L. de N.*] another species. It has both wings yellow on the upperside, and according to *Fruhstorfer* is confined to East Java."

269. \*IXIAS BALIENSIS, *Fruhstorfer*.

*I. baliensis*, *Fruhstorfer*, Societas Entomologica, n. 7 (1897); id., Berl. Ent. Zeitsch., vol. xlii, p. 9 (1897).

Bali (*Fruhstorfer*). Is this really distinct? It was described from a single male. Mr. *Fruhstorfer* says it is intermediate between *I. reinwardtii*, Vollenhoven, and *I. kuehni*, Röber.

270. \*IXIAS VENILIA, Godart.

Sumba? (*Doherty*), Sumba (*Pagenstecher*). Mr. *Doherty* records a species near *I. pyrene* (*pyrene*), Linnæus, from the Sumba coast, several times seen, but no specimen taken. Dr. *Pagenstecher* records *I. venilia* from Sumba, which is probably the same species.

271. HUPHINA TEMENA, Hewitson.

Lombok (*Wallace* and *Fruhstorfer*), Sambawa (*Doherty*), Sumba (*Pagenstecher*).

272. \*HUPHINA CORONIS, Cramer.

Bali (*Fruhstorfer*). Probably the same species as the next, "*Papilio*" *coronis* having been described from China and the Coromandel Coast.

273. HUPHINA CORVA, Wallace.

Bali (*Wallace* and *Doherty*), Lombok (*Fruhstorfer*).

## 274. \*HUPHINA VASO, Doherty.

Lombok (*Fruhstorfer*), Sambawa (*Doherty, Oberthür*). This species has been figured by M. Oberthür in *Études d'Entomologie*, vol. xix, p. 5, pl. iii, fig. 18, *male* (1894), as *Pieris (Huphina) vaso*. Dr. Pagenstecher in his second paper records this species from Sambawa as "*Pieris*" *nerissa*, Fabricius, which is a totally different species. Mr. Fruhstorfer records it from Lombok as *H. corva vaso*.

## 275. HUPHINA JUDITH, Fabricius.

Bali (*Doherty and Fruhstorfer*).

## 276. \*HUPHINA EIRENE, Doherty.

Sambawa (*Pagenstecher*), Sumba (*Doherty*). Dr. Pagenstecher in his second paper places this species under "*Pieris*" *amalia*, Vollenhoven.

## 277. HUPHINA NAOMI, Wallace.

Lombok (*Wallace and Fruhstorfer*), Sambawa (*Doherty*). Dr. Pagenstecher in his second paper places this species under "*Pieris*" *amalia*, Vollenhoven, which is, in de Nicéville's opinion, a synonym of *Huphina lea*, Doubleday. *H. naomi* is quite distinct from *H. lea*. Some of our females of *H. naomi* from Lombok and one from Sambawa respectively are very dissimilar, that sex from the former island being usually extremely dark on both surfaces, so that the white ground-colour of the wings is greatly obliterated, though others again are almost as light as our Sambawa specimen. One might say that the darkest females from Lombok are twice as dark as the light female from Sambawa. Till large series of both sexes of all the species of *Huphina* from all the islands can be compared, it is impossible to be sure how many distinct species or what seasonal forms occur. In India *H. nerissa*, Fabricius, and its local race *H. phryne*, Fabricius, are subject to extensive seasonal dimorphism, the form flying in the rainy-season being extremely dark, while that flying in the dry-season is very light. Whether this phenomenon occurs in the Malayian Archipelago or not we are unable to say.

## 278. \*HUPHINA JULIA, Doherty.

Sambawa (*Pagenstecher*), Sumba (*Doherty and Oberthür*). This species has been figured by Doherty, by M. Oberthür in *Études d'Entomologie*, vol. xix, p. 5, pl. iii, figs. 11, *male*; 17, *female* (1894), as *Pieris (Huphina) julia*, and by Dr. Pagenstecher in *Jahr. des Nass. Ver. für Natur.*, vol. xlix, p. 119, n. 20, pl. i, fig. 2, *male* (1896), as *Pieris julia*.

## 279. HUPHINA MENTES, Wallace.

Lombok (*Wallace* and *Fruhstorfer*), Sambawa (*Doherty*). Dr. Pagenstecher records this species from Sambawa in his second paper as "*Pieris*" *pitys*, Godart, originally described from Java, and figured from thence by Lucas, but given from Timor only by Dr. A. R. Wallace. Mr. Fruhstorfer says that *Pieris synchroma*, Röber, from Flores and Alor, both sexes of which are figured, and *Pieris pitys*, Snellen (*nec* Godart), from Flores, are synonyms of *H. mentes*. Mr. Fruhstorfer keeps *H. pitys*, Godart, and *H. mentes*, distinct, while Mynheer Snellen places *P. mentes* as a synonym of *P. pitys*. This group of the genus is a very difficult one, and till long series of both sexes from all the islands are brought together and compared, the confusion at present obtaining cannot be avoided.

## 280. HUPHINA TAMAR, Wallace.

Bali (*Wallace* and *Doherty*).

## 281. BELENOIS JAVA, Sparrman.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*), Sumba (*Pagenstecher*). Recorded by Wallace from Bali and Lombok as *Pieris coronea*, Cramer, which is a synonym.

## 282. APPIAS ALBINA, Boisduval.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Under *Appias paulina*, Cramer, a species strictly confined to Ceylon, Mr. Doherty has the following note:—"Two forms [of the male] of this very puzzling group occurred both in Sumba and in Sambawa. One was all white, with only a slender dark marginal line, resembling *A. albina* [this is typical *A. albina*]. The other had the hindwing and the apex of the forewing bright ochreous-yellow below, resembling *A. lankapura*, Moore, but without the dark apex [on the upperside of the forewing. In de Nicéville's opinion *A. lankapura* is a synonym of *A. paulina*, and is therefore found only in Ceylon]. It generally had a black or gray discal spot on the forewing." Dr. Wallace records white females [de Nicéville's Form I] from Lombok under "*Tachyris*" *paulina*, Cramer. In Lombok three forms of the female occur, the first is white on both surfaces, the second is white above and mostly chrome-yellow below, the third is primrose-yellow on both surfaces. Mr. de Nicéville calls the wholly white female Form I, and our Lombok females agree well with the figures of "*Catophaga neombo*, Boisduval," in Moore's *Lep. Cey.*, vol. i, pl. 1, figs. 3a, 3b, female (1881). The female which is white above and mostly chrome-yellow below,

de Nicéville calls Form II, and it is figured by Moore in *Lep. Cey.*, vol. i, pl. li, figs. 1, 1a, *female* (1881), as the female of *Catophaga lankapura*, Moore, though all the black markings in the Lombok variety are not as strongly developed as in the Ceylonese form figured. The female which is primrose-yellow on both surfaces de Nicéville calls Form III, and it has been figured from Java in Horsfield and Moore's *Cat. Lep. Mus. E. I. C.*, vol. i, pl. iia, fig. 3, *female* (1857), as *Pieris neombo*, Boisduval, and is almost certainly the *Tachyris albina*, Boisduval, ab. *flavi* [*flavia*, Fruhstorfer, sic!] of Röber, *Tijd. voor Ent.*, vol. xxxiv, p. 282 (1891), from Flores, Kissar, Wetter and Letti. It is not known if all three forms of the female occur also in Bali, Sambawa and Sumba, but it is probable that they do. It must be understood that the figures referred to above in *Lep. Cey.* do not actually portray our Lombok specimens, but they are given here to indicate the form of coloration displayed by them.

### 283. APPIAS LEIS, Hübner.

*Appias eurosundana*, Grose Smith, *Nov. Zool.*, vol. ii, p. 75 (1895); *Tachyris sawela*, Fruhstorfer, *Soc. Ent.*, vol. xi, n. 14, p. 115 (1896); idem, id., *Berl. Ent. Zeitsch.*, vol. xli, p. 390, pl. ix, fig. 8, *female* (1897); *Tachyris eurosundana sawela*, id., *Berl. Ent. Zeitsch.*, vol. xlii, p. 10 (1897).

Lombok (*Fruhstorfer* and *Doherty*), Sambawa (*Doherty* and *Grose Smith*), Sumba (*Pagenstecher*). Besides the two synonyms of *A. leis* given above, others in de Nicéville's opinion are *Pieris galathea*, Felder; *Pieris amasene*, Boisduval [*nec Cramer*]; *Pieris agave*, Felder; *Pieris zoe*, Vollenhoven; *Tachyris urania*, Wallace; *Tachyris jacquinioti*, Wallace [*nec Lucas*]; *Tachyris alope*, Wallace; *Catophaga roepstorffii*, Moore; and *Tachyris mata*, Kheil. Dr. Pagenstecher records *A. leis* in his second paper as *Tachyris zoe*, Vollenhoven, from Sumba. Like *A. albina*, Boisduval, the female of this species is trimorphic. We have received a good series of both sexes from Lombok, three females are Form I, with the broad black band on the upperside of the forewing not bearing the usual five white spots, and the underside being white, this form having been named ab. *umbratilis*, Fruhstorfer, in *Berl. Ent. Zeitsch.*, vol. xli, p. 392 (1896), vol. xlii, p. 10 (1897); and three specimens are Form II, with the underside of the hindwing yellow, which is the ab. *sawela*, Fruhstorfer; Form III, with both wings on the upperside yellow, has not been received, but not improbably it is the ab. *citronella* of Fruhstorfer, described in *Berl. Ent. Zeitsch.*, vol. xli, p. 392 (1896), vol. xlii, p. 10 (1897). Mr. de Nicéville does not propose to criticise Mr. Fruhstorfer's remarks on *Appias albina*, Boisduval, and *A. leis*. The latter gentleman has quite failed to understand those

species, but his position is not singular, probably no two writers think similarly on the subject, and it is only recently since de Nicéville has written up the genus for the fourth volume of his "Butterflies of India, Burmah and Ceylon" that he has himself come to any definite conclusion regarding them.

284. *APPIAS LYNCIDA*, Cramer.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*). Dr. A. R. Wallace records it from Bali and Lombok. Mr. Doherty notes, "I have dubiously recorded *Appias lyncida* from Sambawa." We have since received it from that island.

285. \**APPIAS PANDIONE*, Hübner.

Lombok (*Fruhstorfer*).

286. \**APPIAS LEPTIS*, Felder.

Lombok (*Fruhstorfer*).

287. *SALETARA NATHALIA*, Felder.

Sambawa, Sumba? (*Doherty*). Mr. Doherty notes that from Sumba he obtained a female which he supposed to be that of *A. (Saletara) nathalia*.

288. *HEBOMOIA GLAUCIPPE*, Linnæus.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Mr. Fruhstorfer records this species from Bali and Lombok as *H. javüensis*, sic! and *javüensis*, sic!, Wallace, a species described in 1863, as "*Iphia*" *glauippe*, loc. var. (3) *javanensis*, from Java, but as Dr. Wallace dropped that name in his paper "On the *Pieridæ* of the Indian and Australian Regions," published in 1868, we have followed him, as our specimens from Java, Bali and Lombok hardly differ from the typical race from India.

289. *NEPHERONIA VALERIA*, Cramer.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Wallace, Doherty* and *Fruhstorfer*), Sambawa, Sumba (*Doherty*). Our numerous specimens from Bali, Lombok and Sambawa agree well with the original figure of the male of this species from Java. Mr. Fruhstorfer in *Berl. Ent. Zeitsch.*, vol. xlii, p. 11 (1897), has described *N. valeria sundana* from Lombok, but we do not consider the Lombok race to be distinct from the Javan. Mr. Doherty says that a different species of *Nepheronia* is, he thinks, found in Sumba.

## Subfamily PAPILIONINÆ.

In this subfamily we have followed the order given by the Hon. Walter Rothschild in "Novitates Zoologicae," vol. ii, p. 167 (1895), in his paper entitled "A Revision of the *Papilios* of the Eastern Hemisphere, exclusive of Africa." As Elwes is not prepared to accept Rothschild's trinomial nomenclature for local races, de Nicéville has raised all such to full specific rank while indicating in all cases what Mr. Rothschild considers to be the parent species.

290. *TROIDES NAIAS*, Doherty.

Sambawa, Sumba (*Doherty*). Treated by Rothschild as a subspecies of *T. haliphron*, Boisduval, the typical form of which is from Celebes and the adjacent small islands. Mr. Rothschild does not consider that "*Ornithoptera*" *naias*, var. *sambavana*, Doherty, from Sambawa, can be separated from typical *O. nais* from Sumba. Rothschild spells the name "*sambawanus*." Dr. Staudinger has described and figured this species as *Ornithoptera socrates* from Sambawa and Wetter. Mr. de Nicéville has males only from Sambawa and Sumba, which cannot be distinguished one from the other.

291. *TROIDES HELENA*, Linnæus.

Bali (*Doherty*). The Bali form appears to agree with the typical one from S.-E. Sumatra and Java. Given full specific rank by Mr. Rothschild.

292. \**TROIDES PROPINQUUS*, Rothschild.

Sambawa (*Rothschild*). Described by Rothschild as a subspecies of *T. helena*, Linnæus.

293. *TROIDES SAGITTATUS*, Fruhstorfer.

*Ornithoptera helena sagittatus*, Fruhstorfer, Soc. Ent., vol. xi, n. 15, p. 123 (1896); idem, id., Berl. Ent. Zeitsch., vol. xli, p. 377, pl. ix, fig. 1, *female* (1897); idem, id., Berl. Ent. Zeitsch., vol. xlii, p. 11 (1897).

Lombok (*Fruhstorfer*). We have seen males only of this subspecies of *T. helena*, Linnæus. They have no white internervular streaks on the forewing on the upperside whatever. On the hindwing the costal black band extends as far as the middle of the subcostal interspace, that is to say, there is a large golden-yellow streak anterior to the first subcostal nervule; there is usually only one submarginal black spot in the first median interspace, which is joined to the marginal black lunule, but in one specimen there is a small round isolated spot in

the first subcostal interspace. In de Nicéville's collection is a single male which agrees with the aberration *pluto* of Felder in having the hindwing reddish-yellow ("old gold") instead of clear yellow. This specimen has three pairs of faint whitish streaks between the veins on the underside of the forewing, but none on the upperside. The ordinarily-coloured males do not differ from typical *T. helena*, Linnæus. This subspecies if distinct is based on the female sex, the one figured by Fruhstorfer, which we have not seen.

294. \**PAPILIO OREON*, Doherty.

Sumba (*Doherty*). Given full specific rank by Mr. Rothschild.

295. *PAPILIO ARISTOLOCHIÆ*, Fabricius.

Bali (*Doherty* and *Fruhstorfer*). Our Bali males have four small white spots beyond the discoidal cell of the hindwing as in some Javan specimens of typical *P. aristolochiæ*, some Javan specimens have them twice as large, others but little larger; one Bali specimen has these spots very faint on the upperside. The Bali form approaches the Sambawan local race, which has only three small spots. Mr. Rothschild gives this species full specific rank.

296. *PAPILIO AUSTROSUNDANUS*, Rothschild.

Sambawa (*Doherty*). Mr. Doherty says that the Sambawa form (which he calls *P. aristolochiæ*, Linnæus, but Fabricius first described it) is "normal," but as it has only three discal small white spots on the hindwing, it deserves a subspecific name. Mr. Elwes notes: "The male of the Sambawa form is exactly like one from Camorta in the Nicobar Isles in my collection. If this form must have a varietal name, I think *P. camorta*, Moore, should be used." Described by Mr. Rothschild as a local race of *P. aristolochiæ*, Fabricius. Mr. de Nicéville has not seen specimens from Sambawa.

297. *PAPILIO LOMBOCKENSIS*, Rothschild.

*P. aristolochiæ lombokensis*, Rothschild, Nov. Zool., vol. iii, p. 322, n. 1 (18th September, 1896); *P. aristolochiæ lombokensis*, Fruhstorfer, Soc. Ent., vol. xi, p. 108 (1st October, 1896).

Sawela, Lombok Island, 1,000-2,000 feet (*Doherty*), East Lombok, 2,000 feet (*Fruhstorfer*). This form, which is treated by Mr. Rothschild as a subspecies of *P. aristolochiæ*, Fabricius, has no white spots on the disc of the hindwing, and is usually known as *P. antiphus*, Fabricius. Mr. Rothschild in Nov. Zool., vol. ii, p. 252 (1895) notes that his specimen of *P. aristolochiæ antiphus*, Fabricius, from Lombok,



captured by Wallace, is of small size, but does not differ from certain Bornean and Sumatran individuals. Subsequently, however, he elected to give the Lombok form subspecific rank. Mr. Elwes notes that "*P. antiphus* is quite as good a species as many more, unless you can show a complete series of intergrades between typical *P. aristolochiæ*, Fabricius, and *P. antiphus*, Fabricius." [Mr. Rothschild in treating *P. antiphus* as a local race or subspecies of *P. aristolochiæ* does not say he has seen all intergrades between the typical forms of both, but he notes that the latter has "two, three, four, or five discal spots to the hindwing," which is very close indeed to the former which has no white spots]. "I can distinguish my Lombok from Borneo, Sumatra and Nias *P. antiphus* by the shape of the anal spot on the underside of the hindwing, and if it is a var., it is a var. of *P. antiphus*, and not of *P. aristolochiæ*."

298. PAPILIO NYX, de Nicéville.

*P. (Pangerana) nyx*, de Nicéville, Ann. and Mag. of Nat. Hist., sixth series, vol. xx, p. 225 (1897).

Bali (*Doherty*). This species is allied to *P. nox*, Swainson, from Java. Females only have been obtained.

299. PAPILIO SUMBANUS, Fruhstorfer.

Sambawa, Sumba (*Doherty*), Sumba (*Fruhstorfer*). Mr. Doherty records this species as *P. erichthonius*, Cramer, which is the correct classical spelling of *erithonius*, a synonym of *P. demoleus*, Linnæus. Mr. Fruhstorfer treats this species as a local race of *P. demoleus*. Mr. Rothschild records it from Sambawa and Sumba as *P. demoleus sthenelinus*, Rothschild. We have seen no Sambawa specimens, they may be distinct from the Sumba form, in which case Rothschild's name can be used for that local race, the type of which is from Alor Island. The description of *P. sumbanus* has not been published up to the date of passing final proofs of this paper. In some of his letters to de Nicéville, Fruhstorfer says he has named it *P. pictus*.

300. PAPILIO DEMOLION, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*). Given full specific rank by Mr. Rothschild.

301. PAPILIO PALAWANICUS, Staudinger.

Bali (*Doherty*), Lombok (*Fruhstorfer*). Mr. Rothschild treats this species as a local race of *P. helenus*, Linnæus. From typical *P. helenus*

it appears to constantly differ in having the series of submarginal red lunules on the underside of the hindwing in the male incomplete.

302. *PAPILIO BISERIATUS*, Rothschild.

Sambawa, Sumba (*Doherty*). Mr. Rothschild gives this species subspecific rank under *P. helenus*, Linnæus.

303. *PAPILIO MEMNON*, Linnæus.

Bali (*Doherty* and *Fruhstorfer*). Given full specific rank by Mr. Rothschild.

304. *PAPILIO MERAPU*, Doherty.

Sumba (*Doherty*). Treated by Mr. Rothschild as a local race of *P. memnon*, Linnæus.

305. *PAPILIO CLATHRATUS*, Rothschild.

Lombok (*Fruhstorfer* and *Doherty*), Sambawa (*Doherty*). This also Mr. Rothschild places under *P. memnon*, Linnæus, as a local race.

306. *PAPILIO UMBROSUS*, Rothschild.

Sambawa (*Rothschild*). This is a local race according to Mr. Rothschild of *P. canopus*, Westwood, from Northern Australia. It is one of the most marked instances amongst the few that exist in the islands treated in this paper of an Australian element in the butterfly fauna. Mr. Rothschild has figured it in *Nov. Zool.*, vol. ii, p. 342, pl. viii, fig. 3, male (1895).

307. \**PAPILIO SUMBANUS*, Rothschild.

Patadala in Sumba (*Rothschild*). Mr. Rothschild treats this as a local race of *P. canopus*, Westwood. The female has been figured by Dr. Pagenstecher in his second paper.

308. *PAPILIO THESEUS*, Cramer.

Bali (*Doherty* and *Fruhstorfer*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). A local race of *P. polytes*, Linnæus, according to Mr. Rothschild. Mr. Doherty spells the latter name "*polites*," which is classically more correct. The female from Lombok is of the Form II, which mimics *P. aristolochiæ*, Fabricius. Mr. Rothschild notes that "The Sambawa examples have the white band of the hindwing rather narrower than specimens from other localities."

## 309. \*PAPILIO NEUMOEGENI, Honrath.

Sumba (*Doherty*). This species was described by Doherty as *P. maremba*, but Honrath's name has priority. The latter writer erroneously gave the habitat as Sambawa; it is found only in Sumba. M. Oberthür has figured the male type example and described the female in "Études d'Entomologie," vol. xix, p. 2, pl. iii, fig. 12, *male* (1894), under Doherty's name. Dr. Pagenstecher has written a note on it in Ent. Nach., vol. xxii, pp. 151-153 (1896). Mr. Rothschild gives it full specific rank.

## 310. PAPILIO PERANTHUS, Fabricius.

Bali (*Doherty*), Lombok (*Doherty* and *Fruhstorfer*), var., Sambawa (*Doherty*). Mr. Rothschild separates off the Lombok and Sambawa forms as a local race as *P. peranthus fulgens*, Röber, in which Mr. Fruhstorfer follows him as far as the Lombok race goes. We are unable, however, to trace any differences in either sex between typical *P. peranthus* from Java, and *P. fulgens* from Bali, Lombok and Sambawa. In writing to de Nicéville Mr. Fruhstorfer says that the Lombok and Sambawa form will be described as *P. transiens*, Fruhstorfer, and the Alor form as *P. peranthus phæbus*. The Tanah-Djampea form is *P. peranthus intermedius*, Snellen. None of these local races can in our opinion be separated from the parent form.

## 311. PAPILIO ALCIBIADES, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*). One specimen from Bali in de Nicéville's collection agrees very closely with Eimer's figure and description of his *P. antiphates javanicus* from Java, and both the Java and Bali forms are markedly different from the continental form in having the marginal markings on the upperside of the hindwing entirely densely black, instead of black mixed with grey powdering; other specimens from Bali are normal. Mr. Rothschild treats this species as a local race of *P. antiphates*, Cramer.

## 312. \*PAPILIO HERMOCRATES, Felder.

Sumba (*Pagenstecher*). Mr. Rothschild considers this species to be a local race of *P. aristeus*, Cramer.

## 313. PAPILIO SALLASTIUS, Staudinger.

Sambawa (*Doherty*). Treated by Mr. Rothschild as a local race of *P. eurypylus*, Linnaeus. Dr. Pagenstecher has figured it in Jahr. des Nass. Ver. für Natur., vol. xlix, p. 112, n. 12, pl. i, fig. i, *male* (1896).

## 314. PAPILIO EURYPYLIDES, Staudinger.

Lombok (*Fruhstorfer* as *eurypilus*, sic! *eurypilides*, sic!) Sambawa, Sumba (*Doherty*). Treated by Mr. Rothschild as a local race of *P. eurypylus*, Linnæus. Dr. Pagenstecher has figured it in *Jahr. des Nass. Ver. für Natur.*, vol. xlix, p. 112, n. 13, pl. i, fig. 3, *male* (1896). Mr. Rothschild notes that in Sambawa both *P. sallastius* and *P. eurypylides* fly together.

## 315. PAPILIO AXION, Felder.

Bali (*Doherty*). Treated by Mr. Rothschild as a local race of *P. eurypylus*, Linnæus. A single specimen received, which agrees exactly with Javan examples.

## 316. PAPILIO SARPEDON, Linnæus.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*). Mr. Rothschild records *P. sarpedon adonarensis*, Rothschild, from Tambora in Sambawa, but says that the four specimens he possesses "Stand exactly intermediate between *P. adonarensis* and Indian *P. sarpedon* in the shape of the hindwing." Our single specimen from Sambawa is absolutely inseparable from typical *P. sarpedon*. The Bali and Lombok form is also typical *P. sarpedon*, though Mr. *Fruhstorfer* refers the Lombok form to *P. sarpedon jugans*, Rothschild. If Mr. Rothschild's local race *P. adonarensis* is retained, it must be restricted to specimens from Adonara Island, from whence the type was obtained.

## 317. \*PAPILIO JUGANS, Rothschild.

Waingapoeng in Sumba (*Doherty*). Treated by Mr. Rothschild as a local race of *P. sarpedon*, Linnæus.

## 318. PAPILIO AGAMEMNON, Linnæus.

Bali (*Doherty*), Lombok (*Fruhstorfer*).

## 319. PAPILIO EXILIS, Rothschild.

Sambawa, Sumba (*Doherty*). Treated by Mr. Rothschild as a local race of *P. agamemnon*, Linnæus.

## Family HESPERIIDÆ.

In this family we have followed the order given in the late Capt. E. Y. Watson's paper in *Journ. Bomb. Nat. Hist. Soc.*, vol. ix, pp. 411-437 (1895), entitled "A Key to the Asiatic Genera of the *Hesperiidæ*."

## 320. CELÆNORRHINUS LEUCOCERA, Kollar.

Bali (*Doherty*).

## 321. CELÆNORRHINUS SPILOTHYRUS, Felder.

Bali (*Doherty*). We have three specimens from Bali and one from Mount Arjuno in Java which may constitute a distinct local race of this species. They are, however, only distinguishable from typical *C. spilothyrus* by the almost complete disappearance of the spots on the underside of the hindwing. They have the costal spot of the forewing on the upperside white instead of yellow, thus resembling Malabar and not Ceylon specimens.

## 322. CELÆNORRHINUS SATURATUS, Elwes and Edwards.

*C. saturatus*, Elwes and Edwards, Trans. Zool. Soc. Lond., vol. xiv, p. 120, pl. xviii, fig. 6, male; pl. xxii, figs. 5, 5a, tegumen and clasp of male (1897).

Bali (*Doherty*).

## 323. COLADENIA DAN, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

## 324. SATARUPA DIRÆ, de Nicéville.

Bali (*Doherty*). Originally described in the genus *Daimio*.

## 325. TAGIADES JAPETUS, Cramer.

Bali (*Doherty*), Lombok (*Doherty* and *Fruhstorfer*), Sambawa, Sumba (*Doherty*). This species was described as new from Sambawa and Sumba by *Doherty* as *Tagiades brasidas*, which is a synonym of the widely-spread *T. japetus*.

## 326. TAGIADES SAMBAVANA, Elwes and Edwards.

*T. sambavana*, Elwes and Edwards, Trans. Zool. Soc. Lond., vol. xiv, p. 143, pl. xx, fig. 10, male; pl. xxii, fig. 14, clasp of male (1897).

Bali, Sambawa (*Doherty*). Generally this species resembles *T. atticus*, Fabricius, but has in the male the tibial pencil of hairs brown instead of yellowish-white, and a different form of clasp, which has been figured; and sometimes (not always) with two white points placed one above the other near the apical third of cell 1a (the submedian interspace) in the forewing on the upperside.

## 327. \*TAGIADES ATTICUS, Fabricius.

Lombok (*Fruhstorfer*). This may be the last-named species.

## 328. ODONTOPTILUM ANGULATA, Felder.

Bali (*Doherty*), Lombok (*Doherty* and *Fruhstorfer*), Sambawa (*Doherty*). *Achlyodes sura*, Moore, is a synonym of this species. Mr. de Nicéville has caught *O. angulata* in Hongkong, from whence it was originally described, and these Chinese specimens agree absolutely with Indian ones.

## 329. \*ODONTOPTILUM HYPERIDES, Doherty.

Sambawa (*Doherty*). Described as *Abaratha hyperides*.

## 330. \*ODONTOPTILUM SP.

Sumba (*Doherty*). Mr. Doherty says that a species allied to his *Abaratha hyperides*, but more like *A. angulatus* [sic!], Felder, was found in Sumba, but no specimens have survived.

## 331. CAPRONA SYRICHTHUS, Felder.

Bali, Sumba (*Doherty*).

## 332. SANCUS PULIGO, Mabille.

Bali (*Doherty*).

## 333. KORUTHAIALOS XANITES, Butler.

Bali (*Doherty*). *K. hector*, Watson, has the orange band on the upperside of the forewing narrow, *K. xanites* has it broad.

## 334. KORUTHAIALOS HECTOR, Watson.

Bali (*Doherty*).

## 335. SUASTUS TRIPURA, de Nicéville.

Bali (*Doherty*). Originally described in the genus *Tagiades*.

## 336. \*SUASTUS CHILON, Doherty.

Sumba (*Doherty*).

## 337. TARACTROCERA ARCHIAS, Felder.

Bali (*Doherty*), Lombok (*Doherty* and *Fruhstorfer*), Sambawa, Sumba (*Doherty*). This species is better known as *Taractrocera nigrolimbatus*, Snellen.

## 338. AMPITTIA MARO, Fabricius.

Bali, Sambawa, Sumba (*Doherty*). Mr. Doherty notes that he is doubtful of the identity of his Sambawa and Sumba specimens with the Indian form.

## 339. ISMA VULSO, Mabilille.

*Pamphila vulso*, Mabilille, Ann. Soc. Ent. Belg., vol. xxxvii, p. 55 (1893).

Bali (*Doherty*). Originally described from Java. The type of the genus *Isma* is *I. obscura*, Distant, which is congeneric with the more recently described "*Isoteinon*" *iapis*, de Nicéville, that species having been taken by Watson to be the type of his genus *Lophoides*. The genus *Isma* has seven years priority over *Lophoides*. Messrs. Elwes and Edwards incorrectly give *Isma* as a synonym of their genus *Scobura*.

## 340. ZOGRAPHETUS DURGA, Plötz.

Sambawa (*Doherty*).

## 341. INESSA ILION, de Nicéville.

*I. ilion*, de Nicéville, Journ. A. S. B., vol. lxvi, pt. 2, p. 571, n. 25, pl. iv, fig. 33, male (1897).

Lombok (*Fruhstorfer*).

## 342. MATAPA ARIA, Moore.

Bali (*Doherty*), Lombok (*Fruhstorfer*).

## 343. MATAPA SHALGRAMA, de Nicéville.

Bali (*Doherty*).

## 344. ERIONOTA THRAX, Linnæus.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*).

## 345. GANGARA THYRSIS, Fabricius.

Bali (*Doherty*).

## 346. HIDARI IRAVA, Moore.

Bali (*Doherty*).

## 347. NOTOCRYPTA FEISTHAMELII, Boisduval.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). This is probably the species Mr. Doherty recorded from Sambawa and Sumba as *Plesioneura restricta*, Moore.

## 348. NOTOCRYPTA ALBIFASCIA, Moore.

Bali (*Doherty*). Originally described from Hatsiega in Upper Tenasserim. Mr. de Nicéville has not seen specimens from Bali, so does not know if they are typical or not.

349. UDASPES FOLUS, Cramer.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*).

350. CUPITHA PURREEA, Moore.

Bali (*Doherty*).

351. TELICOTA AUGIAS, Linnæus.

Lombok (*Fruhstorfer*), Sambawa (*Doherty*).

352. TELICOTA BAMBUSÆ, Moore.

Bali (*Doherty*), Lombok (*Fruhstorfer*).

353. TELICOTA (Padraona) GOLA, Moore.

Bali, Sambawa, Sumba (*Doherty*).

354. TELICOTA (Padraona) DARA, Kollar.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). This is probably the species recorded from Sambawa and Sumba by *Doherty* as *Telicota* [*Telicota*] *mæssoides*, Moore. This last de Nicéville has never been able to satisfactorily discriminate, but it is almost certainly a synonym of *T. dara*, and Messrs. Elwes and Edwards sink it under *T. dara*.

355. \* OCYBADISTES MARNAS, Felder.

Sumba (*Pagenstecher*). Originally described from Amboina. It is unknown to de Nicéville, but certainly is not a true *Pamphila*. Messrs. Elwes and Edwards place it in the genus *Telicota*, but Mr. Heron in 1894 made a new genus for its reception.

356. HALPE HOMOLEA, Hewitson.

Bali (*Doherty*).

357. HALPE ZEMA, Hewitson.

Bali (*Doherty*). Mr. *Doherty* says that an unidentified species of *Halpe* occurs in Sambawa.

358. PARNARA (Chapra) MATHIAS, Fabricius.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

359. PARNARA (Chapra) BRUNNEA, Snellen.

Bali (*Doherty*), Lombok (*Fruhstorfer*).



## 360. PARNARA (Chapra) SINENSIS, Mabille.

Bali (*Doherty*). Better known perhaps as *Chapra prominens*, Moore, which is a synonym.

## 361. PARNARA CONJUNCTA, Herrich-Schäffer.

Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*). Given by *Doherty* under its synonymic name, *Parnara narooa*, Moore.

## 362. PARNARA CONTIGUA, Mabille.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa (*Doherty*). This species is better known as *Parnara toona*, Moore.

## 363. PARNARA COLACA, Moore.

Bali (*Doherty*), Lombok (*Fruhstorfer*).

## 364. PARNARA GUTTATUS, Bremer and Grey.

Bali (*Doherty*).

## 365. \*PARNARA TULSI, de Nicéville.

Lombok (*Fruhstorfer*). Mr. *Doherty* says that "Two unidentified species of *Parnara* occur in Sumbawa," one of which is probably *P. contigua*, Mabille.

## 366. ISMENE IONIS, de Nicéville.

Lombok (*Fruhstorfer*), Sambawa (*Doherty*). This species was originally described from Western Java and Sambawa in Journ. Bombay Nat. Hist. Soc., vol. ix, p. 403, n. 49, pl. Q, fig. 61, male (1895). The female from Lombok (hitherto undescribed) is the same expanse as the male; on the upperside of both wings the base is clothed with ochreous instead of orange-yellow setæ; the forewing has no sexual brand; on the underside the hindwing has the discal band much broader than in the male, and pure dazzling white instead of purplish-white. Mr. *Fruhstorfer* has sent two males and a female from Lombok to de Nicéville.

## 367. \*ISMENE ILUSKA, Hewitson.

Sumba (*Pagenstecher*). Dr. *Pagenstecher* records this species from Sumba as *J. illusca* [sic!]. *Ismene iluska* was originally described from Macassar in Celebes. It is probable that Dr. *Pagenstecher*'s specimens are really *I. ionis*, de Nicéville. See No. 366 *ante*.

## 368. HASORA BADRA, Moore.

Bali (*Doherty*), Lombok (*Fruhstorfer*), Sambawa, Sumba (*Doherty*).

369. \*HASORA (Parata) CHROMUS, Cramer.

Sumba (*Doherty*). Recorded by *Doherty* as *Parata malayana*, *Felder*, which is said to be a synonym of *H. chromus*, *Cramer*.

370. HASORA (Parata) SIMPLICISSIMA, *Mabille*.

Bali, Sambawa? Sumba? (*Doherty*). Mr. *Doherty* says that a second species of "*Parata*" occurs both in Sambawa and Sumba which he did not identify. It is probably the present species.

371. BIBASIS SAMBAVANA, *Elwes and Edwards*.

*B. sambavana*, *Elwes and Edwards*, *Trans. Zool. Soc. Lond.*, vol. xiv, p. 305, pl. xxvii, fig. 96, *clasp of male* (1897).

Sambawa (*Doherty*)

372. BADAMIA EXCLAMATIONIS, *Fabricius*.

Bali, Sambawa, Sumba (*Doherty*).

373. RHOPALOCAMPTA SUBCAUDATA, *Felder*.

Bali (*Doherty*).

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*On the manifestation of Social Instinct in the Common Babbler* (*Crateropus canorus*).—By B. B. OSMASTON, *Indian Forest Service*. Communicated by the *Natural History Secretary*.

[Received November 25th; Read December 1st, 1897.]

The existence of a "moral sense" in animals is so often questioned that I feel bound, in justice to the birds, to put on record an account of a scene of which I was a witness, which seems to prove that in some kinds of birds at least social instinct at all events is present in a highly developed form.

In the summer of 1895 I caught and trained a young "Shikra," the Indian Sparrow Hawk, (*Astur badius*), to catch Mynahs and other small birds. One morning in August, while walking round my garden with the Shikra on my hand I saw a party of "seven sisters" (the Jungle Babbler, *Crateropus canorus*) feeding on the ground. At my approach they all flew up into a tree, and as I came still nearer they began to fly across one by one to another tree. I threw the Shikra up at one of them, which she succeeded in capturing after a short chase, bringing it down to the ground in her firm grip. The rest of the Babblers,

however, hearing the cries of their captured "sister," came down to the rescue without the slightest show of hesitation, and in a shorter time than it takes to tell were engaged in a spirited attack on the Hawk, apparently using both beak and claws in their effort to make her relinquish her hold.

The result was unexpected, for before I could reach the spot the Shikra had let the Babbler go and had taken refuge in a neighbouring bush, whilst the "seven sisters" not improbably rather elated at the success of their plucky little affray, collected together in a mango tree and poured forth volumes of abuse at the head of their vanquished enemy.

NOTE.—Since writing the above I have many times flown a Shikra at *C. canorus* always with the same result, viz., that so long as I kept out of the way the Babblers would attack the Hawk *en masse* and give her a real 'bad time.' I never let them actually rescue their 'sister,' as it would have been very demoralizing for the Hawk, but I have not the least doubt but that they would have succeeded in making it so warm for the Hawk that she would have been only too glad to let go and be off. More than once she had begun to utter her cries of alarm, preparatory to letting go, when I arrived on the scene and drove off the Babblers. On one occasion I ran up quickly and actually caught a Babbler on the Hawk's back (the Hawk having another Babbler in her claws) holding on so firmly that I had the greatest difficulty in making it leave go! I think therefore I have fairly proved now that Jerdon's attribution of cowardice to this species (*Birds of India*, vol. ii, pt. i, p. 62), is not always correct.

B. B. O.

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*Notes on various species of Grebes, with especial reference to the power of walking and digestion possessed by these birds.—By F. FINN, B. A., F. Z. S., Deputy Superintendent of the Indian Museum.*

[Received November 25th; Read December 1st, 1897.]

The remarkable birds forming the family *Podicipedidæ* of ornithologists have long possessed for me especial interest, and I venture herewith to record my observations on several of the species, which I have had the good fortune to study in captivity, and thus to observe under conditions which have, I hope, enabled me to set at rest some doubts concerning certain particulars in their economy.

I shall follow wherever possible the nomenclature and arrangement of Mr. H. E. Dresser, who in his *Birds of Europe*, Vol. VIII, has given excellent figures and accounts of most of the species with which I shall here have occasion to deal.

1. *Podiceps cristatus*. The Great Crested Grebe.

In January 1896 I procured from the Calcutta Bazaar a fine specimen of this species, which, however, had its legs broken or dislocated at the hock. In consequence of this, though the feet retained their normal position, it was quite helpless on land, and could only paddle very feebly in the water.

I nevertheless kept it for some days closely confined in a small cage, in the hope that the injured limbs might recover, but although the bird after a day or two fed well upon fish, and seemed strong and lively, its feet got no better, and when I ultimately turned it out on the Museum compound tank it soon disappeared, having probably drifted ashore and been stolen, or fallen a prey to some jackal.

When confined, though as above noted, it took ordinary fish readily (I have seen it eat a dozen as long as large sprats and thicker, and then want more) it did not seem to like prawns, nor would it eat a small siluroid fish which I offered.

On two occasions I saw it deliberately eat one of its own feathers which came out while it was pluming itself, an operation in which, like Grebes generally, it was exceedingly assiduous.

It did not, however, reproduce either feathers or fish-bones in the form of "castings," as suspected by Yarrell (*British Birds*, Vol. IV, p. 121, Fourth Edition); I am certain of this, having had the bird under such close observation. I did, however, notice that its excrement was gritty, as if containing particles of comminuted bone; and I think that anyone who reads the evidence given on this point by Thompson in his "*Birds of Ireland*," Vol. III, pp. 173-189 (reference given by Yarrell *loc. cit.*) will agree with me that there is every reason to believe that this points to the conclusion that no castings are formed, and that feathers and bones are either actually digested or passed out in a comminuted condition.

This bird was of course in winter plumage, but kept its short ruff and ear-tufts expanded when in the cage. It had the bill pink except the upper chap at the tip along the ridge and down to the nostrils where it was dark lead-colour. The iris was brilliant red.

Owing to the crippled condition of the bird I was unable to make any observations as to the power of walking in this species; but this deficiency I was able to supply when at home on leave last October, a young bird having been acquired by the London Zoological Gardens. This specimen, as my own had been, was very savage, drawing blood freely from my hands when I attempted to make it move. Although inclined merely to squat and shove itself along, it could and did walk, but with reluctance, and for a short distance only, standing up on its toes

and waddling along very clumsily. It frequently used its wings to aid it when running, these being full-grown, though the head was still covered with variegated down, already indicating the form of the ornamental plumage on this part.

Some years ago, also in the London Zoological Gardens, I was able to observe the specimen of the large American Grebe, *Podiceps (Aechmophorus) major*, which the Society then possessed. This also seemed able to advance only a few steps at a time, waddling along a little way, and then flopping down on its breast, although it had been some time in the gardens, and was presumably in good health and not cramped or frightened; the latter conditions obtaining to a certain extent in the case of the Great Crested Grebe above alluded to, for this was better on its legs the second time I saw it.

*Podiceps nigricollis.* The Eared Grebe.

Early in the present year on February 11th, I got a male individual of this species from the Calcutta Bazaar, a sufficiently remarkable locality for it. This bird was weakly, and I found it dead on the third day after I obtained it, though it had fed freely on small prawns and fish. It was gentle and did not peck. Though I had it for at least one night in a cage, I found no "castings;" yet, as in the case of the large species, I twice saw it eat one of its own feathers. It walked freely, several yards at a time, in an erect position, as stated by Dresser, who correctly figures it and other Grebes in this attitude. It had the bill lead-grey, dark on the ridge down to the nostrils, and whitish at the base and on the under surface of the mandible. The iris was reddish orange, with a yellowish-white inner ring, and the feet olive-leadен, dark on the under surface of the toes and the outer side of the shank.

The specimen (22115 in Bird Register) has been stuffed in the standing attitude for the Bird gallery in the Museum.

*Podiceps fluviatilis.* The European Dabchick.

I once observed the gait of this bird on land, in the case of a specimen confined in the aviary in the Fish-House at the London Zoological Gardens. It walked on its toes in the ordinary manner of birds, with an awkwardness which reminded me at the time of a diving duck, only in this case it was even more marked, as might be expected, I have often observed this species in a wild state, and have once seen it half run, half fly, over a narrow strip of grassy ground between two ponds; otherwise I never saw it ashore when wild. But to argue from this that it cannot walk would be like denying the cat the power of swimming because this beast is proverbially averse to water.

*Podiceps albigennis* (Sharpe). The Indian Dabchick.

I have had many examples of this species of various ages, and have consequently had ample opportunities of observing it. It frequently remains standing up for some time, and walks and runs about quite actively, and can even jump a little, helping itself frequently when running with its wings. Some specimens are less ready and able to walk than others and more inclined to shove themselves along when squatting, but I attribute this to fatigue or to flurry caused by fright. Any bird which is a clumsy walker normally will naturally blunder in its gait when hurried.

In the early part of December 1895, I got from the Bazaar a young specimen of this bird which I kept for some time in a cage, letting it out to swim and feed in any convenient receptacle for water, from an earthen pot to a large masonry tank. It soon became remarkably tame, and before I had had it a week was inclined to follow me about, and seemed restless when confined and unable to get to me. I have let it out in my room and have had it come and squat down by my feet. In fact, when the photograph\* exhibited (which I owe to the kindness of Mr. T. H. Holland of the Geological Survey) was taken, I could not get the bird to stand still unless my hand was near. At the same time it exhibited much fear of natives, diving in fright when they approached, when it would let me lift it out of the water in my hand. In addition to intelligence, it showed much courage, on two occasions attacking a dog, and once a Scissor-billed Tern, which easily beat it off: the dog of course had not the chance of retaliating allowed it. Its power of resisting injury was also remarkable; on three occasions (twice within a few minutes) it fell at least a yard on to a stone or concrete floor, and was not hurt, though it did not attempt to save itself with its wings.

The quills on these were not quite grown when I got it, and the head was likewise covered with variegated down. While I had it confined I never saw it bring up "castings," nor has this been the case with any of this species that I have kept; nor did I see any feathers swallowed by them, even in the case of a moulting bird.

I ultimately turned this bird out on the tank of the Museum compound, where after remaining tame for a day or two, it speedily became wild. It was inclined to associate with a Coot, which did not appear to be anxious for its society; but towards the ducks I from time to time put on it exhibited what looked very like animosity, attacking

\* This is not clear enough for reproduction,—most unfortunately, as it shows the bird in its normal standing position; i.e., on its toes like an ordinary bird; though I have seen it also in the plantigrade posture.

them at first most vigorously. I fancy, however, that this was merely juvenile mischief, for it became more peaceable as it grew older.

When I placed the Great Crested Grebe above alluded to on one occasion on the tank, its small relative hastily approached, and diving below, could be easily seen through the clear water to come and peck the large bird's toe, rising to the surface out of reach.

It hunted insects and crustaceans when at large, as well as fish, and appreciated a varied diet of these when in captivity. It often came out on to a piece of brickwork, especially at first, to plume itself, and I have even seen it resting there.

I never saw this or any other specimen use its wings when diving; when performing this action it used both feet together, while in swimming it moved by alternate strokes.

This bird had lost nearly all its quills towards the end of January 1896, though they had only recently been fully developed. By this time also the head appeared to be feathered. On the 2nd February the quills were nearly grown again, as I find from my notes then taken.

In the following month (March) I procured an adult, and turned this also out on the tank, and the two soon became friendly. I observed before turning out the new bird that, although hungry, and searching for food with its head under (a common action) in the water in which I placed it, it nevertheless refused to eat a sharp-toothed Goby; it took, however, a spider and some mole-crickets. At the end of March I noticed that this specimen also had moulted all its quills, so that this must be the usual mode of moulting in this species of Grebe at all events.\*

Soon after this I went to the Andamans, and on my return could not distinguish with certainty my old pet from the new dabchick. I did see, indeed, one of them make a Whistling Teal fly out of the water; and if this were the young bird at its accustomed mischief, it had by this time advanced nearly into full breeding plumage, which was not the case with the other bird; but this is, I should think, unlikely.

After this one of these dabchicks disappeared. I often saw one fly short distances in the evening, and noticed that it alighted "anyhow," letting the feet trail behind all the time, and not putting them out in front like a duck or gull.

\* I have observed a similar complete moult of the quills in the Common Coot (*Fulica atra*) the Waterhen (*Gallinula chloropus*) and in a species of *Porphyrio*. In the case of the Coot the observation has been previously made by St. John (Natural History and Sport in Morayshire), but I noticed it independently on the tank here. The Moorhen I noticed in St. James' Park in 1897, and the *Porphyrio* in the Calcutta Zoological Gardens.

One of the birds, I think the same, remained on the tank for at least a year after this, but ultimately disappeared. As before indicated, I have had other specimens, and noted in these also the power of walking denied to the Grebes by some observers. On two occasions I experimented with some in order to find if they could rise off the ground and get on the wing. The results of the experiments have left me somewhat in doubt on this point. In the first case a bird let loose on a lawn was able to raise itself a foot or so from the ground, and I note that it "could evidently have flown off if in good form." This was early in the present year, and the other day I repeated the experiment with another bird, which could hardly clear the ground, but it was, I think, in a weak state at the time, for it could not walk far at a time, and when turned out on the tank came out of the water, a thing I have seldom seen a healthy Dabchick do. In fact, I believe these birds sleep in the water from what I have seen.

The iris in this species is brownish yellow, but I noticed that in my young bird it was hazel at first, and in a still younger one, downy all over, and with no feathers on the wings, it was brown.

The beak is buff, black along the ridge, and green at angle of mouth.

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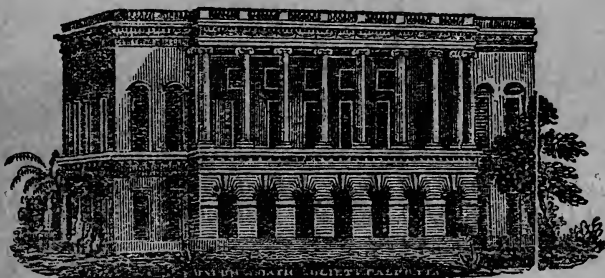
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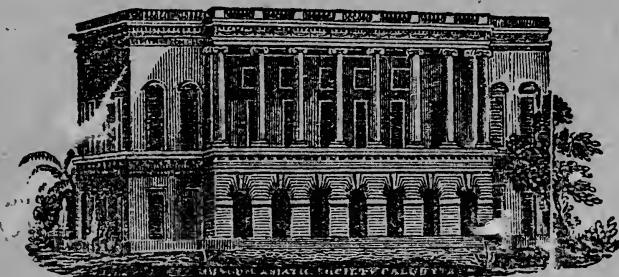
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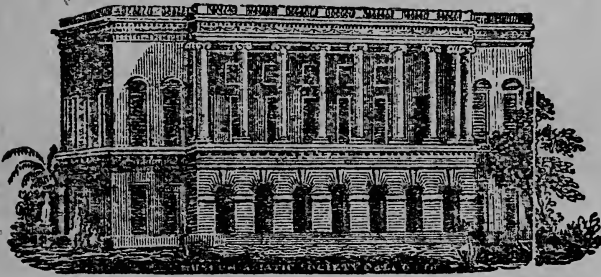
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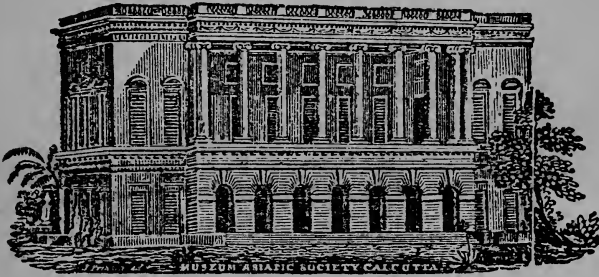




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