

OCHNACEAE (A. Kanis, Leyden)

Woody plants, very small undershrubs to tall trees. *Leaves* distichous or spirally arranged, stipulate, simple, glabrous; midrib prominent on either side. *Inflorescences* 1- to many-flowered, cymose, racemose, or thyrsoid, bracteate; pedicels articulate. *Flowers* actinomorphic, bisexual (rarely functionally polygamous). *Sepals* 5, free or a little connate at base, quincuncial, persistent. *Petals* 5–10, free, contort, caducous. *Staminodes* 0–∞. *Stamens* 5–10–∞; anthers basifix, ± latrorse and dehiscing lengthwise, or with 1–2 apical pores. *Carpels* 2–5–10(–15), superior, free with 1 ovule, or fused with 2–∞ ovules per carpel; styles fused, basigynous or epigynous; stigmas free or ± fused. *Fruit(s)* a drupe(s), berry, or capsule. *Seeds* 1–∞, small or large, sometimes winged, with or without albumen.

Taxonomy. There is little doubt that the family of the *Ochnaceae* represents a natural one among the more primitive in the *Guttiferales* (= *Clusiales* or *Theales s. l.*). Nonetheless, there are striking differences between the genera, even at first sight. It is not difficult to arrange them in a few distinct, supra-generic taxa. A supposed natural system, as far as relevant to the Malesian genera, is as follows:

Subfamily *Ochnoideae*

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|-------------------------|---|
| Tribe OCHNEAE | Subtribe <i>Ochninae</i> 1. <i>Ochna</i> |
| | 2. <i>Brackenridgea</i> |
| | Subtribe <i>Ouratinae</i> 3. <i>Gomphia</i> |

Subfamily *Sauvagesioideae*

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| Tribe EUTHEMIDEAE | 4. <i>Euthemis</i> |
| Tribe SAUVAGESIEAE | Subtribe <i>Sauvagesiinae</i> 5. <i>Neckia</i> |
| | 6. <i>Indovethia</i> |
| | 7. <i>Schuurmansiella</i> |
| | 8. <i>Schuurmansia</i> |

Distribution. About 30 genera and *c.* 250 *spp.* through the tropical, rarely subtropical countries (S. Africa, N. India), chiefly in S. America and Africa. In Malesia 8 genera and 13 *spp.*; absent from Java and the Lesser Sunda Islands.

In *subfam. Ochnoideae*, the monogeneric tribe *Elvasieae* and the genus *Ouratea* are restricted to S. America. Of the 3 genera of the *Ochneae* mentioned above, only *Brackenridgea* is chiefly Malesian. *Ochna* and *Gomphia* are principally African, both reaching the western part of Malesia with one species.

In *subfam. Sauvagesioideae*, the monogeneric tribe *Lophireae* occurs only in Africa, whereas the subtribe *Luxemburgiinae* is restricted to S. America. The 5 relevant genera mentioned above are almost purely Malesian. Of the subtribe *Sauvagesiinae*, *Sinia* DIELS and *Indosinia* VIDAL are found in continental SE. Asia, whereas the majority of the genera is restricted to S. America, only *Sauvagesia* L. occurring both in S. America and Africa.

There is an interesting parallelism between some of the *Sauvagesioideae*, which are more or less restricted to sandstone areas in W. Malesia, and related genera found in similar areas in northern S. America (Roraima flora).

Ecology. The Malesian genera are restricted to everwet areas, except *Ochna* which is adapted to a seasonally dry climate and is deciduous. They are more or less adapted to poorer, sandy or peaty soils in relatively undisturbed areas, except *Schuurmansia* which is a genus of pioneer species.

Pollination. There is no literature on this subject. Pollination probably takes place by insects, because of the brightly coloured and (sometimes?) scented flowers. The colours of the petals are yellow in *Ochna* and *Brackenridgea* *sect. Notochnella*, mostly white, creamy, or tinged purple in other genera, sometimes dark purplish red in *Schuurmansia*. Only *Ochna* has flowers *c.* 3 cm across. Flowers of other genera usually do not exceed 1 cm, but they are often combined to conspicuous inflorescences. The undershrubs of *Neckia*, however, have solitary flowers with relatively small, early caducous petals.

Dispersal. The bluish or black, 1-seeded fruits of the Malesian *Ochneae* are probably mainly dispersed by birds. In *Ochna* and *Brackenridgea* they are contrasting with a purple calyx and torus. The *Euthemideae* have red or white berries on a dark red calyx, which are probably also dispersed by birds (see RIDLEY, *Disp.* 1930). The Malesian *Sauvagesieae* have many-seeded capsules. Their seeds do not show adaptations to a special mode of dispersal, except those of *Schuurmansia* with two wings like propeller blades. The latter characteristic points to wind dispersal, which fits the pioneer-like nature of the genus concerned. The sepals in *Neckia* are also turning dark purple in fruit; the meaning of this phenomenon is not understood.

Morphology. From the description of the family and the key to the genera it will be clear that the morphological differences between subfamilies and tribes are considerable. A discussion on these differences I gave in my thesis (Blumea 16, 1968, 8–15). A short note should be made here on the inflorescence types, as these may not always be easily understood.

The inflorescences in *subfam. Ochnoideae* are all considered to be of a thyrsoid nature, viz racemes with cymose branches. Those of *Gomphia serrata* are lateral and terminal, bearing terminal flowers which makes sympodial growth of the vegetative branches necessary. Those of *Ochna integerrima* have also terminal flowers, but they are terminal on short side branches and monopodial growth of the main branches remains possible. The inflorescences of *Brackenridgea spp.* are terminal, sometimes also lateral. A terminal flower is lacking and monopodial growth of the rachis to a vegetative shoot is still possible, although not equally frequent in all species. The cymose branches are very much shortened here, especially in *sect. Brackenridgea* where flowers are almost sessile on the rachis. In some species there are several branches per inflorescence, each bearing 3(–5) flowers. In other species there are only a few branches, each bearing 7 or more flowers in pseudo-umbels. In *sect. Notochnella* the cymose branches are not shortened so much, whereas the bracts on the rachis sometimes have a more leaf-like appearance. The inflorescences in *subfam. Sauvagesioideae* are more of a paniculate nature. They are profusely branching in *Schuurmansia*, but in the other genera most branches are very much shortened, flowers and fruits of different age standing closely together. In *Neckia* the rachis is bearing several bracts, but only one (terminal?) flower.

Anatomy. The *Ochnaceae* are characterised by the presence of cortical bundles without resin canals (GILG, Ber. Deut. Bot. Ges. 11, 1893, 20–25). The *subfam. Ochnoideae* shows typical 'cristarque' cells in branches and leaves (VAN TIEGHEM, Bull. Mus. Hist. Nat. Paris 8, 1902, 266–273). For other data, see METCALFE & CHALK, Anat. Dicot. 1 (1950) 104, 108, 333–338, 340, f. 76, 77, and DECKER, Phytomorphology 16 (1966) 39–45.

Palynology. The pollen of the *Ochnaceae* only show interesting differences at generic or higher level, but they do not differ fundamentally. See ERDTMAN, Pollen Morph. Pl. Tax. (1952) 290, and MULLER, Rev. Palaeobot. Palynol. 9 (1969) 149–173.

Phytochemistry. No data available. Some species are used locally for medicinal purposes, because of bitter components of unknown nature.

Uses. No economically important applications of Malesian *spp.* have been recorded. For properties of the wood of some species, see under *Ochna integerrima* and *Gomphia serrata*.

Note. The present revision is based on my precursory treatment of Indo-Pacific *Ochnaceae* in Blumea 16 (1968) 1–83.

KEY TO THE GENERA

1. Stamens 10–∞. Carpels (3–)5–10(–15), free. Fruits 1–5, 1-seeded drupes on a swollen torus. Leaves distichous.
2. Anthers opening with 2 apical pores. Stipules intrapetiolarly united. Inflorescences with (1–)3–∞, ± remote flowers, usually thyrsoid, sometimes simple cymes.
3. Stamens 12–∞; ovaries (3–)5–10(–15); embryo straight. Leaves without an intra-marginal nerve.
 1. *Ochna*
 3. Stamens 10; ovaries 5; embryo curved. Leaves with a distinct intra-marginal nerve. 3. *Gomphia*
 2. Anthers opening with 2 longitudinal slits. Stipules free. Inflorescences of umbelloid appearance with ∞ flowers in conferted, cymose clusters of 3 or more. 2. *Brackenridgea*
1. Stamens 5. Carpels 2–5, fused. Fruit a more-seeded berry or capsule; torus not distinctly enlarged in fruit. Leaves alternate, not distichous.
5. Ovary 5-carpelled, 5-celled. Fruit a berry. Anthers opening by 1 apical pore. Leaf margin always stiffly, though sometimes very finely, denticulate. 4. *Euthemis*
5. Ovary 3-carpelled, 1-celled. Fruit a capsule. Anthers opening by 2 longitudinal slits. Leaf margin entire or (bi)serrulate.
 6. Seeds not winged. Fruit opening with 3 valves. Inflorescences simple, or compound and (nearly) all branches shortened. Leaves evenly spaced. Leaf margin (bi)serrulate. Shrubs or undershrubs.
 7. Inflorescences axillary; the rachis bearing a varying number of bracts, but only 1 flower. Undershrubs, up to 1 m, but often much smaller. 5. *Neckia*
 7. Inflorescences terminal (or pseudo-axillary by sympodial growth), many-flowered. Shrublets or shrubs, up to 7 m high.
 8. Staminodes 10, in 1 whorl. Fruit subglobose. Leaf blades oblanceolate, up to 35 cm long.
 6. *Indovethia*
 8. Staminodes ∞, in more than 1 whorl, those of the inner whorl larger. Fruit fusiform. Leaf blades linear oblong, up to 17 cm long. 7. *Schuurmansiella*
 6. Seeds winged. Fruit opening with 3 longitudinal slits under the persistent style. Inflorescences much-branched panicles. Leaves distinctly tufted. Leaf margin entire, glandular dotted. Treelets, usually not exceeding 15 m. 8. *Schuurmansia*

1. OCHNA

LINNÉ, Gen. Pl. ed. 5 (1754) 229; Sp. Pl. 1 (1753) 513; KANIS, Blumea 16 (1968) 22, 83. — *Diporidium* WENDL. f. in Bartl. & Wendl. Beitr. Bot. 2 (1825) 24; O.K. Rev. Gen. Pl. 1 (1891) 104, *emend. illeg., incl. typ. Ochna*. — *Discladium* TIEGH. Bull. Mus. Hist. Nat. Paris 8 (1902) 214, *nom. illeg.* — *Polythecium* TIEGH. Ann. Sc. Nat. Bot. VIII, 16 (1902) 196, 366. — *Pleopetalum* TIEGH. Bull. Mus. Hist. Nat. Paris 9 (1903) 163. — *Polythecanthum* TIEGH. Ann. Sc. Nat. Bot. IX, 5 (1907) 160, 175. — Fig. 1.

Shrubs or treelets, sometimes undershrubs. Stipules small, intrapetiolarly united, caducous. *Leaves* shortly petioled, chartaceous or subcoriaceous; nerves curved upward, especially near the margin, not joining; veinlets \pm at right angles to the nerves near the midrib and joining in irregular secondary nerves, \pm transverse near the margin. *Inflorescences* lateral or terminal thyrses with a terminal flower; peduncle \pm persistent, bearing many, small, distichously conferted, caducous bracts at base, leaving a distinct annulus of scars; pedicels filiform, articulate. *Flowers* with \pm hemispherical torus, distinctly tumid and red in fruit. *Sepals* 5, greenish, accrescent and turning red in fruit. *Petals* 5–10, in 1–2 whorls, yellow. *Stamens* ∞ in 2 or more whorls; filaments subterete; anthers opening with 2 apical pores. *Ovaries* 5–10(–15), obovoid; ovule atropous; stigmas as many as ovaries, on short branches or \pm united. *Fruits* 1–3(–5), greenish, turning black when ripe.

Distr. The majority of the species is found in Africa, south of the Sahara, and in Madagascar. In India and Ceylon 4 *spp.* occur, one of these ranging from Assam to Indo-China, Hainan, the Nicobar Is., and *Malesia*: in the North of the Malay Peninsula.

Ecol. Adapted to a seasonal climate, on poorer soils, below 1500 m. Dispersal by birds because of conspicuous black fruits on red torus and calyx (RIDLEY, Disp. 1930, 419).

1. *Ochna integerrima* (LOUR.) MERR. Trans. Am. Phil. Soc. n.s. 24, 2 (1935) 265, *emend.*; KANIS, Blumea 16 (1968) 36; Fl. Thail. 2 (1970) 25. — *Elaeocarpus integerrimus* LOUR. Fl. Cochinch. (1790) 338. — *O. wallichii* PLANCH. in Hook. Lond. J. Bot. 5 (1846) 650; KING, J. As. Soc. Beng. 62, ii (1893) 231; RIDL. J. Str. Br. R. As. Soc. n. 59 (1911) 83; CRAIB, Fl. Siam. En. 1 (1931) 244; BURK. Dict. 2 (1935) 1569. — *O. crocea* GRIFF. Not. Pl. As. 4 (1854) 463; KURZ, J. As. Soc. Beng. 40, ii (1871) 49, *err. in syn.* *Gomphia sumatrana* JACK; KING, *ibid.* 62, ii (1893) 233. — *O. grandis* RIDL. J. Str. Br. R. As. Soc. n. 59 (1911) 83; Fl. Mal. Pen. 1 (1922) 365. — *Ouratea crocea* (GRIFF.) BURK. Dict. 2 (1935) 1614; Kew Bull. (1935) 318, *p.p., quoad typus*. — Fig. 1.

Deciduous undershrub, shrub, or treelet up to 12 m and 45 cm σ . Stipules 5–8 by 2–3 mm. *Leaves* mostly obovate-oblong or (obovate-) lanceolate, rarely obovate or linear-lanceolate, 6–20(–25) by 2–7 cm, mostly acuminate, sometimes acute or obtuse at apex, mostly acute, sometimes obtuse at base, margin finely denticulate; petiole 2–5 mm. *Inflorescences* compound, many-flowered; rachis $\frac{1}{2}$ –1 $\frac{1}{2}$ (–4) cm; branches 1–3-flowered, monochasial; pedicels 2–4 cm, in

fruit up to 5 cm, the basal 2–8 mm persistent. *Torus* $\frac{1}{2}$ –1 mm high, 1 $\frac{1}{2}$ –2 $\frac{1}{2}$ mm σ , in fruit up to 6 mm high, 10 mm σ . *Sepals* 5, ovate to ovate-oblong, 10–16 by 4–9 mm. *Petals* 5–6(–10), obovate, 15–25 by 8–15 mm, tapering at base or subunguiculate. *Stamens* (25–)30–60(–75); filaments 2 $\frac{1}{2}$ –7 mm, unequal, the outermost longest; anthers 4–6 by 0.4–0.8 mm. *Ovaries* 6–10(–15), 0.7–1.1 by 0.5–0.7 mm; style 10–15 by c. $\frac{1}{2}$ mm, in fruit up to 20 mm; stigmas sometimes on up to 1 mm long branches. *Fruits* mostly 2–3, up to 11 by 8 mm.

Distr. NE. India, E. Pakistan, Burma, Andaman and Nicobar Is., Thailand, Laos, Cambodia, Vietnam, Hainan, in *Malesia*: Malay Peninsula (Peninsular Thailand, Perlis, Kedah, Langkawi Is.).

Ecol. From sea-level up to 1200 m in hilly country, in moist or dry, deciduous forests, often of a mixed Dipterocarp type, on loamy, sandy, or rocky soils. Tall specimens are found near river banks, small shrubs near seashores. Flowering shortly before or during development of new leaves; in the northern part of the area mainly in Febr. and March, in the southern part generally a little earlier, but less restricted, especially in the Malay Peninsula.



Fig. 1. *Ochna integerrima* (LOUR.) MERR. a. Fruiting twig, $\times \frac{2}{3}$, b. inflorescence, $\times \frac{2}{3}$, c. stamen, $\times 4$, d. gynoecium, $\times 4$, e. fruit, $\times 2$ (a & e RIDLEY 15746, b-d GARRETT 1346).

Uses. The bark tastes bitter and yields a digestive tonic (Cochinchina). The wood is recorded as used for huts in the Andamans.

Properties of wood. Light brown, hard, close-grained and brittle.

Excluded

Ochna decaisnei TIEGH. Bull. Mus. Hist. Nat. Paris 8 (1902) 47-49. — *Diporidium decaisnei*

TIEGH. Ann. Sc. Nat. Bot. VIII, 16 (1902) 356 = *O. mauritiana* LAMK, *vide* KANIS, Blumea 16 (1968) 80.

A species based on one collection by RIEDLÉ, erroneously recorded for Timor. The specimen must have been collected during Capt. BAUDIN's expedition on l'Île de France (Mauritius) on the way to Timor. It must have been mislocalized later on.

2. BRACKENRIDGEA

A. GRAY, New Gen. Pl. (1853) 5, preprint of Proc. Am. Ac. Arts Sc. 3 (1857) 51; KANIS, Blumea 16 (1968) 41. — *Campylopora* TIEGH. Bull. Mus. Hist. Nat. Paris 8 (1902) 547. — *Notochnella* TIEGH. l.c. 549. — Fig. 2.

Trees or treelets. Stipules small, free, often more or less laciniate, caducous. Leaves shortly petioled, chartaceous, glossy above, nerves strongly curved to the apex, often some of the lower ones partly parallel to the margin, the higher ones joining successively, veinlets branching, ± transverse. Inflorescence thyrsoid, but of umbelloid appearance, made up of simple or compound, distichously arranged, shortened cymes, the rachis often growing on vegetatively after flowering; bracts small, broadly linguiform to triangular, ± laciniate, ± caducous, often many at base of inflorescence, leaving a distinct annulus of scars; pedicels filiform, ± accrescent and turning red in fruit, articulate at base. Flowers with ± hemispherical torus, distinctly tumid and red in fruit. Sepals 5, accrescent, fleshy and red in fruit. Petals 5(-10), white or yellow. Stamens 10 (or ∞); filaments subterete; anthers dehiscing from the apex downwards by longitudinal slits. Ovaries 5(-10), obovoid; ovule campatotropous, epitropous, ± annularly curved around 2 connecting intrusions of the endocarp; stigma small. Fruits 1-2(-5), greenish, turning black or almost so when ripe.

Distr. 2 or 3 spp. in tropical eastern Africa and Madagascar, probably forming a distinct section; in Malesia 4 spp. in 2 sections are found; a related species occurs in NE. Queensland and Fiji.

Ecol. Confined to the everwet tropical areas, up to c. 1000 m. Dispersal mainly by birds because of conspicuous, black fruits on red torus and calyx (GUPPY, Obs. Nat. Pacif. 2, 1906, 569; RIDLEY, Disp. 1930, 265). The fruits are also capable of floating because of two air-filled spaces between exocarp and endocarp; this was recorded from the Kapuas R. (BECCARI, Wand. Borneo 1904, 187) and from the New Guinea seadrift (HEMSLEY, Bot. Chall. Exp. 3, 1885, 289, t. 54). No specimen has ever been collected in beach forest.

KEY TO THE SPECIES

- 1. Petals 5. Stamens 10. Ovaries 5. (*Sect. Brackenridgea*).
- 2. Inflorescences never axillary, but sometimes terminal on short side-branches.
- 3. Inflorescences made up of many-flowered cymes, the pedicels in 2 or more tiers. Leaves mostly 7½-20 cm long. 1. *B. hookeri*
- 3. Inflorescences made up of 3(-5)-flowered cymes, the pedicels in 1 tier. Leaves mostly 4-12½ cm long. 2. *B. palustris*
- 2. Axillary inflorescences always present when in fertile state. 3. *B. forbesii*
- 1. Petals 5-7(-10). Stamens 10-45. Ovaries 5-10. (*Sect. Notochnella*). 4. *B. fascicularis*

1. Section Brackenridgea

Brackenridgea A. GRAY. — *Campylopora* TIEGH.

Cymes much conferted; peduncle and branches much shortened. Flowers of 1

cyme flowering simultaneously. *Corolla* regularly 5-merous, white. *Stamens* 10, in 1 whorl. *Ovaries* 5.

Distr. Chiefly Malesian with 2 *ssp.* in the Malay Peninsula and Borneo, one reaching Sumatra, Palawan, and Celebes, the other reaching the Andamans and Ko Chang; another *sp.* in New Guinea. Also 1 *sp.* in NE. Queensland and Fiji.

1. *Brackenridgea hookeri* (PLANCH.) A. GRAY, New Gen. Pl. (1853) 6, preprint of Proc. Am. Ac. Arts Sc. 3 (1857) 51; FURTADO, Gard. Bull. Sing. 19 (1962) 182; KANIS, Blumea 16 (1968) 45; Fl. Thail. 2 (1970) 27. — *Gomphia hookeri* PLANCH. in Hook. Lond. J. Bot. 6 (1847) 3; MIQ. Fl. Ind. Bat. 1, 2 (1859) 675, *err.* 'G. glaberrima PLANCH.'; BENN. in Hook. f. Fl. Br. Ind. 1 (1875) 525; KING, J. As. Soc. Beng. 62, ii (1893) 233, *excl. var. corymbosa*; RIDL. Fl. Mal. Pen. 1 (1922) 366. — *Ochna hookeri* (PLANCH.) O.K. Rev. Gen. Pl. 1 (1891) 106. — *B. perakensis* TIEGH. Ann. Sc. Nat. Bot. VIII, 16 (1902) 396. — *Gomphia corymbosa* (KING) RIDL. J. Str. Br. R. As. Soc. n. 54 (1910) 33, *p.p. excl. typus*; Fl. Mal. Pen. 1 (1922) 367. — *Ouratea hookeri* (PLANCH.) BURK. Kew Bull. (1935) 318; Dict. 2 (1935) 1615. — *B. denticulata* FURTADO, Gard. Bull. Sing. 19 (1962) 183. — Fig. 2b¹.

Tree, up to 33 m, 1 m ø. *Leaves* oblong to lanceolate, 7½–20 by 2½–6 cm, obtuse to acute, sometimes acuminate at apex, acute, often ± tapering at base, margin entire, ± acicular denticulate in young treelets; petiole 5–12 mm. *Inflorescences* terminal, made up of many-flowered shortened, sessile cymes, flowering successively or simultaneously, the rachis often not growing on vegetatively after flowering; pedicels 10–15 mm, up to 20 mm in fruit, those of one cyme fixed close together in c. 3, ± distinct tiers. *Torus* c. ½ mm high, 1 mm ø, in fruit up to 3 mm high, 5 mm ø. *Sepals* ovate to obovate, 4–5 by 1½–2 mm. *Petals* ovate to obovate, 3½–5 by 1½–1¾ mm. *Filaments* 1–1½ mm; anthers 1½–2 by c. ½ mm. *Ovaries* c. 0.7 by 0.5 mm; style 1½–3 mm, in fruit up to 5 mm. *Fruits* up to 6½ by 5½ mm.

Distr. India: Andamans, and Thailand: Ko Chang (NE. Gulf of Thailand); in *Malesia*: Malay Peninsula and Borneo.

Ecol. From sea-level up to 750 m, in kerangas forests on sandy soils, on dry hilllocks in swampy forests, in primary lowland Dipterocarpaceae forests and in hill forests.

Vern. Mal. Pen.: *bunga kĕlat mĕrah*, *bunga maskam*, *kayu luru*, Malacca; Borneo: *ĕmpodat*, Sarawak, *sĕmukau*, P. Madjang.

2. *Brackenridgea palustris* BARTELL. Malpighia 15 (1901) 165, t. 10; FURTADO, Gard. Bull. Sing. 19 (1962) 183; KANIS, Blumea 16 (1968) 46; Fl. Thail. 2 (1970) 27. — *B. hookeri* (PLANCH.) A. GRAY *var. leucocarpa* SCHEFF. Nat. Tijds. N. I. 32 (1873) 411. — *Gomphia hookeri* PLANCH. *var. corymbosa* KING, J. As. Soc. Beng. 62, ii (1893) 233. — *B. serrulata* BARTELL. Malpighia 15 (1901) 163, t. 9; FURTADO, Gard. Bull. Sing. 19 (1962)

184. — *B. kingii* TIEGH. Ann. Sc. Nat. Bot. VIII, 16 (1902) 395. — *B. corymbosa* (KING) TIEGH. l.c. 395. — *B. rubescens* TIEGH. l.c. 396. — *Gomphia corymbosa* (KING) RIDL. J. Str. Br. R. As. Soc. n. 54 (1910) 33, *p.p.*; Fl. Mal. Pen. 1 (1922) 367. — *Ochna foxworthyi* ELMER, Leaf. Philip. Bot. 5 (1913) 1823; MERR. En. Philip. 3 (1923) 68. — *B. foxworthyi* (ELMER) FURTADO, Gard. Bull. Sing. 19 (1962) 184. — Fig. 2.

Tree, up to 30 m, 1.2 m ø. *Leaves* (ovate-) oblong to (ovate-)lanceolate, 4–12½ by 1½–5 cm (up to 20 cm long on young treelets), mostly acute to acuminate, sometimes obtuse at apex, rounded to acute, often ± tapering at base, margin entire, ± acicular denticulate in young treelets; petiole 3–10 mm. *Inflorescences* terminal, made up of 3(–5)-flowered, shortened cymes, sessile, or with up to ½ cm long peduncle, flowering simultaneously, sometimes 2 inflorescences of different stages in close succession, the 5–10(–25) mm long rachis growing on vegetatively, sometimes branching in the lower parts; pedicels 8–15 mm, up to 20 mm in fruit, those of one cyme fixed close together in one tier. *Torus* c. ½ mm high, 1 mm ø, in fruit up to 4 mm high, 6 mm ø. *Sepals* ovate to oblong, 3½–6 by 1½–3 mm. *Petals* ovate to obovate-lanceolate, 3½–7 by 1½–3 mm. *Filaments* (½–)1–2(–2½) mm; anthers 1½–3 by c. ½ mm. *Ovaries* c. 0.7 by 0.5 mm; style (1–)2½–4 mm, ± accrescent. *Fruits* up to 8 by 6 mm.

Distr. *Malesia*: Sumatra, Malay Peninsula, Borneo, Philippines (Palawan), and Celebes.

KEY TO THE SUBSPECIES

1. Anthers 1½–2 mm long. Style 2½–4 mm long during anthesis. 1. *ssp. palustris*
1. Anthers 2–3 mm long. Style 1½–2½ mm long during anthesis.
2. Filaments c. 2 mm long during anthesis. Ovaries c. 0.7 by 0.5 mm. 2. *ssp. foxworthyi*
2. Filaments c. ½ mm long during anthesis. Ovaries c. 0.5 by 0.3 mm. 3. *ssp. kjellbergii*

1. *ssp. palustris*. — All synonyms except *Ochna foxworthyi* ELMER.

Cymes 3-flowered, sessile, up to 5-flowered and with up to ½ cm long peduncle in young treelets. *Sepals* 3½–5½ by 1½–3 mm. *Petals* 3½–6 by 1½–3 mm. *Stamens* with 1–2 mm long filaments; anthers 1½–2 mm long, up to 3 mm in young treelets. *Ovaries* c. 0.7 by 0.5 mm; style 2½–4 mm during anthesis. *Fruits* up to 8 by 6 mm.

Distr. *Malesia*: Sumatra, Mentawai Is., Banka, Billiton, Malay Peninsula, Borneo.

Ecol. Usually found in the lowlands, but oc-

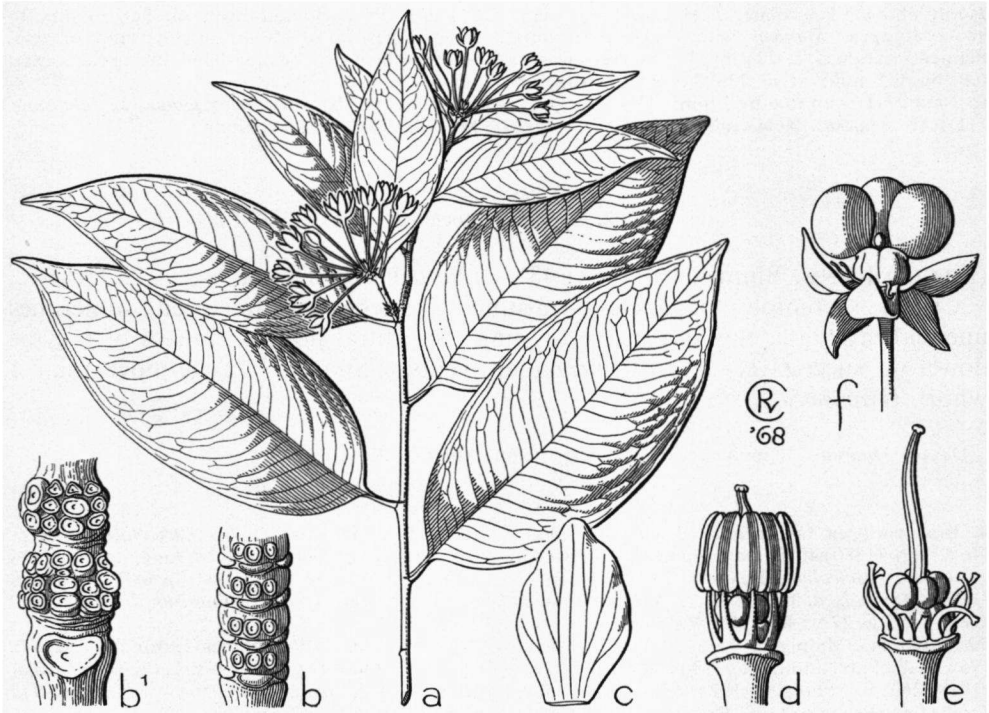


Fig. 2. *Brackenridgea palustris* BARTELL. *a.* Flowering twig, $\times \frac{2}{3}$, *b.* part of twig with scars of flowers and bracts arranged in simple cymes, $\times 4$ (*b'*. ditto of *B. hookeri* (PLANCH.) A. GRAY, scars of many flowers arranged in shortened, cymose, partial inflorescences, $\times 4$), *c.* petal from bud, *d.* flowerbud, sepals and petals removed, *e.* flower, petals and anthers shed, sepals removed, all $\times 6$, *f.* fruiting flower, $\times 2$ (*a-b* & *e* RAHMAT SI TOROES 4187, *c-d* ditto 4162, *f* IBOET 214; *b'* PAIE 13589).

asionally up to 1000 m, reported from peat-swamp forests and from kerangas forests on sandy, sometimes rather rocky soils, with humic podsols.

Uses. The wood is reported twice as being used in house-building (Malacca, Sarawak).

Vern. Sumatra: *majang majang*, *mampat*, *rampat dahan*, *sëniang*, M, *kaju barat laut*, *k. galugus badak*, *k. ludë*, *k. saholat*, *k. topa topa*, Kota Pinang Distr.; *madu luai*, *mensulung kaju*, Banka; *mënsolongang*, Billiton; Mal. Pen.: *lidah mura*, Pahang, *pëndorah*, *chëharahan*, Malacca; Borneo: *mata undang*, *timur bësih*, P. Madjang.

2. *ssp. foxworthyi* (ELMER) KANIS, *Blumea* 16 (1968) 48. — *Ochna foxworthyi* ELMER.

Cymes 3-flowered, sessile. *Sepals* 5–6½ by 2–3 mm. *Petals* 5–7 by 1½–2 mm. *Stamens* with 1¾–2¼ mm long filaments; anthers 2–3 mm long. *Ovaries* c. 0.7 by 0.5 mm; style 1½–2½ mm long during anthesis. *Fruits* up to 5 by 4 mm.

Distr. *Malesia*: Philippines (Palawan).

Ecol. At sea-level, along river in forest, and from 150 m on rocky hillside near river-bank.

3. *ssp. kjellbergii* KANIS, *Blumea* 16 (1968) 48.

Cymes 3-flowered, sessile. *Sepals* 4–5½ by

1½–2 mm. *Petals* 4–4½ by 1¾–2¼ mm. *Stamens* with ¼–¾ mm long filaments; anthers 2½–3 mm long. *Ovaries* c. 0.5 by 0.3 mm; style 1–2 mm long during anthesis. *Fruits* up to 5 by 4 mm.

Distr. *Malesia*: Celebes.

Ecol. At sea-level in swamp and from 400 m at the edge of a lake.

3. *Brackenridgea forbesii* TIEGH. in Morot, J. Bot. 16 (1902) 46, *nom. nud.*; Ann. Sc. Nat. Bot. VIII, 16 (1902) 395, *descr.*; PULLE, Nova Guinea 8 (1912) 667; RENDLE, J. Bot. (1923) Suppl. 7; KANIS, *Blumea* 16 (1968) 49.

Tree, up to 30 m, 55 cm ø. *Leaves* oblong to lanceolate, 5–15 by 1½–5 cm, acute to acuminate at apex, acute or a little tapering at base, entire; petiole 3–5 mm. *Inflorescences* terminal and axillary, made up of a varying number of mostly 3- to 5-flowered, shortened, sessile cymes, flowering simultaneously, the 2–5(–10) mm long rachis mostly growing on vegetatively when terminal, sometimes when axillary; pedicels c. ½ cm, up to 1 cm in fruit, those of one cyme fixed close to each other in one tier. *Torus* c. ½ mm high, ½–¾ mm ø, in fruit up to 2½ mm high, 4 mm ø. *Sepals* ovate to elliptic, 3–4½ by 1¼–1¾ mm.

Petals obovate-lanceolate, 3-4½ by 1-1¼ mm, acute at apex. *Stamens* with c. 1½ mm long filaments; anthers c. 1½ by ½ mm. *Ovaries* c. 0.6 by 0.5 mm; style 1½-2 mm, in fruit up to 3 mm. *Fruits* up to 6 by 5 mm.

Distr. *Malesia*: New Guinea.

Ecol. Primary rain-forest on flat country to steep slopes, up to 750 m, on clay, sand, or peat, in sites which may be inundated during the wettest season.

Vern. W. New Guinea: *jobias*, Je, *obaisang*, Mooi, *serukdeho*, Manikiong.

2. Section Notochnella

(TIEGH.) KANIS, *Blumea* 16 (1968) 43. — *Notochnella* TIEGH.

Cymes ± remote; peduncle ± distinct; branches ± shortened, sometimes unequal in length, the longer overtopping the central flower. *Flowers* of 1 cyme flowering successively. *Corolla* irregular, yellow. *Stamens* ∞, in more than 1 whorl. *Ovaries* 5-10.

Distr. *Malesia*: Philippines (excl. Palawan), monotypic.

4. *Brackenridgea fascicularis* (BLANCO) F.-VILL. Nov. App. (1880) 40; KANIS, *Blumea* 16 (1968) 43. — *Ochna fascicularis* BLANCO, Fl. Filip. ed. 2 (1845) 245; *ibid.* ed. 3, 2 (1878) 92; VIDAL, *Sinopsis* (1883) 19, t. 27A; Rev. Pl. Vasc. Filip. (1886) 79; BARTELL, *Malpighia* 15 (1901) 162; MERR. Gov. Lab. Publ. Philip. 27 (1905) 29; Sp. Blanc. (1918) 263; En. Philip. 3 (1923) 68. — *Diporidium fasciculare* (BLANCO) O.K. Rev. Gen. Pl. 1 (1891) 105; TIEGH. in Morot, J. Bot. 16 (1902) 203. — *Notochnella fascicularis* (BLANCO) TIEGH. Bull. Mus. Hist. Nat. Paris 8 (1902) 549; Ann. Sc. Nat. Bot. VIII, 16 (1902) 403. — *Ouratea mindanaensis* MERR. Philip. J. Sc. 17 (1920) 287; En. Philip. 3 (1923) 68.

Tree up to 25 m, 30 cm ø. *Leaves* oblong to lanceolate, 5-15 by 2-5 cm, sometimes obtuse, mostly acute to ± acuminate at apex, obtuse to acute, sometimes a little attenuate at base, margin entire or ± finely denticulate; petiole 4-8 mm. *Inflorescences* terminal, made up of a varying number of many-flowered, ± shortened cymes, sometimes separate cymes in the axils of normal leaves; pedicels 1-2 cm, up to 3 cm in fruit, the basal 1-5 mm persistent. *Torus* c. 1 mm high, 1½ mm ø, in fruit up to 4 mm high, 7 mm ø. *Sepals* elliptic to obovate, 6-8 by 3-4 mm. *Petals* obovate to obovate-lanceolate, 6-8 by 2½-4½ mm. *Filaments* 1½-2½ mm; anthers 2½-3 by c. ½ mm. *Ovaries* 0.7-0.8 by 0.5-0.7 mm; style c. 4 mm, in fruit up to 7 mm. *Fruits* up to 7 by 6 mm.

Distr. *Malesia*: Philippines.

Ecol. In primary forests at low and medium altitudes, once reported from logged Dipterocarp forest and once along a stream.

KEY TO THE SUBSPECIES

1. Stamens 20-45 . Cymes with 2-5 mm long peduncles. 1. *ssp. fascicularis*
1. Stamens 10-15. Cymes with 5-10(-20) mm long peduncles. 2. *ssp. mindanaensis*

1. *ssp. fascicularis*. — *Ochna fascicularis* BLANCO. Inflorescences with 1-2½ cm long rachis; cymes with 2-5 mm long peduncles, up to 15-flowered. *Sepals* 5. *Petals* 5-7(-10). *Stamens* 20-45. *Ovaries* 7-10.

Distr. *Malesia*: Philippines (Luzon, N. Visayas).

Vern. Philip.: *aniatan*, *dirigkalin*, *bitas*, *mala-kiting kiting*, *masalisi*, Luzon, Tag., *bansilai*, Visayas, Bis.

2. *ssp. mindanaensis* (MERR.) KANIS, *Blumea* 16 (1968) 44. — *Ouratea mindanaensis* MERR.

Inflorescences with 2-6 cm long rachis, often indistinct by development of bracts to normal leaves; cymes with 5-10(-20) mm long peduncles, up to 7-flowered. *Sepals* (3-5). *Petals* (3-5). *Stamens* (8-10)-15. *Ovaries* 6-7.

Distr. *Malesia*: Philippines (Mindanao).

Doubtful

Brackenridgea elegantissima (WALL.) KANIS, *Blumea* 16 (1968) 50. — *Euthemis elegantissima* WALL. in Roxb. Fl. Ind. 2 (1824) 305; in Hook. Bot. Misc. 2 (1830) 77, note; PLANCH. in Hook. Lond. J. Bot. 5 (1846) 647; *ibid.* 6 (1847) 2, *err. in syn. Gomphia sumatrana* JACK; BENN. in Hook. f. Fl. Br. Ind. 1 (1875) 526; KING, J. As. Soc. Beng. 52, ii (1893) 235; BARTELL, *Malpighia* 15 (1901) 160; RIDL, Fl. Mal. Pen. 1 (1922) 368. — *Euthemis* ? *pulcherrima* WALL. ex BENN. in Hook. f. Fl. Br. Ind. 1 (1875) 526, *err. in syn. Gomphia sumatrana* JACK; KING, J. As. Soc. Beng. 52, ii (1893) 233; BARTELL, *Malpighia* 15 (1901) 160.

Based on one sterile, juvenile specimen from Singapore I. It can not be decided whether it belongs to *B. hookeri* (PLANCH.) A. GRAY or to *B. palustris* BARTELL., although it should be certainly one of these species. WALLICH's epithet is the oldest available for any of the species in *Brackenridgea*.

3. GOMPHIA

SCHREB. Gen. Pl. ed. 8 (1789) 291, *p.p.*; KANIS, Taxon 16 (1967) 420, 422; Blumea 16 (1968) 51. — *Ochna* LINNÉ, Sp. Pl. 1 (1753) 513; Gen. Pl. ed. 5 (1754) 229, *p.p. excl. typ.* — *Ouratea* [non AUBL. Hist. Pl. Gui. Fr. 1 (1775) 397] BAILL. Hist. Pl. 4 (1873) 367, *emend., p.p. excl. typ.* — *Meesia* GAERTN. Fruct. 1 (1788) 344, *nom. rej., non HEDW.* Sp. Musc. (1801) 173, *nom. cons.* — *Campylospermum* TIEGH. in Morot, J. Bot. 16 (1902) 40, 194, 197, *nom. superfl.* — *Cercinia* TIEGH. l.c. 198. — *Campylocercum* TIEGH. Bull. Mus. Hist. Nat. Paris 8 (1902) 546. — Fig. 3.

Shrubs or treelets. Stipules small, intrapetiolarly united, caducous. Leaves shortly petioled, chartaceous, nerves close, parallel, \pm straight, curving upward near the margin, forming an inconspicuous marginal nerve and a conspicuous, somewhat wavy nerve parallel to the margin at some distance, veinlets reticulate, joining in irregular secondary nerves parallel to the primary ones. Inflorescences lateral and/or terminal thyrses with \pm reduced branches; peduncle \pm persistent with sometimes a few small bracts at base, not leaving a distinct annulus of scars; pedicels filiform, articulate at base. Flowers with a short, columnar, 5-ribbed gynophore, enlarging and sometimes turning subglobular in fruit. Sepals 5, tinged pinkish, accrescent. Petals 5, yellow, creamy or white. Stamens 10 in 1 whorl; filaments terete, very short; anthers opening with 2 apical pores. Ovaries 5, obovoid; ovule campotropous, epitropous; stigma punctiform. Fruits 1–2(–5), yellowish green, turning dark purple or blue-black when ripe.

Distr. The majority of the species is found in Africa, S. of the Sahara, and in Madagascar. One *sp.* in SW. Peninsular India, Ceylon, E. Thailand, Indo-China, Hainan, and *W. Malesia*.

Ecol. Confined to tropical areas with an everwet climate or with a moderately dry monsoon, up to 1500 m. Dispersal possibly by birds, but the fruits are not as conspicuous as in *Ochna* and *Brackenridgea*, as calyx and torus are not coloured.

1. *Gomphia serrata* (GAERTN.) KANIS, Taxon 16 (1967) 422; Blumea 16 (1968) 53; Fl. Thail. 2 (1970) 28. — *Meesia serrata* GAERTN. Fruct. 1 (1788) 344, t. 70, f. 6. — *G. angustifolia* VAHL, Symb. Bot. Upsal. 2 (1791) 49; SCHEFF. Nat. Tijd. N. I. 32 (1873) 411; BENN. in Hook. f. Fl. Br. Ind. 1 (1875) 525; F.-VILL. Nov. App. (1880) 39; VIDAL, Sinopsis (1883) 19; Rev. Pl. Vasc. Filip. (1886) 79; Phan. Cuming. (1895) 101; BACKER, Schooffl. (1911) 194. — *G. sumatrana* JACK, Mal. Misc. 1, 5 (1821) 29; in Hook. Bot. Misc. 2 (1830) 77; PLANCH. in Hook. Ic. Pl. II, 4 (1845) t. 712; in Hook. Lond. J. Bot. 6 (1847) 2; MIQ. Fl. Ind. Bat. 1, 2 (1859) 675; Sumatra (1860) 209, 534; SCHEFF. Nat. Tijd. N. I. 32 (1873) 411; BENN. in Hook. f. Fl. Br. Ind. 1 (1875) 525, *err. 'sumatrensis'*; KING, J. As. Soc. Beng. 62, ii (1893) 232; RIDL. Trans. Linn. Soc. II, Bot. 3 (1893) 285; Fl. Mal. Pen. 1 (1922) 365; RENDLE, J. Bot. (1924) Suppl. 16; RIDL. Kew Bull. (1925) 79; Fl. Mal. Pen. 5 (1925) 296; MERR. J. Arn. Arb. 33 (1952) 226. — *Ouratea angustifolia* (VAHL) BAILL. ex LANESS. Pl. Util. Col. Fr. (1886) 607; KOORD. Exk. Fl. Java 2 (1912) 107; HALL. f. Beih. Bot. Centralbl. 34, 2 (1916) 34; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 387; En. Philip. 3

(1923) 68; RIDL. Kew Bull. (1930) 76. — *Ochna angustifolia* (VAHL) O.K. Rev. Gen. Pl. 1 (1891) 106. — *Ochna sumatrana* (JACK) O.K. l.c. 106. — *Ouratea sumatrana* (JACK) GILG in E. & P. Nat. Pfl. Fam. 3, 6 (1895) 142; BARTELL. Malpighia 15 (1901) 160; HALL. f. Beih. Bot. Centralbl. 34, 2 (1916) 35; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 387; RIDL. Kew Bull. (1930) 76. — *Ouratea borneensis* BARTELL. Malpighia 15 (1901) 156, t. 6; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 387; RIDL. Kew Bull. (1930) 76. — *Ouratea nerifolia* BARTELL. Malpighia 15 (1901) 158, t. 7, *sphalm. 'neerifolia'*; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 387; AIRY SHAW, Kew Bull. (1940) 249. — *Ouratea beccariana* BARTELL. Malpighia 15 (1901) 159, t. 9; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 387; AIRY SHAW, Kew Bull. (1940) 249. — *Campylospermum sumatranum* (JACK) TIEGH. in Morot, J. Bot. 16 (1902) 197; Ann. Sc. Nat. Bot. VIII, 16 (1902) 298; *ibid.* 18 (1903) 21. — *Campylospermum borneense* (BARTELL.) TIEGH. in Morot, J. Bot. 16 (1902) 197; Ann. Sc. Nat. Bot. VIII, 16 (1902) 301. — *Campylospermum beccarianum* (BARTELL.) TIEGH. Ann. Sc. Nat. Bot. VIII, 16 (1902) 301. — *Campylocercum nerifolium* (BARTELL.) TIEGH. l.c. 304. — *Campylocercum*

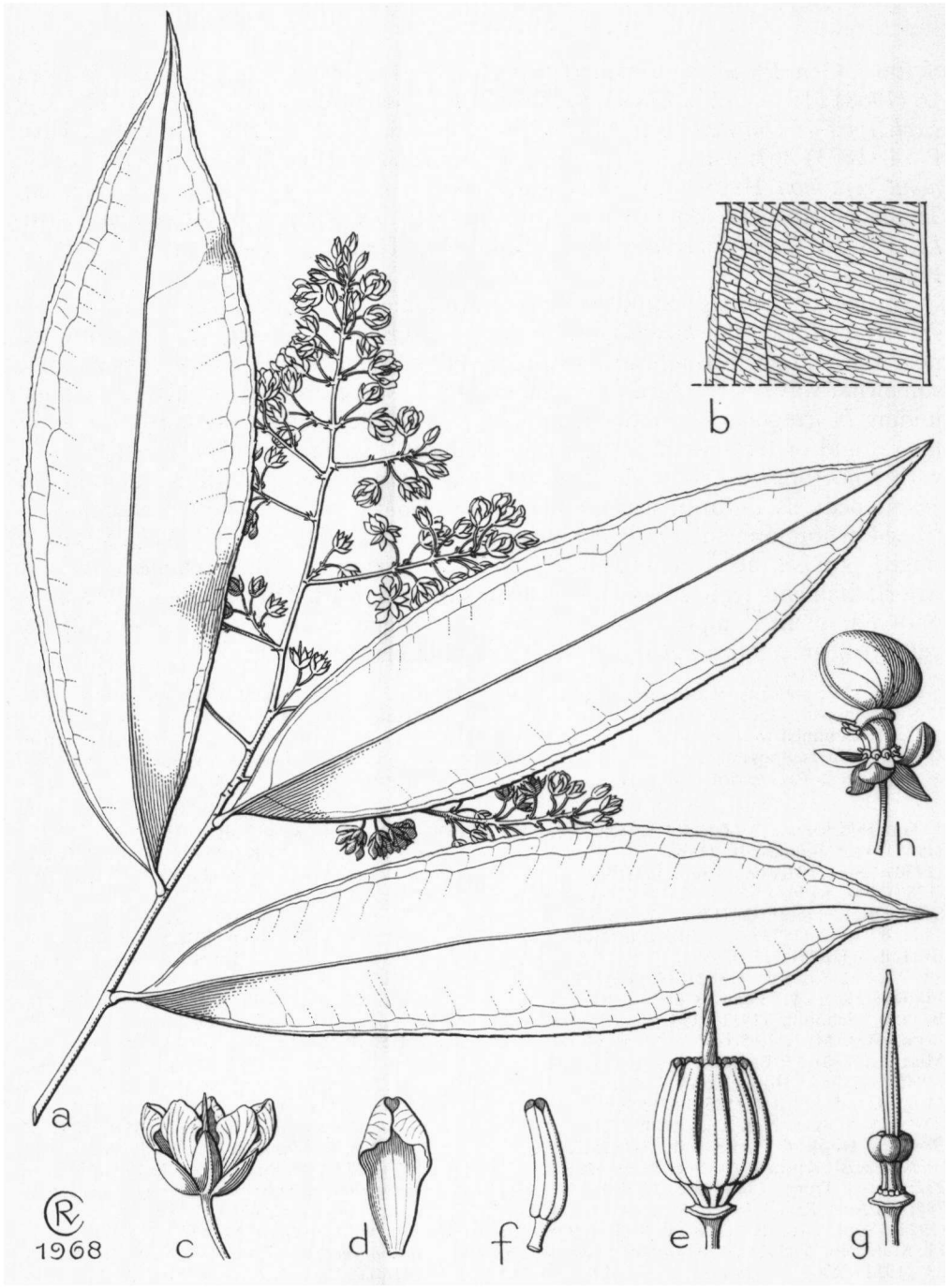


Fig. 3. *Gomphia serrata* (GAERTN.) KANIS. a. Flowering twig, $\times \frac{2}{3}$, b. part of leaf, $\times 1\frac{1}{3}$, c. flower, $\times 2$, d. petal, $\times 4$, e. flower, sepals and petals removed, f. stamen, abaxial view, g. gynoecium with gynophore, all $\times 6$, h. fruiting flower, $\times 2$ (a-g AMPURIA 41444, h SAN 25040).

zollingeri TIEGH. *l.c.* 305. — *Campylospermum wallichianum* TIEGH. Bull. Mus. Hist. Nat. Paris 9 (1903) 76; Ann. Sc. Nat. Bot. VIII, 18 (1903) 17. — *Campylospermum plicatum* TIEGH. Bull. *l.c.* 78; Ann. *l.c.* 19. — *Campylospermum strictum* TIEGH. Bull. *l.c.* 79; Ann. *l.c.* 20. — *Campylospermum kingii* TIEGH. Bull. *l.c.* 79; Ann. *l.c.* 21. — *Campylospermum perakense* TIEGH. Bull. *l.c.* 80; Ann. *l.c.* 21. — *Campylospermum abbreviatum* TIEGH. Bull. *l.c.* 80; Ann. *l.c.* 21. — *Campylospermum cumingii* TIEGH. Bull. *l.c.* 80; Ann. *l.c.* 22. — *G. microphylla* RIDL. Fl. Mal. Pen. 1 (1922) 365, f. 38. — *G. oblongifolia* RIDL. Kew Bull. (1925) 281; Fl. Mal. Pen. 5 (1925) 296. — *Ouratea arcta* CRAIB, Kew Bull. (1926) 341; BACKER & BAKH. f. Fl. Java 1 (1963) 327. — *Ouratea megacarpa* RIDL. Kew Bull. (1930) 76. — *Ouratea microphylla* (RIDL.) CRAIB, Fl. Siam. En. 1 (1931) 245. — *Ouratea sumatrana* (JACK) GILG var. *nervosa* CRAIB, *l.c.* 245. — *Ouratea crocea* (GRIFF.) BURK. Kew Bull. (1935) 318, *p.p. excl. typ.* — Fig. 3.

Shrub or tree, up to 25 m, 40 cm ϕ . Branchlets of young plants sometimes scrambling. Leaves ovate to obovate-lanceolate, 6–20 by 2–6 cm (up to 35 by 10 cm in young plants), chartaceous, mostly acute to acuminate, sometimes obtuse at apex, acute or a little tapering at base, margin finely denticulate; petiole $2\frac{1}{2}$ – $7\frac{1}{2}$ mm. Inflorescences many-flowered; rachis ($2\frac{1}{2}$ –)5–20(–35) cm, primary branches of terminal inflorescences usually up to 10(–15) cm long, secondary branches or primary ones of lateral inflorescences usually reduced or up to 1 cm long, cymose, with (1–)3–7(– ∞), \pm conferted flowers; pedicels $\frac{1}{2}$ – $\frac{3}{4}$ cm, up to 1 cm in fruit. Torus 0.7–1 mm high, 0.7–1 mm ϕ , in fruit up to 5 mm high, 5 mm ϕ . Sepals mostly ovate to elliptic, sometimes obovate, 4–7 by $2\frac{1}{2}$ –4 mm, mostly acute to obtuse, sometimes rounded. Petals obliquely obovate to broad-spatulate, $4\frac{1}{2}$ –8 by $2\frac{1}{2}$ –6 mm, obtuse, rounded or truncate, mostly yellow, sometimes creamy or white. Stamens subsessile or with up to $\frac{1}{2}$ mm long filaments; anthers $2\frac{1}{2}$ –5(–6) by 0.5–0.8 mm. Ovaries 0.7–1 by 0.4–0.6 mm; style 3–5 mm long, up to 7 mm in fruit; stigma minute. Fruits up to 8(–10) by 6(–8) mm.

Distr. SW. Peninsular India, Ceylon, E. Thailand, Indo-China, Hainan; in *Malesia*: Sumatra, Banka, Malay Peninsula, Karimundjawa Is., Borneo, Philippines, and Celebes.

Ecol. From sea-level up to 1200 m, up to 1500 m on Mt Kinabalu, in primary and secondary vegetation: lowland and submontane, mixed Dipterocarp forests, peat swamp forests, high kerangas forests, ridge forests, and open scrub vegetation; on level land to steep slopes, also near river-banks and on cliffs near the sea. Soils are rocky, sandy, loamy or clayish, but usually acid; limestone is reported occasionally, but it is very probable that the soils in the localities concerned have been leached out.

The flower buds are often galled by unidentified insects, especially in the Malay Peninsula, Sumatra, and the smaller islands east of Sumatra.

These buds are about ovoid, with small sepals and petals somewhat sunken in an enlarged torus, whereas gynoeceum and androeceum are strongly suppressed.

Ripe fruits in normal flowers are often empty, which is probably also caused by insect damage, as perforations of the pericarp are sometimes clearly visible. It is recorded once that ants did attack a collector's press for these fruits (CLEMENS, Indo-China). Seeds are rare in herbarium specimens of Malesian collections.

Uses. The wood is reported as being used as poles or planks for the construction of houses in Ceylon, Vietnam, Sumatra, Malay Peninsula, and Sarawak. The leaves are chewed by jungle tribes in Malaya. Roots and leaves are bitter and are decocted in S. India for a stomachic and anti-emetic tonic. Young branches are used against tooth-ache in Cambodia.

Properties of wood: dull red or red-brown, hard and strong, apt to split in drying.

Vern. Sumatra, North: *kaju ndolak*, Batak; West: *kalèk djambak*, *sèbalusi*, Minangkabau; South: *kaju mat*, *k. sèpah*, *lakodjong*, *madjang madjang*; Banka: *mèntungging*, *mèsulung putih*; Mal. Pen., Thailand: *tong pling*; Malaya: *bunga kèlimbing bési*, *chinta mula*, *lidah mura*, *mata kètam batu*, *mèmbatu*, *mènarah*, *mèndapor*, *mèramong*, *murmangong*, *pènarah*, *pèngling*, *pokok lèbah*, *p. luas*, *tampang bési*; several compound names were recorded occasionally with *gèronggang* (= *Cratoxylon*), *jambu* and *kèlat* (= *Eugenia*); Borneo, Sarawak: *kèladang*, *kèlutak*, Iban, *aam*, Kenyah; compound names with *ubah* or *ubar* (= *Eugenia*) were recorded occasionally; Brunei: *chènaga lampong*, Iban, *pinis*, Malay; Sabah: *majang majang*, *quintalai*, Kadazan, *antimagas gimbaan*, Murut, *kolambang*, Rungus Dusun, *posoon*, *tulangkara*, Kinabatangan, *alas*, *tampalanuk*, Tidong, *bakan bitanag*, *biobi*, *malatangor*, *ondogong*, Malay; West Borneo: *mèlindungan*, Dayak; East Borneo: *amir burgang*, Dayak, *batu batu*, *mulak*, *tèngkèdjing kèring*, Malay; Philip., Palawan: *anduyong*, *bibingo*, *huisac*; Luzon: *salactoc*, Zambales, *simahima*, Bicol, *sasahit*, Tagalog; Visayas: *bulocauan*, *caranan*, Panay, *minsarar*, Mindoro; Celebes: *lèbani*, *parasinga tjila*, Bugi, *mampa*, Rangkas, *morosisio*, *wulisi mapute*, Tobela.

Notes. As this species grows under rather different ecological conditions, the variation in its morphological characters is not surprising. Apart from these variations, some geographically more or less separated 'races' can be recognized. This is the reason why in certain Floras two or three different species have been recognized although the distinctive characters can hardly be used at a specific level. Over a large area it is impossible to make a key to these 'races', because the same differences occur in remote parts of the specific area. In Sumatra and the Malay Peninsula plants are relatively uniform, the greatest variation occurring in Borneo, especially in Sarawak. In more exposed habitats, on cliffs and on poor kerangas soils, specimens often have small leaves. On

limestone in the Langkawi Islands a race '*microphylla*' is found with small leaves and very reduced inflorescences. Similar, but less reduced forms are found elsewhere along the coasts of the Malay Peninsula.

Excluded

Gomphia magnoliaefolia ZIPP. ex SPAN. Linnaea 15 (1841) 186, *nom. nud.* = *Pycnarrhena longifolia* (DECNE) BECC. (*Menispermaceae*), *fide* DIELS, Pflanzenreich, Heft 46 (1910) 51.

4. EUTHEMIS

JACK, Mal. Misc. 1, 5 (1821) 15; KANIS, Blumea 16 (1968) 62. — Fig. 4.

Shrubs or shrublets, sparsely branched. Stipules free, caducous. *Leaves* coriaceous, glabrous, denticulate, nerves numerous, parallel, from the midrib curving sideways, straightly ascending to the marginal veins at an angle of *c.* 80°; petiole ± winged. *Inflorescences* terminal, many-flowered, compound racemes; bracts small, caducous. *Flowers* ♂ or polygamous. *Sepals* 5, turning purplish red in fruit. *Petals* 5, white or pinkish. *Staminodes* 0(-5), filamentous. *Stamens* 5, free; anthers subsessile, rostrate. *Ovary* 5-celled; ovules 2 per cell, pendulous, axile; stigma minute. *Fruit* a berry with 5 pyrenes. *Seeds* 1 (2) per cell.

Distr. SW. Cambodia, in *Malesia*: Sumatra, Malay Peninsula, Borneo.

Ecol. Everwet tropical forest below 1250 m, in kerangas forests, on low ridges in peat-swamp forests, and in open ridge forests, on poor, mostly sandy soils. Dispersal probably by birds because of conspicuous, white, rose-pink or red berries (RIDLEY, Disp. 1930, 410).

KEY TO THE SPECIES

1. Inflorescence a panicle, branches well developed with scattered flowers. Leaves 8-40 cm long, margin distinctly denticulate. Mature fruit white. 1. *E. leucocarpa*
1. Inflorescence a very slender, often cernuous raceme, nearly all branches reduced with conferted flowers. Leaves 4-15 cm long, margin faintly denticulate. Mature fruit red. 2. *E. minor*

1. *Euthemis leucocarpa* JACK, Mal. Misc. 1, 5 (1821) 16; WALL. in Roxb. Fl. Ind. 2 (1824) 303; JACK in Hook. Bot. Misc. 2 (1830) 69; PLANCH. in Hook. Ic. Pl. II, 4 (1845) t. 711; MIQ. Fl. Ind. Bat. 1, 2 (1859) 675; Sumatra (1860) 208, 533, *incl. var. latifolia*; SCHEFF. Nat. Tijd. N. I. 32 (1873) 411; BENN. in Hook. f. Fl. Br. Ind. 1 (1875) 526; KING, J. As. Soc. Beng. 62, ii (1893) 234; RIDL. Trans. Linn. Soc. II, Bot. 3 (1893) 285; BARTELL. Malpighia 15 (1901) 167; HALL. f. Beih. Bot. Centralbl. 34, 2 (1917) 30; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 388; RIDL. Fl. Mal. Pen. 1 (1922) 368; DIELS, Bot. Jahrb. 60 (1926) 311; BURK. Dict. 1 (1935) 987; AIRY SHAW, Kew Bull. (1940) 249; MERR. J. Arn. Arb. 33 (1952) 224; VIDAL, Adansonia 1 (1961) 60; KANIS, Blumea 16 (1968) 62; Fl. Thail. 2 (1970) 29. — *E. robusta* HOOK. f. Trans. Linn. Soc. 23 (1862) 163; BARTELL. Malpighia 15 (1901) 168; HALL. f. Beih. Bot. Centralbl. 34, 2 (1917) 32; RIDL. Fl. Mal. Pen. 1 (1922) 368.

Shrub up to 6 m. Branchlets stout, green. Stipules ovate, 4-6 by *c.* 2 mm, acute to acuminate, ciliate. *Leaves* oblong to linear oblong, 8-40 by 2-10 cm, acute at apex, tapering at base, margin distinctly and irregularly denticulate, nerves 1-2 mm apart; petiole 2-5 cm. *Panicles* erect, 8-20 cm; pedicels 4-10 mm, articulate at base; bracts 8-10 by 2-4 mm, lanceolate, acute. *Flowers*

erect, often in pairs. *Sepals* obliquely ovate to elliptic, unequal, 4-7 by 2-3½ mm, ciliate. *Petals* obliquely obovate to spatulate, 4-10 by 2½-5 mm. *Anthers* 3-5 by *c.* 1 mm, yellow. *Ovary* ovoid to bottle-shaped, 2-4 by *c.* 1 mm, style 1½-3 mm. *Fruit* globular, up to 1 cm ø, fleshy, via red turning white. *Seeds* like sectors of a sphere, *c.* 4 by 2 mm.

Distr. SW. Cambodia; in *Malesia*: Sumatra, Riouw & Lingga Is., Banka, Billiton, Malay Peninsula, Anambas Is., Borneo.

Ecol. From sea-level up to 1000 m, on poor soils, preferably in moist, shady places (see also under the genus).

Uses. Medical applications of the roots is reported from Malaya. In Brunei the fruits are used against eye-diseases.

Vern. Sumatra: *bélusung putih*, *kaju padang*, *mata pelanduk*, Banka; *balong*, Billiton; Malaya: *pélawan bérok*; Borneo: *tambu*, Sarawak, *ranggas hutan*, Sabah, *iur iur*, W. Borneo.

2. *Euthemis minor* JACK, Mal. Misc. 1, 5 (1821) 18; WALL. in Roxb. Fl. Ind. 2 (1824) 304; JACK in Hook. Bot. Misc. 2 (1830) 69; MIQ. Fl. Ind. Bat. 1, 2 (1859) 675; Sumatra (1860) 209, 534; SCHEFF. Nat. Tijd. N. I. 32 (1873) 412; BENN. in Hook. f. Fl. Br. Ind. 1 (1875) 526; KING, J. As. Soc. Beng. 62, ii (1893) 235; BARTELL. Malpighia 15

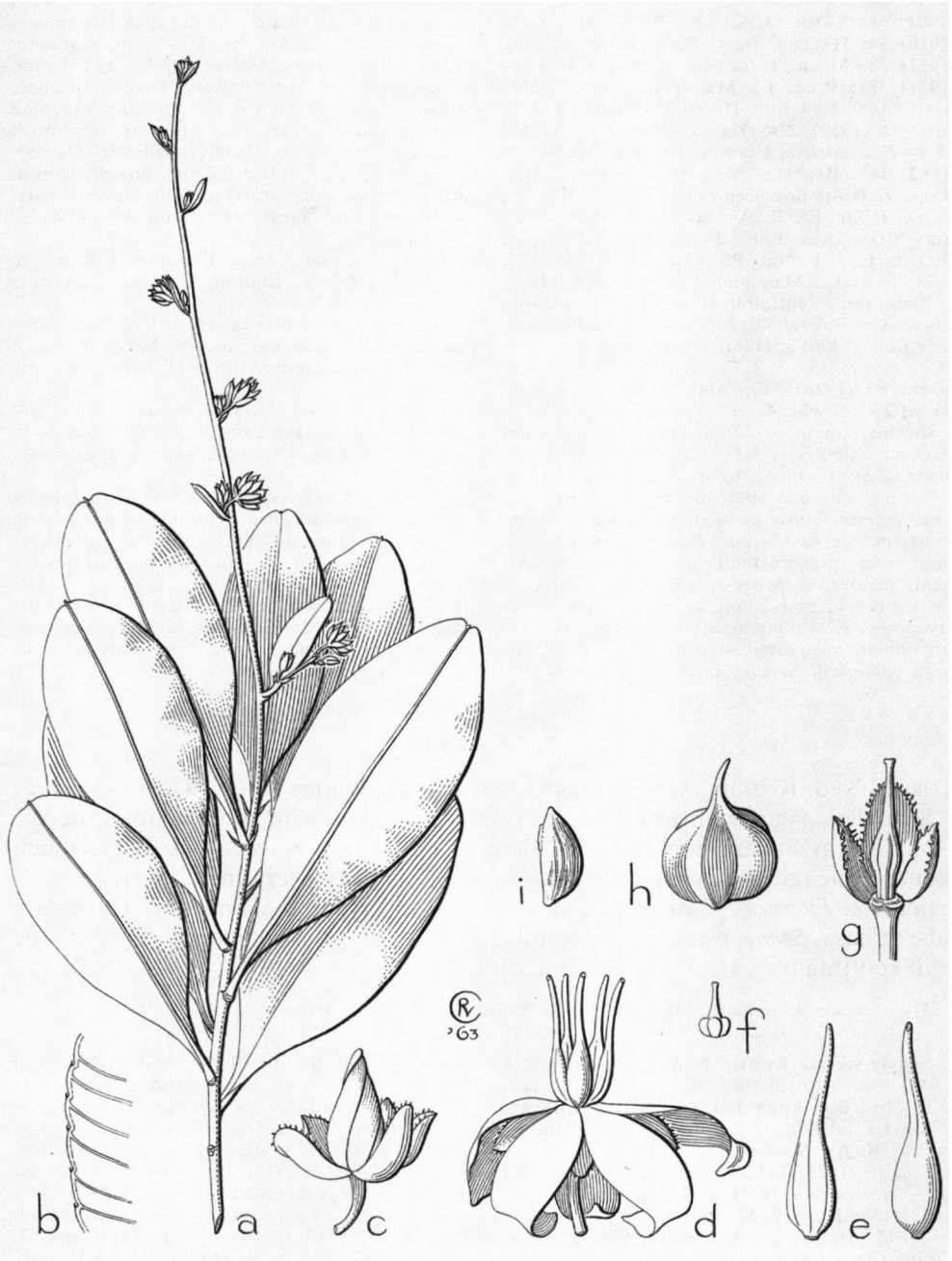


Fig. 4. *Euthemis minor* JACK. *a*. Fertile twig, $\times \frac{2}{3}$, *b*. detail of leaf margin, $\times 4$, *c*. flowerbud, *d*. open ♂ flower, both $\times 4$, *e*. ditto, stamen, ad- and abaxial view, *f*. ditto, reduced pistil, both $\times 6$, *g*. pistil of ♀ or ♀ flower, $\times 4$, *h*. fruit, $\times 2$, *i*. seed, $\times 4$ (*a-c* MEIJER 21807, *d-f* KOSTERMANS & ANTA 1256, *g* Hans WINKLER 1421, *h-i* HALLIER f. 1445).

(1901) 168; RIDL. J. Str. Br. R. As. Soc. n. 54 (1910) 34; HALL. f. Beih. Bot. Centralbl. 34, 2 (1917) 32; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 388; RIDL. Fl. Mal. Pen. 1 (1922) 368; AIRY SHAW, Kew Bull. (1940) 250; MERR. J. Arn. Arb. 33 (1952) 224; KANIS, Blumea 16 (1968) 65. — *E. obtusifolia* HOOK. f. Trans. Linn. Soc. 23 (1862) 163; BARTELL. Malpighia 15 (1901) 169; HALL. f. Beih. Bot. Centralbl. 34, 2 (1917) 33; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 389; AIRY SHAW, Kew Bull. (1940) 250. — *E. engleri* GILG in E. & P. Nat. Pfl. Fam. 3, 6 (1895) 152, f. 78; BARTELL. Malpighia 15 (1901) 169; HALL. f. BEIH. Bot. Centralbl. 34, 2 (1917) 33; AIRY SHAW, Kew Bull. (1940) 250. — *E. ciliata* PEARSON, Kew Bull. (1906) 3; HALL. f. Beih. Bot. Centralbl. 34, 2 (1917) 33. — *E. hackenbergii* DIELS, Bot. Jahrb. 60 (1926) 310; AIRY SHAW, Kew Bull. (1940) 250. — Fig. 4.

Shrublet up to 3(–5?) m. Branchlets slender, blackish. Stipules c. 3 by 1 mm, acuminate, serrulate. Leaves oblong to oblanceolate, 4–15 by 1½–4 cm, obtuse at apex, mucronate, tapering at base, margin faintly denticulate, nerves c. 1 mm apart; petiole to 1½ cm. Racemes lax, 5–30 cm long, often pseudolateral, sometimes drooping, rachis slender, branches ± shortened; bracts on the rachis 5–12 by 1–2 mm, caducous, on branches trigonous, c. 1 mm long, acuminate. Flowers functionally polygamous, complete, often 2 or more conferted. Sepals obovate, unequal, 4–4½

by 2½–3½ mm, ciliate near the apex, acuminate. Petals lanceolate, 6–8 by 2½–3 mm, distinctly reflexed in ♂ flowers. Anthers 3½–4½ by c. 1 mm, yellow. Ovary in ♀ or ♂ flowers obovoid, 5-ribbed, c. 2½ by 1½ mm; style c. 2½ mm long, widening into the ovary; ovary in ♂ flowers very much reduced, depressed-globular, shallowly 5-lobed, c. 0.2 by 0.4 mm; style c. 0.2 mm, broadly conical at base. Fruit globular, up to 6 mm ø, acuminate, 5-ribbed, red. Seeds semi-annular, c. 4 by 2½ mm.

Distr. *Malesia*: Central E. Sumatra, Riouw & Lingga Is., Banka, Billiton, S. Malay Peninsula (?), Borneo.

Ecol. From sea-level up to 1250 m, often found with the previous species, but generally in drier and more exposed places (see also under the genus).

Vern. Sumatra: *bélusung merah*, *kétjing pélanduk*, Banka; Borneo: *buah iték*, Sarawak, *pétikawo*, Sabah, Kedayan, *mata pélandok*, W. Borneo.

Notes. Many specimens are doubtlessly functionally male. I am not certain whether fruiting specimens generally have bisexual or functionally female flowers, but these possibilities are probably both realised.

This species was never recorded from the mainland of the Malay Peninsula. Three older collections are known to me from Singapore I., where it is probably now extinct.

5. NECKIA

KORTH. Ned. Kruidk. Arch. 1 (1848) 358; KANIS, Blumea 16 (1968) 69. — Fig. 5.

Shrublets or undershrubs. Stipules pectinate. Leaves with short petioles, nerves ascending at an angle of 70–80°, slightly curved. Inflorescences axillary, much reduced, the rachis bearing some small bracts, but only 1 terminal flower; pedicels articulate. Flowers 5-merous. *Staminodes* ♂, of 2 types, the inner ones forming a tube at base. *Stamens* adnate to the tube. Ovary 3-carpelled; stigma 1. Style of ripe fruit splitting into 3 parts. Seeds not winged.

Distr. *Malesia*: Sumatra, Malay Peninsula, Borneo, Philippines. Monotypic.

1. *Neckia serrata* KORTH. Ned. Kruidk. Arch. 1 (1848) 358; MIQ. Fl. Ind. Bat. 1, 2 (1859) 118; Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 218; BOERL. & KOORD. Ic. Bog. 1, 4 (1901) 1, t. 76; RIDL. J. Str. Br. R. As. Soc. n. 49 (1908) 13, 14; MERR. *ibid.* n. 86 (1921) 388; KANIS, Blumea 16 (1968) 69. — *N. lancifolia* HOOK. f. Trans. Linn. Soc. 23 (1862) 158; RIDL. J. Str. Br. R. As. Soc. n. 49 (1908) 13; AIRY SHAW, Kew Bull. (1940) 252, *incl. f. major* (RIDL.) AIRY SHAW. — *N. humilis* HOOK. f. Trans. Linn. Soc. 23 (1862) 159; RIDL. J. Str. Br. R. As. Soc. n. 49 (1908) 14. — *N. malayana* RIDL. *l.c.* 11, *incl. var. angustifolia* RIDL.; Fl. Mal. Pen. 1 (1922) 134, f. 13, *incl. f. major* RIDL. *et f. minor* RIDL. — *N. distans* RIDL. J. Str. Br. R. As. Soc. n. 49 (1908) 12; MERR. *ibid.* n. 86 (1921) 388; AIRY SHAW, Kew Bull. (1940) 250. — *N.*

klossii RIDL. J. Str. Br. R. As. Soc. n. 49 (1908) 13; AIRY SHAW, Kew Bull. (1940) 251, *incl. var. borneensis* AIRY SHAW. — *N. parviflora* RIDL. J. Str. Br. R. As. Soc. n. 49 (1908) 14; MERR. *ibid.* n. 86 (1921) 388. — *N. ovalifolia* CAPIT. Bull. Soc. Bot. Fr. 57 (1910) 397, t. 13; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 388; AIRY SHAW, Kew Bull. (1940) 252. — *Sauvagesia jaheriana* CAPIT. Bull. Soc. Bot. Fr. 57 (1910) 397, t. 13; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 388. — *N. grandifolia* RIDL. Kew Bull. (1925) 77. — *N. obovata* AIRY SHAW, Kew Bull. (1940) 251. — *N. philippinensis* MERR. & QUIS. Philip. J. Sc. 82 (1954) 329, t. 2. — Fig. 5.

Shrublet up to 1 m, often much smaller, often unbranched. Stipules compound, 1–3 mm wide, the segments unequal, acicular, ½–1 cm long,

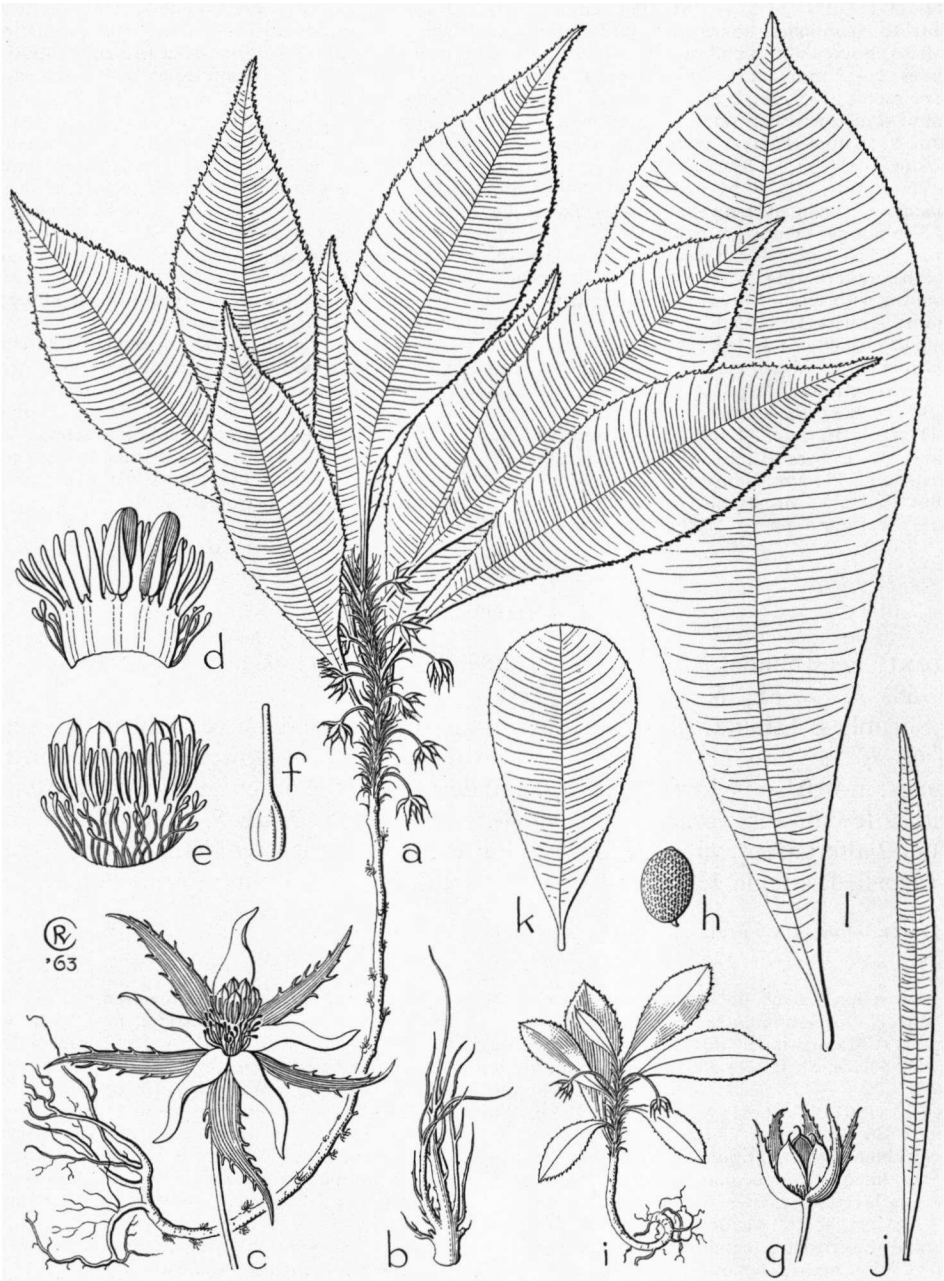


Fig. 5. *Neckia serrata* KORTH. a. Habit, $\times \frac{2}{3}$, b. stipule, $\times 4$, c. flower, $\times 4$, d. androecium, inner view of opened tube, 3 anthers removed, e. ditto, outer view, complete, both $\times 8$, f. pistil, $\times 6$, g. fruit, $\times 2$, h. seed, $\times 20$, i. habit of a dwarfed form, $\times \frac{2}{3}$, j. leaf of a narrow type, $\times \frac{2}{3}$, k. leaf of a rounded type, $\times \frac{2}{3}$, l. leaf of a large type, $\times \frac{2}{3}$ (a-f MEIJER 6854, g-h BROOKE 9613, i KOSTERMANS 9087, j BROOKE 10610, k BROOKE 10006, l POSTHUMUS 600).

lacerate. *Leaves* obovate to long obovate-lanceolate, 3-15(-25) by $\frac{3}{4}$ -2 $\frac{1}{2}$ (-7 $\frac{1}{2}$) cm, mostly acute to acuminate, sometimes obtuse, tapering at base, biserrulate, membranous to chartaceous, nerves 1 $\frac{1}{2}$ -3 mm apart. *Inflorescences* with filiform rachis, 1-5 cm; bracts up to 10, linear, c. 2 mm; sometimes with small stipules; pedicels filiform 8-15 mm. *Flowers* pendulous. *Sepals* lanceolate, 4-7 $\frac{1}{2}$ by 1-3 mm, acute, margins dentate. *Petals* elliptic, 2 $\frac{1}{2}$ -5 by 1 $\frac{1}{4}$ -2 mm. Outer *staminodes* ∞ , unequal, long spatulate or gland-like, $\frac{1}{4}$ -1 mm long; inner staminodes 15-25, 1-1 $\frac{3}{4}$ mm long, \pm half connate, the free lobes spatulate, the 5 lobes alternating with the stamens longer. *Stamens* with terete filaments, the free part up to 1 mm; anthers lanceolate, 1-1 $\frac{1}{2}$ by c. $\frac{1}{2}$ mm, yellow. *Ovary* ovoid, 1-1.2 by 0.5-0.6 mm, style c. 1 mm long; stigma clavate. *Fruit* subtrigonal in cross-section, c. 5 by 2 $\frac{1}{2}$ mm. *Seeds* ellipsoid, c. 0.5 by 0.3 mm, areolate.

Distr. *Malesia*: Sumatra, Mentawai Is., Riouw & Lingga Is., SE. Malay Peninsula (S. Trengganu, Pahang, Johore), Borneo, and Philippines (Samar). Monotypic.

Ecol. Found up to 1200 m, in moist, shady

places in kerangas forests as well as in richer rain-forests, especially on boulders, cliffs and wet slopes, along brooklets and small rivers, sometimes near waterfalls or subject to occasional inundation. Soils are reported as sandstone, acid sand, sandy loam, loam, or tuff.

Notes. The variability in shape and size of this species must primarily be due to variation in ecological conditions. The plants need moist, shady places and will be capable to germinate and to produce a few flowers even while growing in a moss carpet over boulders. The smaller specimens are dwarfed by lack of nutrition. Shade, water-supply, occasional inundation, or other ecological circumstances may also exert influence upon the habit of the plants.

There will probably be genetic differences between local populations, but it seems impracticable to distinguish infra-specific taxa, since no useful differences are found in the geographical distribution of morphological characters. The greatest variability is found among Bornean specimens, whereas the plants with the largest leaves are found in Sumatra.

6. INDOVETHIA

BOERL. Feestbundel P. J. Veth (1894) 89; Ic. Bog. 1 (1897) 9; KANIS, Blumea 16 (1968) 72. — Fig. 6.

Shrublets. Stipules pectinate. *Leaves* subsessile, nerves ascending at an angle of 60-70°, slightly curved. *Inflorescences* terminal, many-flowered, compound racemes; mostly some lower branches well developed, the other ones much shortened with a few flowers; bracts small. *Flowers* \varnothing . *Sepals* 5. *Petals* 5, white. *Staminodes* 10 in 2 alternating whorls, mutually and with the stamens connate at base. *Ovary* 3-carpelled; stigma 1. Style of ripe fruits splitting into 3 parts. *Seeds* not winged.

Distr. *Malesia*: Central E. Sumatra and NW. Borneo. Monotypic.

1. *Indovethia calophylla* BOERL. Feestbundel P. J. Veth (1894) 90, plate; Ic. Bog. 1 (1897) 10, t. 1; BARTELL. Malpighia 15 (1901) 173; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 388; KANIS, Blumea 16 (1968) 72. — *I. beccariana* BARTELL. Malpighia 15 (1901) 172, t. 11; MERR. J. Str. Br. R. As. Soc. n. 86 (1921) 388. — Fig. 6.

Shrublet c. 1 m. Stipules compound, the segments unequal, lanceolate, 5-10 by 2-4 mm, margin lacerate. *Leaves* oblanceolate, 10-35 by 2 $\frac{1}{2}$ -8 $\frac{1}{2}$ cm, acute to acuminate at apex, tapering at base, biserrulate, membranous, stouter nerves 3-7 $\frac{1}{2}$ mm apart. *Inflorescences* 5-20 cm long; rachis c. 2 mm \varnothing ; pedicels filiform, mostly short, up to 12 mm when fruiting; bracts with small stipules, lanceolate, the lower ones up to 8 by 2 mm, the higher ones smaller, shortly pubescent underneath. *Flowers* erect. *Sepals* suborbicular to obovate, 3 $\frac{1}{2}$ -5 by 3-3 $\frac{1}{2}$ mm, margins denticulate. *Petals* obovate, 3-4 by 2-3 mm. *Staminodes*

spatulate, those opposite to the stamens 1 $\frac{3}{4}$ -2 $\frac{1}{2}$ by c. $\frac{3}{4}$ mm, with 3 \pm distinct, parallel nerves, the alternating ones 1 $\frac{1}{2}$ -2 by c. $\frac{1}{2}$ mm, with 1 distinct nerve. *Stamens* with flattened filaments 0.2-0.4 mm long; anthers 1 $\frac{1}{4}$ -1 $\frac{3}{4}$ by 0.5-0.8 mm, the anther-cells basally separated by the cuneate connective provided with a c. $\frac{1}{2}$ mm long mucro. *Ovary* subglobose, c. 1 mm \varnothing ; style c. 1 mm long; stigma minute, trigonous. *Fruit* subglobose, up to 12 mm \varnothing , papillate. *Seeds* c. 0.8 by 0.2 mm, areolate.

Distr. *Malesia*: Central E. Sumatra (Riouw Prov.), NW. Borneo (Sarawak, 1st Div.; W. Borneo, NE. of Pontianak).

Ecol. A rare, local lowland species, reported from moist, shady places, in primary or secondary (Dipterocarp) forests, on richer (loamy) soils. Occasionally reported from the edge of a lake and above a torrent in the forest. Also once collected under rubber.



Fig. 6. *Indovethia calophylla* BOERL. a. Fertile twig, $\times \frac{1}{3}$, b. sepal from bud, c. ditto, petal, both $\times 6$, d. ditto, part of androecium, inner view, e. ditto, outer view, both $\times 20$, f. inner staminode from flower, g. ditto, outer staminode, h. ditto, stamen, i. ditto, pistil, all $\times 6$, j. fruit, $\times 2$, k. seed, $\times 10$ (a after Ic. Bcg. 1, t. 1, b-g BUWALDA 6256, h-j TEYSMANN HB 10893, k BROOKE 9455).

7. SCHUURMANSIELLA

HALL. f. Rec. Trav. Bot. Néerl. 10 (1913) 344; KANIS, Blumea 16 (1968) 73. — Fig. 7.

Shrubs with slender branchlets. Stipules acicular. Leaves short-petioled, nerves ascending at an angle of c. 80° . Inflorescences terminal, many-flowered, compound racemes; branches much shortened, with flowers of successive age; bracts small, those of one branch conferted. Flowers ♀. Sepals 5. Petals 5, white or pinkish, purplish at base, in anthesis soon surpassing the sepals in size. Staminodes ♂, of 2 types, the inner ones mutually and with the stamens connate at base. Ovary 3-carpelled; stigma 1. Style of ripe fruits also splitting into 3 parts. Seeds not winged.

Distr. *Malesia*: NW. Borneo. Monotypic.



Fig. 7. *Schuurmansiella angustifolia* (HOOK. f.) HALL. f. *a.* Fertile twig, $\times \frac{2}{3}$, *b.* flowerbud, $\times 4$, *c.* flower, petals shed, $\times 4$, *d.* part of androecium, inner view, $\times 6$, *e.* pistil, $\times 8$, *f.* fruit, *g.* open fruit, both $\times 2$, *h.* seed, $\times 6$ (*a-f* ABANG MUAS 5139, *g* ANDERSON 8368, *h* BUJANG 12990).

1. *Schuurmansiella angustifolia* (HOOK. f.) HALL. f. *Rec. Trav. Bot. Néerl.* 10 (1913) 345, t. 7; MERR. *J. Str. Br. R. As. Soc.* n. 86 (1921) 387; KANIS, *Blumea* 16 (1968) 73. — *Schuurmansia angustifolia* HOOK. f. *Trans. Linn. Soc.* 23 (1862) 157. — Fig. 7.

Shrub up to 7 m high. Stipules up to 12 by c. $\frac{1}{2}$

mm. *Leaves* linear-oblong, 8–17 by $\frac{3}{4}$ – $1\frac{1}{2}$ cm, long acuminate at apex, \pm tapering at base, chartaceous, margin serrulate, nerves $\frac{1}{2}$ –1 mm apart. *Inflorescences* c. 15 cm long; rachis c. 1 mm \varnothing ; branches with up to 5 flowers; pedicels filiform, up to 12 mm in fruit; bracts acicular, 2–3 mm under the branches, smaller at base of pedicels. *Flowers*

erect. *Sepals* ± linguiform, 1-1¼ by ¾-1 mm. *Petals* ovate, 3½-4½ by 1¾-2¼ mm, distinctly reflexed. Outer *staminodes* ∞, small; inner ones 25-30, linear, 2-3 mm, purplish. *Stamens* with flattened filaments ½-1 mm long, purplish; anthers lanceolate, 1½'-2½' by 0.3-0.6 mm. *Ovary* ovoid, c. 1.2 by 0.7 mm; style c. 0.3 mm, purplish; stigma capitate. *Fruit* ellipsoid, sub-

trigonus in cross-section, c. 8½ by 3 mm. *Seeds* 0.5-1 by 0.2-0.5 mm, tomentose.

Distr. *Malesia*: NW. Borneo (Sarawak, 1st and 4th Div.).

Ecol. A lowland species, reported from up to 600 m, in moist places, especially in kerangas forests on poor soils, and on sandstone cliffs, even near the sea.

8. SCHUURMANSIA

BLUME, Mus. Bot. Lugd. Bat. 1 (1850) 177, t. 32; KANIS, Nova Guinea, Bot. 6 (1961) 63; Blumea 16 (1968) 74. — Fig. 8-10.

Trees or treelets with stout, often hollow branches. Stipules entire. *Leaves* conferted at intervals (fig. 10), glandular along the margins, nerves almost straightly ascending at an angle of 60-70°. *Inflorescences* terminal, many-flowered, panicles often with many hypsophylls at base; peduncle and branches distinctly ribbed, often with con- or recaulescences. *Flowers* ♂ or polygamous. *Sepals* 5. *Petals* 5, white, creamy or purplish. *Staminodes* ∞, in 1 or 2 whorls, the inner ones mutually and with the stamens connate at base. *Ovary* 3-carpelled; stigmas 1 or 3. *Fruit* opening with 3 longitudinal slits, the style usually not splitting. *Seeds* winged like a propeller with 2 blades.

Distr. Solomons and Bismarcks; in *Malesia*: Borneo, Philippines, Celebes, Moluccas, and New Guinea.

Ecol. Pioneer plants, from sea-level up to 3000 m, especially in natural or anthropogenous secondary vegetation.

KEY TO THE SPECIES

- 1. Style as long as the ovary or longer; stigma capitate or punctiform. 1. *S. elegans*
- 1. Style half as long as the ovary or shorter; stigma 3-lobed.
- 2. Filaments ± twice the length of the anthers. 2. *S. vidalii*
- 2. Filaments as long as the anthers or shorter. 3. *S. henningsii*

1. *Schuurmansia elegans* BLUME, Mus. Bot. Lugd. Bat. 1 (1850) 178, t. 32; MIQ. Fl. Ind. Bat. 1, 2 (1859) 118; Illustr. 1 (1871) 66, t. 29; CAPIT. Bull. Soc. Bot. Fr. 57 (1910) 397; HALL. f. Rec. Trav. Bot. Néerl. 10 (1913) 346; MERR. Philip. J. Sc. 11 (1916) Bot. 19; En. Philip. 3 (1923) 68; HEINE in Fedde, Rep. 54 (1951) 240; Pfl. Samml. Clemens Kinab. (1953) 63; KANIS, Nova Guinea, Bot. 6 (1961) 64, f. 1a; Blumea 16 (1968) 75. — *S. parviflora* RIDL. Trans. Linn. Soc. II, Bot. 9 (1916) 18. — *S. borneensis* RIDL. Kew Bull. (1930) 77.

Treelet or tree, up to 15(-30?) m, sometimes with low stiltroots. Stipules linguiform, 1½-4 by 1½-2½ mm, sometimes shortly ciliate. *Leaves* obovate-oblong to lanceolate, 10-30 by 2½-10 cm, rounded or somewhat acuminate at apex, ± tapering at base, margins ± involute, chartaceous, nerves 1-1½ mm apart; surface of dried leaves very finely reticulate by protruding intercellular walls of epidermal cells, giving an impression of striation parallel to the nerves; petiole 1½-6 cm. *Inflorescences* 10-25 cm; peduncle 2-5 mm ø; pedicels filiform, 3-6 mm; bracts broadly linguiform, up to 2 mm long, sometimes shortly

ciliate. *Flowers* bisexual, erect. *Sepals* elliptic to obovate, 3-6 by 1½-4 mm. *Petals* obovate, 4-8 by 2-5 mm. Outer *staminodes* 0-∞, linear, 1-1½ mm long; inner ones 15-25, linear to spatulate, 2½-5 mm long, with 1 distinct nerve. *Filaments* 1-2 mm; anthers 1¼-2 by c. ½ mm, connective distinctly protruding. *Ovary* subovoid, 1½-3 by 1¼-2 mm, papillate, sometimes with a few glandular-capitate hairs; style 1½-3 mm, growing in fruit, widening into the ovary; stigma small, capitate or punctiform. *Fruit* fusiform, up to 2½ by ½ cm, acuminate. *Seeds* c. ¾ by ¼ mm, with c. 3 mm long, slender wings.

Distr. *Malesia*: Borneo, Philippines (Mindanao, only 1 collection of uncertain identity reported from Agusan), Celebes, Moluccas, and New Guinea.

Ecol. From sea-level up to 2000 m, in primary and secondary forests, on level land to steep slopes, sometimes near river-banks or in swampy localities; on clay or more sandy or rocky soils. Probably not uncommon locally, but rarely flowering.

Vern. Philip., Mindanao: *tanang*, Manobo;

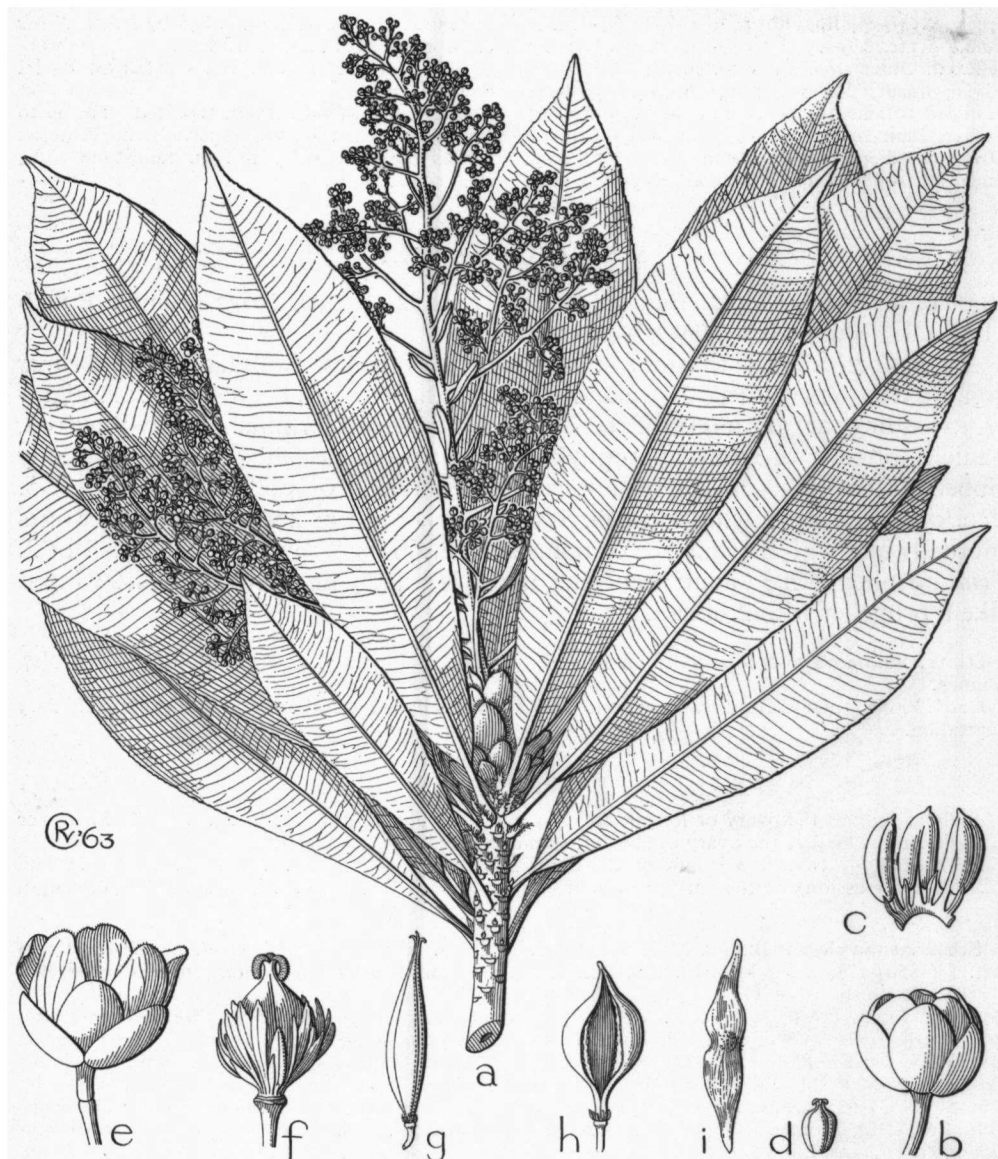


Fig. 8. *Schuurmansia henningsii* K. SCH. a. Fertile branch, $\times \frac{1}{2}$, b. ♂ flower, $\times 5$, c. ditto, part of androecium, inner view, d. ditto, reduced pistil, both $\times 8$, e. ♀ flower, $\times 5$, f. ditto, sepals and petals removed, $\times 8$, g. fruit, h. open fruit, both $\times 1\frac{1}{2}$, i. seed, $\times 5$ (a-d HOOGLAND & PULLEN 5356, e-f BRASS 29335, g HOOGLAND 3507, h-i BW 4987).

Celebes: *labo labo*, Toradja; Ambon: *wat lopu*; New Guinea, Vogelkop Pen.: *hikselah*, Tehid.

2. *Schuurmansia vidalii* (F.-VILL.) MERR. Philip. J. Sc. 11 (1916) Bot. 19; En. Philip. 3 (1923) 69; KANIS, Nova Guinea, Bot. 6 (1961) 69, f. 1c; Blumea 16 (1968) 76. — *Calophyllum vidalii* F.-VILL. in Ceron, Cat. Pl. Herb. Manila (1892)

229, plate. — *S. parvifolia* MERR. Philip. J. Sc. 11 (1916) Bot. 19.

Treelet up to 7 m. Stipules 1–2½ by 1–2 mm, shortly ciliate. Leaves obovate-lanceolate, 5–11 by 1½–4 cm, obtuse to obtusely acuminate at apex, tapering at base, margins somewhat involute, strongest nerves c. 1 mm apart, papyraceous to chartaceous; petiole ½–2 cm. Inflorescences 7–15



Fig. 9. *Schuurmansia henningsii* K. SCH. After anthesis, Cycloop Mts (Photogr. SLEUMER, July 1961).

cm; peduncle $1\frac{1}{2}$ – $3\frac{1}{2}$ mm \varnothing ; pedicels 1–2 mm; bracts very small, semi-annular to triangular. *Flowers* erect. *Sepals* obovate, 2– $2\frac{3}{4}$ by $1\frac{1}{2}$ –2 mm. *Petals* obovate, c. $3\frac{1}{2}$ by $2\frac{1}{2}$ mm, white or pink. *Outer staminodes* 10– ∞ , filiform, $\frac{3}{4}$ –1 mm long; *inner staminodes* c. 25, linear, $1\frac{1}{2}$ –2 mm, c. $\frac{1}{2}$ mm connate at base. *Filaments* c. $1\frac{3}{4}$ mm; *anthers* $\frac{3}{4}$ –1 by 0.4–0.5 mm. *Ovary* subglobular, \pm 3-lobed, 0.4–0.5 mm \varnothing , glabrous; *stigma* 3-lobed, subsessile. *Fruit* fusiform, c. 10 by 3 mm, acuminate. *Seeds* c. 0.6 by 0.4 mm, with c. 2 mm long, basally connate wings.

Distr. Malesia: Philippines (Luzon: Aurora, Camarines Sur & Sorsogon Prov., 3 collections). *Ecol.* In (mossy) forest, from 500 to well over 1000 m, possibly also at sea-level.

3. *Schuurmansia henningsii* K. SCH. Bot. Jahrb. 9 (1888) 210; K. SCH. & HOLLR. Fl. Kais. Wilh. Land (1889) 50; WARB. Bot. Jahrb. 13 (1891) 283; E. & P. Nat. Pfl. Fam. 3, 6 (1895) f. 75; K. SCH. & LAUT. Fl. Schutzgeb. (1901) 448; PULLE, Nova Guinea 8 (1912) 667; HALL. f. Rec. Trav. Bot. Néerl. 10 (1913) 346; E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) f. 41; LANE POOLE, For. Res. (1925) 116; WHITE & FRANCIS, Proc. R. Soc. Queensl. 38 (1927) 247; WHITE, J. Arn. Arb. 10 (1929) 241; KANIS, Nova Guinea, Bot. 6 (1961) 65, f. 1b; Blumea 16 (1968) 76. — *S. bamleri* K. SCH. & LAUT. Fl. Schutzgeb. (1901) 448; Nachtr. (1905) 318, incl. var. *longifolia* LAUT.; HALL. f. Rec. Trav. Bot. Néerl. 10 (1913) 350. — *S. gilgiana* LAUT. in K. Sch. & Laut. Fl. Schutzgeb. Nachtr.

(1905) 319; HALL. *f. Rec. Trav. Bot. Néerl.* 10 (1913) 348. — *S. microcarpa* CAPIT. Bull. Soc. Bot. Fr. 57 (1910) 398, t. 11, 12, 17; BAKER, J. Bot. 61 (1923) Suppl. 4. — *S. theophrasta* HALL. *f. Rec. Trav. Bot. Néerl.* 10 (1913) 346; HOLTH. & LAM, *Blumea* 5 (1942) 213. — *S. pseudopalma* HALL. *f. Rec. Trav. Bot. Néerl.* 10 (1913) 347. — *S. rauwolfioides* HALL. *f. l.c.* 349; K. SCH. Bot. Jahrb. 9 (1888) 211, *sine nomen*. — *S. longifolia* (LAUT.) GILG in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 80; A. C. SMITH, J. Arn. Arb. 22 (1941) 524. — ? *S. lophiroides* GILG, *l.c.* 80. — ? *S. oreophila* GILG, *l.c.* 80. — ? *S. schlechteri* GILG, *l.c.* 80. — ? *S. crassinervia* GILG, *l.c.* 80. — *S. coriacea* A. C. SMITH, J. Arn. Arb. 22 (1941) 525. — *S. montana* A. C. SMITH, *l.c.* 526. — *S. grandiflora* A. C. SMITH, *l.c.* 527. — Fig. 8-10.

Treelet or tree, up to 15(-20?) m, sometimes with stiltroots up to 1 m high. Stipules $\frac{1}{2}$ -5 by $\frac{1}{2}$ -3 mm, often up to 3 mm long, ciliate. Leaves obovate-lanceolate, 6-85 by $1\frac{1}{2}$ -15 cm, obtuse to acuminate at apex, tapering at base, margins somewhat involute, nerves 2-7 mm apart, chartaceous or subcoriaceous; petiole up to 4 cm. Inflorescences 7-65 cm; peduncle $1\frac{1}{2}$ -8 mm σ ; pedicels filiform, 2-5 mm; bracts usually very small, \pm triangular, sometimes larger and transitional to leaves. Flowers σ or functionally unisexual, erect. Sepals obovate to elliptic, 3-5 by $1\frac{1}{2}$ -3 mm, greenish, sometimes purplish. Petals obovate-oblong, 4-7 $\frac{1}{2}$ by $1\frac{1}{2}$ -4 mm, white, creamy, pink or purplish red. Outer staminodes 0- ∞ , filiform, c. 1 mm long; inner ones 5-30, filiform to linear, $1\frac{1}{2}$ -2 mm long. Stamens in σ flowers with $\frac{3}{4}$ -2 $\frac{1}{2}$ mm long filaments; anthers $1\frac{1}{2}$ -2 $\frac{1}{2}$ by $\frac{1}{2}$ - $\frac{3}{4}$ mm; in σ flowers with $\frac{1}{4}$ - $\frac{1}{2}$ mm long filaments; anthers c. 1 by $\frac{1}{3}$ mm. Ovary subglobular to ovoid, \pm 3-lobed, glabrous, in σ flowers $\frac{1}{2}$ -1 by $\frac{1}{3}$ - $\frac{3}{4}$ mm, in σ flowers c. 3 by 2 mm; style cylindric, up to 1 mm; stigma 3-lobed. Fruit fusiform, up to $1\frac{1}{2}$ by $\frac{3}{4}$ cm, acuminate. Seeds c. 1 by $\frac{1}{3}$ mm with c. 2 $\frac{1}{2}$ mm long, slender wings.

Distr. Solomons and Bismarcks; in *Malesia*: Moluccas (Talaud Is., Halmahera, Ceram), New Guinea.

Ecol. From sea-level up to 3000 m, in primary and secondary forests, on landslides and in secondary grasslands, on level land to steep slopes, sometimes near river-banks or in swampy localities, on clay or more sandy or rocky soils; scattered or locally common in open habitats.

Vern. Moluccas, Talaud Is.: *arisusu uruné*; Tidore: *malétopé*; Ambon: *ut lapu, was lapu*; W. New Guinea, Ajamaru: *batsjevak*, Maibrat; Biak I.: *rambuan*; NE. New Guinea, Wabag: *opaga, orpach*; Hagen: *pappai, popai, porkai, pupai*; Minj: *bubar, bubus*; Chimbu: *akèssa, a'ulareh, hahèssa, mènmen*; Aiyura: *arebi*; Budemu: *sipulund*; Huon Pen., Sambui: *pelip*; Sattelberg: (*m*)*beli*; Andarora: *haiwinge*, Nauti, *yatsiga*,

Manki; SE. New Guinea, Tari: *obbo*; Kutubu: *karadéwa*; Mendi: *op*; Kairuku: *engefukenge*; Buna: *kembusa*; Bausa: *wèrawèra*.

* Notes. The striking variation in vegetative characters is for the greater part due to differences in ecological conditions. The greatest influence is exercised by the altitude. Papuan material, arranged according to increasing altitude, shows a very regular decrease in leaf size, especially between 1000 and 3000 m. At the same time the leaves become more coriaceous and more distinctly petioled. Exposition and age of the plants play a less important role in the determination of the leaf size.

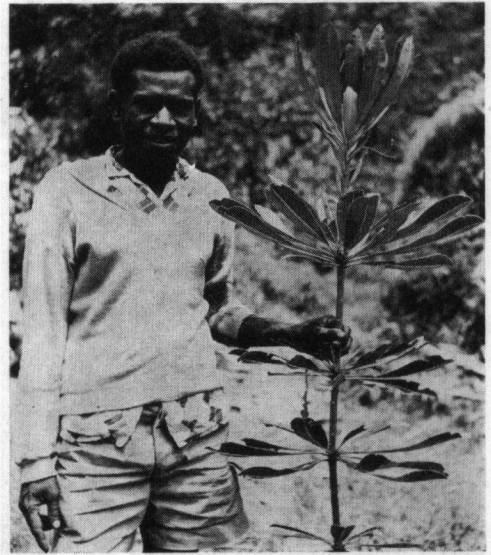


Fig. 10. *Schuurmansia henningsii* K. SCH. Small-leaved, young plant, Edie Creek, Morobe Distr., c. 2000 m, MICHAEL holding the twig (NGF 13949) (Photogr. SLEUMER, 1961).

The dimensions and colours of flower parts are also rather variable, but less easy to correlate with other data. These variations probably indicate genetical differences between local populations. More detailed local studies will be necessary to decide whether any infraspecific taxa can be distinguished.

A majority of the specimens has relatively large anthers and small pistils, whereas a minority has relatively small anthers and large pistils. It was observed once, that most specimens in a profusely flowering stand had proportionally large anthers and did not set fruit. It is not certain, however, that the flowers are always functionally unisexual. Polygamy is likely to occur, as the reduction of either stamens or ovary is never complete.

Excluded

Sauvagesia erecta LINNÉ, Sp. Pl. 1 (1753) 203; MIQ. Fl. Ind. Bat. 1, 2 (1857) 118; KOORD. Exk. Fl. Java 2 (1912) 607; BACKER & BAKH. *f. Fl. Java* 1 (1963) 327; KANIS, *Blumea* 16 (1968) 80.

Erroneously recorded for Java by MIQUEL without reference to material or other source of information. His error might be caused by a collection of *Sauvagesia erecta* L. in G, which is labelled: 'Perrottet, Java, 1819'. Although Perrottet visited the eastern part of Java in that particular year, it is clear that the specimen concerned was mislabelled and in fact was collected in Cayenne on the same voyage.

Tetramerista MIQ. Fl. Ind. Bat. Suppl. (1860) 534 belongs to the *Theaceae*, *vide* GILG, Ber. Deut. Bot. Ges. 11 (1893) 22, *et auct. div.*