

CONNARACEAE (P. W. Leenhouts, Leyden)

Trees, shrubs, or (most Mal. *spp.*) lianas. Indument of simple hairs, rarely dendroid (*Connarus spp.*), often mixed with capitate-glandular hairs. *Leaves* spirally arranged, exstipulate, imparipinnate, rarely unifoliolate. Base of the petiole and petiolules thickened. Leaflets usually not strictly opposite, penninerved to triplinerved, entire, the base often slightly peltate. *Inflorescences* axillary, pseudoterminal or terminal, paniculate, bracteate; pedicels articulated near the apex. *Flowers* 5(-4)-merous, hypogynous, bisexual (rarely by abortion unisexual and then dioecious), heterotri- or -distylous. *Sepals* usually (in Mal. *spp.* always) free or confluent at the very base only. *Petals* free. *Stamens* free or coherent at the base, in 2 whorls, inner (epipetalous) ones nearly always smaller, not rarely sterile or staminodial, sometimes partly absent; anthers dorsifixed in the lower half, curving outwards in anthesis, dehiscing lengthwise and introrse. *Pistils* (8-)5(-3) or 1, epipetalous, free; ovary 1-celled, with 2 nearly basal to axillary, collateral, orthotropous or anatropous (in Mal. *Connarus*) ovules, one of which sometimes small and sterile. *Fruits* dry or more or less fleshy, one-seeded, usually opening by a ventral slit, sometimes also dehiscing along the dorsal side, rarely circumsciss at the base, sometimes indehiscent. *Seed* large, always with an ariloid, with or without endosperm; cotyledons thick, flat.

Distribution. Genera 16, with an estimated number of *c.* 300-350 species, the family circum-tropical, but predominantly developed in Africa, in *Malaysia* represented by 6 genera and *c.* 40 species.

Ecology. Most Malaysian representatives are lianas or scandent shrubs, frequenting open places in the forest, forest-edges, river-banks, *etc.*; a few are medium-sized rain-forest trees. In contrast with the African species among which are many treelets and shrubs from parklands and savannahs, no Malaysian representatives are found in similar habitats in the Lesser Sunda Islands.

Pollination is probably usually performed by insects. The flowers are white to cream-coloured or pinkish, and small, but form together often rather conspicuous inflorescences, which are usually placed near the ends of the twigs. Moreover, the flowers are often reported to be fragrant and in all probability contain honey; at least in *Ellipanthus* the outer side of the staminal tube is sometimes gland-like thickened and is reported to secrete nectar.

In the whole family the flowers are distinctly heterostylous. J. H. HEMSLEY (Fl. Trop. E. Afr., Connar. 1956, 2) wonders whether (part of) these flowers are functionally unisexual. A tendency towards dioecism is only known from the genus *Ellipanthus*. In the other genera the stamens as well as the ovaries, in short-styled as well as in long-styled flowers seem to be fertile. As, however, the flowering period of an individual plant is short, and they are flowering only once a year, it is difficult to solve this problem in the herbarium. It deserves the attention of field botanists.

Dispersal of fruits will probably be effected by birds. The colours of ripe, open fruits are very conspicuous with a typical contrast between pericarp and seed: fruit orange to scarlet, sometimes inside bright green, seed partly protruding, shining brown to black, partly (rarely entirely) covered by the fleshy, yellow to orange ariloid.

Anatomy. SCHELLENBERG, Mitt. Bot. Mus. Un. Zürich no 50 (1910) 80; MOLL & JANSSONIUS, Mikr. 3 (1914) 5 (*Ellipanthus*); SCHELLENBERG, Pfl. R. Heft 103 (1938) 3; HEIMSCH, Lilloa 8 (1942) 168; METCALFE & CHALK, Anat. Dicot. 1 (1950) 471.

Mucilaginous cells are present in the epidermis of many species. In *Malaysia* they are especially large in the upper surface of the leaflets of *Agelaea*, leaving when dried minute pits which are easily observed with a hand lens.

Secretory cavities filled with mucilage or with brown resinous material are known to occur in the parenchyma in several genera. In *Malaysia* they are specially conspicuous in *Connarus*, both in the mesophyll of the leaflets and in the floral parts: sepals, petals, and filaments (see COSTERUS, Ann. Jard. Bot. Btzg Suppl. 2, 1898, 109).

Uses. See BRILL & WELLS, Philip. J. Sc. 12 (1917) A, 184.

Morphology. The *inflorescence* seems to be essentially axillary and paniculate. The development apparently goes according to two schemes. Firstly, by the grouping together towards the ends of the twigs and by the reduction of the upper leaves to bracts, the inflorescences may become pseudo-terminal (vegetative terminal bud present and often developing after the flowering period) or terminal (no vegetative terminal bud present). Secondly, the inflorescences may remain axillary and become fasciculate

(sometimes even pseudo-umbellate) by the reduction of the peduncle; in this case all branches are often of about the same length, and together inserted on a knob. This is often found in ramiflorous species.

The *arilloid*. SCHELLENBERG (Pfl. R. Heft 103, 1938, 13) obviously wrongly interpreted the fleshy appendages of the seed as a true aril. PLANCHON already, in his study of true and false arils (Ann. Sc. Nat. III, Bot. 3, 1845, 298) made mention of *Connarus* as an example of a false aril. The most important point in this respect is that the 'aril' is always attached to the testa, and never, as far as I have observed, to the funicle. In many cases the 'aril' is even split on the side facing the hilum leaving the funicle free. Moreover, as far as I could see, the 'adnate aril' is always the testa itself, there is no separate testa beneath. Its margin and marginal lobes, which are developed in a later ontogenetical phase may be free, however, e.g. in *Ellipanthus tomentosus* ssp. *kingii*. These facts strengthen the opinion that the fleshy structure represents an arilloid. Phylogenetically the primitive situation might have been the 'pseudobaccate' structure in which the greater part of the testa is developed into a sarcotesta. The genus *Rourea* offers all stages from the nearly complete sarcotesta towards its reduction to a small spot just opposite the hilum. From this most reduced phase can be derived the *arillode*, which loosely envelopes the whole seed as found in subg. *Palliatius*. This arilloid only develops in a late ontogenetical stage; young seeds only show the small sarcotestal part. The anatropous, laterally attached seeds of *Connarus* also clearly show the independence of the 'aril' from the funicle: here the arilloid is distinctly developed around the micropyle, more or less as a caruncle, and usually remains too small even for reaching the funicle! As a whole the situation in *Connaraceae* seems comparable with that in the *Sapindaceae*, as studied by VAN DER PIJL (Acta Bot. Neerl. 6, 1957, 618).

SPERLICH (Sitz. Ber. Ak. Wiss. Wien 120, 1911, 349) and FUNKE (Ann. Jard. Bot. Btzg 40, 1929, 61-64) gave some anatomical details on the leaf-joints and the latter stated in passing that by this structure he could distinguish between *Connaraceae* and *Leguminosae*. No mention has been made in literature as far as I can ascertain whether the leaflets of *Connaraceae* perform sleeping movements as is typical for numerous *Leguminosae* (at least of the subfamily *Papilionateae*). According to observations by Messrs JACOBS and BISSET in Kebun Raya Indonesia (March 1958) *Santaloides mimosoides* shows distinct sleeping movements, the others not or only in juvenile leaves.

TAXONOMY. The present revision of the Malaysian *Connaraceae* differs considerably from the monograph by SCHELLENBERG (Pfl. R. Heft 103, 1938). My objections against the latter monograph are of two kinds:

1. SCHELLENBERG's specific (and sometimes also his generic) delimitation is in my opinion often far too narrow. This is especially demonstrated in such genera as *Rourea* and *Connarus*. SCHELLENBERG himself was apparently aware of this tendency as appears from his study on Bornean species (Bot. Jahrb. 59, 1924, Beibl. no 131, p. 22).

2. A much more serious objection is that the relationships, as given in the monograph, are, in my opinion, sometimes artificial. This concerns both the subdivision of the genera and that of the family.

In *Connarus* and *Rourea* the microspecies, which in my opinion form one Linneont and can in cases hardly be discriminated, as for example *Connarus grandis* and *C. trifoliatus*, often turned out to have been referred to different sections or even subgenera.

The subdivision of the family into tribes rests, I believe, on an unsound basis. SCHELLENBERG's basic principle has been the distinction between axillary versus terminal inflorescences. As far as I have seen these extremes are often gradingly joined. A good example is that of the genera *Agelaea* and *Castanola* which correspond in many characters, but are placed by SCHELLENBERG far apart in the tribes *Agelaeae* and *Castanoleae* respectively, as the former are characterized by terminal, the latter by axillary inflorescences. The study of large collections of *Agelaea* learned, however, that within this genus this character is rather variable: in *A. trifolia* GILG the inflorescence is pseudoterminal, provided with a distinct terminal bud, which develops after the flowering period, resulting into axillary infructescences. On the other side I could not find any trace of a vegetative terminal bud in for example *A. obliqua* BAILL. An other case in point is provided by comparison of the genera *Jaundea*, *Byrsocarpus*, *Santaloidella*, and *Santaloides*, placed by SCHELLENBERG as highly developed representatives in the tribe *Byrsocarpeae*, with *Rourea*, considered by him to belong to the tribe *Connareae*. I could not find any important difference between these five genera except in the development of the arilloid; and as to this character they distinctly form one series (for details see sub *Rourea*).

In a much earlier publication (Mitt. Bot. Mus. Un. Zürich no 50, 1910) SCHELLENBERG gave in my opinion a more satisfactory evaluation of relationships.

Affinity with other families. SCHELLENBERG does not find reason to deviate from the current opinion to tie the *Connaraceae* to the affinity of *Rosaceae-Leguminosae*. Wood-anatomically HEIMSCH prefers to look for their relationship with the *Sapindaceae*, and this is obviously also the opinion of HUTCHINSON who incorporated them in his *Sapindales*.

It has also been occasionally suggested to affiliate them to the *Oxalidaceae* with which some species and genera have been confused in the past, but ERDTMAN rejects this relation on the strength of palynological arguments without giving other positive evidence.

Notes. *Connaraceae* are often confused with the *Leguminosae*, especially with the genus *Derris*. The only reliable difference between the two families is found in the ovules, which are collateral in the *Connaraceae*, serial in the *Leguminosae*. A character which nearly always can be used is also the absence of

stipules in the *Connaraceae* and their presence in the *Leguminosae* (with a few very rare exceptions). Attention is called here to the bracts in fasciculate axillary inflorescences which in *Connaraceae* are often placed similar to stipules and can easily be confounded with them.

The genus *Ellipanthus* is by superficial resemblance sometimes confused with *Dichapetalum*.

Specific delimitation turned out to be often very difficult, especially in *Rourea* and *Connarus*. Identification of incomplete material is frequently impossible: properly both flowers and fruits are necessary for satisfactory identification.

In widely distributed variable species it has mostly not been possible to distinguish subspecies or varieties by name because of the presence of intergrading specimens prohibiting a clear distinction of taxa. In case these 'races' can be more or less defined and occupy a geographical area of their own I have, for convenience, indicated by short descriptions their salient characters, but merely referred to them by α , β , γ , and so on.

KEY TO THE GENERA

1. Pistils 4-5, usually more than 1 fruit per flower (if there is only one fruit, some undeveloped pistils are often still present at the base). Calyx usually accrescent.
2. Upper surface of the dried leaflets with many minute pits. Leaves 3-foliolate. Fruits usually warty to papillose. 2. *Agelaea*
2. Upper surface of the dried leaflets not pitted. Fruits smooth.
3. Calyx distinctly imbricate, also in flower, immediately after flowering conically contracted in a peculiar way, accrescent and hard in fruit and (in *Mal. spp.*) usually cupular in shape, enclosing the base of the fruit. Fruit 1 per flower (very rarely 2; no pistil remains at the base). Seed (in *Mal. spp.*) usually enveloped by a loose arilloid 4. *Rourea*
3. Calyx only in the bud more or less imbricate, not conically contracted immediately after flowering, not appressed to the fruit. Usually more than 1 fruit per flower (and undeveloped pistils always still present). Seed provided with a sarcotesta.
4. Petals about as long as the sepals or shorter, not folded inwards in bud. Calyx not accrescent. Fruits more or less fleshy, oblique to slightly acuminate, pericarp inside densely pubescent. Seeds with endosperm. Leaflets not emarginate at the apex 1. *Cnestis*
4. Petals lorate, many times longer than the sepals, in bud folded inwards. Calyx in fruit conspicuous. Fruits dry, uncinat-acuminate at the apex, pericarp inside glabrous. Seeds without endosperm. Leaflets emarginate at the apex 3. *Roureopsis*
1. Pistil 1 per flower. Calyx not accrescent.
5. Inflorescences axillary, small, often glomerulous. Tissue of floral parts without glands; epidermis without glandular-capitate hairs. Seeds with endosperm. Leaves unifoliolate 5. *Ellipanthus*
5. Inflorescences terminal, large, paniculate. Sepals, petals, and stamens with glands in their tissue; epidermis often with glandular-capitate hairs. Seeds without endosperm. Leaves rarely partly unifoliolate 6. *Connarus*

1. CNESTIS

JUSS. Gen. (1789) 374; SCHELLENB. Pfl. R. Heft 103 (1938) 28; ANDREAS & PROP, Blumea 7 (1954) 602.—*Thysanus* LOUR. Fl. Coch. (1790) 284.—Fig. 1.

Lianas or scandent shrubs, rarely small trees. *Leaves* imparipinnate. *Inflorescences* axillary (in *Mal. spp.*) or terminal, solitary or consisting of fascicled branches inserted on knobs; bracts minute, scale-like to lanceolate. *Flowers* bisexual (?), 5-merous, heterotri- or -distylous. *Sepals* (in *Mal. spp.*) slightly confluent at the base, lanceolate, acute, imbricate in bud. *Petals* (in *Mal. spp.*) with indented and incurved tip. *Stamens* 10, free, all fertile, though the inner ones slightly shorter. *Pistils* 5, ovary pubescent. *Fruits* up to 5 per flower, usually some reduced, more or less pear-shaped, slightly beaked, opening by a longitudinal ventral slit, outside densely minutely tomentose, inside appressed-pilose; pericarp thick, probably more or less fleshy when fresh; calyx not enlarged. *Seed* 1, flattened bean-shaped, partly surrounded by a sarcotesta in the basal part opposite the hilum; endosperm present.

Distr. About 40 *spp.*, mainly in tropical Africa and Madagascar, 2 *spp.* in SE. Asia and *W. Malaysia*. Ecol. The *Malaysian* species are usually lianas in the forest.

Nomencl. SCHELLENBERG subdivided the genus into 2 sections and 4 subsections; both *Malaysian* species belong to *sect. Eucnestis* SCHELLENB., *subsect. Aequipetalae* SCHELLENB. As the type species of

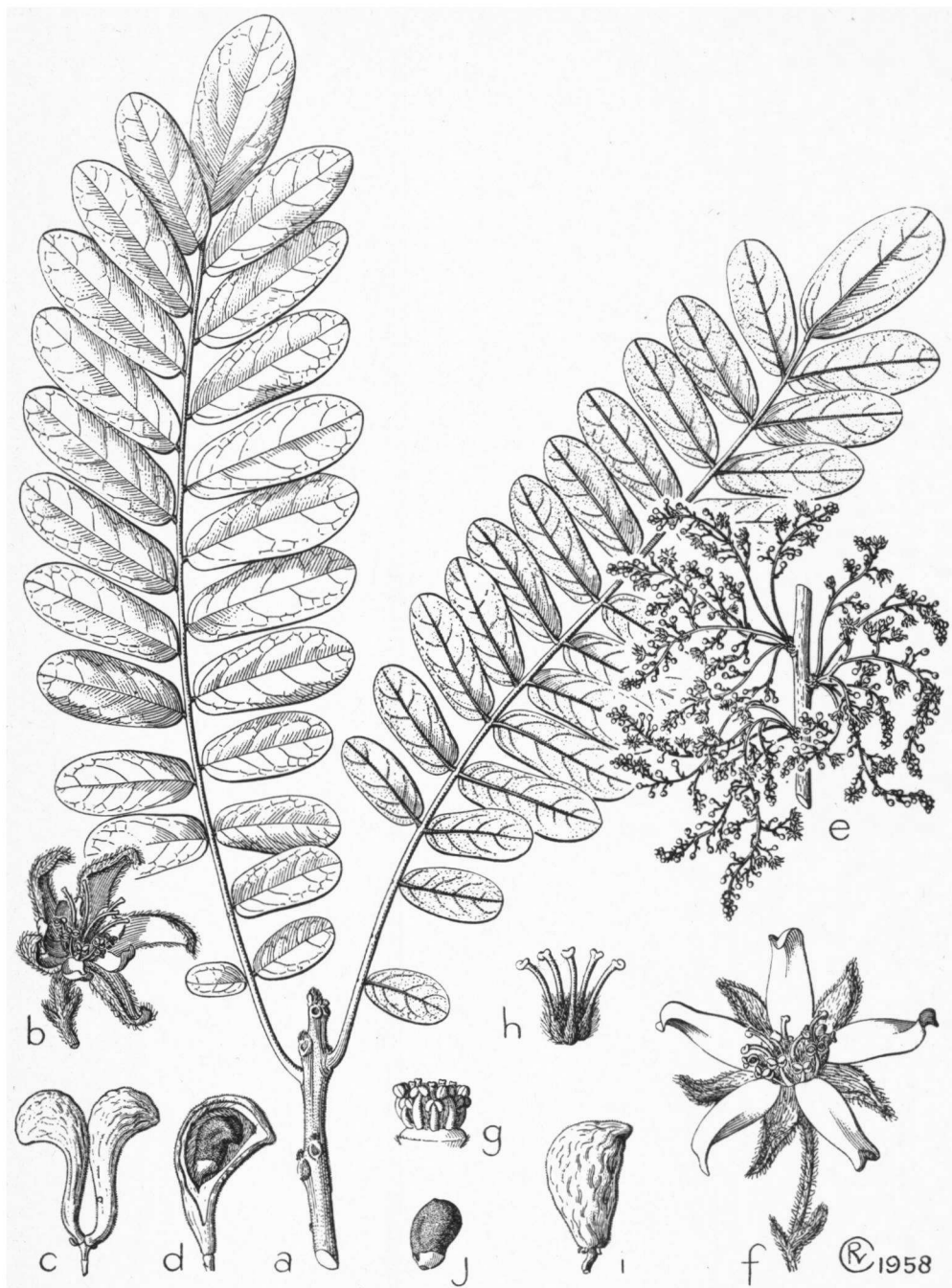


Fig. 1. *Cnestis platantha* GRIFF. a. Habit, $\times \frac{1}{2}$, b. flower, $\times 5$, c. fruits, $\times \frac{1}{2}$, d. ditto, opened, $\times \frac{1}{2}$.—*C. palala* (LOUR.) MERR. ssp. *diffusa* (BLANCO) ANDREAS. e. Part of twig with inflorescences, $\times \frac{1}{2}$, f. flower, $\times 5$, g. stamens and pistils in short-styled flower, $\times 7$, h. long-styled pistils, $\times 7$, i. fruit $\times \frac{1}{2}$, .seed, $\times \frac{1}{2}$ (a–b KING's coll. 6466, c VAN STEENIS 9337, d GUSDORF 157, e–h BS 26943, i–j ELMER 21482).

Cnestis indicated by him (*C. corniculata* LAMK) is in his system inserted in *sect. Ceratocnestis*, these sectional epithets must be revised. I have refrained from doing this as it would have necessitated a complete revision of the genus, both taxonomically and nomenclatorally, which falls outside the scope of this work.

Morph. The pubescence of both Malaysian species consists of simple hairs, not rarely intermingled with capitate-glandular hairs.

The leaflets of the Malaysian species are minutely pellucid glandular-punctate.

The flowers of the Malaysian species are scentless and apparently have a reddish calyx and white to creamy petals. The fruits are described as apricot-like in shape, size, and colour, the latter changing from yellow to scarlet. The seeds are black with a bright-yellow sarcotesta.

Taxon. The two Malaysian species have been delimited in a different way by nearly every author; therefore the interpretation of the literature is rather difficult. I fully agree with ANDREAS & PROP who, on the basis of an extensive analysis of many characters, consider the relative length of the corolla and the calyx as the only trustworthy differential character. This entails that only flowering material can be identified with certainty. The range of variation, shown by the vegetative parts and by the fruits, is different for the two species, but there is so much overlapping that these characters can be used only in extreme cases.

KEY TO THE SPECIES

1. Petals about as long as the sepals or slightly longer. Branches of the inflorescence racemose, slender, 1-3 of them much longer than the other ones. Fruits up to c. 4 cm long, usually rather stout.

1. *C. palala*

1. Petals about half as long as the sepals. Branches of the inflorescence paniculate, all of about the same length. Fruits 4 1/2-7 cm long, usually more slender.

2. *C. platantha*

1. *Cnestis palala* (LOUR.) MERR. J.R. As. Soc. Str. Br. no 85 (1922) 201; En. Philip. 2 (1923) 240; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 23; MERR. Trans. Am. Phil. Soc. n.s. 24, 2 (1935) 184; SCHELLENB. Pfl. R. Heft 103 (1938) 36, f. 4, p.p.; RIDL. Kew Bull. (1938) 275, p.p.; ANDREAS & PROP, Blumea 7 (1954) 612.—*Thyrsanus palala* LOUR. Fl. Coch. (1790) 284, excl. syn. RUMPH.; ed. 2 (1793) 349.—*C. corniculata* (non LAMK) BLANCO, Fl. Filip. (1837) 386; ed. 2 (1845) 270; ed. 3, 2 (1878) 138.—*C. diffusa* BLANCO, Fl. Filip. (1837) 386; MERR. Philip. J. Sc. 4 (1909) Bot. 127; SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 14, p.p.; MERR. Sp. Blanc. (1918) 164; SCHELLENB. Pfl. R. Heft 103 (1938) 38.—*C. polyphylla* (non LAMK) BLANCO, Fl. Filip. ed. 2 (1845) 270; ed. 3, 2 (1878) 137.—*C. ramiflora* GRIFF. Notul. 4 (1854) 432; HOOK. f. Fl. Br. Ind. 2 (1876) 54, p.p.; KURZ, For. Fl. Burma 1 (1877) 329; VIDAL, Sinopsis (1883) Atlas t. 39 f. c; KING, J. As. Soc. Beng. 66, ii (1897) 21, p.p.; PIERRE, Fl. For. Coch. 5 (1898) t. 376 C; LECOMTE, Fl. Gén. I.—C. 2 (1908) 44, f. 7 f; RIDL. Fl. Mal. Pen. 1 (1922) 554, p.p.—*C. platantha* (non GRIFF.) KURZ, For. Fl. Burma 1 (1877) 328.—*Rourea rugosa* (non PLANCH.) F.—VILL. Nov. App. (1880) 56.

ssp. diffusa (BLANCO) ANDREAS, Blumea 7 (1954) 613.—*C. diffusa* BLANCO.—*C. corniculata* (non LAMK) BLANCO.—*C. polyphylla* (non LAMK) BLANCO.—Fig. 1e-j.

Liana, sometimes shrub or treelet. Branchlets densely buff-tomentose, as are the petioles, rhachises, petiolules, and the inflorescences. Leaves c. 10-15-jugate; petiolules up to 1 mm. Lateral leaflets oblong to (ob)lanceolate, usually with parallel margins (the more elliptic lower pairs excepted), 4-9 1/2 by 1 1/2-3 1/2 cm, terminal ones elliptic, 6-9 1/2 by 2-3 1/2 cm, all thin-chartaceous, above glabrous or on the midrib short-tomentose,

beneath on the midrib densely, furthermore sparsely, short-pubescent; base cordate, in the lateral leaflets oblique; apex blunt to slightly acuminate; nerves (5)-8 pairs, nearly transverse, curved, distinctly looped and joined at some distance from the margin, inconspicuous. Inflorescences axillary, partly ramiflorous, in fascicles of 5 to more, slender, racemose to narrowly paniculate, rather many-flowered branches, 1-3 of them 4-8 cm long, the other ones up to 2 1/2 cm. Sepals 3 mm, pubescent on both sides. Petals oblong-ovate, 3-4 mm long, glabrous except a hair-tuft outside just above the base. Stamens glabrous. Fruits 1(-4) per flower, pear-shaped, rounded or slightly beaked, faintly curved, 3 1/2-4 by 2-2 1/4 cm.

Distr. Malaysia: Sumatra (E. coast), Lingga Arch., Malay Peninsula (the prevailing species), Borneo (rare), and the Philippines (Luzon, Lubang, Burias, Cebu, Semirara Isl.).

The other subspecies, *subsp. palala*, mainly differs by the straight, distinctly beaked fruits and the often smaller number of leaflets. It occurs in SE. Asia (Andaman Isl., Burma, Siam, and Indo-China).

Ecol. In rain-forests and thickets, along streams, up to 200 m. Fl. (Oct.-)Jan.-March (-Apr.), fr. May-July.

Vern. Andor *balimbing*, Sum., *blimbing hotan*, *këlidong*, Mal. Pen.; Philippines: *palo santo*, *palo tauilo*, Spanish, *ibaibaan*, *kalakalamaysan*, *piaspian*, Tag., *salsaladai*, Ilk., *toivotagotumi*, P. Bis.

Note. The Philippine specimens differ slightly from the above description. The main differences are: nerves 6-10 pairs, straight to curved; long branches of the inflorescences 3-6 cm long; pubescence of the inflorescence and of the calyx partly capitate-glandular; fruits smaller (2-2 1/2 by 1-1 1/2 cm).

2. *Cnestis platantha* GRIFF. Notul. 4 (1854) 434; ANDREAS & PROP, Blumea 7 (1954) 614.—*Rourea*

dasyphylla MIQ. Sumatra (1861) 528.—*Connarus polyphyllus* MIQ. Sumatra (1861) 529.—*C. ramiflora* (non GRIFF.) HOOK. f. Fl. Br. Ind. 2 (1876) 54, p.p., et auct. div.—*Santalodes dasyphyllum* O.K. Rev. Gen. 1 (1891) 155.—Fig. 1a-d.

Large liana, shrub, or treelet. Branchlets densely fulvous- to ferruginous-tomentose, as are the petioles, rhachises, petiolules, and inflorescences. *Leaves* c. 10–20-jugate; petiolules $1/2$ – $1\frac{1}{2}$ mm. Lateral leaflets oblong-obovate to oblong, 3 – $8\frac{1}{2}$ by $1\frac{1}{2}$ – $2\frac{1}{2}$ cm, increasing in size upwards, terminal leaflet obovate to lanceolate, 6–8 by 2 – $2\frac{1}{2}$ cm, all thin-chartaceous, minutely pubescent on the midrib above, sparsely to rather densely woolly tomentose beneath; base of the lateral leaflets broadly rounded to subcordate, oblique, specially in the upper pairs, of the terminal one (rounded to) acute; apex rounded to acute; nerves c. 5–8 pairs, usually more or less ascending (to nearly transverse), curved, usually fading towards the margin, sometimes distinctly looped and joined, rather inconspicuous. *Inflorescences* ramiflorous, on knobs, in fascicles of 5–8 narrow-paniculate, many-flowered, equally long (c. 5–8 cm) branches. *Sepals* 3 mm long, pubescent on both sides. *Petals* elliptic, 1 – $1\frac{1}{2}$ mm long, glabrous. *Stamens* glabrous. *Fruits* 1(–2) per flower, pear-shaped, sinu-

ously curved, slender, $4\frac{1}{2}$ –7 by $1\frac{1}{2}$ – $2\frac{1}{2}$ cm, rounded at the apex.

Distr. Malaysia: Sumatra (the prevailing species), Malay Peninsula (Perak, rare), Borneo, and Celebes (once collected in the central part).

Ecol. In primary and secondary forests up to c. 500 m. *Fl.* July–Oct., *fr.* Dec.–Feb.

Uses. The seeds and possibly also the fruits are eaten.

Vern. Baih patuh senggulin, baih sēklat sulok, djukut abang, sinih, udjan mas, Sum.

Notes. This species is mostly described as a large liana with drooping branches and tufted leaves. A few times it has been recorded as a large tree, but this may be based on erroneous observation.

One collector mentioned a sticky white latex, followed by a clear fluid, when cutting the branches.

Excluded

Cnestis volubilis BLANCO, Fl. Filip. (1837) 383 = *Rourea volubilis* MERR. Philip. Govt. Lab. Publ. no 27 (1905) 36, *pro basionym* = *Santaloides volubilis* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 51, *pro basionym* = probably no *Connaracea* (cf. p. 517b).

2. AGELAEAE

SOLAND. ex PLANCH. Linnaea 23 (1850) 437; SCHELLENB. Pfl. R. Heft 103 (1938) 65.—*Castanola* LLANOS, Mem. R. Ac. Cienc. Madr. III, 2 (1859) 505; SCHELLENB. Pfl. R. Heft 103 (1938) 169.—*Hemiandrina* HOOK. f. Trans. Linn. Soc. 23 (1860) 171.—*Troostwykia* MIQ. Sum. (1861) 531.—Fig. 2–3.

Lianas (sometimes scrambling shrubs). *Leaves* trifoliolate. *Inflorescences* axillary, pseudo-terminal, or truly terminal, paniculate, usually some of the main branches nearly equally strongly developed. *Bracts* and *bracteoles* rather persistent, bracts terete, slightly thickened at the apex, bracteoles narrowly linear. *Flowers* bisexual, (4)–5-merous. *Sepals* outside minutely tomentose, inside short-appressed-pubescent. *Petals* linear, distinctly exceeding the sepals, glabrous. *Stamens* 10(–5), slightly connate at the base, episepalous ones distinctly longer than epipetalous ones, the latter rarely fully absent. *Pistils* 5 (rarely, specially in African *spp.*, some more, which are often sterile), heterodi- or -tristylous; ovary and style-base pubescent; style cylindrical; stigma minute, 3-lobed. *Fruits* not rarely more than 1 per flower, usually strongly recurved; sustained by the persistent, not accrescent calyx, often tuberculate, more or less densely tomentose, red when ripe, opening by a lengthwise slit; pericarp rather thin. *Seed* 1, shining black, partly covered by an orange or yellow ariloid; endosperm none.

Distr. About 50 *spp.* in Africa, Madagascar, SE. Asia, and Malaysia.

Ecol. Rain-forests, mainly at low altitudes.

Taxon. The genus can be subdivided into 2 subgenera:

Agelaea, according to SCHELLENBERG, *l.c.*, with about 46 *spp.* (according to others much less), is restricted to Africa and Madagascar.

Troostwykia (MIQ.) SCHELLENB. (Mitt. Bot. Mus. Un. Zürich no 50, 1910, 65), consists of one species in W. Africa, and four in Asia and Malaysia. In SCHELLENBERG's monograph this subgenus was considered to represent a separate genus for which the oldest name *Castanola* was adopted.

The main difference between the two subgenera is found in the inflorescence, which is axillary in *subg. Troostwykia*, but pseudo-terminal to terminal in *subg. Agelaea*. As already mentioned in the

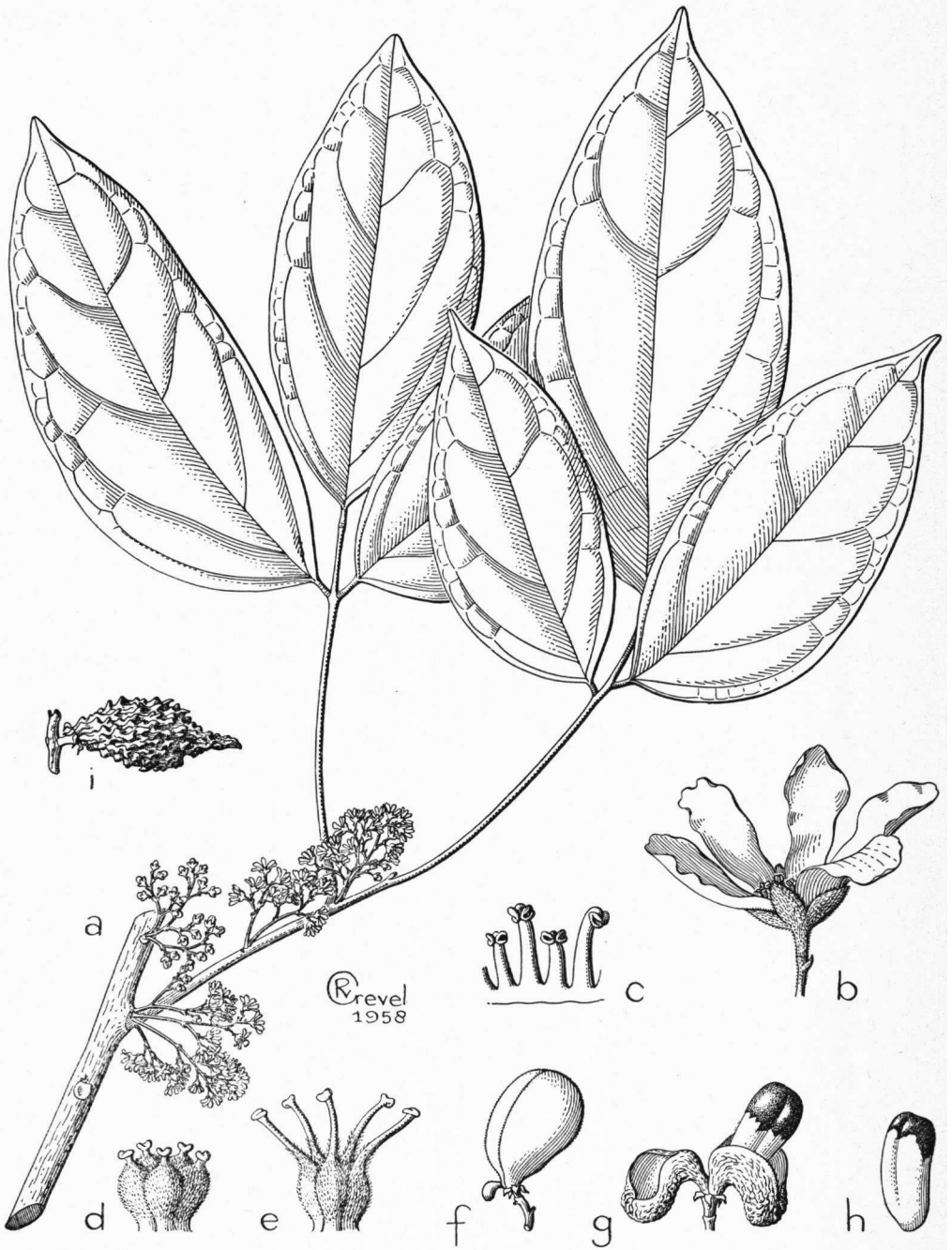


Fig. 2. *Agelaea trinervis* (LLANOS) MERR. a. Flowering twig, $\times 1/2$, b. flower, $\times 5$, c. stamens from outside, $\times 10$, d. short-styled pistils, $\times 10$, e. long-styled pistils, $\times 10$, f. fruit, nat. size, g. ditto, opened, nat. size, h. seed, nat. size.—*A. borneensis* (HOOK. f.) MERR. i. Fruit, nat. size (a, e herb. BECC. 3057, b-d SCHIFFNER 2037, f BACKER 26015, g-h WRAY 48, i WENZEL 675).

general remarks on the family I adhere less importance to this character than advocated by SCHELLENBERG.

Subg. Agelaea is characterized by tufted hairs, which superficially look like stellate hairs; in *subg. Troostwykia* the hairs are distinctly simple and not tufted.

The species of *subg. Troostwykia* are very well characterized by densely set minute pits in the upper surface of the dried leaflets; these pits correspond with large mucilaginous cells in and below the epidermis. These cells are absent in *subg. Agelaea*.

The nearest allied genus seems to be *Pseudoconnarus* from tropical S. America which, apart from some anatomical characters, differs by the presence of endosperm.

Morph. The major part of the bracts in the inflorescence is obviously homologous with the petiole of a leaf; the terminal thickening with the aborted blade.

The flowers show a great variability, even within one inflorescence. The terminal flowers, which open the first, are most completely developed and most constant. The flowers towards the base of the inflorescence may show all kinds of deviations: a smaller or sometimes greater number of (part of) the floral parts, absence of one whorl of stamens, etc. Therefore, I have based my descriptions on terminal flowers at the end of the anthesis, when all parts, even the stamens, are fully grown out.

Usually several pistils of each flower enlarge initially, but all except one or two usually stop developing at an early stage.

KEY TO THE SPECIES

1. Fruits distinctly papillose, long-beaked. Twigs and petioles, at least in the young parts, densely pubescent.
2. Leaflets elliptic to oblong, up to 20 cm long, more or less distinctly triplinerved, nerves 5-6 pairs.
 3. *A. borneensis*
 4. *A. insignis*
1. Fruits rugulose to warty, not or shortly beaked. Twigs and petioles (sub)glabrous.
3. Leaflets distinctly penninerved, nerves 7-10 pairs. Lateral leaflets nearly equilateral.
 1. *A. macrophylla*
 2. *A. trinervis*
3. Leaflets usually distinctly triplinerved, nerves c. 5 pairs. Lateral leaflets usually very oblique.

1. *Agelaea macrophylla* (ZOLL.) LEENH., *nov. comb.*
—*Erythrostigma macrophyllum* ZOLL. Nat. Tijd. N.I. 14 (1857) 174.—*Connarus diepenhorstii* MIQ. Sum. (1861) 529, 207.—*Taeniochlaena diepenhorstii* KURZ, J. As. Soc. Beng. 39, ii (1870) 76.—*A. hullettii* KING, J. As. Soc. Beng. 66, ii (1897) 19; RIDL. Fl. Mal. Pen. 1 (1922) 553.—*A. diepenhorstii* KING, J. As. Soc. Beng. 66, ii (1897) 20; SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 67; BACK. Schoolfl. (1911) 286; KOORD. Exk. Fl. Java 2 (1912) 340.—*A. sarawakensis* MERR. J. Str. Br. R. As. Soc. no 85 (1922) 199.—*Hemiandrina hullettii* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 26.—*Hemiandrina macrophylla* SCHELLENB., l.c.—*Hemiandrina sarawakensis* SCHELLENB., l.c.—*Castanola macrophylla* SCHELLENB. Pfl. R. Heft 103 (1938) 171; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 5.—*Castanola hullettii* SCHELLENB. Pfl. R. Heft 103 (1938) 172.—*Castanola sumatrana* SCHELLENB. Pfl. R. Heft 103 (1938) 174.—Fig. 3.

Liana, sometimes a creeping shrub or small tree (?); stem up to 4 cm thick. Branches 1/2-1 cm thick, glabrous. Leaves glabrous to minutely ferruginous-tomentose; lateral petiolules 1/2-1 cm. Leaflets oblong-lanceolate, 13-27 by 4-10 cm (terminal ones sometimes ovate-lanceolate, 18-30 by 6 1/2-12 cm), coriaceous, sometimes minutely tomentose on the nerves beneath, lateral ones usually slightly oblique; base rounded to acute; apex shortly acuminate, acumen blunt to emarginate, nerves (5-)-7-10 pairs, patent to nearly transverse. Inflorescences minutely pubescent, narrow-paniculate, with 2-3 branches up to 4 cm long and

some shorter ones. Flowers offensively-smelling, heterodistylous. Sepals 1 1/2 mm long. Petals 2 1/2-3 mm long. Stamens 10, glabrous. Pistils 5 (rarely less or up to 8), predominantly middle-styled. Infructescences small, with few fruits. Fruits obovoid, 1 1/4-1 1/2 by 3/4 cm, c. 3 mm long beaked, warty, densely tomentose. Seeds obovoid to cylindrical, rounded at both ends, for 2/3-3/4 covered by the arilloid.

DISTR. *Malaysia*: Sumatra, Lingga Arch., Malay Peninsula, Borneo, Java, and Bali.

Ecol. Primary, secondary, and teak-forests, also on marshy soils and on limestone rocks, up to 750 m. Fl. mainly May-Aug., fr. (June)-Aug.-Dec.

Vern. *Akar tanduk*, *bajut simungan*, Sum., *areuj kokotokan*, S, *antjeng*, *kluron*, *ojod* (*gambir*), *tjometan*, *tungkul*, J, *akar malam*, Born.

Notes. The flowers are extremely variable. Though 5-merous flowers predominate, 4-merous flowers are present in most of the specimens. Part of these 4-merous flowers still possess 5 pistils. The gynaeceum may be pleiomerous, but is never meiomerous. Some otherwise 5-merous flowers may have a 4-merous calyx.

2. *Agelaea trinervis* (LLANOS) MERR. Sp. Blanc. (1918) 164; En. Philip. 2 (1923) 239.—*Erythrostigma obliquum* ZOLL. Nat. Tijd. N.I. 14 (1857) 174, non *Agelaea obliqua* BAILL. (1866/67) *quae est Nestis obliqua* P. BEAUV. (1804).—*Castanola trinervis* LLANOS, Mem. R. Ac. Cienc. Madr. III, 2 (1859) 503; BLANCO, Fl. Filip. ed. 3, 4 (1880) 103; SCHELLENB. Pfl. R. Heft 103 (1938) 172.—*A. walli-*



Fig. 3. *Agelaea macrophylla* (ZOLL.) LEENH. Habit of the coarse liana, cultivated in Kebun Raya Indonesia (XVII.F.18), Nov. 1957.

chii HOOK. f. Fl. Br. Ind. 2 (1876) 47; KING, J. As. Soc. Beng. 66, ii (1897) 18; MERR. Philip. J. Sc. 4 (1909) Bot. 126; RIDL. Fl. Mal. Pen. 1 (1922) 553; BURK. Dict. (1935) 71.—*A. glabrifolia* HANCE, J. Bot. 14 (1876) 257.—*A. cambodiana* PIERRE, Fl. Coch. 5 (1898) t. 376 A; LECOMTE, Fl. Gén. I.—C. 2 (1908) 45, f. 7 d.—*A. densiflora* PIERRE, Fl. Coch. 5 (1898) t. 376 B; LECOMTE, Fl. Gén. I.—C. 2 (1908) 45.—*A. agamae* MERR. J. Str. Br. R. As. Soc. no 85 (1922) 198.—*Hemiandrina agamae* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 26.—*Hemiandrina obliqua* SCHELLENB., l.c.—*Hemiandrina trinervis* SCHELLENB., l.c.—*Castanola glabrifolia* SCHELLENB. Kew Bull. (1927) 374; Pfl. R. Heft 103 (1938) 173.—*Castanola wallichii* SCHELLENB. Kew Bull. (1927) 375; CRAIB, Fl. Siam. En. 1 (1928) 359; SCHELLENB. Pfl. R. Heft 103 (1938) 174.—*Castanola obliqua* SCHELLENB. Pfl. R. Heft 103 (1938) 172; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 5.—*Castanola agamae* SCHELLENB. Pfl. R. Heft 103 (1938) 173.—Fig. 2a-h.

Liana or climbing shrub; stem c. 5 cm thick. Branches 3-4 mm thick, glabrous. *Leaves* (sub)glabrous; lateral petiolules c. $\frac{3}{4}$ cm. Lateral leaflets usually very oblique, ovate (to oblong-lanceolate), 8-19 by $3\frac{1}{2}$ -10 cm, cuneate to rounded (rarely slightly cordate) at the base, terminal ones obovate (to elliptic), 10-30 by $4\frac{1}{2}$ -12 cm, broadly cuneate (rarely rounded to cordate) at the base; all leaflets coriaceous, glabrous or sometimes minutely tomentose on the nerves beneath, shortly (to rather long and slender) blunt-acuminate; nervation prominent beneath; mostly tripinerved, midrib in addition with c. 4 pairs of nerves in the upper half. *Panicles* dense, 2-3(-6) cm long, minutely greyish pubescent. *Flowers* (4-5)-merous, heterodistylous, fragrant. *Sepals* 2 mm long. *Petals* 5 mm long. *Stamens* 10, glabrous. *Pistils* (4-5). *Infructescences* small, with few fruits. *Fruits* slightly oblique, obovoid, 1-2 $\frac{1}{2}$ by $\frac{1}{2}$ -1 $\frac{1}{4}$ cm, slightly narrowed at the base, rounded (very rarely shortly beaked) at the apex, rugulose to warty, densely minutely tomentose. *Seeds* oblong-obovoid, the arilloid covering $\frac{1}{3}$ - $\frac{3}{4}$ or even more of the surface.

Distr. Annam, Laos, Cochinchina, Siam, and Malaysia: Sumatra, Malay Peninsula, W. Java, Borneo, Philippines (Luzon, Samar, Leyte, Biliran, Mindanao), and Moluccas (Sula Isl., Ceram).

Ecol. Primary and secondary rain-forests, also along forest-edges and river-banks, up to c. 800 m. Fl. Jan.-Oct., fr. Jan.-Dec.

Uses. The bark and the leaves are used in native medicine; a decoction of the roots is used against rheumatism and stomach-ache.

Vern. *Andor tungir, basam*, Sum., *akar kachang bitina*, a. k. *jantān bukit*, a. *nyamok*, a. *pinang kētul* (or *bētul*), a. p. *kutat*, a. p. *kutiay*, a. *pregat*, a. *susudū*, *kēlētint nyamok*, Mal. Pen., *akar bangikar, galiput, kamaralam, malam (akar)*, Born.; Philip.: *dagtung*, Mbo., *tayabak, ulali*, Tag.

Notes. The flowers of this species are much less variable than those of *A. macrophylla*; 4-merous flowers are present in a few specimens only.

Long- and short-styled flowers seem to be about equally frequent.

More variability is found in the fruits and seeds. An extreme in this respect is represented by '*A. agamae*' the fruits of which are distinctly warty, possess a small beak, are relatively small ($1\frac{1}{4}$ by $\frac{3}{4}$ cm), and are distinctly stipitate at the base, while the seeds are nearly entirely covered by the arilloid.

3. *Agelaea borneensis* (HOOK. f.) MERR. Philip. J. Sc. 4 (1909) Bot. 127; SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 65.—*Erythrostigma villosum* ZOLL. Nat. Tijd. N.I. 14 (1857) 175, non *A. villosa* SOLAND. ex PLANCH. (1850).—*Hemiandrina borneensis* HOOK. f. Trans. Linn. Soc. 23 (1860) 171, t. 28.—*Troostwykia singularis* MIQ. Sum. (1861) 531, 207; Ann. Mus. Bot. Lugd. Bat. 3 (1867) 88; BOERL. Handl. 1 (1890) 320.—*A. vestita* HOOK. f. Fl. Br. Ind. 2 (1876) 46, nom. illeg.; VIDAL, Sinopsis (1883) t. 39 f. D; KING, J. As. Soc. Beng. 66, ii (1897) 17; BACK. Schoolfl. (1911) 286; KOORD. Exk. Fl. Java 2 (1912) 339; RIDL. Fl. Mal. Pen. 1 (1922) 553; HENDERS. Gard. Bull. S.S. 4 (1928) 246; BURK. Dict. (1935) 70.—*A. everettii* MERR. Philip. J. Sc. 4 (1909) Bot. 127; BROWN, Min. Prod. Philip. For. 1 (1920) 376; MERR. En. Philip. 2 (1923) 239.—*A. woodii* MERR. J. Str. Br. R. As. Soc. no 85 (1922) 199.—*Hemiandrina everettii* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 25.—*Hemiandrina villosa* SCHELLENB., l.c.; HEYNE, Nutt. Pl. (1927) 699.—*Hemiandrina woodii* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 25.—*Castanola villosa* SCHELLENB. Kew Bull. (1927) 375; Pfl. R. Heft 103 (1938) 177, f. 32; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 5.—*Castanola everettii* SCHELLENB. Pfl. R. Heft 103 (1938) 176.—*A. platyphylla* ELM. Leaf. Philip. Bot. 10 (1939) 3717, nom. illeg.—Fig. 2i.

Liana or scrambling shrub, sometimes a small tree; stem (2-)-5-10 cm thick. Branches 3-5 mm thick, densely fulvous-tomentose when young, glabrescent. *Leaves* pubescent to subglabrous; lateral petiolules 2-4 mm long. Lateral leaflets oblique, elliptic (rarely ovate or obovate), 5-13 by 2-6 cm, terminal ones elliptic to obovate, 7-20 by 3-10 cm; chartaceous to subcoriaceous, sometimes bullate, more or less densely ferruginous-tomentose, specially beneath, rarely nearly glabrous; base rounded; apex blunt-acuminate (acumen $\frac{1}{2}$ -1 $\frac{1}{2}$ cm); midrib and nerves strongly prominent beneath; nerves 5-6 pairs, the basal ones more or less ascending. *Panicles* lax, up to 8-10 cm long, usually consisting of the main axis and some basal branches, many-flowered, fulvous-pubescent. *Flowers* (4-5)-merous, heterotristylous, fragrant. *Sepals* $1\frac{1}{4}$ -1 $\frac{1}{2}$ mm long. *Petals* c. 2 $\frac{1}{2}$ mm long. *Stamens* 10(-5), filaments minutely pubescent. *Pistils* (3-5). *Infructescences* small, with few fruits. *Fruits* sinusoid-ovate to -ellipsoid, $1\frac{1}{2}$ -2 $\frac{1}{2}$ by $\frac{3}{4}$ -1 $\frac{1}{4}$ cm, narrowed at the base, 3-10 mm beaked at the apex, coarsely papillose by fleshy, 3-4 mm long papillae, densely short-pubescent. *Seeds* obovoid, rounded at both ends, the basal half (or less) covered by the arilloid.

Distr. *Malaysia*: Sumatra, Malay Peninsula, West and Central Java, Borneo, and the Philippines; a dubious specimen (PARKER 2264) from Burma (Tavoy Distr.).

Ecol. Primary and secondary rain-forests, also along periodically inundated river-banks and on limestone rocks, up to c. 700 m. *Fl.* and *fr.* Jan.-Dec.

Uses. The stems and branches are highly esteemed for making ropes; they are strong and do not decay in water, for which reason they are specially in use for rafts and bow-nets.

Vern. *Akar basau, ako (sēbasah) itam, andor galung, kaju poyoh*, Sum., *akkar itam*, Banka, *akar kachang kachang, a. kankachang, a. mēkachang hitam, a. nyamok, a. rusa rusa, a. tēlur buyok, a. tulō bujok*, Mal. Pen., *akar kēring, a. malam, langsat kaja, marangrugon, sumbalan, surong mangis, winud*, Born.; Philippines: *balagam, oñgali, uñgali*, P. Bis., *kamāgsa, kamāksa*, Tag., *ñgáluk*, Ibn.

Notes. This species is specially variable in its leaves (size, shape, and pubescence) and to a lesser degree in its flowers. In one specimen (FRI T. 95) the flowers are (3-)4(-5)-merous, with only epise-palous stamens. On the whole 4-merous flowers are rare, the Philippine specimens excepted. Medium-styled specimens are rare, long- and short-styled ones about equally common. The number of stamens is usually 10, but may be reduced to 5 in both long- and short-styled flowers.

The name *Agelaea vestita* is illegitimate as some synonyms were mentioned; HOOKER based it upon the oldest name, *Cnestis vestita* WALL., which is a *nomen nudum*.

4. *Agelaea insignis* (SCHELLENB.) LEENH., *nov. comb.*—*Hemiandrina insignis* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 26.—*Castanola insignis* SCHELLENB. Pfl. R. Heft 103 (1938) 176.

Liana. Branchlets probably densely ferruginous-tomentose, as are the petioles and petiolules. Lateral leaflets oblique, ovate-lanceolate, c. 20-40 by 6-12 cm, terminal ones lanceolate to oblanceolate, 14-40 by 6-13 cm; thin-coriaceous, smooth to slightly bullate above, midrib on both sides densely ferruginous-tomentose, nerves beneath sparsely pilose; base of the lateral leaflets very oblique, subcordate, of the terminal ones equilateral, narrowed, rounded; apex tapering shortly blunt-acuminate; nervation strongly prominent beneath, nerves 10-14 pairs, patent, curved, distinctly looped and joined close to the margin. *Inflorescences, flowers, and infructescences* unknown. *Fruits* ovoid, c. 3 by 1½ cm, with a ¾ cm long slender beak, densely long-papillose, densely minute-tomentose. *Seeds* oblong-ellipsoid, rounded at both ends, for c. 1/3 covered by the arilloid.

Distr. *Malaysia*: Borneo (Sarawak: near Kuching, apparently very rare).

Ecol. *Fr.* Nov., Feb.

3. ROUREOPSIS

PLANCH. *Linnaea* 23 (1850) 423; SCHELLENB. Pfl. R. Heft 103 (1938) 107.—*Taeniochlaena* HOOK. f. in B. & H. Gen. Pl. 1 (1865) 433; SCHELLENB. Pfl. R. Heft 103 (1938) 167.—Fig. 4-6.

Usually lianas, sometimes shrubs or treelets. Twigs sometimes hooked. *Leaves* imparipinnate, rarely partly unifoliolate. Apex of the leaflets always distinctly emarginate. *Inflorescences* axillary, mainly in the upper leaf-axils, racemose or paniculate, usually fasciculate, small. *Bracts* lanceolate, small, appressed, densely pubescent. *Flowers* rather long-stalked, bisexual, (4-)5-merous. *Petals* linear, gradually narrowed from base to apex, thin, in bud doubled down inwards, enclosing the stamens. *Stamens* twice as many as petals, slightly confluent at the base or free, epipetalous ones slightly smaller, all fertile, glabrous. *Pistils* (4-)5(-7), heterodistylous; ovary oblique-ovoid, style cylindrical, always rather short, stigma bilobed. *Calyx* in fruit persistent, spreading, not or only slightly accrescent, red. *Fruits* up to 5 per flower, oblique-ellipsoid, opening by a ventral slit, red, the apex uncinately-acuminate; pericarp coriaceous, glabrous inside. *Seed* 1, ellipsoid, attached at the base, the hilum partly to entirely surrounded by a rather small, yellow, fleshy arilloid; no endosperm.

Distr. About 10 *spp.*, 2 of which in W. Africa, the other ones in SE. Asia (Upper Burma to S. China and Indo-China) and W. *Malaysia* (as far east as W. Java and Borneo).

Ecol. In primary and secondary forests, along river-banks etc., usually at low to medium altitude. Notes. The *arilloid* is apparently of sarcotestal nature and nearly fully adnate to the seed; only the uttermost margin is free.

Roureopsis seems to be specially related to and intermediate between *Agelaea* and *Rourea*.

KEY TO THE SPECIES

- 1. Leaflets numerous (rarely less than 10 pairs), the lateral ones always distinctly oblique, not acuminate.
 - 1. *R. asplenifolia*
- 1. Leaves up to 5(-7)-jugate, lateral ones not or only very slightly oblique, usually distinctly acuminate.
 - 2. Fruits glabrous. Basal pair of nerves usually strongly ascending. Inflorescences nearly always subglabrous. Pistils glabrous (very rarely sparsely pubescent) 2. *R. emarginata*
 - 2. Fruits tomentose. Basal pair of nerves not conspicuously ascending. Inflorescences densely tomentose. Pistils woolly pubescent.
 - 3. Nerves 5-8 pairs. Leaflets 6-10(-18) cm long. Inflorescences c. 4 cm long, in fascicles of 1-5 branches.
 - 3. *R. acutipetala*
 - 3. Nerves 8-10 pairs. Leaflets (8-)13-18 cm long. Inflorescences c. 2 cm long, in fascicles of 5-10 branches 4. *R. pinnata*

1. Section Roureopsis

Fruits glabrous.

1. *Roureopsis asplenifolia* SCHELLENB. Pfl. R. Heft 103 (1938) 111.—Fig. 4a-c.

Large liana. Branchlets minutely fulvous-tomentose when young, glabrescent. Leaves (4-)10-16(-24)-jugate, leaflets opposite to alter-

nate, the short petiole and the rachis densely tomentose, glabrescent. Leaflets subsessile, most of the lateral ones oblique-trapezoid to oblique-rhomboid, 1 1/2-2 1/2 by 1/2-1 cm, basal ones broad-ovate, 1 by 1 cm or more, terminal leaflet elliptic

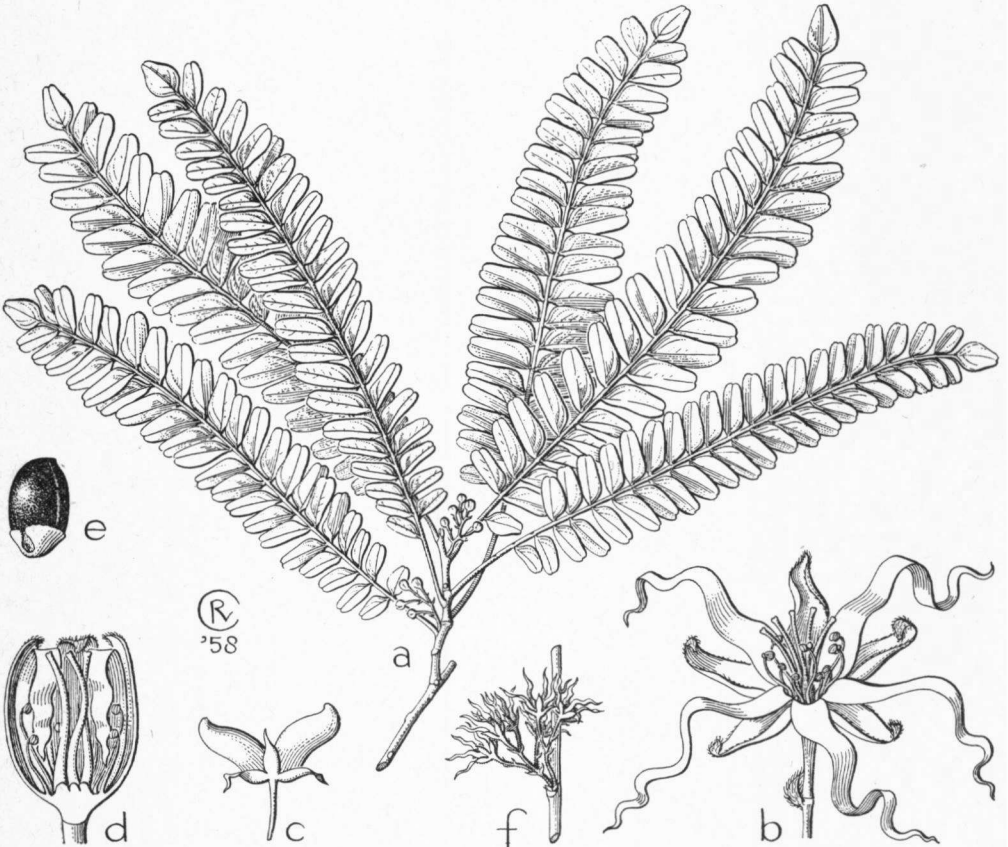


Fig. 4. *Roureopsis asplenifolia* SCHELLENB. a. Twig with young inflorescences, x 1/2, b. flower, x 5, c. fruits, nat. size.—*R. emarginata* (JACK) MERR. d. Flower bud in longitudinal section, x 5, e. seed, nat. size.—*R. acutipetala* (MIQ.) LEENH. f. Inflorescence, x 1/2 (a-b SPARE 1019, c SF 31978, d ALVINS 80, e Cult. Hort. Bog., f MÜLLER s.n.).

to ovate-rhomboid, $2\frac{1}{2}$ – $2\frac{3}{4}$ by $1\frac{1}{2}$ cm, all thin-chartaceous, glabrous above, minutely pubescent on the midrib beneath and along the margins, mainly near the cuneate base; apex deeply emarginate; nerves 4–5 pairs, one pair distinctly ascending, all distinctly looped and joined; veins parallel to the nerves, nearly indistinguishable from the latter. *Inflorescences* racemose, umbelliform, with about 4 flowers, c. 2 cm long, subglabrous to glabrous except the densely pubescent bracts; pedicels slender, c. $\frac{1}{2}$ cm. *Flowers* 5-merous, apparently protogynous. *Sepals* ovate, blunt, 2– $2\frac{1}{2}$ by 1– $1\frac{1}{2}$ mm, sparsely pubescent on both sides with the exception of the densely fulvous-tomentose outer side of the tip. *Petals* 7 by $\frac{2}{3}$ mm. *Stamens* slightly cohering at the base. *Fruits*

1–2(–4) per flower, $1\frac{1}{4}$ by $\frac{3}{4}$ cm, glabrous except a few appressed hairs near the apex.

Distr. Malaysia: Sumatra and the Malay Peninsula.

Ecol. In forests and scrub-jungle, along riverbanks, up to c. 200 m. *Fl.* May–July, *fr.* March, July, Oct.–Nov.

Vern. Kaju itam, Sum.

Note. Closest allied to *R. stenopetala* SCHELLENB. (Burma to Cochinchina) which differs by its less-jugate leaves with oblique-rhomboid, stiff-chartaceous to coriaceous leaflets, and by the much longer sepals, both in flower and in fruit. SCHELLENBERG, *l.c.* p. 110, cited also a few specimens of *R. stenopetala* from the Malay Peninsula; those which I could examine doubtless represent *R. asplenifolia*.



Fig. 5. *Roureopsis emarginata* (JACK) MERR. Fruiting twig of a coarse-leaved Sumatran form (γ), one fruit dehiscent and the black, shining seed protruding. *Cult. Hort. Bog.* (XVII.F.27), Nov. 1957.

2. *Roureopsis emarginata* (JACK) MERR. J. Arn. Arb. 33 (1952) 220.—*Cnestis emarginata* JACK, Mal. Misc. 2, no 7 (1822) 42; Hook. Comp. 1 (1835) 150.—*R. javanica* PLANCH. Linnaea 23 (1850) 424; Walp. Ann. 2 (1851) 299; Miq. Fl. Ind. Bat. 1, 2 (1859) 661; BACK. Schoolfl. (1911) 287; KOORD. Exk. Fl. Java 2 (1912) 340; SCHELLENB. Bot. Jahrb. 59 (1924), Beibl. no 131, p. 27; Pfl. R. Heft 103 (1938) 113; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 6.—*R. pubinervis* PLANCH. Linnaea 23 (1850) 424; Walp. Ann. 2 (1851) 299; Miq. Fl. Ind. Bat. 1, 2 (1859) 661; HOOK. f. Fl. Br. Ind. 2 (1876) 50; KING, J. As. Soc. Beng. 66, ii (1897) 16; KOORD. Exk. Fl. Java 2 (1912) 340; RIDL. Fl. Mal. Pen. 1 (1922) 552; BURK. Dict. (1935) 1917; SCHELLENB. Pfl. R. Heft 103 (1938) 112, f. 19.—*R. scortechinii* KING, J. As. Soc. Beng. 66, ii (1897) 16; RIDL. Fl. Mal. Pen. 1 (1922) 552; non BURK. & HENDERS. Gard. Bull. S.S. 3 (1925) 365 = *Rourea prainiana*.—*Taeniochlaena birmanica* PRAIN, J. As. Soc. Beng. 67, ii (1898) 285; Ann. R. Bot. Gard. Calc. 9 (1901) 20, t. 26.—*R. birmanica* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 27; Pfl. R. Heft 103 (1938) 112.—? *R. rubricarpa* WU, Act. Phytotax. Sin. 6 (1957) 287, t. 49 f. 14.—Fig. 4d-e, 5-6.

Liana, up to 25 m by 1-2 cm, sometimes a shrub. Branchlets glabrous or the young parts more or less densely fulvous-tomentose. *Leaves* 1-5(-7)-jugate, glabrous or the petiole, rhachis, and petiolules more or less densely pubescent. *Leaflets* broad-ovate to elliptic, rarely obovate or oblong to lanceolate, in a few specimens oblique-rhomboid, basal ones sometimes suborbicular, upwards increasing in size but becoming narrower, 2-15 by 1/2-6 cm, herbaceous to thin-chartaceous, glabrous to densely appressed-pubescent on the midrib beneath; base rounded (in basal leaflets) to acute or decurrent (in terminal leaflet); apex blunt or gradually to rather abruptly acuminate; acumen short and broad to rather long and slender, always distinctly emarginate, sometimes the midrib mucronulate; nerves 3-7 pairs, basal ones ascending (except in elliptic to oblong leaflets), the other ones nearly transverse, faintly to strongly curved, distinctly looped and joined at some distance from the margin, not very conspicuous; veins partly parallel to the nerves and nearly indistinguishable from the latter. *Inflorescences* axillary and sometimes (truly?) terminal, usually fascicles of (1-)2-3 racemes, one of which being stronger developed; racemes more or less umbelliform, up to 5 cm long, with 4-5 flowers, subglabrous (rarely densely tomentose) with the exception of the minute, densely pubescent bracts. *Flowers* 5-merous. *Sepals* ovate to oblong, rounded or acute, 4-5 1/2 by 1 1/4-2 1/2 mm, glabrous to sparsely pubescent on both sides, mainly outside at the apex. *Petals* 6-12 by 3/4-1 1/2 mm, glabrous or outside with a few hairs in the upper half. *Stamens* free (or ± cohering at the base). *Pistils* glabrous (rarely thinly pubescent). *Fruits* 1-3 per flower, 1-1 3/4 by 3/4-1 cm, glabrous.

Distr. Yunnan, Burma, and *Malaysia*: Sumatra, Malay Peninsula, W. Java, and Borneo.

Ecol. In and along open to dense, primary and

secondary forests, in scrub-jungles and along riverbanks, from sea-level up to 1250 m. *Fl.* Feb.-Aug. (-Dec.), *fr.* March-May and Oct.-Jan.

Uses. The boiled leaves are used in native medicine for poulticing sore parts.

Vern. *Akar balimbing*, *aku sebasawu rēnidaun*, Sum., *akar kēdēmūt*, Banka, *a. kachang-kachang merah*, *a. k. bētina*, *a. kēličhi*, *a. nyamok*, *a. tukehel*, Mal. Pen., *areuj gojal*, *aruj tjalinjing*, *kitjang aroy*, *tjetjer katjepet*, S.

Notes. In the broad sense as accepted here a rather variable species. It mainly consists of three forms, which are, however, neither morphologically nor geographically clearly distinguishable. I refrain emphatically from naming them and have merely indicated under which specific name the typical specimens were formerly known. These forms can, in their typical specimens, be characterized as follows:

α. Leaves usually 4-7-jugate; leaflets rather small, ovate, usually distinctly acuminate, acumen

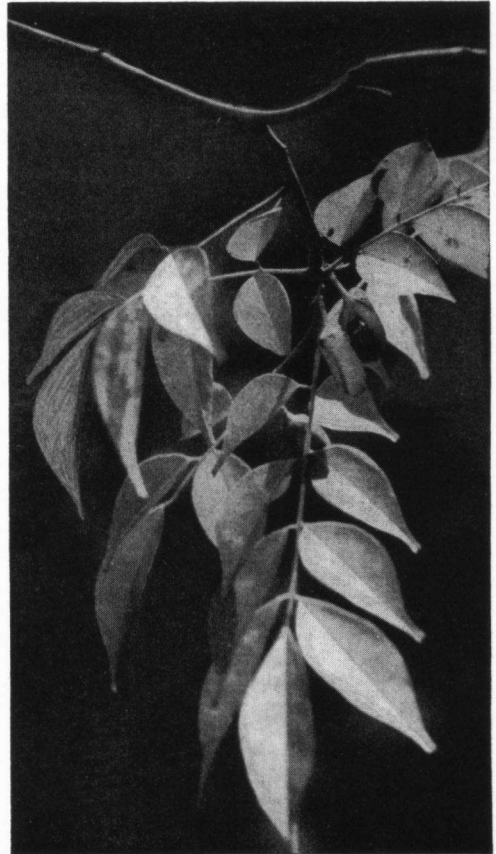


Fig. 6. *Roureopsis emarginata* (JACK) MERR. Fruiting twig of a more slender-leaved Javanese form (α) with more leaflets with emarginate acumen. Cult. Hort. Bog. (XVII. F. 23), Nov. 1957.

broad and distinctly emarginate, midrib rarely mucronulate, base rounded to subcordate; pistils always glabrous; plant fully glabrous. This form is mainly restricted to Java and Borneo, furthermore known from Banka and the Lingga Archipelago (*R. javanica*). Fig. 6.

β. Different from the first one only by the indumentum on the young twigs, the petioles, rhachises, petiolules, and at least on the midrib beneath; midrib always mucronulate. Known only from the Malay Peninsula (*R. pubinervis*).

γ. Leaves 2-4-jugate; leaflets relatively large, oblong to lanceolate, tapering acuminate, acumen slender, minutely emarginate, midrib not mucronulate, base often cuneate; pistils glabrous or thinly pubescent; plant fully glabrous. This form is known from Sumatra, a few specimens from the Malay Peninsula, furthermore from Burma and Yunnan (?) (*R. scortechinii*). Fig. 5.

The type specimen of *Cnestis emarginata*, which now seems to be lost, probably comes nearest to forma γ.

2. Section Taeniochlaena

LEENH., *nov. stat.*—*Taeniochlaena* HOOK. *f* in B. & H. Gen. Pl. 1 (1865) 433; SCHELLENB. Pfl. R. Heft 103 (1938) 167.

Fruits pubescent.

3. *Roureopsis acutipetala* (MIQ.) LEENH., *nov. comb.*—*Rourea acutipetala* MIQ. Sum. (1861) 528.—*Taeniochlaena griffithii* HOOK. *f* in B. & H. Gen. Pl. 1 (1865) 434; Fl. Br. Ind. 2 (1876) 55; OLIV. in Hook. Icon. Pl. (1895) t. 2392; KING, J. As. Soc. Beng. 66, ii (1897) 20; RIDL. Fl. Mal. Pen. 1 (1922) 554.—*Taeniochlaena acutipetala* KURZ, J. As. Soc. Beng. 39, ii (1870) 76; CRAIB, Fl. Siam. En. 1 (1928) 365; BURK. Dict. (1935) 2119; SCHELLENB. Pfl. R. Heft 103 (1938) 168, f. 30.—*Santalodes acutipetalum* O.K. Rev. Gen. 1 (1891) 155.—*Taeniochlaena borneensis* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 23; Pfl. R. Heft 103 (1938) 169.—Fig. 4f.

Climbing shrub or liana, sometimes treelet. Branchlets minutely pubescent when young, glabrescent. Leaves (unifoliolate to) 1-4-jugate. Leaflets oblong (to ovate), 6-10(-18) by 2½-5(-6) cm, stiff-coriaceous; base acute to rounded, sometimes slightly cordate; apex blunt to slightly acuminate, ± emarginate, acumen broad and blunt; nerves c. 5-8 pairs, curved, distinctly looped and joined; veins laxly reticulate, nearly invisible above. Inflorescences in fascicles of 1-5, paniculate or racemose, up to c. 4 cm long, rather many-flowered, tomentose. Flowers 4-5-merous. Sepals oblong-ovate to lanceolate, acute, 3½-7 by 1½ mm, outside tomentose, inside glabrous. Petals 10-11 by 1-1½ mm, glabrous. Stamens free. Pistils (4-5(-7)), ovary densely pilose. Fruits 1-5 per flower, 2-2½ by 1 cm, densely minutely fulvous-tomentose.

Distr. *Malaysia*: Sumatra, Malay Peninsula, and Borneo.

The taxonomic status of forma γ remains uncertain. *R. scortechinii* was based upon two specimens, one of which (CURTIS 1998) doubtless belongs to the genus *Rourea* (probably *R. prainiana*); the other one (SCORTECHINI 613) has only very young flowerbuds, making a detailed analysis impossible. This latter specimen matches rather well those from Sumatra, and, as far as can be judged, agrees entirely with *R. birmanica* from Upper Burma. This latter species is slightly different from typical '*R. javanica*', however, by some characters in the flowers (relatively short petals, slightly pubescent pistils) and by the partly apparently terminal inflorescences, apart from the differences in the vegetative parts. *R. rubricarpa*, finally, seems closely allied to *R. birmanica*, differs, however, mainly by its pubescence.

As to the possible synonymy of the present species with *Connarus lucidus* JACK I fully share the doubt as expressed by SCHELLENB. (Pfl. R. Heft 103, 1938, 112).

Note. In one inflorescence 4- and 5-merous flowers can be found. Moreover, pleiomery of the gynaeceum is rather common even in one inflorescence, specially in 4-merous flowers of *ssp. borneensis*.

ssp. acutipetala.

Branchlets early glabrescent. Leaves entirely glabrous, up to 3-jugate. Flowers predominantly 5-merous.

Distr. Sumatra, Malay Peninsula.

Ecol. In primary and secondary forests at low altitude. Fl. Jan., March, and July, fr. (Dec.) March (May).

Uses. The very tough stems are used for tying fences. The boiled roots are used as an application for lumbago.

Vern. *Kembassouw*, Sum., *akar batu*, *a. bērom-bong*, *a. china*, *a. kachang bētina*, *a. k. jantan bukit*, *a. k. pital*, *a. pērēngat*, *a. sēsudu*, *chēndērai pait*, Mal. Pen.

ssp. borneensis (SCHELLENB.) LEENH., *nov. stat.*—*Taeniochlaena borneensis* SCHELLENB.

Tomentum of the branchlets rather long persistent. Leaves 2-4-jugate, petiole, rhachis, and petiolules minutely tomentose, leaflets densely appressed-pubescent on the midrib beneath, sometimes also beneath on the nerves and above on midrib and nerves. Flowers 4(-5)-merous; pistils 4-7.

Distr. Borneo; one specimen from the Malay Peninsula (Perak, KING's coll. 2668) probably also belongs to this subspecies.

Ecol. In secondary forests, up to 150 m. *Fl.* Dec.-Jan., *fr.* Oct.

Vern. *Těngirih*, Born.

4. *Roureopsis pinnata* (KING) LEENH., *nov. comb.*—*Agelaea pinnata* KING, J. As. Soc. Beng. 66, ii (1897) 18; RIDL. *Fl. Mal. Pen.* 1 (1922) 553.—*Taeniochlaena pinnata* SCHELLENB. *Mitt. Bot. Mus. Un. Zürich no 50* (1910) 30; *Pfl. R. Heft 103* (1938) 169.

Liana. Branchlets minutely tomentose, gradually glabrescent. *Leaves* 1(–2)-jugate, petiole, rhachis, and petiolules minutely tomentose. *Leaflets* oblong or oblong-ovate, (8–)13–18 by (3¹/₂)–5¹/₂–6¹/₂ cm, chartaceous, glabrous above or on both sides tomentose on midrib and nerves; base broadly cuneate to rounded; apex slightly tapering-acuminate, acumen broad, ± emarginate; nerves 8–10 pairs, slanting, faintly curved, all except the lower ones distinctly looped and joined, veins transverse. *Inflorescences* axillary and on the older branches, in fascicles of c. 5–10 few-flowered racemes, 1¹/₂–2 cm long, all densely minutely fulvous-tomentose. *Flowers* 4(–5)-merous. *Sepals* lanceolate, acute, 5 by 1¹/₂ mm, outside thinly pubescent, inside nearly glabrous, the apex excepted. *Petals* 11 by

1 mm, glabrous. *Stamens* free. *Pistils* 4–5, ovary and the basal half of the style woolly pubescent. *Infructescences* slightly elongated, the fruit-bearing axes much thickened, only few flowers developing fruits. *Fruits* c. 3 per flower, 2¹/₂ by 1 cm, sparsely minutely tomentose.

Distr. *Malaysia*: Sumatra (Tapanuli: Pulo Liman, once found, RAHMAT 5327), Malay Peninsula (Perak: Larut, once found).

Ecol. Open jungle at low altitude. *Fl.* Jan., *fr.* Aug.

Notes. Doubtless most closely allied to *R. acutipetala*, but distinctly different. The specimen from the Malay Peninsula is distinctly more pubescent than the specimen from Sumatra.

Excluded

Taeniochlaena polyneura SCHELLENB. *Bot. Jahrb.* 59 (1924) *Beibl. no 131*, p. 24; *Pfl. R. Heft 103* (1938) 169.—The type of this species (MOTLEY 685 *p.p.* in herb. K) consists of a young twig with inflorescences of *R. acutipetala* *ssp. borneensis* and an older twig with a leaf of *Lansium domesticum* JACK (*Meliac.*). As these leaves play an important part in the description of this 'species', the name is illegitimate and should be discarded.

4. ROUREA

AUBL. *Hist. Pl. Guiane* 1 (1775) 467, t. 187; SCHELLENB. *Pfl. R. Heft 103* (1938) 194; *nom. cons. prop.*—*Santaloides* LINNÉ, *Fl. Zeyl.* (1747) 192, *p. maj. p.*; LINNÉ *ex O.K. Rev. Gen. Pl.* 1 (1891) 155 (*Santalodes*), *nom. illeg.*; SCHELLENB. *Mitt. Bot. Mus. Un. Zürich no 50* (1910) 46; *Pfl. R. Heft 103* (1938) 119; J. H. HEMSL. & BULLOCK, *Taxon* 5 (1956) 57, *nom. cons. prop.*—*Kalawael* ADANS. *Fam. Pl.* 2 (1763) 344, *nom. rejic. prop.*—*Byrsocarpus* SCHUM. & THONN. *Kongl. Dansk. Vid. Selsk. Skrift. IV*, 3 (1827) 246; SCHELLENB. *Pfl. R. Heft 103* (1938) 146.—*Jaundea* GILG, *Notizbl. Berl.-Dahl.* 1 (1895) 66; SCHELLENB. *Pfl. R. Heft 103* (1938) 161.—*Santaloidella* SCHELLENB. *Pfl. R. Heft 103* (1938) 118.—*Fig. 7–9.*

Lianas or erect shrubs, sometimes small trees; part of the twigs often hooked. *Leaves* imparipinnate, rarely unifoliolate. *Inflorescences* axillary, often together pseudo-terminal (to truly terminal?), paniculate. *Bracts* ovate-lanceolate, acute. *Bracteoles* lanceolate, small, fimbriate. *Flowers* bisexual, 5-merous. *Sepals* distinctly imbricate, ovate, acute, outside usually minutely pubescent, ciliate along the margin, barbulate at the apex, inside glabrous. *Petals* lanceolate, 2–3 times as long as the sepals, thin, glabrous. *Stamens* 10, confluent at the base, glabrous, epispalous ones distinctly longer than epipetalous ones; filaments filiform. *Pistils* 5, heterotristylous; ovary oblique-ovoid, pubescent or glabrous; style slender, stigma capitate, faintly 2-lobed. *Calyx* in fruit accrescent, coriaceous or hard. *Fruits* 1 (very seldom 2) per flower, ellipsoid to ovoid, usually slightly recurved, delicately striate lengthwise, glabrous (in *Mal. spp.*), usually opening lengthwise by a ventral slit, rarely pericarp tearing loose irregularly ± circumsciss at the base; pericarp thin, coriaceous to very hard. *Seed* 1, ellipsoid to subglobular, usually flattened, either the testa itself partly or nearly entirely fleshy, or the seed enveloped by a fleshy arillode; no endosperm.

Distr. About 90–100 species (acc. to SCHELLENBERG, Pfl. R. Heft 103, 1938, but probably much less) in the tropics of Central and S. America, Africa (also Madagascar), SE. Asia, *Malaysia*, NE. Australia, and Melanesia (to and including Samoa).

Ecol. Primary and secondary rain-forests, especially along the edges, along river-banks, roads, *etc.*; mainly at low altitudes.

According to J. H. HEMSLEY (in Fl. of E. Trop. Afr.) the fruits are eaten by birds and monkeys, which apparently are very fond of them.

Uses. A decoction of the roots of some species is used as a medicine against stomach-ache and dysentery; of some other species, this decoction is poisonous, and is used for killing dogs. The arillode is eaten. See BURK. Dict. (1935) 1950.

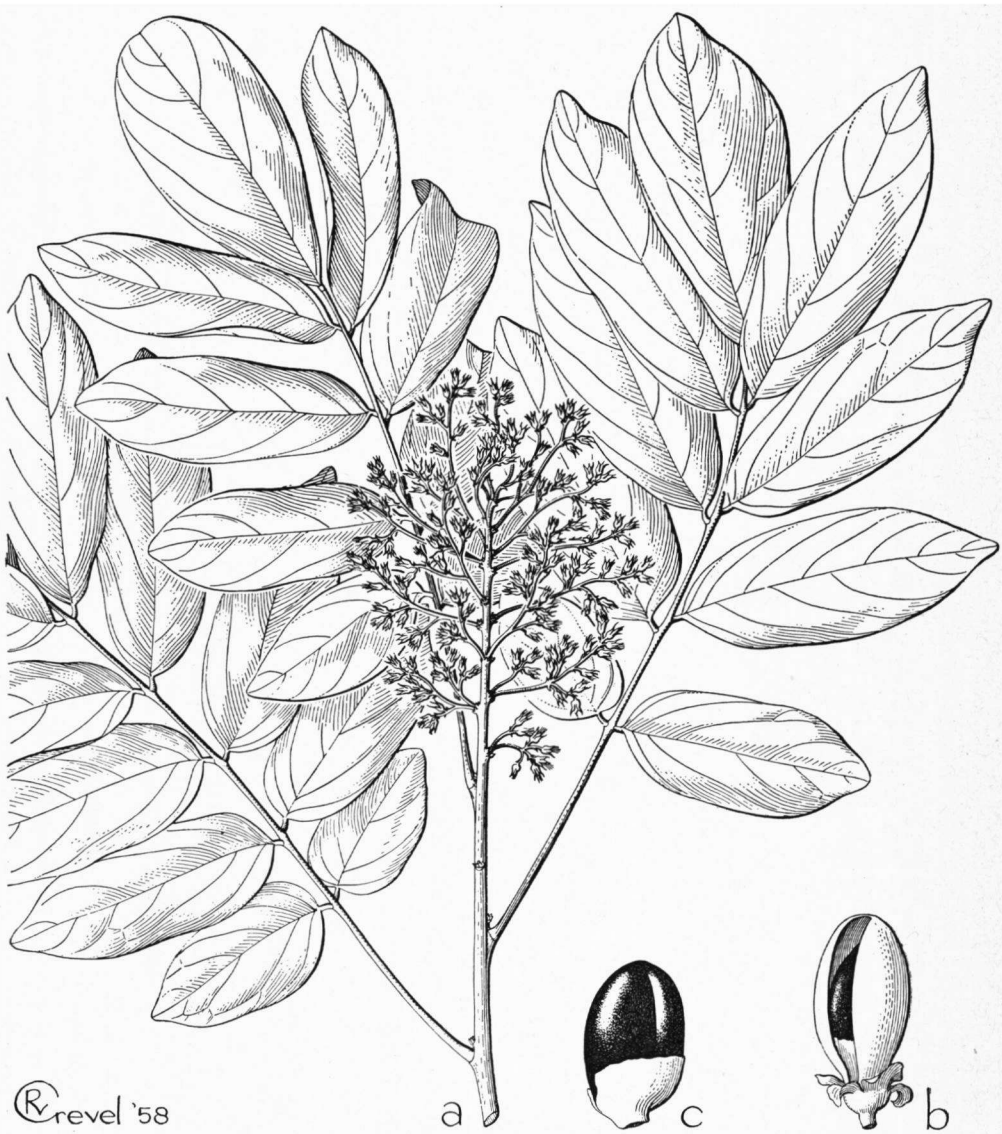


Fig. 7. *Rourea oligophlebia* MERR. a. Flowering twig, $\times \frac{1}{2}$, b. fruit, and c. seed, nat. size (a RAHMAT 6775 and BARTLETT 8161, b RAHMAT 4912, c CLEMENS 3365).

Morph. In principle the phyllotaxis of the present genus is spiral ($\frac{2}{5}$), often rather irregular, however, and in some species even not rarely pseudo-opposite.

The flowers are recorded to be fragrant. The calyx is initially creamy-white, turning to pink at the end of the anthesis, and to dull-crimson when the fruit is ripening. Short after anthesis the calyx is contracted in a very peculiar way into a slender cone, with a small tuft of stamens protruding from the apex; this is a valuable character for recognizing the genus. The corolla is creamy to white, turning to pinkish-white; though choripetalous, it falls off as a whole, as the petals are conglutinated slightly above their bases. The filaments are waxy-white, the anthers yellow. The pistils are usually pilose, at least at the base of the sharp centripetal edge of the ovary; the upper half of the style is always glabrous. The ovary is pale yellow, the style white, and the stigma brown.

The fruits turn from bright green via yellow to red; the inner surface remains green. After dehiscence the pericarp is recurving (if it is not shed as a whole, like in *sect. Afrosantaloides*), and the seed is protruding from the pericarp.

The seed. Normally the testa is shining light-brown to black. However, at least part of the testa is fleshy and yellow to red, moreover, it is fragrant. In *subg. Jaundea* this sarcotesta covers the whole seed or the greater part of it. In *subg. Rourea* the sarcotesta is restricted to a small area near the base of the seed, opposite to the hilum. In *subg. Palliatus* the sarcotestal part fully coincides with the one in *subg. Rourea*; during the ripening of the seed, however, a loose arillode is developing from this small sarcotesta, which at the end loosely envelops the whole seed; this arillode is only slit at the side of the hilum.

Taxon. In the circumscription accepted here, the genus *Rourea* comprises 5 genera distinguished by SCHELLENBERG (Pfl. R.), viz *Santaloidella*, *Santaloides*, *Byrsocarpus*, *Jaundea*, and *Rourea*. The first four of these genera made part of his tribe *Byrsocarpeae*, the last named genus was considered to belong to the tribe *Connareae*. In fact all these genera differ only in the degree of development of the sarcotesta. And as to this character they form a gradual series, the only exception being the arillode of *Santaloides*. This arillode develops in a very late ontogenetical stage, however, as an outgrowth of a sarcotesta of quite the same kind as in his genera *Rourea* and *Santaloidella*.

In my opinion the genus *Rourea* in the wide sense should be placed in the tribe *Byrsocarpeae*, and it may be subdivided in the following way:

Subg. Jaundea (GILG) LEENH. (comprising the genera *Jaundea* and *Byrsocarpus*): sarcotesta covering the whole seed or a great part of it; hilum basal, large; calyx spreading in fruit. About 24 *spp.*, mainly in Africa, 1 in Madagascar, 1 in Annam and Sumatra (*R. oligophlebia*). Possibly both former genera might be kept apart as sections.

Subg. Rourea (comprising the genera *Santaloidella* and *Rourea sensu* SCHELLENB.): sarcotesta covering only a small part of the seed near the base just opposite the hilum; hilum lateral, near the base, small; calyx appressed in fruit. About 30 *spp.*, 1 in W. Africa, all others in Central and South America.

Subg. Palliatus LEENH. (*Santaloides sensu* SCHELLENB.): seed entirely enveloped by an arillode which is fixed near the base opposite the hilum; hilum lateral near the base, small; calyx appressed in fruit. About 35 *spp.* in Africa, SE. Asia, *Malaysia*, NE. Australia, and Melanesia.

The last subgenus may further be subdivided into 2 sections:

Sect. Palliatus (*Santaloides subg. Dalbergioidea & Mimosoidea sensu* SCHELLENB.): fruit dehiscing by a ventral slit. About 30 *spp.*; distribution as the subgenus with the exception of Africa, *incl.* all but three of the Mal. *spp.*

Sect. Afrosantaloides (SCHELLENB.) LEENH. (*Santaloides subg. Afrosantaloides* SCHELLENB. Pfl. R. Heft 103, 1938, 137): fruit dehiscing irregularly around the base. About 7–8 *spp.*, 5 of which are confined to W. Africa, 1 in Madagascar, 1 in the Deccan and the Malay Peninsula (*R. pratiana*), and possibly 1 in Borneo (*R. ovale*).

Nomencl. The proposal to conserve *Rourea* AUBL. against *Kalawael* ADANS. needs some comment and entails its typification.

In 1717 HERMANN, in his 'Museum Zeylanicum', gave some notes on two different plants from Ceylon, both recorded by their vernacular names, *Kalawael* (*l.c.* p. 21 & 24) and *Kiridiwael* (*l.c.* p. 10). As appears from his specimens preserved in the British Museum (the first named also in Herb. Leyden) *Kalawael* = *Derris heptaphylla* (L.) MERR. and *Kiridiwael* = *Rourea minor* (GAERTN.) LEENH.

In 1747 LINNÉ described in his 'Flora Zeylanica', in the class *Decandria*, the genus *Santaloides* L. in which by citation he included both *Kalawael* and *Kiridiwael*. From his description and from the systematic position he gave to his genus it is clear that he based it on *Kiridiwael*, of which he obviously must have seen a HERMANN specimen; none is preserved in the Linnean Herbarium. The mention of 'styli duo' in his diagnosis must be a mistake, as it does not fit any of the two HERMANN species. It is thus inferred, that *Santaloides* L. 1747 should be typified by *Kiridiwael*, that is *Rourea*, and in this sense it has always been understood. It is most remarkable that LINNÉ did not refer to it in his later works.

In 1763 ADANSON described in his 'Familles des Plantes' (vol. 2, p. 344) the genus *Kalawael* in his family *Pistaciae*. He based himself exclusively on the description of LINNÉ 1747, repeating the mistake alluded to above '2 stil. 2 stig.' He provided the generic name *Kalawael* with the references: 'Herm. Zeyl. 24. *Santaloides* Linn.', adding, in the index (*l.c.* p. 530) 'Kiridivel' as another synonym, thereby maintaining exactly the same citation and circumscription as LINNÉ had cited in 1747 for *Santaloides*.

Though ADANSON accepted the name *Kalawael*, a common Ceylonese vernacular for *Derris*, it is clear that the typification of *Kalawael* ADANS. should be in accordance with the taxonomical position he gave to it, and with his diagnosis. And the latter which he derived from LINNÉ should in turn be typified in the same sense as *Santaloides* L., that is by *Kiridiwael* HERM. = *Rourea minor* (GAERTN.) LEENH. The conclusion is, therefore, that *Kalawael* ADANS. 1763 is an earlier taxonomic synonym of *Rourea* AUBL. 1775.

The arguments for proposing to reject *Kalawael* in favour of *Rourea* are primarily that no taxonomist has taken up this name since it was proposed by ADANSON in 1763 and no binary combination has been attached to it, whereas *Rourea* is a well-known large genus. A minor issue is that the generic name *Kalawael* is a common vernacular in Ceylon for *Derris*.

KEY TO THE SPECIES

- 1. Seed covered by a sarcotesta in the basal half 1. *R. oligophlebia*
- 1. Seed enveloped by an arillode.
- 2. Pericarp tearing loose irregularly ± circumscess at the base.
- 3. Leaves 3-6-jugate 7. *R. prainiana*
- 3. Leaves uni- to 3-foliolate 8. *R. ovale*
- 2. Fruit dehiscent with a ventral lengthwise slit.
- 4. Leaves mimosoid, leaflets many (up to c. 25 pairs) and small (up to 3½ by 1½ cm).
- 5. Lateral leaflets (nearly) equilateral at the base; pubescence fulvous 4. *R. mimosoides*
- 5. Lateral leaflets distinctly oblique at the base; pubescence reddish-brown 5. *R. fulgens*
- 4. Leaves not mimosoid.
- 6. Leaflets bullate, beneath at least pubescent on the midrib and the nerves 2. *R. rugosa*
- 6. Leaflets not bullate, usually glabrous, if pubescent only on the midrib beneath.
- 7. Pistils extremely small (½-1 mm) (or plant dioecious?) 6. *R. radlkoferiana*
- 7. Pistils at least 1½-2 mm 3. *R. minor*

Subgenus *Jaundea*

(GILG) LEENH., *nov. comb.*—*Byrsocarpus* SCHUM. & THONN., 1827.—*Jaundea* GILG, 1895.—*Byrsocarpus subg. Jaundea* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 43.

Calyx spreading in fruit. Seed entirely or for the greater part covered by a sarcotesta; hilum basal, large.

1. *Rourea oligophlebia* MERR. Pap. Mich. Ac. Sc. 23 (1938) 178.—Fig. 7.

Liana. Twigs thin-tomentose when young. Leaves (4-)5-9-jugate; lateral petiolules 2-4 mm long. Leaflets ovate (basal pairs), oblong to rarely oblong-ovate (lateral ones) or oblong-obovate (terminal ones), 5-10 by 2-4 cm, thin-chartaceous, glabrous above, minutely pubescent mainly on the nerves and veins beneath; base of lateral leaflets usually oblique, rounded to cuneate, sometimes slightly decurrent, base of terminal ones equilateral, cuneate; apex blunt, usually minutely emarginate and mucronulate; nerves 5-6 pairs, ascending, slightly curved to nearly straight, gradually looping into the marginal vein. Inflorescences

pseudo-terminal, each consisting of 1(-3) raceme(s), 2-5 cm long, few-flowered, thinly pubescent. Calyx 3 mm high, minutely pubescent outside. Petals 4 mm long. Ovary pilose. Fruits ellipsoid, straight, 2¼-3 by 1-1¼ cm, acute. Seed up to halfway covered by a sarcotesta.

Distr. Indo-China (Annam) and Malaysia: Sumatra (Tapanuli and Asahan, S to the Bila River).

Ecol. Along forest-edges at low altitude. Fl. March-May, fr. May-July.

Vern. *Andor garunggang*, M.

Note. This very interesting species is the only representative of *subg. Jaundea* outside Africa.

Subgenus *Palliatius*

LEENH., *nov. nom.*—*Santaloides* L. ex O.K. *emend.* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 46.

Calyx appressed in fruit. Seed entirely enveloped by an arillode which is attached near the base opposite the hilum; hilum lateral near the base, small.

1. Section Palliatus

Rourea sect. Dalbergioideae PLANCH. *Linnaea* 23 (1850) 414.—*Rourea sect. Mimosoideae* PLANCH. *Linnaea* 23 (1850) 420.—*Santaloides subg. Dalbergioidea* SCHELLENB. *Mitt. Bot. Mus. Un. Zürich* no 50 (1910) 49.—*Santaloides subg. Mimosoidea* SCHELLENB. *Mitt. Bot. Mus. Un. Zürich* no 50 (1910) 54.

Fruit dehiscent by a ventral slit.

2. *Rourea rugosa* PLANCH. *Linnaea* 23 (1850) 422; Walp. *Ann.* 2 (1851) 298; MIQ. *Fl. Ind. Bat.* 1, 2 (1859) 661; HOOK. *f. Fl. Br. Ind.* 2 (1876) 48; KING, *J. As. Soc. Beng.* 66, ii (1897) 14; RIDL. *Fl. Mal. Pen.* 1 (1922) 550; non F.—VILL. *Nov. App.* (1880) 56, *quae est Cnestis palala* (LOUR.) MERR.—*Connarus rugosus* WALL. *Cat.* (1847) no 8527, *nom. nud.*—*Santalodes rugosum* O.K. *Rev. Gen.* 1 (1891) 155; BURK. *Dict.* (1935) 1952; SCHELLENB. *Pfl. R. Heft* 103 (1938) 141.

Liana, up to 25 m by 7½ cm. Twigs densely fulvous-tomentose. *Leaves* (4–)7 to c. 20-jugate; lateral petiolules c. ½ mm long. *Leaflets* oblong-ovate to lanceolate, rarely ovate (especially the terminal ones), 5½–9(–12) by 1¼–4(–5) cm, (basal pairs elliptic to ovate, 2–3 by 1½ cm), thin-coriaceous to stiff-chartaceous, slightly bullate, sparsely tomentose on the midrib above, thinly short-pilose on the nerves beneath; base of lateral leaflets slightly oblique, cordate, of the terminal ones equilateral, broadly cuneate; apex slightly acuminate to caudate, blunt; nerves 6–10 pairs, patent, rather irregular, nearly straight, distinctly looped and joined. *Inflorescences* axillary, consisting of 5 fascicled, narrow panicles (and often some smaller ones), which are 7–15 cm long, rather many-flowered, fulvous-tomentose. *Calyx* 2 mm high, laxly pilose outside. *Corolla* 5 mm long. *Ovary* and basal half of the style laxly pilose. *Fruits* oblong-ovoid, curved, 1¼–1¾ by ½–¾ cm, acute.

Distr. *Malaysia*: Malay Peninsula.

SCHELLENBERG (1938) erroneously localized the specimen WRAY 1923, from Assam Kumbang, Perak, as being collected in Assam.

Ecol. Primary and secondary forests, up to 850 m. *Fl.* mainly Jan.–June, *fr.* May–Aug.

Uses. A decoction of the roots is used by the Malays as a medicine for stomach-ache; furthermore, it is drunk after childbirth.

Vern. *Akar batah*, *a. hutam*, *a. kělĕntit* (or *kuluntĕt*) *kĕra*, *a. klinlek nghmoo*, *a. sĕm(b)ĕlit*, *a. s. darah*, *a. s. puteh*, (*bĕnga*) *akar pĕrĕjeb*, *kĕlĕntit nyamok*.

3. *Rourea minor* (GAERTN.) LEENH., *nov. comb.*—*Aegicerus minus* GAERTN. *Fruct.* 1 (1788) 216, t. 46, *excl. syn. Umbraculum maris* RUMPH.; non WILLD. *Sp. Pl.* 1 (1797) 1184, *et auct.*—*Cnestis florida* JACK, *Mal. Misc.* 2, 7 (1822) 43; HOOK. *Comp. Bot. Mag.* 1 (1835) 151; Walp. *Repert.* 1 (1842) 561; MERR. *J. Arn. Arb.* 33 (1952) 220.—*Cnestis monadelpha* ROXB. [*Hort. Beng.* (1814) 34, *nom. nud.*] *ex DC. Prod.* 2 (1825) 87.—*Connarus javanicus* BL. *Bijdr.* (1826) 1166; Walp. *Repert.* 5

(1845–6) 421.—*Connarus microphyllus* HOOK. *f. & ARN. Bot. Beech. Voy.* (1833) 179, *nom. illeg.*—*Connarus roxburghii* HOOK. *f. & ARN. Bot. Beech. Voy.* (1833) 179, *nom. illeg.*—*R. santaloides* W. & A. *Prod.* (1834) 144; BEDDOME, *Fl. Sylv.* 3 (1871) t. 11; F.—VILL. *Nov. App.* (1883) 56; E. & P. *Nat. Pl. Fam.* 3, 3 (1888) f. 34 F; TRIM. *Fl. Ceyl.* 2 (1894) 1; PIERRE, *Fl. Coch.* 5 (1898) t. 379 B, *incl. var. mekongensis*; BRANDIS, *Ind. Trees* (1906) f. 92; LECOMTE, *Fl. Gén. I.–C.* 2 (1908) 47.—*Cnestis erecta* BLANCO, *Fl. Filip.* (1837) 387; MERR. *Philip. Gov. Lab. Publ.* no 27 (1905) 37.—*Cnestis glabra* (non LAMK) BLANCO, *Fl. Filip.* (1837) 387; ed. 2 (1845) 271; ed. 3, 2 (1878) 138, t. 140.—*Omphalobium pictum* BLANCO, *Fl. Filip.* ed. 2 (1845) 271; ed. 3, 2 (1878) 139.—*Cnestis acuminata* WALL. *Cat.* (1847) no 8533, *nom. nud.*—*Omphalobium obliquum* PRESL, *Epim. Bot.* (1849) 207.—*R. multiflora* PLANCH. *Linnaea* 23 (1850) 418; Walp. *Ann.* 2 (1851) 297; MIQ. *Fl. Ind. Bat.* 1, 2 (1859) 658; F.—VILL. *Nov. App.* (1880) 56; VIDAL, *Sinopsis* (1883) t. 39 f. A.—*R. caudata* PLANCH. *Linnaea* 23 (1850) 419; Walp. *Ann.* 2 (1851) 297; HOOK. *f. Fl. Br. Ind.* 2 (1876) 48.—*R. heterophylla* PLANCH. *Linnaea* 23 (1850) 419; Walp. *Ann.* 2 (1851) 297; MIQ. *Fl. Ind. Bat.* 1, 2 (1859) 658.—*R. pulchella* PLANCH. *Linnaea* 23 (1850) 419; Walp. *Ann.* 2 (1851) 297; MIQ. *Fl. Ind. Bat.* 1, 2 (1859) 658; HOOK. *f. Fl. Br. Ind.* 2 (1876) 48; KURZ, *For. Fl. Burma* 1 (1877) 324; KING, *J. As. Soc. Beng.* 66, ii (1897) 13; RIDL. *Fl. Mal. Pen.* 1 (1922) 550.—*R. commutata* PLANCH. *Linnaea* 23 (1850) 420, *nom. illeg.*; KURZ, *For. Fl. Burma* 1 (1877) 324; F.—VILL. *Nov. App.* (1880) 56; LECOMTE, *Fl. Gén. I.–C.* 2 (1908) 48; KANJILAL *et al. Fl. Assam* 2 (1938) 2.—*R. microphylla* PLANCH. *Linnaea* 23 (1850) 421, *nom. illeg.*; LECOMTE, *Fl. Gén. I.–C.* 2 (1908) 47.—*R. humilis* BL. *Mus. Bot.* 1 (1850) 262; Walp. *Ann.* 2 (1851) 297; MIQ. *Fl. Ind. Bat.* 1, 2 (1859) 658; KING, *J. As. Soc. Beng.* 66, ii (1897) 13; BACK. *Schoolf.* (1911) 287, *incl. also f. pulchella*; KOORD. *Esk. Fl. Java* 2 (1912) 340; RIDL. *Fl. Mal. Pen.* 1 (1922) 550; MERR. *Pl. Elm. Born.* (1929) 95.—*R. javanica* BL. *Mus. Bot.* 1 (1850) 262, f. 59; Walp. *Ann.* 2 (1851) 297; SCHNIZL. *Iconogr.* 4 (1866–70) t. 247 f. 17–20; LECOMTE, *Fl. Gén. I.–C.* 2 (1908) 48.—*R. simplicifolia* BL. *Mus. Bot.* 1 (1850) 263; Walp. *Ann.* 2 (1851) 297; MIQ. *Fl. Ind. Bat.* 1, 2 (1859) 658.—*Connarus obliquus* PRESL, *Walp. Ann.* 3 (1851) 844.—*R. florida* MIQ. *Sum.* (1861) 528.—*R. brachyandra* F.v.M. *Fragm.* 8 (1872) 6; F. M. *Bail. Queensl. Fl.* 2 (1900) 328.—*R. acuminata* HOOK. *f. Fl. Br. Ind.* 2 (1876) 48; KING, *J. As. Soc. Beng.* 66, ii (1897) 12; RIDL. *Fl. Mal. Pen.* 1 (1922) 550.—*Connarus monocarpus*

(non L.) F.—Vill. Nov. App. (1880) 57.—? *Connarus paniculatus* (non ROXB.) F.—VILL. Nov. App. (1880) 57.—*R. obliqua* RADLK. Sitz. Ber. Bayer. Akad. Wiss. 16 (1886) 366.—*Santalodes acuminatum* O.K. Rev. Gen. 1 (1891) 155; SCHELLENB. Pfl. R. Heft 103 (1938) 136.—*Santalodes caudatum* O.K. Rev. Gen. 1 (1891) 155; SCHELLENB. Pfl. R. Heft 103 (1938) 132.—*Santalodes floridum* O.K. Rev. Gen. 1 (1891) 155; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 28; BURK. Dict. (1935) 1951; SCHELLENB. Pfl. R. Heft 103 (1938) 124; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 7.—*Santalodes heterophyllum* O.K. Rev. Gen. 1 (1891) 155.—*Santalodes humile* O.K. Rev. Gen. 1 (1891) 155.—*Santalodes monadelphum* O.K. Rev. Gen. 1 (1891) 155; SCHELLENB. Pfl. R. Heft 103 (1938) 122, f. 21.—*Santalodes multiflorum* O.K. Rev. Gen. 1 (1891) 155.—*Santalodes pulchellum* O.K. Rev. Gen. 1 (1891) 155; BURK. Dict. (1935) 1952; SCHELLENB. Pfl. R. Heft 103 (1938) 126.—*Santalodes roxburghii* O.K. Rev. Gen. 1 (1891) 155, *nom. illeg.*; SCHELLENB. Pfl. R. Heft 103 (1938) 125.—*Santalodes simplicifolium* O.K. Rev. Gen. 1 (1891) 155; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 29; Pfl. R. Heft 103 (1938) 129.—*Sarcotheca paniculata* RIDL. Trans. Linn. Soc. II, 3 (1893) 282; Fl. Mal. Pen. 1 (1922) 324; KNUTH, Pfl. R. Heft 95 (1930) 427.—*R. anomala* KING, J. As. Soc. Beng. 66, ii (1897) 11; RIDL. Fl. Mal. Pen. 1 (1922) 549.—*R. acropetalata* PIERRE, Fl. Coch. 5 (1898) t. 379 d; LECOMTE, Fl. Gén. 1.—C. 2 (1908) 47.—*R. volubilis* (non *Cnestis volubilis* BLANCO) MERR. Philip. Gov. Lab. Publ. no 27 (1905) 36, *pro specim.*; Philip. J. Sc. 4 (1909) Bot. 125; BROWN, Min. Prod. Philip. For. 1 (1920) 378; HAYATA, Ic. Pl. Formos. 10 (1921) 3; MERR. En. Philip. 2 (1923) 240; ITO, Illustr. Formos. Pl. (1927) t. 16; SASAKI, Cat. Gov. Herb. Formosa (1930) 263.—*R. samoensis* LAUT. Bot. Jahrb. 41 (1908) 226.—*R. erecta* MERR. Philip. J. Sc. 4 (1909) Bot. 125; Fl. Manil. (1912) 220; En. Philip. 2 (1923) 239.—*Santaloides anomalum* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 50; CRAIB, Fl. Siam. En. 1 (1928) 360; SCHELLENB. Pfl. R. Heft 103 (1938) 128.—*Santaloides brachyandrum* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 50; Pfl. R. Heft 103 (1938) 125.—*Santaloides volubile* (non *Cnestis volubilis* BLANCO) SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 51, *pro specim.*; MERR. Sp. Blanc. (1918) 164.—*Santaloides erectum* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 52; Fedde, Rep. 10 (1911) 247; MERR. Sp. Blanc. (1918) 163; SCHELLENB. Pfl. R. Heft 103 (1938) 133.—*Santaloides microphyllum* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 53, *nom. illeg.*; Pfl. R. Heft 103 (1938) 130, *incl. also var. grandifoliolata*.—*R. unifoliolata* MERR. Philip. J. Sc. 8 (1913) Bot. 372; En. Philip. 2 (1923) 240.—*R. imbricata* ELM. Leaf. Philip. Bot. 7 (1915) 2597; MERR. En. Philip. 2 (1923) 240.—*R. microcarpa* ELM. Leaf. Philip. Bot. 7 (1915) 2599.—*R. subvolubilis* ELM. Leaf. Philip. Bot. 7 (1915) 2600.—*R. luzoniensis* MERR. Philip.

J. Sc. 14 (1919) 404; En. Philip. 2 (1923) 240.—*Santaloides papuanum* SCHELLENB. Bot. Jahrb. 58 (1923) 179; Pfl. R. Heft 103 (1938) 124.—*Santaloides samoense* SCHELLENB. Bot. Jahrb. 58 (1923) 180; Pfl. R. Heft 103 (1938) 122.—*Santaloides minus* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 28; Pfl. R. Heft 103 (1938) 126.—*Santaloides cordatum* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 29, *p.p.*; Pfl. R. Heft 103 (1938) 128.—*Santaloides beccarii* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 30; Pfl. R. Heft 103 (1938) 137.—*Santaloides luzoniensis* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 30; Pfl. R. Heft 103 (1938) 137.—*Connaropsis varians* CRAIB, Kew Bull. (1926) 158; Fl. Siam. En. 1 (1926) 207.—*Santaloides rubellum* SCHELLENB. Kew Bull. (1927) 376; Pfl. R. Heft 103 (1938) 133.—*Santaloides siamense* SCHELLENB. Kew Bull. (1927) 376; Pfl. R. Heft 103 (1938) 133.—*Sarcotheca varians* KNUTH, Pfl. R. Heft 95 (1930) 425.—*Santaloides desmos* GUILL. Bull. Mus. Hist. Nat. Paris II, 9 (1937) 285.—*Santaloides vieillardii* SCHELLENB. Pfl. R. Heft 103 (1938) 125.—*Santaloides acropetalum* SCHELLENB. l.c. 127.—*Santaloides celebicum* SCHELLENB. l.c. 130.—*Santaloides sumatrense* SCHELLENB. l.c. 132.—*Santaloides vitiense* SCHELLENB. l.c. 135.—*Santaloides discolor* SCHELLENB. l.c. 136, *nom. illeg.*, non O.K.—*Santaloides elmeri* SCHELLENB. l.c. 289.—Fig. 8.

Usually a large liana, rarely a shrub or treelet. Twigs glabrous or the young parts minutely tomentose. *Leaves* unifoliolate to 9-jugate, almost always glabrous; lateral petiolules ($1/2$ -)2-6 mm long. *Leaflets* suborbicular or ovate to lanceolate, terminal ones sometimes obovate, 1-25 by $1/2$ -10 cm, thin-chartaceous to coriaceous, smooth and shining on both sides or minutely papillose and dull to slightly glaucous beneath; base equilateral to oblique, acute to cordate; apex short and broad to caudate acuminate, acumen blunt; nerves 4-7(-11) pairs, either neatly pinnate or more or less triplinerved, always distinctly looped and joined near the margin; reticulations inconspicuous to distinctly minutely tessellate. *Inflorescences* mainly in the upper leaf-axils, or pseudo-terminal, consisting of 1-5 axes, central one up to 20 cm long, the other ones distinctly shorter, all loosely paniculate to subracemose, usually rather many-flowered, glabrous. *Calyx* 2-3 mm high, minutely tomentose to glabrous. *Corolla* 4-7 $1/2$ mm long. *Pistils* pubescent to glabrous (sometimes even varying in the same inflorescence!). *Fruits* oblique-ellipsoid to oblique-ovoid, straight to curved, 1-3 by $1/3$ -1 cm, blunt to acute.

Distr. Ceylon, SW. Deccan, continental SE! Asia from E. Bengal and Assam to S. China (Hongkong), Hainan, and Kôtôsyô Isl. near Formosa, the Andaman and Nicobar Islands, Malaysia (unknown only from the Lesser Sunda Islands east of Bali), NE. Queensland, New Caledonia, the New Hebrides, and the Fiji and Samoa Islands.

Ecol. In primary and secondary forests, bamboo-and teak-forests (Java), usually along forest edges, in more open places and along river-banks,

also in swamps, in thickets, and on coastal rocks, from sea-level up to 1800 m. *Fl.* and *fr.* Jan.–Dec.

Uses. The branches are used as ropes. The wood and the roots are apparently poisonous, and a decoction, mixed up with dog's food, is used for killing dogs. A decoction of the wood and the roots is also used in medicine.

Vern. Palo santo, Spanish, *akar këntjing njamuk*, *a. nasi-nasi*, *ba-blimbing*, *tëmbassau*, Sum., *akar bala*, *a.* (or *asam*) *nyamok*, *a. sëmëlit*, *bëbatal bukit*, *kachang-kachang*, *pëngichut*, *pëta bumi*, Mal. Pen., *aroy burris*, *a. tjëtjër*, *tjalintjing*, S, *itil mingip*, *ojot-wuluan*, *upil aking*, J, *kadëlik*, *liktjilikan*, Md, *akar malam*, *kolabat*, Born.; Philip.: *baraláng*, *paragauük*, Ibn., *bitog*, Ig., *dakolai*, Mbo., *gapae-gapae*, *uñgali*, Bis., *gikos-gikos*, *guraikan*, *hanmababau*, *kamagsa*, *k. tagilis*, *kamagsang-tindig*, *kamaisa*, *kamumin*, *maputl*, Tag., *hanmababau*, *magtabig*, *mabindato*, *uñgalina mapula*, Bis., *kalayan*, *tioa*, Bag., *magtabig*, Pamp.; *wallkok*, New Guinea.

Morph. In some specimens, mainly from the Malay Peninsula (and in the type specimen from Ceylon) the seeds are abnormal: stalked, globular, without arillode, thus shining light-brown with a lighter line lengthwise.

Taxon. In the circumscription as given here the species shows a wide range of variability, and consequently possesses a very large number of synonyms.

Already in 1924 SCHELLENBERG (*Bot. Jahrb.* 59, 1924, Beibl. no 131, p. 28) considered the numerous 'species' of the *Rourea minor* complex as constituting small, closely related and usually replacing microspecies which, together, make the impression of a chain or mosaic of races ('geographische Rassen einer Gesamtart'). The increase of material has entailed increase in difficulty of defining these small species against one another and it has appeared that the already feeble demarcations between them have in most cases fallen away or have been weakened so much that I feel they cannot be

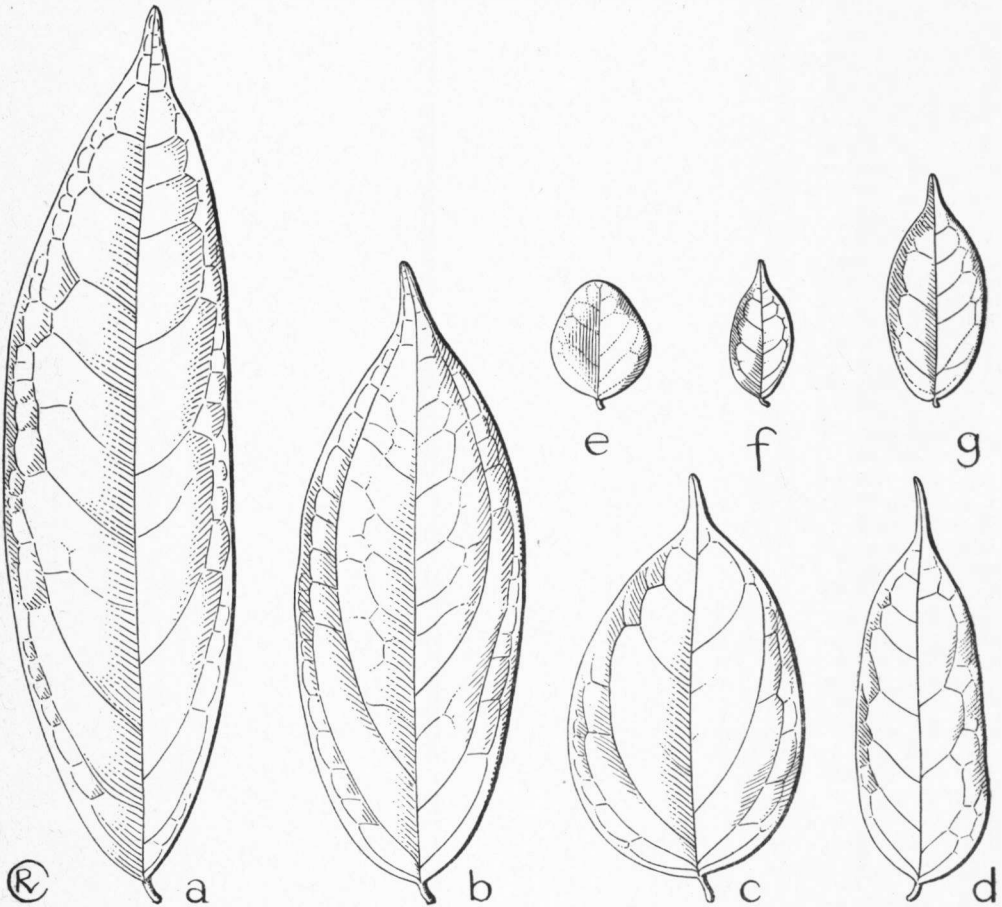


Fig. 8. Variability of leaflets in *Rourea minor* (GAERTN.) LEENH. *a.* '*acropetala*' (POILANE 29530), *b.* '*florida*' (HAVILAND s.n.), *c.* '*florida*' (FOX 5121), *d.* '*erecta*' (BS 76866), *e.* '*beccarii*' (BROOKE 10821), *f.* '*microphylla*' (WANG 1838), *g.* '*acuminata*' (SF 32196). All $\times 2/3$.

kept up. This has led to the present wide species concept.

The fact remains that within the complex specific population certain local partial populations can be distinguished as racial variants, by minor characters of the number of leaflets, their shape, texture, and nervation. As both in continental Asia and on the Malaysian and Melanesian islands in each subregion a limited number of two to three clearly distinguishable variants occur they may give the impression of representing 'good species' to the local botanist. In Hainan for example there occur two populations which are there clearly representing distinct taxa, locally known as *R. roxburghii* and *R. microphylla* and would be well acceptable as distinct species to the Hainan botanist, although the differences are mainly vegetative. If the characters of these 'species' are 'followed' in Indo-China these differences become less clear which has induced SCHELLENBERG to create a large-leaved variety of *R. microphylla* (*var. grandifoliolata*). If the populations are further followed up towards the south in the Mal. Peninsula and east in the Philippines they gradually merge and their demarcation completely breaks down.

From the monographer's standpoint, considering a species over its entire area of distribution it appears quite impossible to give any taxonomical subdivision of it. In the variation there are two definitely non-geographical tendencies. The first extreme of these tendencies is characterized by a rather large number of rather small leaflets, which are chartaceous, often dull beneath, distinctly, often caudate-acuminate, neatly penninerved, and minutely tessellate-reticulate; the fruits are often small. The other extreme has unifoliolate to 2-jugate leaves, relatively large, coriaceous leaflets, shining on both sides; usually they are only shortly broad-acuminate, and often more or less triplinerved, the reticulations are inconspicuous to invisible; fruits are usually rather large.

Specimens of the first small-leaved category have been mainly referred to as *R. caudata* (Siam, Indo-China, and Yunnan), *R. rubella* (Indo-China), *R. microphylla* (Tonkin, S. China, and Hainan; very extreme form) fig. 8f, *Santaloides elmeri* (Borneo), *R. acuminata* (Sumatra and the Malay Peninsula) fig. 8g, *Santaloides beccarii* (Borneo) fig. 8e, *R. erecta* (Philippines) fig. 8d, and *Santaloides celebicum* (Celebes).

More or less intermediate are *R. pulchella* (Malay Peninsula), *Santaloides sumatrense* (Sumatra), *R. minor* (Ceylon), and *Santaloides roxburghii* (Indo-China, S. China, and Hainan).

A wide and uninterrupted range of variability is shown by forms described as *R. javanica* (Java) and *Santaloides vittense* (Fiji).

The main forms representing the second tendency have been referred to as *R. anomala* (Assam to the Malay Peninsula), *R. acropetala* (Indo-China) fig. 8a, *R. florida* (from the Andaman and Nicobar Islands to the Samoa Islands) fig. 8b, c, and *Santaloides cordatum* (Borneo).

For descriptions and more complete details of all these and some other variations I refer to

SCHELLENBERG (Pfl. R. Heft 103, 1938) who treated them as species.

R. minor is doubtless most closely related to *R. balanseana* from New Caledonia, of which I have seen only inadequate material but which might also be conspecific.

Nomencl. The name *Aegiceras minus* GAERTN. was based exclusively upon some fruits from Ceylon, which are now preserved in the Rijks-herbarium at Leyden (KÖNIG *s.n.* in herb. L carpologica 1163), and which doubtless belong to the present species. On account of the synonym *Umbraculum maris* RUMPH. cited by GAERTNER—which represents a true *Aegiceras*—WILLDENOW, and all subsequent authors, wrongly emended GAERTNER's diagnosis.

The identity of *Cnestis glabra* (non LAMK) BLANCO, as well as some other of BLANCO's species, remains doubtful; the plate 140 as given in the 3rd edition of his Flora exactly represents the present species. *Connarus paniculatus* (non ROXB.) F.-VILL. was based upon this plate.

The name *Rourea volubilis* MERR. = *Santaloides volubilis* SCHELLENB. is based on *Cnestis volubilis* BLANCO, Fl. Filip. (1837) 385. As BLANCO described his species as possessing "cinco capillas" and "germenes al parecer unidos; pero que se separan facilmente", it seems to be quite impossible that it belongs to *Rourea*, and even to the *Connaraceae*. In the 2nd edition (1845, p. 270) BLANCO reduced it to *Cnestis trifolia* LAMK, and F.-VILL. (Nov. App. 1880, 56) reduced it to *Rourea heterophylla* PLANCH.

4. *Rourea mimosoides* (VAHL) PLANCH. *Linnaea* 23(1850) 420.—*Connarus mimosoides* VAHL, *Symb.* 3 (1794) 87; WILLD. *Sp. Pl.* 3 (1800) 693.—*Cnestis mimosoides* JACK, *Mal. Misc.* 2, 7 (1822) 44; Hook. *Comp. Bot. Mag.* 1 (1835) 151; MERR. *J. Arn. Arb.* 33 (1952) 221.—*Connarus lucidus* HASSK. *Tijd. Nat. Gesch. Phys.* 10 (1843) 144, non JACK (1822); *Cat. Hort. Bog.* (1844) 248; *Walp. Repert.* 5 (1845/6) 420.—*Connarus nitidus* HASSK. *Flora* 27 (1844) 616; *Walp. Repert.* 5 (1845/6) 420.—*R. parvifolia* PLANCH. *Linnaea* 23 (1850) 420, *nom. nud.*—*R. parallela* PLANCH. *Linnaea* 23 (1850) 421; *Walp. Ann.* 2 (1851) 298; *Miq. Fl. Ind. Bat.* 1, 2 (1859) 659; KING, *J. As. Soc. Beng.* 66, ii (1897) 14, *incl. var. major*; LECOMTE, *Fl. Gén.* 1.—C. 2 (1908) 50; BACK. *Schoolfl.* (1911) 287.—*R. sororia* PLANCH. *Linnaea* 23 (1850) 421; *Walp. Ann.* 2 (1851) 298; *Miq. Fl. Ind. Bat.* 1, 2 (1859) 660.—*R. wallichiana* PLANCH. [*Linnaea* 23 (1850) 421, *nom. nud.*] *ex Bl. Mus. Bot.* 1 (1850) 263; *Miq. Fl. Ind. Bat.* 1, 2 (1859) 659; *Hook. f. Fl. Br. Ind.* 2 (1876) 49; *KURZ, For. Fl. Burma* 1 (1877) 325.—*R. villosa* PLANCH. *Linnaea* 23 (1850) 422; *Walp. Ann.* 2 (1851) 298; *Hook. f. Fl. Br. Ind.* 2 (1876) 48; *KURZ, For. Fl. Burma* 1 (1877) 325.—*R. lucida* PLANCH. *Linnaea* 23 (1850) 423; *Bl. Mus. Bot.* 1 (1850) 263; *Miq. Fl. Ind. Bat.* 1, 2 (1859) 659; *SCHNIZL. Iconogr.* 4 (1866/70) t. 247 f. 1–11; *GILG in E. & P. Nat. Pfl. Fam.* 3, 3 (1894) f. 36; *KOORD. Exk. Fl. Java* 2 (1912) 340.—*R. nitida* PLANCH.

Linnaea 23 (1850) 423.—*R. concolor* BL. Mus. Bot. 1 (1850) 264; Walp. Ann. 2 (1851) 299; MIQ. Fl. Ind. Bat. 1, 2 (1859) 660; HOOK. f. Fl. Br. Ind. 2 (1876) 49; KING, J. As. Soc. Beng. 66, ii (1897) 15; RIDL. Fl. Mal. Pen. 1 (1922) 551.—*R. phyllanthoides* BL. Mus. Bot. 1 (1850) 264; Walp. Ann. 2 (1851) 299; MIQ. Fl. Ind. Bat. 1, 2 (1859) 660.—*R. polyphylla* BL. Mus. Bot. 1 (1850) 264; Walp. Ann. 2 (1851) 299; MIQ. Fl. Ind. Bat. 1, 2 (1859) 660.—*R. similis* BL. Mus. Bot. 1 (1850) 264; Walp. Ann. 2 (1851) 298; MIQ. Fl. Ind. Bat. 1, 2 (1859) 659; Sum. (1861) 207; HOOK. f. Fl. Br. Ind. 2 (1876) 49; KOORD.-SCHUM. Syst. Verz. 2 (1910) 22, incl. var. *macrantha* BOERL. & KOORD.; RIDL. Fl. Mal. Pen. 1 (1922) 551; BURK. & HENDERS. Gard. Bull. S.S. 3 (1925) 365; HENDERS. Gard. Bull. S.S. 4 (1928) 246.—*Santalodes concolor* O.K. Rev. Gen. Pl. 1 (1891) 155; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 32; BURK. Dict. (1935) 1951; SCHELLENB. Pfl. R. Heft 103 (1938) 144.—*Santalodes mimosoides* O.K. Rev. Gen. Pl. 1 (1891) 155; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 30; CRAIB, Fl. Siam. En. 1 (1928) 360; BURK. Dict. (1935) 1951; SCHELLENB. Pfl. R. Heft 103 (1938) 142, f. 25, incl. also *f. intermedium*; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 7.—*Santalodes nitidum* O.K. Rev. Gen. Pl. 1 (1891) 155.—*Santalodes phyllanthoides* O.K., l.c.; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 31; Pfl. R. Heft 103 (1938) 143.—*Santalodes polyphyllum* O.K. Rev. Gen. Pl. 1 (1891) 155.

—*Santalodes simile* O.K., l.c.; SCHELLENB. Pfl. R. Heft 103 (1938) 145.—*Santalodes villosum* O.K. Rev. Gen. Pl. 1 (1891) 155; SCHELLENB. Pfl. R. Heft 103 (1938) 143.—*Santalodes wallichianum* O.K. Rev. Gen. Pl. 1 (1891) 155; SCHELLENB. Pfl. R. Heft 103 (1938) 145.—*R. quocensis* PIERRE, Fl. Coch. 5 (1898) t. 379 c.—*R. intermedia* RIDL. J. Fed. Mal. States Mus. 10 (1920) 88.—*Santalodes havilandii* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 32.—Fig. 9a–f.

Large liana, up to 50 m by 10 cm, rarely an erect shrub with drooping branches, sometimes a tree (?). Twigs minutely fulvous-tomentose, more or less glabrescent. *Leaves* 2- to c. 25-jugate, at least the petiole, rachis, and petiolules pubescent; lateral petiolules up to 1/2 mm long. *Leaflets* ovate or elliptic to oblong (terminal ones sometimes obovate), 1/2–3 1/2 by 1/2–1 1/2 cm, chartaceous (to coriaceous), shining above, dull and minutely papillose, sometimes glaucous beneath and glabrous or minutely pilose on the nerves; base slightly cordate or truncate, in lateral leaflets slightly oblique; margins in oblong leaflets usually parallel; apex emarginate or obtuse; nerves 2–10 pairs, looped and joined, inconspicuous. *Inflorescences* axillary, often together pseudo-terminal, each consisting of 1–3 narrow panicles (the upper, greater part usually racemose), central one up to 12 cm long, lateral ones slightly shorter, all rather densely fulvous-tomentose, many-flowered. *Calyx* 1 1/2–2 (–3) mm high, variously hairy. *Corolla* 3 1/2–5 (–6 1/2)

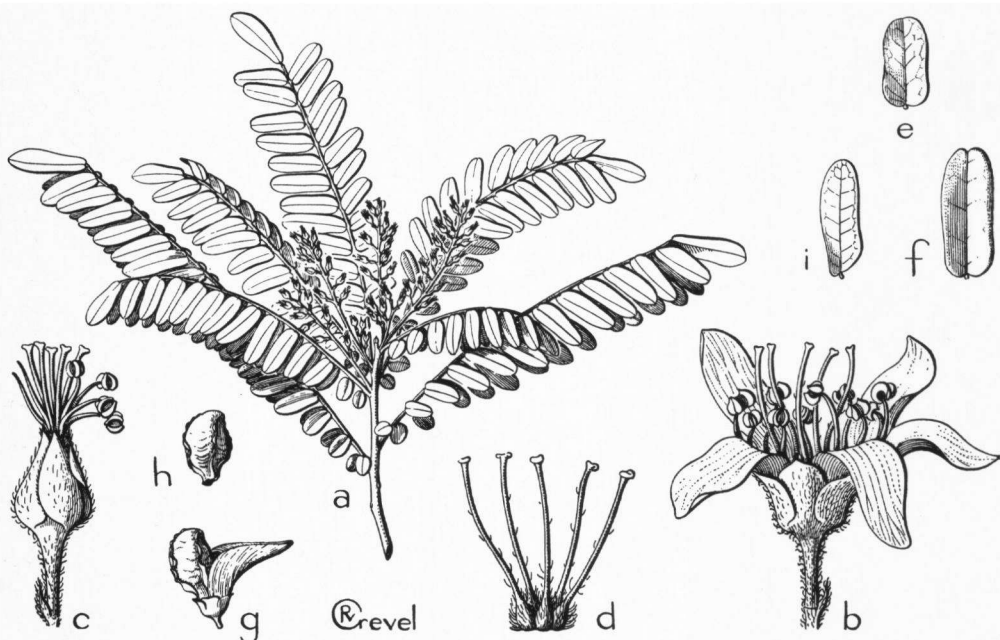


Fig. 9. *Rourea mimosoides* (VAHL) PLANCH. a. Flowering twig (*f. obtusifolia*), $\times 1/2$, b. flower, $\times 5$, c. ditto just after anthesis, $\times 5$, d. long-styled pistils, $\times 5$, e. leaflet of *f. obtusifolia*, nat. size, f. leaflet of *f. mimosoides*, nat. size.—*R. fulgens* PLANCH. g. Opened fruit, h. seed, i. leaflet, all nat. size (a, c, SF 39593, b, d LOBB 341, e KOSTERMANS 4563, f KEP 36047, g–i KEP 76340).

mm long. Indument on *pistils* variable. *Fruits* narrowly ellipsoid, curved, 1-1½ by ½ cm.

Distr. Andaman and Nicobar Islands, Lower Burma, Siam, Cambodia, and *Malaysia*: Sumatra, Malay Peninsula, W. Java, and Borneo.

Ecol. In primary and secondary forests, in bamboo forests and shrubberies, along roads and river-banks, sometimes near the beach, 0-750 m (Mt Kinabalu 1500 m). *Fl.* and *fr.* Jan.-Dec.

Uses. A decoction of the roots is used as a medicine against dysentery, and possibly also against leprosy. The stems can be used for binding fences.

Vern. *Tjuma lagi*, Sum., *akar kachang halus daun*, a. *sēmēlit*, *hujan panas*, *pérget*, *pétai-pétai*, *pinang keroh*, *rajak kayu*, *sēmēlit darah*, s. *puteh*, Mal. Pen., *areuj tjalingtjingan*, *tēmēlék*, S, *kang-gum*, Born.

Notes. The leaflets are slightly sensitive.

The nearest relative of the present species is *R. harmandiana* PIERRE from Cochinchina, differing by its very oblique leaflets, which are cuneate at the base.

Rather variable, especially in its vegetative parts. As these variations are grading, however, and moreover concern characters of slight importance, it appeared to be impossible to distinguish between these variants as several distinct species as has been done up till the present. The only distinction, which seems to be of some value, is between the following two forms:

f. mimosoides (*Connarus mimosoides* VAHL; *Connarus lucidus* HASSK.; *Connarus nitidus* HASSK.; *R. parallela* PLANCH.; *R. sororia* PLANCH.; *R. quocensis* PIERRE).—Fig. 9f.—Leaflets usually oblong with parallel margins, relatively large (1½-3½ cm long), margins distinctly recurved, midrib deeply sunken above, apex emarginate. Inflorescences usually composed of 3 axes.

Distr. As the species, Sumatra excepted.

f. obtusifolia LEENH. *nov. f.* (*R. wallichiana* PLANCH.; *R. concolor* BL.; *R. polyphylla* BL.; *R. similis* BL.).—Fig. 9a, e.—Leaflets ovate to elliptic, small (rarely more than 1½ cm long), margins and midrib usually flat, apex obtuse. Inflorescences usually consisting of 1 axis only. (Based on *R. similis* BL.)

Distr. As the species, with the exception of the Andaman and Nicobar Islands, of Cambodia, and of Java.

5. *Rourea fulgens* PLANCH. *Linnaea* 23 (1850) 423; *Walp. Ann.* 2 (1851) 298; *Miq. Fl. Ind. Bat.* 1, 2 (1859) 661; *HOOK. f. Fl. Br. Ind.* 2 (1876) 49; *KING, J. As. Soc. Beng.* 66, ii (1897) 15; *RIDL. Fl. Mal. Pen.* 1 (1922) 551; *HEYNE, Nutt. Pl. ed. 2* (1927) 699; *HENDERS. Gard. Bull. S.S.* 4 (1928) 246.—*Connarus fulgens* WALL. *Cat.* (1847) no 8524, *nom. nud.*—*Santalodes fulgens* O.K. *Rev. Gen. Pl.* 1 (1891) 155; *BURK. Dict.* (1935) 1951; *SCELLENB. Pfl. R. Heft* 103 (1938) 144; *BAKH. f. in Back. Bekn. Fl. Java (em. ed.)* 7A (1948) fam. 154, 7.—Fig. 9g-i.

Large climbing shrub or liana. Twigs densely ferruginous-tomentose, gradually glabrescent. *Leaves* 6- to c. 25-jugate, petiole, rachis, and petiolules pubescent like the twigs. *Leaflets* sessile, lateral ones oblique, oblong to lanceolate (lower pairs ovate, c. ¾ by ½ cm), terminal ones equilateral, oblong-elliptic to oblong-obovate, all c. 1½-2½ by ½-¾ cm, thin-chartaceous, thinly ferruginous-pilose, mainly beneath, lower surface minutely papillose; base in lateral leaflets very oblique, truncate to faintly cordate, in terminal ones equilateral, narrowed, slightly cordate; apex blunt to rounded; nerves 6-7 pairs, nearly transverse, straight, distinctly looped and joined. *Inflorescences* axillary, partly pseudo-terminal, each composed of (1-)3 axes, the central one of which is much stronger developed than the lateral ones, and up to 8 cm long; all narrowly paniculate, rather densely ferruginous-pubescent. *Calyx* 2½ mm high, outside with a few long hairs. *Corolla* 5 mm long. *Pistils* glabrous except a few bristles near the base. *Fruits* ovoid to ellipsoid, curved, 1½-1¾ by c. ½ cm.

Distr. Lower Burma (Tenasserim) and *Malaysia*: Banka and the SW. part of the Malay Peninsula (Selangor, Negri Sembilan, Johore, and Singapore).

Erroneously mentioned from Java by SCHELLENBERG, 1938, *l.c.*, on account of a specimen in the herbarium of PLOEM (L); this specimen has certainly been mislocalized.

Ecol. Collected at low altitudes. *Fl.* Dec.-April, *fr.* Sept.-Dec.

Uses. A decoction of the roots is said to be used as a medicine against stomach-ache.

Vern. *Akar soanai*, Banka, *sēmilat putih*, Mal. Pen.

Note. Doubtless most closely related to *R. mimosoides* from which it differs by its reddish-brown pubescence and the very oblique bases of its lateral leaflets.

6. *Rourea radlkoferiana* K. SCHUM. in Schum. & Laut. *Fl. Schutzgeb.* (1900) 342.—*Santaloides radlkoferianum* SCHELLENB. *Mitt. Bot. Mus. Un. Zürich no* 50 (1910) 53; *Bot. Jahrb.* 58 (1923) 180; *Pfl. R. Heft* 103 (1938) 130, f. 22.—*R. simulans* MERR. & PERRY, *J. Arn. Arb.* 23 (1942) 391.

Large climbing shrub. Twigs minutely fulvous-pubescent. *Leaves* 3-8-jugate, glabrous or minutely pubescent; lateral petiolules 1½-2 mm long. *Leaflets* lanceolate, lateral ones with nearly parallel margins, terminal ones often broadened towards the centre, 1½-7½ by ¾-3 cm, thin-chartaceous, glabrous or beneath pubescent on the midrib and with a few scattered hairs on the nerves; base rounded (rarely narrowed), slightly oblique in lateral leaflets; apex gradually acuminate, acumen short to rather long, blunt; nerves 6-10 pairs, nearly transverse, straight, distinctly looped and joined. *Inflorescences* axillary, in fascicles of 4-5 panicles, the central one slightly longer, up to 7 cm long, rather many-flowered, glabrous to rather densely ferruginous-pilose. *Calyx* 2-3 mm high, thinly tomentose outside. *Corolla* 3½-5 mm long. *Pistils* extremely small,

$\frac{1}{2}$ –1 mm high, possibly sterile! *Fruits* (sec. SCHELLENBERG) strongly curved, $1\frac{1}{2}$ cm long.

Distr. *Malaysia*: E. New Guinea (Augusta and April Fluss and Lower Fly River).

Ecol. Rain-forest borders, river-banks. *Fl.* Sept., Nov.

Note. I have referred *R. simulans* to the present species, though the only specimen known (BRASS

8288) differs slightly from the type specimen of *R. radlkofertiana*, mainly by being distinctly more hairy. It is remarkable that both specimens possess very small pistils, which even might be sterile. This is the main reason that I have kept this species separate from *R. minor*, which it very closely approaches in vegetative characters, specially its 'race' described as *R. acuminata*.

2. Section Afrosantaloides

(SCHELLENB.) LEENH., *nov. comb.*—*Santaloides* subg. *Afrosantaloides* SCHELLENB. Pfl. R. Heft 103 (1938) 137.

Fruit dehiscing irregularly around the base.

7. *Rourea prainiana* TALBOT, For. Fl. Bombay 1 (1909) 368, f. 213.—*Roureopsis scortechinii* KING, J. As. Soc. Beng. 66, ii (1897) 16 *pro specim. fruct.*, *typo excl.*; BURK. & HENDERS. Gard. Bull. S.S. 3 (1925) 365.—*Santaloides prainianum* SCHELLENB. Pfl. R. Heft 103 (1938) 127.

Scandent shrub or small tree. Twigs nearly glabrous. *Leaves* 3–6-jugate, glabrous, leaflets often alternating; lateral petiolules 2–3 mm long. *Leaflets* oblong-ovate (terminal ones more elliptic), 5–8 by $1\frac{1}{2}$ –3 cm, stiff-chartaceous, slightly glaucous-waxy beneath; the base in lateral leaflets slightly oblique, broadly cuneate, somewhat decurrent, in terminal ones equilateral and more acute; apex gradually caudate-acuminate, blunt; nerves 4–6 pairs, patent (at least the basal ones), straight to curved, distinctly looped and joined (sometimes with the exception of the basal ones), not very conspicuous. *Inflorescences* axillary, glabrous, in fascicles of 4–5 axes, which are all nearly of the same length (up to c. 10 cm), laxly paniculate in the lower part, pseudo-racemose with long-stalked flowers in the upper. *Calyx* 3 mm high, thinly pubescent outside. *Corolla* 8 mm long. *Pistils* glabrous. *Fruits* elliptic-ovoid, acute, straight, $2\frac{1}{2}$ –3 by 1 cm.

Distr. W. Deccan and *Malaysia*: Malay Peninsula (Perak: G. Hijau).

Ecol. Mountains, 1500–1750 m. *Fl.* Sept., fr. Feb. and Sept.

Twigs glabrous except the tips, glaucous-waxy. *Leaves* uni-(to tri-)foliolate, glabrous. *Leaflets* elliptic (to ovate, specially the lateral ones), 9–10 by 4–5 cm (lateral ones c. 4 by 2 cm), chartaceous, white waxy beneath; base rounded, rarely broadly cuneate, subpellate; apex gradually to \pm abruptly acuminate, acumen usually rather long (up to $1\frac{1}{2}$ cm), slender, and blunt; nerves 5–6 pairs, patent, straight to slightly curved, distinctly looped and joined at some distance from the margin. *Inflorescences* axillary, in fascicles of 4–5, the central one up to c. 8 cm long, only slightly longer than the other ones, all narrowly paniculate to racemose, rather few-flowered, glabrous; pedicels rather long. *Calyx* 2 mm high, thinly pubescent outside, mainly along the margin and at the apex. *Pistils* with some long hairs. *Calyx* spreading in fruit, 1 cm diam. Immature *fruits* ovoid-ellipsoid, faintly curved, 2 by $\frac{3}{4}$ cm, blunt to blunt-acuminate, probably basally dehiscent. *Seed* enveloped by the arillode.

Distr. *Malaysia*: Borneo (Sarawak: Mattang). Ecol. *Fl.* Sept., fr. Dec.

Note. The taxonomical position of this species is not yet clear. The spreading calyx under the fruit is unusual in subg. *Palliatius*; the arillode is, however, normally developed. As far as can be judged from the young fruits, the dehiscence points to sect. *Afrosantaloides*. If this would appear not to be true, the species will have to be compared again with *R. minor*.

Incertae sedis

8. *Rourea ovale* (SCHELLENB.) LEENH., *nov. comb.*—*Santaloides ovale* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 29; Pfl. R. Heft 103 (1938) 127.

Excluded

Rourea diversifolia MIQ. Sum. (1861) 528.—*Santaloides diversifolium* O.K. Rev. Gen. Pl. 1 (1891) 155 = *Connaropsis diversifolia* (MIQ.) KURZ (*Oxalid.*).

5. ELLIPANTHUS

HOOK. *f.* in B. & H. Gen. Pl. 1 (1862) 434; SCHELLENB. Pfl. R. Heft 103 (1938) 181.—*Hemandradenia* STAPP, Kew Bull. (1908) 288; SCHELLENB. Pfl. R. Heft 103 (1938) 64.—*Pseudellipanthus* SCHELLENB. in Mez, Bot. Arch. 1 (1922) 314; Pfl. R. Heft 103 (1938) 189.—Fig. 10.

Shrubs or small trees. *Leaves* unifoliolate. *Inflorescences* axillary, paniculate to glomerulous, small. *Bracts* early caducous, lanceolate, small. *Flowers* 4–5 merous, protandrous, bisexual or unisexual, in the latter case plants apparently dioecious.

Sepals valvate in bud, outside densely pubescent. *Petals* free, cochlear-imbricate in bud, (greenish- or creamy-) white. *Stamens* twice as much as petals, connate at base, episepalous ones well developed, epipetalous ones staminodial, much smaller; the tube outside glabrous, inside pilose. *Pistil* 1, pilose, somewhat laterally inserted; ovary oblique, flattened ovoid; style slender; stigma disk-shaped to bilobed, rather large. *Fruits* densely tomentose, yellowish to brownish when ripe, slightly to strongly dorsally geniculate, the basal part constricted into a short to long stipe, the fertile part more or less (flattened-)ovoid, fertile part opening lengthwise by a slit; pericarp woody; calyx persistent, not accrescent. *Seed* 1, ellipsoid, blunt at both ends, shining black, the basal part covered with a yellowish to orange ariloid; endosperm about 1 mm thick, hard.

Distr. About 10 *spp.*, 3 in Africa, 2 in Madagascar, the other ones in Ceylon, continental SE. Asia (Deccan to Hainan), the Andamans, and the western half of *Malaysia*.

Ecol. Shrubs or small, rarely medium-sized trees in rain-forests at low to medium altitudes.

Notes. The distinction made by SCHELLENBERG between *Ellipanthus* with bisexual, 5-merous flowers and *Pseudellipanthus* with dioecious, 4-merous flowers (only in Borneo) would be acceptable for defining supraspecific taxa if these characters would be constant. It has appeared, however, that, if a sufficient number of flowers of one inflorescence is examined, the number of floral parts is variable within it, though either 4- or 5-merous flowers are predominant in one specimen. The flowers of '*Pseudellipanthus*' are always unisexual, those of '*Ellipanthus*', however, may probably be also occasionally unisexual, specially in *E. tomentosus* var. *gibbosus* in the Malay Peninsula, though as the flowers of the latter are protandrous, it is sometimes difficult to establish whether the stamens have been, or the pistil will be, fertile.

The *ariloid* is doubtless of sarcotestal nature, as it is in the other genera. In the greater part of the material it is no more than a small fleshy part of the testa near the base, and so represents a true sarcotesta. In *E. tomentosus* ssp. *kingii* it is composed of some long lobes, which at least partly cover the normal dry testa, and therefore may better be called an arilode.

KEY TO THE SPECIES

- 1. Flowers predominantly 5-merous, nearly always bisexual 1. *E. tomentosus*
- 1. Flowers predominantly 4-merous, dioecious 2. *E. beccarii*

1. *Ellipanthus tomentosus* KURZ, J. As. Soc. Beng. 41, ii (1872) 305; BRANDIS, Ind. Trees (1906) 213, f. 94; CRAIB, Fl. Siam. En. 1 (1928) 366; SCHELLENB. Pfl. R. Heft 103 (1938) 186, f. 34¹⁻⁴.—*E. helferi* HOOK. f. Fl. Br. Ind. 2 (1876) 55; VIDAL, Sinops. Atl. (1883) t. 39 f. B; RIDL. J. Fed. Mal. St. Mus. 10 (1920) 88; SCHELLENB. Pfl. R. Heft 103 (1938) 184.—*E. griffithii* HOOK. f. Fl. Br. Ind. 2 (1876) 56; KING, J. As. Soc. Beng. 66, ii (1897) 10; RIDL. Fl. Mal. Pen. 1 (1922) 548; BURK. Dict. (1935) 918; SCHELLENB. Pfl. R. Heft 103 (1938) 184.—*E. calophyllus* (non KURZ) F.—VILL. Nov. App. (1883) 351.—*E. luzoniensis* VIDAL, Rev. Pl. Vasc. Filip. (1886) 104; MERR. En. Philip. 2 (1923) 241; SCHELLENB. Pfl. R. Heft 103 (1938) 188, f. 345⁵⁻⁶.—*E. monophyllus* O.K. var. *griffithii* O.K. Rev. Gen. Pl. 1 (1891) 155, nom. illeg.—*E. curtisii* KING, J. As. Soc. Beng. 66, ii (1897) 9; RIDL. Fl. Mal. Pen. 1 (1922) 548.—*E. gibbosus* KING, J. As. Soc. Beng. 66, ii (1897) 10; RIDL. Fl. Mal. Pen. 1 (1922) 549; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 27; CRAIB, Fl. Siam. En. 1 (1928) 365; SCHELLENB. Pfl. R. Heft 103 (1938) 184.—*E. kingii* BOERL. & KOORD. Ic. Bog. (1897) t. 18; K. & V. Bijdr. Booms. 5 (1900) 61; BACK. Schoolf. (1911) 289; KOORD.—SCHUM. Syst. Verz. 1 (1911-13) fam. 127, 24; KOORD. Exk. Fl. Java 2 (1912)

341; SCHELLENB. Pfl. R. Heft 103 (1938) 188, f. 357⁷⁻⁸; BAKH. f. in Back. Bekn. Fl. Java (em. ed) 7A (1948) fam. 154, 8.—*E. cinereus* PIERRE, Fl. Coch. 5 (1898) t. 378 f. C; LECOMTE, Fl. Gén. I.—C. 2 (1908) 55, f. 7g.—*E. subrufus* PIERRE, Fl. Coch. 5 (1898) t. 378 f. D; LECOMTE, Fl. Gén. I.—C. 2 (1908) 56.—*E. mindanaensis* MERR. Philip. J. Sc. 4 (1909) Bot. 124; non J. As. Soc. Str. Br. no 76 (1917) 84, nec En. Born. (1921) 291, nec Pl. Elm. Born. (1929) 96 (all = *E. beccarii*); En. Philip. 2 (1923) 241; SCHELLENB. Pfl. R. Heft 103 (1938) 185, excl. *specim. Born.*, which belong to *E. beccarii*.—*Connarus urdanetensis* ELM. Leaf. Philip. Bot. 7 (1915) 2594.—*E. burebidensis* ELM. Leaf. Philip. Bot. 7 (1915) 2596.—*E. vidalii* ELM. Leaf. Philip. Bot. 7 (1915) 2596.—? *E. neglectus* GAMBLE, Kew Bull. (1917) 26; SCHELLENB. Pfl. R. Heft 103 (1938) 186.—*E. longifolius* MERR. Philip. J. Sc. 17 (1921) Bot. 262; En. Philip. 2 (1923) 241; SCHELLENB. Pfl. R. Heft 103 (1938) 185.—*E. urdanetensis* MERR. En. Philip. 2 (1923) 241.—*E. sarawakensis* SCHELLENB. Pfl. R. Heft 103 (1938) 185.—Fig. 10.

Shrubs or small to medium-sized trees, up to 25-30 m by 50-60 cm. *Branchlets* fulvous-tomentose, at least when young. *Petioles* 1/2-3 1/2 cm long, slender, articulated near the leaf-base, tomentose, glabrescent. *Leaves* elliptic to lanceolate, some-

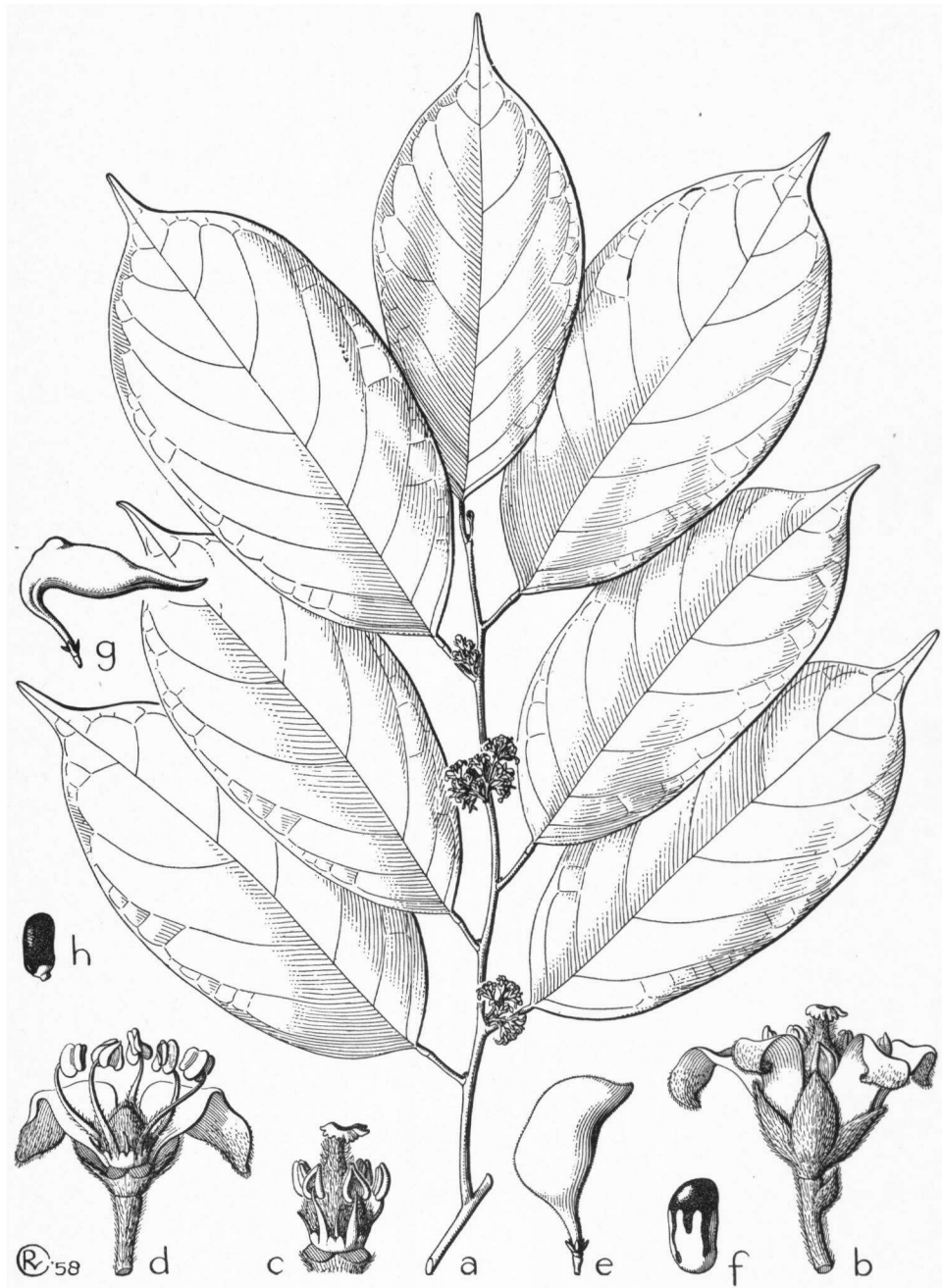


Fig. 10. *Ellipanthus tomentosus* KURZ. a. Flowering twig (var. *gibbosus*), $\times \frac{1}{2}$, b. bisexual flower (var. *luzoniensis*), $\times 5$, c. stamens, staminodes, and pistil (ditto), $\times 5$, d. σ flower (ditto), $\times 5$, e. fruit (ditto), $\times \frac{3}{4}$, f. seed (ssp. *kingii*), $\times \frac{3}{4}$, g. fruit (var. *gibbosus*), $\times \frac{3}{4}$, h. seed (var. *gibbosus*), $\times \frac{3}{4}$ (a RIDLEY 14678, b-c Bs 26844, d ELMER 6889, e FB 25299, f KOORDERS 5294, g-h SF 32329).

times obovate, 7–22(–33) by 3–9 cm, papyraceous to coriaceous, tomentose on the midrib above, beneath glabrous to thinly tomentose on the whole surface; base acute, rounded, or subcordate, sometimes slightly peltate; apex tapering to rather abruptly, blunt- to acute-acuminate; nerves 5–10 (–12) pairs, patent to nearly transverse, distinctly looped and joined or not. *Inflorescences* axillary or ramiflorous, paniculate to glomerulous, up to c. 2½ cm long, many- to few-flowered, always densely pilose. *Flowers* bisexual (always?), protandrous, (4–)5(–6)-merous. *Sepals* ovate to deltoid, blunt or acute, 1½–2 mm long, inside tomentose to glabrous. *Petals* ovate to linear, blunt, 2–4½ by 1¼–2½ mm, outside pilose, inside minutely tomentose usually with the exception of the base. *Stamens* glabrous or inside pubescent, at least the tube, staminodes glabrous; anthers pale yellow. *Pistil* pale orange, stigma usually 2-lobed, white. *Infructescences* not accrescent, usually with few fruits. *Fruits* ½–3 cm stipitate, slightly to c. 135° geniculate on top of the stipe, the fertile part blunt-triangular to oblique-ovoid, often much flattened, 2–4 by ¾–1¼ cm, blunt with a style-remnant or short-beaked, the ventral suture straight and smooth or sinuous and tuberculae either in the middle or near the base. *Seed* 12–20 by 6–10 mm, often flattened; arilloid minute and cupular to covering ⅔ of the seed and deeply lobed, always adaxially split up to below the hilum.

Distr. Deccan (?), Lower Burma, Siam, Cambodia, Cochinchina, Laos, and *Malaysia*: Sumatra, Malay Peninsula, Java, Borneo, the Philippines, and Celebes.

Note. The flowers of *E. tomentosus* are said to possess a strong sweet scent, like *Coffea* or like *Cananga odorata*.

KEY TO THE SUBSPECIES

1. *Inflorescences* axillary on the young twigs, glomerulous or distinctly paniculate, few-flowered. Arilloid covering less than half the seed, usually very small only. *ssp. tomentosus*
1. Kamiflorous, loosely glomerulous, all paniculate branches of about the same length, many-flowered. Arilloid covering the seed for about ⅔ part, 5-lobed till near the base. *ssp. kingii*

ssp. tomentosus.—All synonyms with the exception of *E. kingii*.

With the exception of the characters mentioned in the key, as variable as the species as a whole.

Distr. As the species, Java excepted.

Note. On account of the exceptional variability of this subspecies I have tried to distinguish at least some of the more common and morphologically and geographically more or less well circumscribed varieties; some more populations, which may be of taxonomical value, but are at present still quite insufficiently known, are mentioned only.

var. tomentosus.—*E. griffithii* HOOK. f.—*E. curtisii* KING.—*E. cinereus* PIERRE.

Tree, up to 30 m high, sometimes a shrub. Branchlets slender, remaining tomentose for a long time. Petioles ½–¾ cm long. Leaves 8–18 by 3–6 cm, stiff, usually thin-coriaceous, tomentose beneath, specially on the nerves; base neither acute, nor peltate; apex tapering acuminate; nerves faintly curved, looped and joined near the margin. *Inflorescences* glomerulous, few-flowered. Fruits short-stipitate (5–7½ by 3 to 10 by 2 mm), less than 90° geniculate, fertile part c. 2 by ¾–1¼ cm, ventral suture smooth. Seed for 1–5 mm covered by the faintly lobed sarcotesta.

Distr. Lower Burma, Siam, Cochinchina, Cambodia, Laos, and *Malaysia*: Sumatra (*incl.* also Simalur), and the Malay Peninsula.

Ecol. Rain-forests and deciduous jungle, up to c. 700 m. *Fl.* nearly the whole year, *fr.* March–June.

Uses. Wood hard and durable.

Vern. *Kérantai mèrah*, Mal. Pen.

var. gibbosus (KING) LEENH., *nov. stat.*—*E. helferi* HOOK. f.—*E. gibbosus* KING.—Fig. 10a, g–h.

Shrub or small tree, up to c. 10 m high. Branchlets 2–4 mm thick, soon glabrescent. Petioles ¾–1½ cm long, soon glabrescent. Leaves 9–22 by 4–8 cm, papyraceous, subglabrous; base faintly acuminate, subpeltate; apex tapering acuminate; nerves curved, not distinctly joined. *Inflorescences* glomerulous, few-flowered. Flowers probably sometimes unisexual. Fruits long-stipitate (1¼–2 cm by 1½–2 mm), about 90° or somewhat more geniculate, fertile part flattened, c. 2½–3 by 1 cm, ending in a slightly curved beak, ventral suture at least at the corner strongly tuberculate. Seed for 3–5 mm covered by a faintly lobed to rounded sarcotesta.

Distr. Andamans, Lower Burma, Peninsular Siam, and *Malaysia*: Malay Peninsula.

Ecol. Rain-forests, up to c. 800 m. *Fl.* April–Sept., *fr.* March–Oct.

Notes. Besides the typical form as described above, there are some apparently very closely related, though in some points differing forms which have not been given infraspecific epithets. Specimens from Pahang and Johore are nearly all characterized by their slightly smaller, fully glabrous leaves with distinctly interchanging nerves. These specimens are vegetatively nearly indistinguishable from '*E. sarawakensis*' (Borneo), which differs from them by its fruits, these being shortly stipitate, c. 45° geniculate, the fertile part blunt-triangular, ventral suture smooth; about ⅓ of the flowers are, according to the fruits, 4-merous, and in this character, as well as in the fruit-form it comes near to *E. beccarii*.

A few specimens from the Malay Peninsula (KEP 23787, SF. 24263 & 30732) are distinguished by very large leaves, which are distinctly peltate at the base, and by large, slender fruits, the fertile part of which is about 4 cm long. These specimens are nearly indistinguishable from '*E. mindanaensis*' (Mindanao) which, however, is again different by its caudate-acuminate leaves.

var. luzoniensis (VIDAL) LEENH., *nov. stat.*—*E. helferi* (non HOOK. f.) VIDAL.—*E. calophyllus* (non KURZ) F.-VILL.—*E. luzoniensis* VIDAL.—*Connarus urdanetensis* ELM.—*E. burebidensis* ELM.—*E. vidalii* ELM.—*E. longifolius* MERR.—*E. urdanetensis* MERR.—*E. sarawakensis* SCHELLENB.—Fig. 10b-e.

Shrub or tree, up to 25 m by 50 cm. Branchlets 2½–5 mm thick, early glabrescent, then shining black. Petioles 1–3½ cm long, glabrous. Leaves usually elliptic to oblong, 7–15(–21) by 3–9 cm, pergamentaceous to chartaceous, subglabrous; base usually acute to cuneate, rarely rounded or subpeltate; apex gradually to rather abruptly cuneate-acuminate; nerves 5–7 pairs, usually rather patent, faintly curved and inconspicuously looped and joined. Inflorescences more distinctly paniculate than in the other varieties, as the main axis is distinctly stronger developed (2–3½ cm long). Fruits short- to long-stipitate, basal part not very slender, fertile part c. 2½–4 by 1¼ cm, not strongly flattened. Seeds for 4–7 mm covered by a faintly lobed sarcotesta.

Distr. *Malaysia*: Borneo (Sarawak), Philippines (Palawan excepted), and Central Celebes.

Ecol. Rain-forests, up to c. 1100 m. *Fl.* mainly July–Jan., *fr.* Dec.–May.

Vern. *Alomañgói, atarúkan, banato, Tag., dañgalis, Bag., pañgalámag, Mbo., guisik, Yak., saling-udak, Bis., wojo, Celebes.*

Notes. As a whole this variety is rather uniform, the fruits excepted. Some extremes are represented on the one side by *E. burebidensis, vidalii, and urdanetensis*, all characterized by rather large, relatively broad and more pubescent leaves, on the other side by *E. longifolius*, the leaves of which are lanceolate, 19–33 by 4–8 cm, coriaceous, and nearly glabrous. These extremes are connected with the group of average specimens by some intermediates.

ssp. kingii (BOERL. & KOORD.) LEENH., *nov. stat.*—*E. kingii* BOERL. & KOORD.—Fig. 10f.

Trees, up to c. 25 m by 60 cm. Branchlets c. 2 mm thick, pubescent. Petioles 1–1½ cm, tomentose. Leaves elliptic to obovate, 7–14 by 3–7 cm, chartaceous, more or less densely tomentose, at least beneath; base rounded, not peltate; apex shortly blunt-acuminate; nerves (7–)9–12 pairs, curved, distinctly looped and joined close to the margin. Inflorescences ramiflorous, loosely glomerulous, the main branches of about the same length, paniculate. Sepals ovate. Fruits variable. The deeply 5-lobed arillode covering 2/3–3/4 part of the seed.

Distr. *Malaysia*: Java (Mts Salak and Malang in W. and Mt Willis in E. Java), apparently very rare.

Ecol. Rain-forests at 1000–1500 m. *Fl.* April–June, *fr.* Sept.–Oct.

KOORDERS mentioned the presence of nectar at the base of the staminal tube (which is sometimes thickened).

Notes. According to KOORDERS very conspicuous by its smooth, copper-red bark.

The fruits of the few specimens from E. Java

are different from those of the only fruiting specimen from W. Java. The latter are 90° or more geniculate, long- and slender-stipitate, and the fertile part is strongly flattened, the ventral suture distinctly tuberculated; in the former the fruits are short- and thick-stipitate, up to 90° geniculate, not flattened, and only very faintly tuberculated along the ventral suture.

2. *Ellipanthus beccarii* PIERRE, *Fl. Coch.* 5 (1898) t. 378 (text only).—*E. mindanaensis* (non MERR.) MERR. *J. As. Soc. Str. Br. no 76* (1917) 84; *En. Born.* (1921) 291; *Pl. Elm. Born.* (1929) 96; SCHELLENB. *Pfl. R. Heft 103* (1938) 185, *pro specim. Born.*—*Pseudellipanthus beccarii* SCHELLENB. in *Mez, Bot. Arch.* 1 (1922) 314; *Pfl. R. Heft 103* (1938) 191, f. 35 B.—*Pseudellipanthus peltatus* SCHELLENB. in *Mez, Bot. Arch.* 1 (1922) 314; *Pfl. R. Heft 103* (1938) 191, f. 35 A.—*Dichapetalum tetramerum* RIDL. *Kew Bull.* (1938) 234.

Shrub or small tree, up to c. 8 m by 10 cm. Branchlets ferruginous-tomentose when young, glabrescent. Petioles ½–1¼ cm. *Leaves* elliptic or elliptic-ovate to lanceolate, 7½–18 by 3½–5½ cm, herbaceous to thin-coriaceous, glabrous above (sometimes the midrib and the bases of the nerves excepted), more or less densely ferruginous-pubescent beneath; base rounded, peltate or not; apex acuminate; nerves 8–11(–14) pairs, faintly curved, distinctly looped and joined. *Inflorescences* axillary, glomerulous, ½–1 cm, few-flowered, densely pilose. *Flowers* unisexual (dioecious), 4(–5)-merous. *Sepals* narrowly deltoid to linear, 2–2½ mm long, inside subglabrous. *Petals* elliptic, blunt, c. 4 by 1½ mm, outside pilose, inside in the upper half densely tomentose. *Stamens* in the basal half pilose, in ♂ flowers 3½ mm long, the tube ¾ mm, in ♀ flowers 1–2 mm, the tube ½ mm; the staminodes glabrous, not rarely absent. *Pistil* in ♂ flowers moderately reduced to fully absent. *Infructescences* with a few fruits only. *Fruits* shortly stipitate (¼–¾ cm), about 90° geniculate, the fertile part blunt-triangular, c. 1½ by 1 cm, smooth. *Seed* with a minute cupular sarcotesta.

Distr. *Malaysia*: Borneo.

Ecol. Rain-forests, up to c. 900 m. *Fl.* May–Jan., *fr.* Aug., Nov.

Vern. *Kadarai or karadai, kedelai seluang.*

Notes. Two varieties are well distinguishable:

var. beccarii (incl. also *Dichapetalum tetramerum* RIDL.), characterized by the non-peltate leaf-base (surroundings of Kuching).

var. peltatus (SCHELLENB.) LEENH., *nov. stat.* (*E. mindanaensis* auct. non MERR. *pro specim. Born.*)—*Pseudellipanthus peltatus* SCHELLENB.. Characterized by a peltate leaf-base (N. and E. Borneo).

Excluded

Ellipanthus scortechinii KING, *J. As. Soc. Beng.* 66, ii (1897) 8 = *Dichapetalum gelonioides* (ROXB.) ENGL. (*Dichap.*).

6. CONNARUS

LINNÉ, Sp. Pl. 2 (1753) 675; Gen. Pl. ed. 5 (1754) 305; SCHELLENB. Pfl. R. Heft 103 (1938) 216.—*Tapomana* ADANS. Fam. Pl. 2 (1763) 343, *nom. illeg.*—*Omphalobium* GAERTN. Fruct. 1 (1788) 217, t. 46 f. 3.—*Erythrostigma* HASSK. Flora 25 (1842) Beibl. 45.—*Anisostemon* TURCZ. Bull. Soc. Nat. Mosc. 20 (1847) 152.—*Tricholobus* BL. Mus. Bot. 1 (1850) 236.—Fig. 11–15.

Lianas, shrubs, or small trees. *Leaves* imparipinnate, sometimes trifoliolate, rarely unifoliolate. *Leaflets* always more or less conspicuously, pellucid-glandular punctate. *Inflorescences* terminal and often in the upper leaf-axils, paniculate. *Flowers* bisexual, fragrant, 5-merous, sepals, petals, and stamens more or less distinctly punctate by glands appearing as dark dots in the herbarium. *Sepals* slightly confluent at the base, usually thick and fleshy. *Petals* free, imbricate in bud, at least glandular-ciliate along the margin just below the middle and there slightly cohering just before anthesis (though less than in *Rourea*), nearly always hairy at the apex; hairs partly capitate-glandular. *Stamens* 10, connate at the base, epipetalous ones always shortest and often sterile to staminodial; filaments usually sparsely glandular-pubescent, connective on the apex with a tuft of gland-topped hairs. *Pistil* 1, heterodistylous, ovary globular, style slender, stigma capitate, ovary and basal half of the style densely pilose, upper half of the style glandular-pubescent. *Calyx* in fruit persistent, not accrescent. *Fruits* pod-like, opening lengthwise along the ventral, and sometimes also along the dorsal suture, often somewhat compressed, the base often narrowed into a stipe, the dorsal suture usually rather straight, the ventral one often bulging just above the stipe, and strongly sinuate, the style-remnant usually more or less shifted to the dorsal side, often developed as an acutely triangular beak; pericarp dry, chartaceous to woody. *Seed* 1, more or less bean-shaped, testa shining black, basal part partly enveloped by a fleshy, yellow arillode, which is 2-lobed, wavy along the margin, and inserted just below the hilum; no endosperm.

Distr. According to SCHELLENBERG, *l.c.*, about 100 species but in my opinion much less, pantropical, though especially richly developed in S. America and in SE. Asia and *Malaysia*, in Australia represented by 1 and in Melanesia by 2 species.

Ecol. In and along forests, often also in more open places, in park- and even grass-lands, at low and medium altitudes.

Uses. The timber of some arboreous American species seems to be valued. Most of the Malaysian species are lianas and are only used for ropes. A decoction of several parts of different species is used as a medicine, possibly on account of the occurrence of saponin.

Morph. The leaflets of many species are apparently in vivo slightly conduplicate.

The bracts are in a few species (in *Malaysia*: *C. ferrugineus*, *villosus*, *culionensis*, and *odoratus*) subulate to cylindrical; their apex is often thickened to tripartite, suggesting reduced pinnate leaves.

The calyx is usually brown-pubescent, the corolla is white to pinkish, often with red spots, probably representing the internal glands, the filaments are pinkish, the anthers and style yellow.

The reduction of the inner stamens is in degree. They are always much shorter than the outer ones, and usually less pubescent; they may be fully fertile, the anthers either being as large as those of the outer ones or smaller. According to BURCK (Ann. Jard. Bot. Btzg 6, 1887, 251) in the latter case the pollen-grains may be smaller and so possibly sterile; it is not clear, however, if this refers only to anthers which remain closed. In many cases the inner stamens look quite normal, but the anthers apparently never open; in some species they are fully staminodial, thread-like and capitate, and then sometimes some of them may be wanting.

The fruits are usually yellow when immature, becoming orange to red; the inner side of the pericarp is light-coloured, the seed, which apparently is not exposed when the fruits are ripe, is shining black with a yellow arillode.

Taxon. In the present revision I have refrained from giving a subdivision of the genus into subgenera and sections. The one given by SCHELLENBERG, *l.c.*, is in my opinion not reflecting the natural relation-

ships, at least as far as Malaysian species are concerned; in some cases species from distant sections appeared to be either conspecific or very closely allied. I studied only a small part of the genus which cannot easily be subdivided in clearly demarcated groups.

For identification of specimens the fruits are most important; the leaves are rather characteristic and constant in a few species only; the characters of the flowers are still less important except the presence or absence of indument on the petals.

KEY TO THE SPECIES

1. Hairs branched, usually stellate.
2. Petals outside pubescent 8. *C. culionensis* var. *stellatus*
2. Petals outside glabrous.
3. Leaves 1-4-jugate; nerves ascending, usually distinctly looped and joined near the margin; veins laxly reticulate. Fruits densely pubescent 7. *C. villosus*
3. Leaves (1)-4-8-jugate; nerves not distinctly ascending, vaguely joined; veins transverse to the midrib, parallel, dense. Fruits glabrous 9. *C. odoratus*
1. Hairs simple or plant glabrous.
4. Petals outside glabrous or with a few scattered capitate-glandular hairs mainly along the margin and at the apex.
5. Pericarp thin, fruits relatively small ($1\frac{1}{2}$ - $3\frac{3}{4}$ by 1-2 cm) 11. *C. semidecandrus*
5. Pericarp thick, woody; fruits relatively large ($3\frac{1}{2}$ -7 by 2-4 cm).
6. Twigs (as well as petiole, rhachis, and petiolules) densely ferruginous-pubescent. Leaves (1)-3-5-jugate. Bracts nearly always subulate, $\frac{3}{4}$ -1 cm long. Fruits remaining pubescent for a long time.
7. Sepals 2- $2\frac{1}{2}$ mm long, inside glabrous. Leaflets thin-coriaceous, usually smooth and nearly glabrous, with (8)-10-18 pairs of nerves 2. *C. euphlebius*
7. Sepals 4- $4\frac{1}{2}$ mm long, inside densely tomentose. Leaflets stiff-coriaceous, usually bullate and pubescent, with 5-8 pairs of nerves 6. *C. ferrugineus*
6. Twigs glabrous or minutely tomentose at the tips only. Leaves 1-2-jugate. Bracts nearly always deltoid, minute. Fruits soon glabrous.
8. Leaflets pubescent beneath on midrib and nerves 1. *C. agamae*
8. Leaflets fully glabrous.
9. Veins rather dense and conspicuous. Leaflets stiff-coriaceous 3. *C. planchonianus*
9. Veins neither very dense, nor conspicuous. Leaflets chartaceous to thin-coriaceous.
10. Fruit-beak lateral, distinct. Petals 6-7 mm long. Leaflets usually decurrent at the base, often more or less triplinerved 4. *C. grandis*
10. Fruit-beak nearly terminal, inconspicuous. Petals 2- $2\frac{1}{2}$ mm long. Leaflets not decurrent at the base, not triplinerved 19. *C. salomonensis*
4. Petals distinctly pubescent outside.
11. Twigs densely pubescent, gradually glabrescent.
12. Fruits large (5-6 by 3-4 by 2 cm), thick-walled. Sepals inside pubescent. Leaflets elliptic to oblong 5. *C. subinaequifolius*
12. Fruits small ($2\frac{1}{2}$ by $1\frac{1}{2}$ cm), thin-walled. Sepals inside glabrous. Leaflets (oblong to) lanceolate. 8. *C. culionensis* var. *culionensis*
11. Twigs glabrous or minutely pubescent at the tips only.
13. Bracts subulate, c. 1 cm long *C. peekelii*, cf. p. 541
13. Bracts deltoid, minute.
14. Endocarp glabrous. Inflorescences glabrous, the ultimate branches excepted.
15. Fruits not stipitate. Ultimate branches of the inflorescences narrowly paniculate. Sepals $1\frac{1}{2}$ mm long. Petals 5-6 mm 16. *C. lucens*
15. Fruits stipitate. Ultimate branches of the inflorescences subspicate. Sepals more than 2 mm long. Petals c. 9 mm 17. *C. winkleri*
14. Endocarp sparsely to densely pubescent. Inflorescences distinctly pubescent.
16. Leaflets *caudate*-acuminate, when dry blackish-verrucose on both surfaces. Fruits obovoid, slightly flattened, $2\frac{1}{2}$ by $1\frac{3}{4}$ cm, beak lateral 14. *C. whitfordii*
16. Leaflets usually not *caudate*-acuminate (if so, then fruit different), if verrucose, then warts not black.
17. Fruits curved to falcate, broad and flattened. Ultimate branches of the inflorescences subspicate 18. *C. schumannianus*
17. Fruits either straight (stipe excepted) or curved-spindle-shaped. Ultimate branches of the inflorescences paniculate.
18. Fruits $1\frac{3}{4}$ cm long, endocarp sparsely glandular-pubescent. Sepals inside thinly tomentose. Petals 4-5 mm long 13. *C. lamii*
18. Fruits 2 cm long or more, endocarp densely pubescent. Sepals inside (sub)glabrous. Petals 5-10 mm long.
19. Fruits slenderly semi-obovoid, $3\frac{1}{2}$ cm long, beak lateral (near the apex). Sepals blunt. 10. *C. paniculatus*

19. Fruit-shape otherwise, beak about terminal. Sepals acute.
 20. Fruits 2–2½ cm long, oblique-ellipsoid. Lower side of the leaflets minutely verrucose; reticulations not conspicuous 12. *C. cochinchinensis*
 20. Fruits 3–5 cm long, usually spindle-shaped. Leaflets not verrucose; reticulations conspicuous, tessellate 15. *C. monocarpus* ssp. *malayensis*

1. *Connarus agamae* MERR. Philip. J. Sc. 13 (1918) Bot. 68; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 37; MERR. Pl. Elm. Born. (1929) 94; SCHELLENB. Pfl. R. Heft 103 (1938) 254.—Fig. 11a.

Tree, up to 17 m by 20 cm, sometimes shrub or climber. Twigs thinly pubescent, glabrescent, sparsely lenticellate. *Leaves* 1–2-jugate (at the base of the inflorescence sometimes unifoliate); petioles ¼–½ cm long. *Leaflets* oblong, slightly oblique, 11–20 by 4–10 cm (terminal ones slightly ovate, equilateral, up to 26 by 12 cm), thin-chartaceous, glabrous above, more or less densely minutely ferruginous-pilose mainly on the midrib and nerves beneath; base rounded to acute, slightly cordate and subpeltate; apex blunt; nerves 8–15 pairs, straight to slightly curved, strongly looped close to the margin, but not joined; veins and reticulations inconspicuous above, veins mainly transverse to the nerves, not dense. *Inflorescences* c. 15–35 cm long, rather broad, densely minutely ferruginous-pubescent, many-flowered. Bracts minute. *Sepals* ovate, acute, 2½ by 1½ mm, not keeled, on both sides thinly pilose, brown. *Petals* linear, blunt, 6½ mm long, on both sides with a few glandular hairs, densely punctate. *Stamens* all fertile, for ⅔ mm connate, all filaments capitate-glandular pubescent. *Fruits* obovate, 5 by 3½ by 2 cm, with a 1–1½ cm long, slender stipe; beak acute, small, at about ⅓ of the height; pericarp glabrous, shining, slightly wrinkled, woody, c. 2 mm thick, inside densely fulvous-tomentose.

Distr. *Malaysia*: NE. Borneo.

Apparently restricted to the E. part of Br. N. Borneo; the specimens, collected by HALLIER in W. Borneo, cited by SCHELLENBERG, 1938, obviously belong to *C. euphlebius*.

Ecol. In forests at low altitude, up to 300 m. Fl. Oct.–Jan., May, fr. May–July.

Vern. *Akar kulibat, bēluguh, buah kaban, karopkupan, kulabit, lēkabang.*

Note. Nearest related to *C. euphlebius*.

2. *Connarus euphlebius* MERR. J. Str. Br. R. As. Soc. no 85 (1922) 200; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 38; MERR. Pl. Elm. Born. (1929) 94; HENDERS. Gard. Bull. S.S. 7 (1933) 99; SCHELLENB. Pfl. R. Heft 103 (1938) 257, incl. also *f. microcarpa*.—Fig. 12.

Liana, up to 25 m high, or scandent shrub. Branches densely ferruginous-pubescent, as are the petiole, rachis, and petiolules. *Leaves* 1–4-jugate; petiolules ¼–½ cm long. *Leaflets* lanceolate (lower ones) to lanceolate-ovate or oblanceolate (upper pairs), 7½–27 by 2½–9 cm, stiff-chartaceous to subcoriaceous, pubescent, at least on the nerves beneath; base rounded to cuneate, usually subpeltate; apex slightly, shortly, and bluntly acuminate; nerves (8–)10–18 pairs, straight

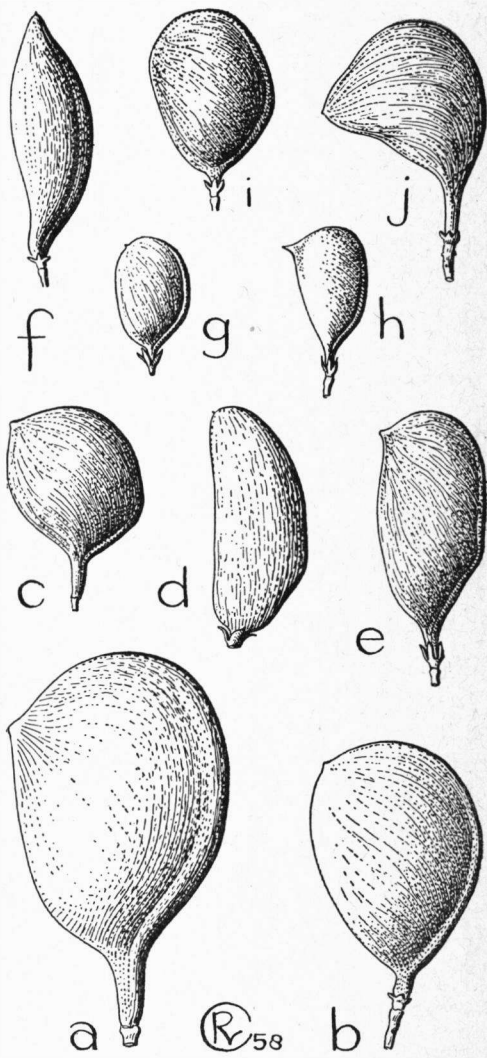


Fig. 11. Different fruit forms in *Connarus*. a. *C. agamae* MERR. (ELMER 20341), b. *C. salomoniensis* SCHELLENB. (NGF 7949), c. *C. winkleri* SCHELLENB. (WINKLER 2567), d. *C. semidecandrus* JACK ('*furfuraceus*'); RAHMAT 4614), e. *C. paniculatus* ROXB. (SF 25895), f. *C. monocarpus* L. ssp. *malayensis* LEENH. (MEIJER 4427), g. *C. semidecandrus* JACK f. β (SF 25920), h. *ditto*, f. α (BROOKE 9860), i. *C. odoratus* HOOK. f. (ELMER 21617), j. *C. schumannianus* GILG (BRASS 27586). All $\times \frac{3}{4}$.

to slightly curved, dense and parallel, nearly always distinctly looped and joined close to the margin; veins transverse to the nerves, usually rather dense. *Inflorescences* up to 45 by 30 cm, densely ferruginous-tomentose, many-flowered. Bracts cylindrical, incurved, up to 1½ cm long. *Sepals* elliptic, acute to blunt, 2–2½ by 1–1¼ mm, not to distinctly keeled, outside densely pubescent, inside glabrous. *Petals* lanceolate, blunt to slightly emarginate at the apex, 5½–7 mm long, outside glabrous except sometimes a few glandular hairs at the apex, inside glabrous or in the upper part sparsely capitate-glandular pubescent, punctate. *Stamens* ½ mm connate, epipetalous ones usually fertile, filaments glabrous or glandular-pubescent. *Fruits* obovoid, rather flattened, 3½–5 by 2–4 cm, not or only shortly (up to ¾ cm) stipitate; beak usually distinct, acute, at about ⅔ of the height; pericarp obliquely wrinkled, outside densely minutely ferruginous-tomentose, glabrescent, woody, c. 1 mm thick, inside densely ferruginous-pubescent.

Distr. *Malaysia*: P. Tioman (E of Malaya), Borneo, and the Moluccas.

Ecol. In forests at rather low altitude, up to 600 m. *Fl.* Feb.–July, Oct., *fr.* Oct.–Nov. (March, July).

Vern. *Aka bëlian*, Borneo.

Note. Nearest related to *C. agamae*.

KEY TO THE INFRASPECIFIC TAXA

1. Leaflets glabrous above. Stamens all fertile.
 - ssp. euphlebius*
 2. Leaves 3–4-jugate, leaflets not bullate.
 - var. euphlebius*
 2. Leaves 1–3-jugate, leaflets bullate.
 - var. bullatus*
 1. Leaflets minutely tomentose on the midrib above. Epipetalous stamens staminodial
 - ssp. moluccanus*
- ssp. euphlebius.*
 Leaflets glabrous above; base subpeltate; nerves 10–18 pairs, dense, near the margin distinctly joined. Sepals not keeled, outside densely appressed-pubescent. Petals inside in the upper part sparsely glandular-pubescent. Stamens all fertile, all filaments glandular-pubescent.
 Distr. P. Tioman (E of Malaya) and Borneo.
- var. euphlebius.*
 Pubescence short, tomentose. Leaves 3–4-jugate; leaflets not bullate. Fruit-beak distinct.
 Distr. As the subspecies.
- var. bullatus* LEENH. *Blumea* Suppl. 4 (1958) *in the press.*
 Pubescence more shaggy, velvety. Leaves 1–3-jugate; leaflets bullate. Fruit-beak rather inconspicuous.
 Distr. Borneo (E. coast: Sangkulirang Isl., once collected).
- ssp. moluccanus* LEENH. *Blumea* Suppl. 4 (1958) *in the press.*

Leaflets above minutely tomentose on the midrib and sometimes also on the nerves, glabrescent; base not peltate; nerves c. 8 pairs, not very close, only part of them distinctly joined; venation less dense than in *ssp. euphlebius*. The ultimate branches of the inflorescence usually densely spicate; bracts rather small. Sepals distinctly keeled, outside densely woolly pubescent. Petals fully glabrous. Epipetalous stamens sterile, all filaments glabrous.

Distr. Moluccas (Sula Islands: Taliabu, once collected).

Note. This may prove to be a good species; as long as fruits are unknown I prefer the present solution, however.

3. *Connarus planchonianus* SCHELLENB. *Kew Bull.* (1927) 375; CRAIB, *Fl. Siam. En.* 1 (1928) 364; BURK. *Dict.* 1 (1935) 650; SCHELLENB. *Pfl. R. Heft* 103 (1938) 262, f. 45 B.—*C. grandis* (non JACK) HOOK. *f. Fl. Br. Ind.* 2 (1876) 53; KURZ, *For. Fl. Burma* 1 (1877) 328; KING, *J. As. Soc. Beng.* 66, ii (1897) 7; RIDL. *Fl. Mal. Pen.* 1 (1922) 547.—*C. wallichii* (non PLANCH.) SCHELLENB. *Candollea* 2 (1925) 94, 97.

Usually a rather large liana, up to 30 m by 15 cm, sometimes described as a shrubby creeper, an erect shrub (2 m high), or even a tall tree. Branches minutely tomentose when young, soon glabrous. *Leaves* 1–2-jugate, glabrous; petiolules ¾ cm long. *Leaflets* oblong to lanceolate, 10–30 by 3½–12 cm, stiff-coriaceous, sometimes minutely warty beneath; base broadly cuneate to rounded, subpeltate; apex blunt to very shortly, blunt-acuminate; midrib very prominent beneath, nerves 8–14 pairs, gradually, usually slightly curved, rather inconspicuously joined close to the margin; veins transverse to the midrib, rather dense and conspicuous. *Inflorescences* up to 40 cm long, very broad, rather densely ferruginous-tomentose, the main branches also widely branched, flower-bearing axes densely spicate. Bracts scale-like and minute to filiform curved and up to ¾ cm long. *Sepals* elliptic to lanceolate, blunt to acute, 3 by 1–1½ mm, not keeled, densely minutely tomentose outside, inside minutely pubescent. *Petals* lanceolate-spathulate, blunt, 5–6 mm long, glabrous, punctate. *Stamens* connate for 1 mm, the epipetalous ones probably not always fully fertile; filaments, mainly those of the episepalous stamens, scattered glandular-pubescent. *Fruits* flattened ellipsoid to obovoid, 4–6 by 2½–3 cm, stipe 1–1½ cm long, beak rather inconspicuous, inserted at or near the apex; pericarp coarsely obliquely wrinkled, glabrous outside, woody, c. 1 mm thick, inside sparsely shortly pubescent.

Distr. *Malaysia*: Sumatra (E. coast: Bila River near Rantauaparap, once collected) and Malay Peninsula, north to Tenasserim.

Ecol. In open to dense, primary and secondary forests, at up to 300 m. *Fl.* (May–)Aug.–Nov., *fr.* March–April and Sept.

Vern. *Kaju lipat*, Sum., *akar larak*, *a. tulang daeng padang*, *angor satasin*, *bunga mëroyan*, *b. pamo-pamo rimba*, Mal. Pen.



Fig. 12. *Connarus euphlebius* MERR. (Cult. Hort. Bog. XVII-F-12, Oct. 1957).

Note. Doubtless nearest related to *C. kingii* SCHELLENB. from the Andamans which differs in the following points: leaflets thinner, nerves less numerous, veins less dense and less conspicuous, fruits broader; the flowers of the two species are identical. SCHELLENBERG recorded *C. kingii* also from Lower Burma; I saw only one of the two specimens cited by him, and this doubtless represented *C. planchonianus*.

4. *Connarus grandis* JACK, Mal. Misc. 2, no 7 (1822) 40; Hook. Comp. 1 (1835) 150; Walp. Rep. 1 (1842) 561; BL. Mus. Bot. 1 (1850) 267, incl. also var. *kiladja* and *lunulatus*; Walp. Ann. 2 (1851) 301; MIQ. Fl. Ind. Bat. 1, 2 (1859) 663; KOORD. Exk. Fl. Java 2 (1912) 339; SCHELLENB. Candollea 2 (1925) 94, 97; HEYNE, Nutt. Pl. (1927) 699; BURK. Dict. 1 (1935) 649; SCHELLENB. Pfl. R. Heft 103 (1938) 254, f. 45 A; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 4; non HOOK. f. Fl. Br. Ind. 2 (1876) 53; nec KURZ, For. Fl. Burma 1 (1877) 328; nec KING, J. As. Soc. Beng. 66, ii (1897) 7; nec RIDL. Fl. Mal. Pen. 1 (1922) 547 (all of which = *C. planchonianus*).—*Anisostemon trifoliatus* TURCZ. Bull. Soc. Nat. Mosc. 20 (1847) 152; Walp. Ann. 1 (1848) 199.—*C. polyanthus* PLANCH. Linnaea 23 (1850) 428; Walp. Ann. 2 (1851) 300; MIQ. Fl. Ind. Bat. 1, 2 (1859) 665.—*C. trifoliatus*; ROLFE, J. Bot. 23 (1885) 212, *sphalm. trifoliolatus*; MERR. Philip. J. Sc. 4 (1909) Bot. 119; En. Philip. 2 (1923) 238; SCHELLENB. Pfl. R. Heft

103 (1938) 263.—*C. rolfei* VIDAL, Phan. Cuming. (1885) 23, 106, *nom. illeg.*—*C. ellipticus* KING, J. As. Soc. Beng. 66, ii (1897) 7, *excl. basionym*; RIDL. Fl. Mal. Pen. 1 (1922) 547; MERR. Pl. Elm. Born. (1929) 95.—*C. diversifolius* SCHEFFER ex BACK. Schoolfl. (1911) 289, *excl. basionym?*—*C. lunulatus* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 37.—Fig. 13g.

Large liana (up to 30 m by 7½ cm), rarely a shrub or small tree (up to 7 m by 18 cm). Branches glabrous, sometimes distinctly lenticellate. Leaves 1–2-jugate, sometimes without a terminal leaflet; petiolules ½–¾ cm. Leaflets oblong-ovate to lanceolate-oblong, sometimes slightly oblique, 5½–27 by 3½–12½ cm, thin-chartaceous to thin-coriaceous, glabrous; base acute to broadly rounded, sometimes even cordate, rarely subpeltate, often slightly decurrent; apex tapering blunt-acuminate; nerves 5–10 pairs, the basal pair originating from the very base of the leaflet, all slightly curving to near the apex, not distinctly joined; veins rather inconspicuous, mainly transverse to the midrib. Inflorescences up to c. 35 by 30 cm, more or less densely fulvous-tomentose, rather many-flowered. Bracts minute. Sepals ovate to elliptic, acute, 2½–3½ by 1–1½ mm, not keeled, outside rather densely, inside more sparsely, minutely appressed-pubescent, the apex with a few bristle-like capitate-glandular hairs. Petals linear, blunt, white, pink, or cream-coloured, often distinctly red punctate, 6–7 mm long, outside some-

times with a few scattered glandular hairs near the base and the apex minutely tomentose, inside glabrous. *Stamens* for $\frac{1}{2}$ mm connate, in Philippine specimens usually all fertile, in W. Malaysian ones epipetalous stamens usually sterile to staminodial and sometimes even partly absent; filaments, at least of the long stamens, with scattered glandular hairs. *Fruits* coarse, obovoid, 5-7 by $3\frac{1}{2}$ -4 by 2 cm, without or with a short stipe (up to $\frac{1}{2}$ cm); beak acute, often hooked, inserted at 60-90% of the height; pericarp rather smooth, glabrous, woody, c. 2 mm thick, inside densely ferruginous-pubescent.

Distr. Malaysia: Sumatra (*incl.* also Simalur and Banka), Malay Peninsula, W. Java (mainly Depok and Mt Salak), Borneo, and the Philippines, possibly also on Talaud Isl.

The Moluccan specimens cited by SCHELLENBERG (1938) I have referred to *C. semidecandrus*.

Ecol. In primary, secondary, and mossy forests, usually along the edges, in more open places, and along river-banks, also on a marshy soil, up to 1400 m. *Fl.* (March-)May-Aug.(-Dec.), *fr.* (Jan.-)June-Aug.(-Dec.).

Uses. According to HEYNE a decoction of the bark of this or some related species is used as a medicine for asthma and other chest-complaints.

Vern. *Akar mambu, mēribungan akar, tjapé, Sum., olor mahara lutung, Simalur, tēlēlang, Banka, akar chinchin, Mal. Pen., aroy ki tjaŋg, bangkongan, ki hanjēr, ki ladja, S, dulipat, likabang, Born.*

Notes. Though SCHELLENBERG classified *C. grandis* JACK and *C. trifoliatius* ROLFE in different sections, *Xyloconarus* and *Pseudoxyloconarus* respectively, they differ so little that they do not even deserve the rank of subspecies. On the whole, the Philippine specimens are characterized by constantly 3-foliolate leaves, by distinctly better developed epipetalous stamens, and by usually slightly smaller, more flattened fruits the beak of which is more hooked and inserted at only about 60% of the height. Especially in Borneo intermediates occur between both extremes.

A fruiting specimen from Central Celebes (KJELLBERG 2546) comes very close to the present species as well as to *C. agamae*. It mainly differs from both by its fruits: semi-ellipsoid, c. 5 by $2\frac{1}{2}$ cm, rather flattened, narrowed though not distinctly stipitate at the base, the straight dorsal side ending in a conical, 1 cm long, acute rostrum; pericarp glabrous, rugose, 3 mm thick, hard and woody, inside sparsely pubescent. As I am not convinced that these fruits are normal, and as flowers are still unknown, I have referred this specimen provisionally to *C. grandis*.

5. *Connarus subinaequifolius* ELM. *Leaf.* Philip. Bot. 1 (1908) 297, *sphalm. subinequifolius*; MERR. Philip. J. Sc. 4 (1909) Bot. 124; En. Philip. 2 (1923) 238; SCHELLENB. Pfl. R. Heft 103 (1938) 259.—*C. bracteatus* MERR. Philip. J. Sc. 4 (1909) Bot. 120; En. Philip. 2 (1923) 237.—*C. castaneus* MERR. Philip. J. Sc. 14 (1919) Bot. 403; En. Philip. 2

(1923) 237; SCHELLENB. Pfl. R. Heft 103 (1938) 358.—Fig. 13f.

Scandent shrub. Branches densely ferruginous-pubescent when young, more or less glabrescent. *Leaves* 2-3-jugate; petiolules $\frac{1}{2}$ - $\frac{3}{4}$ cm. *Leaflets* elliptic to oblong, 6-18 by 2-7 cm, thinly coriaceous, above glabrous or minutely pubescent on the midrib, beneath either densely red sericeous-pubescent, or midrib and nerves minutely ferruginous-tomentose and glabrescent; base acute to rounded, sometimes subpeltate; apex shortly blunt- to acute-acuminate; nerves 5-8 pairs, gradually curved, more or less distinctly looped and joined near the margin; veins either transverse to the midrib, parallel and rather dense, or reticulate. *Inflorescences* up to 40 cm long, densely ferruginous-tomentose, the ultimate branches racemose and with many flowers. Bracts nearly filiform, curved, c. 1 cm long. *Sepals* lanceolate to obovate, acute, $3\frac{1}{2}$ -4 by $1\frac{1}{2}$ -2 mm, on both sides rather densely pubescent. *Petals* lanceolate, blunt, 6-7 mm long, outside rather densely tomentose, inside thinly glandular-pubescent, densely punctate. Epipetalous *stamens* glabrous or with few glandular hairs, epispalous ones slightly glandular-pubescent, probably all fertile. *Fruits* obovate, 5-6 by 3-4 by 2 cm, stipe usually very short (up to $\frac{3}{4}$ cm), beak inconspicuous, inserted at about $\frac{3}{4}$ of the height; pericarp densely red velvety-pubescent, sometimes rather early glabrescent, woody, c. 1 mm thick, inside sparsely short-pubescent.

Distr. Malaysia: Philippines (Batan Isl., Luzon, Polillo, Dinagat Isl. near Mindanao).

var. subinaequifolius.—*C. subinaequifolius* ELM.—*C. bracteatus* MERR.

Leaflets relatively narrow, subglabrescent; veins transverse to the midrib, dense. Fruit early glabrescent.

Distr. Luzon and Dinagat Isl.

Ecol. In forests up to 850 m. *Fl.* April-May, *fr.* March-May.

Note. The only specimen known from Dinagat Island (Bs 83928) is slightly different by the following characters: leaflets more coriaceous, fully glabrous; nerves 3-4 pairs, ascending, not distinctly joined; sepals inside glabrous (fruits of this form are unknown).

var. sericeus LEENH., *nov. var.*—*C. castaneus* MERR.

Leaflets relatively broad, densely sericeous-pubescent beneath; veins coarsely reticulate. Fruits remaining pubescent for a long time.

Distr. Luzon, Batan Isl., and Polillo.

Ecol. Forests at low altitude. *Fr.* Nov.-Dec.

6. *Connarus ferrugineus* JACK, Mal. Misc. 2, no 7 (1822) 37; Hook. Comp. 1 (1835) 149; Walp. Rep. 1 (1842) 561; MIQ. Fl. Ind. Bat. 1, 2 (1859) 666; HOOK. f. Fl. Br. Ind. 2 (1876) 51; GILG in E. & P. Nat. Pfl. Fam. 3, 3 (1888) f. 34 B-C; KING, J. As. Soc. Beng. 66, ii (1897) 3; BURK. J. Str. Br. R. As. Soc. no 73 (1916) 249; RIDL. Fl. Mal. Pen. 1 (1922) 545; HENDERS. Gard. Bull. S.S. 4 (1928) 246;

BURK. Dict. 1 (1935) 649; SCHELLENB. Pfl. R. Heft 103 (1938) 258, incl. also *f. macrocarpa* and *f. microcarpa*.

Liana, up to 25 m by 10 cm, sometimes an erect shrub (up to 5 m high), or a small tree. Branches densely ferruginous-tomentose, more or less glabrescent. *Leaves* 3–5-jugate, petiole, rhachis, and petiolules densely tomentose when young, rather early glabrescent; petiolules 2–3 mm. *Leaflets* oblong-obovate to oblanceolate, 3¹/₂–20 by 1¹/₂–8 cm (becoming longer and relatively narrower upwards), stiff chartaceous to coriaceous, often bullate, when young appressed-sericeous-pubescent above, glabrescent, beneath rather shaggy ferruginous-pilose on midrib and nerves; base rounded, slightly peltate; apex up to 1 cm long blunt-acuminate; nerves 5–8 pairs, gradually curved, looped and joined near the margin, veins mainly transverse to the nerves. *Inflorescences* c. 20–30 cm long, rather narrow, sparingly branched, few-flowered; flowers clustered, densely brown-tomentose. Bracts cylindrical, curved, thickened at the apex, 1–2 cm. *Sepals* oblong, slightly complicate, blunt, 4–4¹/₂ by 1¹/₂ mm, slightly keeled, densely brown-tomentose on both surfaces. *Petals* linear-spathulate, blunt, 7–8 mm long, rather stiff, glabrous, punctate. *Stamens* connate for 1 mm, all fertile; filaments with a few scattered glandular hairs. *Fruits* ellipsoid, straight, 3¹/₂–7 by 2–3 cm, not or up to 1 cm long stipitate, beak minute, near the apex; pericarp outside densely, minutely crimson-tomentose, glabrescent and wrinkled, woody, c. 1¹/₂ mm thick, inside ± ferruginous-tomentose.

Distr. Malaysia: Malay Peninsula (mainly along the W. coast).

KING erroneously recorded this species for Sumatra. According to HENDERSON it occurs also in Lower Siam, but no specimens have either been mentioned in literature, or have been found by me in herbaria.

Ecol. In primary forests and bamboo thickets, mainly in more open places, along the forest borders, river-banks, and on the rocky seashore up to c. 200 m. *Fl.* Dec.–Feb. (June, Sept.), *fr.* (April) June–Aug. (Oct.).

Uses. The fruits are used by the Malays for poisoning dogs.

Vern. *Akar merah, a. pulau hantu, (a. pulis antau), a. sakalat, a. sēmdērap, a. tēnggēk kērau, bunga akar sēṭēbal, bunga burutta, poko pulis hutan, sēmḗlīt jantan, sēmḗlīt papan.*

Note. This species seems to be most closely related to *C. subinaequifolius* from the Philippines.

7. *Connarus villosus* JACK, Mal. Misc. 2, no 7 (1822) 38; Hook. Comp. 1 (1835) 149; Walp. Rep. 1 (1842) 561; MIQ. Fl. Ind. Bat. 1, 2 (1859) 666; non RIDL. Fl. Mal. Pen. 1 (1922) 547, and all subsequent authors (= *C. odoratus* Hook. f.).—*Tricholobus fulvus* BL. Mus. Bot. 1 (1850) 237; Walp. Ann. 2 (1851) 304; MIQ. Fl. Ind. Bat. 1, 2 (1859) 666; Sum. (1861) 530.—*C. tricholobus* SCHELLENB. Mitt. Bot. Mus. Un. Zürich no 50 (1910) 75; Pfl. R. Heft 103 (1938) 229.—*C. plumoso-stellatus* MERR. Philip. J. Sc. 13 (1918) Bot.

72; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 33; Pfl. R. Heft 103 (1938) 230.—Fig. 13a–e.

Liana or scandent shrub. Branches densely stellate-plumose, as are the leaves and inflorescences, more or less glabrescent. *Leaves* 1–4-jugate, petiolules 1¹/₄–1¹/₂ cm. *Leaflets* obovate to lanceolate, 4–17 by 1¹/₂–5 cm, thin-coriaceous, glabrous above, densely ferruginous-pubescent beneath, rather early glabrescent; base acute to slightly rounded, subpeltate; apex tapering acute-acuminate; midrib strongly prominent beneath, nerves 4–8 pairs, ascending, curved, usually distinctly looped and joined near the margin, inconspicuous above, veins laxly reticulate. *Inflorescences* 10–30 cm long, few-flowered. Bracts very conspicuous, subulate, circinnate, c. 1¹/₂ cm long, often without a flower, giving the inflorescence a very characteristic crispy appearance. *Sepals* lanceolate, acute, complicate, 3¹/₂–5 by 1 mm, outside densely pubescent, inside glabrous. *Petals* linear, blunt, 5¹/₂–8 mm long, glabrous except the glandular-ciliate margins, punctate. *Stamens* 1¹/₂ mm connate, all fertile, epipetalous ones glabrous, episepalous ones with many glandular hairs in the upper half of the filaments. *Fruits* ellipsoid, 3–4¹/₄ by 1³/₄–2¹/₄ cm, not stipitate; beak minute, either inserted at 3¹/₄ of the height or nearly at the apex; pericarp rather thin, outside densely orange-brown pubescent, inside glabrous.

Distr. Malaysia: Sumatra (Indragiri and Palembang) and Borneo (Sarawak: around Kuching up to Matang and Paloh).

Ecol. In primary, dipterocarp and karengas forests, at low altitude. *Fl.* May, Aug., *fr.* Sept.–Jan. (April).

Vern. *Badju-badju, tankei laju, Sum., guid malam, Born.*

Notes. In Sumatran specimens the hairs are less strongly branched and therefore the pubescence is less crispy than in Bornean ones; this difference is specially conspicuous on the fruits. Furthermore the beak of the fruit in Bornean specimens is rather distinct and inserted at c. 3¹/₄ of the height, in Sumatran specimens it is minute and inserted near the apex.

Though I have not examined the type specimen (cited by SCHELLENBERG as being in the Herb. Delessert, G, but which could not be found), I am satisfied that RIDLEY and SCHELLENBERG have wrongly interpreted JACK's species. JACK's description of his Sumatran plant fits nicely with several later collections from that island, but differs in many points from *C. villosus* in the sense of SCHELLENBERG (of which JACK's specimen was the only one from Sumatra) and which I have classified as *C. odoratus*.

The present species is closely allied to the Philippine *C. culionensis*, furthermore it is related to *C. ferrugineus* and to *C. odoratus*.

8. *Connarus culionensis* MERR. Philip. J. Sc. 4 (1909) Bot. 120; En. Philip. 2 (1923) 237; SCHELLENB. Pfl. R. Heft 103 (1938) 267.—*C. stellatus* MERR. Philip. J. Sc. 4 (1909) Bot. 119; En. Philip. 2 (1923) 238; Philip. J. Sc. 29 (1926) 371; SCHEL-

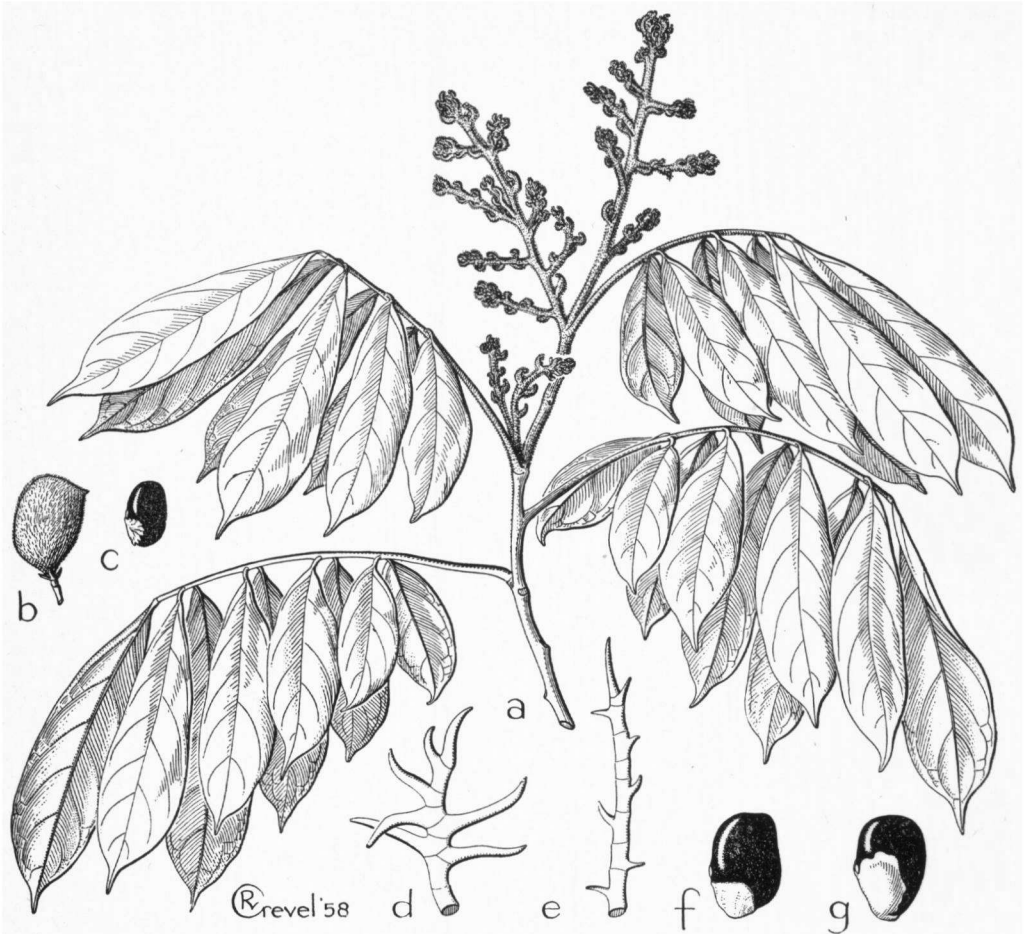


Fig. 13. *Connarus villosus* JACK. a. Flowering twig, $\times 1/2$, b. fruit, $\times 1/2$, c. seed, $\times 1/2$, d-e. branched hairs, $\times 200$.—*C. subinaequifolius* ELM. f. Seed, $\times 1/2$.—*C. grandis* JACK. g. Seed, $\times 1/2$ (a, d PRAETORIUS s.n. H.L.B. 909. 116-168, b-c BIANCHI 47, e AMIRUDDIN 29, f Bs 47269).

LENB. Pfl. R. Heft 103 (1938) 229.—? *C. erianthus* ELM. Leaf. Philip. Bot. 5 (1913) 1762, *nom. illeg.*, *non* BENTH. *ex* BAKER, 1871; MERR. En. Philip. 2 (1923) 237.—? *C. lanatus* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 41.

Liana or more or less scandent to erect shrub. Branches densely ferruginous-tomentose, more or less glabrescent. *Leaves* 2-5-jugate, the petiole, rhachis, and petiolules densely rusty tomentose when young; petiolules $1/4$ - $1/2$ cm. *Leaflets* lanceolate (the terminal ones oblanceolate) to oblong, 4-15 by 1- $5\frac{1}{2}$ cm, thin-chartaceous to subcoriaceous, when young ferruginous-tomentose on both sides, especially beneath; base usually subpeltate, of the lateral leaflets rounded to slightly cordate rarely cuneate, of the terminal ones cuneate; apex gradually, sometimes very shortly blunt-acuminate; nerves 5-6(-9) pairs, ascending, curved

(rarely nearly straight), looped and more or less distinctly joined near the margin. *Inflorescences* 20-35 cm long, densely ferruginous-tomentose, the branches transverse, up to 15 cm long, many-flowered. Bracts minute and scale-like to subulate, up to 1 cm long, and recurved. *Sepals* oblong-ovate, $3\frac{1}{2}$ by $1\frac{1}{2}$ mm, complicate, keeled, outside densely brown-tomentose, inside glabrous. *Petals* linear to elliptic, blunt, $5\frac{1}{2}$ -8 mm long, rather densely (rarely outside sparsely) appressed-pubescent on both sides, inside with many glandular hairs, brownish to white, punctate. *Stamens* for c. $3/4$ mm connate, epipetalous ones probably not always fertile, all filaments slightly glandular-pubescent, especially the episepalous ones in the upper part. *Fruits* oblique-ellipsoid, compressed, c. $2\frac{1}{2}$ by $1\frac{1}{2}$ cm, stipe very short, beak minute, nearly terminal, pericarp thin, outside obliquely

minutely wrinkled, ferruginous-tomentose, glabrescent, inside subglabrous.

Distr. *Malaysia*: North Borneo (Banguey Isl.) and S. Philippines (Balabac, Palawan, Calamianes, and Sulu Islands).

Ecol. On dry, open slopes, in dry thickets, and in forests, at low altitude.

Notes. The type of *C. lanatus* (= *C. erianthus*) differs in a few characters from the present species; in some points it seems to be intermediate between *C. culionensis* and *C. ferrugineus*.

C. ferrugineus, *villosus*, and *culionensis* are mutually closely related and, moreover, replace each other geographically; they differ in too many points, however, for treating them as subspecies.

var. culionensis.—All synonyms except *C. stellatus*.

Hairs not distinctly stellate. Leaflets lanceolate, up to 4½ cm wide, the base never cuneate in the lateral ones. Petals outside, especially in the upper half, densely pubescent. Stamens all fertile.

Distr. Palawan and Calamianes.

var. stellatus (MERR.) LEENH., *nov. stat.*—*C. stellatus* MERR.

Hairs distinctly stellate. Leaflets sometimes oblong, up to 5½ cm wide; base of the lateral ones sometimes cuneate. Petals outside sparsely pubescent. Epipetalous stamens probably sterile. Fruit unknown.

Distr. As the species.

9. *Connarus odoratus* HOOK. *f. Trans. Linn. Soc.* 23 (1860) 172; MERR. *Pl. Elm. Born.* (1929) 95.—*Tricholobus ferrugineus* BL. *Mus. Bot.* 1 (1850) 237; Walp. *Ann.* 2 (1851) 304; MIQ. *Fl. Ind. Bat.* 1, 2 (1859) 667, *non C. ferrugineus* JACK, 1822.—*C. hebephyllus* KING, *J. As. Soc. Beng.* 66, ii (1897) 5.—*C. villosus* (*non* JACK) RIDL. *Fl. Mal. Pen.* 1 (1922) 547; SCHELLENB. *Bot. Jahrb.* 59 (1924) Beibl. no 131, p. 33; Pfl. R. Heft 103 (1938) 228.—Fig. 11i.

Liana or scandent shrub, up to 35 m by 15–20 cm, possibly sometimes a small tree. Branches densely ferruginous-tomentose by dendroid hairs when young, glabrescent, lenticellate. *Leaves* (1–)4–8-jugate, petiole, rachis, and petiolules densely tomentose when young; petiolules ½ cm. *Leaflets* lanceolate, 3–16 by 1½–5 cm (gradually increasing in size from the basal pair to the terminal leaflet), thin-chartaceous, when young tomentose on midrib and nerves beneath, soon glabrescent; base rounded to cuneate, becoming less oblique and more acute from the basal pair to the terminal leaflet, sometimes subpeltate; apex tapering long and slender acuminate; nerves 6–10 pairs, oblique, curved, rather indistinctly looped and joined near the margin, inconspicuous above, veins fine, dense, transverse to the midrib. *Inflorescences* up to c. 20 cm long, widely branched, densely ferruginous-tomentose, flowers mainly crowded towards the ends of the branches. Bracts subulate, circinnate and c. 1 cm long to deltoid and minute. *Sepals* oblong-ovate, acute, 3½ by 1 mm, complicate, outside densely pubescent, inside glabrous. *Petals* linear-spathulate, 6 mm long, glabrous, punctate.

Stamens for ½ mm connate, all fertile, filaments with a few scattered glandular hairs. *Fruits* oblique-ellipsoid, not compressed, 3–3¼ by 2–2½ cm, stalk c. ¼ cm long, beak minute, inserted at 85% of the height to nearly terminal, pericarp thin, outside glabrous, minutely wrinkled and verruculose, inside more or less densely dendroid-pubescent.

Distr. *Malaysia*: Malay Peninsula and Borneo.

Ecol. In forests and thickets, at up to 450 m. *Fl. May, Oct., Dec., fr. Aug.–Nov.* (Feb., May).

Note. *C. odoratus* is distinctly related to *C. ferrugineus*, *villosus*, and *culionensis*, as well as to *C. paniculatus* and *semidecandrus*.

10. *Connarus paniculatus* ROXB. [*Hort. Beng.* (1814) 49, *nom. nud.*] *Fl. Ind.* 3 (1832) 139; HOOK. *f. Fl. Br. Ind.* 2 (1876) 52; KURZ, *For. Fl. Burma* 1 (1877) 327; BRANDIS, *Ind. Trees* (1906) 212; SCHELLENB. *Pfl. R. Heft* 103 (1938) 260; KANJILAL *et al. Fl. Assam* 2 (1938) 2; *non* F.—VILL. *Nov. App.* (1880) 57, = ? *Rourea minor*.—*C. wightii* HOOK. *f. Fl. Br. Ind.* 2 (1876) 51; BRANDIS, *Ind. Trees* (1906) 212; GAMBLE, *Fl. Madras* 2 (1918) 272; SCHELLENB. *Pfl. R. Heft* 103 (1938) 227.—*C. bariensis* PIERRE, *Fl. Coch.* 5 (1898) t. 377; SCHELLENB. *Pfl. R. Heft* 103 (1938) 261.—*C. harmandianus* PIERRE, *Fl. Coch.* 5 (1898) t. 377 b; LECOMTE, *Fl. Gén. I.–C.* 2 (1908) 51.—*C. rufulus* PIERRE, *Fl. Coch.* 5 (1898) t. 378 b; LECOMTE, *Fl. Gén. I.–C.* 2 (1908) 52; SCHELLENB. *Pfl. R. Heft* 103 (1938) 267.—*C. hainanensis* MERR. *Lingn. Sc. J.* 13 (1934) 58; CHUN, *Sunyatsenia* 4 (1940) 244.—*C. yunnanensis* SCHELLENB. *Pfl. R. Heft* 103 (1938) 228.—Fig. 11e.

Liana (acc. to ROXBURGH a large tree). Branchlets minutely ferruginous-tomentose at the tip, early glabrescent. *Leaves* 2–3-jugate, glabrous; petiolules ½ cm. *Leaflets* oblong to lanceolate, 10–16 by 3½–6 cm, stiff-chartaceous to thin-coriaceous; base subpeltate, rounded or sometimes slightly cordate; apex blunt to shortly and broadly blunt-acuminate, acumen not rarely slightly emarginate; nerves 5–8 pairs, patent to ascending, slightly to distinctly curved, not joined, inconspicuous above; veins parallel, not very dense, nearly invisible. *Inflorescences* (in Malayan specimens unknown) broadly paniculate, 10–40 cm long, shortly and densely ferruginous-tomentose, glabrescent. Bracts scaly, minute. *Sepals* elliptic to obovate, 2½–3½ by 1–1½ mm, blunt, distinctly keeled, outside densely ferruginous-pubescent, inside subglabrous. *Petals* narrowly spatulate, c. 7½ mm long, blunt, outside shortly and densely pubescent, inside sparsely tomentose. *Stamens* connate for ½–1¼ mm, all fertile, filaments glandular-pubescent. *Fruits* semi-obovoid, convex, 3½ by 1¾ by 1¼ cm, base narrowed into a short, slender stipe (c. 4 mm long), beak inconspicuous, inserted at c. 90% of the height to near the apex, pericarp thin, outside striate, granulate, glabrescent, inside rather densely shortly pubescent.

Distr. W. Deccan, Bengal, Assam, S. China, Indo-China, Hainan, and *Malaysia*: Malay Peninsula (Johore).

Ecol. In forests at low altitude. Fr. May, July, Oct.

Vern. *Akar chin-chin*.

Note. This species doubtless comprises several distinct races, which SCHELLENBERG treated as species even classified in 3 different sections. The differences between them are minute and mainly concern the vegetative parts (shape and size of leaflets, number of nerves, more or less prominent nervation and reticulations); in fertile characters these races differ slightly in length and degree of hairiness of the petals, shape and size of fruit, and the pericarp which may be subglabrous inside. The material at hand was insufficient for characterizing these subspecies. The Malayan specimens also represent a distinct race, and therefore I have based my description as far as possible (inflorescences and flowers were unknown) on Malayan material only.

C. paniculatus is apparently both related to *C. odoratus* and to *C. latifolius* WALL. (Bengal and Burma, possibly conspecific with *C. semidecandrus*), and *C. semidecandrus*.

Sterile and flowering Malayan specimens are to all probability nearly indistinguishable from *C. monocarpus*, which radically differs in fruit.

11. *Connarus semidecandrus* JACK, Mal. Misc. 2, no 7 (1822) 39; Hook. Comp. 1 (1835) 150; Walp. Rep. 1 (1842) 561; BL. Mus. Bot. 1 (1850) 269, incl. also var. *latifolius*; MIQ. Fl. Ind. Bat. 1, 2 (1859) 664; Sum. (1861) 529; Hook. f. Fl. Br. Ind. 2 (1876) 52; KURZ, For. Fl. Burma 1 (1877) 326; RIDL. Trans. Linn. Soc. Bot. 3 (1893) 291; KING, J. As. Soc. Beng. 66, ii (1897) 4; BRANDIS, Ind. Trees (1906) 213; BAKH. Schoolfl. (1911) 289; RIDL. Fl. Mal. Pen. 1 (1922) 546, f. 53; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 39; BURK. Dict. 1 (1935) 650; SCHELLENB. Pfl. R. Heft 103 (1938) 280; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 4; MERR. J. Agn. Arb. 33 (1952) 221.—*Clompanus funicularis* RUMPH. Herb. Amb. 5 (1747) 70, t. 37 f. 2; MERR. Int. Rumph. (1917) 248.—*Omphalobium gaudichaudii* DC. Prod. 2 (1825) 85.—? *Erythrostigma diversifolia* HASSK. Flora 25 (1842) Beibl. 45; Flora 27 (1844) 622; Cat. Hort. Bog. (1844) 247.—? *C. wallichii* PLANCH. Linnaea 23 (1850) 426; Walp. Ann. 2 (1851) 300; MIQ. Fl. Ind. Bat. 1, 2 (1859) 665; non SCHELLENB. Candollea 2 (1925) 94 & 97 (= *C. planchonianus*).—*C. neurocalyx* PLANCH. Linnaea 23 (1850) 428; Walp. Ann. 2 (1851) 300; MIQ. Fl. Ind. Bat. 1, 2 (1859) 665; VIDAL, Sinopsis (1883) Atlas t. 39 f. E; MERR. Philip. J. Sc. 4 (1909) Bot. 121; Fl. Man. (1912) 220; En. Philip. 2 (1923) 238; SCHELLENB. Pfl. R. Heft 103 (1938) 276.—*C. obtusifolius* PLANCH. Linnaea 23 (1850) 428; Walp. Ann. 2 (1851) 301; MIQ. Fl. Ind. Bat. 1, 2 (1859) 665; MERR. Philip. J. Sc. 4 (1909) Bot. 121.—*C. gaudichaudii* PLANCH. Linnaea 23 (1850) 429; BL. Mus. Bot. 1 (1850) 266; MIQ. Fl. Ind. Bat. 1, 2 (1859) 662; KANEHIRA, Fl. Micr. (1933) 129, f. 44; SCHELLENB. Pfl. R. Heft 103 (1938) 277.—*C. nitidus* WALL. ex PLANCH. Linnaea 23 (1850) 436, nom. nud., non HASSK. 1844.

—*C. furfuraceus* BL. Mus. Bot. 1 (1850) 268; Walp. Ann. 2 (1851) 301; MIQ. Fl. Ind. Bat. 1, 2 (1859) 664; SCHELLENB. Pfl. R. Heft 103 (1938) 278.—*C. mutabilis* BL. Mus. Bot. 1 (1850) 269, incl. also var. *barbatus, elongatus, and splendens*; Walp. Ann. 2 (1851) 301; MIQ. Fl. Ind. Bat. 1, 2 (1859) 664; SCHELLENB. Pfl. R. Heft 103 (1938) 281; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 4.—? *Erythrostigma ellipticum* ZOLL. Nat. Tijd. Ned. Ind. 14 (1857) 174.—*C. pyrrocarpus* MIQ. Sum. (1861) 530.—*C. gibbosus* WALL. [Cat. (1847) no 8541 A & B, nom. nud.]; ex PLANCH. Linnaea 23 (1850) 436, nom. nud.] ex HOOK. f. Fl. Br. Ind. 2 (1876) 52; KURZ, J. As. Soc. Beng. 45, ii (1877) 215; For. Fl. Burma 1 (1877) 327; RIDL. Trans. Linn. Soc. Bot. 3 (1893) 290; BRANDIS, Ind. Trees (1906) 212; BURK. Dict. 1 (1935) 649; SCHELLENB. Pfl. R. Heft 103 (1938) 276.—*C. griffithii* HOOK. f. Fl. Br. Ind. 2 (1876) 52; KURZ, For. Fl. Burma 1 (1877) 326; RIDL. Fl. Mal. Pen. 1 (1922) 546; CRAIB, Fl. Siam. En. 1 (1928) 363; SCHELLENB. Pfl. R. Heft 103 (1938) 278.—*C. bankensis* BURCK. Ann. Jard. Bot. Btzg 6 (1887) 251, nom. nud.—? *C. ellipticus* KING, J. As. Soc. Beng. 66, ii (1897) 7, excl. specim.; SCHELLENB. Candollea 2 (1925) 97 & 98; Pfl. R. Heft 103 (1938) 274.—*C. quocensis* PIERRE, Fl. Coch. 5 (1898) t. 377 A; LECOMTE, Fl. Gén. I.—C. 2 (1908) 52.—*C. amplifolius* PIERRE, Fl. Coch. 5 (1898) t. 377 D; LECOMTE, Fl. Gén. I.—C. 2 (1908) 53; SCHELLENB. Pfl. R. Heft 103 (1938) 275.—*C. balsahanensis* ELM. Leaf. Philip. Bot. 5 (1873) 327; RIDL. En. Philip. 2 (1923) 237; SCHELLENB. Pfl. R. Heft 103 (1938) 275.—*C. borneensis* MERR. Philip. J. Sc. 13 (1918) Bot. 69; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 39; Pfl. R. Heft 103 (1938) 275.—*Santaloides cordatum* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 29, p. p. typ. excl.—*C. jackianus* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 40; Pfl. R. Heft 103 (1938) 282; non WALL. ex PLANCH. Linnaea 23 (1850) 437, nom. nud. = *Sapind*.—*C. gracilis* BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 3, nom. illeg.; Blumea 6 (1950) 365.—*C. nigropunctus* GAGNEP. Bull. Soc. Bot. Fr. 99 (1952) 30.—Fig. 11d, g-h.

Large liana or scandent or creeping shrub, sometimes even a small tree; stem up to 10 cm thick. Branches glabrous or the young parts densely ferruginously pubescent, later on verrucose-lenticellate. Leaves 1–3(–5)-jugate, glabrous or minutely pubescent in all parts; petioles $1/4$ – $3/4$ cm. Leaflets elliptic to lanceolate, 4–25 by 2–9 cm, papyraceous, chartaceous, or thin-coriaceous, not rarely slightly verrucose beneath, glabrous or on the lower side minutely pubescent, mainly on midrib and nerves; base cuneate to rounded, usually subpetalate; apex blunt to acuminate, acumen blunt or emarginate; nerves 4–12 pairs, straight to curved, either distinctly looped and joined or not, veins usually rather fine and dense, transverse to the midrib, sometimes, however, more coarse and reticulate, pseudo-secondary ones sometimes strongly developed. Panicles terminal and in the upper leaf-axils, broad, up to 35 cm

long, minutely ferruginous- or fulvous-tomentose, many-flowered. Bracts minute. *Sepals* ovate or elliptic to oblong, blunt to acute, sometimes emarginate, $1\frac{1}{4}$ –4 mm long, not or slightly keeled or prominently 3-nerved, outside rather densely appressed-pubescent or tomentose, inside nearly always glabrous. *Petals* lanceolate(-spathulate) to linear, $2\frac{1}{2}$ –7 mm long, blunt, outside glabrous except margins and apex, inside usually sparsely to rather densely glandular-pubescent. *Stamens* connate for $\frac{1}{4}$ – $1\frac{1}{2}$ mm, epipetalous ones fertile to minute and staminodial, at least the episepalous ones mainly in the upper part with some to many glandular hairs. *Fruits* oblique-pyriform to semi-ellipsoid, compressed (rarely bulging), $1\frac{1}{2}$ – $3\frac{3}{4}$ by 1–2 cm, obliquely $\frac{1}{4}$ – $1\frac{1}{2}$ cm long stipitate, the beak distinct to inconspicuous, inserted near or at the apex, pericarp minutely ferruginous-pubescent, glabrescent, thin, inside glabrous to densely pubescent.

Distr. S. Indo-China, Siam, Burma, ? Andamans, *Malaysia* (the eastern half of Java and the Lesser Sunda Isl. excepted), also in Micronesia (Palau) and Melanesia (Solomon Isl.).

Ecol. In primary and secondary forests, especially in slightly more open parts, along forest edges and river-banks, in clearings, along the beach, also in thickets and alang-alang fields, both on dry and swampy soils, on granite and limestone, from sea-level up to 1100 m. *Fl.* mainly Jan.–May, *fr.* mainly April–July.

Uses. As the present species has obviously often been confused with some others, it is especially difficult to get trustworthy information about its uses. Even the field-labels give seemingly contradictory information: one collector mentions the fruits as reputed for being poisonous, according to another collector they are after boiling eaten as jam. According to RUMPHIUS in the Moluccas the young leaves are boiled and eaten as a legume. The wood is said to be tough.

Vern. *Akar kalat*, *a. tanduk*, *karubu*, *silatut*, *tangis kërè*, Sum., *akar aanda*, *a. puteh*, *a. suanai* (*putie*), *Banka*, *iop iip*, *Siam*, *akar kuaia*, *a. lèpan*, *a. mèmbur*, *a. mumbô*, *a. nyamok* (or *myamok*), *a. pulang dahing* (or *a. tulang daeng*), *a. tukor*, *bunga akar tupi-tupi*, *stanggih burrong*, *tanga burong*, *Mal. Pen.*, *simbo krah*, *Born.*, *camagsa*, *kamot*, *sandallno*, *tañisan*, *Philip.*, *kunit wawakas imbolay*, *Cel.*, *kali-ja fua*, *ketahu*, *Mol.* (Sula Islands).

Notes. A very polymorphous species, as a whole best characterized by its fruits in combination with glabrous petals, locally sometimes also recognizable by vegetative characters. From *C. grandis* it can with certainty only be distinguished by its fruits and that is the reason that the synonyms *Erythrostigma diversifolia*, *Connarus wallichii*, and *Erythrostigma ellipticum* of which the fruits are unknown, are cited as dubious.

It was difficult to clear up the delimitation and, hence, the synonymy of the present species, especially in continental Asia. *C. latifolius* WALL. (Bengal and Burma), which is intermediate be-

tween *C. semidecandrus* and *C. paniculatus*, may also be sunk into the former.

The species as accepted here contains a number of local races and forms for which it is difficult to give a reliable subdivision. The more important ones are the following:

α . The typical form is characterized by sterile (usually staminodial) epipetalous stamens, only slightly punctate sepals and slightly or not at all punctate petals, nerves which are usually distinctly looped and joined near the margin, and shortly stipitate, distinctly beaked fruits. Fig. 11h. This is the more common form, which is distributed in Burma and throughout W. Malaysia (not in the Philippines).

β . Different from α by its distinctly punctate sepals and petals, by the nerves, which are at least for the greater part not looped and joined, and by the less flattened fruits, which are very shortly stipitate and inconspicuously beaked. Fig. 11g. This form occurs in Indo-China, Siam, Sumatra, and the Malay Peninsula. In the Malaysian and the Siamese specimens of this form all the stamens are fertile, in the specimens from Indo-China the epipetalous ones are staminodial. In literature this form is best known as '*C. griffithii*', though the type of that name belongs to α . It has been described under several names from Indo-China. '*C. furfuraceus*' apparently represents an extreme form of β from Central Sumatra. Fig. 11d. It is mainly characterized by its long, cylindrical fruits ($2\frac{1}{2}$ – $3\frac{3}{4}$ by 1– $1\frac{3}{4}$ cm), which are nearly straight.

γ . Closely related to β and described as *C. neurocalyx*. In its flowers (the stamens are always all fertile) and fruits it nearly fully agrees with '*C. griffithii* auct.'; the main difference is that in '*C. griffithii* auct.' the leaflets are minutely pubescent, mainly on midrib and nerves beneath, and the veins are very inconspicuous, in '*C. neurocalyx*' the leaves are fully glabrous, and the venation is distinct. '*C. neurocalyx*' is known from the Philippines, Celebes, and in a few specimens, which are intermediate between it and α , from Borneo.

'*C. neurocalyx*' itself apparently consists of two forms, the typical one with large fruits ($2\frac{1}{2}$ –3 by $1\frac{1}{2}$ –2 cm) and a second one with smaller fruits ($1\frac{1}{2}$ – $2\frac{1}{2}$ by 1– $1\frac{1}{2}$ cm); the former is known from east central Luzon (Prov. Pangasinan, Zambalas, Pampanga, and Bataan), the other one from Palawan, west central Luzon (Prov. Bataan, Bulacan, Rizal, Laguna, and Batangas), and Celebes.

'*C. balsahanensis*' represents part of the specimens from Palawan; they differ from the rest of '*C. neurocalyx*' by their rather big leaflets (19–25 by 6– $8\frac{1}{2}$ cm) with more nerves (10–12 pairs). They are small-fruited.

δ . This has been distinguished under the name *C. gaudichaudii*. In its vegetative parts it is not very different from γ . The flowers differ from those of '*C. neurocalyx*' and '*C. griffithii* auct.' only by the acute sepals which are blunt in both other forms. The main difference is shown by the fruits which are long-stipitate ($\frac{3}{4}$ – $1\frac{1}{2}$ cm as against up to $\frac{1}{2}$ cm in the other forms) and distinctly beaked.

It is known from the Moluccas (Sula Islands, Buru, and Ambon), New Guinea (*incl.* the Aru Islands), the Solomon Islands (Radewu, New Georgia, and Choiseul), and Palau.

12. *Connarus cochinchinensis* (BAILL.) PIERRE, Fl. Coch. 5 (1898) t. 378 A; LECOMTE, Fl. Gén. I.—C. 2 (1908) 54, f. 7 a; CRAIB, Fl. Siam. En. 1 (1928) 362; SCHELLENB. Pfl. R. Heft 103 (1938) 265.—*Tricholobus cochinchinensis* BAILL. *Adansonia* 9 (1869) 150.—*C. attopoeuensis* PIERRE, Fl. Coch. 5 (1898) t. 377 C.

Liana or treelet. Branches thinly pubescent when young, lenticellate. *Leaves* (1–)2–3-jugate, glabrous; petiolules $1\frac{1}{4}$ – $\frac{1}{2}$ cm. *Leaflets* ovate or elliptic to oblong, $2\frac{1}{2}$ –13 by ($1\frac{1}{2}$)–3–7 $\frac{1}{2}$ cm, thin-coriaceous, minutely verrucose beneath; base rounded (to slightly cordate); apex slightly to distinctly tapering-acuminate, acumen short and broad (blunt or emarginate) to slender; nerves 5–7 pairs, oblique, nearly straight, curving towards the margin, not joined, inconspicuous, veins inconspicuous, mainly transverse, lax. *Inflorescences* dense, up to c. 10 by 4–5 cm, sparsely appressedly stiff-pilose. Bracts minute. *Sepals* lanceolate, acute, 3–4 by $\frac{3}{4}$ –1 mm, convex, keeled, rather densely appressedly stiff-pilose outside, inside glabrous. *Petals* linear-spathulate, acute, 5–8 mm long, outside appressedly shaggy pilose, inside sparsely shortly pubescent, punctate. *Stamens* for 1 mm connate, epipetalous ones probably not always fertile, mainly the episepalous ones rather densely glandular-pubescent, especially in the upper part. *Fruits* oblique-ellipsoid, bulging, 2–2 $\frac{1}{2}$ by cm, stalk $\frac{1}{2}$ cm long, beak apical; pericarp thin, outside glabrous, minutely oblique-wrinkled, inside densely pubescent.

Distr. SE. and S. Indo-China and Siam, in *Malaysia*: in the northern part of the Malay Peninsula.

Ecol. Shrub-jungle and forests, at low altitude. Fl. Jan.–Aug., fr. July, Sept., Dec.

Note. Apparently specially allied to *C. semidecandrus* ('*C. quocensis* PIERRE') and to *C. paniculatus*.

13. *Connarus lamii* LEENH. *Blumea* Suppl. 4 (1958) *in the press*.

Branches glabrous, minutely lenticellate. *Leaves* unifoliolate to 2-jugate, subglabrous; petiolules 4 mm long. *Leaflets* oblong-ovate (rarely ovate), 12–17 by 5–9 cm (terminal ones up to 20 by 9 cm), stiff-chartaceous, glabrous except for some scattered, short hairs on the lower side near the base; base rounded to cordate, usually distinctly subpeltate; apex tapering acuminate, acumen short, broad, and blunt; nerves 6–8 pairs, patent, curved, not distinctly joined, inconspicuous above; veins transverse to the midrib, dense, parallel, slender, nearly invisible above. *Inflorescences* interrupted-paniculate, 20–30 cm long, branches shortly and densely ferruginous-tomentose, rather many-flowered. Bracts minute. *Sepals* oblong-elliptic, c. 3 by 1 mm, acute, keeled towards the base, shortly sparsely tomentose on both sides. *Petals* oblong-obovate,

4–5 mm long, outside sparsely appressed-pubescent, inside densely glandular-tomentose. *Stamens* connate for $\frac{1}{3}$ – $\frac{1}{2}$ mm, all fertile, filaments with some scattered glandular hairs. *Fruits* (not attached to the specimen) nearly semi-discoid, rather compressed, $1\frac{3}{4}$ by $1\frac{1}{2}$ by 1 cm, stipe slender, 3 mm long, beak acute, at $\frac{2}{3}$ – $\frac{3}{4}$ of the height, pericarp thin, outside glabrous, striate and slightly granular, inside scattered shortly glandular-pubescent.

Distr. *Malaysia*: W. New Guinea (Mamberamo, once collected).

Ecol. Altitude 6 m. Fl. Oct.

Note. Probably specially related with *C. semidecandrus* ('*C. gaudichaudii*').

14. *Connarus whitfordii* MERR. Philip. J. Sc. 4 (1909) Bot. 123; En. Philip. 2 (1923) 238; SCHELLENB. Pfl. R. Heft 103 (1938) 266.—*C. mindanaensis* MERR. Philip. J. Sc. 4 (1909) Bot. 122; C. B. ROB. Philip. J. Sc. 6 (1911) Bot. 205; MERR. En. Philip. 2 (1923) 237; SCHELLENB. Pfl. R. Heft 103 (1938) 257.—*C. caudatus* MERR. Philip. J. Sc. 17 (1921) 261; En. Philip. 2 (1923) 237.—*C. oliganthus* ELM. Leaf. Philip. Bot. 10 (1939) 3718, *nom. illeg.*—Fig. 14.

Liana, up to 8 m by 2 cm, sometimes scandent shrub or treelet. Branches sparsely ferruginous-tomentose to glabrous. *Leaves* (1–)2–3-jugate, the petiole, rachis, and petiolules with a few scattered hairs; petiolules 3–4 mm long. *Leaflets* ovate or elliptic to oblong, $2\frac{1}{2}$ –11(–17) by $1\frac{1}{4}$ –5 $\frac{1}{2}$ cm, chartaceous, blackish-verrucose on both sides when dry, especially beneath (probably representing the internal glands), glabrous; base broadly cuneate to rounded; apex tapering caudate-acuminate, blunt; nerves (3–)4–5 pairs, ascending, strongly curved, not rarely distinctly looped and joined; veins laxly transverse-reticulate to transverse and rather dense. *Inflorescences* c. 20–40 cm long, densely ferruginous-tomentose, laxly to densely branched, branches up to 20 cm long, many-flowered. Bracts minute. *Sepals* elliptic, blunt, $2\frac{1}{2}$ –3 by $1\frac{1}{4}$ mm, keeled, densely tomentose outside, inside glabrous. *Petals* lanceolate, blunt, $4\frac{1}{2}$ –6 mm long, outside densely, inside in the upper half thinly tomentose, densely punctate. *Stamens* for $\frac{1}{2}$ mm connate, all fertile, episepalous filaments with a few glandular hairs. *Fruits* obovoid, slightly compressed, $2\frac{1}{2}$ by $1\frac{3}{4}$ cm, stipe $\frac{1}{4}$ cm, beak minute, lateral, usually inserted at about $\frac{2}{3}$ of the height, pericarp thin, outside diagonally striate, glabrous, inside sparsely to rather densely shortly pubescent.

Distr. *Malaysia*: E. Philippines (Luzon, Bucas Grande Isl., Poliillo, Samar, Leyte, Biliran, and Mindanao).

Ecol. In and along primary and secondary forests, up to c. 750 m. Fl. Jan.–April (July, Sept.), fr. Oct.–Jan. (April, June).

Uses. Fluted stem used for tying.

Vern. *Kauang*, Mbo., *sapinib*, *uul*, *C. Bis*, *uñgali*, S. L. Bis.

Notes. I am not quite certain about the conspecificity of *C. mindanaensis*, which differs in a

few vegetative characters (leaves more often 3-foliolate, nervation somewhat different); its flowers are too young for analysis, and fruits are lacking. In literature both species have already been confused. For instance SCHELLENBERG, *l.c.* 1938, cited a few specimens under both species (and part of the other specimens, cited by him under *C. mindanaensis*, belong to *C. winkleri*), and the greater part of the specimens, cited by MERRILL, *l.c.* 1923, under *C. mindanaensis*, certainly represent *C. whitfordii*.

The identification of specimens of this species is very difficult. Flowering material differs distinctly from *C. semidecandrus* by the densely pubescent



Fig. 14. *Connarus whitfordii* MERR. a. Flowering twig, $\times \frac{1}{2}$, b. long-styled flower, $\times 5$, c. stamens and pistil of short-styled flower, $\times 5$, d. fruit, $\times \frac{3}{4}$ (a PNH 2628, b PNH 21536, c-d PNH 14354).

petals, but is nearly indistinguishable from *C. monocarpus*. The fruits, on the other hand, are distinctly different from those of *C. monocarpus*, but indistinguishable from those of *C. semidecandrus*. Fruiting specimens, in which some petals are left at the base of the fruits, allow trustworthy identification. The caudate-acuminate leaflets are characteristic, but not conclusive.

15. *Connarus monocarpus* LINNÉ, Sp. Pl. (1753) 675; SCHELLENB. Pfl. R. Heft 103 (1938) 284, f. 47; non F.—VILL. Nov. App. (1880) 57 = *Rourea minor*.

ssp. malayensis LEENH., *nov. subsp.* (typified by *C. falcatus* BL.)—*Cnestis pentaphylla* SPANOGHE, *Linnaea* 15 (1841) 189; Walp. Rep. 1 (1842) 561.—*C. oligophyllus* WALL. ex PLANCH. *Linnaea* 23 (1850) 427; Walp. Ann. 2 (1851) 300; MIQ. Fl. Ind. Bat. 1, 2 (1859) 665; HOOK. f. Fl. Br. Ind. 2 (1876) 53; KING, J. As. Soc. Beng. 66, ii (1897) 5; RIDL. Fl. Mal. Pen. 1 (1922) 546, *incl. var. maingayi*; CRAIB, Fl. Siam. En. 1 (1928) 364; BURK. Dict. 1 (1935) 649; SCHELLENB. Pfl. R. Heft 103 (1938) 231, f. 43 A.—*C. falcatus* BL. Mus. Bot. 1 (1850) 266; Walp. Ann. 2 (1851) 301; MIQ. Fl. Ind. Bat. 1, 2 (1859) 663; BURCK, Ann. Jard. Bot. Btzig 6 (1887) 252; BACK. Schooifl. (1911) 288; KOORD. Exk. Fl. Java 2 (1912) 339; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 33; Pfl. R. Heft 103 (1938) 235, f. 43 B; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 3.—*C. hasseltii* BL. Mus. Bot. 1 (1850) 266; Walp. Ann. 2 (1851) 301; MIQ. Fl. Ind. Bat. 1, 2 (1859) 662; BACK. Schooifl. (1911) 288; KOORD. Exk. Fl. Java 2 (1912) 339; SCHELLENB. Pfl. R. Heft 103 (1938) 234; BAKH. f. in Back. Bekn. Fl. Java (em. ed.) 7A (1948) fam. 154, 3.—*C. spanoghei* BL. Mus. Bot. 1 (1850) 267, *nom. illeg.*; MIQ. Fl. Ind. Bat. 1, 2 (1859) 663.—*C. maingayi* HOOK. f. Fl. Br. Ind. 2 (1876) 53; KING, J. As. Soc. Beng. 66, ii (1897) 3; SCHELLENB. *Candollea* 2 (1925) 100.—*C. hallieri* MERR. Philip. J. Sc. 4 (1909) Bot. 122; En. Philip. 2 (1923) 237; SCHELLENB. Pfl. R. Heft 103 (1938) 233.—*C. fragrans* ELM. Leaf. Philip. Bot. 4 (1912) 1507; SCHELLENB. Pfl. R. Heft 103 (1938) 233, *excl. syn. C. oliganthus* ELM.—*C. carnosus* ELM. Leaf. Philip. Bot. 4 (1912) 1508; SCHELLENB. Pfl. R. Heft 103 (1938) 235.—*C. palawanensis* ELM. Leaf. Philip. Bot. 5 (1913) 1763; MERR. En. Philip. 2 (1923) 238; SCHELLENB. Pfl. R. Heft 103 (1938) 274.—*C. densiflorus* MERR. Philip. J. Sc. 13 (1918) Bot. 70; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 39; MERR. Pl. Elm. Born. (1929) 95.—*C. celebicus* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 34; Pfl. R. Heft 103 (1938) 233.—*C. pentaphyllus* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 34; Pfl. R. Heft 103 (1938) 234.—*C. strictinervis* SCHELLENB. *Candollea* 2 (1925) 100; Pfl. R. Heft 103 (1938) 265.—Fig. 11f.

Liana, up to 25(–40) m by 15 cm, sometimes a shrub or small tree. Branches glabrous, often lenticellate. Leaves (1–)2–4-jugate, glabrous; petiolules $\frac{1}{2}$ cm. Leaflets ovate-elliptic to lanceolate, 4–14 by 2 $\frac{1}{2}$ –7 cm, chartaceous to coriaceous; base cuneate or rounded to subcordate, sometimes

subpeltate, in lateral ones sometimes slightly oblique; apex shortly to caudate acuminate; nerves rather inconspicuous, 3–8 pairs, patent or ascending, curved, more or less distinctly looped and joined; veins mainly transverse to the midrib, rather dense; reticulations tessellate. *Inflorescences* up to c. 15 cm long, shortly and densely tomentose, widely and laxly branched and with rather many flowers. Bracts minute. *Sepals* ovate, acute, 2–3 by 1 $\frac{1}{4}$ –1 $\frac{1}{2}$ mm, usually distinctly keeled, outside densely pubescent, inside glabrous. *Petals* lanceolate to linear, 6–10 mm long, blunt, on both sides rather densely minutely tomentose, punctate. *Stamens* 1–1 $\frac{1}{2}$ mm connate, either all fertile or the epipetalous ones sterile, all filaments with few scattered glandular hairs. *Fruits* obliquely (sometimes even rather strongly curved) spindle-shaped to oblique-ellipsoid, in the latter case distinctly shortly stipitate, c. 3–5 by 1–2 cm, bright-yellow to orange, beak usually acute, apical, pericarp thin, coriaceous, outside rather smooth, minutely lengthwise striate, inside densely pubescent.

Distr. Malaysia: throughout, the Moluccas and New Guinea excepted, reported from the Nicobars by KURZ.

A second subspecies *monocarpus* in Ceylon and the W. Deccan.

Ecol. In dense as well as open, primary and secondary forests, in clearings, along forest-edges and river-banks, and on rocks near the sea-shore, both on dry and on swampy soil, even in marshes, often reported from limestone, up to 600 m. *Fl. Jan.–May, fr. mainly Sept.–April.*

Uses. Stems and branches are used for tying purposes. A decoction of the bark is drunk for stomach-ache; the pounded root should be used for poulticing for itch.

Vern. Feu fewu, Sum., akar kunjai, Banka, akar tulang daeng, kahyu sadin, lèlèmak, mèrènsa, satik, Mal. Pen., chamba ün, gadel laut, kitjarang aroy, S., buah sungung, tangi balu, tuba raung, Born.; Philippines: bago-bago, P. Bis., oñgali, S. L. Bis.; kunet wawakas im bolai, Cel.

Notes. This subspecies is best characterized by its rather stiff leaflets with slender, ascending nerves and rather inconspicuous venation, and by its usually spindle-shaped fruits. Apart from the most common form, which is distributed throughout western Malaysia, two other forms are more or less distinguishable:

α. Leaflets relatively broad, thick-coriaceous. Malay Peninsula (*C. maingayi*).

β. Mainly characterized by its oblique-ellipsoid, slenderly stipitate fruits with rather thick, woody pericarp. Typical specimens are only known from Timor (*C. pentaphyllus*). What has been referred to as '*C. celebicus*' is a series of intergrades between this form and the common W. Malaysian one.

Ssp. monocarpus from Ceylon and the W. Deccan differs from *ssp. malayensis* mainly by the following characters: fruits inside glabrous; sepals relatively long (3–3 $\frac{1}{2}$ mm, in *malayensis* rarely more than 2 mm); venation more reticulate, less dense, not conspicuously tessellate; young parts ferruginous-tomentose.

An authentic specimen of HERMANN from Ceylon, exactly fitting the description is preserved in the Leyden Herbarium.

C. monocarpus seems to be allied with *C. africanus* LAMK from W. Africa, and in Malaysia with *C. winkleri* and *C. lucens*.

16. *Connarus lucens* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 36; Pfl. R. Heft 103 (1938) 253.—Fig. 15.

Branches glabrous. *Leaves* (2-)3-4-jugate, glabrous; petiolules $\frac{1}{2}$ cm. *Leaflets* oblong-ovate to oblong-lanceolate, 7-15 by $2\frac{1}{2}$ -5 cm, stiff-chartaceous; base rounded; apex tapering blunt-acuminate; nerves 6-8 pairs, patent, curved, indistinctly joined near the margin, rather inconspicuous; veins transverse to the midrib, rather

lax, nearly invisible above. *Inflorescences* up to c. 25 cm long, widely branched, thinly tomentose, the branches itself narrowly paniculate. Bracts minute. *Sepals* $1\frac{1}{2}$ by $\frac{3}{4}$ mm, ovate, acute, outside rather densely, inside more thinly tomentose. *Petals* linear, 5-6 mm long, outside rather densely tomentose, except at the base, inside thinly pubescent, punctate. *Stamens* for $\frac{1}{2}$ mm connate, epipetalous ones probably sterile, all filaments rather densely glandular-pubescent. *Fruits* trapezoid to oblique-ellipsoid, 4 by 2 cm, moderately flattened, not stipitate, beak minute, acute, apical; pericarp $1\frac{1}{2}$ -2 mm thick, woody, outside minutely wrinkled, glabrous, inside glabrous.

Distr. Malaysia: Borneo (Sarawak: Sarebas region).

Ecol. Fl. July, *fr.* April, July.



Fig. 15. *Connarus lucens* SCHELLENB. Inflorescence in anthesis. Cult. Hort. Bog. (XVII. F. 30), Nov. 1957. This plant is the source of the type specimen.

Note. Probably nearest related to *C. monocarpus* ('*pentaphyllus*') and possibly also to *C. winkleri*.

17. *Connarus winkleri* SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 38; Pfl. R. Heft 103 (1938) 256, f. 45 D.—Fig. 11c.

Liana, 25 m high, sometimes creeping shrub or small tree. Branches glabrous. *Leaves* 2–3-jugate, glabrous; petiolules $\frac{1}{2}$ cm. *Leaflets* ovate to elliptic or oblong, 7–17 by 3–7 cm, thin-chartaceous to thin-coriaceous; base broadly cuneate to rounded, rarely acute, in lateral ones often slightly oblique; apex acuminate; nerves 6–8 pairs, patent, rather strongly curved, usually distinctly looped and joined, veins (transverse-) reticulate. *Inflorescences* up to c. 25 cm long, rather laxly branched, branches rather long, ascending, subsipicate, glabrous the tips excepted. Bracts minute. *Sepals* ovate, blunt or acute, $2\frac{1}{4}$ – $3\frac{1}{2}$ by 1 – $1\frac{1}{2}$ mm, faintly keeled, on both sides variously pubescent. *Petals* ovate-lanceolate, $8\frac{1}{2}$ – $9\frac{1}{2}$ mm long, blunt, tomentose on both sides, punctate. *Stamens* for $1\frac{1}{2}$ mm connate, apparently all fertile, long filaments more or less densely glandular-pubescent, short ones either sparsely so or glabrous. *Fruits* ellipsoid, more or less bulging, 2 – $3\frac{1}{2}$ by $1\frac{1}{2}$ – $2\frac{1}{2}$ cm, stipe $\frac{1}{4}$ – 1 cm long, beak minute, acute, at or near the apex; pericarp thin-coriaceous to woody, outside laxly obliquely veined, on both surfaces glabrous.

Distr. *Malaysia*: N. & E. Borneo, SE. Philippines (Leyte, Mindanao, Basilan).

Ecol. In forests at low altitude.

Note. As far as can be judged from the diagnosis and a photograph of the type specimen, *C. pachyphyllus* MERR. (Philip. J. Sc. 13, 1918, Bot. 71) may also be closely related to the present species. Apparently it mainly differs by the following characters: leaves 3-foliolate, leaflets thick-coriaceous, petiolules rather long, nerves about 9 pairs.

ssp. winkleri.

Branches black. Leaflets thin-chartaceous; apex shortly acuminate, blunt; reticulations lax. Inflorescences lax. Fruits relatively large, much swollen, stipe $\frac{1}{2}$ – 1 cm long, pericarp thin-coriaceous, outside coarsely veined.

Distr. Borneo.

ssp. philippinensis LEENH. Blumea Suppl. 4 (1958) in the press.

Branches light-grey. Leaflets thin-chartaceous to coriaceous; apex caudate-acuminate, acute or blunt; reticulations dense. Inflorescences more dense and many-flowered. Fruits up to $2\frac{1}{2}$ by $2\frac{1}{4}$ cm, less swollen, stipe c. $\frac{1}{4}$ cm long, pericarp c. 1 mm thick, woody, outside minutely wrinkled. Distr. Philippines.

Vern. *Amoŋgali*, *uñgaño*, Basilan.

Note. The position of this latter subspecies remains somewhat dubious. SCHELLENBERG cited two specimens, which I refer to this subspecies, under *C. mindanaensis*, to which it doubtless shows some resemblance. It shows also resemblance to *C. monocarpus* ('*pentaphyllus*').

18. *Connarus schumannianus* GILG in K. Sch. & Laut. Fl. Schutzgeb. (1900) 341; SCHELLENB. Pfl. R. Heft 103 (1938) 253.—Fig. 11j.

Scandent shrub to large liana, sometimes a small tree. Branches subglabrous. *Leaves* uni- or 3-foliolate (to 2-jugate), glabrous; petiolules $\frac{1}{2}$ – $\frac{3}{4}$ cm. *Leaflets* oblong to elliptic, 8–17 by 4–8 cm, chartaceous; base rounded, subpeltate; apex rounded or blunt-acuminate; nerves 5–7 pairs, patent, slightly curved, not distinctly joined; veins laxly reticulate, mainly transverse. *Inflorescences* up to 40 cm long, thinly and minutely pubescent, branches rather short, poorly branched, ultimate branchlets subsipicate with the flowers crowded near their apex. Bracts minute. *Sepals* oblong-lanceolate, blunt to acute, $2\frac{1}{2}$ – 3 by 1 mm, outside densely tomentose, inside sparsely pubescent. *Petals* linear-spathulate, 7 mm long, outside in the basal half sparsely tomentose, inside glandular-pubescent, densely punctate. *Stamens* for $\frac{3}{4}$ mm connate, epipetalous ones probably sterile, glabrous, long filaments sometimes glandular-pubescent towards the tip. *Fruits* curved to falcate, flattened, $2\frac{1}{2}$ – $3\frac{1}{2}$ by 2 – $2\frac{3}{4}$ cm, gradually narrowed at base into an up to 1 cm long stipe, beak acute, terminal; pericarp thin, outside minutely striate, verruculose, on both surfaces sparsely pubescent.

Distr. *Malaysia*: E. New Guinea (Sepik River, Cape Vogel Peninsula) and Louisiades (Misima & Rossel Isl.).

Ecol. In and along rain-forests, sometimes on limestone, from sea-level up to 80 m. *Fl.* April, July, Oct., *fr.* April, July–Oct.

Note. In its leaves resembling *C. salomonensis*, best characterized by its more or less falcate fruits.

19. *Connarus salomonensis* SCHELLENB. Pfl. R. Heft 103 (1938) 260.—Fig. 11b.

Large liana or small tree (up to 12 m). Branches glabrous. *Leaves* (1)–2-jugate, glabrous; petiolules 3–6 mm. *Leaflets* ovate to elliptic-oblong, 8–22 by 4–11 cm, thin-coriaceous to chartaceous; base rounded, sometimes subpeltate; apex acute; nerves 6–8 pairs, patent, slightly curved, not distinctly joined; veins transverse, spaced. *Inflorescences* c. 20–25 cm long, the uppermost parts minutely ferruginous-tomentose, broadly paniculate, many-flowered. Bracts deltoid, minute. *Sepals* oblong, $2\frac{1}{4}$ by 1 mm, blunt, outside rather densely minutely tomentose, inside sparsely pubescent. *Petals* obovate, $2\frac{1}{2}$ by $1\frac{1}{2}$ mm, slightly ciliate at the apex, further glabrous, sparsely punctate. *Stamens* for $\frac{1}{2}$ mm connate, epipetalous ones staminodial, glabrous except for some glandular hairs on top of the reduced anther, long filaments with some glandular hairs in the apical half. *Fruits* semi-ellipsoid, nearly straight, slightly flattened, $3\frac{1}{2}$ – 5 by 2–3 cm, stipe up to $\frac{1}{2}$ cm long, beak minute, inserted slightly below the apex; pericarp woody, 1 – $1\frac{1}{2}$ mm thick, outside smooth, faintly lengthwise striate, glabrous, inside sparsely pubescent to glabrous.

Distr. Solomon Islands (Bougainville, New Georgia, and Malaita) and *Malaysia*: New Guinea (Gulf Distr.) and New Britain.

Ecol. In rain-forests up to 800 m and along the coast on mud flats subject to tidal inundation. *Fl.* Jan., fr. Jan., March, July-Aug.

Uses. In the Solomon Islands the seeds are chewed as a substitute for betel nuts.

Notes. The present species is doubtless related to *C. schumannianus* from New Guinea and to *C. pickeringii* A. GRAY from Fiji. From the former species it is distinctly different in its flowers and fruits, but hardly so in the leaves. *C. pickeringii* mainly differs by the woolly pubescence of its young parts, inflorescences, and flowers, by longer flowers (c. 7 mm), and smaller more or less tomentose fruits (c. 3 by 2 cm).

It is not impossible that *C. salomoniensis* will prove to be conspecific with and has to be reduced to *C. peekelii* described from New Ireland. I saw some loose fruits of one of the syntypes from the Wroclaw Herbarium and they agree very well with those of *C. salomoniensis*. According to the description *C. peekelii* differs, however, by its long, cylindrical bracts and long petals pubescent outside. For this reason I have provisionally incorporated it under the dubious species.

Dubious species

Of the following species I did either see no material or the material was insufficient.

Connarus pachyphyllus MERR. Philip. J. Sc. 13 (1918) Bot. 71; SCHELLENB. Bot. Jahrb. 59 (1924) Beibl. no 131, p. 40; Pfl. R. Heft 103 (1938) 282.

See notes under *C. winkleri*.

Distr. *Malaysia*: Borneo (Sarawak).

Vern. *Bua tumut*.

Connarus peekelii SCHELLENB. Bot. Jahrb. 58 (1923) 180; Pfl. R. Heft 103 (1938) 262.

See notes under *C. salomoniensis*.

Distr. *Malaysia*: New Ireland.

Connarus subfoveolatus MERR. Philip. J. Sc. 13 (1918) Bot. 15; En. Philip. 2 (1923) 238; SCHELLENB. Pfl. R. Heft 103 (1938) 278.

Scandent shrub, c. 6 m high. Branches lenticellate, sparingly pubescent when young. *Leaves* trifoliolate, glabrous; petiolules 3–5 mm long. *Leaflets* ovate to elliptic, 9–13 by 4½–7 cm, stiff-chartaceous; base rounded, slightly peltate; apex rather abruptly acuminate, acumen 8–12 mm long, blunt; midrib grooved above, nerves 3–4 pairs, strongly ascending, curved, looped and more or less distinctly joined; veins and veinlets together minutely tessellate-reticulate. *Inflorescences* up to 12 cm long, rather lax, densely minutely ferruginous-tomentose. *Sepals* oblong, blunt, 2 mm long, pubescent. *Petals* lanceolate, blunt, 3–3½ mm long, glabrous, densely punctate. *Stamens* slightly connate, epipetalous ones staminodial, all filaments glabrous. *Fruits* unknown.

Distr. *Malaysia*: Philippines (Luzon).

Ecol. In damp forests at medium alt. *Fl.* May.

Note. Possibly a good species, probably related to *C. semidecandrus*.

Excluded

Connarus foetens BLANCO, Fl. Filip. (1837) 525 = *Murraya paniculata* (L.) JACK (*Rut.*).

Connarus lucidus JACK, Mal. Misc. 2, no 7 (1822) 41; Hook. Comp. 1 (1835) 150; Walp. Rep. 1 (1842) 561; MIQ. Fl. Ind. Bat. 1, 2 (1859) 666; (*non?*) Sum. (1861) 530; SCHELLENB. Pfl. R. Heft 103 (1938) 112; MERR. J. Arn. Arb. 33 (1952) 221.

If this species really belongs to the *Connaraceae* it might be synonymous with *Roureopsis emarginata* (see there and SCHELLENBERG, l.c.). In my opinion it is also possible that it belongs to some other family, for instance *Leguminosae*.

Connarus santaloides (*non* VAHL) BLANCO, Fl. Filip. ed. 2 (1845) 366; ed. 3, 2 (1878) 314, t. 155 = *Murraya paniculata* (L.) JACK (*Rut.*).

Excluded

Eurycoma JACK, Mal. Misc. 2, no 7 (1822) 44, originally described in the *Connaraceae*, is generally referred to the *Simaroubaceae*.

Nothocnestis MIQ. Sum. (1861) 530, originally described in the *Connaraceae*, has been reduced to *Kurrimia* = *Bhesa* (*Celastr.*).