

CELASTRACEAE—II¹ (Ding Hou, Leyden)

The family *Hippocrateaceae* was established by A. L. DE JUSSIEU (Ann. Mus. Hist. Nat. Paris 18, 1811, 486, as *Hippocrateaceae*) and three years later R. BROWN created the family *Celastraceae* (in Flinders, Voy. Terra Austr. 2, 1814, 554, as *Celastrineae*). BROWN was well aware that his new 'order' (family in our sense) closely approached *Hippocrateaceae* and hinted at the possibility that they might be fused later.

This was indeed effected by HOOKER *f.* (in B. & H. Gen. Pl. 1, 1862, 358), who reduced *Hippocrateaceae* to a tribe of the *Celastraceae*. Still up till the present there has been no unanimity of opinion on this question. Disagreement with HOOKER's vision started with MIERS (Trans. Linn. Soc. 38, 1873, 319-330) in his elaboration of the South American *Hippocrateaceae*; he reviewed the history of the two families and ably summarized their general characters. Basing himself on literature and new observations he put forward eleven points of difference for their distinction. However, many new genera and species have been described since 1873 which have obliterated many of MIERS's arguments, and recent specialists agree that, if any, only few characters do hold.

LOESENER, who kept the two families apart (in E. & P. Pfl. Fam. 3, 5, 1892, 189-230; *ibid.* ed. 2, 20b, 1942, 87-231), in discussing the African genus *Campylostemon* WELW. (Notizbl. Berl.-Dahl. 13, 1937, 563-577) remarked that the chief difference between the families would be: isomerous flowers in *Celastraceae* and anisomerous flowers in *Hippocrateaceae*. In passing it may be noted here that, in absence of fruit, he referred *Campylostemon*, which possesses 5 stamens, to the *Celastraceae*.

In his comprehensive work on the American *Hippocrateaceae* (Brittonia 3, 1940, 341-555) A. C. SMITH found the isomery obviously not an absolutely discriminating character as he reduced *Kippistia* MIERS (3 stamens) to *Cheiloclinium* MIERS (with 5 stamens), stating that the combined genus is a very coherent one. In his opinion the most important characters separating *Hippocrateaceae* from *Celastraceae* would be: (i) stamens inserted within the disk (not outside it or fused with it), (ii) stamens 3, except in two species of *Cheiloclinium* (not 5 or 4), and (iii) anthers dehiscing by lateral, apical, or extrorse clefts (never introrse).

In 1941, in connection with the publication of the new Hippocrateaceous genus *Brassiantha* A.C.SM. from New Guinea, I. W. BAILEY & A. C. SMITH (J. Arn. Arb. 22, 389-394, t. 1) stated that properly the only differential character left seemed to be the place of insertion of the stamens and they added that if that were so, the separation of the two families should be considered artificial.

In this respect it is very interesting to note that the Indo-Malesian genus *Kokoona* THW. was originally classified in *Hippocrateaceae* on account of its stamens which are inserted within the disk, and this was admitted also later by MIERS, *l.c.* Later authors have arranged it, however, unanimously with the *Celastraceae*, because of its arboreous habit, capsular fruit, and isomerous stamens. Properly it should be marked as a transitional link.

The African genus *Campylostemon* has also proved to be such a link, since LAWALRÉE has described the structure of its fruit (Bull. Jard. Bot. Brux. 18, 1947, 250-254). Its flowers fit *Celastraceae* and are isomerous, but its capsular fruit is similar to that of the *Hippocrateae* group. LAWALRÉE found the fruit characters more important than the isomerous stamens and preferred to arrange *Campylostemon* with *Hippocrateaceae* of which he broadened and redefined the family concept. He was aware, however, that all the differences listed in his diagnosis are only quantitative and needed further study.

From this succinct review it appears that *Celastraceae* and *Hippocrateaceae* are connected by several intermediate genera and species which obscure a sharp distinction. This is corroborated by the data which emerge from auxiliary data derived from palynological, anatomical, and chemotaxonomical observations.

(1) Part I was published in vol. 6 (1963) 227-291.

ERDTMAN stated that pollen grains \pm similar to those of *Hippocrateaceae* occur in *Celastraceae* (Pollen Morph. Pl. Tax. Angiosp. 1952, 105, fig. 52A and 204, fig. 121B).

METCALFE & CHALK found the anatomical characters of *Hippocrateaceae* very similar to those of *Celastraceae* and concluded that the two families are very closely related (Anat. Dicot. 1, 1950, 387-404).

HEGNAUER concluded that as far as phytochemical characters are known the separation of *Celastraceae* and *Hippocrateaceae* seems hardly justified from that point of view (this vol., p. 230).

Summarizing, it appears that the overwhelming evidence is in favour of accepting one natural family, *Celastraceae*, a name which has been proposed for conservation by BULLOCK (Taxon 7, 1958, 10, 18).

Taxonomic position of the genus *Siphonodon*

There is controversial opinion about the inclusion of *Siphonodon* in the family, largely because of the interpretation of the flower, and more in particular about the question whether the central appendage found in the apically hollow pistil represents the style which HOOKER doubted because of it being covered by a cuticle. On this question I have recently given a survey (Blumea 12, 1963, 36-37). CROIZAT raised it to the rank of subfamily (Lilloa 13, 1947, 41, 43) and GAGNEPAIN & TARDIEU-BLOT to family rank (Nat. Syst. 14, 1951, 102). But this change of rank does not involve its exclusion from the *Celastrales*. In fact, HUTCHINSON retained it in close proximity to the *Hippocrateaceae*. Wood-anatomical data do not provide specific clues as this anatomy is rather heterogenous in *Celastraceae*. Palynologically, ERDTMAN is inclined to support the creation of a new family, but it may be doubted whether sufficient data are available. It would seem to me that a consideration on the taxonomic position of *Siphonodon* cannot be divorced from a consideration of the Papuan *Brassiantha* and the Australian genus *Hedraianthera* which also possess an apically hollow pistil. An apically hollow pistil occurs also in unrelated plants, e.g. in *Erycibe* (*Convolvulaceae*).

Emendation of family circumscription

In consequence of the considerations given above the provisional family description needs a few emendations, viz: add to the characters of the calyx:—'in some *Salacias* slightly, irregularly 3-5-lobed in the apical part and then circumscissile at the base, or lengthwise splitting, or not lobed'; and add to the characters of the cotyledons:—'or massive (*Salacia*), free or united'.

Germination. N. HALLÉ (Mém. Inst. Franç. Afr. Noire n. 64, 1962, 38-40, f. 22-24) made observations on seed germination of some species of the former *Hippocrateaceae*. He found that species with wingless seed and massive cotyledons, or winged seed with united cotyledons and a thickened marginal 'nerve' have hypogeal germination; he found this in *Salacia* (2 spp. observed), *Cuervea* (1 sp.), *Simirestis* (1 sp.) and *Loeseneriella* (1 sp.). Species with winged seed with a thin marginal 'nerve' and free cotyledons are epigeal: *Reissantia* (1 sp.), *Apodostigma* (1 sp.) and *Campylostemon* (1 sp.). The data of seed germination in the *Celastraceae* are still inadequate to be evaluated taxonomically at present.

Generic delimitation in '*Hippocrateaceae*' as accepted here I have discussed in detail in a precursory paper (Blumea 12, 1963, 31-38).

NEW KEY TO THE GENERA (based on flowering material)

1. Stamens 5 or 4.
2. Pistil not hollow in the apical part.
3. Leaves spirally arranged or alternate.
4. Leaves with cross-bar veins between the nerves. Petiole thickened at the apex beneath. Petals contorted. Styles 2, free or slightly united at the base. See vol. 6, p. 280 . . . 9.¹ *Bhesa*
4. Venation reticulate. Petiole not thickened at the apex beneath. Petals usually imbricate, rarely valvate (*Perrottetia*). Style simple.

(1) The numbering of the genera in the key in part I, l.c. 231-232, was, unfortunately, erroneous.

- 5. Petals always larger than the calyx lobes and usually different in shape, imbricate. Ovary 3-4-celled (2-celled in *Maytenus diversifolia*).
- 6. Ovary (2-)3-celled, each cell with two collateral ovules.
- 7. Ovary free from the disk. Ovules with a cup-shaped aril at the base. Scandent shrubs, always unarmed. See vol. 6, p. 233 1. *Celastrus*
- 7. Ovary usually partly immersed in the disk. Ovules without arillar cup at the base, though the seeds are arillate. Erect (sometimes scandent?) shrubs or small trees, sometimes spinous. See vol. 6, p. 238 2. *Maytenus*
- 6. Ovary 4-celled, each cell with c. 10 ovules arranged in two series. See vol. 6, p. 243. 3. *Xylonymus*
- 5. Petals usually similar to calyx lobes both in size and shape, usually valvate. Ovary 2-celled. See vol. 6, p. 288 12. *Perrottetia*
- 3. Leaves decussate or opposite.
- 8. Petals slightly united at the base (very rarely free, e.g. in *Microtropis filiformis*). Disk proper absent, filaments united at the base into a ring or short tube, by some interpreted to represent a disk, usually united with the petals. See vol. 6, p. 272 8. *Microtropis*
- 8. Petals free. Disk conspicuous, fleshy, cupular or flat (covering the ovary and coherent with it in *Glyptopetalum sp.*), free from the petals.
- 9. Ovary 3-, or 4-5-celled. Ovules 1-18 in each cell.
- 10. Ovary 4-5-celled.
- 11. Ovules 2 in each cell. See vol. 6, p. 245 4. *Euonymus*
- 11. Ovule 1 in each cell. See vol. 6, p. 254 5. *Glyptopetalum*
- 10. Ovary 3-celled. Ovules (4-6-)8-18 in each cell.
- 12. Petals contorted, without appendage. See vol. 6, p. 258 6. *Kokoona*
- 12. Petals imbricate, usually with appendages on the inner side, very rarely naked. See vol. 6, p. 262 7. *Lophopetalum*
- 9. Ovary 2-celled, or 1-celled by abortion (*Pleurostyliia*). Ovules 2 in each cell.
- 13. Disk more or less flat. Anthers subglobose and rounded at the apex, connective invisible on the dorsal side. See vol. 6, p. 284 10. *Cassine*
- 13. Disk cupular. Anthers ovoid and short-apiculate, connective distinct and broad on the dorsal side. See vol. 6, p. 287 11. *Pleurostyliia*
- 2. Pistil hollow in the apical part (best observed in a longitudinal section of the flower).
- 14. Cavity of the pistil without a style-like appendage. Petals valvate. Disk composed of 5 pulvinate glands contiguous at the ends to form a pseudocontinuous annulus. Stamens inserted inside the disk 13. *Brassiantha*
- 14. The hollow cavity with a cylindric, style-like appendage arising from the bottom. Petals imbricate. Disk united with the ovary. Stamens inserted outside the disk 14. *Siphonodon*
- Stamens 3, rarely 2.
- 15. Calyx distinctly 5-lobed even at very young stage, spreading at anthesis.
- 16. Flowers in axillary fascicles 17. *Salacia*
- 16. Flowers in axillary cymes, or terminal thyrses, or panicles.
- 17. Inflorescences with short, supplementary branchlets in the dichotomies or in the axils of branches. Disk inconspicuous 16. *Reissantia*
- 17. Inflorescences without short, supplementary branchlets as above. Disk conspicuous.
- 18. Petals subcoriaceous when dry, densely puberulous outside, subvalvate or the margins slightly overlapping 15. *Loeseneriella*
- 18. Petals thin, rarely slightly fleshy, glabrous, imbricate, the margins much overlapping. 17. *Salacia*
- 15. Calyx almost unlobed or slightly, irregularly lobed at the apex, during anthesis breaking transversely along an irregular line near its base, sometimes irregularly splitting lengthwise, rarely the whole calyx unlobed, saucer-shaped and persistent 17. *Salacia*

NEW KEY TO THE GENERA
(based on fruiting material)

- 1. Fruits capsular, dehiscent.
- 2. Fruits with 3 divergent, follicle-like parts. Seed with a basal wing.
- 3. Cotyledons united, at least partly so 15. *Loeseneriella*
- 3. Cotyledons free 16. *Reissantia*
- 2. Fruits otherwise. Seed wingless, or with an apical wing (*Kokoona*), or the wing surrounding the seed proper (*Lophopetalum*).
- 4. Leaves with crossbar-like veins between the nerves; petiole thickened at the apex beneath. See vol. 6, p. 280 9. *Bhesa*
- 4. Leaves with reticulate veins; petiole not thickened at the apex beneath.
- 5. Leaves spirally arranged or alternate.
- 6. Fruits less than 1¼ cm long, 3-celled (very rarely 2-celled).

7. Seeds completely enveloped by the aril. Scandent shrubs. See vol. 6, p. 233 . . . 1. *Celastrus*
 7. Seeds only at the lower half or at the base enveloped by the aril. Erect (sometimes scandent?)
 shrubs or small trees. See vol. 6, p. 238 2. *Maytenus*
 6. Fruits 2½–6½ cm long, 4- or 5-celled.
 8. Fruits subglobose, 5-sulcate, 5-celled. Seeds usually 2–4 in each cell . . . 13. *Brassiantha*
 8. Fruits oblong, 4-angular, 4-celled. Seeds c. 10 in each cell. See vol. 6, p. 243 . . . 3. *Xylonymus*
 5. Leaves decussate or opposite.
 9. Fruits 3–5-celled, loculicidally dehiscent, usually 3–5-valved, 3–∞-seeded.
 10. Fruits usually 4–5-angular or -lobed, 4–5-celled, occasionally 1–3-celled by abortion, each cell
 1- or 2-seeded. Seeds not winged, completely or incompletely enveloped by aril.
 11. When the fruit dehisces its axis splitting completely together with the valves, leaving no
 columella. Seeds usually 2 in each cell, attached to the top or base at the inner angle; raphe
 not branched. See vol. 6, p. 245 4. *Euonymus*
 11. When the fruit dehisces its axis splitting or not, but remains free from the valves. Seeds only
 1 in each cell, hanging from the top of the persistent axis; raphe branched usually at the
 morphological base of the seed, the bands ascending on the other side towards the hilum.
 See vol. 6, p. 254 5. *Glyptopetalum*
 10. Fruits 3-angular, -lobed, or ± winged, 3-celled, each cell usually 4–12-seeded. Seeds winged;
 no aril.
 12. Seeds attached at their base, wing at the apical end. See vol. 6, p. 258 . . . 6. *Kokoona*
 12. Seeds surrounded by a wing, attached laterally at the ± centre. See vol. 6, p. 262.
 7. *Lophopetalum*
 9. Fruits usually 1-celled, splitting on one side, usually 1-seeded. See vol. 6, p. 272. 8. *Microtropis*
 1. Fruits drupaceous or berry-like, indehiscent.
 13. Fruits with a lateral, persistent style. See vol. 6, p. 287 11. *Pleurostyliia*
 13. Fruits with a terminal persistent style or its scar, or with a depressed cavity at the upper end (*Siphonodon*).
 14. Leaves alternate; twigs zigzag. Fruit a small, globular berry. Seeds muricate-foveolate or tuber-
 culate. See vol. 6, p. 288 12. *Perrottetia*
 14. Leaves decussate, opposite, or spiral; twigs not zigzag. Fruit otherwise, always larger. Seeds
 smooth.
 15. Fruits obovoid-oblong or broad-ellipsoid, 1–2-seeded. See vol. 6, p. 284 . . . 10. *Cassine*
 15. Fruits subglobose, few- to many-seeded, sometimes 1-seeded in *Salacia*.
 16. Leaves decussate or opposite (except in *S. vimeria* and sometimes in *S. chinensis*). Stamens 2
 or 3, persistent or leaving distinct scars at the base of the fruit. Climbers, shrubs or rarely small
 trees 17. *Salacia*
 16. Leaves spiral. Stamens 5, caducous, and their scars usually not distinct at the base of the fruit.
 Tall trees 14. *Siphonodon*

13. BRASSIANTHA

A. C. SMITH, J. Arn. Arb. 22 (1941) 389.—Fig. 23.

Small tree. Stipules small, deltoid or ovate, caducous. *Leaves* alternate or spiral. *Inflorescences* axillary, paniculate, rarely cymose, few-flowered. *Flowers* 5-merous. *Calyx* lobes imbricate. *Petals* valvate. *Disk* extrastaminal, fleshy, annular-pulvinate or slightly cupular, composed of 5 pulvinate glands contiguous at the ends. *Stamens* 5, erect, inserted at the inner side of the notches of disk; anthers basifixed, dehiscing by a transverse slit, ± extrorse. *Pistil* hollow in the upper ⅓, apex truncate. *Ovary* 5-celled, short-conical, base confluent with the disk; style none; stigma inconspicuous. *Ovules* 2–5 in each cell, superposed or biseriate. *Fruit* capsular, subglobose, loculicidal, after dehiscing leaving a conspicuous, club-shaped columella. *Seeds* (1–)2–4(–5) in each cell, completely enveloped by an aril when young, leaving an opening on one side when ripe; albuminous; cotyledons flat, foliaceous.

Distr. Monotypic; *Malesia*: New Guinea.

Ecol. In lowland forests, sometimes found at 1800–1900 m.

Notes. A. C. SMITH & I. W. BAILEY (J. Arn. Arb. 22, 1941, 389–394) gave a full account of the mor-

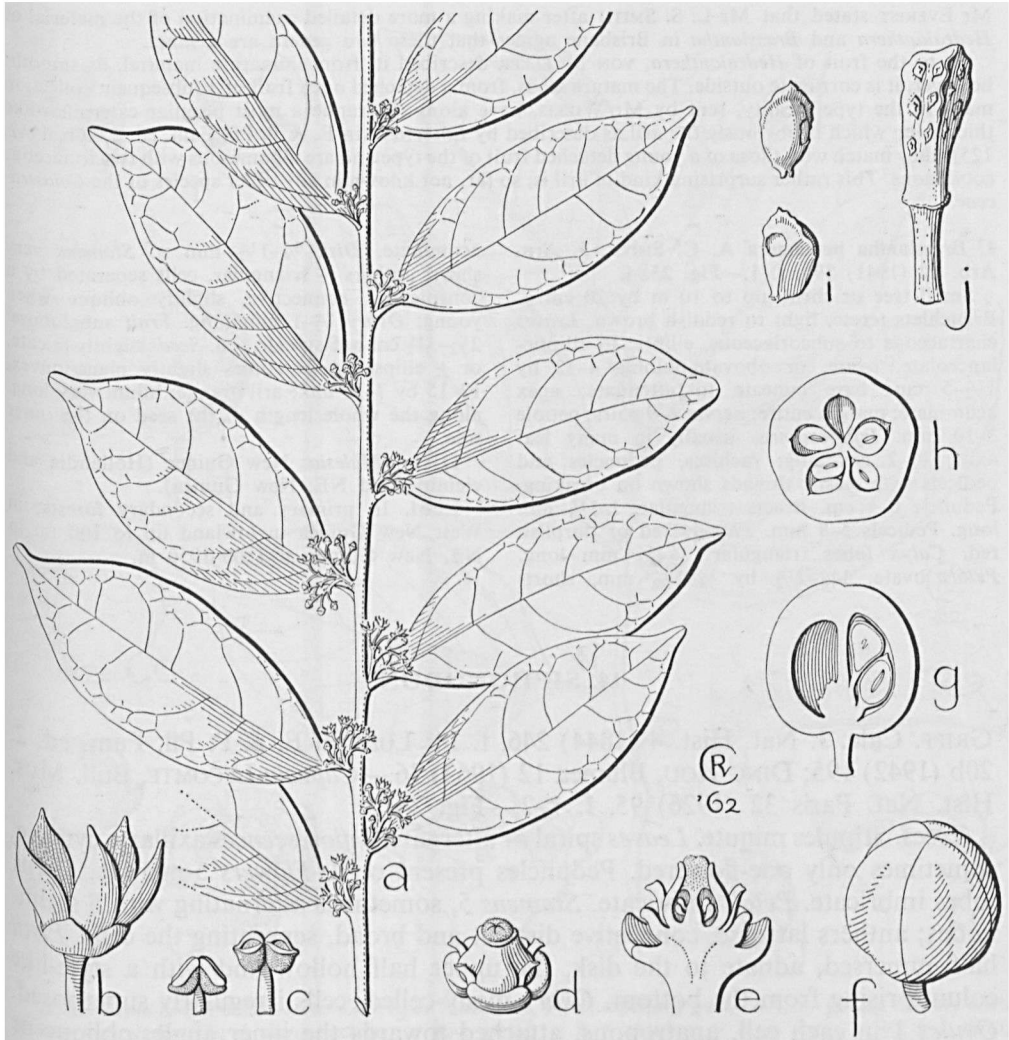


Fig. 23. *Brassiantha pentamera* A. C. SMITH. a. Habit, $\times \frac{2}{3}$, b. flower, $\times 8$, c. young and mature stamens, $\times 16$, d. flower, calyx lobes, petals, and anthers removed, $\times 16$, e. ditto, in section, $\times 16$, f. fruit, $\times \frac{2}{3}$, g-h. ditto, longitudinal and cross-sections, $\times \frac{2}{3}$, i. seeds, $\times \frac{2}{3}$, j. columella, $\times \frac{2}{3}$ (a-b, d-e BRASS 8954, c BRASS 8889, f-i BW 5513, j NGF 9587).

phological and anatomical characters and of the taxonomical affinities of this interesting genus. I can add that *Brassiantha* must be quite closely allied to the monotypic Australian genus *Hedraianthera* F. v. M. (Fragm. 5, 1865, 58) by the alternate or spirally arranged leaves, few-flowered, paniculate inflorescences, divaricate anther-cells, pistil hollow in the apical end, a 5-celled ovary of which each cell contains several ascendent, superposed ovules, the sessile stigma, and capsular fruit which has evidently a columella after dehiscing. The chief difference between these two genera is, as far as I know, found in the disk, the insertion of the stamens, and in the seed: in *Brassiantha* the disk is fleshy, composed of five pulvinate glands contiguous at the ends, the stamens are inserted at its inner side before the notches of the disk, and the seed is more or less completely enclosed by an aril; in *Hedraianthera* the disk is rather thin, annular, 5-notched, the stamens are inserted just beneath the outer margin of the disk, and the seed has a caterpillar-like aril attached on one side.

The type of *Hedraianthera porphyropetala* F. v. M. (Fragm. 5, 1865, 59; F. M. BAILEY, Queensl. Fl. 1, 1899, 256; Compr. Cat. Queensl. Pl. 1913, f. 77) was collected by J. DALLACHY (*s.n.*, type in MEL, isotypes in L & K) at Rockingham Bay, Queensland. I am very grateful to Messrs J. H. WILLIS and S. L. EVERIST, Australia, for kindly sending us the material of type and later collections together with valuable data of *Hedraianthera*. In a letter addressed to Dr VAN STEENIS, dated December 5th, 1963,

Mr EVERIST stated that Mr L. S. SMITH after making a more detailed examination of the material of *Hedraianthera* and *Brassiantha* in Brisbane agrees that these two genera are distinct.

As to the fruit of *Hedraianthera*, VON MUELLER described it, from immature material, as smooth; however, it is corrugate outside. The mature seeds, from a detached open fruit of a subsequent collection made in the type locality, sent by Mr WILLIS, have along the raphe a most peculiar caterpillar-like thickening which is obviously the aril as described by LOESNER (in E. & P. Pfl. Fam. ed. 2, 20b, 1942, 125); they match with those of a young detached fruit of the type and are albuminous with two foliaceous cotyledons. This rather surprising kind of aril is, so far, not known in any other species of the *Celastraceae*.

1. *Brassiantha pentamera* A. C. SMITH, J. Arn. Arb. 22 (1941) 390, t. 1.—Fig. 23a-j.

Small tree or shrub up to 10 m by 20 cm σ . Branchlets terete, light to reddish brown. Leaves chartaceous to subcoriaceous, elliptic to elliptic-lanceolate, ovate, or obovate-oblong, 4–12 by 1½–5 cm; base cuneate to attenuate; apex acuminate; margin entire; nerves 4–9 pairs; petiole 3–10 mm. Inflorescences usually in many leaf axils, ½–2 cm long; rachises, peduncles and pedicels with elastic threads shown on breaking. Peduncle 0–1 cm. Bracts triangular, 1–1¼ mm long. Pedicels 5–8 mm. Flowers red or purplish red. Calyx lobes triangular, ½–¾ mm long. Petals ovate, 1¾–2½ by ¾–1½ mm, short-

acuminate. Disk ¾–1½ mm σ . Stamens very short; anthers \pm triangular, cells separated by a conspicuous connective, slightly oblique when young. Ovary ½–1 mm long. Fruit subglobose, 2½–3½ cm σ , 5-sulcate, red. Seeds slightly falcate, or \pm ellipsoid, sometimes slightly planoconvex, 12–15 by 7–10 mm; aril orange; hilum very long, along the whole length of the seed on the outer side.

Distr. *Malesia*: New Guinea (Hollandia and vicinity, and NE. New Guinea).

Ecol. In primary and secondary forests, in West New Guinea in lowland up to 100 m, in NE. New Guinea at 1800–1950 m.

14. SIPHONODON

GRIFF. Calc. J. Nat. Hist. 4 (1844) 246, t. 14; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 195; DING HOU, Blumea 12 (1963) 36.—*Capusia* LECOMTE, Bull. Mus. Hist. Nat. Paris 32 (1926) 95, f. 1–2.—Fig. 24.

Trees. Stipules minute. Leaves spiral or alternate. Inflorescences axillary, cymose, sometimes only one-flowered. Peduncles present or 0. Flowers 5-merous. Calyx lobes imbricate. Petals imbricate. Stamens 5, sometimes alternating with 5 staminodes; anthers latrorse, connective distinct and broad, separating the cells. Pistil half-immersed, adnate to the disk, the upper half hollow and with a style-like column rising from the bottom. Ovary many-celled, cells irregularly superposed. Ovules 1 in each cell, anatropous, attached towards the inner angle, oblique or pendulous. Fruit drupaceous, hard, with numerous bony, 1-seeded stones. Seeds flat, albuminous; testa membranous; cotyledons flat, free.

Distr. Species c. 7, distributed from SE. Asia through Malesia to Australia. Fig. 26.
Ecol. In forests from lowland up to 1375 m.

KEY TO THE SPECIES

1. Central column of the pistil obtuse at the top. Calyx lobes smaller than petals. Stamens with filaments united at the lower half or at the base 1. *S. celastrineus*
1. Central column of the pistil peltate at the top and covering the tips of the anthers. Calyx lobes larger than the petals. Stamens usually free 2. *S. peltatus*

1. *Siphonodon celastrineus* GRIFF. Calc. J. Nat. Hist. 4 (1844) 247, t. 14; HOOK. f. Trans. Linn. Soc. 22 (1844) 133, t. 26; HASSK. Nat. Tijd. N.I. 10 (1856) 150; MIQ. Fl. Ind. Bat. 1, 2 (1859) 592 ('*Sophonodon*'); LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 629; KURZ, For. Fl. Burma 1 (1877) 254; PIERRE, Fl. For. Coch. 19 (1894) sub t. 312A, in

text, p.p.; KOORD. Minah. (1898) 396; MERR. Philip. J. Sc. 3 (1908) Bot. 239; KOORD. in Junghuhn Gedenboek (1910) 175; BACK. Schoolfl. (1911) 238; KOORD.-SCHUM. Syst. Verz. (1911) Fam. 158, 5; KOORD. Exk. Fl. Java 2 (1912) 526; MERR. Fl. Manila (1912) 302; PITARD, Fl. Gén. I.-C. 1 (1912) 906, f. 114, 9–11, p.p.; MERR. En-

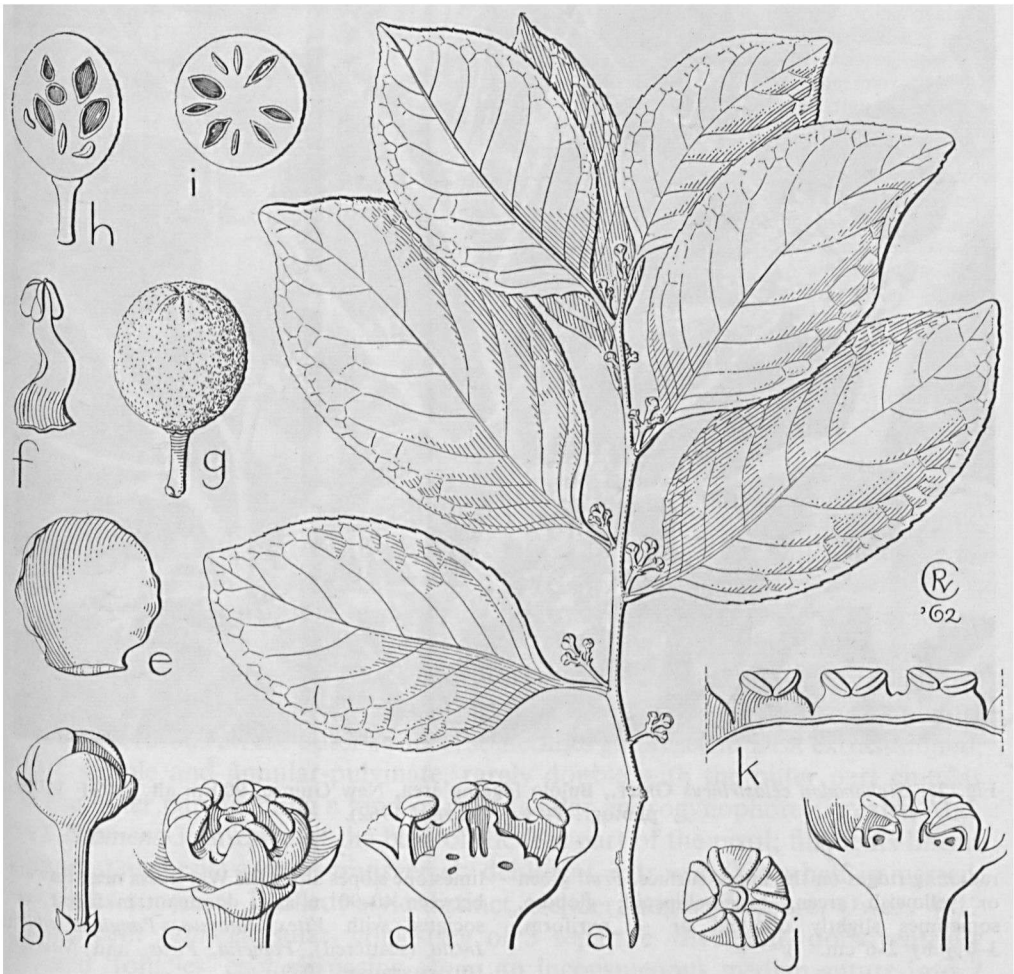


Fig. 24. *Siphonodon celastrineus* GRIFF. a. Habit, $\times \frac{2}{3}$, b. opening bud, $\times 4$, c. young flower, with petals removed, $\times 8$, d. ditto, section, $\times 8$, e. petal, $\times 8$, f. stamen, $\times 8$, g. fruit, $\times \frac{2}{3}$, h-i. ditto, longitudinal and cross-sections, $\times \frac{2}{3}$.—*S. peltatus* DING HOU. j. Flower seen from the top, calyx lobes and petals removed, $\times 8$, k. stamens, $\times 8$, l. flower, in section, $\times 8$ (a-f SAN 18729, g-i KOSTERMANS 5860, j-l CARR 13908).

Philip. 2 (1923) 485, incl. var. *acuminatissima* MERR. et var. *subglobosa* MERR.; CRAIB, Fl. Siam. En. 1 (1926) 293; REHDER, J. Arn. Arb. 14 (1933) 63; LOES, in E. & P. Pfl. Fam. ed. 2, 20b (1942) 196; TARDIEU, Suppl. Fl. Gén. I.-C. (1948) 824, p.p.—*S. pyriformis* MERR. Philip. J. Sc. 3 (1908) Bot. 240; En. Philip. 2 (1923) 485; LOES, in E. & P. Pfl. Fam. ed. 2, 20b (1942) 196.—*Xanthophyllum subglobosum* ELM. Leaf. Philip. Bot. 5 (1913) 1676, incl. var. *longifolium* ELM.—*S. pyriformis* var. *parvifolium* MERR. Philip. J. Sc. 27 (1925) 33.—Fig. 24a-i, 25.

Tree up to 35 m by 90 cm ϕ , very rarely with buttresses up to 1-1½ m high (fide KOSTERMANS 13472 & 13487). Leaves chartaceous to subcoriaceous, sometimes coriaceous, olivaceous or

grey-greenish when dry, ovate-oblong or elliptic-oblong to lanceolate, 4-23 by 3½-9½ cm; base cuneate or round; apex acute to acuminate; margin usually crenate, sometimes remotely or obscurely crenulate, rarely entire; nerves 6-10 pairs; petiole ½-2 cm. Inflorescences cymose or umbelliform, (1-)few(-∞)-flowered. Peduncle ½-1½ cm. Pedicels 5-11 mm. Flowers cream-white; calyx and petals sometimes containing reddish brown cells or spots in the tissue. Calyx lobes reniform or subrotund, 1-2 mm long. Petals ovate, 2¼-3½ by 1¾-2½ mm, obtuse. Stamens c. 1 mm; filaments flat, united at the lower ½ or near the base; anthers usually perpendicularly bent inward in bud. Pistillar body usually \pm semi-globose, sometimes \pm short conical, occasionally with 5

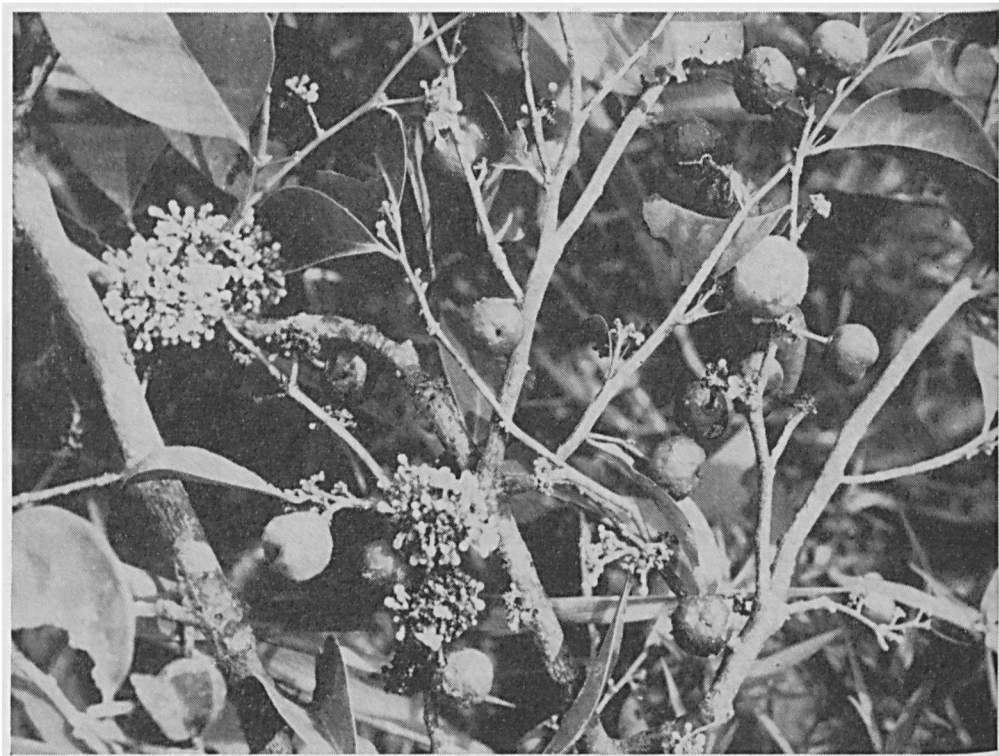


Fig. 25. *Siphonodon celastrineus* GRIFF., Bulolo logging area, New Guinea, 900 m alt. (NGF 15080; photogr. P. VAN ROYEN, 1962).

radiating ridges on the upper surface. Fruit green or yellowish green, broad-ellipsoid, globose, sometimes slightly obovoid or \pm pyriform, 3–6½ by 2–6 cm.

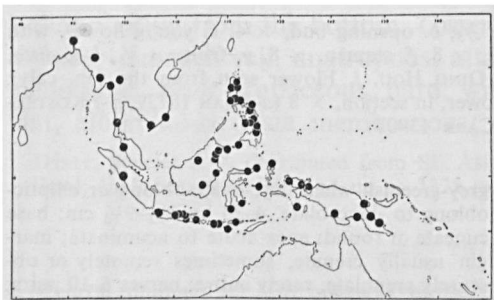


Fig. 26. Distribution of *Siphonodon celastrineus* GRIFF.

Distr. Widely distributed but scattered in India, Burma, Thailand, Indo-China, and throughout Malesia. Fig. 26.

Ecol. In forests, from the lowland up to 1375 m; found on limestone in E. Kutai and Java, also collected on level clay soil in W. New Guinea.

In Sula Sanana I. (West Moluccas) it occurs on

limestone slopes along the Wai Bussa near Fowata between 40–90 m as a dominant in forest, associated with *Vitex cofassus*, *Pangium edule*, *Intsia* (scattered), *Pometia*, *Ficus*, and *Nauclea* (BLOEMBERGEN, 1939).

Vern. Java: *danoklot kĕpu*, *karangasĕm*, *tĕdjo*, *wanitan*, *wĕlaham*, J, *ki putri*, *ki singuguh kaju*, S, *langghadeung*, Md; Lesser Sunda Is., Flores: *oĕkapa*, Ende I.; Borneo: *kalantaid*, North Borneo, *tulang*, Dajak; Celebes: *indohe hapoetĕ*, Muna, *kalawalan*, Menado, *kapupukina*, Muna; Moluccas: *tua*, Sula Is.; New Guinea: *aruai*, Japen, *mobiek*, *pieh*, Kĕbar lang., *uwoga*, Orokaiva lang.

Notes. The shape and size of leaves and fruits are very variable, even in the same collection. In the herbarium fruits are, in most cases, detached; some very large fruits show holes and are deformed by insects. Only few flowering specimens available; it seems that the flowers fall off easily after drying. It is desirable to have them in different stages of development, preserved in liquid for further study of their variability.

There are three specimens cited in the original description of *S. pyriformis* MERR., i.e. ELMER 5985 (lectotype, US), FB 5141 (not seen), and BS 2875 (US). According to MERRILL, it would differ from *S. celastrineus* by its pyriform fruit. However,

I have seen pyriform fruits in several specimens of *S. celastrineus*, e.g. KOORDERS 1122 β (BO) from Java. My hesitation to reduce *S. pyriformis* to *S. celastrineus* was overcome by the examination of two flowers on ELMER 5985 which showed that the floral characters are exactly similar.

4. *Siphonodon peltatus* DING HOU, Blumea 12 (1963) 38.—Fig. 24j-l.

Tree c. 27 m. *Leaves* chartaceous, olivaceous or light brown above, light brown beneath, oblong-ovate, 11–14½ by 5–6½ cm; base round or acute; apex (all damaged) probable acute; margin entire; nerves 6–8 pairs; petiole ½–1 cm. *Inflorescences* condensed. Peduncle very short or obscure, sometimes up to c. 5 mm. Pedicels c. 2 mm. *Flowers*

cream-coloured. *Calyx* lobes very broad-ovate or suborbicular, c. 4 mm \emptyset , \pm entire, with 3 faint, slightly branched veins. *Petals* suborbicular, c. 3 mm \emptyset , rather fleshy, the marginal part thin and transparent (when dry), wavy. *Stamens* \pm free, or some of them slightly united at the base; filaments flat, broad-oblong, c. 1 mm long; anthers deltoid, perpendicularly bent inward, the tips under the peltate apex of the central column. *Pistil* flat, round, slightly concave near the center, the central column peltate at the apex. *Ovules* arranged on one level (?). *Fruit* unknown.

Distr. *Malesia*: SE. New Guinea (Lala River), once collected.

Ecol. In forest at c. 1650 m.

15. LOESENERIELLA

A. C. SMITH, Am. J. Bot. 28 (1941) 438; WILCZEK, Fl. Congo Belge 9 (1960) 148; HALLÉ, Mém. Inst. Fr. Afr. Noire n. 64 (1962) 103.—*Hippocratea auct.*, p.p., *typ. excl.*—Fig. 28.

Liana, or scandent rarely erect shrubs. Stipules interpetiolar or sometimes \pm intrapetiolar. *Leaves* decussate. *Inflorescences* axillary, dichotomously cymose. *Calyx* deeply 5-lobed. *Petals* 5, usually rather thick, subcoriaceous to coriaceous when dry, subvalvate or the margins slightly overlapping, usually acuminate, entire, puberulous on the outer surface, sometimes glabrescent. *Disk* extrastaminal, fleshy, simple and annular-pulvinate, rarely double with the outer part cupular and the inner part forming a kind of receptacular androgynophore (in extra-Mal. spp.). *Stamens* 3, inserted at the base of the free part of the pistil; filaments linear, reflexed at anthesis; anthers transversely dehiscent, extrorse. *Ovary* half-immersed, sometimes superior, 3-celled; style distinct, slender; stigma obscure. *Ovules* 4–12 in each cell. *Fruit* capsular, consisting of 3 separate, divergent, dorsoventrally flattened ‘follicles’ each dehiscing along an inconspicuous median suture into 2 navicular valves. *Seeds* usually with a basal wing, the wing usually membranous, with 1 submedian (raphe) and 1 marginal ‘nerve’; endosperm 0; cotyledons completely, sometimes only partly united.

Distr. About 26 spp., in tropical Africa, Asia and Malesia, southeastward as far as the New Hebrides; in Malesia 4 spp.

Ecol. In forests, in Malesia from the lowland up to c. 850 m.

KEY TO THE SPECIES

1. The upper ½–⅔ of the petals on the inner surface and disk at the top distinctly pilose.
2. Pericarp usually thin-leathery, after dehiscence the sutural margins slightly reflexed. Seed proper very narrowly oblong-ellipsoid, 3–4½ by ½–¾ cm; most part of the wing unilateral, 3–5½ by ⅓–¾ cm, rather thick and not transparent when dry, the submedian and marginal nerves inconspicuous.
 1. *L. macrantha*
2. Pericarp rather woody, after dehiscence the sutural margins not reflexed. Seed proper very broad-ellipsoid, 1–1⅓ by ¾ cm; wing \pm at one end of the seed, c. 3 by 1½ cm, membranous and \pm transparent, the submedian and marginal nerves conspicuous.
 2. *L. sogerensis*
3. Leaves usually elliptic-oblong or -lanceolate; apex acuminate. Anthers and filaments glabrous.
 3. *L. cumingii*
3. Leaves broad-elliptic to rounded; apex obtuse or rounded. Inner surface of both the filaments at the apical part and the base of the anthers papillose or puberulous

1. Inner surface of the petals and disk glabrous. (Pericarp thin-leathery, after dehiscence the sutural margins slightly spreading. Seed proper elliptic-membranous, ovate to ovate-oblong, or elliptic, 2-4 by 1¼-2 cm, with conspicuous submedian and marginal nerves.) 4. *L. pauciflora*

1. *Loeseneriella macrantha* (KORTH.) A. C. SMITH, Am. J. Bot. 28 (1941) 439.—*Hippocratea macrantha* KORTH. Kruidk. (1842) 187, t. 39; MIQ. Fl. Ind. Bat. 1, 2 (1859) 599; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 153; ROLFE, Kew Bull. (1918) 47, *excl. syn.*; RIDL. Fl. Mal. Pen. 1 (1922) 455, *excl. syn.*; MERR. En. Philip. 2 (1923) 486; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 213; AMSHOFF, Blumea 5 (1945) 486.—*Hippocratea hasseltiana* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 154; BACK. Schoolfl. (1911) 236.—*Hippocratea trilobulata* RIDL. Kew Bull. (1938) 241.

Liana. Stipules ± intrapetiolar, lanceolate, ⅔-1 mm long, the scars united in a ring on the older branchlets. Leaves chartaceous to thin-coriaceous, sometimes shining above, elliptic to elliptic-lanceolate, ovate-oblong to lanceolate, sometimes broad-elliptic or -ovate, rarely obovate, (5½)-10-20½ by (3)-5-8 cm; base obtuse, cuneate; apex acute, short-acuminate to acuminate; margin subentire rarely slightly crenulate; nerves 6-8 pairs; petiole ½-1 cm. Inflorescences sometimes ramiflorous, 1-6 cm long, up to 5 times branched, usually glabrous rarely sparsely light yellowish puberulous; sometimes flowers on a young, axillary short-shoot with bracts or reduced leaves and such shoot resembling a thyriform inflorescence. Peduncle ½-3 cm. Bracts deltoid, c. 1½ mm long. Pedicels 5-7 mm, the central one usually longer, up to 10 mm, sometimes with elastic threads shown on breaking. Flowers green or yellowish green, rarely yellowish. Calyx lobes deltoid, 1-1¼ mm long, puberulous outside. Petals ovate-oblong, 4½-6½ by 1¾-2½ mm, densely pilose (uniseriate hairs) on the upper half or ⅔ inside and on the margins. Disk annular-pulvinate, 1½-3 mm ø, ½-2½ mm high, the basal part before the calyx lobes slightly extended obliquely outward and downward, pilose (uniseriate hairs) at the top, very rarely glabrous when young. Stamens c. 2 mm. Pistil 1-2 mm emerging from the disk. Ovules 4-6 in each cell. Follicles ovate- or elliptic-oblong, obtuse at the apex, 5-8 by 2-3½ cm. Seeds (incl. wing) obovate-oblong, 3½-6 by ½-1 cm.

Distr. From New Ireland (W. coast), the Solomon Is. (New Georgia group), and the New Hebrides (Santa Cruz group) to Ceylon; in *Malesia*: Sumatra (Indragiri, Palembang), Riouw (P. Durian), Malay Peninsula (Perak, Selangor, Pahang, Johore, Singapore), Banka, Central Java (Kediri and Kinderzee), Borneo (North Borneo, Banjarmasin, and Sarawak), SE. and Central Celebes (Kendari and Latooë), Moluccas (Sula Is.) and New Guinea (throughout but scattered). Fig. 27.

Ecol. In lowland forests up to 400 m, also found in river flood plain, riverside, and mangrove swamp forests.

Galls. Insects galls on leaves (BRASS 13920).

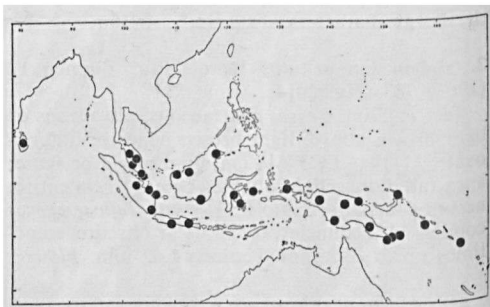


Fig. 27. Distribution of *Loeseneriella macrantha* (KORTH.) A. C. SMITH

Vern. Malay Peninsula: *akar bintang*, *akar china*, *akar mata pèlandok*, *gambir ayèr*, M; North Borneo: *bohan kutongan*, Bajao Sporna.

2. *Loeseneriella sogerensis* (BAK. f.) A. C. SMITH, Am. J. Bot. 28 (1941) 439.—*Hippocratea sogerensis* BAK. f. J. Bot. 61 (1923) Suppl. 10.

Liana. Stipules triangular or deltoid, c. 1 mm long, ± intrapetiolar, the scars forming ± a ring on the older branches. Leaves subcoriaceous to coriaceous, elliptic, elliptic-oblong or -lanceolate, rarely ovate-oblong, 5½-11 by 2½-4½ cm; base cuneate; apex acuminate; margin crenulate; nerves 5-9 pairs; petiole ½-1 cm. Inflorescences 3 or 4 times branched, 1½-2½ cm long, densely puberulous, ferruginous. Peduncle 1-2 cm. Bracts triangular, 1-1¼ mm long. Pedicels 1-3 mm. Flowers yellowish. Calyx lobes semiorbicular or triangular, ¾-1 mm long, puberulous on the outside. Petals ovate-oblong to lanceolate, 4-5 by 1½-1¾ mm, pilose on the upper ½-⅓ inside and on the margins. Disk annular-pulvinate, 1¼-1½ mm high, 1½-2 mm ø, short-pilose at the top, in the basal part before the calyx lobes slightly extended outward and downward. Stamens 1½-2 mm. Pistil 1-1½ mm emerging from the disk. Ovules 6-10 in each cell. Follicles obovate, c. 4½ by 2½ cm, pericarp woody. Seeds (incl. wing) ovate-oblong or lanceolate, 3¼-4 by 1½ cm. Distr. *Malesia*: New Guinea (Sogere, Kanosia, Lower Fly R., and Milne Bay Distr.).

Ecol. In lowland forests and along mangrove swamp.

Notes. The type of *L. sogerensis* is FORBES 440 (BM, L); its flowers are quite similar to those of *L. macrantha*. BAKER stated it to differ from the latter by the shape of the leaves and the colour of the flowers. Besides, the leaves are usually smaller and distinctly crenulate, the inflorescences are densely rusty puberulous, the pericarp rather woody, and the seeds possess a prominent membranous wing attached at one end.

The number of ovules per cell is quite variable in this species and is sometimes found to vary in

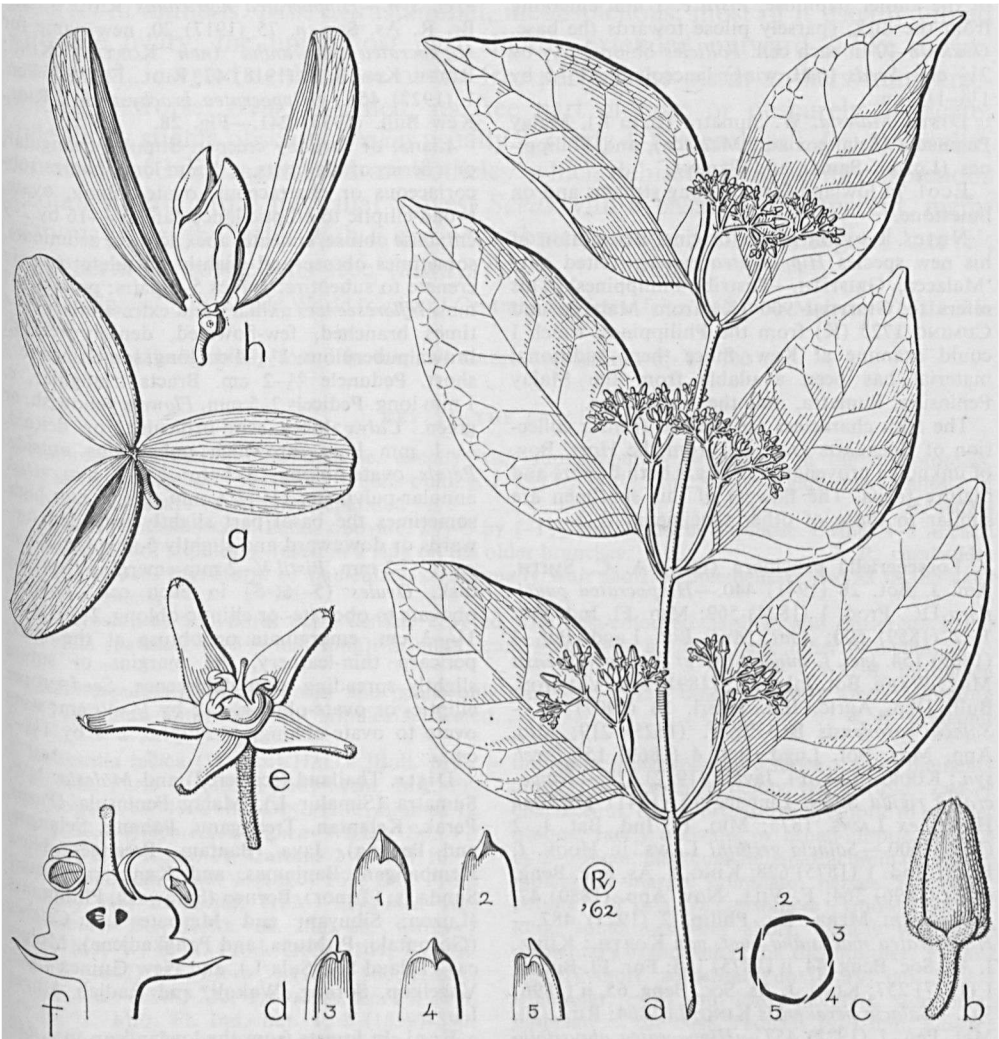


Fig. 28. *Loeseneriella pauciflora* (DC.) A. C. SMITH. a. Habit, $\times \frac{2}{3}$, b. bud, $\times 4$, c. diagram showing arrangement of petals, d. tips of petals, $\times 8$, e. open flower, $\times 4$, f. flower in section, petals removed, $\times 12$, g. fruit, $\times \frac{2}{3}$, h. dehiscent follicle, immature, in centre adhering seeds with basal wing, $\times \frac{2}{3}$ (a-f, h SPANOGHE s.n., g SOEGENG REKSODIHARDJO 146).

one specimen, or even in one flower.

3. *Loeseneriella cumingii* (LAWS.) DING HOU, Blumea 12 (1963) 32.—*Hippocratea cumingii* LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 624; KING, J. As. Soc. Beng. 65, ii (1896) 358; F.-VILL. Nov. App. (1880) 47; VIDAL, Phan. Cuming. (1885) 103.—*Hippocratea macrantha* (non KORTH.) ROLFE, Kew Bull. (1918) 47; MERR. En. Philip. 2 (1923) 486, pro CUMING 1725.—*Hippocratea trichopetala* MERR. Philip. J. Sc. 13 (1918) Bot. 21; En. Philip. 2 (1923) 486.

Scandent shrub. Stipules triangular or lanceolate, $\frac{1}{2}$ –1 mm long, spacious. Leaves coriaceous, broad-elliptic or rotund, sometimes ovate, 3–11

by $2\frac{1}{2}$ – $7\frac{3}{4}$ cm; base rounded, obtuse, rarely cuneate; apex obtuse, rounded, rarely emarginate; margin crenulate; nerves 5–8 pairs; petiole 3–4 mm. Inflorescences 2–4 times branched, $\frac{1}{2}$ –4 cm long, light brownish puberulous, sometimes glabrescent especially on the peduncles. Peduncle $1\frac{1}{2}$ – $2\frac{1}{2}$ cm. Bracts deltoid, c. 1 mm long. Pedicels $3\frac{1}{2}$ – $4\frac{1}{2}$ mm. Flowers greenish yellow, or green. Calyx lobes triangular, c. $\frac{1}{2}$ mm long, puberulous outside. Petals lanceolate, $4\frac{1}{2}$ –5 by $1\frac{1}{3}$ – $1\frac{1}{2}$ mm, pilose on the upper $\frac{1}{2}$ – $\frac{1}{3}$ inside and on the margins. Disk annular-pulvinate, c. 1 mm high, $1\frac{1}{2}$ –2 mm ϕ , pilose at the apex, slightly 5-notched at the base. Stamens c. 2 mm, the inner surfaces of both the filament at the apical part and the base

of the anther papillose. *Pistil* c. 1 mm emerging from the disk, sparsely pilose towards the base. *Ovules* 8–10 in each cell. *Follicles* oblong, 6½ by 2½ cm. *Seeds* (incl. wing) lanceolate, 4½–5 by 1½–1½ cm.

Distr. *Malesia*: W. Sumatra (Batu I.), Malay Peninsula (Selangor and Malacca), and Philippines (Luzon, Samar and Panay).

Ecol. In lowland forests along streams and on limestone.

Notes. LAWSON in the original description of his new species *Hippocratea cumingii* cited only 'Malacca, GRIFFITH.—Distrib. Philippines'. This refers to GRIFFITH 906 (K) from Malacca and CUMING 1725 (K) from the Philippines, which I could examine at Kew. Since then, additional material has been available from the Malay Peninsula, Sumatra, and the Philippines.

The fruit characters are derived from a collection of BOERLAGE (*s.n.*, L), from the Hort. Bog. of unknown provenance; it bears both flowers and mature fruits. The flowers of this specimen are similar to those of other specimens.

- ✓ *X. Loeseneriella pauciflora* (DC.) A. C. SMITH, *Am. J. Bot.* 28 (1941) 440.—*Hippocratea pauciflora* DC. *Prod.* 1 (1824) 569; *Miq. Fl. Ind. Bat.* 1, 2 (1859) 600; *Ann. Mus. Bot. Lugd.-Bat.* 4 (1869) 154. *incl. f. minor* MIQ. *et f. novoguineensis* MIQ.; *WARB. Bot. Jahrb.* 13 (1891) 366; VALETON, *Bull. Dép. Agric. Ind. Néerl.* 10 (1907) 30.—*Salacia javanensis* BL. *Bijdr.* (1825) 219; *Miq. Ann. Mus. Bot. Lugd.-Bat.* 4 (1869) 151, *excl. syn.*; KOORD. *Exk. Fl. Java* 2 (1912) 527.—*Hippocratea rigida* SPAN. *Linnaea* 15 (1841) 178, *non HAMP. ex LAWS.* 1875; *Miq. Fl. Ind. Bat.* 1, 2 (1859) 600.—*Salacia griffithii* LAWS. in *Hook. f. Fl. Br. Ind.* 1 (1875) 628; KING, *J. As. Soc. Beng.* 65, ii (1896) 364; F.-VILL. *Nov. App.* (1880) 47, *pro nomen*; MERR. *En. Philip.* 2 (1923) 487.—*Hippocratea macrantha* *auct. non KORTH.*: KURZ, *J. As. Soc. Beng.* 44, ii (1875) 164; *For. Fl. Burma* 1 (1877) 257; KING, *J. As. Soc. Beng.* 65, ii (1896) 357.—*Salacia perakensis* KING, *l.c.* 364; RIDL. *Fl. Mal. Pen.* 1 (1922) 457.—*Hippocratea obtusifolia* (*non ROXB.*) KOORD.—SCHUM. *Syst. Verz.* (1911) *Fam.* 159, 2; KOORD. *Exk. Fl. Java* 2 (1912) 527; MERR. *En. Philip.* 2 (1923) 486; HOLTHUIS & LAM, *Blumea* 5 (1945) 205; AMSHOFF, *l.c.* 518.—*Hippocratea lawsonii* ELM. *Leaf. Philip. Bot.* 7 (1915) 2688; MERR. *En. Philip.* 2 (1923) 486,

excl. syn.—*Hippocratea nigricaulis* RIDL. *J. Str. Br. R. As. Soc. n.* 75 (1917) 20, new name for *Hippocratea macrantha* (*non KORTH.*) KING; ROLFE, *Kew Bull.* (1918) 47; RIDL. *Fl. Mal. Pen.* 1 (1922) 455.—*Hippocratea brachystachys* RIDL. *Kew Bull.* (1938) 241.—Fig. 28.

Liana, or shrubby creeper. *Stipules* triangular, or a series of filaments, c. 1 mm long. *Leaves* subcoriaceous or chartaceous, ovate-oblong, ovate, broad-elliptic to elliptic-lanceolate, 3½–16 by 2–9 cm; base obtuse, cuneate; apex acute to acuminate, sometimes obtuse and slightly apiculate; margin crenate to subentire; nerves 5–8 pairs; petiole 3–7 mm. *Inflorescences* axillary and extra-axillary, 1–4 times branched, few-flowered, densely reddish brown puberulous, 1½–4 cm long, sometimes very short. *Peduncle* ½–2 cm. *Bracts* triangular, c. 1 mm long. *Pedicels* 2–5 mm. *Flowers* yellowish, or green. *Calyx* lobes semi-orbicular, or deltoid, ½–1 mm long, brownish puberulous outside. *Petals* ovate-oblong, 3–5 by 1½–2 mm. *Disk* annular-pulvinate, 1½–2½ mm ø, c. 1 mm high, sometimes the basal part slightly extended outwards or downward and slightly 5-angular. *Stamens* 1½–2 mm. *Pistil* ¾–2 mm emerging from the disk. *Ovules* (5–)6(–8) in each cell. *Follicles* obovate to obovate- or elliptic-oblong, 2½–7¾ by 1½–3 cm, emarginate or obtuse at the apex; pericarp thin-leathery, the margins of suture slightly spreading after dehiscence. *Seed* proper elliptic- or ovate-oblong, 1–2 by ½–¾ cm; wing ovate to ovate-oblong, or elliptic, 2–4 by 1¼–2 cm.

Distr. Thailand (scattered) and *Malesia*: NW. Sumatra (Simalur I.), Malay Peninsula (Perlis, Perak, Kelantan, Trengganu, Pahang, Selangor, and Penang), Java (Bantam, Preanger, Lusa Kembangan, Banjumas, and Kangean), Lesser Sunda Is. (Timor), Borneo (Sarawak), Philippines (Luzon, Sibuyan, and Masbate I.), Celebes (Gorontalo, P. Muna, and Pangkadjene), Moluccas (Talaud and Sula I.), and New Guinea (Aru, Vogelkop, Sorong, Wakoli, and Radjah Ampat I.).

Ecol. In forests from the lowland up to c. 840 m, sometimes found on limestone rocks.

Vern. Sumatra: *olor balijan dotan*, Simalur; Malay Peninsula: *akar china*; Borneo: *bohan kutongan*, Bajau E.C.; Moluccas: *poenclángi*, Nenusu.

16. REISSANTIA

HALLÉ, *Bull. Mus. Hist. Nat. Paris* 30 (1958) 466; *Mém. Inst. Fr. Afr. Noire n.* 64 (1962) 84.—*Hippocratea auct.*, *p.p.*, *excl. typ.*—Fig. 29.

Lianas, scandent or sometimes erect shrubs, rarely small trees. *Leaves* decussate very rarely associated with some subopposite ones. *Inflorescences* axillary, sometimes crowded on short shoots, dichotomously cymose, or rarely paniculate, usually with supplementary branchlets in the dichotomies or in the axils of branchlets. *Flowers* small. *Calyx* lobes 5, imbricate. *Petals* 5, imbricate, erect or

suberect at anthesis. *Disk* extrastaminal, inconspicuous, most of it usually united with the ovary, the uppermost part slightly extended outward \pm like a rim. *Stamens* 3, inserted at the base of the free part of the pistil; anthers transverse-oblong, extrorse. *Ovary* 3-celled, its free part globose or obscurely 3-sulcate; style short; stigma obscure. *Ovules* usually 2, rarely 4-8 in each cell. *Fruit* capsular, consisting of 3 divergent, separate 'follicles' which dehisce along an inconspicuous median suture into 2 navicular valves. *Seeds* with a basal, \pm transparent, membranous wing, the latter with a distinct submedian and a thick marginal 'nerve'; endosperm 0; cotyledons free (always?).

Distr. Species 7, in the Old World tropics of Central and West Africa, and Indo-Malesia; 4 of them in Malesia.

Ecol. In Malesia chiefly found in lowland forests, sometimes up to 700 m.

KEY TO THE SPECIES

- 1. Inflorescences dichotomous-cymose, usually with supplementary branchlets in the dichotomies.
- 2. Flowers pedicelled ($\frac{1}{2}$ -1 mm). Petals oblong, 1-1½ by ¼-½ mm. Stamens glabrous. Ovules 2 in each cell. Scars of stipules separated 1. *R. indica*
- 2. Flowers almost sessile. Petals obovate, 2½-3 by 1-1½ mm. Stamens papillose. Ovules 4-8 in each cell. Scars of stipules \pm fused in a ring on the older branches. 2. *R. cassinoides*
- 1. Inflorescences thyriform or paniculate, occasionally with short, supplementary shoots in the axils of branchlets.
- 3. Inflorescences and floral parts densely covered with rust-coloured papillae and uniseriate hairs. Petals spatulate (3-3½ mm long). Stipular scars \pm fused in a ring on the older branches. 3. *R. ferruginea*
- 3. Inflorescences glabrous. Calyx and petals only papillose. Petals oblanceolate or obovate-oblong (2½-3 mm long). Scars of stipules separated 4. *R. grahamii*

1. *Reissantia indica* (WILLD.) HALLÉ [Bull. Mus. Hist. Nat. Paris 30 (1958) 466] Mém. Inst. Fr. Afr. Noire n. 64 (1962) 85; DING HOU, *Blumea* 12 (1963) 33.—*Hippocratea indica* WILLD. Sp. Pl. 1 (1797) 193; ROXB. Pl. Corom. 2 (1798) 16, t. 130; Fl. Ind. ed. Wall. 1 (1820) 169; DC. Prod. 1 (1824) 568; BL. Bijdr. (1825) 219, *incl. var. evonymoides* BL.; ROXB. Fl. Ind. ed. Carey 1 (1832) 165; W. & A. Prod. (1834) 104; KORTH. Kruidk. (1842) 185; Flora 31 (1848) 580; HASSK. Pl. Jav. Rar. (1848) 230; THWAITES, En. Pl. Zeyl. (1858) 52; MIQ. Fl. Ind. Bat. 1, 2 (1859) 599; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 152, *incl. f. timorensis* MIQ.; LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 624; KURZ, J. As. Soc. Beng. 44, ii (1875) 164; For. Fl. Burma 1 (1877) 256; VIDAL, Rev. Pl. Vasc. Filip. (1886) 89; PIERRE, For. Fl. Coch. 19 (1894) t. 302A; KING, J. As. Soc. Beng. 65, ii (1896) 359; MERR. Philip. J. Sc. 1 (1906) Suppl. 86; KOORD.-SCHUM. Syst. Verz. (1911) Fam. 159, 1; BACK. Schooffl. (1911) 236; KOORD. Exk. Fl. Java 2 (1912) 526; PITARD, Fl. Gén. I.-C. 1 (1912) 898, *p.p.*; MERR. Sp. Blanc. (1918) 236; RIDL. Fl. Mal. Pen. 1 (1922) 455; MERR. En. Philip. 2 (1923) 485; RENDLE, J. Bot. 62 (1924) Suppl. 23; MERR. & CHUN, Sunyatsenia 5 (1940) 112.—*Hippocratea volubilis* (non LINNÉ) BLANCO, Fl. Filip. (1837) 27; ed. 2 (1845) 20; ed. 3, 1 (1877) 37.—*Fristimera indica* A. C. SMITH, Am. J. Bot. 28 (1941) 440; J. Arn. Arb. 26 (1945) 175; TARDIEU, Suppl. Fl. Gén. I.-C. 1 (1948) 817.
Liana, sometimes a small shrub or tree. Stipule triangular, c. ½ mm long, 3-lobed, lacinate or

fimbriate, sometimes just a series of short filaments along the branchlet below the petiole. *Leaves* chartaceous, ovate, broad-ovate, elliptic to elliptic-oblong, rarely obovate, or broad-elliptic, 3½-13 by 2-6½ cm; base cuneate; apex acuminate, short-apiculate; margin crenulate; nerves 5-8 pairs; petiole 5-8 mm. *Inflorescences* cymose, 2-6 cm long, sometimes very short, usually with supplementary branchlets in the dichotomies. Peduncle very short, sometimes up to 3½ cm. Bracts triangular, c. ½ mm long, lacinate, sometimes fimbriate at the base. Pedicels ½-1 mm. *Flowers* light yellow or greenish yellow, small. *Calyx* thin, papillose on both surfaces, almost divided to the base, lobes triangular, ½-¾ mm long, slightly erose. *Petals* \pm oblong, 1-1½ by ¼-½ mm, papillose on both surfaces. *Disk* with the free part opposite the stamens slightly thicker. *Stamens* ½-1 mm. Free part of *pistil* flask-like, c. ½ mm long. *Ovules* 2 in each cell, inserted at the base. *Follicles* elliptic- or obovate-oblong, 3-5½ by 1¼-1½ cm; pericarp leathery, valves c. ½ mm thick, the sutural margins slightly spreading after dehiscence. *Seeds* (*incl. wing*) 2¾-3½ by 1 cm, seed proper broad-elliptic, or elliptic, 1-1½ by ½-¾ cm.

Distr. Widely distributed but scattered in India, Ceylon, Burma, Thailand, Indochina, S. China (Yunnan and Hainan), and Malesia: Sumatra (Taliabu and Mangoli), Malay Peninsula (Perlis, Pahang, Penang, and Singapore), Java (throughout), Lesser Sunda Is. (Lombok, Sumbawa and Timor), Borneo (Bundu and Tarat),

Philippines (Luzon, Lubang I., San Mateo, and Mindanao), and Celebes (Gorontalo, Kendari, Pangkadjene, Bonthain, and Lelewao).

Ecol. In rain- and monsoon-forests, on ridges, in secondary forests, sometimes found on limestone, from the lowland up to 650 m.

Uses. According to HEYNE (Nutt. Pl. 1927, 985) the sap of the stem is drunk for treating fever. The leaves, slightly scorched and seasoned with sambal, are given to eat to women in child-bed, and compounded with *adas-pulasari* (*Alyxia sp.*) are used for poultice in treating rheumatism.

Vern. Java: (*areu*) *mangèndèr*, *hòèh tùtung*, *ojot tju-tju-rian*, S; Borneo: *saripangil*, *tutok otik*, Dusun.

Notes. *Hippocratea volubilis* described by BLANCO was not a new species as MERRILL erroneously concluded, but merely the identification of a Philippine plant as *Hippocratea volubilis*, as indicated by the reference 'Lin. *ibid.*' at the end of BLANCO's description (1845). MERRILL referred this record with doubt to *Hippocratea indica*, and though the inflorescences are described as racemose and the fruit as obliquely cordate I agree this is probably the best disposition of it.

Under the vernacular names of *Alor sta* (SF 10416) and *Serapat akar* (SF 13405), BURKILL & HANIFF (Gard. Bull. S.S. 6, 1930, 184) identified these two collections as *Hippocratea ?indica* and derived the information of medicinal uses. I examined the collection SF 13405 (SING) which is a sterile young shoot and may belong to *Rubiaceae*. The identity of the other specimen, SF 10416, which has not yet been found, is still doubtful.

2. *Reissantia cassinoides* (DC.) DING HOU, Blumea 12 (1963) 33.—*Hippocratea? cassinoides* DC. Prod. 1 (1824) 569; MIQ. Fl. Ind. Bat. 1, 2 (1859) 600.—*Hippocratea indica* (non WILLD.) SPAN. Linnaea 15 (1841) 179.—*Hippocratea glaga* KORTH. Kruidk. (1842) 186, t. 40; Flora 31 (1848) 580; WALP. Ann. 2 (1850–51) 193; MIQ. Fl. Ind. Bat. 1, 2 (1859) 599; Ann. Mus. Bot. Lugd.–Bat. 4 (1869) 153; BACK. Schoolf. (1911) 236.—*Hippocratea beccarii* TUYN, Blumea 10 (1960) 139, f. 3.

Liana. Stipules \pm intrapetiolar, triangular, 3-lobed, or lacinate, c. $\frac{1}{2}$ mm long. Branchlets occasionally producing rootlets, sometimes with 2 buds in a leaf axil. Leaves chartaceous to subcoriaceous, elliptic- or ovate-oblong, sometimes broad-elliptic, 7–15 by 3–8 cm; base obtuse or cuneate; apex acuminate, sometimes apiculate; margin entire, or remotely, slightly crenulate; nerves 4–6 pairs; petiole 8–13 mm. Inflorescences dichotomous-cymose, $4\frac{1}{2}$ – $8\frac{1}{2}$ cm long, usually with short, supplementary branchlets in the dichotomies. Peduncle 3– $4\frac{1}{2}$ cm. Bracts triangular or deltoid, c. 1 mm long. Flowers pale yellow or yellowish green, almost sessile. Calyx fleshy, divided almost to the base, lobes deltoid, $\frac{1}{2}$ –1 mm long, slightly erose at the margin. Petals fleshy, broad-elliptic, obovate, $2\frac{1}{2}$ –3 by 1– $1\frac{1}{2}$ mm, with slightly inflexed margin, densely papillose on both surfaces. Free part of disk slightly 5-angular. Stamens $\frac{2}{3}$ –1 mm; filaments densely covered with

papilla-like hairs. Pistil $\frac{2}{3}$ –1 mm emerging from the disk; stigma obscurely 3-lobed. Ovules 4–8 in each cell. Follicles ovate to elliptic-oblong, $6\frac{1}{2}$ – $8\frac{1}{2}$ by $2\frac{1}{2}$ –5 cm, the valves rather woody, c. $\frac{2}{3}$ mm thick. Seeds (incl. wing) 6–7 by $1\frac{1}{2}$ – $\frac{3}{4}$ cm, seed proper ellipsoid, $1\frac{1}{2}$ –2 by $\frac{2}{3}$ –1 cm.

Distr. South Peninsular Thailand (Nakawm Sritamarat) and Malesia: S. Sumatra (Palembang), Banka, W. Java (Mt Salak), Lesser Sunda Is. (Timor), and Borneo (North Borneo and Sarawak).

Ecol. In lowland forests up to 480 m.

Vern. Java: (*areu*) *mangèndèr*, S.

Note. I have seen only 3 collections with fruits, in 2 of which the follicle is elliptic-oblong, 6– $8\frac{1}{2}$ by $2\frac{1}{2}$ –3 cm, and c. 2½ times as long as wide; in the type of *Hippocratea beccarii* it is ovate, $7\frac{1}{2}$ by 5 cm; this is not correlated with floral differences.

3. *Reissantia ferruginea* (KING) DING HOU, Blumea 12 (1963) 33.—*Hippocratea ferruginea* KING, J. As. Soc. Beng. 65, ii (1896) 357; RIDL. Fl. Mal. Pen. 1 (1922) 455.

Liana up to 20 m. Stipules triangular, c. $\frac{1}{3}$ mm long. Leaves chartaceous, ovate, obovate, or elliptic, 7– $10\frac{1}{2}$ by $3\frac{3}{4}$ –5 cm; base cuneate; apex acute, obtuse; margin entire; nerves 4–7 pairs; petiole 6–8 mm. Inflorescences paniculate, sometimes ramiflorous, up to 5 cm long, densely covered with rust-coloured papillae or uniseriate hairs. Peduncle $1\frac{1}{2}$ – $2\frac{1}{2}$ cm. Bracts $\frac{2}{3}$ mm long. Pedicels 1– $1\frac{1}{2}$ mm. Flowers light greenish yellow. Calyx and petals densely covered with rust-coloured papillae and short-uniseriate hairs especially on the outer surfaces. Calyx lobes triangular or ovate, c. $\frac{3}{4}$ mm long, margin lacinate or short-fimbriate. Petals spatulate, 3– $3\frac{1}{2}$ by c. $\frac{2}{3}$ mm, usually boat-shaped, with erose margin. Free part of disk wavy or slightly 5-angular. Stamens c. $\frac{1}{2}$ mm; filaments densely covered with papillae or uniseriate hairs especially on the outer surface. Pistil c. $\frac{1}{8}$ mm emerging from the disk. Ovules 6 in each cell. Fruit unknown.

Distr. Malesia: Malay Peninsula (Penang) and SE. Borneo (W. Kutai).

Ecol. Lowland forests, up to 450 m.

4. *Reissantia grahamii* (WIGHT) DING HOU, Blumea 12 (1963) 33.—*Hippocratea grahamii* WIGHT, Ill. Ind. Bot. (1839) 134; Ic. Pl. Ind. Or. 2 (1840) t. 380; LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 624.—*Hippocratea salacioides* KORTH. Kruidk. (1842) 188; Flora 31 (1848) 580; MIQ. Fl. Ind. Bat. 1, 2 (1859) 600; Ann. Mus. Bot. Lugd.–Bat. 4 (1869) 153.—*Hippocratea zippeliana* MIQ. Ann. Mus. Bot. Lugd.–Bat. 4 (1869) 153.—*Hippocratea megalocarpa* MERR. Philip. J. Sc. 13 (1918) Bot. 20; En. Philip. 2 (1923) 486.—*Hippocratea ellipticarpa* MERR. Philip. J. Sc. 17 (1920) 275; En. Philip. 2 (1923) 485.—*Kokoona luzoniensis* MERR. Philip. J. Sc. 27 (1925) 32 ('*Kokoonia*'), ex char.—*Loeseneriella zippeliana* A. C. SMITH, Am. J. Bot. 28 (1941) 440.—*Pristimera grahamii* A. C. SMITH, J. Arn. Arb. 26 (1945) 178.—Fig. 29.

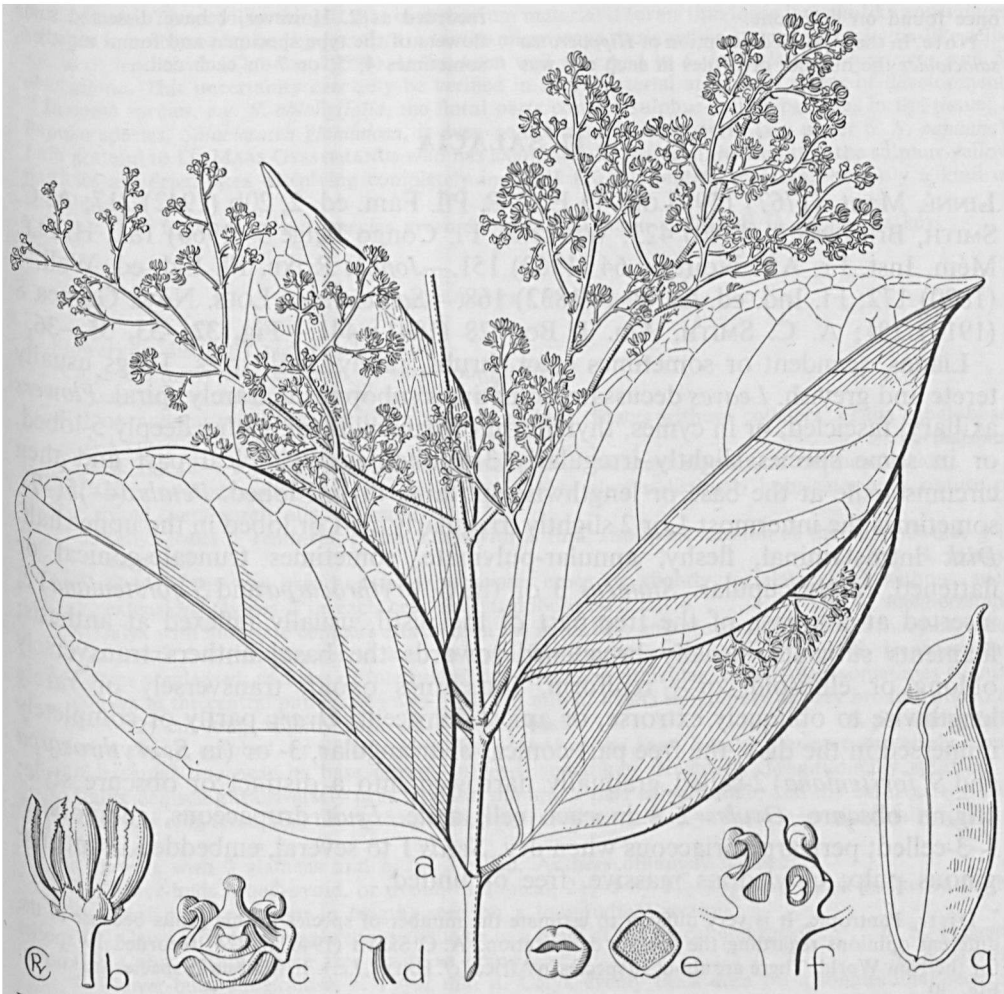


Fig. 29. *Reissantia grahamii* (WIGHT) DING HOU. *a*. Habit, $\times \frac{2}{3}$, *b* flower, $\times 4$, *c*. ditto, calyx lobes and petals removed, $\times 16$, *d*. style, $\times 16$, *e*. young and old anthers seen from top, $\times 32$, *f*. flower in section, petals removed, $\times 16$, *g*. seed, with basal wing, $\times \frac{2}{3}$ (*a-f* ZIPPELIUS *s.n.*, *g* JAHERI *s.n.*).

Liana or scandent shrub, up to 25 m. Stipules triangular, *c.* $\frac{1}{2}$ mm long. Leaves subcoriaceous to coriaceous, broad-elliptic, elliptic, or ovate-oblong, slightly obovate, or suborbicular, (5-)8-19½ by (2½-)5-10 cm; base cuneate or rounded; apex short-acuminate, sometimes obtuse or rounded; margin entire or remotely crenulate; nerves 5-6 pairs; petiole $\frac{1}{6}$ -1¼ cm. Inflorescences paniculate or thyriform, (3½-)10-14 cm long, many-flowered. Peduncle (1-)5-5½ cm. Bracts deltoid, $\frac{1}{3}$ -½ mm long, lacinate. Pedicels $\frac{1}{2}$ -1¼ mm. Flowers pale yellowish green. Calyx almost divided to the base, lobes suborbicular, rarely deltoid, $\frac{2}{3}$ -1 mm long, erose or lacinate. Petals obovate-oblong or oblanceolate, 2½-3 by 1 mm, usually with inflexed margin, slightly curved inward at anthesis, erose. Disk sometimes slightly 5-angular and the angles alternate with the petals.

Stamens *c.* $\frac{1}{3}$ mm; filaments usually papillose on the outer and sometimes also the inner surface. Pistil *c.* $\frac{1}{3}$ mm emerging from the disk, triangular, *c.* $\frac{3}{4}$ mm \varnothing at the base. Ovules (4-)6(-7) in each cell. Follicles obovate-oblong, 9-13 by 3½-4½ cm; pericarp \pm woody, valves *c.* 1½ mm thick. Seeds (*incl.* wing) oblong-lanceolate, 6-10 by 1¾-2¾ cm; seed proper elliptic- or ovate-oblong, 2-2¼ by $\frac{3}{4}$ -¾ cm.

Distr. India (Concan, Sylhet, and S. Andaman), Upper Burma (Mingin), Thailand (Nu Song, Makum, Muang Pua and Watana) and Malesia: West Central Sumatra (Mt Singalang), E. Java (Besuki and Kediri), Borneo (Kapuas), Philippines (Palawan, Mindoro, Luzon, and Mindanao), Moluccas (Kai Is.), and New Guinea (Sorong, Ramoi, and Milne Bay).

Ecol. Lowland forests, sometimes up to 700 m,

once found on limestone.

Note. In the original description of *Hippocratea salacioides* the number of ovules in each cell was

recorded as 2. However, I have dissected some flowers of the type specimen and found mostly 6, sometimes 4, 5, or 7 in each cell.

17. SALACIA

LINNÉ, Mant. (1767) 159; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 217; A. C. SMITH, Brittonia 3 (1940) 423; WILCZEK, Fl. Congo Belge 9 (1960) 181; HALLÉ, Mém. Inst. Fr. Afr. Noire n. 64 (1962) 151.—*Johnia* ROXB. Fl. Ind. ed. Wall. 1 (1820) 172; Fl. Ind. ed. Carey 1 (1832) 168.—*Salacicratea* LOES. Nova Guinea 8 (1910) 281; A. C. SMITH, Am. J. Bot. 28 (1941) 441.—Fig. 32—33, 35—36.

Lianas, scandent or sometimes erect shrubs, rarely small trees. Twigs usually terete and greyish. *Leaves* decussate, sometimes subopposite, rarely spiral. *Flowers* axillary, fascicled, or in cymes, thyriform or paniculiform. *Calyx* deeply 5-lobed, or in some species slightly irregularly 3–5-lobed in the apical part and then circumscissile at the base or lengthwise splitting, or not lobed. *Petals* (4–)5(–7), sometimes the innermost 1 or 2 slightly irregularly cleft or lobed in the upper half. *Disk* intrastaminal, fleshy, annular-pulvinate, sometimes truncate-conical or flattened, rarely cupular. *Stamens* 3 or (in *S. erythrocarpa* and *S. forsteniana*) 2, inserted at the base of the free part of the pistil, usually reflexed at anthesis; filaments subulate, usually broadened towards the base; anthers transversely oblong or ellipsoid, or ± reniform, sometimes ovoid, transversely or rarely lengthwise to obliquely extrorse, or apical-dehiscent. *Ovary* partly or completely immersed in the disk, the free part conical or triangular, 3- or (in *S. erythrocarpa* and *S. forsteniana*) 2-celled, gradually narrowed into a distinct or obscure style; stigma obscure. *Ovules* 2–8 in each cell, axile. *Fruit* drupaceous, subglobose, 1–3-celled; pericarp coriaceous when dry. *Seeds* 1 to several, embedded in mucilaginous pulp; cotyledons massive, free or united.

Distr. Pantropic. It is very difficult to estimate the number of species in this genus because of the different opinions regarding the generic delimitation. A. C. SMITH (1940, p. 424) recorded 29 species for the New World. There are about 90 species in Africa (cf. HALLÉ, *l.c.*). In Malesia 29 species are known. Fig. 30.

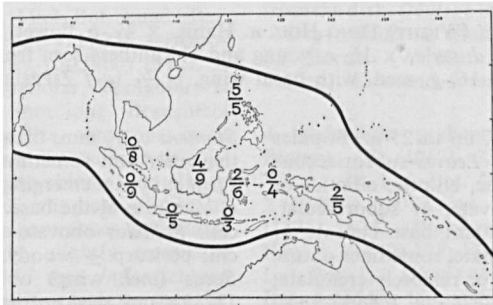


Fig. 30. Distribution of *Salacia* in Malesia. Species density indicated in each subarea, endemics above the hyphen, non-endemic below it.

Ecol. In Malesia in forests and thickets, sometimes found on limestone, occasionally in freshwater swamps, from sealevel up to 1800 m.

Uses. The fruits of some species are edible, a little flesh coating the seeds. A decoction from the roots of a few species is used for medicinal purpose (cf. BURKILL, Dict. 1935, 1942–1943; HEYNE, Nutt. Pl. 1927, 985).

Morph. The morphological status of the edible flesh coating the seeds (actually the endocarp), here

designated as 'pulp', is not known to me. It could be tissue from either mesocarp or endocarp, or from both of them. The peculiar thing is that in herbarium material it forms thin loose lamella-like appendages attached to both exocarp and endocarp. Under the microscope the lamellae appear parenchyma-like cells, e.g. in *S. leucoclada* (CLEMENS 29599). It has been well observed in *S. leucoclada*, *S. laurifolia*, and *S. oblongifolia*. This uncertainty can only be verified in fresh material at various stages of development.

In some species, e.g. *S. oblongifolia*, the floral parts contain sulphur-yellow particles in the tissue; a Papuan species, *Salacicratea glandulosa*, is even named after this property (see under 6. *S. papuana*). I am grateful to Dr MAAS GEESTERANUS who has examined the material; he said that the sulphur-yellow particles are dried latex dissolving completely in KOH (10%) solution and are obviously a kind of kautchuk.

Note. The fruits of several species are unknown; this made it difficult to frame the key.

KEY TO THE SPECIES

1. Flowers in distinctly peduncled cymes.
2. Calyx distinctly 5-lobed even in very young stage.
3. Cymes lax, rachises or internodes distinct.
 4. Disk annular-pulvinate, 1-2 times as wide as high. Bracts without colleters. Fruits subglobose, 2-3 cm \emptyset 1. *S. korthalsiana*
 4. Disk flat, 3-4 times as wide as high. Bracts with colleters inserted at the base inside.
 5. Calyx without colleters on the inner base, lobes always distinctly imbricate, apex obtuse or round, very rarely slightly acute.
 6. Calyx lobes \pm reniform, entire. Disk with a thin, rim-like extension at the base. Ovules 4 in each cell 2. *S. cymosa*
 6. Calyx lobes very broad-ovate or -obovate, erose or slightly laciniate. Disk without such extension. Ovules 2 in each cell. Fruits globose, 4-5 cm \emptyset 3. *S. subalternifolia*
 5. Calyx with fimbriate colleters attached on the inner base and protruding from the margins, lobes separate from each other at least in open flowers, apex acute 4. *S. blepharophora*
3. Cymes condensed, rachises or internodes invisible. Disk orbicular, usually flat, sometimes slightly convex in the central part, $\frac{1}{3}$ - $\frac{1}{2}$ mm high, $1\frac{1}{2}$ mm \emptyset . Fruits subglobose or very broadly obovoid, 4-8(-12) cm long, slightly contracted at the base 5. *S. oblongifolia*
2. Calyx almost unlobed, or slightly, irregularly lobed at the apex, breaking away transversely along an irregular line near its base during anthesis, sometimes irregularly, longitudinally splitting.
7. Calyx dehiscent transversely near its base, the upper part calyptra-like, and the basal part \pm like a narrow ring remaining below the petals, very rarely associated with some longitudinally splitting ones.
 8. Flowers with 3 stamens and ovary 3-celled. Anthers obliquely dehiscent.
 9. Flower-buds broad-ovoid, or ovoid, or conical, $2\frac{1}{2}$ -5 by $2\frac{1}{2}$ - $3\frac{1}{2}$ mm. Calyx thickened in the apical part (c. 1 mm in length) seen on a longitudinal section.
 10. Calyx with free membranous tissue or in a mass at the apical end inside 6. *S. papuana*
 10. Calyx without such free tissue as above 7. *S. sororia*
 9. Flower-buds subglobose, c. $1\frac{1}{2}$ -2 mm \emptyset . Calyx evenly thick seen on a longitudinal section.
 8. *S. ledermannii*
 9. *S. forsteniana*
8. Flowers usually with 2 stamens and ovary 2-celled. Anthers transversely dehiscent.
7. Calyx not lobed, or splitting irregularly lengthwise, and persistent at the base of a flower.
 11. Cymes lax, rachises or internodes distinct. Calyx splitting at anthesis and remaining at the base of a flower. Anthers slightly obliquely dehiscent 10. *S. intermedia*
 11. Cymes condensed, or flowers almost fascicled. Calyx not lobed, saucer-shaped at the base of a mature flower. Anthers transversely dehiscent 11. *S. wenzelii*
1. Flowers in fascicles, or on a very short, axillary, bracteate tubercle or peduncle.
12. Calyx in the mature flower erose but not lobed, saucer-shaped 11. *S. wenzelii*
12. Calyx distinctly 5-lobed.
13. Stamens 2. Ovary 2-celled. Fruits globose, $1-1\frac{3}{4}$ cm \emptyset , 1-seeded 12. *S. erythrocarpa*
13. Stamens 3. Ovary 3-celled.
14. Disk in mature flowers thin, cupular, sometimes stamens inserted on the ovary at some distance above this disk, the interval resembling a short "gynandrophore". Ovules (2-)4 in each cell. Leaves large, yellowish when dry. Fruits broadly ovoid or subglobose, usually $5\frac{1}{2}$ - $6\frac{1}{2}$ by $5-5\frac{1}{2}$ cm 13. *S. macrophylla*
14. Disk rather fleshy, flat, discoid, or annular-pulvinate, no interval between disk and insertion of stamens. Ovules usually 2 in each cell (4-5 in each cell in *S. marginata*).
15. Disk flat, slightly concave or discoid, or slightly convex towards the center, 4-7 times as wide as high.
16. Disk large, $3\frac{1}{2}$ -5 mm \emptyset .

17. Pedicels $1\frac{1}{3}$ -2 cm. Calyx lobes slightly erose. Disk suborbicular, sometimes obscurely 5-lobed.
14. *S. longipedicellata*
17. Pedicels $\frac{1}{6}$ - $\frac{1}{2}$ cm. Calyx lobes short-fimbriate. Disk distinctly 5-lobed.
18. Branchlets sharply 4-angular. Leaves distinctly serrate-crenate. Petals suborbicular or broad-elliptic, $3\frac{1}{2}$ -4 by $2\frac{3}{4}$ - $3\frac{3}{4}$ mm. Ovules 2 in each cell 15. *S. castaneifolia*
18. Branchlets terete. Leaves entire. Petals \pm oblong, 6 by 4 mm. Ovules 4-5 in each cell.
15. *S. marginata*
16. Disk rather small, usually less than 2 mm ϕ .
19. Disk convex at the central part, thin and rim-like at the margin. Calyx lobes unequal in size and shape 17. *S. grandiflora*
19. Disk thick on the margin.
20. Disk with a thin, membranous extension at the base just beneath the margin. Pedicels without elastic threads shown on breaking. Branches usually densely covered with lenticels.
18. *S. verrucosa*
20. Disk without the extension as above. Pedicels with elastic threads shown on breaking. Branches rather smooth 19. *S. ovalis*
15. Disk annular-pulvinate, usually higher than wide, rarely twice as wide as high or less.
21. Anthers short-apiculate, \pm longitudinally dehiscent. Fruits subglobose, c. $6\frac{1}{2}$ cm ϕ .
20. *S. leuocladia*
21. Anthers obtuse, transversely, very rarely slightly obliquely dehiscent.
22. Disk 2-3 mm wide. Petals usually ovate or broad-ovate, 3-6 by $2\frac{1}{2}$ -4 mm.
23. Leaves bluntish, greenish when dried, upper surface finely prominently reticulate-veined. Disk annular-pulvinate, apical end almost as wide as the base, c. 1 mm high and 2 mm ϕ .
21. *S. venosa*
23. Leaves almost always distinctly acuminate, brownish when dried, upper surface smooth. Disk conical-pulvinate, gradually narrowed towards the apex, $1\frac{1}{2}$ -2 mm high and 3 mm ϕ .
22. *S. maingayi*
22. Disk $\frac{3}{4}$ - $1\frac{3}{4}$ mm wide. Petals usually oblong or elliptic, $1\frac{1}{2}$ - $3\frac{1}{4}$ by $\frac{3}{4}$ - $1\frac{3}{4}$ mm.
24. Ovules attached at the central part of the axis. Fruits $2\frac{3}{4}$ - $4\frac{1}{3}$ mm ϕ (not known in *S. nitidissima*).
25. Flower-buds broad-oblong, usually angular. Petals slightly keeled.
26. Disk with a thin narrow rim-like extension a little above the base. Fruits rugose. Leaves usually entire or subentire.
27. Leaves especially the old ones with elastic threads shown on breaking. Calyx entire. Fruits globose or subglobose, $2\frac{3}{4}$ - $3\frac{1}{2}$ cm ϕ , not contracted at the base. 23. *S. laurifolia*
27. Leaves without elastic threads shown on breaking. Calyx glandular. Fruits broad-obovoid, c. $4\frac{1}{3}$ by $3\frac{1}{3}$ cm, contracted at the base. 24. *S. exsculpta*
26. Disk without the rim-like extension as above. Fruit smooth. Leaves usually distinctly crenulate 25. *S. euphlebia*
25. Flower-buds globose, not angular. Petals smooth. Disk 1 mm high, $1\frac{3}{4}$ mm ϕ , wider at base, gradually narrowed upwards 26. *S. nitidissima*
24. Ovules attached at the top of the axis. Fruits small, 1- $1\frac{1}{2}$ cm ϕ .
28. Leaves spiral or sometimes subopposite. Flowers brownish 27. *S. viminea*
28. Leaves decussate, rarely associated with some subopposite ones.
29. Petals distinctly yellowish marginate, 3-4 by $2\frac{1}{2}$ -4 mm. Disk 1 mm high, 1- $1\frac{1}{2}$ mm ϕ .
28. *S. chinensis*
29. Petals not yellowish marginate, c. 2 by $\frac{2}{3}$ mm. Disk c. $\frac{2}{3}$ mm high, $\frac{2}{3}$ -1 mm ϕ .
29. *S. kalahiensis*

1. *Salacia korthalsiana* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 152; KOORD.-SCHUM. Syst. Verz. (1911) Fam. 159, 1; BACK. Schooff. (1911) 237; RIDL. Fl. Mal. Pen. 1 (1922) 457; MERR. Pl. Elm. Born. (1929) 171; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 226.—*S. radula* (non G. DON) DIETR. ex HASSK. Tijds. Nat. Gesch. Phys. 11 (1844) 190; HASSK. Pl. Jav. Rar. (1848) 231.—*S. sinensis* (non LINN.) BLANCO, Fl. Filip. ed. 3, 1 (1877) t. 86, excl. descr.—*Hippocratea obtusifolia* (non ROXB.) MERR. Philip. J. Sc. 1 (1906) Suppl. 86.—*S. philippinensis* MERR. Philip. J. Sc. 7 (1912) Bot. 291; En. Philip. 2 (1923) 487; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 226.—*Hippocratea obtusa* RIDL. Fl. Mal. Pen. 5 (1925) 299.—*Hippocratea* sp. BURKILL & HANIFF, Gard. Bull.

S.S. 6 (1930) 184.

Liana up to 18 m, rarely erect shrub or small tree up to 10 m. Stipules triangular, c. $\frac{1}{2}$ mm long. Leaves chartaceous to subcoriaceous, elliptic- or ovate-oblong, sometimes ovate or elliptic, $6\frac{1}{2}$ - $26\frac{1}{2}$ by 3-13 cm (in sterile material up to 32 by 14 cm); base cuneate, or obtuse; apex acuminate, cuspidate; margin remotely, slightly crenulate; nerves 6-11 pairs; petiole $\frac{1}{2}$ - $1\frac{1}{4}$ cm. Inflorescences cymose, axillary, sometimes ramiflorous, 1-2 in a leaf axil, 1-3 cm long, rarely crowded on a young shoot with reduced leaves or bracts simulating a thyriform inflorescence up to 8-15 cm long. Peduncle 0- $1\frac{1}{2}$ cm. Bracts deltoid, c. $\frac{3}{4}$ mm long. Pedicels $4\frac{1}{2}$ -12 mm. Flowers yellowish green, slightly concave at the base.

floral parts containing sulphur-like particles. *Calyx* lobes deltoid or suborbicular, $\frac{3}{4}$ –1 mm long, obtuse, margin slightly erose, lacinate or short-fimbriate. *Petals* broad-elliptic, -ovate, obovate, or oblong, $2\frac{1}{2}$ – $4\frac{1}{2}$ by $1\frac{1}{2}$ – $2\frac{3}{4}$ mm, obtuse or rounded, entire. *Disk* annular-pulvinate, $\frac{1}{2}$ –1 mm high, c. $1\frac{1}{4}$ mm ϕ , usually covered with fine papillae, truncate at the apex, the tissue opposite the calyx lobes slightly extended outward and downward. *Stamens* 3, 1– $1\frac{1}{2}$ mm; anthers \pm transversely dehiscent. Pistil $\frac{3}{4}$ –1 mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2(–3) in each cell, attached at the upper inner angle. *Fruit* subglobose, 2–3 cm ϕ . *Seed* 1, subglobose, $1\frac{1}{3}$ –2 cm ϕ .

Distr. Peninsular Thailand (Talang) and *Malesia*: Sumatra (Palembang), Malay Peninsula (Pahang, Johore, and Singapore), Java (throughout), Lesser Sunda Is. (Bali), Borneo (Kuching, N. Borneo, Kutai, Blu-u, and Mt Medadam), Philippines (Palawan, Luzon, Romblon, Bohol, Biliran, Cebu, Panay, and Mindanao). Fig. 31.

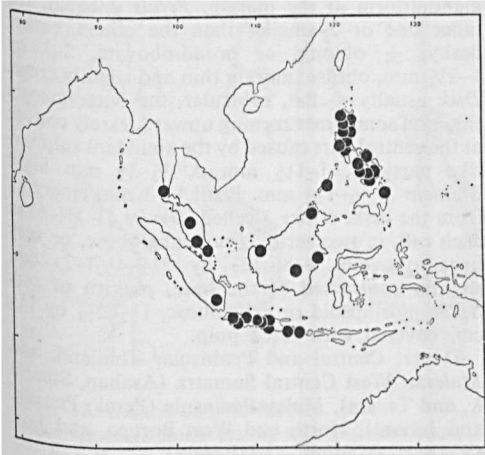


Fig. 31. Distribution of *Salacia korthalsiana* MIQ.

Ecol. In forests and thickets, sometimes occurring on limestone rocks, in E. Java found in teak forest, 50–1400 m.

Galls. Leaves with insect galls.

Uses. The plant under the name 'akar bétang' (SF 17583, SING) was identified as *Hippocratea* sp. by BURKILL & HANIFF (*l.c.*). It is said to be used for cracked lips. An extract from the root with water is drunk (*cf.* BURKILL, *Dict.* 1935, 1177).

Vern. *Pěja pinygan*, Palembang; Mal. Pen.: *akar bétang*, *akar mēnjéla*, M; Java: *a'roy kùluk*, *Pökük*, S, *tjantél wěsi*, J; Philippines: *aropit*, Tag., *bagi*, *balagin*, Tagb.

Notes. MIQUEL cited the collections of KORTHALS (*s.n.*, L) and JUNGHUHN (*s.n.*, L) with the original description. Since the epithet is '*korthalsiana*', I have chosen the KORTHALS collection as the lectotype.

HASSKARL, *l.c.*, attributed *S. radula* to 'A. DTR. II.691.3'. He might have intended to ascribe the

species to D. DIETRICH (*Synopsis Plantarum*, 1839, in which there is no such name as *S. radula*), or refer to the name *S. radula* G. DON (*Gen. Syst.* 1, 1831, 628). I have not seen any specimen annotated by HASSKARL as *S. radula*, but from his detailed description there is no doubt about its identity. BACKER, *l.c.*, rightly reduced it to the present species.

2. *Salacia cymosa* ELMER, *Leafl. Philip. Bot.* 5 (1913) 1792; MERR. *En. Philip.* 2 (1923) 486.—Fig. 36i.

Climbing and sprawling shrub. Stipules triangular, c. $\frac{1}{2}$ mm long, entire. *Leaves* subcoriaceous, shining above and rather dull beneath, elliptic or slightly ovate-oblong, 8–15 by 3–7 cm; base cuneate, slightly obtuse, or rarely rounded; apex acuminate; margin subentire, sparsely and slightly crenulate; nerves 5–6 pairs; petiole 1– $1\frac{1}{2}$ cm. *Inflorescences* paniculate-cymose, on axillary brachyblasts, up to 2 cm long. Peduncle obscure. Bracts deltoid or \pm reniform, 1– $1\frac{1}{2}$ mm long, with lacinate or subulate collectors inserted at the base on the inner side, margin lacinate or fimbriate. Pedicels 3–4 mm. *Calyx* lobes \pm reniform, $\frac{1}{2}$ –1 mm long, entire. *Petals* broad-elliptic, or -oblong, $3\frac{1}{2}$ – $4\frac{1}{2}$ by $2\frac{1}{4}$ – $3\frac{1}{4}$ mm, entire, slightly contracted at the base. *Disk* fleshy, orbicular, flattened, \pm convex at the central part, $1\frac{1}{2}$ –2 mm ϕ , $\frac{1}{2}$ mm high, when dried with a thin yellowish rim. *Stamens* 3, c. $\frac{3}{4}$ mm; anthers transversely dehiscent. Pistil c. $\frac{1}{3}$ mm emerging from the disk. *Ovary* 3-celled. *Ovules* 4 in each cell, attached at the top inner angle.

Distr. *Malesia*: Philippines (Palawan), once collected.

Ecol. In thickets at low altitudes.

3. *Salacia subalternifolia* MERR. & PERRY, *J. Arn. Arb.* 20 (1939) 236.—Fig. 36d.

Liana. Stipules lacinate, inserted obliquely on the branchlets just below the articulation of the petiole. *Leaves* sometimes also associated with subopposite or even subalternate ones, shining on the upper surface, elliptic to elliptic-oblong, 9–15 by $4\frac{1}{2}$ –8 cm; base cuneate; apex acute, sometimes obtuse; margin remotely crenulate; nerves 5–7 pairs; petiole 4–6 mm. *Inflorescences* axillary, paniculate-cymose, sometimes branched from the very base and then seemingly more than one in a leaf-axil. Peduncles usually short. Bracts triangular, c. 1 mm long, lacinate, short-fimbriate, or erose on the margin, with filiform or lacinate collectors inserted at the base inside. Pedicels 5–6 mm, with elastic threads shown on breaking. *Flowers* greenish yellow. *Calyx* almost divided to the base, lobes very broad-ovate or -obovate, $\frac{2}{3}$ –1 mm long, obtuse or rounded, or slightly acute at the apex, erose or slightly lacinate at the margin. *Petals* elliptic, oblong, or obovate-oblong, 3 by $1\frac{1}{2}$ – $1\frac{3}{4}$ mm, obtuse, \pm entire, with distinct 5 or more longitudinal veins slightly elevated on the outer surface when dry. *Disk* fleshy, flat, suborbicular, slightly concave at the central part, c. $1\frac{1}{2}$ mm ϕ , c. $\frac{1}{2}$ mm high, the

basal part slightly extended outward into a narrow, thin rim. *Stamens* 3, c. $\frac{1}{2}$ mm; anthers transversely dehiscent. Pistil slightly emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell. *Fruit* globose, 4–5 cm \varnothing , pericarp $3\frac{1}{2}$ mm thick, the inner surface with irregular meshes. *Seeds* suborbicular, \pm planoconvex, c. $2\frac{1}{2}$ mm \varnothing .

Distr. *Malesia*: New Guinea (Lower Fly R. and Middle Tor R.), twice collected.

Ecol. In lowland forests.

Notes. This species is very closely related to *S. cymosa* of the Philippines especially in the characters of the disk. However, the ovules are two in each cell in the present species, being 4 in *S. cymosa*.

The phyllotaxy of the present species is not constantly subalternate or subopposite. The duplicate of the type (BRASS 8066, BO, L) in the Bogor Herbarium and a specimen collected by GJELLERUP (731, L) have opposite or decussate leaves associated with some subopposite ones on the same branch.

4. *Salacia blepharophora* DING HOU, Blumea 12 (1963) 35.

Low liana. Branchlets verrucose. Stipules deltoid, c. 1 mm long. *Leaves* subcoriaceous, shining above, elliptic to elliptic-oblong, rarely obovate-oblong, 4–13 by 2–5 cm; base cuneate; apex obtuse, acute, or short-acuminate; margin \pm entire, or obscurely crenulate; nerves 4–8 pairs; petiole 5–7 mm. *Inflorescences* axillary, short, paniculate-cymose, or on an axillary brachyblast, 1–2 cm long. Peduncle very short (up to 3 mm) or 0. Bracts triangular, $\frac{1}{2}$ – $\frac{2}{3}$ mm long, lacerate, with fimbriate colleters inside. Pedicels c. 5 mm. *Calyx* short-cupular, with fimbriate colleters attached at the base on the inner side and protruding beyond its margin, lobes spreading and separate from each other at anthesis, triangular, $\frac{1}{2}$ –1 mm long, acute, \pm entire. *Petals* persistent (?), broad-oblong, rarely broad-elliptic, obtuse, entire or slightly erose, 2– $2\frac{2}{3}$ by $1\frac{1}{2}$ – $1\frac{3}{4}$ mm. *Disk* fleshy, flat, orbicular, c. 2 mm \varnothing and c. $\frac{1}{2}$ mm high, the tissue at the base slightly protruding outward like a thin rim. *Stamens* 3, c. $\frac{1}{2}$ mm; anthers transversely dehiscent; free part of the pistil pyramidal, c. $\frac{1}{2}$ mm high. *Ovary* 3-celled. *Ovules* 2 in each cell, attached at the upper inner angle. Immature fruit slightly triangular.

Distr. *Malesia*: Central Celebes (Matana Lake), once collected.

Ecol. In thickets along a lake, 400 m.

5. *Salacia oblongifolia* BLUME, Bijdr. (1825) 220, non G. DON, 1831, nec OLIVER, 1868; MIQ. Fl. Ind. Bat. 1, 2 (1859) 598; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 150, t. 6, incl. f. *latior* MIQ.; KOORD.-SCHUM. Syst. Verz. (1911) Fam. 159, 1; BACK. Schoolfl. (1911) 238; KOORD. Exk. Fl. Java 2 (1912) 527; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 226.—*S. melitocarpa* BLUME, Bijdr. (1825) 220; MIQ. Fl. Ind. Bat. 1, 2 (1859) 599.—*S. lanceolata* TEYSM. & BINN. Nat. Tijds. N.I. 25 (1863) 424; KOORD. Exk. Fl. Java 2 (1912) 528.—

S. campanuloidea KING, J. As. Soc. Beng. 65, ii (1896) 363; RIDL. Fl. Mal. Pen. 1 (1922) 457.—*S. viridis* CRAIB, Kew Bull. (1926) 352.—*S. amantacea* RIDL. Kew Bull. (1938) 239.—*S. klossii* RIDL. l.c. 240.

Liana up to c. 30 m. Stipules triangular, lacinate. *Leaves* chartaceous to subcoriaceous, elliptic-oblong to lanceolate, broad-elliptic, or obovate, 6– $17\frac{1}{2}$ by $2\frac{1}{4}$ –7 cm; base cuneate, or obtuse; apex short-acuminate to cuspidate; margin crenulate or subentire; nerves 5–10 pairs; petiole 8–17 mm. *Inflorescences* axillary, condensed cymes, very short, usually less than $1\frac{1}{2}$ cm long, internodes of the rachises invisible, few-flowered, usually appearing as a very short or obscure peduncle bearing 2 or 3 slender bracteolate branches. Bracts deltoid, c. 1 mm long, slightly erose at the margin. Pedicels 3–4 mm. *Flowers* yellowish or yellowish green, floral parts usually with abundant sulphur-yellow particles in the tissue. *Calyx* lobes \pm erect at anthesis, triangular, or \pm semi-orbicular, $\frac{1}{2}$ –1 mm long, erose or glanduliform at the margin. *Petals* unequal, the inner one or 2 smaller than the others, rather fleshy, \pm oblong, or broad-obovate, 2–3 by 1– $2\frac{1}{2}$ mm, obtuse, margin thin and slightly erose. *Disk* usually \pm flat, orbicular, the outer margin thin and sometimes turning upward, rarely convex at the central part caused by the abundant sulphur-like particles, 1– $1\frac{1}{2}$ mm \varnothing , $\frac{1}{3}$ – $\frac{1}{2}$ mm high. *Stamens* 3, $\frac{1}{2}$ – $1\frac{1}{2}$ mm. Pistil $\frac{1}{2}$ –1 mm emerging from the disk. *Ovary* 3-celled. *Ovules* (3–)4(–6) in each cell, in two series. *Fruit* subglobose, or very broad-obovoid, 4–8(–12) by $3\frac{1}{2}$ – $4\frac{1}{2}$ (–7) cm, slightly contracted at the base, pinkish or red. *Seeds* \pm ellipsoid or subglobose, $1\frac{1}{2}$ – $2\frac{1}{4}$ by $1\frac{1}{2}$ cm, covered with dried pulp.

Distr. Central and Peninsular Thailand, and *Malesia*: West Central Sumatra (Asahan, Siberut I., and Taram), Malay Peninsula (Perak, Penang, and Johore), North and West Borneo, and Java (W. part, Madiun, and Besuki).

Ecol. In forests from the lowland up to 1000 m, sometimes found on sandstone (Taram), in swampy forest (Johore) and in peat forest (Borneo).

Vern. Java: *areuj langari*, *ki-hapiet*, *kikopi*, *manggong*, *tjun-kankan* or *tjun-kaukên*, *trens langari*, S.

Galls. DOCTERS VAN LEEUWEN (Zooecidia 1926, 329, f. 591 & 592) recorded two kinds of leaf-galls found in the present species: (i) disk-like swellings $1\frac{1}{2}$ –2 mm \varnothing , caused by an unknown animal, developed on both surfaces of the leaves and (ii) the leaf-blade curved and rolled up, caused by thrips, so that the margins touch each other. I have also seen these two kinds of galls occurring on some specimens.

Note. BLUME erroneously described the flowers having 5 stamens, as already pointed out by MIQUEL (l.c. 1869, 151).

6. *Salacia papuana* (LOES.) DING HOU, Blumea 12 (1963) 34.—*Salaciratea papuana* LOES. Nova Guinea 8 (1910) 282, t. 65; in E. & P. Pfl. Fam. ed.

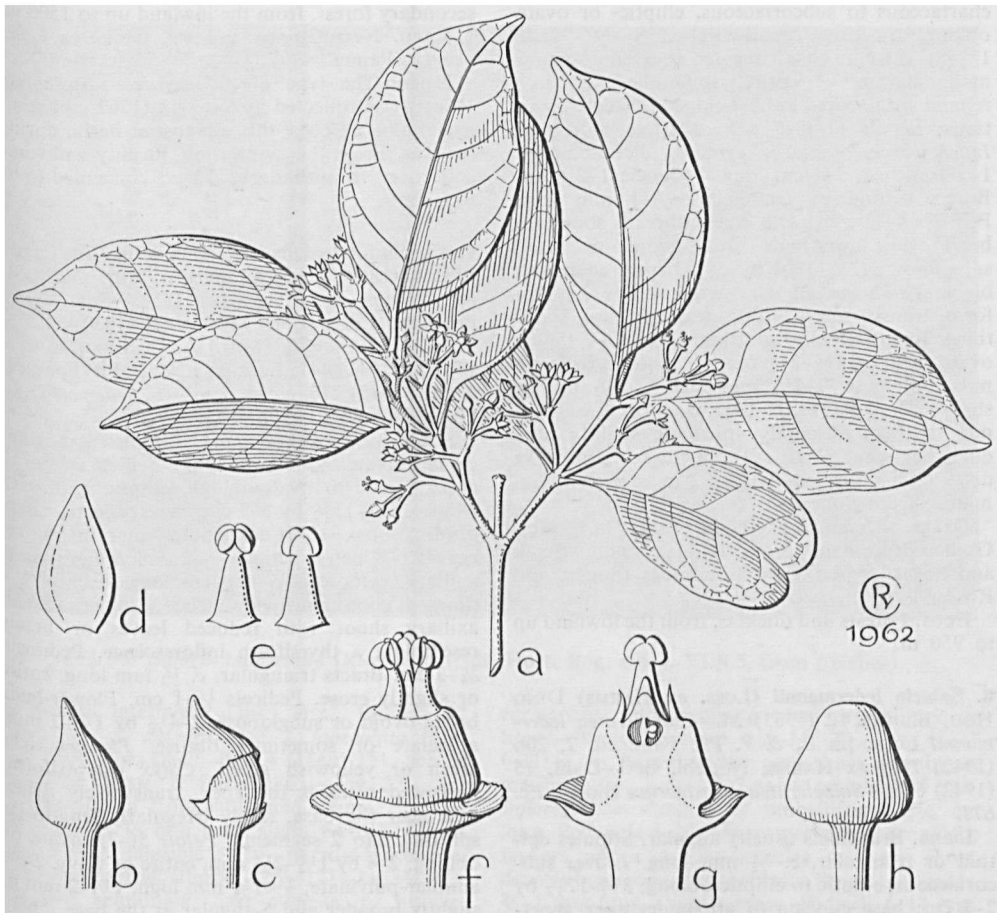


Fig. 32. *Salacia sororia* MIQ. a. Habit, $\times \frac{2}{3}$, b. flower-bud, showing calyptriform calyx, $\times 4$, c. ditto, showing calyx transversally splitting near base, $\times 4$, d. petal, $\times 4$, e. exterior and interior view of stamen, $\times 8$, f. flower, after calyx split circumscissile near base, petals removed, $\times 8$, g. ditto, in section, $\times 8$. —*S. papuana* (LOES.) DING HOU. h. Flower-bud, $\times 4$ (a-g BRASS 28536, h RÖMER 86).

2, 20b (1942) 216.—*Salacicratea glandulosa* A. C. SMITH, Am. J. Bot. 28 (1941) 441.—Fig. 32h. Scandent shrub. Stipules triangular, sometimes obliquely inserted just below the articulation of the petiole. Leaves subcoriaceous, elliptic- or ovate-oblong to lanceolate, 7–20 by $2\frac{1}{3}$ – $8\frac{1}{3}$ cm; base obtuse, acute; apex acuminate; margin entire but undulate, sometimes sparsely crenulate; nerves 6–8 pairs; petiole $\frac{3}{4}$ – $1\frac{1}{3}$ mm. Inflorescences axillary, dichotomously cymose, $3\frac{1}{2}$ –5 cm long. Peduncle $1\frac{3}{4}$ –3 cm. Bracts ovate, 2–3 mm long, obtuse. Pedicels 2–5 mm. Flower-buds broad-ovoid, 3–5 by $2\frac{1}{2}$ – $3\frac{1}{2}$ mm, gradually narrowed towards the obtuse top. Flowers yellowish green. Calyx calyptriform, splitting transversely near the base. Petals 5(–7), ovate to ovate-oblong, or oblong, 3– $6\frac{1}{2}$ by 2– $2\frac{1}{2}$ mm, entire, or the innermost one or two slightly irregularly lobed at the upper half. Disk annular-pulvinate, $2\frac{1}{2}$ –3 mm \varnothing , $1\frac{1}{4}$ – $1\frac{3}{4}$ mm high, slightly broader at the base. Stamens 3, 1–3 mm, slightly apiculate, erect at

anthesis; anthers obliquely dehiscent. Pistil c. $1\frac{1}{3}$ mm emerging from the disk. Ovary 3-celled. Ovules 2 in each cell. Fruit globose, c. $2\frac{1}{2}$ cm \varnothing , 1-seeded (always?). Seed subglobose, c. 2 cm \varnothing , with reticular meshes on the rather smooth inner surface of the pericarp.

Distr. *Malesia*: New Guinea (Andai, Lorentz R. region, and Morobe Distr.).

Ecol. In the Lorentz R. region in riverine forests, in the Morobe District in hill forests at 1500–1800 m.

Note. A. C. SMITH derived the epithet *glandulosa* from the gland-like occurrence of the sulphur-yellow kautchuk particles in the floral parts.

7. *Salacia sororia* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 151.—*Salacicratea sororia* A. C. SMITH, Am. J. Bot. 28 (1941) 441.—*Salacicratea brassii* A. C. SMITH, l.c. 442.—Fig. 32a-g.

Large rambling shrub or liana. Stipules triangular, c. $\frac{1}{2}$ mm long, with colleters inside. Leaves

chartaceous to subcoriaceous, elliptic- or ovate-oblong, sometimes broad-elliptic, $3\frac{1}{2}$ -11(-27) by $1\frac{3}{4}$ -8(-12) cm; base cuneate; apex short-acuminate; margin \pm entire, sometimes obscurely repand with sparse, callose-tipped obsolete crenations; nerves (2-)6-8 pairs; petiole 6-14 mm. *Inflorescences* axillary, cymose, dichotomously 1-3-branched, 2-4 cm long. Peduncle 1-2½ cm. Bracts deltoid or triangular, ½-1 mm long. Pedicels 4-11 mm, with elastic threads shown on breaking. Flower-buds broad-ovoid, or rarely subglobose, (2½-)3-4 by 2½-3 mm, acuminate or rarely obtuse. *Flowers* green. *Calyx* calyptriform, transversely splitting near the base, sometimes longitudinally splitting. *Petals* (4-)5(-6), ovate, 3-4 by $1\frac{3}{4}$ -2¾ mm, \pm entire. *Disk* annular-pulvinate, 1-1½ mm high, 2-2½ mm ϕ , slightly 5-angular at the base. *Stamens* 3, c. 1-1½ mm; anthers obscurely apiculate, slightly obliquely dehiscent. Pistil c. 1 mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell. Immature fruit globose.

Distr. *Malesia*: Moluccas (Sula Is.), New Guinea (Normanby, Aru Is., Hollandia, Sepik and Sogeri region), and Louisiades (Sudest and Rossel Is.).

Ecol. Forests and thickets, from the lowland up to 950 m.

8. *Salacia ledermannii* (LOES. ex HARMS) DING HOU, Blumea 12 (1963) 34.—*Salacicatea ledermannii* LOES. [in E. & P. Pfl. Fam. ed. 2, 20b (1942) 216] ex HARMS, Notizbl. Berl.-Dahl. 15 (1942) 676.—*Salacicatea sarasinorum* HARMS, l.c. 677.

Liana. Branchlets usually angular. Stipules deltoid or triangular, c. ½ mm long. *Leaves* subcoriaceous, elliptic to elliptic-oblong, $3\frac{1}{2}$ -17½ by 2-7 cm; base cuneate to attenuate; apex short-acuminate; margin crenulate, rarely subentire; nerves 6-9 pairs; petiole 3-8 mm. *Inflorescences* axillary, dichotomously cymose, 1½-3 cm long, the flowers usually crowded at the end of the first fork, sometimes an axillary flowering branch with reduced leaves or bracts resembling a thyriform inflorescence. Peduncle ½-1½ cm. Bracts triangular, ½-1 mm long, erose, with colleters at the base inside. Pedicels 4-6 mm. Flower-buds subglobose, 1½-2 mm ϕ . *Flowers* green. *Calyx* calyptriform, pointed at the apex, splitting transversely near the base, rarely associated with some flowers in which the calyx is longitudinally dehiscent. *Petals* 5 (or 6), ovate, 2-4 by $1\frac{1}{3}$ -2½ mm. *Disk* annular-pulvinate, c. ¾ mm high and 1½ mm ϕ . *Stamens* 3, c. ¾-1 mm; anthers obliquely dehiscent, obscurely apiculate. Pistil c. ¾ mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell. *Fruit* globose, c. 2½ cm ϕ , dark olive green. *Seed* 1, globose, c. 1½ cm ϕ .

Distr. Solomon Is. (Owa Raha I.) and *Malesia*: Celebes (Buton I., Kabaena I.; and Loka, sec. HARMS) and New Guinea (Jappen, Lala R., Isuarava, Western Highlands, Morobe Distr., and Northern Div.).

Ecol. Rain-forests, sometimes in thickets and

secondary forest, from the lowland up to 1500 m. Vern. New Guinea: *horowa*, Orokaiva lang., *warren*, Papua.

Note. The type of *Salacicatea sarasinorum* HARMS was collected by SARASIN (1267, not seen) near Loka, Celebes; this was lost at Berlin during the war. From the description, locality and some collections from that area, I have concluded to its reduction.

9. *Salacia forsteniana* MIQ. Ann Mus. Bot. Lugd.-Bat. 4 (1869) 308.—*S. diandra* MIQ. *ibid.* 151, *nom. illeg., non THWAITES* 1858.—*Salacicatea kraemeri* LOES. Bot. Jahrb. 63 (1930) 275.—*Salacicatea diandra* (MIQ.) A. C. SMITH, Am. J. Bot. 28 (1941) 441; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 216, *comb. illeg.*—*S. kraemeri* DING HOU, Blumea 12 (1963) 34.

Scandent shrub or liana. Stipules triangular or lanceolate, ¼-1 mm long. *Leaves* subcoriaceous, ovate to ovate-oblong, elliptic or broad-elliptic, 6½-15½ by 3-9 cm; base cuneate, rarely obtuse; apex short-acuminate; margin entire; nerves 6-8 pairs, petiole ½-2 cm. *Inflorescences* axillary, cymose, 1½-6½ cm long, usually 2-4 times dichotomously branched, sometimes an axillary shoot with reduced leaves or bracts resembling a thyriform inflorescence. Peduncle ¾-3 cm. Bracts triangular, c. ½ mm long, entire or slightly erose. Pedicels ½-1 cm. Flower-buds broad-ovoid or subglobose, 2-4½ by 1½-2 mm, apiculate or sometimes obtuse. *Flowers* light green or yellowish green. *Calyx* calyptriform, narrowed towards the apex, transversely dehiscent near the base, rarely irregularly lengthwise splitting into 2 segments. *Petals* 5(-7), ovate or oblong, 2-4 by $1\frac{1}{2}$ -2½ mm, entire or wavy. *Disk* annular-pulvinate, ¾-1¾ mm high, $1\frac{1}{3}$ -2 mm ϕ , slightly broader and 5-angular at the base, finely papillose. *Stamens* 2, very rarely associated with some flowers containing 3 stamens, ½-1 mm, short-apiculate, erect at anthesis, the connective usually separating the thecae; anthers dehiscent transversely or \pm at the top. Pistil c. ¾ emerging from the disk. *Ovary* 2-celled. *Ovules* 2 in each cell. *Fruit* globose, c. 2-2¾ cm ϕ , 1-seeded (always?). *Seeds* globose, $1\frac{1}{2}$ -1¾ cm ϕ , rather smooth on the surface.

Distr. Micronesia (Palau Is.) and *Malesia*: Central Celebes (Malili), Moluccas (Ternate, Ambon, and Morotai) and New Guinea (Waigeo I. and Normanby I.).

Ecol. Forests, from the lowland up to c. 700 m, once found on limestone cliffs.

Vern. Moluccas: *gumi ganem*, Ternate.

Note. LOESENER cited two collections in the original description of *Salacicatea kraemeri* from Palau Is., viz KRAEMER s.n. and LEDERMANN 14096. These specimens were lost during the war and I have not seen any duplicate of them. From the detailed description, this species is clearly conspecific with *S. diandra*, and in 1942 LOESENER himself reduced his own species to the latter. Because *S. diandra* MIQ. is a later homonym MIQUEL proposed a new name.



Fig. 33. *Salacia intermedia* DING HOU (cult. Hort. Bog. sub n. VI.B.5, from Celebes).

10. *Salacia intermedia* DING HOU, Blumea 12 (1963) 34.—*S. diandra* MIQ. f. *lanceolata* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 151, non *S. lanceolata* TEYSM. & BINN. 1863.—Fig. 33.

Shrub (taken from cultivated plant). Stipules triangular, c. $\frac{1}{2}$ mm long, slightly erose. Leaves chartaceous, lanceolate to narrow-lanceolate, sometimes narrow-elliptic, $12\frac{1}{2}$ – $17\frac{1}{2}$ by $3\frac{3}{4}$ – $4\frac{1}{4}$ cm; apex acuminate; base cuneate, or obtuse; margin subentire or faintly and sparsely crenulate; nerves 6–9 pairs; petiole $\frac{1}{2}$ –1 cm. Inflorescences axillary, cymose, 2– $4\frac{1}{2}$ cm long, 2–4 times dichotomously branched. Peduncle $\frac{1}{2}$ – $2\frac{1}{2}$ cm. Bracts triangular, $\frac{1}{2}$ –1 mm long, glanduliform at the margin, with colleters at the base inside. Pedicels 4–7 mm. Floral parts with sulphur-yellow particles in the tissue. Calyx $\frac{1}{2}$ –1 mm long, when young almost globular and undivided, the apical margin \pm glandular and sometimes irregularly slightly 3–5-lobed, the lobes bent inward, later irregularly slightly splitting or deeply divided. Petals yellow, broad-elliptic or ovate, 3– $3\frac{1}{2}$ by $1\frac{3}{4}$ –2 mm, obtuse or acute, entire or slightly erose. Disk annular-pulvinate, $\frac{3}{4}$ –1 by $1\frac{1}{3}$ – $1\frac{1}{2}$ mm, slightly 5-angular. Stamens 3, c. 1 mm, erect; anthers obscurely apiculate, slightly obliquely dehiscent. Pistil c. $\frac{1}{2}$ mm emerging from the disk. Ovary 3-celled. Ovules 2 in each cell. Very immature fruit globose.

Distr. *Malesia*: Celebes (Gorontalo, Bonthain and Pangkadjene).

Ecol. No data available.

11. *Salacia wenzelii* MERR. Philip. J. Sc. 13 (1918) Bot. 23; En. Philip. 2 (1923) 487.—Fig. 36h. Scandent shrub c. 4 m. Leaves subcoriaceous to

coriaceous, rather shining when dry, elliptic or broad-elliptic, or ovate, $8\frac{1}{2}$ –14(– $20\frac{1}{2}$) by $4\frac{1}{2}$ –7(– $11\frac{1}{2}$) cm; base rounded; apex short acuminate; margin entire; nerves 5–7 pairs; petiole 8–15 mm. Inflorescences cymose or umbelliform, $2\frac{1}{2}$ cm long. Peduncle 4–10 mm, sometimes obscure, the flowers appearing in fascicles on very short, densely bracteolate brachyblasts. Bracts triangular, $\frac{2}{3}$ –1 mm long, slightly erose. Pedicels 6–14 mm. Calyx slightly concave at the base outside, enveloping the floral parts except the top at very young stage, saucer-shaped at the base of the mature flower, $2\frac{1}{2}$ –3 mm ϕ , margin \pm truncate, slightly erose or short-fringed, rarely irregularly lobed and reflexed. Petals ovate or broad-elliptic, 3–4 by 2– $2\frac{1}{2}$ mm, slightly erose. Disk fleshy, annular-pulvinate, $1\frac{1}{2}$ –2 mm ϕ , c. 1 mm high, slightly contracted at the middle, papillose. Stamens 3, $\frac{2}{3}$ –2 mm; anthers transversely dehiscent. Pistil 1– $1\frac{1}{3}$ mm emerging from the disk. Ovary 3-celled. Ovules 2 in each cell, pendulous. Fruit depressed-globose, c. 3 cm ϕ . Seeds subglobose, c. $1\frac{1}{2}$ cm ϕ .

Distr. *Malesia*: Philippines (Luzon, Leyte, Cebu and Mindanao).

Ecol. In forests at low altitudes.

12. *Salacia erythrocarpa* K. SCH. in K. Sch. & Hollr. Fl. Kais. Wilh. Land (1889) 70; in K. Sch. & Laut. Fl. Schutzgeb. (1901) 413; A. C. SMITH, Am. J. Bot. 28 (1941) 441; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 220.

Liana up to 20 m, rarely small shrub or tree up to c. 6 m. Stipules triangular, c. $\frac{1}{2}$ mm long. Leaves chartaceous, elliptic, broad-elliptic, elliptic or obovate-oblong, $3\frac{1}{2}$ –13 by $2\frac{1}{3}$ – $5\frac{1}{2}$ cm; base cuneate; apex acuminate, short-cuspidate; margin

crenulate; nerves 6-8 pairs; petiole 3-8 mm. *Flowers* dull or greenish yellow, axillary, fascicled, or on short bracteolate tubercles. Bracts triangular, $\frac{1}{2}$ -1 mm long, short-fimbriate. Pedicels 2-6 mm. *Calyx* lobes triangular, c. $\frac{1}{2}$ mm long, short-fimbriate. *Petals* broad-obovate, $1\frac{3}{4}$ -2 by $1-1\frac{3}{4}$ mm, sometimes slightly keeled outside, with reddish brown pigment in the tissue, sometimes slightly contracted at the base and with one or 2 depressions near the apex inside, margin erose. *Disk* fleshy, annular-pulvinate, slightly broader at the base (in young flowers the disk slightly, gradually narrowed towards the apex of the pistil), $\frac{1}{2}$ -1 mm high, $1-1\frac{1}{3}$ mm ϕ . *Stamens* 2 (once found a flower with 3), c. $\frac{2}{3}$ mm; anthers \pm transversely dehiscent. Pistil c. $\frac{1}{2}$ mm emerging from the disk, compressed. *Ovary* 2-celled. *Ovules* 2 in each cell. *Fruit* globose, $1-1\frac{3}{4}$ cm ϕ , bright red or orange, usually 1-seeded. *Seed* globose, $\frac{3}{4}$ -1 $\frac{1}{2}$ cm ϕ .

Distr. Solomon Is. (New Georgia) and *Malesia*: Celebes (Minahassa, Nuha Distr., Malili, Buton, Watten Sopeng, and Kendari), New Guinea (Hollandia, Fly R., Andai, Western Highlands, Augusta R., Kaulo, Saugueti-Aitape, Morobe Distr., Koitaki, Kokoda, Milne Bay Distr.).

Ecol. Forests, from the lowland up to 900 m, also found on limestone.

Vern. SW. Celebes: *ampaërae*, Watten Sopeng.

13. *Salacia macrophylla* BLUME, Bijdr. (1825) 221, non MIQ. 1851; HASSK. Tijds. Nat. Gesch. Phys. 11 (1844) 192; Pl. Jav. Rar. (1848) 233; MIQ. Fl. Ind. Bat. 1, 2 (1859) 598; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 148, incl. var. *angustifolia* MIQ.; WARBURG, Bot. Jahrb. 13 (1891) 366; KOORD.-SCHUM. Syst. Verz. (1911) Fam. 159, 1; BACK. Schoolfl. (1911) 238; KOORD. Exk. Fl. Java 2 (1912) 527; HEYNE, Nutt. Pl. (1927) 985.—*S. macrocarpa* KORTH. Kruidk. (1842) 184; Flora 31 (1848) 579, non WELW. ex FRITSCH, 1901; MIQ. Fl. Ind. Bat. 1, 2 (1859) 598; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 150.—*S. celebica* BLUME, Rumphia 4 (1848) 19, t. 178C, f. 1; MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 149.—*Microtropis? coriacea* WALL. [Cat. (1831) n. 4338] ex ETTINGSH. Denkschr. Ak. Wiss. M.-N. Kl. Wien 13 (1857) 64, t. 4, f. 12; MERR. & FREEM. Proc. Am. Ac. Arts Sc. 73 (1940) 306.—*S. buddinghii* SCHEFF. Flora 52 (1869) 306; Nat. Tijds. N.I. 31 (1870) 16.—*S. flavescens* KURZ, J. As. Soc. Beng. 41, ii (1872) 300; LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 627; KURZ, J. As. Soc. Beng. 44, ii (1875) 163; For. Fl. Burma 1 (1877) 260; KING, J. As. Soc. Beng. 65, ii (1896) 368, incl. var. *dumosa* KING; RIDL. J. Fed. Mal. St. Mus. 10 (1920) 86; Fl. Mal. Pen. 1 (1922) 459; BURKILL & HANIFF, Gard. Bull. S.S. 6 (1930) 185; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 228.—*S. ovalis* LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 627, non KORTH. 1842.—*S. kamputensis* PIERRE, For. Fl. Coch. 19 (1894) t. 312B, in text; PITARD, Fl. Gén. I.-C. 1 (1912) 905.—*S. prinoides* var. *macrophylla* (BL.) KING, J. As. Soc. Beng. 65, ii (1896) 367, *pro nomen, excl.*

specimina; RIDL. Fl. Mal. Pen. 1 (1922) 459.—*S. lawsoni* KING, J. As. Soc. Beng. 65, ii (1896) 369, new name for *S. ovalis* LAWS.—*S. oblonga* (non WALL.) RENDLE, J. Bot. 62 (1924) Suppl. 23.—*Siphonodon celastrineus* var. *integrifolia* TARDIEU, Suppl. Fl. Gén. I.-C. 1 (1948) 824.—*S. amplifolia* MERR. ex CHEN & HOW, Act. Phytotax. Sinica 7 (1958) 55, t. 18, f. 1 & 2.—Fig. 36e.

Liana, sometimes shrub or shrubby creeper. Stipules triangular or reniform, $\frac{1}{4}$ - $\frac{2}{3}$ mm long, erose or lacinate. *Leaves* subcoriaceous, sometimes shining, elliptic to narrow elliptic-lanceolate, obovate-oblong, broad-ovate, elliptic to narrow-lanceolate, $7\frac{1}{2}$ -34 by $4\frac{1}{2}$ -13 $\frac{1}{2}$ cm (on sterile branches up to 43 by $16\frac{1}{2}$ -20 cm); base cuneate, attenuate, obtuse or rounded; apex acuminate, cuspidate, rarely acute or obtuse; margin entire rarely remotely crenulate; nerves 7-14 pairs; petiole $\frac{1}{2}$ -2 $\frac{1}{2}$ cm. Bracts triangular, c. 1 mm long, slightly erose. Pedicels 6-10 mm. *Flowers* greenish yellow or pale yellow, or whitish, sometimes light rose, pink or red, in fascicles, on very short axillary bracteate tubercles, sometimes ramiflorous. *Calyx* lobes triangular, c. 1 mm long, acute or obtuse, slightly erose, rarely lacinate. *Petals* \pm erect at anthesis, broad-elliptic, elliptic-oblong, ovate, broad-ovate, 1-3 by $\frac{1}{2}$ -2 mm, acute or obtuse. *Disk* thin; roundish, developing from discoid to cupular, $1\frac{1}{2}$ -2 mm ϕ . *Stamens* 3, 1-1 $\frac{1}{4}$ mm. Pistil c. $\frac{1}{2}$ mm emerging from the disk, pyramidal at the base and narrowed into a cylindrical style. *Ovary* 3-celled. *Ovules* (2-4) in each cell. *Fruit* broad-ellipsoid or subglobose, $5\frac{1}{2}$ -6 $\frac{1}{2}$ by 5-5 $\frac{1}{2}$ cm, sometimes up to 8 cm ϕ (cf. HEYNE, l.c.), orange or red. *Seeds* 3 or more in each fruit, white, ellipsoid, 2-3 by 1-2 cm.

Distr. Widely distributed but scattered in India (Concan and Andamans), Burma (Tenasserim), Peninsular and SE. Thailand, Indo-China (Cambodia), Hainan, through *Malesia*: Sumatra, Malay Peninsula, Borneo, Java, Lesser Sunda Is., and Celebes to New Britain (Massawa). Fig. 34.

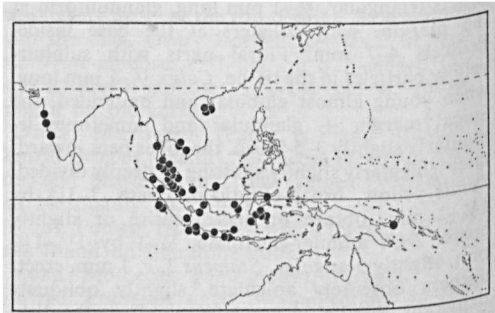


Fig. 34. Distribution of *Salacia macrophylla* BL.

Ecol. In lowland forests, near the coast, occasionally occurring in freshwater swamps, or on limestone rocks, sometimes up to 1200 m. Vern. Sumatra: *paling manwa*, Menggala, *pasoo krumbing*, Banka; Mal. Pen.: *hempédal iték*, *kétimbong*, *nasi sėjuk*, (*pokok*) *sédang*, *sėpapat*, M; Natuna Is.: *marot*, M; Java: *areuj*

kětjipot, aröj ki gauggarangan, aröj mata pötjang, djéroik, kětjipot, kidjeruk, ki-konèng, ki-tèllor, mata pötjang, ralasari, trèng kipènti, S, katjipot, ketjiput, Md.; Lesser Sunda Is.: *gèdèblag*, Bali.

Uses. A decoction from the roots is used in Pahang after childbirth. The ground leaves are applied for belly-ache and also used as a poultice against eczema. The fruits, *i.e.* the flesh round the seeds, are sweetish and edible (*cf.* HEYNE, Nutt. Pl. 1927, 985; BURKILL, Dict. 2, 1935, 1942).

Notes. A fairly common, widely distributed species. Its leaves are very variable in shape and size. The disk is usually discoid or short-cupular and rather flat when young; sometimes it is contracted at the base and seems to be carried by a short stalk or 'androgynophore'.

The colour of the flowers is usually recorded as greenish yellow or pale yellow, or white; however, it has also been noted on several specimens as light rose, pink or red (*cf.* BÜNNEMEIJER 6083, CURTIS 2653, HUME 8785, KEP 6776 & 24156, and MAT 5994).

WARBURG (*l.c.*) stated that NAUMANN had observed it in western New Guinea and he himself found it in fruit at MacCluer Gulf (SW. New Guinea) and Finschhafen (former Kaiser Wilhelm Island). Though the present species quite likely occurs in New Guinea and I have even seen a specimen collected by SCHLECHTER (13727, BO, BM) in New Britain (Massawa), no material is yet collected in the Moluccas and New Guinea.

The type of *S. kamputensis* PIERRE is PIERRE 4065 (P) and the type of *Siphonodon celastrineus* var. *integrifolia* TARDIEU is POILANE 14646 (P). Both of them are from Cambodia and in fruit. I have examined the type specimens and they evidently belong to the present species.

I have examined several collections from Hainan in the Paris Herbarium, *viz* LAU 451, 1447, 1738, 3252; LIANG 61577, 61774 (also in K), and three of them have been cited with the original description of *S. amplifolia*. They clearly belong to the present species.

14. *Salacia longipedicellata* DING HOU, Blumea 12 (1963) 34.

Liana. Stipules triangular, *c.* 1 mm long. *Leaves* chartaceous to thin-coriaceous, elliptic-oblong, 15–24 by 6–10 cm; base cuneate or obtuse; apex acuminate; margin ± entire or slightly crenulate; nerves 6–9 pairs; petiole 8–10 mm. Bracts triangular, *c.* 1½ mm long. Pedicels 1½–2 cm. *Flowers* green, in axillary fascicles. *Calyx* lobes suborbicular or sometimes triangular, 2–2¼ by 2–3 mm, slightly erose. *Petals* rather fleshy, suborbicular, or broad-obovate, 4–6 by 4–6 mm, slightly contracted at the base; margin rather thin, yellowish (when dry). *Disk* fleshy, flat, suborbicular, sometimes slightly 5-lobed, 3½–4½ mm ø, *c.* ½ mm high. *Stamens* 3, *c.* 2 mm; anthers transverse-dehiscent. Pistil *c.* 1 mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell.

Distr. *Malesia*: Borneo (Sandakan and W. Kutai).

Ecol. Lowland hill forests up to 150 m.

15. *Salacia castaneifolia* RIDL. Kew Bull. (1938) 241.

Branchlets sharply 4-angular. Stipules triangular, *c.* 1 mm long, laciniate. *Leaves* subcoriaceous, elliptic-lanceolate, or lanceolate, 14–19 by 4½–6½ cm; base cuneate to attenuate; apex acuminate; margin serrate-crenate; nerves *c.* 12 pairs; petiole 1–1½ cm. *Flowers* fascicled, a few in a leaf axil. Pedicels 2–5 mm. *Calyx* lobes (from flower-bud) deltoid or triangular, ½–1 mm long, short-fimbriate. *Petals* green, fleshy, subtund, or broad-elliptic, 3½–4 by 2¾–3¾ mm; margin thin, yellowish and transparent (after boiling), entire or slightly erose. *Disk* round, flat, 3–4 mm ø, slightly convex near the central part (½–¾ mm high) and gradually, slightly thinner towards the margin. *Stamens* 3, *c.* 1 mm; anthers slightly obliquely dehiscent. Pistil *c.* 1 mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell, pendulous.

Distr. *Malesia*: Borneo (Sarawak), once collected.

16. *Salacia marginata* DING HOU, Blumea 12 (1963) 35.

Liana. Stipules triangular, *c.* ½–1 mm, erose or laciniate. *Leaves* coriaceous, rather shining above, ovate to ovate-oblong, elliptic-oblong, rarely obovate-oblong, 9–19 by 5–8½ cm; base obtuse or cuneate; apex acute; margin entire; nerves 6–9 pairs; petiole ± terete, 1¼–2 cm. *Flowers* greenish, a few on an axillary brachyblast or short peduncle (*c.* 1½ mm). Bracts triangular or deltoid, *c.* 1 mm long. Pedicels 2½–4 mm. *Calyx* lobes ovate, 2–3 mm long, short-fimbriate. *Petals* ± oblong, thin coriaceous when dry, 6 by 4 mm, obtuse; margin rather thin, yellowish when dry. *Disk* fleshy, flat, *c.* 5 mm ø, ¾–1 mm high, 5-lobed. *Stamens* 3, *c.* 2 mm long; anthers transversely dehiscent. Free part of the pistil pyramidal, *c.* 1 mm high. *Ovary* 3-celled. *Ovules* 4–5 in each cell.

Distr. *Malesia*: Philippines (Palawan: Puerto Princesa and Mt Victoria).

Ecol. Lowland forests, from sea-level up to 100 m.

17. *Salacia grandiflora* KURZ, J. As. Soc. Beng. 41, ii (1872) 300, *non* PEYRITSCH, 1878; LAWS, in Hook. f. Fl. Br. Ind. 1 (1875) 626; KURZ, J. As. Soc. Beng. 44, ii (1875) 163; For. Fl. Burma 1 (1877) 259; KING, J. As. Soc. Beng. 65, ii (1896) 365, *incl. var. longifolia* (HOOK. f.) KING; RIDL. J. Fed. Mal. St. Mus. 10 (1920) 86; Fl. Mal. Pen. 1 (1922) 458, f. 45; HEYNE, Nutt. Pl. (1927) 985; BURKILL & HANIFF, Gard. Bull. S.S. 6 (1930) 185. —*S. longifolia* HOOK. f. *ex* LAWS, in Hook. f. Fl. Br. Ind. 1 (1875) 626, *nom. illeg.*, *non* WALL. 1832. —*S. scortechinii* KING, J. As. Soc. Beng. 65, ii (1896) 364; RIDL. Fl. Mal. Pen. 1 (1922) 457.

Liana or scandent shrub, rarely small tree. Branchlets sometimes puberulous, usually whitish when dry. Stipules triangular, *c.* ½ mm long. *Leaves* sometimes spiral, subcoriaceous to coria-

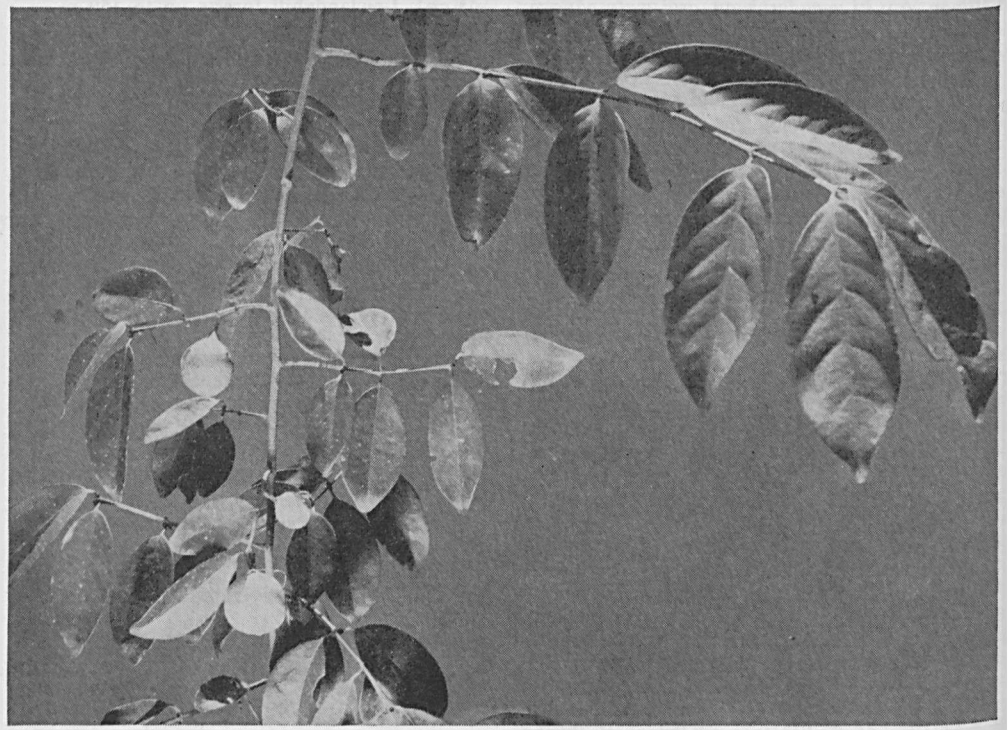


Fig. 35. *Salacia verrucosa* WIGHT (cult. Hort. Bog. sub n. XVII.G.74, from Sumatra).

ceous, usually shining on both surfaces, elliptic-oblong, or -lanceolate, narrow oblong-lanceolate, ovate to ovate-oblong, oblong, very rarely obovate-oblong, 7–34½ by 2½–11½ cm; base obtuse, cuneate; apex acuminate, short-acuminate, or acute, very rarely rounded; margin entire, sometimes sparsely, slightly crenate; nerves 6–12 pairs; petiole 6–15 mm. Bracts triangular, c. 1 mm long, laciniate at the margin. Pedicels 3–6 mm. *Flowers* whitish or yellowish, 3–6 or rarely more on very short, axillary or extra-axillary, bracteolate tubercles, sometimes ramiflorous. Outer 2 *calyx* lobes smaller, deltoid or ovate, 1¼–2 mm long, the inner 3 suborbicular, sometimes slightly sub-reniform, 2–4 mm long, short-fimbriate. *Petals* spreading at anthesis, obovate, or obovate-elliptic, 4–7 by 3–6 mm. *Disk* brown when fresh, suborbicular, ½–1¾ mm high, 1¾–3 mm ø, fleshy, flat, convex in the central part, thin and rim-like towards the margin. *Stamens* 3, ½–⅔ mm; anthers transverse-oblong. *Pistil* c. ¼ mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell. *Fruit* orange pink, 2½–5 cm ø, rugose, subtended by the persistent calyx lobes and petals. *Seeds* 2 or more in each fruit, broad-ellipsoid, 1½–2 by 1–1½ cm.

Distr. India (Andamans), Burma (Mergui), Peninsular Thailand (Nan Chut), and *Malesia*: Sumatra (Tapanuli), Malay Peninsula (throughout but scattered), and E. Borneo (W of Sa-

marinda).

Ecol. In forests from lowland up to 750 m. Vern. Sumatra: *andor solpu*, Tapanuli; Mal. Pen.: (*akar*) *mempedal ayam*, *akar pudal ayam*, *ampedal ayam*, *hempedal ayam*, *membatu pasir*, *mèriku*, *masi sèjuk*, *pedal ayam*, *sèrapat*.

Uses. A decoction from the roots is used after childbirth. The fruits have a sweetish pulp round the seeds which can be eaten (cf. BURKILL, Dict. 2, 1935, 1943; HEYNE, Nutt. Pl. 1927, 985).

Notes. I have chosen MAINGAY 400/2 from Malaya as the lectotype (in K, isotype in L).

The type of *S. scortechinii* was cited by KING as SCORTECHINI 1848 (BM, SING). There is one collection of SCORTECHINI in the Kew Herbarium with the same field label and KING's annotation as the above mentioned two specimens but bearing the number '848'.

18. *Salacia verrucosa* WIGHT, Ill. Ind. Bot. 1 (1840) 134; LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 628; KURZ, J. As. Soc. Beng. 44, ii (1875) 163; For. Fl. Burma 1 (1877) 259; RIDL. J. Fed. Mal. St. Mus. 10 (1920) 86; Fl. Mal. Pen. 1 (1922) 459; MERR. En. Philip. 2 (1923) 488; CRAIB, Fl. Siam. En. 1 (1926) 292; TARDIEU, Suppl. Fl. Gén. I.-C. 1 (1948) 823, *excl. syn.*—*S. polyantha* KORTH. Kruidk. (1842) 182, *non* STEUD. 1841; Flora 31 (1848) 579; MIQ. Fl. Ind. Bat. 1, 2 (1859) 579; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 150;

KING, J. As. Soc. Beng. 65, ii (1896) 367.—*S. kunstleri* KING, l.c. 368; RIDL. Fl. Mal. Pen. 1 (1922) 460.—Fig. 35.

Liana, sometimes erect shrub, rarely a small tree up to 6 m. Branchlets usually densely covered with lenticels, rarely rather smooth. Stipules deltoid, c. 1 mm long, erose. *Leaves* sometimes associated with some spirally arranged ones, chartaceous, shining above, elliptic to elliptic-lanceolate, broad-elliptic, or obovate, 8–18½ by 4–6 cm (on sterile branches up to 24 by 12 cm); base cuneate, obtuse; margin crenulate or subentire; nerves 6–10 pairs; petiole 3–10 mm. Bracts deltoid, c. ½ mm long, short-fimbriate. Pedicels 9–14½ mm. *Flowers* pale dull green, or greenish yellow, many on a short, axillary, bracteate tubercle. *Calyx* divided almost to the base, lobes deltoid, or suborbicular, c. 1 mm long, obtuse, slightly erose or short-fimbriate. *Petals* broad-elliptic, or obovate, 2–3 by 1½–2 mm, rather fleshy, obtuse, entire, with obscure, longitudinal veins. *Disk* suborbicular, flat, slightly concave in the central part, 1¼–1½ mm ø, c. ½ mm high, the tissue at the base slightly extended outward into a narrow membranous rim. Pistil c. ½ mm emerging from the disk, pyramidal. *Ovary* 3-celled. *Stamens* 3, ½–¾ mm; anthers brown coloured at the base. *Ovules* 2, inserted near the inner angle at the base. *Fruit* subglobose, c. 2½ cm ø, red. *Seeds* slightly planoconvex, 1½–1¾ by 1–1½ cm.

Distr. India (Assam & Khasia Hills), Thailand (scattered), Burma (Tenasserim and Mergui), Indo-China (Laos and Cochinchina) and *Malesia*: Sumatra (Indragiri, also in Banka and Billiton), Malay Peninsula (Perak, Kelantan, Pahang, and Langkawi Is.), Borneo (Sarawak, North Borneo, G. Pamatton, Martapura and P. Lampe), Philippines (Luzon), and Celebes (Gorontalo).

Ecol. In forests from lowland up to 920 m. Vern. *Akar pëlutang tanga*, Banka.

Note. According to MERRILL (l.c.), CERON (Cat. Pl. Herb. Manila 1892, 48) recorded the occurrence of *S. verrucosa* WIGHT in the Philippines, on the strength of VIDAL 2402, 2403, and 2405 (K) from Luzon. I have not seen CERON's publication, but these collections of VIDAL are correctly identified.

19. *Salacia ovalis* KORTH. Kruidk. (1842) 182; Flora 31 (1848) 579, non LAWS. 1875; Miq. Fl. Ind. Bat. 1, 2 (1859) 597; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 149; AMSHOFF, Blumea 5 (1945) 519.—*S. roxburghii* (non WALL.) VIDAL, Sinopsis (1883) 20, t. 31D; MERR. En. Philip. 2 (1923) 487.—*S. integrifolia* MERR. Philip. J. Sc. 1 (1906) Suppl. 85; En. Philip. 2 (1923) 487.—Fig. 36f-g.

Liana up to 12 m. Stipules laciniate, attached along the branchlet just below the articulation of the petiole. *Leaves* chartaceous, elliptic-oblong, or elliptic, ovate-oblong or obovate-oblong, 5½–12½ by 2–5 cm; base cuneate; apex acuminate; margin usually entire, very rarely slightly, remotely crenulate; nerves 4–7 pairs; petiole 3–7

mm. Bracts triangular, ¾–1 mm long, usually fimbriate. Pedicels 5–11 mm, with elastic threads shown on breaking. *Flowers* yellowish (once noted), several in fascicles on axillary, short, condensed bracteate tubercles. *Calyx* lobes triangular or deltoid, ½–¾ mm long, lacinate or short-fimbriate. *Petals* suborbicular, or broad-elliptic, 1½–2½ by 1½–2¼ mm, slightly erose, slightly contracted at the base. *Disk* discoid, 1–1½ mm ø, c. ¼ mm high, sometimes slightly 5-angular. *Stamens* 3, c. ¾ mm; anthers transverse-dehiscent. Pistil c. ½ mm emerging from the disk. *Ovary* 3-celled. *Ovules* (1–2) in each cell. *Fruit* subglobose, 2–3 cm ø.

Distr. *Malesia*: Sumatra (East Coast), Java (Djakarta, Pasuruan, Kedungdjati, Besuki), Philippines (Mindoro, Luzon, Panay and Mindanao), Celebes (Pangkadjene, Menado, Ko-Walowa, and Malili), and Moluccas (Sula Is.).

Ecol. In thickets and forests from lowland up to 1200 m.

Vern. Sumatra: *gurach batu*, Asahan; Philippines: *matang olang*, Tag.

20. *Salacia leucoclada* RIDL. Kew Bull. (1938) 238.—*S. litseifolia* RIDL. l.c.

Liana. Branchlets slightly whitish or light brown when dry. Stipules triangular, c. 1 mm long, slightly erose. *Leaves* chartaceous to subcoriaceous, rather shining on both surfaces, elliptic-oblong to lanceolate, 4½–20 by 1½–6 cm; base cuneate; apex acuminate, apiculate; margin entire or sometimes slightly crenulate; nerves 3–7 pairs; petiole 2–3 mm. Bracts triangular, c. 1 mm long, short-fimbriate at the margin. Pedicels 1½–4 mm, with elastic threads shown on breaking. *Flowers* axillary or ramiflorous, 1- or 2, sometimes several in fascicles, usually on short bracteate tubercles. *Calyx* lobes fleshy, semi-orbicular or ± reniform, 1–1½ by 1½–3 mm, glanduliform or slightly erose, sometimes entire at the margin. *Petals* persistent, fleshy, elliptic, or oblong-elliptic, sometimes obovate-oblong, 4–5 by 2–3 mm, obtuse, entire or slightly erose. *Disk* fleshy, annular-pulvinate, slightly contracted at the base, 1½–1¾ mm ø, 1½–1¾ mm high, sometimes slightly narrowed at the apex and base, rather smooth. *Stamens* 3, 1½–2 mm long; anthers free at the lower ⅔, ± longitudinally dehiscent, short-apiculate. Pistil 1–1½ mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2(–3) in each cell, inserted at the central part of axis. *Fruit* subglobose, rusty green, c. 6½ cm ø. *Seeds* planoconvex, c. 3 by 2 cm, densely covered with a layer (c. 3 mm thick) of pulp.

Distr. *Malesia*: Borneo (Sarawak: Lundu, Mt Mulu, Kuala Belait Distr.; Mt Kinabalu; S. Borneo: S of Kuala Kwajan).

Ecol. In forests from lowland up to 1590 m.

Note. RIDLEY described the flowers of *S. litseifolia* as sessile. However, the duplicate of the type (HAVILAND 871, K, SAR) in the Sarawak Herbarium has distinctly pedicelled flowers still attached on the specimen. It might be possible that the specimen which RIDLEY examined had

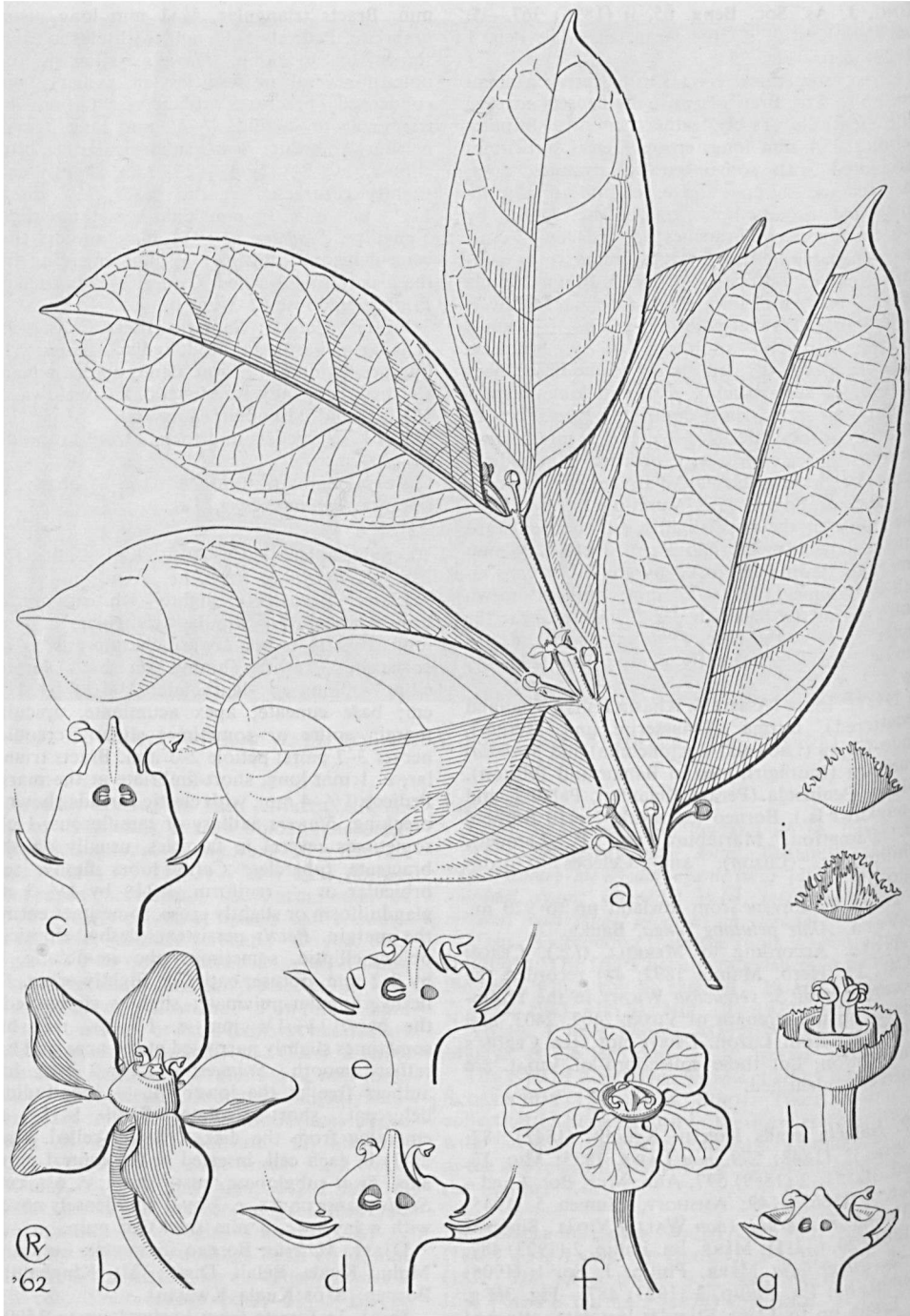


Fig. 36. *Salacia maingayi* LAWS. *a.* Habit, $\times \frac{2}{3}$, *b.* flower, $\times 4$, *c.* ditto, in section, $\times 8$.—*S. subalternifolia* MERR. & PERRY. *d.* Flower, in section, $\times 16$.—*S. macrophylla* BL. *e.* Flower, in section, $\times 16$.—*S. ovalis* KORTH. *f.* Flower, $\times 8$, *g.* ditto, in section, petals removed, $\times 16$.—*S. wenzelii* MERR. *h.* Flower, petals removed, $\times 8$.—*S. cymosa* ELMER. *i.* Exterior and interior view of bract, $\times 8$ (*a-c* CURTIS 3288, *d* GJELLERUP 731, *e* DILLEWIJN 606, *f-g* KOORDERS 28743 β , *h* WENZEL 1534, *i* ELMER 12997).

very young flower-buds or detached flowers with pedicels broken off.

21. *Salacia venosa* DING HOU, *Blumea* 12 (1963) 34.—*Hiptage lawsonii* ELMER, *Leafl. Philip. Bot.* 8 (1915) 2751, non *S. lawsonii* KING, 1896.

Scandent shrub. Stipules triangular. *Leaves* thin-coriaceous, rather shining, elliptic-oblong, 6–13 by 2 $\frac{2}{3}$ –5 cm; base cuneate to attenuate; apex bluntish, sometimes acute; margin entire; nerves 5–8 pairs; petiole 3–7 mm. Bracts triangular c. 1 mm long, short-fimbriate or erose. Pedicels c. 6 mm, with elastic threads shown on breaking. *Flowers* green, few in axillary fascicles. *Calyx* lobes triangular, $\frac{2}{3}$ –1 mm long, obtuse, short-fimbriate. *Petals* broad-ovate, -elliptic, or suborbicular, 3 $\frac{1}{2}$ –4 by 3–4 mm, entire. *Disk* annular-pulvinate, c. 1 mm high, c. 2 mm ϕ , slightly narrower and truncate at the apex. *Stamens* 3, c. 1 $\frac{1}{2}$ mm; anthers \pm transversely dehiscent. *Pistil* c. 2 mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell.

Distr. *Malesia*: Philippines (Luzon: Prov. of Zamboales; Sibuyan; Leyte).

Ecol. In lowland forests and in sandy gravelly ground along the wooded banks, up to 225 m.

Note. From the floral structure of the type (ELMER 12551, BO, K, L) and the characters of the deflorate flowers of MERRILL 2401 (K), it is clear that this species belongs to *Salacia*. Its leaves resemble those of *Hippocratea lawsonii* ELMER (= *Loeseneriella pauciflora*), based on ELMER 12241 (BO, BM, K, L, P), in shape and densely reticulate venation, and MERRILL erroneously reduced it to that species; this mistake was perpetuated by JACOBS in this *Flora*, vol. 5, p. 136.

22. *Salacia maingayi* LAWS. in Hook. *f. Fl. Br. Ind.* 1 (1875) 626; KING, *J. As. Soc. Beng.* 65, ii (1896) 363; RIDL, *Fl. Mal. Pen.* 1 (1922) 461.—*S. lobbii* LAWS. in Hook. *f. Fl. Br. Ind.* 1 (1875) 626; KING, *J. As. Soc. Beng.* 65, ii (1896) 370.—*S. megasperma* RIDL, *Kew Bull.* (1938) 237.—*Fig.* 36a-c.

Shrubby creeper. Stipules deltoid or triangular, $\frac{1}{2}$ – $\frac{1}{2}$ mm long. *Leaves* subcoriaceous, shining, elliptic-oblong, sometimes broad-elliptic, rarely obovate-oblong, (4–)7–16 $\frac{1}{2}$ by (2 $\frac{1}{2}$ –)3 $\frac{1}{4}$ –7 cm; base cuneate, or obtuse; apex acuminate to short-cuspidate; margin subentire; nerves 5–8 pairs; petiole 3–7 mm. Bracts triangular, c. $\frac{1}{2}$ mm long, slightly erose, with filiform or lacinate colleters attached on the inner surface. Pedicels rather stout, 8–13 mm, with elastic threads shown on breaking. *Flowers* waxy pale green, or ochraceous yellow, sometimes greenish yellow, usually 1 or 2 in a leaf axil. *Calyx* lobes fleshy, triangular or semi-orbicular, c. 1 mm long, slightly erose. *Petals* rather fleshy, ovate, broad-ovate, or elliptic, 4 $\frac{1}{2}$ –6 by 2 $\frac{1}{2}$ –4 mm, obtuse, entire. *Disk* conical-pulvinate, c. 3 mm ϕ , 1 $\frac{1}{2}$ –2 mm high, truncate at the apex. *Stamens* 3, 1–1 $\frac{1}{2}$ mm; anthers transversely dehiscent. *Pistil* $\frac{1}{2}$ –1 $\frac{3}{4}$ mm emerging from the disk, pyramidal. *Ovary* 3-celled. *Ovules* 2 in each cell, attached at the central part of axis.

Fruit (only a piece of cross-section seen) c. 4 cm ϕ (c. 6 cm long, *vide* RIDLEY). *Seeds* several in each fruit, \pm oblong, c. 3 cm long, \pm triangular on cross-section, c. 2 cm wide.

Distr. *Malesia*: Malay Peninsula (Perak, Malacca, Penang and Singapore) and Borneo (Sarawak and North Borneo).

Ecol. Lowland forests, in ravines, sometimes on hilly rocks, up to 300 m.

Note. The type of *S. maingayi*, MAINGAY 398 (K), has rather young branchlets, smaller ovate leaves (4–5 by 2 $\frac{1}{2}$ –3 $\frac{1}{2}$ cm) while the type of *S. lobbii*, LOBB *s.n.* (K), has older branchlets, elliptic to elliptic-oblong leaves (7–11 by 3–5 cm). This may be the reason why LAWSON described them as two distinct species at the same time. Additional collections show that these characters are variable, but that the floral characters are constant. RIDLEY (1922, *l.c.*) already reduced *S. lobbii* as a synonym.

23. *Salacia laurifolia* STAFF, *Trans. Linn. Soc. Bot. II*, 4 (1894) 141.—*S. beccarii* RIDL, *Kew Bull.* (1938) 238.

Liana. Branches light greyish, terete sometimes 4-angular. Stipules triangular, c. $\frac{1}{2}$ mm long, lacinate. *Leaves* chartaceous to subcoriaceous, usually the old leaves with elastic threads shown on breaking, elliptic-oblong, -lanceolate, and lanceolate, rarely obovate-oblong, 6 $\frac{1}{2}$ –18 $\frac{1}{2}$ by 2 $\frac{1}{4}$ –8 cm; base cuneate to attenuate, sometimes obtuse; apex acuminate to cuspidate; margin subentire, or remotely, slightly crenulate; nerves 6–8 pairs; petiole $\frac{1}{4}$ –1 $\frac{1}{2}$ cm. Bracts fleshy, deltoid, or ovate, c. 1 mm long, short-fimbriate. Pedicels 2–3 mm. *Flowers* greenish, or dull yellow, in fascicles on short, axillary, bracteate tubercles. *Calyx* lobes fleshy, deltoid, $\frac{1}{2}$ – $\frac{2}{3}$ mm long, erect, obtuse and entire. *Petals* slightly spreading at anthesis, fleshy, thinner near the margin, slightly varying in size, oblong, 2 $\frac{1}{3}$ –2 $\frac{3}{4}$ by $\frac{3}{4}$ –1 $\frac{1}{4}$ mm, entire, obtuse, slightly keeled, sometimes slightly triangular in cross-section, the overlapping margins pressed on the ones below, or fitting in a shallow groove on the dorsal surface of the ones below. *Disk* broad-oblong, 1–1 $\frac{1}{4}$ mm high, $\frac{3}{4}$ –1 mm ϕ , obtuse at the apex, the base slightly extended outward and forming a narrow rim. *Stamens* 3, c. $\frac{1}{2}$ mm; anthers slightly obliquely dehiscent. *Pistil* c. $\frac{1}{3}$ mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell, attached at the central part of the axis. *Fruit* globose or subglobose, 2 $\frac{3}{4}$ –3 $\frac{1}{2}$ cm ϕ , rugose outside. *Seeds* subglobose, 1 $\frac{1}{2}$ –2 cm ϕ , densely covered with pulp.

Distr. *Malesia*: Borneo (Sarawak, Mt Kinabalu, Sandakan, Batu Mili, and W. Kutai).

Ecol. Primary forests, from the lowland up to 1500 m.

24. *Salacia exsculpta* KORTH, *Kruidd.* (1842) 183; *Flora* 31 (1848) 579; MIQ, *Fl. Ind. Bat.* 1, 2 (1859) 597; *Ann. Mus. Bot. Lugd.-Bat.* 4 (1869) 149.—*S. rubra* LAWS. in Hook. *f. Fl. Br. Ind.* 1 (1875) 627; KING, *J. As. Soc. Beng.* 65, ii (1896) 370;

RIDL. Fl. Mal. Pen. 1 (1922) 460. —*S. wrayi* KING, J. As. Soc. Beng. 65, ii (1896) 367; RIDL. Fl. Mal. Pen. 1 (1922) 460.

Liana. Branchlets usually whitish. Stipules triangular or reniform, $\frac{1}{3}$ – $\frac{3}{4}$ mm long, lacinate or short fimbriate. *Leaves* chartaceous to subcoriaceous, rather shining above, elliptic to elliptic-oblong, 5–9 by 2½–4 cm; base acute to attenuate; apex acuminate; margin entire or subentire; nerves 5–8 pairs; petiole $\frac{1}{3}$ – $\frac{3}{4}$ cm. Bracts triangular, $\frac{1}{2}$ – $\frac{3}{4}$ mm long, short-fimbriate. Pedicels 2½–3 mm. *Flowers* yellow, axillary, fascicled. *Calyx* lobes deltoid, c. $\frac{1}{2}$ mm long, fleshy, glandular on the margin. *Petals* ovate-oblong, 1½–2 by $\frac{3}{4}$ –1 mm, slightly keeled outside, obtuse or acute, rarely slightly erose. *Disk* round, short-cylindric, c. $\frac{1}{2}$ – $\frac{3}{4}$ mm high, $\frac{3}{4}$ –1 mm ϕ , with a narrow rim at the base, truncate or slightly concave at the apex. *Stamens* 3, c. $\frac{1}{3}$ mm; anthers transversely dehiscent. Pistil c. $\frac{1}{2}$ mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2(–3) in each cell, inserted at the middle of the axis. *Fruits* broad-obovoid, c. 4½ by 3½ cm, \pm stalk-like, contracted at the base, rugose.

Distr. *Malesia*: Sumatra (Asahan and Singalagang) and Malay Peninsula (Perak, Malacca, Penang, and Singapore).

Ecol. In forests, from the lowland up to 1000 m.

Vern. Sumatra: *kaju baringin*, Asahan; Mal. Pen.: *akar mata kuching*, M.

Notes. In the original description of *S. rubra*, LAWSON cited only 'Malacca, MAINGAY'. There are two sheets of MAINGAY's under that name in the Kew Herbarium; MAINGAY 1525 (lectotype) has two small branches and one of them bears a detached fruit mounted near the pedicel from which it obviously broke off; MAINGAY 398/2 has three branchlets with some detached leaves. Each of these two specimens has a small package containing fruits under the number MAINGAY 3407 mounted on the sheet.

The type of *S. wrayi*, WRAY Jr 2542 (K), has both flowers and fruit; the fruits, which are distinctly rugose, broad-obovoid and contracted at the base, and the leaves are similar to those of *S. rubra*. The flowers of *S. wrayi* very well match those of the present species, the type of which has no fruit.

25. *Salacia euphlebica* MERR. Philip. J. Sc. 13 (1918) Bot. 22; En. Philip. 2 (1923) 486.

Scandent shrub. Young branchlets slightly angular. Stipules triangular, $\frac{1}{2}$ – $\frac{1}{2}$ mm long. *Leaves* chartaceous, elliptic-oblong and lanceolate; 10–21 by 4–6¾ cm; base cuneate, obtuse or rounded; apex acuminate to acuminate-caudate; margin distinctly or rarely obscurely apiculate-crenulate; nerves 6–8 pairs; petiole 3–8 mm. Bracts triangular, c. $\frac{3}{4}$ mm long, slightly short-fimbriate. Pedicels 1–3 mm. *Flowers* greenish yellow, in axillary fascicles on a very short bracteolate brachyblast. *Calyx* lobes triangular or deltoid, c. $\frac{1}{2}$ mm long, slightly erose at the margin. *Petals* rather fleshy, oblong, 1½–2 by $\frac{1}{3}$ –1 mm, rounded. *Disk* short cylindrical, c. 1 mm high,

c. $\frac{2}{3}$ mm ϕ . *Stamens* 3, $\frac{1}{3}$ –1 mm; anthers transversely or sometimes slightly obliquely dehiscent. Pistil c. $\frac{1}{3}$ mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell, attached at the central part of the axis. *Fruit* (broken) subglobose, c. 2¾ cm ϕ , smooth.

Distr. *Malesia*: Malay Peninsula (Perak and Selangor) and Philippines (Mindoro and Mindanao).

Ecol. In thickets and forests at low altitude up to 150 m.

26. *Salacia nitidissima* MERR. J. Str. Br. R. As. Soc. 86 (1922) 325.

Liana. Stipules small, triangular, c. $\frac{1}{3}$ mm long. *Leaves* chartaceous to subcoriaceous, rather shining above, elliptic-oblong, or elliptic, rarely ovate-oblong, 5½–14 by 2–6½ cm; base cuneate; apex acuminate; margin subentire; nerves 5–9 pairs; petiole 7–12 mm. Bracts triangular, $\frac{1}{2}$ –1 mm long, slightly erose. Pedicels 3 mm, with elastic threads shown on breaking. *Flowers* yellowish brown or brownish green, 1–3 in a leaf axil. *Calyx* lobes fleshy, triangular or semi-orbicular, $\frac{1}{2}$ –1 mm long, entire or slightly erose. *Petals* rather fleshy, elliptic or broad-elliptic, 2–3¼ by 1½–1¾ mm, entire. *Disk* annular-pulvinate, c. 1 mm high, c. 1¾ mm ϕ , broader at the base, gradually narrowed upwards. *Stamens* 3, c. $\frac{3}{4}$ mm; anthers transverse-dehiscent. Pistil c. $\frac{1}{2}$ mm emerging from the disk, pyramidal. *Ovary* 3-celled. *Ovules* 2, attached at the central part of the axis.

Distr. *Malesia*: Sumatra (Riouw: Kuala Belilas) and Borneo (Sibuga near Sandakan and Peak of Balikpapan).

Ecol. In lowland forests and also found on limestone at 600 m.

27. *Salacia viminea* WALL. [Cat. (1831) n. 7267] ex LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 627; KING, J. As. Soc. Beng. 65, ii (1896) 362; RIDL. Fl. Mal. Pen. 1 (1922) 456.

Scandent or rarely erect shrub, or vine. Stipules small, triangular. *Leaves* chartaceous, usually spirally arranged, sometimes also associated with opposite or subopposite ones, elliptic to elliptic-lanceolate, sometimes ovate-oblong, 5–14 by 2–6½ cm; base attenuate; apex acuminate; margin slightly crenulate to subentire; nerves 5–9 pairs; petiole 3–5 mm. Bracts triangular, c. $\frac{2}{3}$ mm long, slightly erose. Pedicels 4–9 mm. *Flowers* in fascicles on axillary, bracteate brachyblasts. *Calyx* lobes triangular, $\frac{1}{3}$ mm long, glandular or erose on the margin. *Petals* broad-elliptic, or ovate, 1¾–2½ by 1½–1½ mm, obtuse. *Disk* annular-pulvinate, $\frac{1}{2}$ – $\frac{2}{3}$ mm thick, c. 1 mm ϕ , slightly broader at the base, papillose. *Stamens* 3, $\frac{2}{3}$ mm; anthers transversely dehiscent. Pistil $\frac{1}{3}$ – $\frac{1}{2}$ mm emerging from the disk. *Ovary* 3-celled. *Ovules* 2 in each cell. *Fruit* globose, c. 2 cm ϕ , 1-seeded. *Seeds* globose, c. 1½ cm ϕ , covered with dried pulp.

Distr. Burma (Mergui), Siam, Indo-China (Cambodia), and *Malesia*: Sumatra (Siberut, Siboa-

langit, and Asahan) and Malay Peninsula (Perak, Trengganu, Pahang, Penang, and Singapore).
Ecol. Lowland forests, up to 350 m.

28. *Salacia chinensis* LINNÉ, Mant. 2 (1767) 293; GMEL. in Linné, Nat. Reg. Veget. ed. 13, 1 (1791) 107 ('*sinensis*'); repr. in Syst. Veg. 1 (1796) 107; BLANCO, Fl. Filip. (1837) 26; ed. 2 (1845) 19; ed. 3, 1 (1877) 36, excl. t. 86.—*Tonsella prinoides* WILLD. Ges. Naturf. Fr. Neue Schr. (Act. Acad. Cur. Berl.) 4 (1803) 184 (type not seen).—*Tonsella chinensis* (L.) SPRENG. Syst. 1 (1824) 177.—*S. prinoides* DC. Prod. 1 (1824) 571; BL. Bijdr. (1825) 22; W. & A. Prod. 1 (1834) 105; SPAN. Linnaea 15 (1841) 179, incl. var. *timorensis* SPAN.; KORTH. Kruidk. (1842) 184; HASSK. Tijds. Nat. Gesch. Phys. 11 (1844) 190; Pl. Jav. Rar. (1848) 233; MIQ. Fl. Ind. Bat. 1, 2 (1859) 597; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 148; LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 626; KURZ, J. As. Soc. Beng. 44, ii (1875) 163; For. Fl. Burma 1 (1877) 260; F.-VILL. Nov. App. (1880) 47; VIDAL, Synopsis (1883) 20, t. 31, f. E; Phan. Cuming. (1885) 103; K. SCH. & HOLLR. Fl. Kais. Wilh. Land (1889) 70; KING, J. As. Soc. Beng. 65, ii (1896) 366, incl. var. *macrophylla* quoad specimen, non quoad nomen; K. SCH. & LAUT. Fl. Schutzgeb. (1901) 413; LOES. Nova Guinea 8 (1910) 281; KOORD.-SCHUM. Syst. Verz. (1911) Fam. 159, 2; BACK. Schoolfl. (1911) 237; KOORD. Exk. Fl. Java 2 (1912) 527; MERR. Fl. Manila (1912) 303; Philip. J. Sc. 11 (1916) Bot. 286; Sp. Blanc. (1918) 236; En. Born. (1921) 355; RIDL. Fl. Mal. Pen. 1 (1922) 459; MERR. En. Philip. 2 (1923) 487; RENDLE, J. Bot. 62 (1924) Suppl. 23; MERR. Philip. J. Sc. 29 (1926) 388; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 228.—*S. patens* DECNE, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 441; Herb. Timor. Descr. (1835) 113, non TRIANA & PLANCH. 1872; STEUD. Nom. ed. 2, 2 (1844) 492; MIQ. Fl. Ind. Bat. 1, 2 (1859) 598.—*Comocladia serrata* BLANCO, Fl. Filip. (1837) 30.—*S. evonymiflora* ZIPP. ex MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 149.—*S. latifolia* WALL. [Cat. (1831) n. 4222] ex LAWS. in Hook. f. Fl. Br. Ind. 1 (1875) 629; KING, J. As. Soc. Beng. 65, ii (1896) 366; RIDL. J. Fed. Mal. St. Mus. 10 (1920) 86; Fl. Mal. Pen. 1 (1922) 459; AMSHOFF, Blumea 5 (1945) 518.—*S. naumannii* ENGL. Bot. Jahrb. 7 (1886) 464; Forschungsr. Gazelle 4 (1886) Phanerog. 36, t. 13, ex descr. & pl.; KANEHIRA, Fl. Micrones. (1933) 195, f. 82; LOES. in E. & P. Pfl. Fam. ed. 2, 20b (1942) 228.—*S. littoralis* BACK. Fl. Bat. 1 (1907) 305.—*S. ovalis* (non KORTH.) KOORD.-SCHUM. Syst. Verz. (1911) Fam. 159, 2; BACK. Schoolfl. (1911) 237; KOORD. Exk. Fl. Java 2 (1912) 527.—*S. socia* CRAIB, Kew Bull. (1926) 352.—*Salacicatea kraemeri* (non LOES.) KANEHIRA, Fl. Micrones. (1933) 196, f. 83.
Liana, scandent shrub, or rarely a small tree. Stipules deltoid or reniform, 1/3–1/2 mm long. Leaves subcoriaceous, rather discolorous, ovate, broad-elliptic, elliptic to elliptic-lanceolate, obovate, rarely suborbicular, or obovate-oblong, 4–17 by 1 3/4–9 1/2 cm; base cuneate; apex acute,

short-acuminate to acuminate, sometimes obtuse; margin entire, or slightly crenulate; nerves 4–10 pairs; petiole 1–1 1/2 cm. Bracts triangular, slightly erose. Pedicels 5–10(–18) mm. Flowers yellowish or yellowish green, few to many in fascicles on axillary bracteate tubercles, sometimes ramiflorous. Calyx lobes triangular, semi-orbicular, 1/2–2/3 mm long, obtuse or rounded, slightly erose. Petals broad-elliptic, -ovate, obovate, or suborbicular, 3–4 by 2 1/2–4 mm, obtuse, with reddish brown pigment in the tissue of the central part, the marginal part yellowish when dry, sometimes the marginal part at the base reflexed and the petals seemingly unguiculate. Disk annular-pulvinate, 1 1/2–2 mm ø, c. 1 mm high, slightly contracted at the central part, narrower at the upper part, slightly lobed and extended downward at the base, usually papillose especially at the lower half. Stamens 3, c. 1 1/2 mm; anthers transversely dehiscent, slightly oblique when young. Pistil c. 1 mm emerging from the disk, triangular. Ovary 3-celled. Ovules 2 in each cell, inserted at the upper inner angle. Fruit globose, sometimes broad-ellipsoid, 1 1/2–2 cm ø, red or orange-red when ripe, usually 1-seeded. Seeds globose, 1–1 1/2 cm ø.

Distr. Widely distributed but scattered in India, Ceylon, Burma, Thailand, Indo-China, China (Hainan), and throughout Malesia to the Carolines (Yap and Palau), N. Queensland (Cape York Peninsula), New Britain, Solomon Is., and as far as Fiji. Fig. 37.

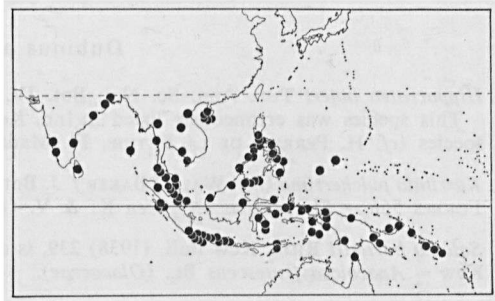


Fig. 37. Distribution of *Salacia chinensis* LINN., also in Fiji.

Ecol. In forests along the seashore and sandy river banks, in lowland primary forests up to 450 m, once recorded at 900 m in Ceylon.

Vern. Sumatra: *akan pèlanduk*, Pariman, *mata pèlanduk*, N. Sum.; Mal. Pen.: *daun puyu*, *rakiat kèchil*, M; Java: (*areuj*) *djahah*, *kètjipot*, *ki tèlor*, *ojot lèma*, *treng kamander konèng*, S, *katjipot*, *mata kantijl*, *tjawelan*, *wangon*, J, *ketjiput*, Md; Lesser Sunda Is.: *anok*, Alor; Philippines: *matang-ùlang*, Tag., *ope*, Ig.; Moluccas: *wolè sèroso*, Halmaheira; New Guinea: *adè-adè*, S. New Guinea, andian, Papua, *kwangoer-patoe*, Aru Is.

Galls. A leaf-gall is caused by an aphid. The leaf blade is rolled or folded up (DOCTERS VAN LEEUWEN, Zooecidia 1926, 330, f. 593).

Notes. The epithet *chinensis* was changed into

sinensis by GMELIN (*l.c.*); it was not that of a new species, as GMELIN cited the literature of LINNÉ. BLANCO applied *S. sinensis* for his plant, citing GMELIN in the second edition of his Flora. MERRILL (Sp. Blanc. 1918, 236) correctly interpreted *Comocladia serrata* BLANCO and *S. sinensis* as belonging to *S. prinoides* (WILLD.) DC. (= *S. chinensis* LINNÉ); the characters given in BLANCO's descriptions are rather clear. Plate 86 in BLANCO's Fl. Filip. ed. 3 (1877) prepared by F.-VILLAR & NAVES named *S. sinensis* is, however, *S. korthalsiana* MIQ., as shown by the ovate-oblong leaves and cymose inflorescences.

The description and drawing of *Salacicratea kraemeri* LOES. in KANEHIRA's Flora Micronesica (1933, 196, f. 83) do not fit to that species, but match rather well *S. chinensis* L., because of the fasciated flowers (not in cymes), 3 stamens (not 2), and the 5-lobed calyx (not calyptra-like).

BRITTON (in Forbes, Wand. 1885, 502) identified two collections of FORBES (3804 and 4075) from Timor as *S. patens* DECNE. According to Dr VAN STEENIS, one of them, the number 3804 (L), is *Glochidion* sp. (*Euphorbiaceae*). Of the other collection I have not seen any material; this also may not belong to *Celastraceae*.

29. *Salacia kalahiensis* KORTH. Kruidk. (1842) 183, t. 38; Flora 31 (1848) 579; MIQ. Fl. Ind. Bat. 1, 2 (1859) 597; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 149.—*S. subscandens* ELMER, Leaf. Philip. Bot. 5 (1913) 1793; MERR. En. Philip. 2 (1923) 487.—

S. minutiflora RIDL. Kew Bull. (1938) 238, non A. C. SMITH, 1939.

Scandent shrub. Stipules lanceolate, 1/2–1 mm long, sometimes lacinate or short-fimbriate at the margin. Leaves elliptic to elliptic-lanceolate, or ovate-oblong, 6–14 1/2 by 1 3/4–5 cm; base cuneate; apex short-acuminate to apiculate; margin crenulate; nerves 4–7 pairs; petiole 3–7 mm. Bracts triangular, obtuse, c. 3/4 mm long. Pedicels 4–4 1/2 mm. Flowers several in fascicles on an axillary, short, simple or sometimes once branched, bracteate brachyblast. Calyx lobes ± deltoid or suborbicular, c. 2/3 mm long, glandular or short-ciliate at the margin. Petals broad-elliptic, 1 1/2–2 by 2/3–1 mm, obtuse, slightly contracted at the base, margin lengthwise reflexed at anthesis, with 5–8 longitudinal veins elevated on the outer surface when dry. Disk fleshy, annular-pulvinate, c. 2/3–1 mm ø, c. 2/3 mm high. Ovary 3-celled. Stamens 3, c. 1 mm. Pistil c. 2/3 mm emerging from the disk. Ovules 2(–1) in each cell. Fruit subglobose, c. 1 1/2 cm ø, red. Seeds broad-ellipsoid, c. 9 by 7 mm, slightly planoconvex.

Distr. Malesia: Java (Palabuhanratu, Banjumas, G. Gombong, and Banjuwangi), Borneo (Sarawak, Kalahiën and Mt Kinabalu), and Philippines (Palawan, Mindoro, Luzon, Samar, Guimaras, and Mindanao).

Ecol. In forests from the lowland up to c. 1200 m.

Vern. Java: *areuj kamander konèng*, S.

Dubious and Excluded

Hippocratea bojeri TUL. Ann. Sc. Nat. Bot. IV, 8 (1857) 92.

This species was erroneously listed in Ind. Kew. as from 'Malacc.'. It is an African (Madagascar) species (*cf.* H. PERRIER DE LA BÂTHIE, Fl. Madagascar, Fam. Hippocrateac., 1946, 22).

Kurrimia pulcherrima (non WALL.) BAKER f. J. Bot. (1924) Suppl. 22, a record from West Java, based on FORBES 566 = *Elaeocarpus oxypyren* K. & V. (*Elaeocarpaceae*).

Salacia bartletti RIDL. Kew Bull. (1938) 239, is according to kind information of Mr L. L. FORMAN, Kew = *Anacolosia frutescens* BL. (*Olacaceae*).

Salacicratea australis LOES. [in E. & P. Pfl. Fam. ed. 2, 20b (1942) 216] *ex* HARMS, Notizbl. Berl.-Dahl. 15 (1942) 676.

Distr. Malesia: New Guinea: Kani Berg, R. SCHLECHTER 17257; Waube Bache, R. SCHLECHTER 17257.

The two collections cited above were destroyed at Berlin and I have not seen any duplicate of them. The characters indicated in the original description are too concise to place this species. It may be related to *Salacia sororia* MIQ. or even be conspecific with it.

HARMS mentioned also an Australian collection: Queensland, Cooktown, on the way to Herberton, WARBURG 19049. Because of the insufficient flowering material, he could not identify it with certainty. I have not seen the specimen or any duplicate of it. So far, there is only one species of *Salacia*, *S. disepala* (C. T. WHITE) DING HOU, known from Queensland bearing a calyptra-like calyx. The specimen mentioned above may belong to it.

Celastrus stylosa WILLD.; F.-VILL. Nov. App. (1880) 47; MERR. En. Philip. 2 (1923) 482.

Gymnospora neglecta WALL.; F.-VILL. *l.c.*; MERR. *l.c.* 483.

Hippocratea arborea ROXB.; F.-VILL. *l.c.*; MERR. *l.c.* 487.

Salacia oblonga WALL.; F.-VILL. *l.c.*; MERR. *l.c.*

Salacia roxburghii WALL. *ex* LAWS.; F.-VILL. *l.c.*; MERR. *l.c.*

The five names listed above are evidently misapplied for the Philippines by F.-VILLAR. There is neither description nor specimen cited for any one of them.

Nomina nuda

For reference these unvalidly published names, which have been mentioned in literature, are listed here instead of placing them in the synonymy of species concerned.

Hippocratea timorensis SPAN. *Linnaea* 15 (1841) 178.—This name was listed in the *Ind. Kew.* but does not occur in the cited work.

Hypsagyne JACK *ex* BURKILL, *J. Str. Br. R. As. Soc.* 73 (1916) 219, 221, 247.—This name was mentioned by JACK in a letter to N. WALLICH. According to MERRILL, *J. Arn. Arb.* 33 (1952) 227, it is *Salacia* L.

Johnia sumatrana JACK *ex* BURKILL, *J. Str. Br. R. As. Soc.* 73 (1916) 221.—This name was mentioned by JACK in a letter to N. WALLICH. According to MERRILL, *J. Arn. Arb.* 33 (1952) 228, it is *Salacia prinoides* (WILLD.) DC. = *S. chinensis* L.

Salacia alternifolia SCORT. MSS. in *Herb. Calc.*, *non* HOCHST. 1844.—KING, *J. As. Soc. Beng.* 65, ii (1896) 362, cited this name in the synonymy of *Salacia viminea* WALL. *ex* LAWS.

Salacia cerasiformis TEYSM. & BINN. *Cat. Hort. Bog.* (1866) 219.

Salacia coromandeliana TEYSM. & BINN. *Cat. Hort. Bog.* (1866) 392 = *S. chinensis* L.

Salacia triplinervis LLANOS, *Mem. Acad. Cienc. Madr.* 3, 4 (1857) 500; repr. in Blanco, *Fl. Filip.* ed. 3, 4, 1 (1880) 101; MERR. *Sp. Blanc.* (1918) 236; *En. Philip.* 2 (1923) 487.—I agree with MERRILL (*l.c.* 1923) that from the specific name LLANOS's plant can not have been a representative of the *Hippocrateaceae*.

Macanea arborea BLANCO, *Fl. Filip.* (1837) 431, according to MERRILL, *Philip. J. Sc.* 10 (1915) Bot. 233; *Sp. Blanc.* (1918) 146; *En. Philip.* 2 (1923) 165 = *Alphonsea arborea* (BLANCO) MERR. (*Annonaceae*).

Addendum

Some additional collections have caused a slight extension of the generic range of the genus *Glyptopetalum*, see p. 256, and *Blumea* 12 (1963) 65.

p. 256 line 5 from top add to Hainan: and Kweichow, and add to line 6: Lesser Sunda Is. (Timor).
p. 258b *G. marivelense* (ELM.) MERR. A new collection has been made in Timor by CINATTI (*n.* 340 in L), but the material is in fruit and therefore only tentatively referred to this species.