

A TAXONOMIC REVISION OF MALLOTUS SECTIONS HANCEA AND STYLANTHUS (EUPHORBIACEAE)

J.W.F. SLIK & P.C. VAN WELZEN

Nationaal Herbarium Nederland, Universiteit Leiden branch,
P.O. Box 9514, 2300 RA Leiden, The Netherlands

SUMMARY

Mallotus sections *Hancea* and *Stylanthus* from Malesia are revised. Descriptions, distribution ranges, habit drawings and keys to all the species in these two sections are provided. The diagnostic characters for the sections are discussed briefly in the section headings. *Mallotus* section *Hancea* is defined more precisely than before, resulting in the exclusion of 4 species from this section (*M. brachythyrus*, *M. havilandii*, *M. insularum* (new rank) and *M. miquelianus*). *Mallotus beccarii* is synonymised with *M. brachythyrus*, and *M. tenuipes* with *M. penangensis*. This section contains 12 species. In *Mallotus* section *Stylanthus*, *M. oblongifolius* is synonymised with *M. peltatus*. This section contains 6 species.

Key words: *Mallotus*, section *Hancea*, section *Stylanthus*, Malesia, taxonomy.

INTRODUCTION

The genus *Mallotus* was first described by De Loureiro (1790). He included only one species: *Mallotus cochinchinensis* (= *Mallotus paniculatus* (Lam.) Müll.Arg.). However, after a revision by Müller Argoviensis (1865), the number of included species increased dramatically. He decided to subdivide the genus into three sections: *Melanolepis* (Rchb.f. & Zoll.) Müll.Arg., *Cordemoya* (Baill.) Müll.Arg. and *Eumallotus* Müll.Arg. One year later he added two more sections: *Blumeodendron* Müll.Arg. and *Rottleropsis* Müll.Arg., thus bringing the total number of sections to five (Müller Argoviensis, 1866). Pax & Hoffmann (1914) proposed a completely new subdivision of the genus into 10 sections, whereby *Cordemoya*, *Blumeodendron* and *Melanolepis* were regarded as separate genera and excluded from *Mallotus*. Their main divisions were based on differences in vegetative characters like leaf position and venation, supplemented by generative characters. They recognised the following sections: *Echinocroton* (F. Muell.) Pax & K. Hoffm., *Plagianthera* (Rchb.f. & Zoll.) Pax & K. Hoffm., *Echinus* (Lour.) Pax & K. Hoffm., *Stylanthus* (Rchb.f. & Zoll.) Pax & K. Hoffm., *Diplochlamys* (Müll. Arg.) Pax, *Philippinenses* Pax & K. Hoffm., *Pleiogyni* Pax & K. Hoffm., *Axenfeldia* (Baill.) Pax & K. Hoffm., *Polyadenii* Pax & K. Hoffm., and *Hancea* (Seem.) Pax & K. Hoffm. Finally, Airy Shaw revised parts of the genus in various publications, of which his 1968 paper deals with the problem of section delimitation. Due to changed ideas about the relationships between some of the species and changed nomenclatural rules for names of sections, his sections partly differ from the sections proposed by Pax & Hoffmann (1914). Airy Shaw (1968) recognised eight sections: *Rottleropsis*

(fusion of *Echinocroton* and *Plagianthera*), *Mallotus* (formerly *Echinus*), *Stylanthus*, *Oliganthea* Airy Shaw (a new section proposed by Airy Shaw), *Rottlera* (Willd.) Rchb.f. & Zoll., corr. Airy Shaw (formerly *Philippinenses*), *Axenfeldia*, *Polyadenii* (including the former genus *Coccoceras*), and *Hancea* (which includes the former section *Diplochlamys*).

Mallotus nowadays includes c. 140 species distributed over tropical Africa, Madagascar, E Asia, Malesia, Melanesia, and Australia. A preliminary checklist, based on a survey of local floras, lists 76 valid species for Malesia (Van Welzen, 1997). In this paper we revise the sections *Hancea* and *Stylanthus* as circumscribed by Airy Shaw (1963, 1966, 1968, 1969, 1971, 1972a, b, 1975, 1976, 1980a, b, c, 1981, 1983) and Slik (1998). These sections only reflect similarity in general appearance, and are mainly based on a few selected characters. It is uncertain if these sections are monophyletic or not. In a later publication we will make a first effort to reconstruct the phylogeny of a part of the genus (Slik & Welzen, in prep.).

TAXONOMIC SECTION

Section *Hancea*

Hancea was described as a new genus by Seemann (1857), who named it after his friend Dr. H.F. Hance. Müller Argoviensis (1865) placed *Hancea* within the genus *Mallotus* and the type species (*M. hookerianus* (Seem.) Müll.Arg.) in his section *Eumallotus*. Later, Pax & Hoffmann (1914) made it a section within the genus *Mallotus*. Airy Shaw (1963, 1966, 1968, 1969, 1971, 1972a, b, 1975, 1976, 1980a, b, c, 1981, 1983) included the following species in the section *Hancea*: *M. beccarii* Airy Shaw, *M. brachythyrus* Merr., *M. echinatus* Elmer, *M. eucaustus* Airy Shaw, *M. griffithianus* (Müll. Arg.) Hook.f., *M. havilandii* Airy Shaw, *M. hookerianus* (Seem.) Müll. Arg., *M. kingii* Hook.f., *M. miquelianus* (Scheff.) Boerl., *M. papuanus* (J.J. Sm.) Pax & K. Hoffm., *M. penangensis* Müll. Arg., *M. stipularis* Airy Shaw, and *M. tenuipes* Airy Shaw. Three more species were added afterwards (Slik, 1998): *M. cordatifolius* Slik, *M. grandistipularis* Slik, and *M. wenzelianus* Slik.

The section is characterised by interpetiolar stipules and strongly unequal opposite leaves, of which the smallest is stipuliform. The non-reduced leaves never have basal macular glands on the upper surface. The indument is always simple (except sometimes on the inner carpel wall).

Mallotus sect. *Hancea* (Seem.) Pax & K. Hoffm.

Mallotus sect. *Hancea* (Seem.) Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 199; Airy Shaw, Kew Bull. 20 (1966) 39; 21 (1968) 388; 23 (1969) 80; 26 (1972) 293; 27 (1972) 86; Kew Bull. Add. Ser. 4 (1975) 160; 8 (1980) 164; Kew Bull. 36 (1981) 324. — *Hancea* Seem., Bot. Voy. Herald (1857) 409. — Type species: *Hancea hookeriana* Seem. (= *Mallotus hookerianus* (Seem.) Müll.Arg.).

Diplochlamys Müll. Arg., Flora 47 (1864) 539. — *Mallotus* sect. *Diplochlamys* (Müll. Arg.) Pax in Engl. & Prantl, Nat. Pflanzenfam. 3, 5 (1890) 55; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 177; Airy Shaw, Kew Bull. 21 (1968) 389. — Type species: *Diplochlamys griffithianus* Müll. Arg. (= *Mallotus griffithianus* (Müll. Arg.) Hook.f.).

Shrubs to usually small trees, dioecious. *Indumentum* mainly consisting of simple hairs, most parts usually covered with glands producing a reddish to yellowish exudate (usually clavate shaped when dried). *Stems* often with conspicuous hoop marks. *Branches* with conspicuously swollen nodes. *Stipules* interpetiolar. *Leaves* simple, opposite, sometimes in one plane, strongly unequal, one of each pair stipuliform; petioles of non-reduced leaves usually basally and apically pulvinate, blade without basal macular glands on upper leaf surface, lower surface not glaucous, dotted with punctulate to clavate glands or not, domatia present or absent; venation usually pinnate, secondary veins ending parallel to (or in) the margin. *Inflorescences* branched or unbranched racemes, in the axils of the stipuliform leaves, solitary; bracts persistent. *Flowers* actinomorphic, not exceeding 1 cm diam.; petals absent; disc absent. *Staminate inflorescences* with one flower per bract; flower buds globose. *Staminate flowers*: sepals 2–4; anthers basi- to dorsifixed; thecae 2, parallel, extrorse, lengthwise, sometimes connective widened; pistillode absent. *Pistillate inflorescences* often developing only one fruit terminally. *Pistillate flowers*: sepals 4–6, persistent; ovary usually 3-locular, echinate, spines often with some long hairs terminally; ovules 1 per locule, axillary, apotropous, ascending; styles persistent, apically splitting into 3 lineate, plumose stigmas; staminodes absent. *Fruits* dehiscent, usually 3-lobed, echinate, loculicidal-septicidal capsules, glabrous to simple or stellate indument on the inside. *Seeds* globose to laterally flattened, usually c. 5 mm diameter.

Distribution — S China and Vietnam to Papua New Guinea.

Habitat & Ecology — Usually in the understorey of primary forest, sometimes also present in secondary forest (mainly selectively logged) in shaded places.

KEY TO THE SPECIES

- 1a. All petioles glabrous or with only a few scattered hairs (naked eye) 2
- b. At least a few petioles conspicuously hairy (naked eye) 4
- 2a. Stipules early caducous to semi-persistent, obovate to ovate to narrowly triangular, 2–13 by 1–4 mm, venation not visible or inconspicuous. Leaves with or without domatia 3
- b. Stipules (semi-)persistent, broadly ovate to ovate, 5–27 by 4–17 mm, venation clearly visible. Leaves without domatia **8. *M. longystylus***
- 3a. Stipules early caducous. Petioles 28–90 mm long, sometimes densely covered with reddish clavate glands, apically strongly pulvinate and bent, giving the leaf a slightly peltate appearance. Leaf blades 9–30 by 2.5–18 cm, lower surface without domatia. Inflorescences often densely covered with glands excreting a conspicuous sticky yellowish red exudate. Staminate inflorescences branched. Pistillate inflorescences with several fruits developing; pedicels 2–27 mm long. Fruit spines often with a globose terminal gland **4. *M. griffithianus***
- b. Stipules early caducous to semi-persistent. Petioles 4–45 mm long, usually without or rarely with few reddish clavate glands, apically pulvinate, but usually not bent. Leaf blades 5–26 by 2–11 cm, lower surface with or without hairy domatia. Inflorescences without or with glands excreting little to no sticky yellowish red exudate. Staminate inflorescences not branched. Pistillate inflorescences with several or only one terminal fruit developing; pedicels 2–10 mm long. Fruit spines usually without a globose terminal gland **10. *M. penangensis***

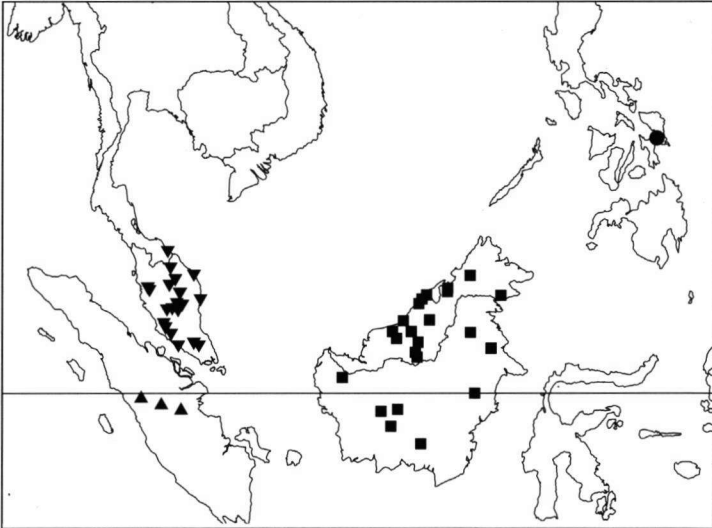
- 4a. Leaves chartaceous to coriaceous, base not to slightly cordate, never surrounding the stem, lobes not overlapping 5
- b. Leaves chartaceous, base deeply cordate, sometimes half-surrounding the stem, lobes usually overlapping **1. M. cordatifolius**
- 5a. Stipules caducous to (semi-)persistent, linear to (narrowly) triangular to ovate to obovate, width up to 3.5 mm, margins curled inward or not when dried 6
- b. Stipules (semi-)persistent, ovate to obovate, width exceeding 4 mm, margins not curled inward when dried **3. M. grandistipularis**
- 6a. Petioles longer than 2.5 cm 7
- b. Petioles up to 2.5 cm long 8
- 7a. Stipules ovate to triangular, margins not curled inward, not black coloured when dried. Petioles up to 6 cm long; leaf blades 11–31.5 by 4–11.5 cm, margin entire, lower surface without domatia. Staminate inflorescences branched. Pistillate inflorescences sometimes branched, up to 15 cm long; pedicels up to 19 mm long. Fruits with 2–7 mm long spines **7. M. kingii**
- b. Stipules linear to ovate to obovate, margins usually curled inward, black coloured when dried. Petioles up to 3 cm long; leaf blades 8.5–23 by 3–6.5 cm, margin sometimes dentate to serrate apically, lower surface usually with domatia. Staminate inflorescences not branched. Pistillate inflorescences not branched, up to 8 cm long; pedicels up to 4.5 mm long. Fruits with up to 1.8 mm long spines **11. M. stipularis**
- 8a. Stipules semi-persistent to caducous, narrowly triangular to triangular to ovate, usually widest at insertion, margins curled inward or not, with or without long hairs along margin, apex usually acute, usually creamish brown when dried. Leaves chartaceous to coriaceous 9
- b. Stipules semi-persistent, linear to ovate (to obovate), often conspicuously widening just above insertion, margins usually curled inward, with long (c. 1 mm) hairs along margin, apex usually rounded, usually black when dried. Leaves chartaceous **11. M. stipularis**
- 9a. Leaves coriaceous to chartaceous, lower surface with or without domatia, 7–15 secondary veins per side. Staminate inflorescences up to 10 cm long, with up to 28 flowers. Staminate flowers with up to 109 stamens. Pistillate inflorescences with bracts 3.5–12 mm long, often with only a single terminal fruit developing. Fruits with spines exceeding 1 mm in length, stigmas 10–22 mm long. — Asia mainland, Philippines, and New Guinea 10
- b. Leaves coriaceous, lower surface without domatia, 11–17 secondary veins per side. Staminate inflorescences up to 3.5 cm long, with up to 16 flowers. Staminate flowers with up to 46 stamens. Pistillate inflorescences with bracts 1.8–4 mm long, several fruits developing. Fruits with spines not exceeding 1 mm in length, stigmas up to 10 mm long. — Only known from Borneo **2. M. eucaustus**
- 10a. Shrubs to small trees up to 8(–20) m high. Leaf base not or only slightly oblique, lower surface completely hairy to only hairy on midrib, 7–12 secondary veins per side. — Found in Asia mainland and the Philippines 11
- b. Small trees up to 15 m high. Leaf base conspicuously oblique, lower surface completely hairy, 9–15 secondary veins per side. — Only known from New Guinea **9. M. papuanus**

- 11a. Stipules 9–20 mm long. Leaf blades 8.5–27 by 3.5–10 cm, base not cordate, lower surface completely hairy, without or with inconspicuous domatia. Pistillate inflorescences up to 11 cm long. Pistillate bracts 5–12 mm long 12
- b. Stipules 6–13 mm long. Leaf blades 4.5–16 by 1–5.5 cm, base sometimes slightly cordate, lower surface glabrous or with sparsely hairy midrib, often with conspicuously hairy domatia. Pistillate inflorescences up to 4.5 cm long. Pistillate bracts up to 6 mm long 6. *M. hookerianus*
- 12a. Most parts with long hairs, usually c. 1 mm long. Stipules up to 14 mm long. Leaf blades 8.5–19 by 3.5–6 cm, base rounded to obtuse, 7–9 secondary veins per side. Stigmas up to 16 mm long 5. *M. hirsutus*
- b. Most parts with short hairs, usually not exceeding 0.5 mm in length. Stipules up to 20 mm long. Leaf blades 15–27 by 4–10 cm, base cuneate, 9–12 secondary veins per side. Stigmas up to 22 mm long 12. *M. wenzelianus*

1. *Mallotus cordatifolius* Slik — Fig. 1, Map 1

Mallotus cordatifolius Slik, *Blumea* 43 (1998) 225. — Type: *PNH 117545* (*Gutierrez et al.*) (holo L), Philippines, Samar Island, Mt Sohoton.

Small tree up to 7 m tall, dbh up to 8 cm. *Indumentum* dense, yellowish, short to long. *Branches* smooth, glabrescent. *Stipules* persistent, narrowly triangular, 7–10 by 1–1.1 mm, margin entire, apex acute, hairy. *Non-reduced leaves*: petioles 5–7 by c. 1 mm, hairy, leaf blade ovate, 6.5–16.5 by 3.5–8.5 cm, length-width ratio 2–2.5, chartaceous, base deeply cordate, surrounding the petiole, slightly oblique, margin irregularly wavy, apex acute to acuminate, upper surface smooth, evenly hairy, lower surface smooth, evenly hairy, domatia absent; venation palmate, veins 6 at petiole attachment, 9–12 secondary veins per side along midrib, ending parallel to the margin. *Stipuliform*



Map 1. Distribution of *Mallotus* sect. *Hancea*: *Mallotus cordatifolius* Slik (●) *M. eucaustus* Airy Shaw (■); *M. grandistipularis* Slik (▲), and *M. kingii* Hook. f. (▼).

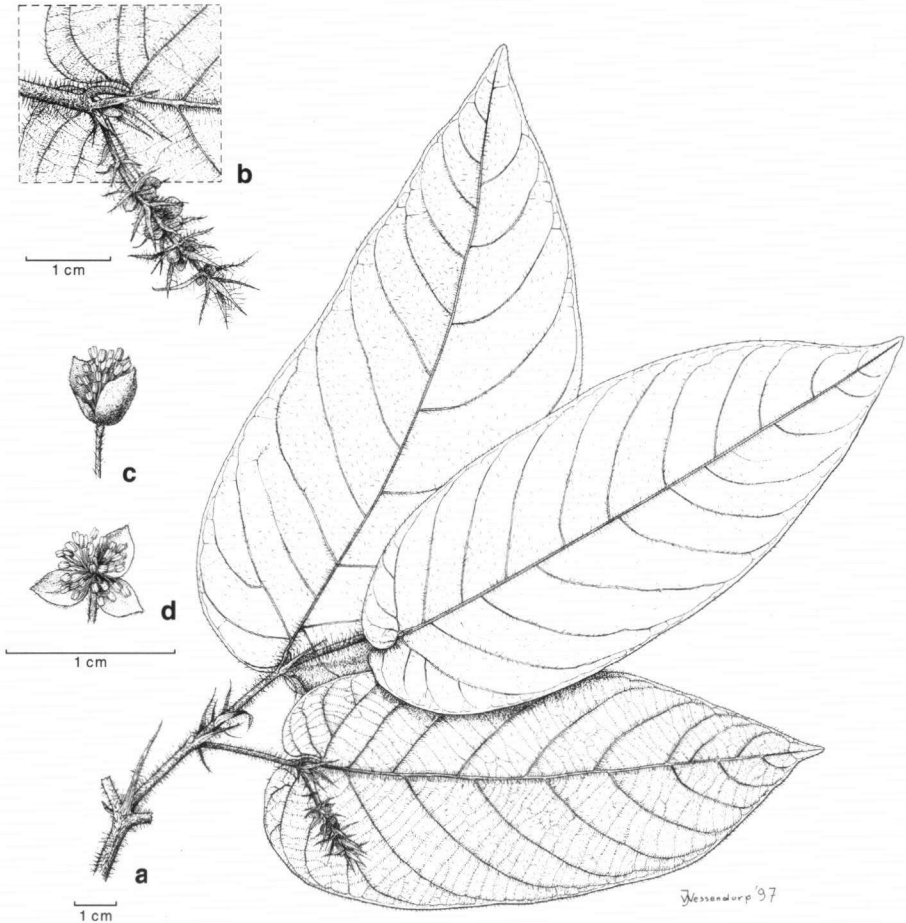


Fig. 1. *Mallotus cordatifolius* Slik. a. Habit of staminate plant; b. detail of node with staminate inflorescence; c. & d. staminate flower (a–d: PNH 117545 (Gutierrez et al.), L).

leaves (narrowly) triangular, 2–2.5 by c. 0.5 mm, hairy, margin entire, apex acute to rounded. *Staminate inflorescences* up to 3.5 cm long, basally c. 0.8 mm thick, unbranched, hairy, nodes up to 31 per inflorescence; bracts narrowly triangular, at right angles with rachis, 4.3–5 by c. 0.7 mm, margin entire, apex acute, hairy. *Buds* globose with acuminate apex, hairy. *Staminate flowers* 4.5–5 mm diam., red; bracteoles absent; pedicels 3.5–4.5 mm long, hairy; sepals 3, persistent (to caducous), basally connate, ovate, 3–3.8 by 1.8–2 mm, margin irregular, apex acuminate, hairy abaxially, glabrous adaxially; stamens up to 100, filaments up to 4 mm long, glabrous, anthers c. 0.5 by 0.5 mm, basifixed; connective not widened. *Pistillate inflorescences* and *fruits* unknown.

Distribution — Only known from Mt Sohoton, Samar Island, Philippines.

Habitat & Ecology — Logged-over forest.

2. *Mallotus eucaustus* Airy Shaw — Fig. 2, Map 1

Mallotus eucaustus Airy Shaw, Kew Bull. 23 (1969) 80; Kew Bull. Add. Ser. 4 (1975) 161. —

Type: *S* 23630 (*Sibat ak Luang*) (holo K; iso L), Borneo, Sarawak, Third Division, Bukit Iju, Ulu Arip, Balingian.

Shrubs to small trees up to 23 m tall, dbh up to 20 cm; bole straight. Outer bark smooth, hoop-marked, rugose, mottled; sapwood hard. *Indumentum* dense, whitish to yellowish, short. *Branches* smooth, glabrescent. *Stipules* caducous to semi-persistent, triangular to narrowly triangular, 4–11 by 1–1.8 mm, margin entire, apex acute, hairy, punctulate to clavate glands few to absent. *Leaves* in one plane. *Non-reduced leaves*: petiole 3–11 by 1–2 mm, hairy, clavate glands few to numerous; blade subovate to elliptic (to obovate), 7–24.5 by 1.5–7 cm, length-width ratio 2.7–5, coriaceous, base cuneate to acute to obtuse, slightly oblique, margin entire to slightly wavy to apically dentate, apex acuminate to aristate, upper surface smooth, hairy on the midrib, glabrescent, punctulate glands few, inconspicuous, lower surface smooth, hairy, especially on veins, punctulate to clavate glands numerous, inconspicuous, domatia absent; venation pinnate, 11–17 secondary veins per side, ending parallel to the margin. *Stipuliform leaves* narrowly triangular, 4–8.3 by 1.5 mm, hairy, margin entire, apex acute. *Staminate inflorescences* up to 3.5 cm long, basally 0.3–0.8 mm thick, unbranched, hairy, punctulate to clavate glands present, nodes up to 16 per inflorescence; bracts narrowly triangular, 2.5–5.5 by 0.6–0.8 mm, margin entire, apex acute, hairy abaxially, glabrous (to few hairs) inside, punctulate glands present. *Buds* globose with acute apex, hairy. *Staminate flowers* c. 3.5 mm diam., reddish yellow to red; bracteoles absent; pedicels 1–4 mm long, hairy; sepals 3, persistent, basally connate to free, elliptic to orbicular, c. 3 by 2.5 mm, margin entire to irregular, apex acute, hairy abaxially, glabrous adaxially; stamens up to 46, filaments up to 1.5 mm long, glabrous; anthers c. 0.5 by 0.6 mm, basifixed; connective more or less widened. *Pistillate inflorescences* up to 7 cm long, basally 0.9–1 mm thick, unbranched, hairy, punctulate glands few, inconspicuous, nodes up to 11 per inflorescence; bracts persistent, narrowly ovate to narrowly triangular, 1.8–4 by 0.6–0.8 mm, margin entire, apex acute, hairy abaxially, glabrous to hairy adaxially, punctulate glands few, inconspicuous. *Pistillate flowers*: bracteoles absent; pedicels 2.5–5 mm long, hairy, punctulate glands few to absent; sepals 5 or 6, free, narrowly triangular, 2.5–4 by c. 0.6 mm, margin entire, apex acute, hairy abaxially, glabrous to hairy adaxially, punctulate to clavate glands few, inconspicuous; ovary 3- (or 4-)locular, echinate, densely woolly hairy, spines 0.5–1 mm long, with long hairs; style 0.5–1 mm long, hairy; stigmas 7–10 mm long, densely covered with plumose to finely granulate papillae on the inside, hairy abaxially, clavate glands absent or present. *Fruit* a shortly echinate, lobed capsule, 8–15 by 5–8 mm, green to light red, hairy; carpels glabrous to hairy adaxially; column c. 4 by 3.5 mm. *Seeds* glossy, globose, c. 4 by 4 by 5 mm; hilum elliptic to slightly deltoid, c. 1 by 0.5 mm.

Distribution — Borneo.

Habitat & Ecology — Mainly a locally common understorey tree in primary forest, but also in secondary, logged-over forest; mostly on well-drained, sandy to (red) clayey soils. Altitude up to 340 m.

Uses — Firewood (hence its name *eucaustus*, which means easy to burn).



Fig. 2. *Mallotus eucaustus* Airy Shaw. a. Habit of pistillate plant; b. staminate inflorescence (a: Keßler et al. B 194, L; b: Sidiyasa & Ambriansyah S 1667, L).

3. *Mallotus grandistipularis* Slik — Fig. 3, Map 1

Mallotus grandistipularis Slik, *Blumea* 43 (1998) 227. — Type: *Burley, Tukirin et al. 2021* (holo L; iso CANB, K, US), Indonesia, Sumatra, Riau Province, Tigapulu Mts, 5 km W of Talanglakat.

Small trees up to 15 m tall, dbh up to 15 cm. Outer bark smooth, hoop-marked. *Indumentum* dense, short to long. *Branches* lenticellate, glabrescent, tubular to clavate glands few to numerous when young. *Stipules* semi-persistent, ovate to obovate, 8–22 by 2.3–9 mm, margin irregular wavy to entire, apex (rounded to) acute (to acuminate), hairy, especially along margin. *Leaves* in one plane. *Non-reduced leaves*: petioles 9–45 by 1.5–2 mm, hairy, tubular to clavate glands few to numerous when young; blade ovate to obovate, 13.5–30.5 by 4–9.5 cm, length-width ratio 3–4, coriaceous,

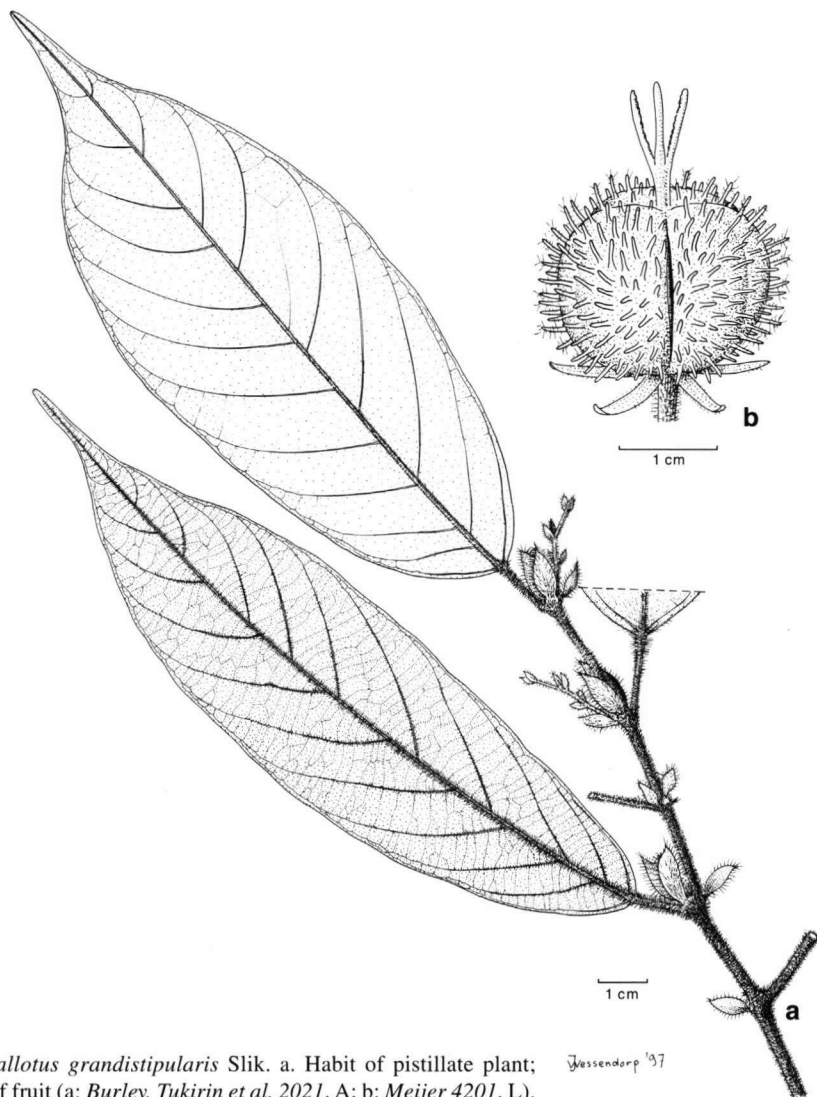


Fig. 3. *Mallotus grandistipularis* Slik. a. Habit of pistillate plant; b. detail of fruit (a: *Burley, Tukirin et al. 2021*, A; b: *Meijer 4201*, L).

base obtuse to rounded, margin entire to slightly wavy, apically sometimes slightly dentate, apex acuminate to caudate, upper surface smooth, glabrous to few hairs on midrib and veins, lower surface smooth, hairy, tubular to clavate to punctulate glands numerous when young; venation pinnate, 10–13(–15) secondary veins per side, ending parallel to the margin. *Stipuliform leaves* obovate, 4–10 by 1.8–3.5 mm, margin entire to wavy, apex acute, hairy, especially along margin, tubular to clavate glands numerous when young. *Staminate inflorescences* unknown. *Pistillate inflorescences* up to 10 cm long, basally c. 1.8 mm thick, unbranched, hairy, tubular to clavate glands few to numerous, nodes up to 9 per inflorescence; bracts ovate to obovate, 3–4 by 1.3–1.4 mm, margin entire to irregular, apex acute, hairy, tubular to clavate glands on the outside only. *Pistillate flowers*: pedicels 5–6 mm long, hairy, tubular to clavate glands numerous; sepals 4 or 5, persistent, free, ovate to narrowly triangular, 5.5–6 by c. 1.1 mm, margin entire, apex acute, hairy, tubular to clavate glands present on outside only; ovary 3-locular, echinate, densely hairy, glands absent, spines 2–2.5 mm long, ending in an inconspicuous gland, apically few long hairs; styles c. 1.8 mm long, hairy; stigmas up to 9.5 mm long, densely covered with granulate papillae on the inside, hairy abaxially. *Fruit* an echinate, lobed capsule, c. 18 by 15 mm, greyish red, hairy; carpels glabrous to sparsely hairy adaxially, punctulate glands absent to numerous; column c. 7.5 by 3.8 mm. *Seeds* glossy, globose, 4.5–5 by 3.5–4.5 by 4–5 mm; hilum elliptic, 1–1.2 by 0.5–1 mm.

Distribution — C Sumatra.

Habitat & Ecology — In primary lowland Dipterocarp forest; on loamy soils. Altitude up to 500 m.

4. *Mallotus griffithianus* (Müll.Arg.) Hook.f. — Fig. 4, Map 2

Mallotus griffithianus (Müll.Arg.) Hook.f., Fl. Brit. India 5 (1887) 433; Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 290; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 178; Ridl., Fl. Malay Penins. 3 (1924) 291; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 115; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1395; Meijer, Bot. News Bull. 7 (1967) 52; Airy Shaw, Kew Bull. 21 (1968) 390; Whitmore, Tree Fl. Malaya 2 (1973) 116; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 163. — *Diplochlamys griffithianus* Müll. Arg., Flora 47 (1864) 539; in DC., Prodr. 15, 2 (1866) 1024. — Type: *Griffith KD 4961* (holo K), India orientali Malayensi.

Buettneria uncinata Mast. in Hook.f., Fl. Brit. India 1 (1884) 377. — Type: *Maingay KD 1450* (holo K), Malacca.

Mallotus impar Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 396; Merr., J. Straits Branch Roy. Asiat. Soc., Special number (1921) 339; Univ. Calif. Publ. Bot. 15 (1929) 157; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117. — Type: *Hose 281* (holo B†; iso EDI, K, L), 'Südwestmalayische Provinz', Borneo, Sarawak, Baram District.

Mallotus woodii Merr., Philipp. J. Sci., Bot. 13 (1918) 81; J. Straits Branch Roy. Asiat. Soc., Special number (1921) 340; Univ. Calif. Publ. Bot. 15 (1929) 158; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117. — Type: *Wood 451* (holo PNH†; iso K), Sabah, Marutai, near Tawau.

Small trees up to 20 m tall, dbh up to 21 cm; bole straight. Outer bark smooth to slightly fissured, hoop-marked, dippled; sapwood soft to medium hard. *Indumentum* sparse, short to long. *Branches* smooth, sparsely (to densely) lenticellate, glabrous to sparsely hairy, glabrescent, clavate glands few to numerous, reddish, on young parts. *Stipules* early caducous, narrowly triangular (to ovate), 4.5–6.5 by 1.3 mm, margin



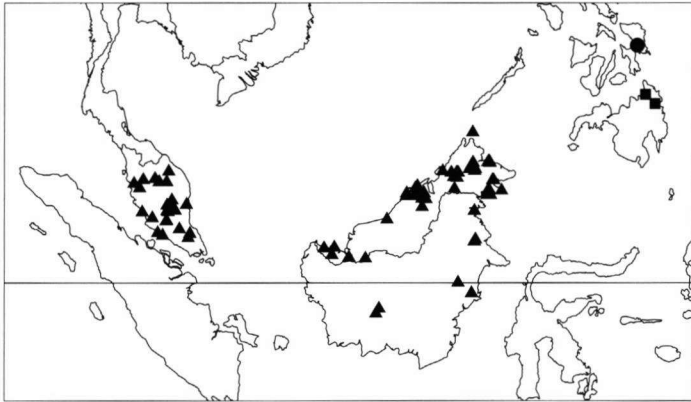
Fig. 4. *Mallotus griffithianus* (Müll.Arg.) Hook.f. a. Habit of pistillate plant; b. detail staminate inflorescence (note that it is branched) (a: Arifin & Ambriansyah B 999, L; b: Ambriansyah & Arbainsyah B 598, L).

entire, apex acute, sparsely hairy abaxially, glabrous adaxially, punctulate glands few to numerous. *Non-reduced leaves*: petiole 28–90 by 0.9–2.3 mm, apically strongly pulvinate and bending upwards, glabrous to sparsely hairy, glabrescent, clavate glands present when young, punctulate when older; blade ovate to elliptic (to slightly obovate), 9–30 by 2.5–18 cm, length-width ratio 2–4.3, coriaceous, base obtuse to acute to rounded, sometimes slightly oblique, margin entire to slightly wavy to apically sometimes dentate, apex acuminate to cuspidate, upper surface smooth, glabrous to sparsely hairy on midrib, punctulate glands few to numerous, lower surface smooth, sparsely hairy on midrib, punctulate glands few to numerous, domatia absent; venation pinnate, 11–17 secondary veins per side, ending parallel to the margin. *Stipuliform leaves* narrowly triangular, 2.5–4 by 1–1.5 mm, hairy, clavate glanded, margin entire, apex acute. *Staminate inflorescences* up to 13 cm long, basally 1–1.5 mm thick, branched, each branch with basal bract, hairy, clavate glands numerous, nodes many; bracts persistent, triangular to ovate, at right angles with the axis, 1.5–1.6 by 0.5–0.6 mm, margin entire, apex acute, sparsely hairy on outside only, clavate glands numerous on outside only. *Buds* globose with acuminate apex, hairy, clavate glands numerous. *Staminate flowers* 4.5–7 mm diam., white to reddish yellow to reddish; bracteoles absent; pedicels 1.3–5 mm long, hairy, clavate glands numerous; sepals 3 or 4, persistent, basally connate, ovate, 1.7–3.5 by 1.1–2 mm, margin entire to slightly irregular, apex acute, hairy on outside only, clavate glands numerous, on outside only; stamens up to 86, filaments 1.3–1.7 mm long; anthers 0.3–0.5 mm high, basifixed; connective not to slightly widened, sometimes slightly overtopping anther. *Pistillate inflorescences* up to 12 cm long, basally 1–3 mm thick, rarely branched, hairy, glabrescent, clavate glands numerous, with sticky yellow exudate, nodes up to 14 per inflorescence; bracts persistent, ovate to narrowly triangular, 2–4 by c. 1 mm, margin entire, apex acuminate to cuspidate, hairy on outside only, clavate glands numerous. *Pistillate flowers*: bracteoles early caducous to sometimes subtending the flower, ovate, 1.3–1.8 by 0.4–0.8 mm, margin entire, apex acute, hairy on outside only, clavate to conical glands numerous; pedicels 2.3–27 mm long, hairy, apically with long hairs, clavate to conical glands numerous; sepals 5, persistent, free to basally connate, ovate to narrowly triangular, 4–8 by 0.9–2.3 mm, margin entire, apex acute, hairy on outside only, clavate glands on outside only; ovary 3-locular, echinate, densely hairy, clavate glands numerous, spines 2–4 mm long, apically often with globose gland, long hairs apically, clavate glands present; style 1–2 mm long, hairy, clavate glands present; stigmas 9–15 mm long, densely covered with granulate papillae on the inside, hairy on the outside, clavate glands present on the outside. *Fruit* an echinate, lobed capsule, 12–18 by 8–12 mm, yellow when young, pink to red to reddish brown when mature, (glabrous to) hairy, clavate glands absent to few; carpel inside glabrous to hairy, clavate glands absent to few; column 7–8 by 5–6 mm. *Seeds* glossy, globose, c. 6 by 5 by 5 mm; hilum elliptic to ovate to triangular, 1–1.5 by c. 1 mm.

Distribution — From Peninsular Thailand and Malaysia into Borneo.

Habitat & Ecology — Mainly a locally common understorey tree in primary forest, but also in secondary logged-over forest; on steep slopes, ridges, hillsides, flat land, along paths, river banks, sometimes on periodically inundated terrain; present on most soil types from peat to sandstone to (yellow) sandy loam to ultrabasic soil to yellow sandy clay to rarely on limestone. Altitude up to 480 m.

Note — A very constant species with little variation in characters.



Map 2. Distribution of *Mallotus* sect. *Hancea*: *Mallotus griffithianus* (Müll.Arg.) Hook.f. (▲), *M. hirsutus* Elmer (■), and *M. longystylus* Merr. (●).

5. *Mallotus hirsutus* Elmer — Fig. 5, Map 2

Mallotus hirsutus Elmer, *Leafl. Philipp. Bot.* 7 (1915) 2648; Airy Shaw, *Alph. Enum. Euphorb. Philipp. Isl.* (1983) 36. — Type: *Elmer 13480* (holo PNH†; iso K, L, NY), Philippines, Mindanao, Agusan Province, Cabadbaran (Mt Urdaneta).

Small trees up to 8 m tall, dbh up to 15 cm. *Indumentum* dense, short to long. *Branches* smooth to slightly fissured, glabrescent, clavate glands absent to few. *Stipules* caducous to semi-persistent, narrowly triangular, 9–14 by 1.5–1.8 mm, margin entire, slightly incurved, apex acute, hairy, clavate glands absent to few outside. *Non-reduced leaves*: petiole 5–16 by 1–1.2 mm, hairy, clavate glands absent to few; blade ovate to elliptic (to slightly obovate), 8.5–19 by 3.5–6 mm, length-width ratio 2.2–3.3, chartaceous to coriaceous, base (rounded) to obtuse, slightly oblique, margin entire to wavy, apex acuminate to cuspidate, upper surface smooth, hairy (to glabrous), especially on midrib and nerves, lower surface smooth, hairy, domatia absent; venation pinnate, 7–9 secondary veins per side, ending parallel to the margin. *Stipuliform leaves* narrowly triangular to ovate, 5–8 by 1.5–1.8 mm, margin entire, apex acute, glabrous to hairy abaxially, glabrous adaxially. *Staminate inflorescences* unknown. *Pistillate inflorescences* up to 10.5 cm long, basally c. 1 mm thick, unbranched, hairy, clavate glands absent to few, nodes up to 5 per inflorescence, usually only terminal node with fruit; bracts persistent, narrowly triangular, 9–12 by 1–1.3 mm, margin entire, apex acute, hairy, glabrous adaxially, clavate glands absent to few. *Pistillate flowers*: bracteoles absent; pedicels 5–7 mm long, hairy, clavate glands absent to few; sepals 5, persistent, free, narrowly triangular, 7–12 by 0.9–1.4 mm, margin entire, apex acute, hairy, glabrous adaxially; ovary 3-locular, echinate, densely hairy, spines 2–5 mm long, hairy; style c. 1 mm long, hairy; stigmas 10–16 mm long, densely covered with granulate papillae on the inside, hairy on the outside. *Fruit* an echinate, lobed capsule, 10–15 by 9–10 mm, hairy in- and outside; column c. 4.5 by 3.5 mm. *Seeds* glossy, globose, c. 4 by 4.5 by 5 mm; hilum elliptic to deltoid, c. 1.5 by 0.6 mm.

Distribution — Mindanao in the Philippines.

Habitat & Ecology — In forest. Altitude 1333 m.



Fig. 5. *Mallotus hirsutus* Elmer. a. Habit of pistillate plant (BS 34549 (Ramos & Pascasio), L).

6. *Mallotus hookerianus* (Seem.) Müll.Arg. — Fig. 6, Map 3

Mallotus hookerianus (Seem.) Müll.Arg., *Linnaea* 34 (1865) 193; in DC., *Prodr.* 15, 2 (1866) 975; J.J. Sm., *Nova Guinea* 8 (1912) 787; Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vii (1914) 202; Airy Shaw, *Kew Bull.* 21 (1968) 400; 23 (1969) 81; 26 (1972) 296. — *Hancea hookeriana* Seem., *Bot. Voy. Herald* (1857) 409. — *Rottlera hookeriana* (Seem.) Scheff., *Ann. Mus. Bot. Lugd.-Bat.* 4 (1868/1869) 124. — Type: *Champion s.n.* (holo K), Hong Kong.

Shrubs to small trees up to 7(–20) m tall, dbh up to 15 cm. *Indumentum* sparsely to densely, short to long. *Branches* smooth to pustulose, hairy, punctulate to clavate glands few to absent. *Stipules* caducous to persistent, narrowly triangular, 6–13 by 0.8–1.5 mm, margin entire, apex acute, hairy, clavate glands few to absent. *Non-reduced leaves*: petiole 6–20 by 0.5–1.8 mm, hairy, punctulate to clavate glands few to absent; blade ovate to slightly obovate, 4.5–16 by 1–6 cm, length-width ratio 2–4, coriaceous, base rounded to obtuse (to slightly cordate), sometimes slightly oblique, margin entire to slightly wavy to sometimes apically serrate, apex acute to cuspidate, upper surface smooth, sometimes pustulose, glabrous to sparsely hairy,

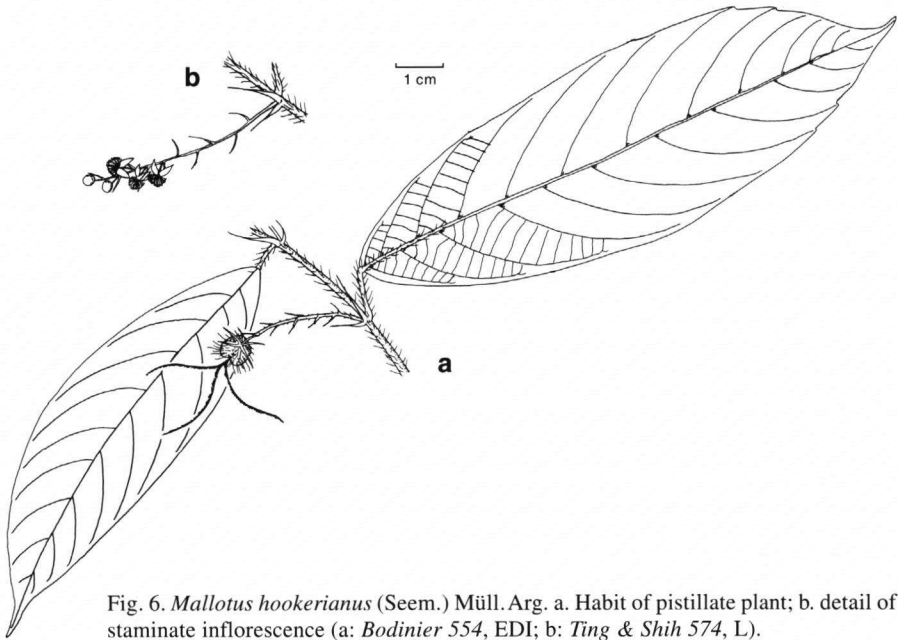
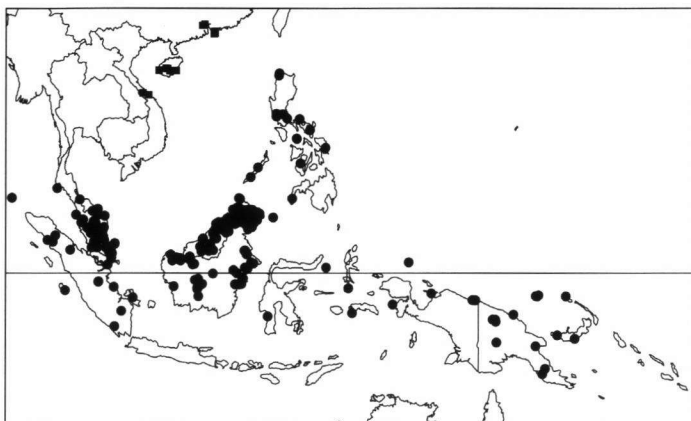


Fig. 6. *Mallotus hookerianus* (Seem.) Müll. Arg. a. Habit of pistillate plant; b. detail of staminate inflorescence (a: *Bodinier 554*, EDI; b: *Ting & Shih 574*, L).

especially on midrib, puncticulate glands few to absent, lower surface smooth, sparsely hairy basally on midrib, puncticulate to clavate glands absent or present, domatia present, usually with hair tufts; venation pinnate, 7–11 secondary veins per side, ending parallel to the margin. *Stipuliform leaves* narrowly triangular, 3–10 by 0.7–1 mm, margin entire, apex acute, hairy, glabrous to sparsely hairy adaxially, clavate glands absent (to few). *Staminate inflorescences* up to c. 10 cm long, basally c. 0.7 mm thick, not branched, hairy, clavate glands numerous to absent, nodes up to 21 per inflorescence; bracts persistent, ovate to narrowly triangular, 2–5 by 0.5–0.6 mm, margin entire, apex acute to cuspidate, hairy abaxially, glabrous to sparsely hairy adaxially, clavate glands absent to numerous. *Buds* globose with acuminate apex, apex hairy, clavate glands absent to numerous. *Staminate flowers* 6–9 mm diam., blueish purple to purplish red to yellowish red; bracteoles absent; pedicels 5–6 mm long, hairy, clavate glands absent to numerous; sepals 3, persistent, free to basally connate, elliptic, recurved, 4–4.5 by 2.5–2.8 mm, sparsely hairy, especially apically, margin entire, apex acute to acuminate, clavate glands absent or present outside; stamens up to 109, filaments 3.3–5 mm long, glabrous, clavate glands absent (to few); anthers 0.5–0.7 by 0.6–0.7 mm, dorsifixed; connective (not to) conspicuously widened with granulate apex. *Pistillate inflorescences* up to 4.5 cm long, basally c. 0.5 mm thick, unbranched, usually only terminal fruit developing, hairy, puncticulate to clavate glands present, nodes up to 8 per inflorescence; bracts persistent, narrowly triangular, 3.5–6 by 0.6–0.8 mm, margin entire, apex acute, hairy. *Pistillate flowers* green; bracteoles absent to subtending the calyx, narrowly triangular, c. 3.5 by 0.5 mm, margin entire, apex acute, hairy; pedicels 2–7 mm long, hairy, clavate glands absent to numerous; sepals 5, persistent, free, narrowly triangular, recurved, 4–5.5 by 0.4–0.5 mm, margin entire,



Map 3. Distribution of *Mallotus* sect. *Hancea*: *Mallotus hookerianus* (Seem.) Müll. Arg. (■) and *M. penangensis* Müll. Arg. (●).

apex acute, hairy; ovary 3-locular, echinate, densely woolly hairy, clavate glands few to absent, spines up to 4 mm long, hairy; style 1–2 mm long, hairy; stigmas 14–22 mm long, densely covered with granulate papillae on the inside, hairy abaxially. *Fruit* an echinate, lobed capsule, 9–10 by 8 mm, green to greenish brown; carpel inside simple to stellate hairy, punctulate to clavate glands few to absent; column 5–6 by 4 mm. *Seeds* glossy, globose, c. 4.5 by 4.5 by 4.5–5 mm; hilum round to elliptic, 1–1.2 by 1–1.2 mm.

Distribution — S China and Vietnam.

Habitat & Ecology — In forest to bush-like vegetations in shaded places; along streams, in ravines, on mountain sides; on clayey, loamy, and sandy soils. Altitude up to 667 m.

Note — Fairly constant in characters, although specimens from Vietnam may be almost glabrous.

7. *Mallotus kingii* Hook.f. — Fig. 7, Map 1

Mallotus kingii Hook.f., Fl. Brit. India 5 (1887) 439; Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 290; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 197; Ridl., Fl. Malay Penins. 3 (1924) 293; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117; Airy Shaw, Kew Bull. 21 (1968) 389; 23 (1969) 81; 26 (1972) 295; Whitmore, Tree Fl. Malaya 2 (1973) 115; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 163. — Type: *King's Collector 7414* (holo K; iso G), Malaya, Perak.

Small trees up to 25 m tall, dbh up to 21 cm; bole straight. Outer bark smooth, slightly lenticellate, brittle, scaly; inner bark hard, granular. *Indumentum* dense, short. *Branches* smooth, glabrescent, clavate to punctulate glands few to numerous. *Stipules* caducous to persistent, ovate, 8–14 by 2–3 mm, margin entire, apex acute to aristate, hairy with few long hairs along margin, clavate glands absent or present. *Non-reduced leaves*: petiole 25–62 by 0.8–2 mm, hairy, punctulate to clavate glands few to numerous; blade elliptic to obovate, 11–31.5 by 4–11.5 cm, length-width ratio 2.2–3, chartaceous, base rounded to obtuse to cuneate, sometimes slightly oblique, margin slightly wavy,

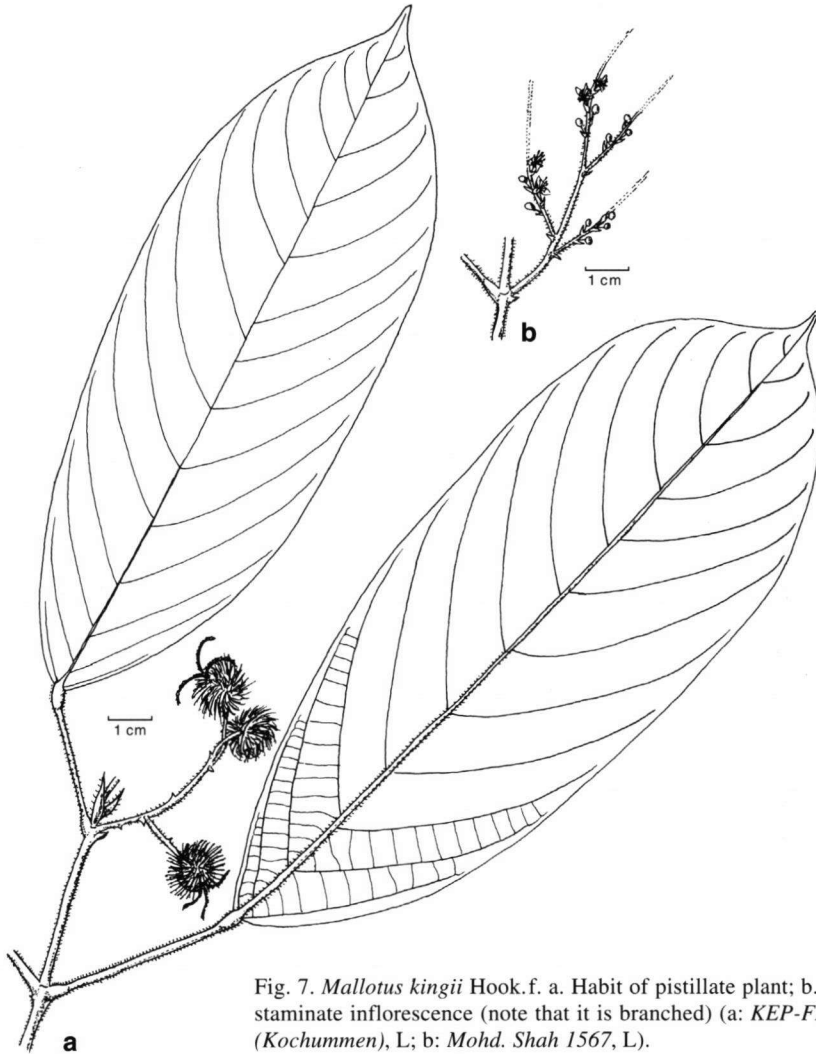


Fig. 7. *Mallotus kingii* Hook.f. a. Habit of pistillate plant; b. detail of staminate inflorescence (note that it is branched) (a: *KEP-FRI 16496* (Kochummen), L; b: *Mohd. Shah 1567*, L).

apex acuminate to cuspidate, upper surface smooth, hairy on midrib and base of veins, punctulate to clavate glands few to numerous, lower surface smooth, hairy, especially on veins, clavate to punctulate glands usually numerous, domatia absent; venation pinnate, 12–14 secondary veins per side, ending parallel to the margin, apically sometimes ending in margin. *Stipuliform leaves* ovate, 4–7 by 2 mm, margin entire, apex acute, hairy, clavate glands absent or present. *Staminate inflorescences* up to 9 cm long, basally c. 1.8 mm thick, branched, hairy, clavate glands numerous, nodes many per inflorescence; bracts persistent, ovate to obovate, 1–1.5 by 0.4–0.5 mm, margin entire to irregular, apex rounded, hairy, clavate glands numerous on outside only. *Buds* globose, hairy, clavate glands numerous. *Staminate flowers* 3–5 mm diam.,

greenish white; bracteoles absent; pedicels 1–2 mm long, hairy, clavate glands numerous; sepals 2 or 3, persistent, basally connate, orbicular to elliptic, c. 3 by 2–3 mm, margin entire, apex acute, hairy abaxially, glabrous adaxially, clavate glands numerous on outside only; stamens up to 98, filaments 3.5–4 mm long, glabrous; anthers c. 0.5 by 0.6 mm, dorsifixed; connective widened or not. *Pistillate inflorescences* up to 15 cm long, basally c. 2 mm thick, unbranched (to branched), hairy, clavate glands numerous, nodes up to 15 per inflorescence; bracts persistent, ovate to deltoid, 1.7–2.5 by 1.5–2 mm, margin entire, apex acute, hairy with long hairs along margin, clavate glands numerous. *Pistillate flowers* green; bracteoles usually absent, subtending the calyx, ovate, 1.8–4 by 0.7–1.5 mm, margin entire, apex rounded, glabrous to hairy with long hairs along margin, clavate glands numerous; pedicels 4–19 mm long, hairy, clavate glands numerous; sepals 5, persistent, free, deltoid to ovate, 1.8–4.5 by 1.5 mm, margin entire, apex acute, glabrous to sparsely hairy with long hairs along margin, clavate glands numerous; ovary 3-locular, echinate, densely woolly hairy, clavate glands absent to few, spines 2–7 mm long, usually with apical gland, glabrous to hairy, sometimes long hairs apically, clavate glands absent to few basally; style 1–1.5 mm long, hairy, clavate glands present; stigmas 6–7 mm long, densely covered with granulate papillae on the inside, hairy on the outside, clavate glands numerous on the outside. *Fruit* an echinate, lobed capsule, 15–16 by 12–13 mm, green, hairy, clavate glands absent to few; carpel inside glabrous to hairy, punctulate to clavate glands few; column 7–8 by 5 mm. *Seeds* glossy, globose, 5.5–6 by 4.5–6 by 5.5–6 mm; hilum elliptic to deltoid, 1.5–2 by 1 mm.

Distribution — Peninsular Thailand and Peninsular Malaysia.

Habitat & Ecology — Primary and secondary forest; on ridges, hillsides, low undulating terrain, and along streams. Altitude up to 833 m.

Note — A fairly constant species with little variation in characters.

8. *Mallotus longystylus* Merr. — Fig. 8, Map 2

Mallotus longystylus Merr., Philipp. J. Sci., Bot. 13 (1920) 560; Enum. Philipp. Flow. Pl. 2 (1923) 434; Airy Shaw, Alph. Enum. Euphorb. Philipp. Isl. (1983) 36. — Type: *BS 35173 (Ramos & Pascasio)* (holo PNH†; iso K), Philippines.

Shrubs to small trees up to 10 m tall, dbh up to 12 cm, sometimes monoecious. *Indumentum* absent to sparse, short. *Branches* smooth (to slightly fissured), slightly pustulose, glabrous to sparsely hairy. *Stipules* persistent, ovate to broadly ovate, 5–27 by 4–17 mm, margin entire to wavy, apex acute to rounded, sparsely hairy, venation parallel, clearly visible. *Non-reduced leaves*: petiole 6–40 by 0.8–2.2 mm, sparsely hairy; blade ovate, 7.5–26 by 3.5–9.5 cm, length-width ratio 2.3–3.3, (chartaceous to) coriaceous, base obtuse to rounded to slightly cordate, slightly oblique, margin entire to wavy, apex acute to acuminate, upper surface smooth, glabrous to sparsely hairy midrib and veins, lower surface smooth, (pustulose), glabrous to sparsely hairy on midrib and veins, domatia absent; venation pinnate, 8–11 secondary veins per side, ending parallel to the margin. *Stipuliform leaves* ovate, 1.5–3.3 by 1.2–1.5 mm, margin entire, apex rounded, hairy. *Staminate inflorescences* up to 9 cm long, basally c. 0.7 mm thick, unbranched, hairy, nodes up to 33 per inflorescence; bracts persistent, broadly ovate to ovate, 5–6 by 4 mm, half to completely enfolding the rachis, margin entire to irregular,

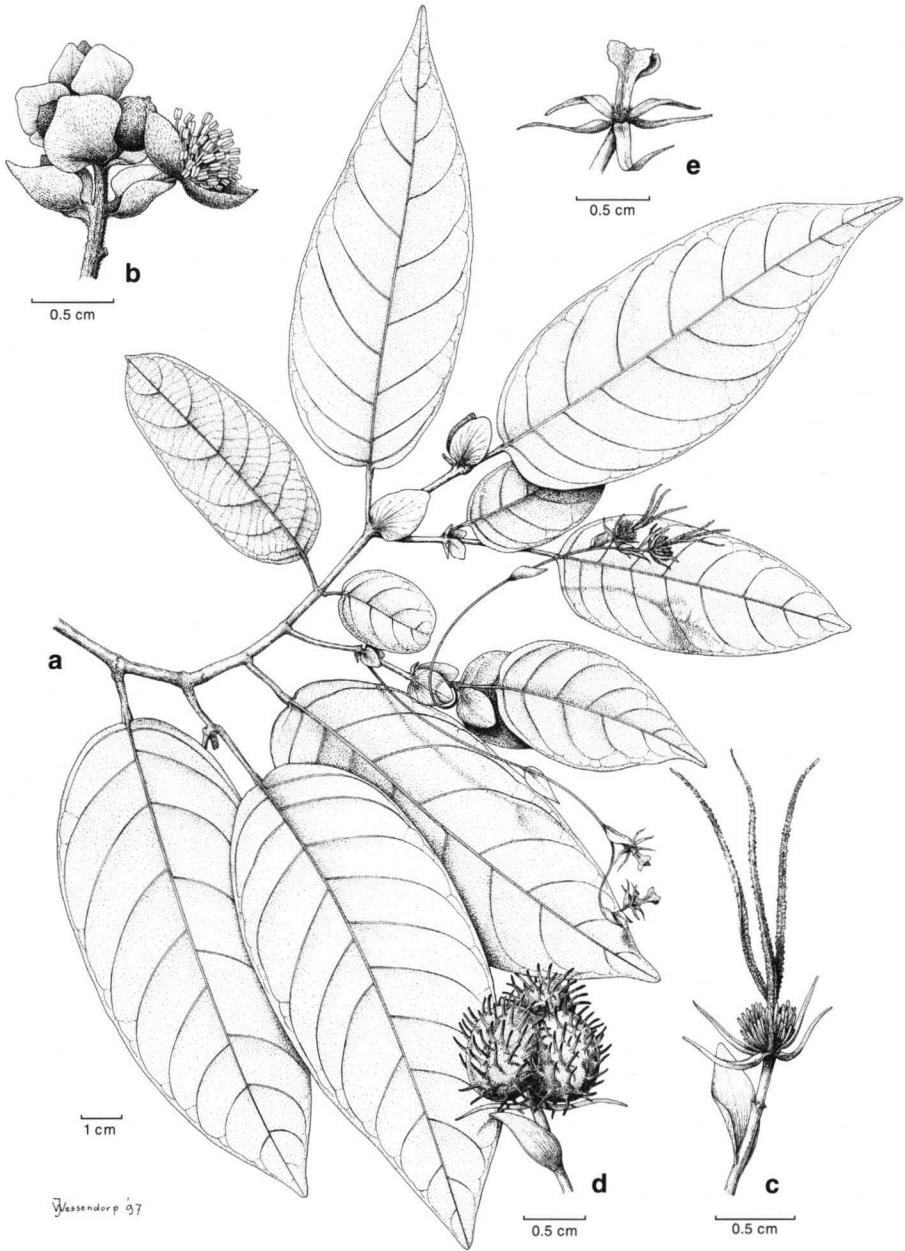


Fig. 8. *Mallotus longystylus* Merr. a. Habit of pistillate plant (note large stipules); b. detail staminate inflorescence; c. pistillate flower; d. fruit; e. column (a, c–e: *PNH 117592* (Gutierrez), L.; b: *PNH 117589* (Gutierrez), L).

apex acute, hairy. *Buds* globose with acuminate apex, hairy. *Staminate flowers* c. 7 mm diam.; bracteoles absent; pedicels 2–4 mm long, hairy; sepals 3 (or 4), persistent, basally connate, elliptic to obovate, c. 5 by 3.5 mm, margin entire to irregular, apex acuminate, hairy, glabrous adaxially; stamens more than 100, filaments up to 2 mm long, glabrous; anthers 0.6–0.7 by 0.5–0.6 mm, basifixed; connective not widened. *Pistillate inflorescences* up to 10 cm long, basally 0.5–0.7 mm thick, unbranched, sparsely hairy, nodes up to 10 per inflorescence; bracts persistent, broadly ovate to ovate, enfolding the rachis when young, 5–10 by 1–3 mm, margin entire to irregular, apex acute, hairy. *Pistillate flowers*: bracteoles absent; pedicels 5–9 mm long, hairy, glands absent to punctulate; sepals (4 or 5), persistent, free, narrowly ovate to narrowly elliptic, 6–7 by 1–1.6 mm, margin entire, involute, apex acute, hairy; ovary 3-locular, echinate, densely hairy, glands absent to punctulate, spines up to 2 mm long, sparsely hairy; style 1.5–2 mm long, densely hairy; stigmas 12–17 mm long, densely covered with granulate papillae on the inside, densely hairy abaxially. *Fruit* an echinate, lobed capsule, c. 10 by 6.5 mm, green to reddish green, hairy; carpel inside glabrous to sparsely hairy; column 4–5 by 3–3.5 mm. *Seeds* glossy, globose, c. 4 by 3.5 by 4 mm; hilum deltoid, c. 1.2 by 1 mm.

Distribution — Samar Island in the Philippines.

Habitat & Ecology — In primary forest. Altitude up to 266 m.

9. *Mallotus papuanus* (J.J. Sm.) Pax & K. Hoffm. — Fig. 9, Map 4

Mallotus papuanus (J.J. Sm.) Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 202; Airy Shaw, Kew Bull. 21 (1968) 400; 23 (1969) 81; Kew Bull. Add. Ser. 8 (1980) 164. — *Mallotus hookerianus* (Seem.) Müll. Arg. var. *papuanus* J.J. Sm., Nova Guinea 8 (1912) 787; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.viii (1919) 19; in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117. — Type: *Gjellerup 316* (holo L; iso A, BO, K, P, U), Irian Jaya, Biwak Hollandia.

Small trees up to 15 m tall, dbh up to 10 cm. Outer bark smooth. *Indumentum* dense, short to long. *Branches* smooth, (pustulose), glabrescent. *Stipules* early caducous, narrowly triangular to linear, 10–17 by 1–1.2 mm, margin entire, sometimes involute, apex acute, densely hairy. *Non-reduced leaves*: petiole 5–12 by 1–2 mm, densely hairy; blade ovate to elliptic to obovate, 6–23 by 2.5–8.5 cm, length-width ratio 2.3–4, coriaceous, base rounded to cordate, conspicuously oblique, margin entire to slightly wavy (to apically dentate), apex acuminate to cuspidate, upper surface smooth, glabrous to hairy, lower surface smooth, hairy, domatia inconspicuous, venation pinnate, 9–15 secondary veins per side, ending parallel to the margin. *Stipuliform leaves* narrowly triangular to linear, 5–14 by 1 mm, margin entire, apex acute, hairy. *Staminate inflorescences* up to c. 4.5 cm long, basally c. 0.5 mm thick, unbranched, hairy, nodes up to 28 per inflorescence; bracts ovate to narrowly triangular, 1.8–2.3 by 0.5 mm, margin entire, apex acute to aristate, hairy, glabrous to hairy adaxially. *Buds* globose with acuminate apex, hairy. *Staminate flowers* c. 4.5 mm diam., pale brownish; bracteoles absent; pedicels 2–2.5 mm long, hairy; sepals 3, more or less connate, elliptic, 1.8–2 by 1.3–1.6 mm, margin entire to irregular, apex acuminate, hairy, glabrous adaxially; stamens up to c. 36, filaments 1.8–2 mm long, glabrous; anthers 0.3–0.5 by 0.6 mm, basifixed; connective slightly widened. *Pistillate inflorescences* up to 9 cm long, basally

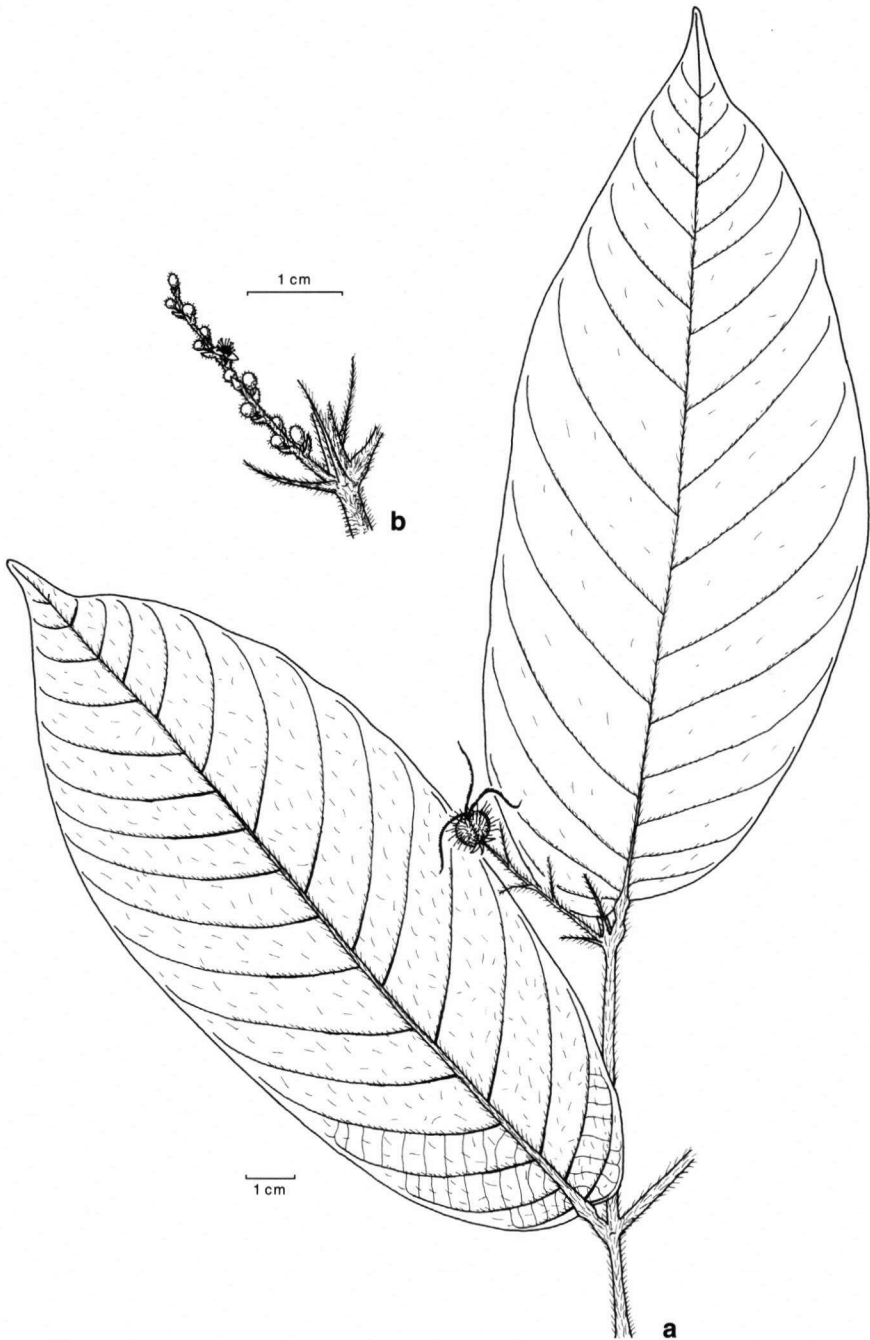
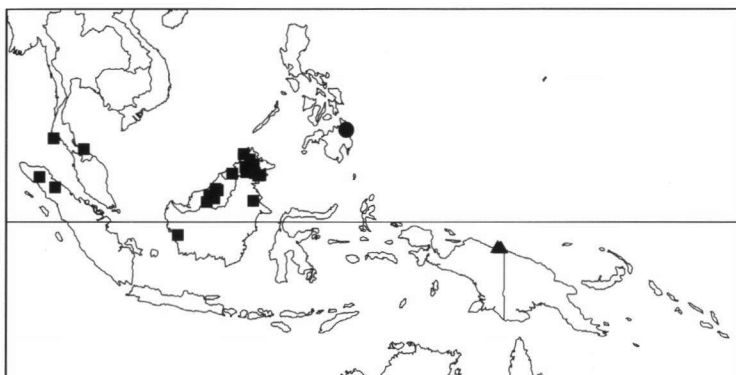


Fig. 9. *Mallotus papuanus* (J.J. Sm.) Pax & K. Hoffm. a. Habit of pistillate plant (note the strongly oblique leaf base); b. detail of staminate inflorescence (note the very slender stipules) (a: Van Royen & Sleumer 6203, L; b: Gjellerup 316, L).



Map 4. Distribution of *Mallotus* sect. *Hancea*: *Mallotus papuanus* (J.J. Sm.) Pax & K. Hoffm. (▲), *M. stipularis* Airy Shaw (■), and *M. wenzelianus* Slik (●).

c. 0.5–0.8 mm thick, usually only terminal fruit developing, unbranched, hairy, nodes up to 6 per inflorescence; bracts narrowly triangular, 4–7 by 0.4 mm, margin entire, involute, apex acute, hairy. *Pistillate flowers* yellowish; bracteoles absent; pedicels c. 2 mm long, hairy; sepals 5, free, narrowly triangular, c. 6 by 0.7 mm, margin entire, apex acute, hairy; ovary 3-locular, echinate, hairy, spines 3–7 mm long, with long hairs; styles 0.7–1 mm long, hairy; stigmas up to 15 mm long, densely covered with granulate papillae on the inside, hairy abaxially. *Fruit* an echinate, lobed capsule, c. 11 by 5 mm, green, hairy; carpel inside hairy; column unknown. *Seeds* glossy, roughly globose, c. 5 by 4.5 by 5 mm, hilum deltoid, c. 1 by 1 mm.

Distribution — Only known from the area around Jayapura, Irian Jaya, Indonesia.

Habitat & Ecology — Primary forest understory; along streams, in river valleys, on steep slopes; on clay, gravel, and rich humus soils. Altitude up to 650 m.

10. *Mallotus penangensis* Müll. Arg. — Fig. 10, Map 3

Mallotus penangensis Müll. Arg., *Linnaea* 34 (1865) 186; in DC., *Prodr.* 15, 2 (1866) 961; Hook. f., *Fl. Brit. India* 5 (1887) 440; Boerl., *Handl. Fl. Ned. Ind.* 3, 1 (1900) 288; Pax & K. Hoffm. in *Engl., Pflanzenr.* IV.147.vii (1914) 201; Ridl., *Fl. Malay Penins.* 3 (1924) 293; Pax & K. Hoffm. in *Engl. & Harms, Nat. Pflanzenfam.* ed. 2, 19c (1931) 117; Meijer, *Bot. News Bull.* 7 (1967) 52; Airy Shaw, *Kew Bull.* 21 (1968) 399; Whitmore, *Tree Fl. Malaya* 2 (1973) 116; Airy Shaw, *Kew Bull. Add. Ser.* 4 (1975) 161, 164; *Kew Bull.* 36 (1981) 324, 328; Keßler & Sidiyasa, *Tropenbos Series* 7 (1994) 133. — Type: *Wallich 8576* (holo G; iso A, K, P), Malaysia, Pulau Penang.

Mallotus echinatus Elmer, *Leafl. Philipp. Bot.* 3 (1910) 925; Pax & K. Hoffm. in *Engl., Pflanzenr.* IV.147.vii (1914) 204; Merr., *Enum. Philipp. Flow. Pl.* 2 (1923) 433; Pax & K. Hoffm. in *Engl. & Harms, Nat. Pflanzenfam.* ed. 2, 19c (1931) 117; Airy Shaw, *Kew Bull. Add. Ser.* 4 (1975) 164; 8 (1980) 166. — Type: *Elmer 12253* (holo PNH†; iso EDI, K, L, NY), Philippines, Sibuyan Island, Capiz Province, Magallanes (Mt Giting-giting).

Mallotus sarawakensis Pax & K. Hoffm. in *Engl., Pflanzenr.* IV.147.vii (1914) 201; Merr., *J. Straits Branch Roy. Asiat. Soc., Special number* (1921) 340; Pax & K. Hoffm. in *Engl. & Harms, Nat. Pflanzenfam.* ed. 2, 19c (1931) 117. — Type: *Hose 184* (holo B†; iso A, EDI, K, L), Borneo, Sarawak, Baram District.

Mallotus leptophyllus Pax & K. Hoffm. in Engl., Pflanzn. IV.147.vii (1914) 203; Merr., J. Straits Branch Roy. Asiat. Soc., Special number (1921) 339; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117. — Type: *Hose 26* (holo B†; iso L), Borneo, Sarawak, Baram District.

Mallotus pseudopenangensis Pax & K. Hoffm. in Engl., Pflanzn. IV.147.vii (1914) 203; in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117. — Lectotype, selected here: *BS 7396 (Ramos)* (lecto US; isolecto NY), Philippines, Luzon, Cagayan.

Mallotus xylacanthus Pax & K. Hoffm. in Engl., Pflanzn. IV.147.vii (1914) 203, 397; S. Moore, J. Bot. 63 (1925) 103; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117. — Lectotype, selected here: *Forbes 3237* (lecto L), Sumatra.

Mallotus papuanus (J.J. Sm.) Pax & K. Hoffm. var. *glabrescens* Pax & K. Hoffm. in Engl., Pflanzn. IV.147.viii (1919) 19. — Lectotype, selected here: *Ledermann 9803* (lecto L), New Guinea, 'Aprilfluss'.

Mallotus papuanus (J.J. Sm.) Pax & K. Hoffm. var. *intermedius* Pax & K. Hoffm. in Engl., Pflanzn. IV.147.viii (1919) 19. — Type: *Ledermann 9539* (holo B†; iso K, L), New Guinea, Etappenberg.

Mallotus penangensis Müll. Arg. var. *grandifolia* Ridl., Fl. Malay Penins. 3 (1924) 293. — Lectotype, selected here: *Ridley 6481* (lecto SING), Singapore, Sungei Morai.

Mallotus tenuipes Airy Shaw, Kew Bull. Add. Ser. 8 (1980) 393. — Type: *S 32221 (Wright & Othman Ismawi)* (holo K; iso L), Sarawak.

Small trees up to 27 m tall, dbh up to 40 cm; bole straight, fluted. Outer bark smooth, hoop-marked, slightly fissured; sapwood quite hard. *Indumentum* sparse, short to long. *Branches* smooth to rarely fissured when older, glabrescent, clavate glands absent to sometimes few at nodes. *Stipules* caducous (to semi-persistent), narrowly triangular to ovate, 2–10 by 1–3 mm, margin entire, apex acute to sometimes rounded, glabrous to hairy abaxially, glabrous adaxially, clavate to punctulate glands absent or present. *Non-reduced leaves*: petiole 4–45 by 0.8–1.5 mm, sparsely hairy, glabrescent, clavate to punctulate glands absent to sometimes few; blade ovate to obovate, 5–25.5 by 2–11 cm, length-width ratio 1.7–5.1, coriaceous, base acute (to obtuse to rounded), rarely oblique, margin entire to slightly wavy, apex acuminate to cuspidate, upper surface smooth, glabrous to sparsely hairy on veins, clavate to punctulate glands absent to few, lower surface smooth, glabrous to sparsely hairy, especially on midrib, domatia absent or present, with simple hair tufts; venation pinnate, 7–14 secondary veins per side, ending parallel to the margin. *Stipuliform leaves* narrowly triangular to ovate, 1–4.7 by 1.3–2 mm, margin entire to irregular, apex acute to rounded, hairy abaxially only, clavate to punctulate glands absent to few. *Staminate inflorescences* up to 7.5 cm long, basally 0.4–1 mm thick, unbranched, hairy, clavate to punctulate glands absent to few, nodes up to 54 per inflorescence; bracts triangular to ovate to deltoid, 0.6–2.5 by 0.5–2.5 mm, margin entire to rarely irregular, apex acute, hairy abaxially only, clavate to punctulate glands absent. *Buds* globose with acuminate apex, hairy, clavate to punctulate glands absent to numerous. *Staminate flowers* 3.7–5.5 mm diam., greenish white to pinkish white to red; bracteoles absent to rarely present, narrowly triangular, c. 2 by 0.4 mm, margin entire, apex acute, hairy abaxially only, clavate to punctulate glands absent to few; pedicels 2–3 mm long, hairy, clavate to punctulate glands absent or present; sepals 3 or 4, free to basally connate, broadly ovate to elliptical, often recurved, 2–5 by 2–2.5 mm, margin entire to irregular, apex acute to acuminate, hairy abaxially only, clavate to punctulate glands absent to numerous; stamens up to c. 98, filaments 3–4 mm long, glabrous to rarely hairy, clavate glands absent; anthers 0.6–0.7 by 0.5–0.7 mm, basi- to dorsifixed; connective widened,



Fig. 10. *Mallotus penangensis* Müll. Arg. a. Habit of pistillate plant; b. detail of staminate inflorescence; c. short petioled form (most common in Sumatra and Borneo) (a: Keßler & Arbainsyah B 604, L; b: Ambriansyah & Arifin W 187, L; c: Ambri & Arifin W 2, L).

sometimes apically protruding. *Pistillate inflorescences* up to 12 cm long, basally 1–1.5 mm thick, usually only terminal fruit developing, unbranched, hairy, clavate glands absent to numerous, nodes up to 18 per inflorescence; bracts persistent, broadly ovate to ovate, 0.9–2 by 0.8–1.1 mm, margin entire, apex acute to acuminate, hairy abaxially only, clavate glands absent or present. *Pistillate flowers*: bracteoles absent; pedicels up to 10 mm long, hairy, clavate to punctulate glands absent or present; sepals 4 or 5, usually free to sometimes basally connate, narrowly triangular, often recurved, 2–7 by 0.5–1.2 mm, margin entire, apex acute, hairy abaxially only, clavate glands absent to numerous; ovary 3-locular, echinate, densely woolly hairy, clavate glands absent or present, spines up to 5 mm long, hairy, apically usually few long hairs, clavate glands absent to few; style 0.7–1 mm long, hairy, clavate glands absent; stigmas 5–16 mm long, densely covered with granulate papillae on the inside, hairy abaxially, clavate glands absent to few. *Fruit* an echinate, lobed capsule, 9–15 by 6–14 mm, green to pinkish to red; carpel inside simple to stellate hairy, punctulate glands absent or present; column 3.5–7 mm long, 3.4–5 mm wide. *Seeds* glossy, roughly globose, 4.5–7 by 3–6.5 by 2.5–8 mm; hilum elliptic to orbicular, 0.5–1.7 by 0.5–1.5 mm.

Distribution — From S Thailand and the Andaman Islands to the Philippines and New Guinea.

Habitat & Ecology — Mainly in the understorey of primary forest or late secondary forest, where it can be very common, sometimes also in young secondary forest or scrub, along creeks, river banks, and roadsides; usually on dry, well-drained terrain, occasional also in swampy places; soils variable: from clay to sandy to loamy, also on limestone. Altitude up to 1666 m.

Uses — Leaves used against 'sakit kepala' (headache) in Sumatra. The wood has a faint sweet aroma and is used for fires and for house construction (Malaysia).

Note — A very variable species, hence the large number of synonyms. The petioles range from very short (c. 0.5 cm) to very long (c. 4.5 cm); the stipules can be very small (c. 2 mm long) to quite large (c. 1 cm long); domatia can be present or absent; leaf sizes range from small (c. 5–7 cm long) to very long (up to c. 27 cm); the pistillate inflorescences can be slender with only 1 terminal fruit developing, or quite thick and with many fruits developing over the whole inflorescence; the fruits can have long spines (whole distribution range) to very short to almost verrucose spines (mainly the Moluccas and New Guinea). As a rule (but not always) the plants become more hairy, the stipules become longer, domatia are more often present, and the inflorescence axes become thicker with more fruits with increasing altitude.

11. *Mallotus stipularis* Meijer ex Airy Shaw — Fig. 11, Map 4

Mallotus stipularis Meijer (Bot. News Bull. 7 (1967) 53, anglise) ex Airy Shaw, Kew Bull. 21 (1968) 398; Meijer, Bot. News Bull. 10 (1968) 231; Kew Bull. 26 (1972) 169; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 164; Kew Bull. 36 (1981) 329. — Type: *Lörzing 14746* (holo K; iso L), Sumatra, N Sibajak, W of Bandarbaru.

Shrubs to small trees up to 17(–27) m tall, dbh up to 30 cm. Outer bark smooth to (slightly) rough, scaly to flaking, mottled. *Indumentum* usually dense, short to long. *Branches* smooth, pustulose when young, glabrescent, clavate glands absent or present.



Fig. 11. *Mallotus stipularis* Airy Shaw. a. Habit of pistillate plant; b. detail of staminate inflorescence (a: Arifin *et al.* B 561, L; b: Arifin *et al.* B 559, L).

Stipules semi-persistent, narrowly ovate to ovate to linear, 7–13 by 1–3.5 mm, often blackish when dried, margin entire, involute, apex rounded (to acute), hairy, long hairs along margin, clavate glands absent to few basally. *Non-reduced leaves*: petiole pustulose, 9–30 by 0.8–1.1 mm, hairy, clavate glands absent (to few); blade elliptic to obovate, 8.5–23 by 3–6.5 cm, length-width ratio 2.5–4, chartaceous to coriaceous, base obtuse to truncate to slightly cordate, often oblique, margin entire to slightly wavy to apically dentate to serrate, apex cuspidate, upper surface smooth, glabrous to hairy,

glabrescent, punctulate glands absent to numerous, lower surface smooth, hairy, punctulate to clavate glands absent or present, domatia usually present, with hair tufts; venation pinnate, 11–15 secondary veins per side, ending parallel to the margin or in the margin. *Stipuliform leaves* linear to narrowly ovate, 4–10 by 1.5–2.5 mm, margin entire to wavy, apex rounded to acute, hairy, long hairs along margin, clavate glands absent. *Staminate inflorescences* up to 5 cm long, basally c. 0.6 mm thick, unbranched, hairy, tubular to clavate glands present, nodes up to 18 per inflorescence; bracts ovate, c. 1.1 by 0.6 mm, margin entire, apex acute, hairy abaxially only, clavate glands absent to few. *Buds* globose, hairy. *Staminate flowers* c. 4.5 mm diam., greenish yellow to reddish; bracteoles absent; pedicels 1–2 mm long, hairy, clavate glands present; sepals 3, basally connate, elliptic, recurved, c. 3 by 2 mm, margin entire, apex acute, hairy abaxially only, clavate glands absent; stamens up to c. 56, filaments c. 2 mm long; anthers c. 0.4 by 0.3 mm, basi- to dorsifixed; connective not to slightly widened. *Pistillate inflorescences* up to 8 cm long, hairy, clavate glands absent (to present), nodes up to 9 per inflorescence; bracts ovate to narrowly ovate, 1.5–4 by 1 mm, margin entire, apex acute to rounded, hairy, clavate glands absent to few. *Pistillate flowers* white; bracteoles absent or present, subtending the calyx, ovate, c. 3 by 1 mm, margin entire, apex acute, hairy, long hairs along margin, clavate glands absent; pedicels 3–4.5 mm long, hairy, clavate glands absent to numerous; sepals 3–5, free, ovate to narrowly triangular, 4–7 by 0.9–1.5 mm, margin entire, apex rounded to acute, hairy, long hairs along margin, clavate glands absent; ovary 3-locular, echinate, woolly hairy, clavate glands absent, spines 0.5–1.8 mm long, hairy, long hairs apically, clavate glands absent; style 1–2.5 mm long, hairy, clavate glands absent; stigmas 6–11 mm long, densely covered with granulate papillae on the inside, hairy abaxially, clavate glands absent. *Fruit* an echinate, lobed capsule, 10–14 by 5–10 mm, greenish; carpel inside hairy, clavate glands absent; column 4.5–5 by 4.5–5.5 mm. *Seeds* glossy, globose, c. 5 by 5 by 4 mm; hilum elliptical to deltoid, c. 1.5 by 1–1.5 mm.

Distribution — S Thailand, Sumatra, and Borneo.

Habitat & Ecology — Mainly a locally common understorey tree in primary forest but also in secondary forest; soils alluvial to dry, basalt-derived to clay-rich to sandy. Altitude up to 1100 m.

Note — Thai specimens can be almost glabrous.

12. *Mallotus wenzelianus* Slik — Fig. 12, Map 4

Mallotus wenzelianus Slik, Blumea 43 (1998) 229. — Type: Wenzel 2697 (holo G; iso A, UC), Philippines, Mindanao, Surigao Province, Jubud.

Small trees up to 7 m tall, dbh up to 15 cm. *Indumentum* dense, short. *Branches* smooth, pustulose, glabrescent, clavate glands absent to few. *Stipules* semi-persistent, narrowly triangular, 11–20 by 1.4–2.2 mm, margin entire, apex acute, hairy, clavate glands absent to numerous. *Non-reduced leaves*: petiole 10–22 by 1.5–2 mm, pustulose, hairy, clavate glands absent to numerous; blade (ovate to) elliptic, 15–27 by 4–10 cm, length-width ratio 2.6–3.7, chartaceous, base cuneate, margin slightly serrate, apex cuspidate, upper surface smooth, sparsely hairy, on midrib and veins, punctulate glands numerous, lower surface smooth, hairy, especially on midrib and veins, punctulate glands numerous, domatia absent; venation pinnate, 9–12 secondary veins per

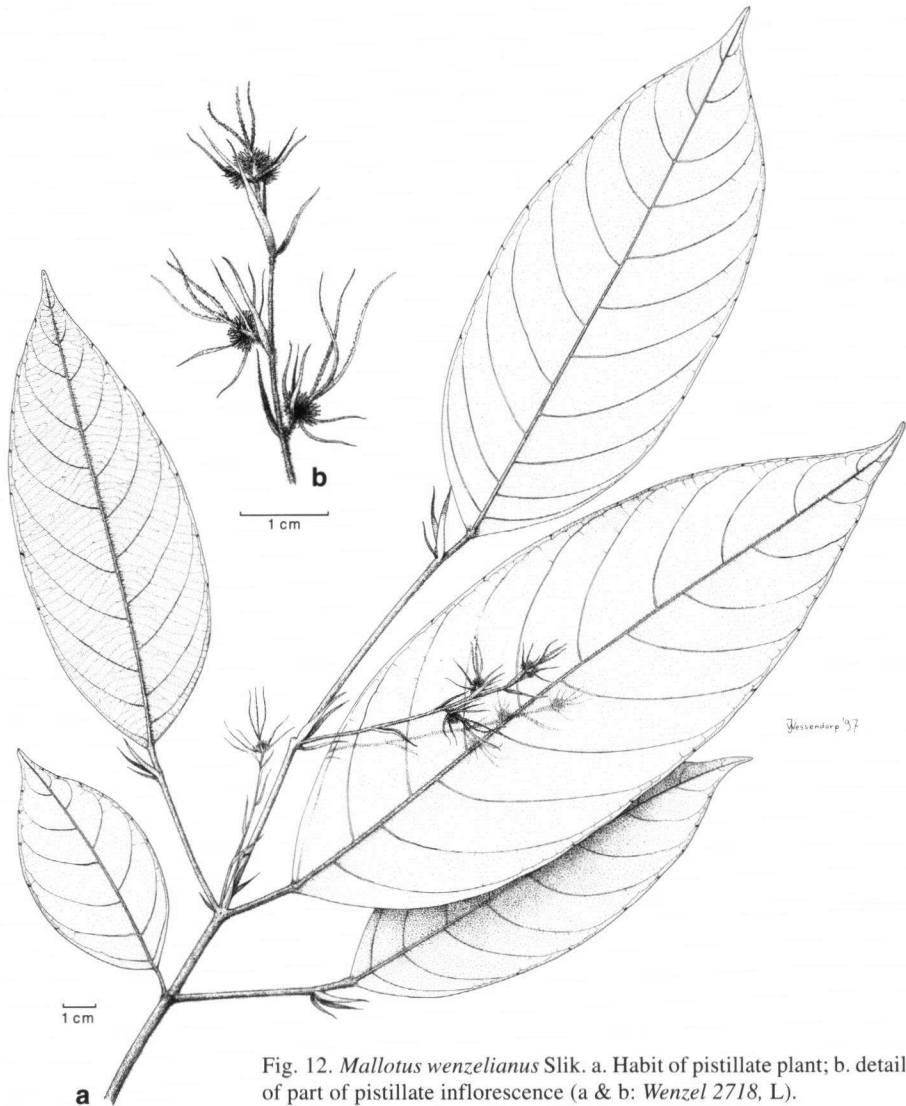


Fig. 12. *Mallotus wenzelianus* Slik. a. Habit of pistillate plant; b. detail of part of pistillate inflorescence (a & b: Wenzel 2718, L).

side, ending in the margin. *Stipuliform leaves* narrowly triangular, 3.5–12 by c. 1 mm, margin entire, apex acute, hairy, clavate glands present. *Staminate inflorescences* unknown. *Pistillate inflorescences* up to 11 cm long, basally c. 1 mm thick, only terminal fruit developing, unbranched, hairy, clavate glands present, nodes up to 6 per inflorescence; bracts narrowly triangular, 5–11 by 0.6–1.3 mm, margin entire, involute, apex acute, hairy, glabrous to hairy adaxially, clavate glands few to numerous. *Pistillate flowers*: bracteoles rarely present, linear, c. 3.3 by 0.2 mm, margin entire, involute, apex acute, hairy, clavate glands few; pedicels 1.5–6 mm long, hairy, clavate glands few; sepals 4 or 5, free, narrowly triangular, 8–12 by 0.9–1 mm, margin entire, apex

acute, hairy abaxially only, clavate glands on outside only; ovary 3-locular, echinate, densely hairy, clavate glands few, spines 2–4 mm long, hairy, long hairs apically, clavate glands absent; style c. 1 mm long, hairy, clavate glands absent; stigmas up to 22 mm long, densely covered with granulate papillae on the inside, hairy abaxially, clavate glands absent. *Fruit* an echinate, lobed capsule, 10–14 by c. 10 mm, hairy, clavate glands few; carpel inside hairy, clavate glands absent; column c. 5 by 3–4 mm. *Seeds* unknown.

Distribution — Mindanao in the Philippines.

Habitat & Ecology — In forest. Altitude up to 150 m.

Section *Stylanthus*

The name *Stylanthus* was first used for a section within the genus *Rottlera* (Reichenbach & Zollinger, 1856). Shortly afterwards, Müller Argoviensis (1865) placed *Rottlera* within the genus *Mallotus* and the type species of the section *Stylanthus* (*M. floribundus* (Blume) Müll. Arg.) was placed in his newly proposed section *Eumallotus*. Pax & Hoffmann (1914) decided to use the section *Stylanthus* within the genus *Mallotus*. Airy Shaw included the following species within this section: *M. floribundus* (Blume) Müll. Arg., *M. garrettii* Airy Shaw, *M. lackeyi* Elmer, *M. oblongifolius* (Miq.) Müll. Arg., *M. peltatus* (Geiseler) Müll. Arg., and *M. thorellii* Gagnep. Forster (1999) described *M. surculosus* for Australia, which also belongs within this section.

The section is characterised by its strong smell of fenugreek when dried. The indumentum is a mixture of simple, tufted and stellate hairs. The twigs are lenticellate, and the stipules are usually small and caducous. The leaves are alternate (to apically pseudo-opposite) and usually conspicuously terminally grouped on the twigs. They are often peltate, and the upper surface displays several basal macular glands.

Mallotus sect. *Stylanthus* (Rchb. f. & Zoll.) Pax & K. Hoffm.

Mallotus sect. *Stylanthus* (Rchb. f. & Zoll.) Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 172; Airy Shaw, Kew Bull. 20 (1966) 38; 21 (1968) 387; 26 (1972) 293; Kew Bull. Add. Ser. 4 (1975) 160; 8 (1980) 163; Muelleria 4 (1980) 233; Kew Bull. 36 (1981) 323. — *Adisca* Blume, Bijdr. Fl. Ned. Ind. 11 (1825) 609. — *Rottlera* sect. *Stylanthus* Rchb. f. & Zoll., Verhand. Naturk. Vereen. Ned.-Indië 1 (1856) 312. — Type species: *Adisca floribunda* Blume (= *Mallotus floribundus* (Blume) Müll. Arg.).

Shrubs to small trees, dioecious, (strongly) smelling of fenugreek when dried. *Indumentum* simple, tufted and stellate, most parts covered with glands (gland-dotted) producing a clear yellowish globose shaped exudate. *Branches* often conspicuously lenticellate. *Stipules* usually caducous. *Leaves* terminally grouped on branches, simple, peltate or not, alternate to apically pseudo-opposite, chartaceous when dried; petioles often with constricted base and/or apex when dried; blade margin with glands, upper surface always with conspicuous basal macular glands, more or less gland-dotted, usually densely covered with white granular dots, lower surface usually conspicuously gland-dotted, domatia absent or present; venation palmate, tripliveined or pinnate, ending in or parallel to the margin. *Inflorescences* not branched, axillary to terminal, usually solitary; bracts usually (early) caducous. *Flowers* actinomorphic, small, not exceeding 1 cm diam., petals absent, disc absent. *Staminate inflorescences* raceme-like thyrses,

several flowers per bract. *Staminate flowers*: bracteoles usually absent; sepals 2–5, often recurved; anthers basi- to dorsifixed; thecae 2, parallel, extrorse, opening lengthwise, sometimes connective widened; pistillode absent. *Pistillate inflorescences* racemes. *Pistillate flowers*: calyx caducous to (partly) persistent, completely enclosing ovary with only stigmas exerted, when fruits develop the calyx is torn into 2–5 lobes; ovary usually 3-locular, echinate; ovules 1 per locule, axillary, apotropous, ascending; styles persistent, apically splitting into 3 lineate, plumose stigmas; staminodes absent. *Fruits* dehiscent, usually 3-lobed, echinate, loculicidal-septicidal capsules; carpels inside glabrous or tufted to stellate, gland-dotted or not. Seeds globose to laterally flattened, usually 5–8 mm diameter.

Distribution — From India and Sri Lanka to S China to New Guinea, the Solomon Islands and Australia.

Habitat & Ecology — In primary and secondary forest, often preferring open places (gaps, river- and roadsides), but sometimes also in the forest understorey.

KEY TO THE SPECIES

- 1a. Leaves not peltate to sub-peltate, distance between base of leaf blade and petiole insertion not exceeding 1 mm 2
- b. Leaves peltate, distance between base of leaf blade and petiole insertion clearly exceeding 1 mm 3
- 2a. Leaves broadly ovate to ovate, 5–12 by 2.5–8 cm, length-width ratio 1.3–2.3, base not to slightly cordate, margin irregularly wavy, lower surface glaucous, domatia absent, glabrous (to sparsely hairy on veins), densely gland-dotted, upper surface usually with 1–4 macular glands near the petiole insertion, venation ending in the margin. — N Thailand and Laos **14. M. garrettii**
- b. Leaves ovate to obovate, 3.5–21(–29) by 1–13 cm, length-width ratio (1.3–)2–4, base slightly to deeply cordate, margin usually more or less dentate, lower surface not glaucous, domatia usually present as hair tufts, glabrous to densely hairy, not to (densely) gland-dotted, upper surface usually with 2–7(–13) macular glands near the petiole insertion, venation ending parallel to the margin. — India and S China to New Guinea **16. M. peltatus**
- 3a. Petioles and twigs glabrous or with few scattered hairs (naked eye) 4
- b. Petioles and twigs conspicuously hairy (naked eye) 5
- 4a. Leaf blade usually broadly ovate to orbicular, length-width ratio 0.7–1.9, margin slightly wavy (to dentate), apex acute to acuminate, lower surface with two to several conspicuously large hair tufts at petiole insertion (except in E Papua New Guinea and the Solomon Islands), rarely hairy domatia present higher along the midrib, often glaucous, (sparsely to) densely gland-dotted, venation ending in the margin **13. M. floribundus**
- b. Leaf blade ovate to obovate, length-width ratio (1.3–)2–4, margin often dentate, apex acuminate to aristate, lower surface without conspicuous large hair tufts at petiole insertion (hair tufts can be present, but are similar to those in axils of veins higher up the midrib), hairy domatia usually present in axils of most veins along the midrib, not glaucous, not (to densely) gland-dotted, venation ending parallel to the margin **16. M. peltatus**

- 5a. Stipules caducous to persistent, up to 9 mm long. Upper leaf surface conspicuously yellowish red gland-dotted (to not or sparsely gland-dotted, but then stipules 5–9 mm long), lower surface usually gland-dotted (sometimes very densely so) . . . 6
- b. Stipules early caducous, up to 5 mm long. Upper leaf surface without or with only a few yellowish red glands, lower surface not to gland-dotted . . . **16. M. peltatus**
- 6a. Stipules caducous to (semi-)persistent, 2.5–5 mm long, placed at petiole insertion. Leaves usually small, ovate to broadly ovate to orbicular, 3–16 by 2–15 cm, distance between base leaf blade and petiole insertion 3–22 mm, lower surface usually very densely gland-dotted (often exceeding 100 glands per cm²). Staminate inflorescences up to 11 cm long, up to 38 nodes with flowers; bracts caducous, triangular to ovate to broadly ovate, 1.5–2.8 mm long; buds globose. Pistillate inflorescences up to 14.5 cm long, up to 18 nodes with flowers; bracts caducous, triangular to ovate to broadly ovate, 1.8–3.8 mm long. Fruits verrucose to echinate. — SE Asian mainland and Australia, not in Borneo and the Philippines 7
- b. Stipules usually semi-persistent, 5–9 mm long, sometimes placed c. 3 mm above petiole insertion. Leaves usually very large, ovate (to obovate), 5–33.5 by 3–21 cm, distance between base leaf blade and petiole insertion 7–38 mm, lower surface usually sparsely gland-dotted (usually 0–16 glands per cm²). Staminate inflorescences up to 32 cm long, up to 64 nodes with flowers; bracts caducous to persistent, narrowly triangular to triangular, 1.5–6.5 mm long; buds ovoid. Pistillate inflorescences up to 37 cm long, up to 54 nodes with flowers; bracts caducous to persistent, narrowly triangular, 3.5–7 mm long. Fruits echinate. — Borneo and the Philippines **15. M. lackeyi**
- 7a. Leaf apex acute to acuminate, lower surface without domatia; 6–9 secondary veins per side. Staminate pedicels 2.5–3 mm long. Pistillate pedicels 4–9 mm long. Fruits sparsely echinate, spines up to 2 mm long. — Australia **17. M. surculosus**
- b. Leaf apex often aristate, lower surface usually with hairy domatia; 4–7 secondary veins per side. Staminate pedicels 1.3–2.3 mm long. Pistillate pedicels 1–1.5 mm long. Fruits densely verrucose to shortly echinate, spines up to 1 mm long. — SE Asian mainland **18. M. thorelii**

13. Mallotus floribundus (Blume) Müll. Arg. — Fig. 13, Map 5

Mallotus floribundus (Blume) Müll. Arg., *Linnaea* 34 (1865) 187; in DC., *Prodr.* 15, 2 (1866) 962; Rolfe, *J. Bot.* 23 (1885) 215; Hook. f., *Fl. Brit. India* 5 (1887) 432; Boerl., *Handl. Fl. Ned. Ind.* 3, 1 (1900) 288; J. J. Sm., *Meded. Dept. Landb. Ned.-Indië* 10 (1910) 417; Elmer, *Leafl. Philipp. Bot.* 4 (1911) 1297; Koord., *Exkurs.-Fl. Java* (1912) 492; Pax & K. Hoffm. in *Engl., Pflanzenr.* IV.147.vii (1914) 173; IV.147.viii (1919) 17; Merr., *J. Straits Branch Roy. Asiat. Soc.*, Special number (1921) 338; *Enum. Philipp. Flow. Pl.* 2 (1923) 433; Ridl., *Fl. Malay Penins.* 3 (1924) 290; Pax & K. Hoffm. in *Engl. & Harms, Nat. Pflanzenfam.* ed. 2, 19c (1931) 115; Burkill, *Dict. Econ. Prod. Malay Penins.* 2 (1935) 1395; Corner, *Wayside Trees Mal.* (1940) 271; Backer & Bakh. f., *Fl. Java* 1 (1964) 483; Meijer, *Bot. News Bull.* 7 (1967) 51; Airy Shaw, *Kew Bull.* 21 (1968) 385; 26 (1972) 305; Whitmore, *Tree Fl. Malaya* 2 (1973) 113; Airy Shaw, *Kew Bull. Add. Ser.* 4 (1975) 172; *Kew Bull.* 31 (1976) 392; *Kew Bull. Add. Ser.* 8 (1980) 166; *Kew Bull.* 36 (1981) 323, 326; *Alph. Enum. Euphorb. Philipp. Isl.* (1983) 36; Corner, *Wayside Trees Mal.* ed. 2 (1988) 306; Nguyen Nghia Thin, *Euph. Vietnam* (1995) 11. — *Adisca floribunda* Blume, *Bijdr. Fl. Ned. Ind.* 11 (1825) 610. — *Rottlera floribunda* (Blume) Hassk., *Cat. Hort. Bot. Bogor.* (1844) 238; Rchb. f. & Zoll., *Linnaea* 28 (1856) 313; Baill., *Etude Euphorb.* (1858) 426; Miq.,

Fl. Ned. Ind. 1 (1859) 393. — *Mappa floribunda* (Blume) Zoll. & Mor., Syst. Verz. (1855) 17. — *Mallotus floribundus* (Blume) Müll. Arg. var. *genuinus* Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 174, nom. inval. — Lectotype, selected here: *Blume s.n.* (L sheet 904.105-104) (lecto L), Java.

Ricinus tanarius Lour., Fl. Cochinch. 1 (1790) 584, non L.; 2 (1793) 717, nom. inval. — Type: *Igyn G. 123* (holo BM), Bach dan nam.

Mallotus amentiformis Müll. Arg., Flora 47 (1864) 468; in DC., Prodr. 15, 2 (1866) 962. — Type: *Griffith KD 4762* (iso K), Malay Peninsula.

Mallotus annamiticus Kuntze, Revis. Gen. Pl. 2 (1891) 608; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 204; Merr., Trans. Amer. Philos. Soc., New Ser. 24 (1935) 236. — *Coelodiscus annamiticus* (Kuntze) Gagnep. in Lecomte, Fl. Gén. Indo-Chine 5 (1925) 375. — Type: *Kuntze 3823* (holo NY; iso NY), Annam, Turong.

Mallotus floribundus (Blume) Müll. Arg. var. *pilosus* Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 174; Airy Shaw, Kew Bull. Add. Ser. 8 (1980) 166. — Lectotype, selected here: *Lauterbach 1232* (lecto WRSL), Papua New Guinea.

Shrubs to small trees up to 18(–25) m tall, dbh up to 30 cm; bole mostly straight; crown bushy, much branching. Outer bark smooth to fissured, lenticellate; sapwood soft. *Indumentum* glabrous or simple to tufted, whitish to creamish. *Branches* lenticellate, glabrescent, gland-dotted on young parts. *Stipules* early caducous, triangular to ovate, 1.6–3.8 by 0.6–1.3 mm, margin irregular to entire, apex acute (to acuminate), hairy abaxially only, gland-dotted abaxially or not. *Leaves* peltate, petiole insertion 3–27 mm from base of leaf blade; petiole 11–152 by 0.4–2.5 mm, glaucous, basally usually constricted when dried, apically sometimes slightly constricted, glabrous to sparsely hairy, glabrescent, gland-dotted or not; blade (ovate) to broadly ovate to orbicular, 2–20 by 2–17.5 cm, length-width ratio 0.7–1.9, base rounded to truncate to slightly emarginate, margin irregularly wavy (to slightly dentate to crenate), marginal glands 1–12 per leaf side, apex acute to acuminate (to slightly cuspidate), upper surface smooth, glabrous (to sparsely hairy at petiole insertion), sparsely gland-dotted or not, especially at petiole attachment, basal macular glands 0–8 on veins, 3–55 mm from petiole insertion, apical macular glands 0–19 on veins, 1–6(–17) mm from margin, lower surface smooth, usually glaucous, glabrous to hairy, gland-dotted, domatia present, basally often conspicuously large; venation palmate, 7–11 veins originating from petiole, 3–6 secondary veins per side along midrib, ending in the margin. *Staminate inflorescences* up to 23 cm long, basally up to c. 1 mm thick, solitary to sometimes grouped together, glabrous to hairy, gland-dotted, nodes up to 46 per inflorescence, flowers 1–9 per node; bracts early caducous, triangular to ovate to broadly ovate, cup-shaped around pedicel base, 0.6–2.6 by 0.5–2.8 mm, margin entire to irregular, apex acute (to acuminate to rounded), hairy abaxially, glabrous (to sparsely hairy) inside, gland-dotted or not. *Buds* globose, glabrous to hairy, gland-dotted or not. *Staminate flowers* 2–6 mm diam., white yellowish, slightly fragrant; pedicels 1.3–5 mm long, glabrous to hairy, gland-dotted or not; sepals 2–5, free to basally connate, elliptic to ovate (narrowly triangular to triangular), often recurved, 0.5–5 by 0.5–2.3 mm, margin entire, apex (rounded to) acute (to acuminate), glabrous to hairy, gland-dotted or not; stamens up to 56, filaments up to 4 mm long, glabrous to rarely hairy, rarely gland-dotted; anthers 0.3–0.5 by 0.3–0.6 mm, basifixed; thecae glabrous to hairy along aperture; connective not (to slightly) widened. *Pistillate inflorescences* up to 22 cm long, basally 1–2 mm thick, usually solitary, hairy, glabrescent, gland-dotted, nodes up to 14(–19) per inflorescence; bracts caducous, (triangular to) ovate to broadly

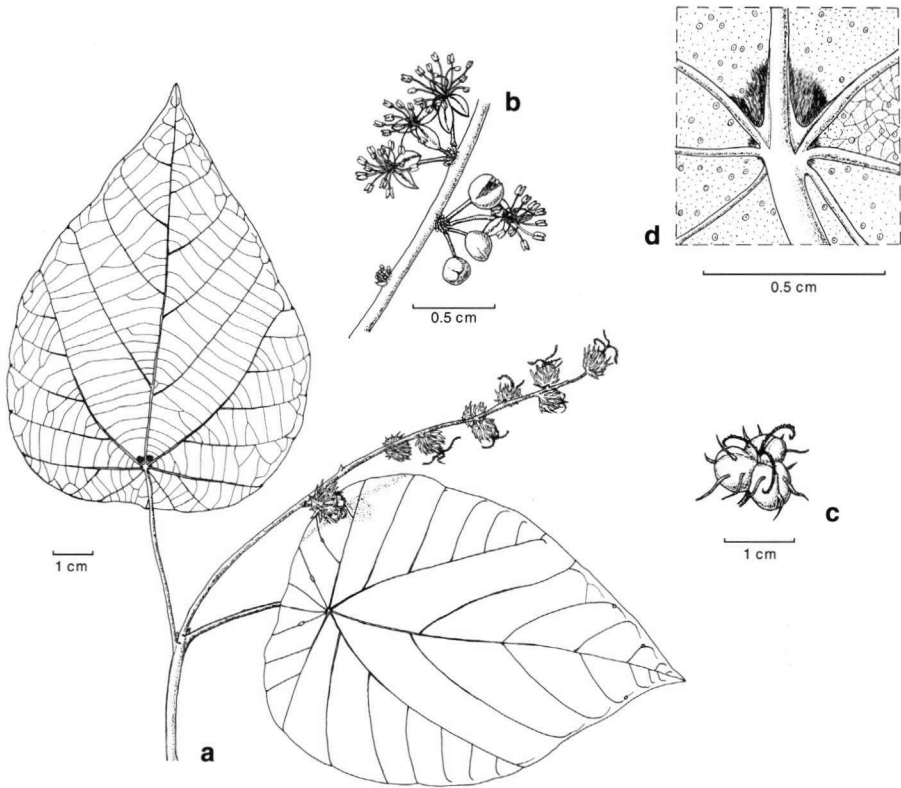
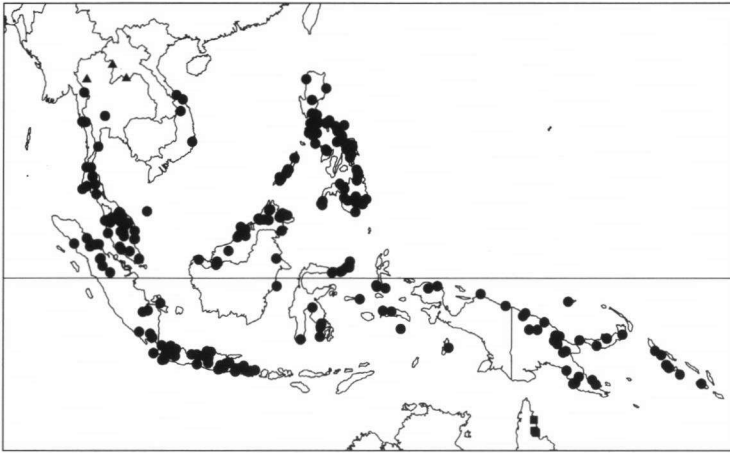


Fig. 13. *Mallotus floribundus* (Blume) Müll. Arg. a. Habit of pistillate plant; b. detail of staminate inflorescence; c. fruit; d. hairy domatia at petiole insertion of the lower leaf surface (a, c & d: *S* 31697 (*Anderson*), L; b: *SAN* 33313 (*Ampuria*), L).

ovate, 0.9–3.5 by 0.6–2 mm, margin irregular to entire, apex (rounded to) acute (to acuminate), hairy, gland-dotted or not. *Pistillate flowers* pale green to whitish; bracteoles absent to caducous, (broadly) ovate to elliptic, rarely linear to triangular, 0.5–1.4 by 0.3–0.8 mm, margin entire to irregular, apex (rounded to) acute (to acuminate), glabrous to hairy abaxially only, gland-dotted or not; pedicels 0.7–7 mm long, glabrous to hairy, gland-dotted or not; calyx caducous, 2–5-lobed, free to more or less connate, narrowly triangular to triangular, 1.1–6 by 0.2–1.8 mm, margin entire to irregular, apex acute (to acuminate), hairy abaxially, glabrous to hairy adaxially, gland-dotted or not; ovary (2- or) 3- (or 4-)locular, echinate, densely woolly hairy, densely gland-dotted, spines up to 7 mm long, hairy, gland-dotted or not, especially basally; style up to 6 mm long, glabrous to hairy, gland-dotted; stigmas 4–11 mm long, densely covered with granulate papillae adaxially, glabrous to hairy abaxially, gland-dotted abaxially. *Fruit* an echinate, lobed capsule, 10–20 by 7–12 mm, green, glabrous to hairy, densely gland-dotted; carpel inside glabrous to hairy, gland-dotted or not; column 4–7 by 4–10 mm. *Seeds* glossy, globose, 4.7–8 by 5 by 3–8 mm; hilum deltoid to cordate, 0.5–2.2 by 0.8–3 mm.



Map 5. Distribution of *Mallotus* sect. *Stylanthus*: *Mallotus floribundus* (Blume) Müll.Arg. (●), *M. garrettii* Airy Shaw (▲), and *M. surculosus* P.I. Forst. (■).

Distribution — SE Asia to New Guinea and the Solomon Islands.

Habitat & Ecology — Locally common in primary and secondary forest, mainly in open places; often found on river banks, along roads, in gaps, clearings, and open fields; in badly drained swampy areas as well as in dry areas; on most soil types, from sandy to loamy to clayey to limestone. Altitude up to 500(–933) m.

Uses — The rather aromatic male flowers are used in Java with rice-flour in making scented medicinally applied powders. In Peninsular Malaysia a decoction of the root is administered against fever, after child birth, and against stomachache and cholera. In Sumatra the tough wood is used to make small objects. Cultivated as an ornamental in Burma.

Note — This species, although very widespread, is remarkably uniform in shape throughout its distribution range. There are only two characters that change conspicuously from west to east. Firstly, east of Borneo the lower leaf surfaces of the plants are often densely velvety hairy as opposed to (almost) glabrous west of Sulawesi. This was reason for Pax & Hoffmann (1914) to describe the variety *pilosus*. Secondly, in eastern New Guinea and the Solomon Islands the conspicuous hair tufts in the axils of the basal secondary leaf veins are often (Papua New Guinea) or always (Solomon Islands) absent.

14. *Mallotus garrettii* Airy Shaw — Fig. 14, Map 5

Mallotus garrettii Airy Shaw, Kew Bull. 21 (1968) 387; 26 (1972) 306. — Type: *Garrett 140* (holo K; iso L), Siam, Maharat Circle, Nan District, Doi Pha Ngua.

Shrubs to small trees up to 8 m tall. *Indumentum* lacking or sparse. *Branches* lenticellate, glabrescent, gland-dotted on young parts. *Stipules* early caducous, triangular, 1.5–1.9 by 0.8–0.9 mm, margin irregular, apex acute, glabrous to sparsely hairy abaxially, glabrous adaxially, not gland-dotted. *Leaves* sometimes slightly peltate,

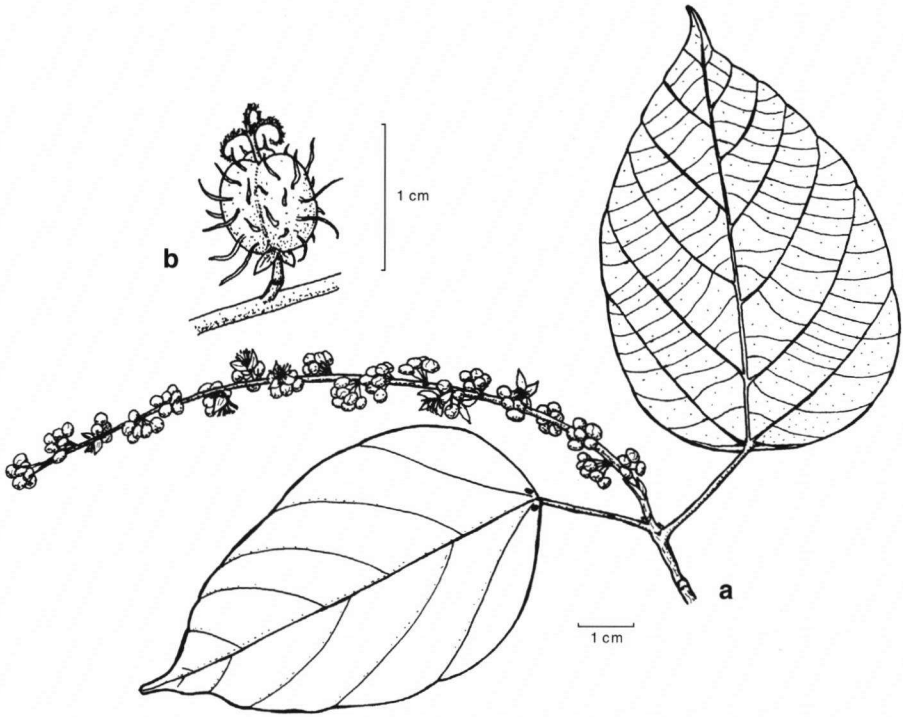


Fig. 14. *Mallotus garrettii* Airy Shaw. a. Habit of staminate plant; b. detail of part of the pistillate inflorescence with a fruit (a: Garrett 140, L; b: Kerr 21234, K).

distance between leaf blade base and petiole insertion up to 1 mm; petiole 12–75 by 0.4–1.2 mm, glaucous, basally (slightly) constricted when dried, glabrous (to sparsely hairy), gland-dotted or not; blade ovate, 5–12 by 2.5–8 cm, length-width ratio 1.3–2.3, base round to truncate to slightly emarginate, margin irregularly wavy, marginal glands 7–17 per leaf side, apex acuminate (to cuspidate), upper surface smooth, glabrous, not gland-dotted (or sparsely at petiole insertion), basal macular glands 1–4 on veins, 0.5–10 mm from petiole insertion, apical macular glands 0–5 on veins, 1–2 mm from margin, lower surface smooth, glaucous, glabrous to sparsely hairy on veins, densely gland-dotted, domatia absent; leaves tripliveined, 3–6 secondary veins per side, ending parallel to or in the margin. *Staminate inflorescences* up to 13 cm long, basally c. 1 mm thick, sometimes grouped, hairy, gland-dotted, especially at nodes, nodes up to 31 per inflorescence, flowers 1–8 per node; bracts early caducous, broadly ovate, c. 0.7 by 0.6–1.1 mm, margin irregular, apex acute, hairy abaxially, glabrous adaxially, densely gland-dotted on outside only; buds globose, glabrous to sparsely hairy, gland-dotted (sparsely) or not. *Staminate flowers* 3–4.5 mm diam.; pedicels 2–3.3 mm long, glabrous, not gland-dotted; sepals 3, free to basally connate, elliptic to broadly ovate, recurved, 2.3–2.8 by 1.5–1.7 mm, margin entire, apex acute, glabrous to hairy, glabrous adaxially, gland-dotted; stamens up to 45, filaments up to 2 mm long, glabrous; anthers c. 0.4 by 0.5 mm, basifixed; connective widened. *Pistillate*

inflorescences up to 9 cm long, basally 1–1.5 mm thick, hairy, gland-dotted, nodes up to 16 per inflorescence; bracts caducous, ovate, c. 1 by 0.8–1 mm, margin irregular, apex acute, hairy, gland-dotted. *Pistillate flowers*: bracteoles absent; pedicels up to 2 mm long, hairy, gland-dotted; calyx semi-persistent, 2–5-lobed, free to more or less connate, narrowly triangular to triangular to ovate, c. 2 by 0.6–1.5 mm, margin entire to irregular, apex acute, hairy, glabrous adaxially, gland-dotted; ovary 3-locular, echinate, densely woolly hairy, densely gland-dotted, spines up to 3 mm long, hairy, gland-dotted; style up to 2.5 mm long, hairy, gland-dotted; stigmas up to 5 mm long, densely covered with granulate papillae on the inside, hairy abaxially, gland-dotted outside. *Fruit* an echinate, lobed capsule, c. 8 by 6 mm, hairy, densely gland-dotted; carpel inside hairy, not gland-dotted. *Seeds* glossy, roughly globose, c. 4 by 3.5–4 by 4 mm; hilum deltoid to cordate, 0.5–1.2 by 0.8–1.5 mm.

Distribution — N Thailand and Laos.

Habitat & Ecology — In primary, rather wet forest; along streams. Altitude 600–1140 m.

15. *Mallotus lackeyi* Elmer — Fig. 15, Map 6

Mallotus lackeyi Elmer, *Leafl. Philipp. Bot.* 4 (1911) 1298; Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vii (1914) 176; Merr., *Enum. Philipp. Flow. Pl.* 2 (1923) 433; Philipp. J. Sci. 29 (1926) 382; Univ. Calif. Publ. Bot. 15 (1929) 158; Meijer, *Bot. News Bull.* 7 (1967) 51; Airy Shaw, *Kew Bull.* 26 (1972) 308; Whitmore, *Tree Fl. Malaya* 2 (1973) 114; Airy Shaw, *Kew Bull. Add. Ser.* 4 (1975) 172; Alph. Enum. Euphorb. Philipp. Isl. (1983) 36; Keßler & Sidiyasa, *Tropenbos Series* 7 (1994) 133. — Type: *Elmer 13017* (holo PNH⁺; iso EDI, L, NY), Philippines, Palawan, Puerto Princesa (Mt Pulgar).

Mallotus sanchezii Merr., *Philipp. J. Sci., Bot.* 7 (1912) 402. — Type: *Quadras* (holo PNH, not traced), Philippines, Mindanao, Misamis province, Talisayan.

Shrub to small tree up to 17 m tall, dbh up to 20 cm; bole straight to crooked; crown spreading. Outer bark smooth to slightly fissured, knobby; sapwood soft. *Indumentum* dense. *Branches* lenticellate, glabrescent, densely gland-dotted. *Stipules* usually persistent, inserted up to c. 3 mm above petiole insertion, narrowly triangular to triangular, 5–9 by 2–3.5 mm, margin entire to irregular, involute, apex acute (to acuminate), densely hairy, especially along midrib, gland-dotted abaxially or not. *Leaves* peltate, distance between leaf blade base and petiole insertion 7–38 mm; petiole 25–180 by 0.6–2.3 mm, basally thickened, densely hairy, glabrescent, gland-dotted sparsely to densely; blade ovate (to orbicular), 5–33.5 by 3–21 cm, length-width ratio 1.2–2.3, base rounded (to truncate), margin (slightly) dentate to irregularly wavy, marginal glands 18–33 per leaf side, apex aristate, upper surface smooth, sparsely hairy, especially on veins and along margin, gland-dotted sparsely to densely, basal macular glands 0–5 on veins, 4–18 mm from petiole insertion, apical macular glands 0–7 on veins, 1–4 mm from margin, lower surface smooth, densely hairy, gland-dotted sparsely to densely, domatia absent; venation palmate, 7–10 veins from petiole insertion, 5–9 secondary veins per side along midrib, ending parallel to or in the margin. *Staminate inflorescences* up to 32 cm long, basally 1–4 mm thick, usually solitary, densely hairy, gland-dotted, nodes up to 64 per inflorescence, flowers 1–15 per node; bracts caducous, triangular to narrowly triangular, 1.5–6.5 by 0.7–1.3 mm, margin entire, apex rounded to acute, densely hairy, usually glabrous adaxially, gland-dotted; buds ovate with acute

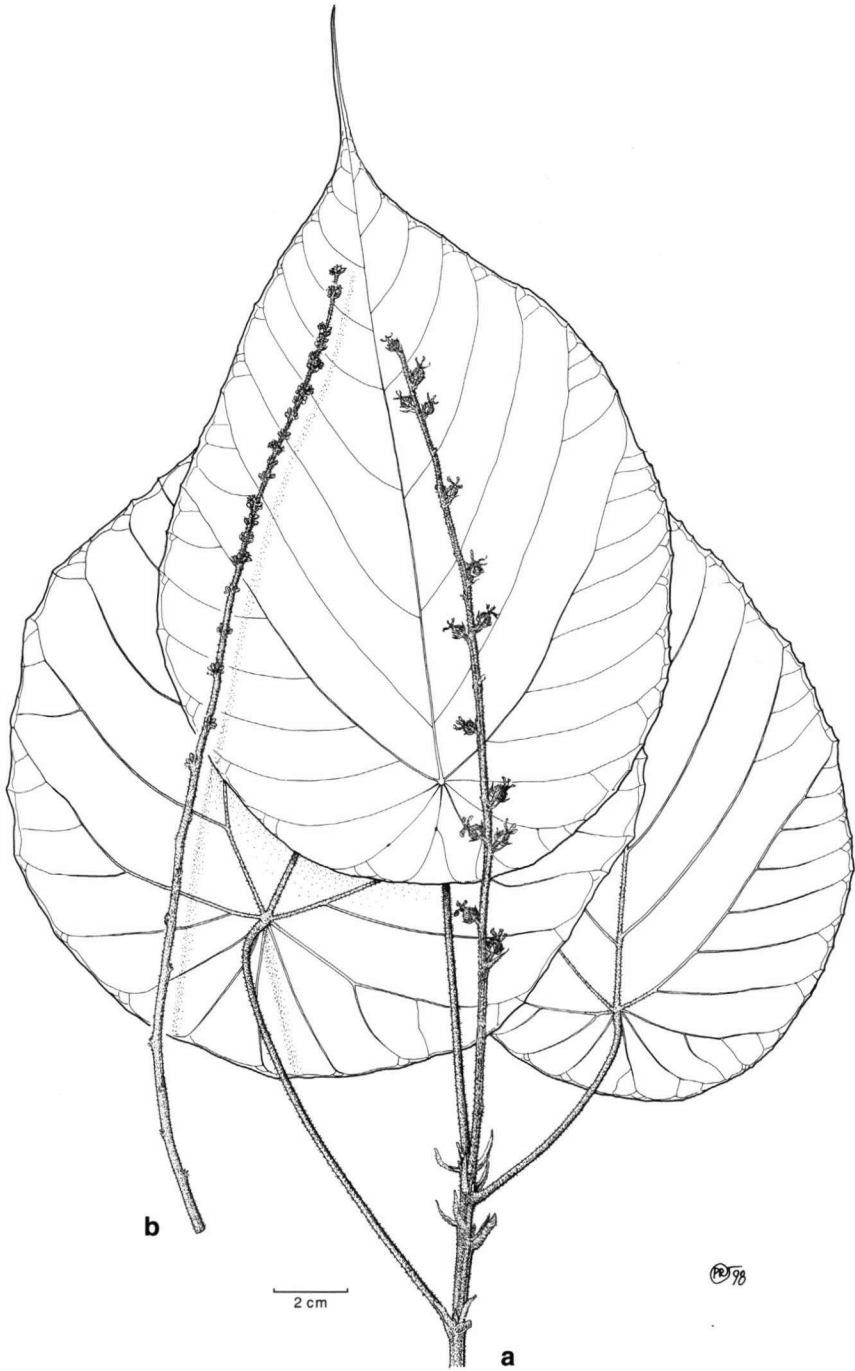
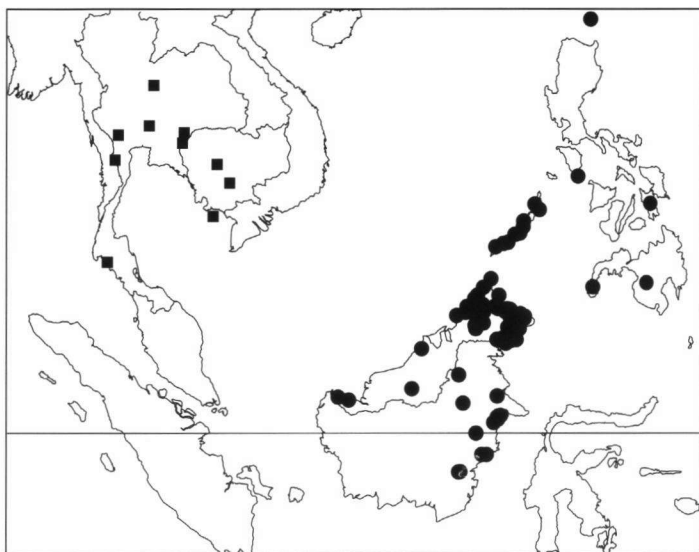


Fig. 15. *Mallotus lackeyi* Elmer. a. Habit of pistillate plant; b. detail of staminate inflorescence (a: *Keßler PK 1100*, L; b: *Ambriansyah & Arifin AA 207*, L).



Map 6. Distribution of *Mallotus* sect. *Styланthus*: *Mallotus lackeyi* Elmer (●) and *Mallotus thorelii* Gagnep. (■).

apex, densely hairy. *Staminate flowers* 3–3.5 mm diam., white to yellow, not to slightly fragrant; pedicels 0.8–3 mm long, hairy, not gland-dotted; sepals 3–5, free to basally connate, narrowly elliptic to elliptic to ovate, sometimes recurved, 1.8–2.5 by 0.7–1 mm, margin entire, apex acute to slightly acuminate to cuspidate, hairy abaxially, especially basally, glabrous adaxially, gland-dotted or not; stamens up to 34, filaments up to 3.3 mm long, glabrous; anthers 0.2–0.3 by 0.4–0.5 mm, basifixed; connective widened. *Pistillate inflorescences* up to 37 cm long, basally 2–4 mm thick, densely hairy, gland-dotted, nodes up to 54 per inflorescence; bracts caducous, linear to triangular, 3.5–7 by 0.4–1.5 mm, margin entire, involute, apex acute, hairy, glabrous to hairy adaxially, gland-dotted outside only. *Pistillate flowers* white to cream; bracteoles caducous, linear, 1.3–3.5 by 0.2–0.7 mm, margin entire, involute, apex acute, hairy, gland-dotted; pedicels up to 7 mm long, often recurved at fruit maturity, hairy, gland-dotted; calyx persistent, 3–6-lobed, basally connate, narrowly triangular to triangular, 3.5–5 by 0.6–1.8 mm, margin entire, apex acute, hairy, glabrous adaxially, gland-dotted; ovary 3-locular, densely echinate, densely hairy, gland-dotted, spines up to 2 mm long, densely hairy, gland-dotted or not; style persistent, up to 1 mm long, hairy, gland-dotted; stigmas 4–5 mm long, densely covered with granulate papillae on inside, hairy abaxially, gland-dotted outside. *Fruit* an echinate, lobed capsule, 10–13 by 3.5–7 mm, light green to yellow green (to reddish), hairy, gland-dotted; carpel inside hairy, not gland-dotted; column 3.5–5 by 5–5.5 mm. *Seeds* glossy, globose, c. 5 by 4.5 mm; hilum deltoid to cordate, c. 1.5 by 1.5–2 mm.

Distribution — Borneo and the Philippines.

Habitat & Ecology — Locally common in primary and secondary forest where it prefers open places; often along streams and rivers, in gaps, along roads, but also

growing in the forest understorey; on dry and periodically flooded areas; on most soil types, from yellow to brown sand to clay to sandstone to limestone. Altitude up to 800(–2693) m.

Note — This species is very uniform in shape throughout its distribution range. In Sarawak and Peninsular Malaysia specimens of *M. peltatus* can look very similar to *M. lackeyi*. These *M. peltatus* specimens can be recognised by their less dense and more tufted indumentum, their upper leaf surface that is not gland-dotted, their small and early caducous stipules, and their fruits with long styles.

16. *Mallotus peltatus* (Geiseler) Müll. Arg. — Fig. 16, Map 7

Mallotus peltatus (Geiseler) Müll. Arg., *Linnaea* 34 (1865) 187; in DC., *Prodr.* 15, 2 (1866) 967; Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vii (1914) 174; in Engl. & Harms, *Nat. Pflanzenfam.* ed. 2, 19c (1931) 115; Corner, *Wayside Trees Mal.* (1940) 272; Backer & Bakh. f., *Fl. Java* 1 (1964) 483; Airy Shaw, *Kew Bull.* 26 (1972) 307; Whitmore, *Tree Fl. Malaya* 2 (1973) 113; Airy Shaw, *Kew Bull.* 36 (1981) 327; Corner, *Wayside Trees Mal.* ed. 2 (1988) 307. — *Aleurites peltatus* Geiseler, *Croton. Monogr.* (1807) 81. — Type: *Rottler s.n.* (holo C), in Herbarium Vahl as a *Croton* species from India orientalis.

Adisca acuminata Blume, *Bijdr. Fl. Ned. Ind.* 11 (1825) 610. — *Rottlera acutifolia* Hassk., *Cat. Hort. Bot. Bogor.* (1844) 238; Miq., *Fl. Ned. Ind.* 1, 2 (1859) 393. — *Mappa acutifolia* (Hassk.) Zoll. & Mor., *Syst. Verz.* (1855) 17. — *Rottlera acuminata* (Blume) Baill., *Étude Euphorb.* (1858) 426 (non A. Juss., 1824), nom. inval. — *Mallotus acuminatus* (Blume) Müll. Arg., *Linnaea* 34 (1865) 187; in DC., *Prodr.* 15, 2 (1866) 966; Kurz, *Forest Fl.* 2 (1877) 383; Hook. f., *Fl. Brit. India* 5 (1887) 431; J. J. Sm., *Meded. Dept. Landb. Ned.-Indië* 10 (1910) 422; Koord., *Exkurs.-Fl. Java* (1912) 492; Ridl., *Fl. Malay Penins.* 3 (1924) 290; S. Moore, *J. Bot.* 63 (1925) 103; Backer & Bakh. f., *Fl. Java* 1 (1964) 483. — Lectotype, selected here: *Blume s.n.* (L sheet 904.75-689) (lecto L), Java.

Rottlera longifolia Rchb. f. & Zoll., *Verhand. Naturk. Vereen. Ned.-Indië* 1 (1856): 31; Miq., *Fl. Ned. Ind.* 1, 2 (1859) 394; *Fl. Ned. Ind. Eerste Bijv.* (1862) 181; Scheff., *Ann. Mus. Bot. Lugd.-Bat.* 4 (1868/1869) 123. — *Mallotus longifolius* (Rchb. f. & Zoll.) Müll. Arg. in DC., *Prodr.* 15, 2 (1866) 967. — *Mallotus longifolius* (Rchb. f. & Zoll.) Müll. Arg. var. *genuinus* Müll. Arg. in DC., *Prodr.* 15, 2 (1866) 967, nom. inval. — Lectotype, selected here: *Teijsmann s.n.* (L sheet 904.105-380) (lecto L), Sumatra.

Rottlera oblongifolia Miq., *Fl. Ned. Ind.* 1, 2 (1859) 396. — *Mallotus oblongifolius* (Miq.) Müll. Arg., *Linnaea* 34 (1865) 192; in DC., *Prodr.* 15, 2 (1866) 973; J. J. Sm., *Meded. Dept. Landb. Ned.-Indië* 10 (1910) 425; Koord., *Exkurs.-Fl. Java* (1912) 491; Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vii (1914) 193; Merr., *J. Straits Branch Roy. Asiatic Soc.*, Special number (1921) 339; Ridl., *Fl. Malay Penins.* 3 (1924) 293; S. Moore, *J. Bot.* 63 (1925) 103; Pax & K. Hoffm. in Engl. & Harms, *Nat. Pflanzenfam.* ed. 2, 19c (1931) 117; Backer & Bakh. f., *Fl. Java* 1 (1964) 484; Meijer, *Bot. News Bull.* 7 (1967) 52; Airy Shaw, *Kew Bull.* 21 (1968) 388; 26 (1972) 306; Whitmore, *Tree Fl. Malaya* 2 (1973) 116; Airy Shaw, *Kew Bull. Add. Ser.* 4 (1975) 173; 8 (1980) 168; *Muelleria* 4 (1980) 233; *Kew Bull.* 36 (1981) 327; *Alph. Enum. Euphorb. Philipp. Isl.* (1983) 37; Corner, *Wayside Trees Mal.* ed. 2 (1988) 306; Keßler & Sidiyasa, *Tropenbos Series* 7 (1994) 133. — *Mallotus oblongifolius* (Miq.) Müll. Arg. var. *genuinus* Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vii (1914) 193, nom. inval. — Type: *Zollinger 245* (holo U; iso A, BM, G, L, MEL, P), Java, Tjikoja.

Hancea muricata Benth., *Fl. Hongk.* (1861) 306. — Type: *Hance 7298* (holo K; iso MEL, P), Hongkong.

Rottlera flavigutta Miq., *Fl. Ned. Ind. Eerste Bijv.* (1862) 453. — Type: *Teijsmann HB 3667* (holo U), Sumatra orient. in prov. Palembang, prope Muara-enim.

Mallotus porterianus Müll. Arg., *Linnaea* 34 (1865) 185; in DC., *Prodr.* 15, 2 (1866) 960; Hook. f., *Fl. Brit. India* 5 (1887) 432; Boerl., *Handl. Fl. Ned. Ind.* 3, 1 (1900) 288; Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vii (1914) 192; Ridl., *Fl. Malay Penins.* 3 (1924) 292; S. Moore,

- J. Bot. 63 (1925) 103; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1398; Corner, Wayside Trees Mal. (1940) 273. — Lectotype, selected here: *Porter 9094* (lecto K), Peninsular Malaysia, Penang.
- Mallotus furetianus* Müll. Arg., Linnaea 34 (1865) 190; in DC., Prodr. 15, 2 (1866) 968; F.B. Forbes & Hemsl., J. Linn. Soc. Bot. 26 (1894) 439; Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vii (1914) 194; Gagnep. in Lecomte, Fl. Gén. Indo-Chine 5 (1925) 352; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117. — Type: *Furet 126* (holo P), China, Hongkong.
- Mallotus lambertianus* Müll. Arg., Linnaea 34 (1865) 190; in DC., Prodr. 15, 2 (1866) 968; Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 289; Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vii (1914) 194; in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 117. — *Rottlera lambertiana* (Müll. Arg.) Scheff., Ann. Mus. Bot. Lugd.-Bat. 4 (1868/1869) 125. — Type: *Lambert s.n.* (holo G n.v.), Moluccas.
- Mallotus helferi* Müll. Arg., Linnaea 34 (1865) 190; in DC., Prodr. 15, 2 (1866) 968; Kurz, Forest Fl. 2 (1877) 384; Hook. f., Fl. Brit. India 5 (1887) 431; Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 289. — *Mallotus oblongifolius* (Miq.) Müll. Arg. var. *helferi* (Müll. Arg.) Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vii (1914) 194. — Type: *Helper 138* (holo G n.v.), India orientalis, insula Kolonkhin fluminis Saluin.
- Mallotus longifolius* (Rchb. f. & Zoll.) Müll. Arg. var. *pubescens* Müll. Arg. in DC., Prodr. 15, 2 (1866) 967. — Lectotype, selected here: *Zollinger 1812* (lecto L), Sumatra.
- Mallotus stylaris* Müll. Arg. in DC., Prodr. 15, 2 (1866) 973; Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 290. — *Rottlera stylaris* (Müll. Arg.) Scheff., Ann. Mus. Bot. Lugd.-Bat. 4 (1868/1869) 125. — Lectotype, selected here: *Korthals s.n.* (L sheet 904.105-332) (lecto L), Borneo.
- Mallotus puberulus* Hook. f., Fl. Brit. India 5 (1887) 435; Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 290; Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vii (1914) 172; Ridl., Fl. Malay Penins. 3 (1924) 290. — Type: *Scortechini s.n.* (holo K), Perak.
- Mallotus columnaris* Warb., Bot. Jahrb. Syst. 13 (1891) 349; Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 289; Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vii (1914) 176; Merr., Philipp. J. Sci., Bot. 11 (1916) 283. — Type: *Warburg 20515* (holo B†; iso A, EDI), 'Kl. Key und Aru Inseln'.
- Mallotus odoratus* Elmer, Leafl. Philipp. Bot. 4 (1911) 1299; Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vii (1914) 176; Merr., Enum. Philipp. Flow. Pl. 2 (1923) 434; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 115. — Type: *Elmer 12584* (holo PNH†; iso EDI, L, NY), Philippines, Palawan, Puerto Princesa (Mt Pulgar).
- Mallotus alternifolius* Merr., Philipp. J. Sci., Bot. 7 (1912) 395. — Type: *F.B. Curran 4124* (holo PNH†), Philippines, Palawan, near Puerto Princesa.
- Mallotus camiguinensis* Merr., Philipp. J. Sci., Bot. 7 (1912) 397. — Type: *B.S. Fénix 4047* (holo PNH†), Philippines, Babuyan Islands, Camiguin.
- Mallotus oblongifolius* (Miq.) Müll. Arg. var. *siamensis* Pax & K. Hoffm. in Engl., Pflanzenz. IV. 147.vii (1914) 194. — Lectotype, selected here: *J. Schmidt 691* (lecto C; iso UC), 'Südwest-malaysische Provinz, Siam'.
- Mallotus oblongifolius* (Miq.) Müll. Arg. var. *villosulus* Pax & K. Hoffm. in Engl., Pflanzenz. IV. 147.vii (1914) 194; Airy Shaw, Kew Bull. 20 (1966) 42; Kew Bull. Add. Ser. 8 (1980) 169; Muellera 4 (1980) 234. — Type: *Lauterbach 1054* (holo B†), 'Papuasische Provinz, Neu-Guinea, Kaiser Wilhelmsland, am Gogolflusse'.
- Mallotus tenuispicus* Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vii (1914) 201; Airy Shaw, Kew Bull. 21 (1968) 400. — Type: *Schlechter 14467* (holo B†; iso K, WRSL), 'Papuasische Provinz, Neu-Guinea, Torricelli-Gebirge'.
- Mallotus maclurei* Merr., Philipp. J. Sci. 21 (1922) 347; Lingnaam Agric. Rev. 2 (1924) 29; Lingnan Sci. J. 5 (1927) 110. — Type: *McClure 8558* (holo PNH†; iso A, NY), Ng Chi Leng.
- Mallotus peekelii* Pax & K. Hoffm., Notizbl. Bot. Gart. Berlin-Dahlem 10 (1928) 384. — Type: *Peekel 921* (holo B†; iso BRI), 'Papuasische Provinz, Neu-Mecklenburg, Lamekot'.
- Mallotus oblongifolius* (Miq.) Müll. Arg. var. *rubriflorus* Chakrab., J. Econ. Taxon. Bot. 6 (1985) 496. — Type: *Chakrabarty 10174* (holo PBL; iso PBL), Great Nicobar Is., hill above Baludera.
- Mallotus peltatus* (Geiseler) Müll. Arg. var. *rubriflorus* Chakrab., J. Econ. Taxon. Bot. 6 (1985) 497. — Type: *Nair 3694* (holo PBL; iso PBL), South Andaman Is., Obragunj.

Shrubs to small trees up to 15(–21) m tall, dbh up to 30 cm; bole fluted, twisted to slanting; crown branching freely, widely spreading to rounded pyramidal. Outer bark smooth to fissured, lenticellate, mottled. *Indumentum* sparse to dense, whitish to cream. *Branches* lenticellate, glabrescent, gland-dotted on young parts. *Stipules* early caducous, triangular to ovate, 1.8–5 by 0.7–1.5 mm, margin entire to irregular, apex acute, hairy abaxially only, gland-dotted or not. *Leaves* not peltate to peltate (sometimes both in one individual), distance between leaf blade base and petiole insertion 2–17 mm; petiole 4–110 by 0.5–1.5 mm, constricted to thickened basally and apically, hairy, especially basally and apically, glabrescent, gland-dotted or not, especially basally and apically; blade ovate to obovate, 3.5–21(–29) by 1–10(–13) cm, length-width ratio (1.3–)2–4, base attenuate to cordate, margin (slightly) dentate to irregularly wavy (to slightly crenate), marginal glands 10–28 per leaf side, apex acuminate to cuspidate to aristate, upper surface smooth (to pustulose), glabrous to hairy, especially on veins, sparsely gland-dotted or not, especially along veins, basal macular glands 2–7(–13) on veins, 1.5–14(–21) mm from petiole or midrib, apical macular glands 0–8 on veins, 1–9 mm from margin, lower surface smooth, hairy, especially on veins, glabrescent, gland-dotted or not, domatia present usually with hair tufts; venation pinnate to tripliveined to palmate, when peltate 8–10 veins originating from petiole insertion, 5–13 secondary veins per side along midrib, ending parallel to the margin. *Staminate inflorescences* up to 24 cm long, basally 0.5–1.5 mm thick, rarely grouped, hairy, gland-dotted, nodes up to 38(–70) per inflorescence, flowers 1–12 per node; bracts early caducous, deltoid to ovate, 0.9–2.3 by 0.4–1.2 mm, margin entire to irregular, apex rounded to acute, hairy abaxially only, gland-dotted outside only, especially basally; buds globose to ovate with acute to acuminate apex, glabrous to hairy, gland-dotted or not. *Staminate flowers* 3–6 mm diam., whitish green to cream to red-dish, fragrant; pedicels 0.6–3 mm long, glabrous to hairy, gland-dotted or not; sepals 3–5, free to basally connate, (triangular to) elliptic (to obovate), often recurved, 1.5–2.5 by 0.5–1.3 mm, margin entire to irregular, apex acute to acuminate, glabrous to hairy abaxially only, gland-dotted or not; stamens up to 50; filaments 1–3.5 mm long, glabrous, sometimes gland-dotted; anthers 0.2–0.3 by 0.3–0.5 mm; connective widened, sometimes with protruding apex. *Pistillate inflorescences* up to 28 cm long, basally 1–2.8 mm thick, hairy, glabrescent, gland-dotted, nodes up to 29 per inflorescence; bracts caducous (to persistent), ovate, cup-shaped, half surrounding the pedicel, 1–2.8 by 0.7–1.5 mm, margin entire to irregular, apex acute, hairy abaxially only, gland-dotted or not. *Pistillate flowers* green to (light) yellow to yellowish red, fragrant; bracteoles absent to caducous, triangular to ovate, 0.8–1.3 by 0.3–0.6 mm, margin entire to irregular, apex acute, hairy abaxially only, gland-dotted outside only; pedicels 1–7 mm long, glabrous to hairy, gland-dotted or not; calyx caducous, lobes (1 or) 2 or 3 (or 4), free to more or less connate, triangular to ovate, 0.5–4.5 by 0.2–2.3 mm, margin entire to irregular, apex acute to acuminate, hairy abaxially only, gland-dotted or not; ovary (2- or) 3- (or 4-)locular, echinate, glabrous to hairy, densely gland-dotted, spines up to 5 mm long, hairy, usually ending in a few long hairs, rarely gland-dotted basally; style 2–7 mm long, glabrous to hairy, gland-dotted or not; stigmas 3–7 mm long, densely covered with granulate papillae on the inside, glabrous to hairy abaxially, gland-dotted outside. *Fruit* an echinate, lobed capsule, 7–15 by 5.5–8 mm, purple tinged to dark red, glabrous to hairy, densely gland-dotted; carpel inside hairy, gland-dotted or not;

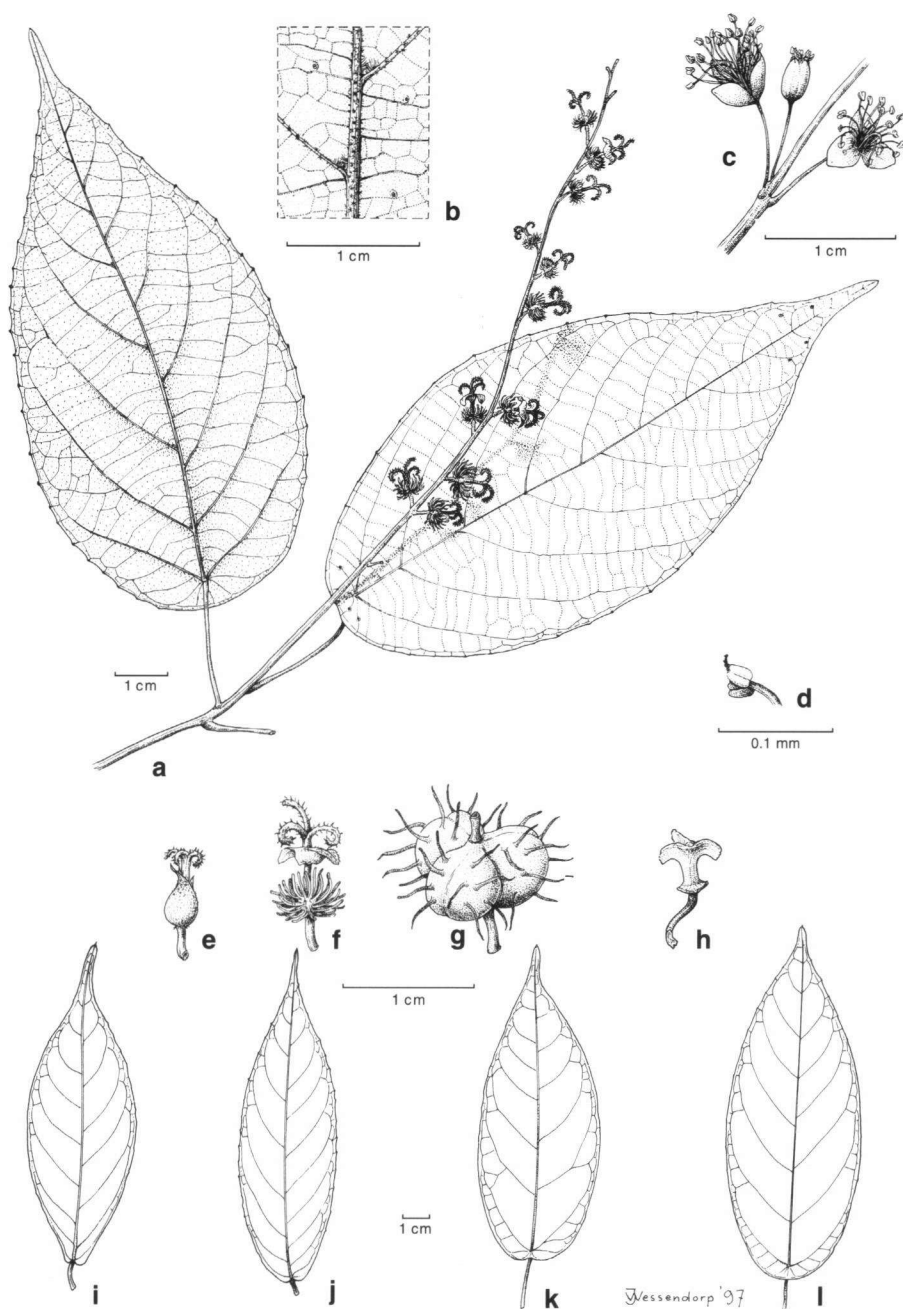
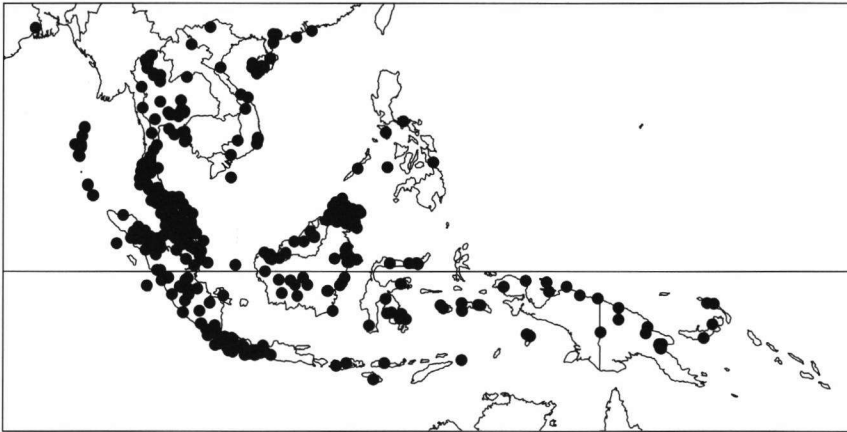


Fig. 16. *Mallotus peltatus* (Geiseler) Müll. Arg. a. Habit of pistillate plant; b. hairy domatia at leaf lower surface; c. detail of staminate inflorescence; d. detail stamen; e-h. development from pistillate flower to fruit to column; i-l. different leaf shapes possible within this species (a & b, e-h, k & l: Geesink & Santisuk 5001, L.; c & d, i & j: Kostermans 13662, L).



Map 7. Distribution of *Mallotus* sect. *Stylanthus*: *Mallotus peltatus* (Geiseler) Müll. Arg.

column 4–6 by 4–6.5 mm. *Seeds* glossy, roughly globose, 4–6 by 3–5 by 3–5.5 mm; hilum deltoid, 1–2.5 by 1–2.5 mm.

Distribution — From India, the Andaman Islands and S China to New Guinea.

Habitat & Ecology — Locally common in primary to secondary forest, preferring open places like river banks, forest edges, roadsides, cleared areas, but sometimes also found in the forest understorey; both in wet (riverine, swampy) areas and on well-drained soils; soils include thick humus, limestone, sandstone, sandy clay, sandy loam soil, volcanic rock, gravel, red shale. Altitude up to 1000(–1800) m.

Notes — This species is very variable in leaf shape and indumentum throughout its distribution range. This variability is the main reason for the large number of synonyms for this species. Airy Shaw had already reduced this abundance of names to two species, *M. oblongifolius* (without peltate leaves) and *M. peltatus* (with peltate leaves). He suggested that these two species should be united into one species, but did not do so himself. Considering the large variability in leaf shape, the fact that some individuals have both peltate and non-peltate leaves on the same branch and the lack of other differentiating characters, we have to conclude that *M. peltatus* and *M. oblongifolius* are in fact one and the same species. In general there are three main leaf types: 1) the obovate-penniveined type which usually occurs in India, S China, Thailand, Malaysia, Borneo, Sumatra, and Java; 2) the cordate-tripliveined type which usually occurs on the Andamans, Sumatra, Malaysia, Philippines, Sulawesi, Moluccas, and New Guinea; 3) the peltate-palmativeined type which is usually found on the Andamans, Malaysia, Sumatra, northern Borneo, Java, and the Lesser Sunda Islands. The indumentum of the plants ranges from almost completely glabrous to densely hairy on most parts. In general the plants found in Sumatra, Malaysia, northern Borneo, Java, and New Guinea can be very hairy. Some specimens collected in Sumatra, Malaysia, Vietnam, and N Borneo are very similar to *M. lackeyi*, but differ from that species in their smaller, early caducous stipules, not densely gland-dotted upper leaf surface, longer styles, and longer spines of the fruits.

17. *Mallotus surculosus* P.I. Forst. — Fig. 17, Map 5

Mallotus surculosus P.I. Forst., *Austrobaileya* 5 (1999) 488 — Type: *P.I. Forster PIF 14420* (holo BRI; iso A, MEL, QRS), Australia, Queensland, Cook District, Shiptons Flat, 9 km from Lions Den Hotel.

Shrubs to small trees up to 10 m tall, dbh up to 20 cm, often spreading by root suckers. *Indumentum* dense and sometimes flaky, whitish to cream. *Branches* lenticellate, densely hairy, glabrescent, gland-dotted on young parts. *Stipules* caducous, ovate, 2.5–5 by 1–2 mm, margin entire, apex acute, hairy abaxially only, especially along midrib, gland-dotted. *Leaves* peltate, distance between leaf blade base and petiole insertion 5–14 mm; petiole 25–140 by 1–1.5 mm, basally and apically sometimes thickened, hairy, glabrescent, gland-dotted; blade ovate to orbicular, 7.5–15.5 by 5.5–12.5 cm, length-width ratio 1.1–1.6, base truncate to slightly emarginate (to rounded), margin irregularly wavy to slightly dentate, marginal glands 20–24 per leaf side, apex acute to acuminate, upper surface smooth, glabrous to hairy, densely gland-dotted, basal macular glands 4–8 on veins, 4–32 mm from petiole insertion along veins, apical macular glands 0–4 on veins, 1–2 mm from margin, lower surface smooth, hairy, gland-dotted, domatia absent; venation palmate, 8–10 veins originating from petiole, 6–9 secondary veins per side along midrib, ending in the margin. *Staminate inflorescences* up to 5 cm long, basally up to c. 1 mm thick, hairy, gland-dotted, nodes up to 24 per inflorescence, flowers 1–3 per node; bracts caducous, (broadly) ovate, base conspicuously narrowed, 1.5–2 by 1–1.5 mm, margin entire, apex acute to acuminate, hairy abaxially only, gland-dotted or not. *Buds* globose, hairy, gland-dotted. *Staminate*

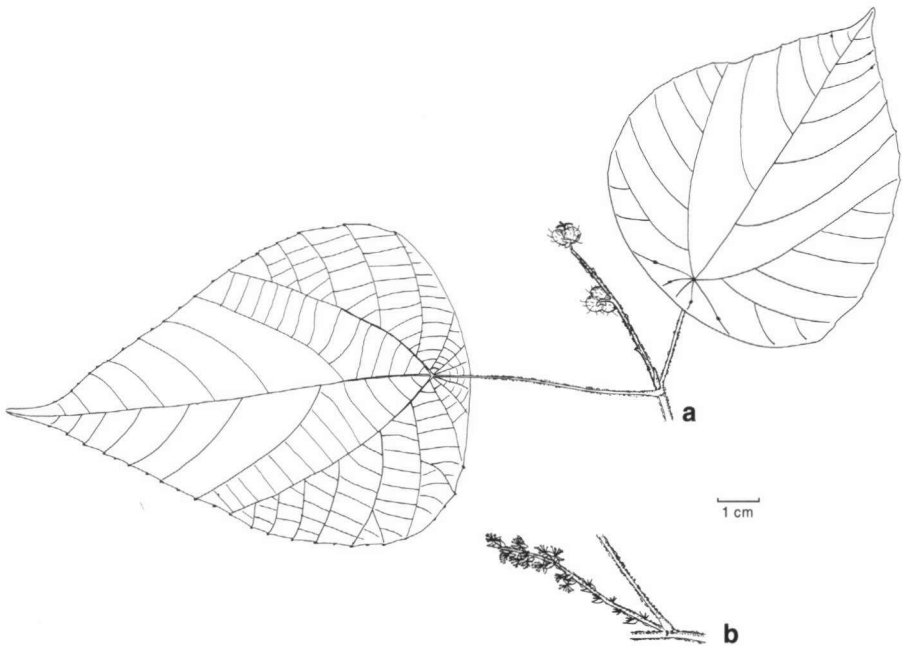


Fig. 17. *Mallotus surculosus* P.I. Forst. a. Habit of pistillate plant; b. detail of staminate inflorescence (a: Hyland 13775, L; b: Forster PIF 14420, BRI).

flowers 3–4 mm diam., creamish yellow; pedicels 2.5–3 mm long, glabrous (to hairy), not gland-dotted; sepals 3 or 4, free to basally connate, elliptic to ovate, recurved, 1.8–2.3 by 1–1.5 mm, margin entire, apex acute, hairy abaxially, glabrous to hairy adaxially, gland-dotted; stamens up to 30, filaments up to 2 mm long, glabrous; anthers 0.2–0.3 by 0.2–0.3 mm, basi- to dorsifixed; thecae glabrous; connective not (to slightly) widened. *Pistillate inflorescences* up to 10 cm long, basally 1–1.5 mm thick, hairy, glabrescent, gland-dotted, nodes up to 13 per inflorescence; bracts caducous to persistent, (broadly) ovate, more or less cup-shaped around base of pedicels, 1.5–2 by 1–1.2 mm, margin entire, apex acute, hairy abaxially only, gland-dotted. *Pistillate flowers*: bracteoles absent; pedicels 4–5 mm long, hairy, sparsely hairy apically, gland-dotted; calyx persistent, lobes 3–5, free to more or less connate, ovate to triangular, 1.2–2.5 by 0.5–1 mm, margin entire to irregular, apex acute, hairy abaxially only, gland-dotted or not; ovary 3-locular, echinate, sparsely hairy, densely gland-dotted, spines up to 2 mm long, hairy, not gland-dotted; style 0.5–1 mm long, hairy; stigmas up to 2.5–3 mm long, densely covered with granulate papillae on the inside, hairy abaxially, gland-dotted outside. *Fruit* an echinate, lobed capsule, 8–10 by 4.5–5.5 mm, green, glabrous to hairy, densely gland-dotted; carpel inside glabrous to hairy, not gland-dotted; column 2.5–3 by 2.5–3 mm. *Seeds* glossy, roughly globose, c. 2.5 by 2 by 2.5 mm; hilum round, c. 0.5 mm diameter.

Distribution — NE Australia.

Habitat & Ecology — In rain (gallery) and vine forest; usually common in scrub along roads or creeks; on sandy (red) soils, dry to alluvial. Altitude up to 300 m.

18. *Mallotus thorelii* Gagnep. — Fig. 18, Map 6

Mallotus thorelii Gagnep., Notul. Syst. 4 (1923) 53; in Lecomte, Fl. Gén. Indo-Chine 5 (1925) 358; Airy Shaw, Kew Bull. 26 (1972) 307. — Lectotype, selected here: *Thorel s.n.* (lecto P; iso G, P), Oudan, Me Kong.

Shrubs to small trees up to 10 m tall. *Indumentum* dense, whitish to yellowish. *Branches* lenticellate, hairy, glabrescent, gland-dotted. *Stipules* early caducous (to persistent), (narrowly) triangular to ovate, 2.5–4.5 by 0.9–1.4 mm, margin irregular to entire, apex acute to acuminate, hairy abaxially, glabrous (to sparsely hairy) inside, gland-dotted. *Leaves* peltate, petiole insertion 3–22 mm from base; petiole 15–130 by 0.7–1.7 mm, basally (sometimes also apically) usually slightly thickened to constricted when dried, hairy, glabrescent, gland-dotted; blade ovate to triangular (to orbicular), 3–16 by 2–15 cm, length-width ratio 1–2, base rounded to truncate to slightly emarginate, margin irregularly wavy to slightly dentate, marginal glands 10–20 per leaf side, apex acuminate to cuspidate to aristate, upper surface smooth, sparsely hairy, especially on veins and along margin, glabrescent, densely gland-dotted, basal macular glands 2–6 on veins, 3–18 mm from petiole insertion, apical macular glands 0–3 on veins, 1–3 mm from margin, lower surface smooth, hairy, especially on veins, densely gland-dotted, domatia present often with hair tufts, venation palmate, 8–11 veins originating from petiole insertion, 4–7 secondary veins per side along midrib, ending in the margin. *Staminate inflorescences* up to 11 cm long, 1–1.3 mm thick at base, usually solitary, hairy, gland-dotted, nodes up to 38 per inflorescence, flowers up to 6 per node; bracts caducous, triangular to ovate, 1.5–2.8 by 0.5–1.2 mm, margin entire to irregular, apex

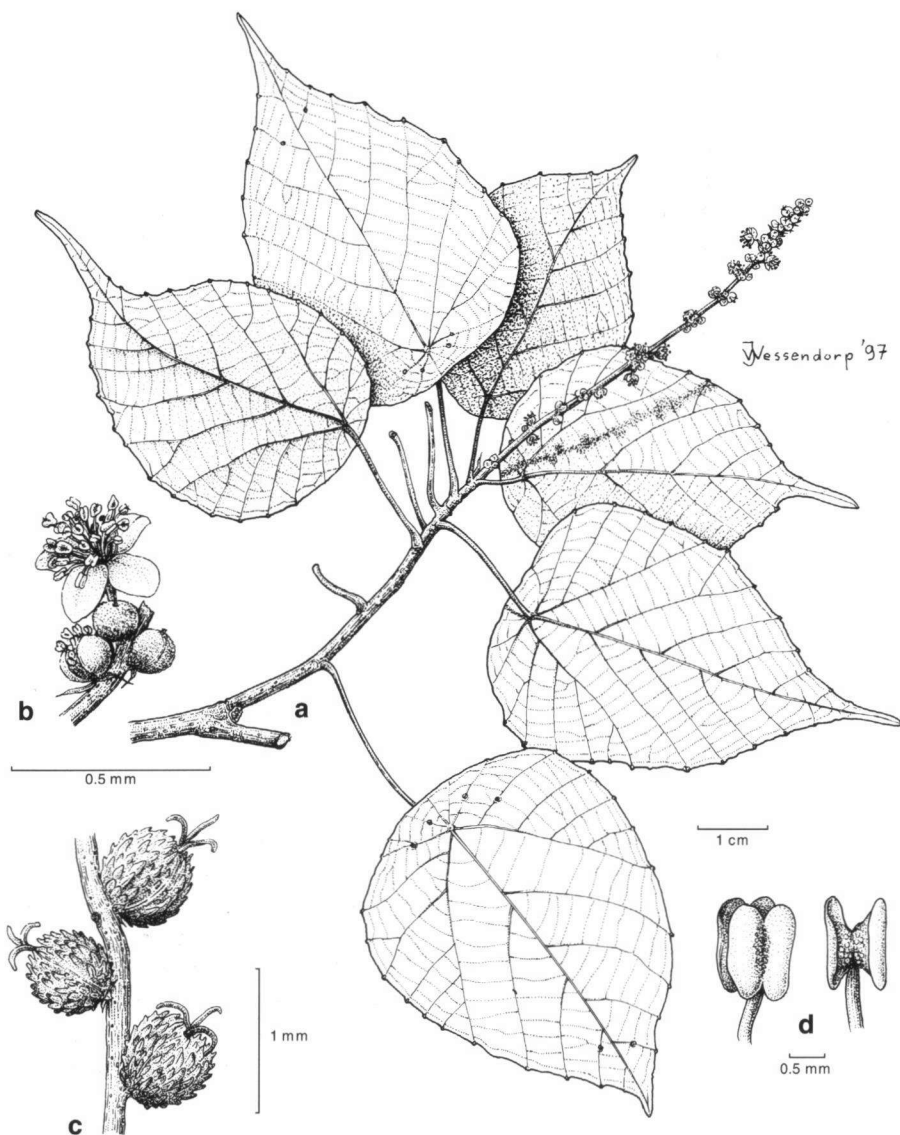


Fig. 18. *Mallotus thorelii* Gagnep. a. Habit of staminate plant; b. staminate flowers; c. part of pistillate inflorescence with fruits; d. detail stamen (a & b, d: *Put 3105*, L; c: *Kerr 19611*, L).

acute to acuminate, hairy abaxially, glabrous (to long simple hairy at base) adaxially, gland-dotted abaxially, rarely adaxially; buds globose with acuminate apex, hairy, gland-dotted. *Staminate flowers* 3.5 mm diam.; bracteoles rarely present, ovate to obovate, 0.5–1.2 by 0.2–0.4 mm, margin irregular to entire, apex acute, glabrous to hairy, glabrous adaxially, not gland-dotted; pedicels 1.3–2.3 mm long, hairy, gland-dotted; sepals 4, basally connate, elliptic, recurved, 2–2.5 by 0.8–1 mm, margin entire,

apex acuminate, glabrous to hairy, glabrous adaxially, gland-dotted; stamens up to 40; filaments up to 2 mm long, glabrous, gland-dotted or not; anthers 0.3–0.5 by 0.5 mm, basifixed; thecae rarely gland-dotted; connective not widened to widened. *Pistillate inflorescences* up to 14.5 cm long, basally 0.7–1.3 mm thick, hairy, glabrescent, gland-dotted, nodes up to 18 per inflorescence; bracts early caducous, triangular, 3.5–3.8 by 1.3 mm, margin entire, apex acute, hairy abaxially only, gland-dotted outside only. *Pistillate flowers*: pedicels 1–1.5 mm long, hairy, gland-dotted; calyx persistent, lobes 2–5, free to more or less connate, ovate to triangular, 1.3–3.5 by 0.7–2.8 mm, margin entire, apex acute (to cuspidate), hairy abaxially only, gland-dotted; ovary 3- (or 4-)locular, verrucate to shortly echinate, densely woolly hairy, glabrescent, densely gland-dotted, spines up to 1 mm long, densely hairy, gland-dotted, especially basally; style persistent, 0.6–1.5 mm long, hairy, gland-dotted; stigmas 2–4 mm long, densely covered with granulate papillae on the inside, hairy abaxially, gland-dotted outside. *Fruit* an echinate to verrucose, lobed capsule, 6–8 by 5–6 mm; carpel inside hairy, not gland-dotted; column c. 4 by 2.5 mm. *Seeds* glossy, roughly globose, 2.5 by 1.8 by 2 mm; hilum elliptic, 0.8 by 0.4 mm.

Distribution — SE Asian mainland (Thailand, Peninsular Malaysia, Cambodia).

Habitat & Ecology — In primary and secondary forest; in scrub, along forest edges and river sides. Altitude up to 50 m.

EXCLUDED SPECIES

The following species have been excluded from *Mallotus* section *Hancea* because they differ significantly from the species mentioned above. They usually have two stipules between opposite leaves (as opposed to one), the reduced opposite leaves can be stipuliform but also cordate (as opposed to exclusively stipuliform), basally they have macular glands on their upper leaf surfaces (as opposed to none), the indument is simple and tufted (as opposed to exclusively simple), they are gland-dotted with glands resembling those found within the section *Stylanthus* instead of those within the section *Hancea*, and finally the staminate inflorescences are raceme-like thyrses with several flowers per bract (as opposed to just one flower per bract in *Hancea*).

It is likely that the excluded species mentioned below are all closely related. However, a phylogenetic analysis will have to be carried out to find their closest relatives within the genus *Mallotus*. At first glance they closely resemble the species found in the sections *Axenfeldia* (Baill.) Pax & K. Hoffm. and *Rottleropsis* Müll. Arg.

19. *Mallotus brachythyrus* Merr. — Fig. 19, Map 8

Mallotus brachythyrus Merr., Sarawak Mus. J. (1928) 526; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 162. — Type: *Mjöberg 147* (holo PNH†; iso BM, UC), Borneo, Sarawak, Mt Poi.

Mallotus beccarii Airy Shaw, Kew Bull. 27 (1972) 86; Kew Bull. Add. Ser. 4 (1975) 162. — Type: *Beccari PB 1800* (holo K), Borneo, Sarawak, First Division, Mt Matang,

Shrubs up to 3 m tall, dioecious. *Indumentum* glabrous to dense, whitish yellowish, simple to tufted to stellate. *Branches* lenticellate, glabrescent, gland-dotted or not. *Stipules* caducous, narrowly triangular to ovate, 7–10 by 1.3–2 mm, margin entire to irregular, involute, apex acute, glabrous to hairy abaxially, glabrous adaxially, gland-

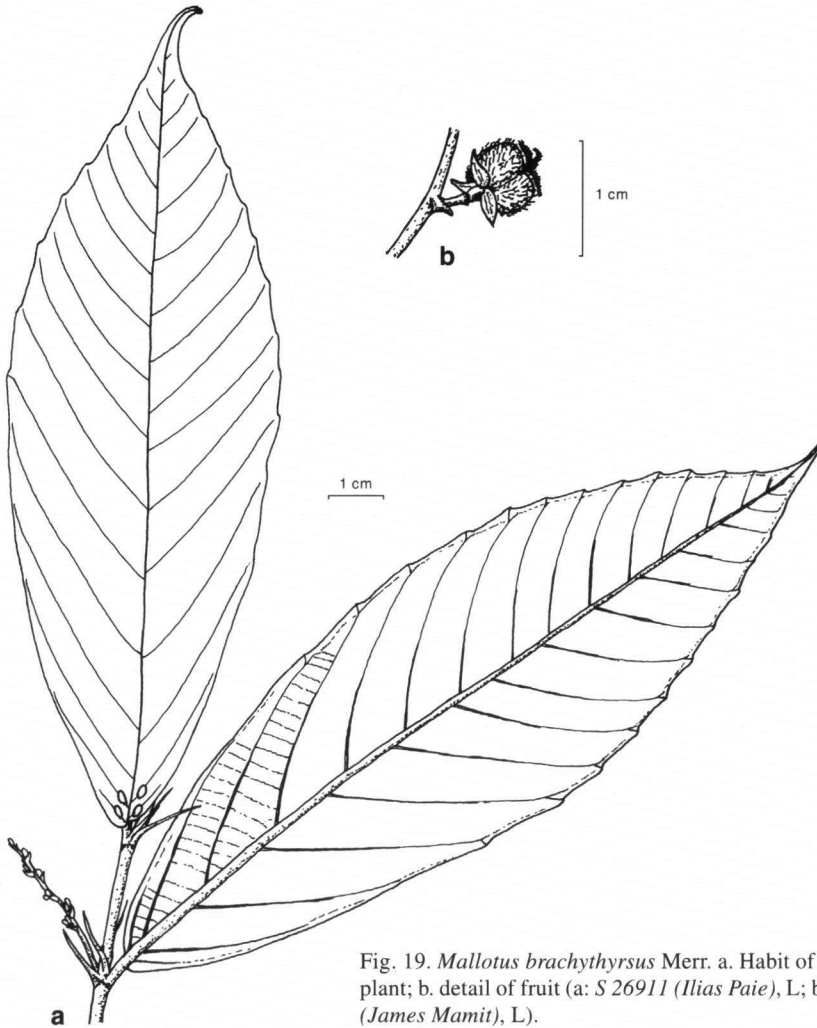
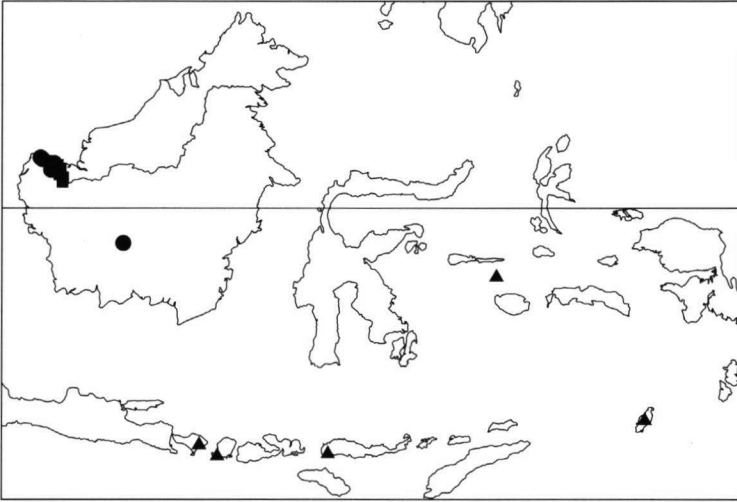


Fig. 19. *Mallotus brachythyrus* Merr. a. Habit of staminate plant; b. detail of fruit (a: S 26911 (*Ilias Paie*), L; b: S 35263 (*James Mamit*), L).

dotted or not. *Leaves* simple, opposite, strongly unequal, one of each pair reduced, stipuliform. *Non-reduced leaves*: petioles 2–5 by 0.8–1 mm, hairy, glabrescent, gland-dotted or not; blade ovate to obovate, 6–20 by 2–7.5 cm, length-width ratio 2.2–3.4, chartaceous to coriaceous, base acute to cuneate to slightly cordate, usually oblique, margin (slightly) dentate, marginal glands 7–17 per leaf side, apex acuminate to cuspidate, upper surface smooth, reddish brown when dried, glabrous, densely gland-dotted (or not), basal macular glands 2–4 on veins, 0.5–3 mm from midrib, apical macular glands 0–9 on veins, 1–7 mm from margin, lower surface smooth, creamish when dried, hairy, especially on midrib and veins, gland-dotted or not, domatia absent or present, with hair tufts; venation pinnate, 9–13 secondary veins per side, ending parallel to or in the margin. *Stipuliform leaves* ovate to narrowly triangular, 2.5–12 by 1.5–2 mm, margin entire to irregular, apex acute, glabrous to hairy, glabrous adaxially, gland-



Map 8. Distribution of *Mallotus brachythyrus* Merr. (●), *M. havilandii* Airy Shaw (■), and *M. insularum* (Airy Shaw) Slik (▲).

dotted or not. *Inflorescences* in axils of stipuliform leaves, unbranched, solitary. *Flowers* actinomorphic, small. *Staminate inflorescences* raceme-like thyrses, up to 2–2.6 cm long, basally c. 1 mm thick, hairy, gland-dotted, nodes up to 11 per inflorescence, flowers 1–6 per node; bracts persistent, (broadly) ovate, 1–2 by 0.9–1.5 mm, margin irregular, apex acute, hairy abaxially only, gland-dotted or not; buds globose (to slightly ovate), hairy, gland-dotted. *Staminate flowers* up to 3 mm diam., greenish to cream; bracteoles absent; pedicels c. 1 mm long, hairy, gland-dotted; sepals 3, ovate, 1.5–2 by 0.7–1 mm, margin entire, apex acute, hairy abaxially only, gland-dotted outside only; stamens up to c. 60; filaments up to 1 mm long, glabrous; anthers c. 0.2 by 0.3 mm, basifixed; thecae 2, parallel, extrorse, opening lengthwise, glabrous; connective not (to slightly) widened. *Pistillate inflorescences* racemes, up to 5 cm long, basally c. 1 mm thick, hairy, gland-dotted, nodes up to 4 per inflorescence; bracts persistent, ovate, clasping the pedicel, 1.8–2 by 1–1.2 mm, margin irregular, apex acute, hairy abaxially only. *Pistillate flowers* pedicels 5–6 mm long, hairy, gland-dotted or not; sepals 3, ovate, 2.5–5 by 1.3–2.8 mm, margin irregular, apex acute, hairy abaxially only, gland-dotted; ovary 3-locular, echinate, densely hairy, gland-dotted, spines 0.6–0.8 mm long, glabrous to hairy, not gland-dotted; ovules 1 per locule, axillary, anatropous, ascending; styles persistent, up to 1 mm long, hairy, gland-dotted; stigmas 3–4 mm long, densely covered with granulate papillae on the inside, hairy abaxially, gland-dotted outside. *Fruit* an echinate, lobed capsule, 5–7 by c. 5 mm, loculicidal-septicidal, green, hairy, not gland-dotted; carpel inside glabrous (to hairy), not gland-dotted; column c. 4 by 4–5 mm. *Seeds* glossy, roughly globose, c. 5 by 4–5 by 4.5–5 mm; hilum elliptic to deltoid, c. 1.2 by 0.5–3 mm.

Distribution — Borneo (Sarawak, C Kalimantan).

Habitat & Ecology — In primary and secondary forest; on yellow sandy clay soils. Altitude up to 500 m.

Note — The plants can range from almost completely glabrous to conspicuously hairy. Airy Shaw (1972b) described the species *M. beccarii*, which differs from *M. brachythyrus* in being very hairy as opposed to nearly glabrous. However, all characters, except for the glabrescence, are variable enough to include *M. beccarii* as a synonym of *M. brachythyrus*. The specimen collected in C Kalimantan differs from the specimens known from Sarawak in not being gland-dotted on most parts.

20. *Mallotus havilandii* Airy Shaw — Fig. 20, Map 8

Mallotus havilandii Airy Shaw, Kew Bull. 20 (1966) 39; 23 (1969) 82; Kew Bull. Add. Ser. 4 (1975) 161, 163. — Type: *Haviland 1720* (holo K; iso L), Sarawak, Mt Koum.

Small trees up to 8 m tall, dbh up to 15 cm, dioecious. Outer bark smooth. *Indumentum* dense, simple to tufted to stellate. *Branches* smooth, lenticellate, glabrescent, gland-dotted, nodes not to only slightly swollen. *Stipules* semi-persistent, narrowly triangular, 6–11 by 0.6–1.5 mm, margin entire, involute, apex acute, hairy, not gland-dotted. *Leaves* simple, opposite, unequal, one of each pair much smaller, small leaf sometimes caducous. *Non-reduced leaves*: petioles 2–5 by 1.5–2.5 mm, hairy, gland-dotted; blade ovate to obovate, 11–24.5 by 3.5–8 cm, length-width ratio 2.8–4.1, chartaceous, base cordate, oblique, margin wavy to apically dentate to serrate, marginal glands 9–15 per leaf side, apex cuspidate to aristate, upper surface smooth, hairy, especially on veins, not gland-dotted, basal macular glands present, similar to apical glands, often glands present on all veins, 2–20 mm from margin, lower surface smooth, hairy, gland-dotted, domatia absent; venation basally palmate to apically pinnate, veins 7 from petiole insertion, 11–16 per side along midrib, ending parallel to or apically in margin. *Reduced leaves* cordate, 15–30 by 14–22 mm, margin dentate, apex acuminate, indumentum and glands similar to non-reduced leaves, macular glands on upper surface, especially basally along veins. *Inflorescences* in axils of reduced leaves, unbranched, solitary. *Flowers* actinomorphic. *Staminate inflorescences* thyrses-like racemes, up to 23 cm long, basally c. 1 mm thick, hairy, gland-dotted, nodes up to 47 per inflorescence, flowers up to 3 per node; bracts persistent, narrowly triangular, 3–7 by 0.5–1 mm, margin entire, involute, apex acute, hairy, gland-dotted; buds globose with acuminate apex, hairy. *Staminate flowers* 2.5–3.5 mm diam.; pedicels 3–4 mm long, hairy, rarely gland-dotted; sepals 4, more or less connate, elliptic to ovate, recurved, 1.8–2.5 by 1–1.8 mm, margin entire to irregular, apex acute, hairy, gland-dotted; stamens up to 44; filaments up to 2 mm long, glabrous; anthers 0.3 by 0.4 mm, basifixed; thecae 2, parallel, extrorse, opening lengthwise, glabrous; connective not widened to widened. *Pistillate inflorescences* racemes, up to 27 cm long, basally 1–1.5 mm thick, hairy, gland-dotted, nodes up to 12 per inflorescence; bracts persistent, narrowly triangular, 4–10 by 0.8–1 mm, margin entire, involute, apex acute, hairy, gland-dotted. *Pistillate flowers* pedicels 1.5–5 mm long, hairy, gland-dotted; sepals 2–5, sometimes apically split, more or less connate to free, ovate to narrowly ovate, c. 4 by 1.3 mm, margin entire to irregular, apex acute, hairy abaxially only, gland-dotted; ovary 3-locular, echinate, densely hairy, gland-dotted, spines up to 0.5 mm long, hairy, long simple hairs apically, rarely gland-dotted; ovules 1 per locule, axillary, apotropous, ascending; styles persistent, 1–1.5 mm long, hairy, gland-dotted; stigmas up to 4.5 mm long, densely covered with granulate papillae on the inside, hairy abaxially, gland-dotted

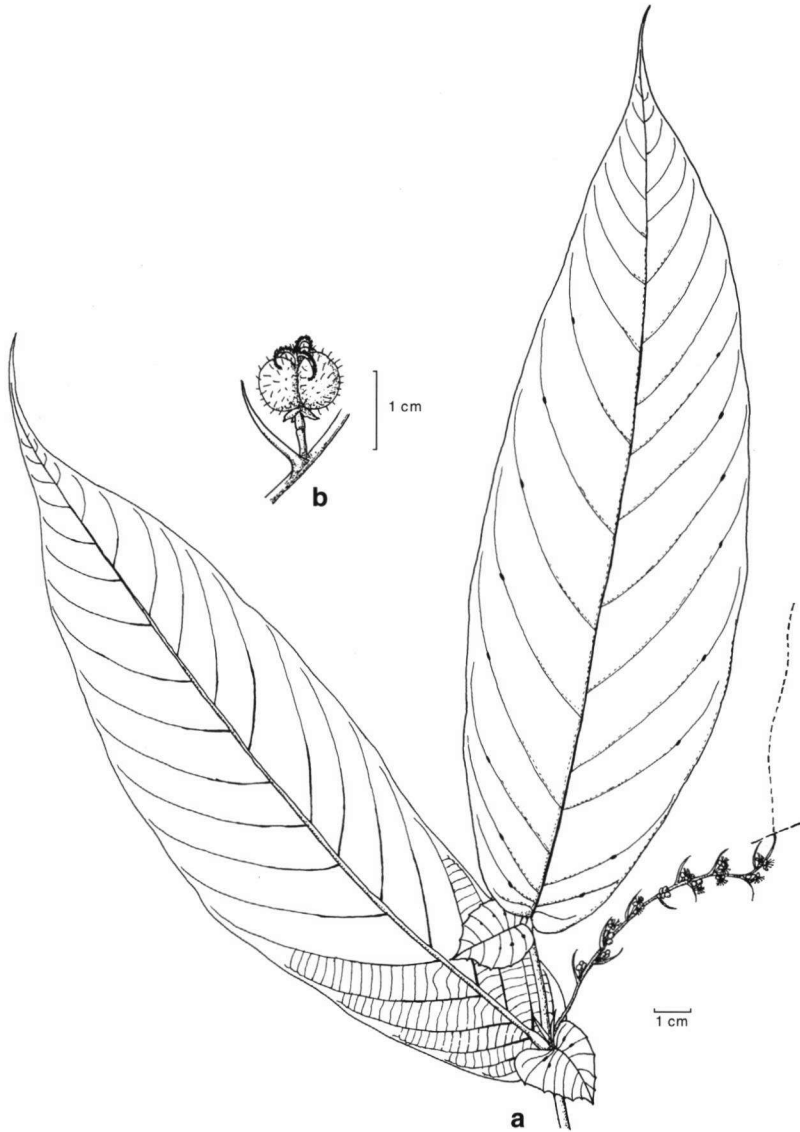


Fig. 20. *Mallotus havilandii* Airy Shaw. a. Habit of staminate plant; b. detail of fruit (a: *Haviland 1720, L*; b: *Chew Wee-lek CWL 675, L*).

outside. *Fruit* an echinate, lobed capsule, c. 10 by 7 mm, loculicidal-septicidal, light green to green, hairy, gland-dotted; carpel inside hairy, gland-dotted; column unknown. *Seeds* glossy, roughly globose, c. 6 by 6 by 5 mm; hilum deltoid to cordate, c. 1.5 by 2 mm.

Distribution — Only known from Sarawak, west of Kuching.

Habitat & Ecology — Only found on limestone. Altitude up to 166 m.

21. *Mallotus insularum* (Airy Shaw) Slik, *stat. nov.* — Fig. 21, Map 8

Mallotus miquelianus (Scheff.) Boerl. var. *insularum* Airy Shaw, Kew Bull. 20 (1966) 40. —
Type: *Buwalda 4575* (holo K; iso L), Moluccas, Tanimbar Islands (Timor Laut), Pulau Jamdena.

Shrubs up to 3.5 m tall, dioecious. *Indumentum* dense, simple to tufted to stellate. *Branches* smooth to slightly fissured, sometimes lenticellate, glabrescent, gland-dotted or not, nodes slightly swollen. *Stipules* usually caducous, sometimes persistent, triangular to ovate, 1.5–4.5 by 0.4–1 mm, margin irregular to regular, apex acute, hairy abaxially only, gland-dotted or not. *Leaves* simple, opposite, unequal. *Non-reduced leaves*: petioles 1–5 by 0.5–1 mm, hairy, gland-dotted or not; blade elliptic to obovate, 5–14 by 2.5–5.5 cm, length-width ratio 1.9–4, chartaceous, base cuneate to truncate to cordate, sometimes slightly oblique, margin wavy to dentate, marginal glands 3–13 per leaf side, apex acute to acuminate, upper surface smooth, glabrous to hairy, especially on midrib and veins, gland-dotted or not, basal macular glands 2–6 on veins, 1–12 mm from midrib, apical macular glands absent, lower surface smooth, hairy, especially on veins, gland-dotted, domatia absent; venation pinnate, veins 7–11 per side, ending parallel to or apically in the margin. *Reduced leaves* cordate to ovate to

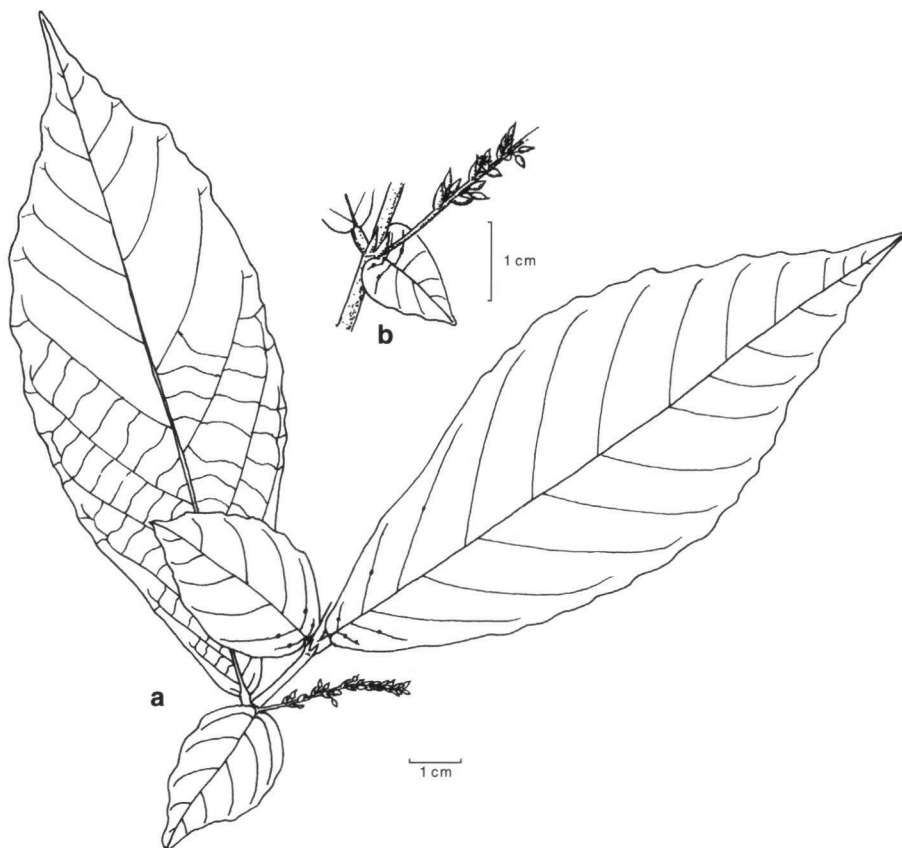


Fig. 21. *Mallotus insularum* (Airy Shaw) Slik. a. Habit of staminate plant; b. detail of staminate inflorescence (a & b: *Buwalda 4575*, L).

obovate, 7–42 by 5–25 mm, margin wavy to dentate, apex acute, upper surface with 2–6 basal macular glands, glabrous, gland-dotted, lower surface hairy, gland-dotted. *Inflorescences* in axils of reduced leaves, unbranched, solitary. *Flowers* actinomorphic. *Staminate inflorescences* thyrse-like racemes, up to 9.5 cm long, basally 0.5–1 mm thick, hairy, gland-dotted or not, nodes up to 30 per inflorescence, flowers up to 3 per node; bracts persistent, ovate, 1.3–4 by 0.5–0.8 mm, margin entire to irregular, apex acute, hairy abaxially, glabrous to hairy adaxially, not gland-dotted; buds (globose to) ovate, hairy, gland-dotted or not. *Staminate flowers* up to 4 mm diam., yellowish green; pedicels 1–3 mm long, hairy, gland-dotted or not; sepals 2 or 3, more or less connate, ovate to elliptic, c. 2.5 by 1.5 mm, margin irregular, apex acute, hairy abaxially only, not gland-dotted; stamens up to 53; filaments 2.3–3.5 mm long, glabrous; anthers 0.2–0.3 by c. 0.4 mm, basifixed; thecae 2, parallel, extrorse, opening lengthwise, glabrous; connective usually widened. *Pistillate inflorescences* racemes, up to 5 cm long, basally c. 1 mm thick, hairy, gland-dotted sparsely, nodes up to 6 per inflorescence; bracts persistent, narrowly triangular to triangular, 3–5 by 0.8–1 mm, margin entire, involute, apex acute, hairy. *Pistillate flowers* pedicels 4–5 mm long, hairy; sepals 2–4, more or less connate to free, ovate to narrowly triangular, 2–2.5 by c. 1 mm, margin entire to irregular, apex acute, hairy; ovary 3-locular, echinate, densely hairy, gland-dotted, spines up to 0.5 mm long, hairy, long simple hairs apically, rarely gland-dotted; ovules 1 per locule, axillary, apotropous, ascending; styles persistent, 0.5–1 mm long, hairy, gland-dotted; stigmas up to 2.5 mm long, densely covered with granulate papillae on the inside, hairy abaxially, gland-dotted outside. *Fruit* an echinate, lobed capsule, 6–7 by c. 5 mm, loculicidal-septicidal, hairy, gland-dotted; carpel inside hairy; column unknown. *Seeds* unknown.

Distribution — Lesser Sunda Islands, Moluccas, and Tanimbar Islands.

Habitat & Ecology — In primary (monsoon) forest; on dry places. Altitude up to 1000 m.

Note — Plants from Bali and Lombok have less pronounced dentate leaves in comparison to the plants from the Moluccas and the E Lesser Sunda Islands. From the mountains of Flores an aberrant specimen (*Schmutz 2860*) was collected which differs from the type by its less conspicuously unequal opposite leaves.

22. *Mallotus miquelianus* (Scheff.) Boerl. — Fig. 22, Map 9

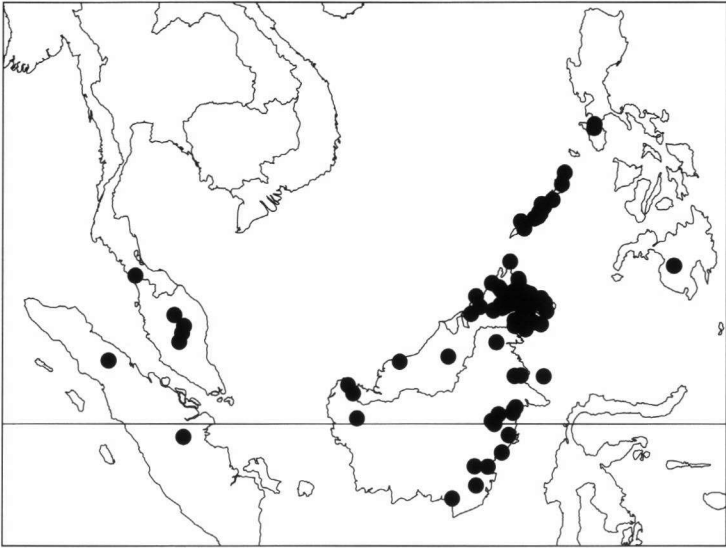
Mallotus miquelianus (Scheff.) Boerl., *Handl. Fl. Ned. Ind.* 3, 1 (1900) 290; Pax & K. Hoffm. in *Engl., Pflanzenz.* IV.147.vii (1914) 200; Merr., *J. Straits Branch Roy. Asiat. Soc.*, Special number (1921) 339; *Enum. Philipp. Flow. Pl.* 2 (1923) 434; S. Moore, *J. Bot.* 63 (1925) 103; Merr., *Philipp. J. Sci.* 29 (1926) 382; *Univ. Calif. Publ. Bot.* 15 (1929) 158; Pax & K. Hoffm. in *Engl. & Harms, Nat. Pflanzenfam.* ed. 2, 19c (1931) 117; Burkill, *Dict. Econ. Prod. Malay Penins.* 2 (1935) 1395; Airy Shaw, *Kew Bull.* 20 (1966) 40; Meijer, *Bot. News Bull.* 7 (1967) 53; Airy Shaw, *Kew Bull.* 26 (1972) 295; Whitmore, *Tree Fl. Malaya* 2 (1973) 114; Airy Shaw, *Kew Bull. Add. Ser.* 4 (1975) 163; *Kew Bull.* 36 (1981) 326; *Alph. Enum. Euphorb. Philipp. Isl.* (1983) 36; Keßler & Sidiyasa, *Tropenbos Series* 7 (1994) 133. — *Rottlera miqueliana* Scheff., *Ann. Mus. Bot. Lugd.-Bat.* 4 (1868/1869) 124. — Lectotype, selected here: *Korthals s.n.* (L sheet 904.105-154) (lecto L), Borneo, Sakoembang, regione fl. Doesson.

Mallotus anisophyllus Hook.f., *Fl. Brit. India* 5 (1887) 436; Boerl., *Handl. Fl. Ned. Ind.* 3, 1 (1900) 290; Merr. & Rolfe, *Philipp. J. Sci.*, Bot. 3 (1908) 107; Elmer, *Leafl. Philipp. Bot.* 4 (1911) 1286; Ridl., *Fl. Malay Penins.* 3 (1924) 293. — Type: *Maingay KD 1413* (holo K; iso L), Malacca.

Shrubs up to 3(–10) m tall, dbh up to 10 cm, dioecious; bole crooked, vegetative reproduction via root shoots. Outer bark smooth, scaly; sapwood hard, tough, durable. *Indumentum* sparse to dense, simple to tufted to stellate. *Branches* smooth to slightly fissured, lenticellate, hairy, not gland-dotted, nodes only slightly swollen. *Stipules* early caducous, ovate, 4–13 by 1.8–3 mm, margin entire to irregular, apex acute, hairy abaxially only, not gland-dotted. *Leaves* simple, opposite, unequal, one of each pair much smaller. *Non-reduced leaves*: petioles 2–7 mm long, basally 2–3 mm thick, hairy, not gland-dotted; blade elliptic to obovate, 7–32 by 2.5–13 cm, length-width ratio 2–4.7, chartaceous, base cuneate (cordate), oblique, margin wavy to dentate, marginal glands 10–23 per leaf side, apex cuspidate to aristate, upper surface smooth, glabrous (to hairy), not gland-dotted, basal macular glands 2–6 on veins, 1–6 mm from midrib, apical glands 2–13 per side between the veins, 4–10 mm from margin, lower surface smooth, hairy, especially on veins, gland-dotted or not, domatia absent or present, with hair tufts; venation pinnate, 11–18 secondary veins per side, ending in marginal glands especially apically. *Reduced leaves* (semi-)persistent, cordate, 8–55 by 8–48 mm, margin entire to wavy, marginal glands sometimes present, apex rounded, upper surface with (0–)2 (to several) basal macular glands on veins, rarely also a few apical glands on veins, glabrous to hairy, not gland-dotted, lower surface sometimes with domatia, hairy, gland-dotted. *Inflorescences* in axils of reduced leaves, unbranched, solitary. *Flowers* actinomorphic. *Staminate inflorescences* thyrse-like racemes, up to 13.5 cm long, basally c. 1 mm thick, hairy, not gland-dotted, nodes up to 18 per inflorescence, flowers up to 6 per node; bracts persistent, ovate, 1.5–3 by 0.9–1.7 mm, margin entire to irregular, apex acute, hairy abaxially only, gland-dotted or not; buds ovate (to globose), apex acute to acuminate, hairy, gland-dotted. *Staminate flowers* 2.5–6 mm diam., yellowish green to whitish green; pedicels 2.5–5.5(–10) mm long, glabrous to hairy, gland-dotted or not; sepals (2 or) 3, free, ovate to elliptic, 1.8–5 by 1–1.8 mm, margin entire to irregular, apex acute, glabrous to hairy, gland-dotted; stamens up to 55; filaments 2.3–4.5 mm long, glabrous; anthers c. 0.3 by 0.5 mm, basifixed; thecae 2, parallel, extrorse, opening lengthwise, glabrous; connective widened. *Pistillate inflorescences* racemes to rarely thyrse-like racemes, up to 10 cm long, basally c. 2.3 mm thick, hairy, gland-dotted or not, nodes up to 13 per inflorescence, flowers 1(–3) per node; bracts persistent, ovate, 3–4.5 by 1–2 mm, margin entire to irregular, apex acute, hairy abaxially only, not gland-dotted. *Pistillate flowers* dirty green to yellowish white to purplish brown; bracteoles sometimes present, ovate, c. 1.3 by 1 mm, margin entire to irregular, apex acuminate, hairy, not gland-dotted; pedicels 1–6 mm long, hairy, gland-dotted or not; sepals 3, free, ovate, 4–8 by 2–3.3 mm, margin entire to irregular, apex acute, hairy abaxially only, gland-dotted; ovary 3- (or 4-)locular, echinate, hairy, gland-dotted, spines 0.8–1.5 mm long, hairy, few long hairs apically, gland-dotted; ovules 1 per locule, axillary, apotropous, ascending; styles persistent, up to 1 mm long, hairy, not gland-dotted; stigmas up to 5(–9) mm long, densely covered with granulate papillae on the inside, hairy abaxially, not gland-dotted. *Fruit* an echinate, lobed capsule, 8–12 by 5–7 mm, loculicidal-septicidal, green to brownish red; carpel inside glabrous, not gland-dotted; column 3.3–4 by 4–4.6 mm. *Seeds* glossy, roughly globose, c. 4.5 by 4–4.5 by 4.5 mm; hilum elliptic to deltoid, 0.5–1.3 by 0.5 mm.



Fig. 22. *Mallotus miquelianus* (Scheff.) Boerl. a. Habit of pistillate plant; b. detail of staminate inflorescence (a: Keßler PK 1968, L; b: Sidiyasa S 436, L).



Map 9. Distribution of *Mallotus miquelianus* (Scheff.) Boerl.

Distribution — Peninsular Thailand, Peninsular Malaysia, Sumatra, Borneo, and the Philippines.

Habitat & Ecology — Locally common in primary and secondary forests (scrub), mostly found on disturbed sites but also in the forest understorey; on undulating terrain, ridges, marshy areas, near streamlets, forest edges, and roadsides; on alluvial (swampy) to well-drained terrain; on a large variety of soil types, from limestone to sandy soils to clayey loam. Altitude up to 700 m.

Uses — Used for making walking sticks. Poison.

Note — Very hairy specimens can be found in Sabah (and to a lesser extent also in Sarawak and the Philippines) as opposed to the nearly glabrous specimens from other localities.

ACKNOWLEDGEMENTS

We would like to thank the following institutes for sending their material on loan: A, ANSHIR, B, BM, BO, BRI, C, CANB, EDI, F, G, K, KEP, LAE, MEL, NY, P, QRS, SAN, SING, U, UC, US, WAN, WRSL. We are grateful to Joop Wessendorp, Jan van Os, and Pryono for their excellent drawings of the species treated in this paper.

This study was supported by grant 895.100.008 of the Netherlands Foundation for the Advancement of Tropical Research (WOTRO), within the Priority Programme 'Biodiversity of Disturbed Ecosystems'.

REFERENCES

- Airy Shaw, H.K. 1963. Notes on Malaysian and other Asiatic Euphorbiaceae. *Kew Bull.* 16: 349–352.
 Airy Shaw, H.K. 1966. Notes on Malaysian Euphorbiaceae. *Kew Bull.* 20: 38–45.

- Airy Shaw, H.K. 1968. Malaysian and other Asiatic Euphorbiaceae. *Kew Bull.* 21: 379–400.
 Airy Shaw, H.K. 1969. Malesian and other Asiatic Euphorbiaceae. *Kew Bull.* 23: 80–82.
 Airy Shaw, H.K. 1971. Malesian and other Asiatic Euphorbiaceae. *Kew Bull.* 25: 526–528.
 Airy Shaw, H.K. 1972a. The Euphorbiaceae of Siam. *Kew Bull.* 26: 292–308.
 Airy Shaw, H.K. 1972b. Notes on Malaysian and other Asiatic Euphorbiaceae. *Kew Bull.* 27: 86–87.
 Airy Shaw, H.K. 1975. The Euphorbiaceae of Borneo. *Kew Bull. Add. Ser.* 4: 160–174.
 Airy Shaw, H.K. 1976. New or noteworthy Australian Euphorbiaceae. *Kew Bull.* 31: 391–393.
 Airy Shaw, H.K. 1980a. The Euphorbiaceae of New Guinea. *Kew Bull. Add. Ser.* 8: 162–172.
 Airy Shaw, H.K. 1980b. New or noteworthy Australian Euphorbiaceae II. *Muelleria* 4: 232–235.
 Airy Shaw, H.K. 1980c. Notes on Euphorbiaceae from Indomesia, Australia and the Pacific. *Kew Bull.* 35: 393.
 Airy Shaw, H.K. 1981. The Euphorbiaceae of Sumatra. *Kew Bull.* 36: 323–330.
 Airy Shaw, H.K. 1983. An alphabetical enumeration of the Euphorbiaceae of the Philippine Islands. Royal Botanic Gardens Publication, Kew, Great Britain.
 De Loureiro, J. 1790. *Flora Conchinchinensis*. Volume 1: 635. Ulyssipone, Lisbon, Portugal.
 Forster, P.I. 1999. A taxonomic revision of *Mallotus* Lour. (Euphorbiaceae) in Australia. *Austrobaileya* 5: 457–497.
 Müller Argoviensis, J. 1865. Euphorbiaceae. *Linnaea* 34: 185–192.
 Müller Argoviensis, J. 1866. Euphorbiaceae tribus Acalypheae. In: A. de Candolle, *Prodrromus Systematis Naturalis Regni Vegetabilis* 15, 2: 956–983, 1024. Paris, France.
 Pax, F.A. & K. Hoffmann. 1914. Euphorbiaceae–Acalypheae–Mercurialinae. In: A. Engler (ed.), *Das Pflanzenreich* IV.147.vii: 145–212, 396–397. Leipzig, Germany.
 Reichenbach, H.G. & H. Zollinger. 1856. Over soorten van Rottlera. *Verhand. Natuurk. Vereen. Ned.-Indië* 1: 19–31.
 Seemann, B.C. 1857. Flora of the Island of Hong Kong. The Botany of the Voyage of H.M.S. *Herald*: 409–410. London, Great Britain.
 Slik, J.W.F. 1998. Three New Malesian species of *Mallotus* section *Hancea* (Euphorbiaceae). *Blumea* 43: 225–232.
 Van Welzen, P.C. 1997. Malesian Euphorbiaceae Newsletter 6: 1–31.

IDENTIFICATION LIST

The numbers behind the collector numbers refer to the following taxa:

- | | |
|--------------------------------|----------------------------|
| 1 = <i>M. brachythyrus</i> | 12 = <i>M. kingii</i> |
| 2 = <i>M. cordatifolius</i> | 13 = <i>M. lackeyi</i> |
| 3 = <i>M. eucaustus</i> | 14 = <i>M. longystylus</i> |
| 4 = <i>M. floribundus</i> | 15 = <i>M. miquelianus</i> |
| 5 = <i>M. garrettii</i> | 16 = <i>M. papuanus</i> |
| 6 = <i>M. grandistipularis</i> | 17 = <i>M. peltatus</i> |
| 7 = <i>M. griffithianus</i> | 18 = <i>M. penangensis</i> |
| 8 = <i>M. havilandii</i> | 19 = <i>M. stipularis</i> |
| 9 = <i>M. hirsutus</i> | 20 = <i>M. surculosus</i> |
| 10 = <i>M. hookerianus</i> | 21 = <i>M. thorelii</i> |
| 11 = <i>M. insularum</i> | 22 = <i>M. wenzelianus</i> |

A series 21: 15; 38: 13; 557: 15; 759: 13; 794: 15; 858: 18; 1127: 15; 1864: 13; 1897: 18; 1981: 15; 2300: 13; 2567: 15; 2840: 13; 2880: 15; 2984: 18; 3549: 15 — Achmad 503: 17; 896: 17; 1320: 17 — Aet & Idjan 644: 17 — Afriastini 2590: 17; 2690: 17; 2739: 18; 2749: 17 — Afriastini & Rohajawati 2930: 4; 2949: 17 — Agullana 843: 18; 1798: 18 — Ahern: 4 — Ajoeb 157: 17 — Allen & Kadim 438: 17 — Alonis 221: 17 — Alston 12993: 17; 13870: 17; 14453: 17; 15222: 17 — Alvins 635: 18; 855: 17; 1044: 17; 1079: 17; 1094: 17; 1291: 7 — Ambri & Arifin W 2: 18; W 83: 18; W 99: 18; W 333: 18; W 335: 18 — Ambriansyah AA 663: 15; AA 675: 13 —

- Ambriansyah & Arbainsyah AA 991: 17; B 598: 7; B 602: 19; B 805: 13 — Ambriansyah & Arifin AA 207: 13; AA 242: 17; AA 316: 17; AA 1678: 13; W 187: 18 — Amdjah 395: 15; 481: 15; 531: 17; 800: 15 — Amir 241: 17 — Amiril Saridan P6 236: 18 — Andau 231: 13 — Andrews 798: 18 — Annandale: 17 — ANU series 1561: 4 — Apostol 821: 15; 3460: 13; 3628: 15 — Argent & Amiril Saridan 9358: 18; 9392: 3; 93107: 18; 93108: 18; 93139: 18 — Argent & Reynoso 4254: 18; 4374: 18 — Arifin & Ambriansyah B 999: 7; B 1548: 17 — Arifin et al. B 559: 19; B 561: 19; B 912: 7 — Arifin Z. et al. AA 1787: 17 — Arsat 1204: 15; 1273: 17 — Awanghela 2684: 7.
- Backer 714: 4; 716: 17; 915: 4; 1745: 17; 8106: 4; 8973: 17; 9966: 17; 16260: 17; 17171: 17; 17381: 17; 17554: 4; 17596: 4; 17622: 4; 17654: 17; 18004: 4; 18219: 4; 18352: 4; 18385: 4; 18488: 17; 21284: 17; 21363: 17; 22876: 17; 24115: 17; 26359: 17 — Bakhuizen van den Brink 738: 17; 1158: 17; 6190: 17 — Balajadia 7080: 18 — Balakrishnan 158: 17; 678: 17; 1042: 17; 2913: 17; 3953: 18; 4067: 17 — Bangham 1093: 17 — Bartlett 6679: 17; 8152: 17; 8190: 4; 8401: 17; 13560: 15 — Bartlett & La Rue 9: 4 — Basilin 748: 4; 995: 4 — Bateson 87: 4 — Bayak 1290: 4 — bb series 9203: 17; 12123: 17; 12129: 18; 18084: 4; 25010: 4; 29881: 4; 30443: 18; 30469: 18; 34516: 18; 35396: 18; 35749: 17 — Beaman 9719: 15; 10147: 15 — Beaman et al. 9210: 13 — Beccari PB 995: 18; PB 1800: 1; PB 2204: 4; PB 3380: 18; PB 3768: 18; PS 756: 17; PS 767: 17 — Becking 114: 4 — Beumée A 504: 17; 585: 17; 2318: 4; 3648: 4 — Bhargava 2424: 17; 3258: 17; 3371: 17; 4225: 17 — Bhargava et al. 6303: 17; 6361: 17 — Blewett 45: 15 — Bloembergen 4482: 11; 4571: 4 — Blume 214: 17 — Bodinier 554: 10; 1200: 17; 1201: 17; 1293: 10 — Boeadi 31: 17 — Boerlage 399: 18; 433: 18 — Bogner 406: 17 — Bojeng bin Sitam 9377: 18 — Boonkird 74: 17; 3295: 4 — Borden 1903-4: 18 — Bourell 2214: 17; 2257: 4 — Bramo 2286: 18 — Brass 616: 4; 24316: 4; 29301: 4 — Brinkman 675: 17; 815: 17 — Britton 24: 17 — Britton & Winder 69: 17 — Brooke 10158: 13 — Bruggeman & Hagen 991: 17 — BRUN series 16: 18; 275: 7; 15013: 18 — BS series 116: 4; 240: 17; 250: 17; 540: 15; 546: 4; 697: 15; 787: 15; 883: 15; 1065: 15; 1158: 4; 1533: 15; 1616: 4; 1681: 13; 1717: 18; 1720: 17; 2305: 15; 6568: 4; 6951: 15; 7381: 18; 7396: 18; 7425: 18; 10637: 4; 13374: 18; 13774: 18; 15459: 4; 18661: 4; 20163: 4; 20907: 4; 21583: 15; 21875: 13; 23729: 4; 24608: 4; 28766: 18; 29442: 4; 31384: 4; 33024: 18; 33546: 18; 34549: 9; 35173: 14; 35326: 18; 35377: 18; 35378: 18; 35532: 18; 36801: 4; 40880: 15; 40907: 4; 43982: 13; 44071: 15; 49138: 4; 49147: 4; 75573: 4; 77338: 13; 77378: 13; 77612: 13; 79496: 4; 79513: 18; 81142: 15; 83630: 4 — BSIP series 1018: 4; 1268: 4; 2914: 4; 8180: 4; 13899: 4 — Bünnemeijer 58: 17; 216: 17 — Burkill 3232: 17; 9990: 17 — Burkill & Haniff 13590: 17 — Burkill & Shah 1110: 7 — Burkill et al. 15706: 7 — Burley 2093: 17; 2134: 17 — Burley et al. 1704: 18; 1787: 18; 2021: 6; 4121: 17; 4122: 17 — Burley, Tukirin et al. 805: 17; 1557: 17; 1570: 17; 2021: 6 — Buwalda 2897: 17; 2898: 17; 4575: 11; 6331: 15; 6649: 17; 6902: 17 — BW series 1197: 18; 3779: 17; 4327: 16; 5856: 4; 6160: 17; 6794: 4; 7458: 17; 8405: 17; 8420: 17; 11392: 4; 12180: 18; 12809: 17.
- Campbell 104: 17; 122: 18; 408: 7 — Carr 12589: 4 — Castro 4451: 18; 4564: 18; 7186: 7 — Chakrabarty 3234: 18; 10174: 17 — Chanthamuk 37: 17 — Charoenphol 155: 17 — Charoenphol et al. 3582: 17; 3836: 17; 4090: 17 — Chermisrivathana 1441: 17; 1449: 17 — Chew Wee-lek 300: 4; 505: 17; 659: 8; 672: 17; 675: 8 — Chew Wee-lek et al. 39: 18; 216: 18; 282: 18; 294: 18; 2767: 18 — Chin 1552: 15; 8252: 10 — Chin & Mustafa 3303: 4 — Chun 4903: 10; 6480: 10; 6506: 10; 6598: 10; 6706: 10; 6915: 10 — Chun & Tso 43373: 10; 43654: 17; 43776: 10 — Church 188: 18 — Church et al. 820: 18; 975: 17; 1168: 3; 1174: 18; 1990: 18 — J. Clemens & M.S. Clemens 3130: 4; 3608: 17; 4099: 4; 4148: 17; 20289: 15; 20290: 15; 22243: 15; 32035: 18; 40103: 18; 40777: 18 — M.S. Clemens 246: 4 — Collins 319: 17; 393: 17; 697: 17; 2363: 17 — Conn 1796: 17 — Coode 5419: 15; 5966: 17; 6021: 17; 6070: 17; 6215: 17; 6893: 7; 7038: 7; 7350: 18; 7861: 18; 7930: 3 — Curtis 674: 17; 675: 17; 755: 18; 1381: 17; 1461: 17; 1462: 17; 2248: 17; 2260: 17; 2286: 18; 2377: 12; 2382: 17; 2656: 17; 2707: 17; 2764: 17; 3331: 17.
- Darbyshire 402: 4; 962: 4 — Davidson 1355: 17 — Dayar Arbain 92: 17; 185: 17; 253: 17 — De Jong 642: 15 — De Vogel 1588: 13; 1589: 17; 1647: 17; 1690: 13; 1773: 17; 2122: 17; 2540:

- 17; 3058: 4; 3061: 4; 3782: 4; 3894: 4; 4084: 18; 4086: 18 — De Vogel & Vermeulen 6491: 4; 6936: 4 — De Voogd 208: 4; 592: 19 — De Wilde & De Wilde-Duyfjes 12077: 17; 12444: 17; 15667: 17; 15725: 17; 18112: 17; 18166: 17; 18489: 17; 18652: 17; 18757: 17; 18962: 17; 18970: 17; 19215: 17; 19605: 4; 19660: 17; 19661: 17; 19924: 18; 19978: 18; 20200: 18; 20548: 4; 20849: 4; 21011: 17; 21388: 17 — Dee Bunpheng 1088: 17; 1103: 17 — Derry 992: 17; 1226: 7; 9094: 17 — Ding Hou 451: 7; 458: 7 — Docters van Leeuwen 5285: 17; 7753: 19; 10291: 18; 11199: 17 — Dransfield 1011: 17; 6275: 15; 6298: 18; 6853: 18 — Dransfield et al. 7272: 18.
- Eberhardt 1545: 17; 1658: 17; 1662: 17; 1686: 17; 2549: 10; 2562: 17; 2690: 17; 2765: 10; 2790: 17; 2901: 17; 3025: 10; 3033: 4 — Elbert 2495: 11; 2509: 17; 3147: 4; 3150: 17; 4111: 17 — Elmer 7099: 4; 11167: 4; 12194: 18; 12253: 18; 12584: 17; 12702: 4; 12817: 15; 13017: 13; 13024: 4; 13026: 4; 13333: 4; 13480: 9; 15590: 4; 20124: 15; 20517: 13; 20594: 13; 20766: 13; 20779: 18; 20792: 17; 20796: 18; 20866: 17; 20934: 17; 20963: 13; 21041: 18; 21100: 7; 21158: 17; 21324: 7; 21536: 15 — Enchai 9397: 7 — Endek 20772: 17 — Endert 71: 4; 1866: 15; 2196: 4; 3028: 17; 3488: 13; 4021: 17; 4087: 17; 4694: 13; 4772: 17; 4831: 3; 4919: 7; 5114: 15; 5153: 13; 5185: 15 — Enggoh 7304: 15 — Ernst 466: 17 — Evangelista 964: 18; 973: 15; 1013: 4.
- Faray 57: 17; 138: 17 — FB series 2612: 18 — Forbes 594: 17; 1308: 15; 1312 A: 15; 1513 A: 15; 1765: 17; 2803: 18; 2822: 17; 3145: 17; 3237: 18; 3238: 15 — Forman 1094: 7 — Forster PIF 13603: 20; 13646: 20; 14420: 20; 23558: 20 — Foster & Pasua 3463: 18; 3552: 18 — Fox 5016: 4 — Fraser 802: 15 — Frodin 6872: 4 — Frodin et al. 2844: 7 — Fuchs 21338: 7 — Fung 20025: 17; 20071: 17; 20092: 10; 20334: 10 — Furet 126: 17.
- Galoengi 240: 17 — Garrett 140: 5; 993: 17; 1322: 17; 1385: 17 — Geesink 8973: 18 — Geesink & Santisuk 5001: 17 — Geesink et al. 5643: 17; 5668: 17; 6813: 17; 7231: 17 — Gianni 546: 7 — Gjellerup 316: 16 — Godefroy 313: 21 — Goklin 1293: 13 — Goodenough 1799: 18; 1818: 7; 1891: 17; 1982: 7; 5059: 18; 10527: 17; 10541: 17 — Grashoff 177: 4 — Gressitt 753: 17; 955: 17; 1036: 10; 1070: 17 — Griffith 4758: 17; KD 4762: 4; KD 4961: 7 — Guard & Kaloug 20244: 17 — Guard & Osman 23684: 12.
- Haenke 584: 4 — Hallé 1125: 18; 1181: 18 — Hallier 192: 4; 444: 4; 444a: 4; 4444: 4 — Hamid 10590: 18 — Hance 1806: 10; 7298: 17 — Hansen 774: 19; 1278: 17 — Hansen & Smitinand 12266: 17; 12358: 17; 12486: 17 — Hardial & Munir 15: 17 — Hardial & Samsuri 196: 17 — Hartley 10657: 4; 10766: 18; 10906: 17 — Harvey 10126: 15 — Haviland 882: 4; 1591: 18; 1596: 18; 1720: 8 — Haviland & Hose 3248: 7; 3667: 18 — Hayata 370: 17 — Helfer 138: 17; 181: 17; 4731: 17 — Henderson 4548: 17 — Hildebrand 4: 17 — Ho 1760: 17; 1765: 15; 1886: 18; 2779: 15 — Hochreutiner 2263: 17 — Hommel 1: 4 — Hoogland 3927: 4; 5180: 4; 5181: 4 — Hoogland & Craven 10797: 18 — Hore 7593: 17 — Horsfield 202: 4; 203: 17 — Hose 22: 18; 26: 18; 111: 4; 184: 18; 281: 7; 467: 4 — Hotta 15815: 3 — How 70319: 10; 70500: 17; 70974: 17; 71735: 10; 71825: 10 — Huc 614: 17 — Hyland 13775: 20.
- Iboet 301: 17 — Igyn G. 123: 4 — Iwatsuki et al. 1658: 17; B-7301: 15; B-7302: 15.
- Jacobs 5140: 17; 5426: 18; 8446: 17; 9494: 18 — Jansen 4692: 4 — Jarvie & Ruskandi 5391: 3 — Johns 7709: 18.
- Kadim & Mahmood 29: 4 — Kadim & Noor K 522: 17 — Kadir & Enggoh 10350: 13; 10357: 17 — Kamis 4723: 18 — Karta 42: 17 — Kartawinata 898: 15 — Kasim bin Rajab 349: 17 — Kato & Wiriadinata B-4781: 17; B-5363: 17; B-6531: 17 — Kato et al. C-3663: 17 — Keenan et al. 1576: 4 — Keith 425: 4; 7085: 15; 7158: 15 — Keng et al. 8857: 7 — KEP series 33691: 18; 35693: 4; 63165: 17; 80102: 7; 94271: 17; 95032: 18; 97805: 18; 99829: 17; 99908: 7; 104418: 12; 104836: 18; 104951: 7; 104978: 18; 110207: 17 — KEP-FRI series 34: 17; 41: 17; 71: 18; 94: 17; 104: 17; 488: 17; 546: 4; 2289: 7; 2435: 18; 3166: 18; 3180: 18; 3369: 12; 3458: 15; 3516: 17; 3518: 17; 3527: 15; 3702: 17; 3730: 17; 3769: 7; 3785: 7; 3842: 18; 4074: 4; 4088: 17; 4110: 7; 4320: 4; 4369: 4; 4377: 7; 4721: 18; 4844: 18; 4856: 18; 6005: 7; 6028: 18; 6397: 7; 6611: 7; 6657: 18; 6883: 17; 6981: 17; 7784: 18; 7794: 17; 7841: 18; 8179: 18; 8329: 18; 8417: 18; 8516: 4; 8567: 12; 8616: 18; 8662: 17; 8789: 18; 8897: 18; 8962: 18; 10589: 18; 10653: 4; 11251: 17; 11319: 18; 11373: 18; 11711: 17; 13037: 18; 13203: 17; 13311: 12; 13723:

- 18; 13744: 18; 14027: 18; 14461: 7; 14581: 18; 14603: 18; 14660: 12; 14692: 12; 14735: 18; 14758: 18; 15198: 7; 15229: 18; 15355: 18; 15918: 12; 16496: 12; 16664: 18; 17113: 7; 17277: 18; 17305: 18; 17328: 18; 17572: 18; 17877: 17; 20063: 17; 20294: 12; 20415: 18; 20594: 18; 20707: 17; 20721: 12; 21668: 18; 21784: 15; 23334: 7; 23346: 15; 23867: 18; 25091: 15; 25606: 7; 26790: 7; 26863: 17; 28240: 17; 28390: 12; 28728: 18; 35410: 12; 41292: 7; 95032: 18 — Kerr 2576: 17; 3622: 17; 4159: 17; 5682: 21; 5983: 21; 5983A: 21; 6037: 17; 6883: 17; 7044: 21; 7116: 17; 9273: 17; 9491: 17; 10063: 17; 10063 A: 17; 10866: 17; 11187: 17; 11836: 17; 12156: 4; 12444: 4; 12579: 17; 12674: 17; 12674 A: 17; 14065: 17; 14065 A: 17; 14293: 15; 14398: 17; 14481: 18; 14939: 19; 15039: 17; 15951: 18; 16344: 4; 16461: 17; 16986: 19; 17161: 4; 17234: 4; 17262: 17; 17413: 17; 18333: 4; 18568: 17; 18885: 17; 19126: 17; 19301: 21; 19611: 21; 19846: 21; 21234: 5; 21675: 17 — Keßler PK 1968: 15 — Keßler & Arbainsyah B 604: 18 — Keßler et al. B 101: 18; B 150: 18; B 164: 3; B 174: 3; B 194: 3; B 200: 7; B 201: 7; B 791: 18; PK 1100: 13 — King's Collector 3: 17; 100: 17; 435: 17; 477: 17; 485: 17; 539: 17; 864: 4; 1674: 17; 4602: 7; 7184: 18; 7414: 12 — Kinsey 1951: 18 — Kinsun Bakia 62: 13 — Kirkup 440: 7 — Kjellberg 706: 17; 3862: 17 — KL series 1366: 17; 3044: 17; 3141: 4; 3152: 15 — Klackenbergh & Lundin 644: 17; 645: 17 — Kloss et al. 6667: 4; 6852: 4 — Ko 52120: 10; 52127: 10; 52289: 17 — Koerniasih 24: 4 — Koie 1796: 17 — Koorders 2520: 4; 2521: 4; 2522: 4; 2523: 4; 2524: 4; 2525: 4; 2526: 4; 2527: 4; 2528: 4; 2529: 4; 2530: 4; 2531: 4; 2532: 4; 2533: 17; 2534: 17; 2535: 17; 2552: 17; 2554: 17; 2569: 17; 10321: 4; 11164: 17; 11465: 4; 11466: 4; 12910: 4; 12951: 4; 14875: 4; 16903: 4; 16904: 4; 16905: 4; 16906: 4; 22691: 4; 23759: 4; 25162: 4; 25399: 4; 26895: 17; 28913: 4; 30325: 17; 30539: 17; 30978: 17; 32934: 4; 34498: 17; 34515: 17; 35083: 4; 36762: 4; 39737: 4; 39739: 4; 40602: 4; 47734: 17 — Kostermans 289: 18; 767: 17; 1170: 18; 1293: 18; 1318: 18; 4940: 18; 5344: 15; 5512: 18; 5948: 18; 5950: 18; 6011: 15; 6229: 18; 6356: 18; 6685: 7; 6693: 18; 7019: 7; 7563: 18; 7625: 18; 8632: 18; 8946: 15; 8949: 15; 9134: 18; 9320: 3; 9575: 15; 9637: 15; 10155: 18; 10178 B: 18; 10179: 18; 10229: 18; 10696: 15; 13662: 17; 14053: 18; 19283: 17; 21017: 17; 21137: 17; 21264: 13; 21571: 15; 21591: 13; 21596: 15; 21715: 15 — Kostermans & Soegeng 123: 16; 162: 18; 387: 16; 518: 4 — Kostermans & Van Woerden 110: 17; 126: 17 — Krukoff 4064: 17; 4080: 18 — Kuntze 3823: 4.
- LAE series 6546: 4; 10375: 18; 53675: 18; 59131: 18; 62231: 17; 63408: 18; 66009: 4; 77257: 18; 77515: 18 — Lakshnaka 388: 17; 621: 4 — Lam 954: 4; 7805: 16 — Lanjouw 41: 17 — Larsen & Larsen 32601: 4; 33223: 17; 33240: 17; 33365: 17; 33366: 17; 33545: 17 — Larsen, Santisuk & Warncke 2555: 17; 2694: 17; 3099: 17; 3138: 17 — Larsen et al. 41056: 17; 41233: 17; 41238: 17; 42682: 17; 42730: 17; 42877: 17; 43014: 17; 43292: 17; 43730: 17; 44059: 17; 44481: 5; 45527: 17; 46713: 17 — Latiff 834: 18; 2200: 17 — Latiff et al. 3988: 4; 4146: 4 — Lau 185: 17; 1470: 17; 1601: 17; 3544: 10; 5551: 17; 5810: 17 — Laumonier 39: 18; 1921: 18; 3994: 17; 4622: 18 — Lauterbach 1232: 4 — Leach & Naoni 5379: 17 — Ledermann 8790: 4; 9539: 18; 9657: 18; 9803: 18 — Lei 526: 17; 781: 17 — Leighton 73: 18; 430: 15; 762: 13; 1026: 18; 1091: 18 — Levine 1982: 10 — Liang 61553: 17; 61594: 17; 62025: 10; 64437: 10; 65138: 17; 66485: 10 — Lister Turner 12: 4 — Lörzing 3930: 17; 3995: 17; 5052: 17; 5053: 17; 5556: 17; 5561: 17; 6859: 19; 7042: 19; 7342: 19; 8462: 4; 9642: 17; 14746: 19; 15224: 17; 15225: 17; 16312: 4; 16371: 15 — Lugas 2217: 13; 2263: 18; 2457: 13.
- Maidin 1458: 15; 1468: 15; 1500: 13; 1683: 4; 1688: 18; 2358: 15; 3196: 17 — Mail 1833: 7; 2656: 15 — Maingay KD 1413: 15; KD 1432: 7; KD 1444: 18; KD 1446: 17; KD 1447: 18; KD 1450: 7; KD 3126: 17 — Maradjo 286: 6; 384: 17 — Marcan 202: 17; 1190: 17; 1200: 17 — Maroef 216: 15; 428: 4 — Martens 30: 4 — Mat 17940: 18 — Mat-Salleh et al. 3430: 7 — Maxwell 74-834: 17; 75-88: 17; 75-352: 17; 75-483: 17; 75-856: 17; 78-284: 17; 87-297: 17; 89-534: 17; 89-663: 17; 89-679: 17; 89-881: 17; 89-1008: 17; 91-502: 17; 91-613: 17; 94-534: 17; 95-506: 17 — McClure 8558: 17; 9678: 10; 9700: 17; 20067: 10; 20163: 10 — McGregor 207: 4 — Meijer 1764: 17; 1766: 17; 2091: 15; 2612: 18; 2987: 17; 4201: 6; 10611: 11; 10727: 17; 10903: 17 — Meijer & Dewol 131637: 15 — Meijer & Noerta 9119: 4 — Merrill 715: 4; 1231: 17; 1246: 15; 2096: 15; 2232: 4; 2398: 4; 2765: 4; 2889: 4; 3067: 4; 4048: 15; 6821: 18; 7239: 15; 9255: 4; 9509: 13; 9569: 15; 11392: 4; 11396: 4 — Metzner 180: 17 — Mjöberg 147:

- 1 — Mogeia 4225: 7; 4289: 17; 4313: 1; 4398: 18 — Motley 732: 15 — Murata, Fukuoka & Phengkklai T-16420: 17; T-16423: 17; T-16451: 17 — Murata et al. T-2740: 18; T-37081: 17.
 Nair 3694: 17; 4853: 17; 4903: 17; 4904: 17 — Nais & Dolois 6774: 13 — Nangkat 160: 4 — NGF series 3905: 4; 6546: 4; 11578: 4; 12326: 17; 12886: 4; 13479: 17; 21032: 17; 21962: 18; 22330: 4; 22469: 4; 26033: 17; 26691: 17; 27404: 18; 35167: 4; 41431: 17; 46552: 4; 46569: 4; 46609: 17; 48689: 17; 48690: 17 — Niel 3538: 4 — Nodi 733: 15 — Noermawati 41: 4 — Nooteboom 1448: 18; 1642: 15; 5230: 17; 5248: 17; 5898: 4 — Nooteboom & Chai 1653: 18; 1748: 18.
 Ogata 10296: 12; 10305: 17; 10431: 17; 10680: 15; 10730: 7; 10816: 15; 10855: 15; B 165: 18; B 201: 7 — Oro 31051: 18 — Orolfo 2861: 15.
 Palee 52: 17 — Parkinson 1699: 4 — Pascual 1096: 15; 1099: 13 — Pasua 7020: 18 — Pawanchee 13676: 7 — Peekel 921: 17 — Phengkklai 1282: 17 — Phengkklai et al. 4218: 17 — Phengnaren 103: 17; 486: 17 — Phusomsaeng 462: 4; 463: 4; 1596: 17 — Phusomsaeng et al. 1605: 4 — Pinnin et al. 431: 17 — Pleyte 946: 4 — PNH series 40: 4; 340: 13; 2906: 4; 2954: 18; 5854: 18; 6097: 14; 6108: 4; 6226: 15; 6227: 4; 6647: 13; 6656: 15; 10323: 4; 11020: 4; 11467: 4; 12474: 4; 12486: 15; 13345: 15; 13974: 4; 14155: 15; 14235: 13; 14575: 4; 17526: 4; 18678: 17; 21666: 4; 23016: 4; 23039: 15; 23056: 15; 36311: 4; 37149: 4; 37732: 4; 41829: 18; 41891: 18; 41909: 18; 41967: 13; 42091: 13; 42245: 4; 42410: 18; 91538: 13; 97799: 4; 98233: 4; 117391: 14; 117545: 2; 117589: 14; 117592: 14 — Podzorski 525: 18; 725: 15; 735: 15 — Poilane 999: 17; 1085: 10; 1088: 10; 1102: 10; 1394: 4; 2787: 17; 6194: 17; 6821: 17; 8249: 18; 8260: 18; 8310: 17; 9945: 17; 10215: 17; 10436: 10; 13573: 17; 17974: 17; 24863: 17 — Polak 2187: 15 — Porter 9094: 17 — Posthumus 635: 17; 652: 17; 858: 17; 1027: 17 — PPI series 2866: 4; 10215: 18 — Prawiroatmodjo & Maskuri 1282: 17; 1372: 17; 1403: 17; 1547: 17 — Prawiroatmodjo & Soekowo 2000: 4 — Prijanto & Tantra 44: 17 — Promdej et al. 266: 17 — Puasa 1432: 13 — Purselglove 4665: 1 — Put 691: 17; 1231: 17; 1619: 17; 2695: 17; 2709: 17; 3105: 21; 4213: 17.
 Rabil 206: 17; 370: 17 — Rachmat 800: 17 — Rahayu 310: 17 — Rahayu & Maskuri 380: 17; 466: 17 — Rahmat si Boeia (= Rahmat si Toroos) 71: 15; 283: 17; 338: 17; 805: 17; 839: 15; 938: 17; 1528: 17; 1654: 17; 1663: 17; 2223: 17; 2237: 15; 2639: 15; 2987: 17; 3559: 4; 3695: 4; 4423: 17; 4596: 17; 4753: 17; 4832: 17; 4884: 17; 4932: 17; 4948: 17; 4965: 17; 5079: 17; 5233: 15; 5270: 15; 5361: 15; 5382: 17; 5433: 17; 5468: 17; 5632: 15; 5801: 17; 6697: 17; 6880: 17; 7760: 17; 7841: 19; 7938: 17; 9385: 17; 9455: 17; 9508: 17; 10054: 17 — Ramos 1280: 15; 1287: 15 — Ramsri 26: 17 — Repin et al. 6565: 18; 06568: 18 — Reppie 506: 4 — Ridley 43: 17; 1391: 4; 1788: 7; 2294: 7; 2302: 15; 2676: 17; 2973: 17; 3451: 18; 6481: 18; 7648: 17; 7649: 18; 8204: 17; 8491: 17; 8593: 12; 9061: 15; 9459: 17; 9585: 17; 10229: 17; 12050: 17; 12159: 18; 12382: 4; 12453: 15; 13231: 17; 14509: 17; 14511: 4; 14898: 17; 14899: 17; 14935: 4; 15409: 4; 15602a: 17; 15735: 17; 16183: 18 — Ridsdale 138: 15; 404: 17; 408: 17; 1978: 13 — Robinson 1080: 17; 1392: 17 — Rumuton 106: 17; 192: 13 — Rutten 253: 17; 265: 15; 352: 17; 515: 15; 628: 17; 715: 17; 750: 15; 759: 15; 1737: 4; 1843: 4; 1852: 17; 1873: 17 — Ryding 666: 17.
 S series 330: 17; 1135: 18; 5939: 7; 8286: 7; 12741: 17; 14811: 18; 15750: 18; 16173: 17; 16288: 18; 16536: 18; 16798: 7; 18022: 7; 18603: 15; 19886: 19; 20847: 8; 21717: 17; 22118: 19; 22442: 19; 22886: 8; 22976: 3; 23020: 18; 23222: 3; 23252: 17; 23319: 3; 23339: 17; 23419: 3; 23630: 3; 23771: 3; 24342: 18; 24355: 15; 24521: 18; 24631: 3; 24688: 17; 25248: 18; 25778: 18; 25838: 18; 26911: 1; 27259: 4; 27661: 17; 29095: 3; 29557: 3; 29672: 18; 29986: 3; 30356: 13; 30708: 18; 31598: 18; 31633: 17; 31697: 4; 32089: 18; 32221: 18; 32517: 18; 32826: 18; 32978: 18; 34186: 8; 35263: 1; 36176: 19; 36595: 3; 37935: 18; 38160: 18; 38601: 17; 39260: 18; 39638: 7; 39924: 7; 39937: 4; 40080: 4; 40290: 3; 41021: 18; 42231: 7; 43386: 18; 43549: 18; 44750: 4; 44849: 18; 44954: 18; 46175: 17; 46226: 8; 46471: 3; 46488: 7; 47048: 7; 49011: 19; 57623: 3; 59918: 4; 59985: 1; 62128: 18; 68713: 7 — Sales 4261: 18 — Samat & Abdullah 2232: 7 — Sambunlig 704: 13 — Samsuri 1163: 18 — Samsuri & Shukor 457: 18; 490: 12 — SAN series 15424: 18; 16039: 7; 16122: 18; 16159: 17; 16214: 18; 16853: 17; 16879: 7; 16898: 13; 18777: 19; 18798: 18; 19095: 15; 19614: 7; 19673: 15; 20052: 15; 20136: 18; 20687: 18;

20816: 13; 20960: 18; 21138: 13; 21206: 18; 21299: 13; 21310: 18; 21353: 15; 21383: 7; 21496: 7; 21655: 18; 21751: 18; 22676: 7; 24454: 4; 24480: 17; 24507: 18; 24509: 15; 25751: 7; 26038: 17; 26531: 15; 26532: 18; 26857: 3; 27420: 15; 27675: 18; 29306: 15; 29462: 7; 29602: 19; 30034: 7; 30096: 19; 30119: 19; 30420: 18; 30440: 18; 30496: 15; 31056: 18; 31456: 17; 31624: 17; 31928: 18; 32052: 18; 32542: 17; 32627: 13; 32883: 15; 33193: 13; 33210: 17; 33243: 18; 33313: 4; 33326: 4; 33327: 17; 33365: 18; 33371: 18; 33413: 18; 33984: 15; 34019: 18; 34029: 13; 34103: 19; 34163: 17; 34792: 13; 34797: 17; 34877: 18; 35392: 18; 35463: 18; 35571: 15; 35760: 18; 35839: 13; 35923: 18; 36012: 18; 36354: 4; 36428: 13; 36489: 4; 36584: 18; 36902: 13; 36986: 7; 37145: 17; 37453: 18; 37491: 7; 37493: 7; 37505: 18; 37552: 7; 37576: 18; 37578: 13; 37668: 13; 37861: 7; 38175: 13; 38220: 18; 38382: 7; 38521: 18; 38779: 13; 38806: 7; 39925: 13; 40527: 18; 41459: 4; 42508: 18; 43677: 15; 44797: 18; 46266: 17; 46333: 15; 47408: 18; 47609: 13; 47788: 13; 48462: 18; 48753: 7; 49225: 18; 49228: 18; 49314: 18; 51099: 18; 51214: 18; 52860: 17; 54124: 18; 54537: 17; 54864: 17; 54934: 7; 57054: 17; 57763: 18; 59829: 4; 60177: 18; 60428: 18; 60596: 18; 60873: 18; 62211: 18; 63892: 13; 64724: 18; 64763: 19; 64773: 19; 64999: 15; 65309: 18; 65546: 13; 65575: 7; 65624: 13; 66213: 18; 66687: 18; 67357: 15; 68180: 17; 68485: 17; 69001: 7; 69494: 15; 69994: 15; 70898: 18; 71847: 18; 72826: 18; 73247: 7; 73756: 7; 74358: 13; 75333: 15; 75339: 15; 75342: 18; 75694: 13; 75702: 15; 75711: 18; 75719: 18; 75759: 17; 76162: 13; 76710: 15; 76721: 17; 76743: 13; 76747: 13; 76750: 15; 77002: 15; 77281: 13; 77300: 18; 77328: 4; 77593: 17; 78173: 3; 78597: 15; 79059: 17; 79166: 13; 79663: 19; 79974: 18; 80794: 7; 80826: 4; 80860: 18; 80861: 13; 80911: 15; 80945: 18; 81357: 18; 81585: 18; 82939: 18; 83117: 18; 83399: 19; 83609: 7; 83754: 18; 83802: 7; 83858: 7; 84028: 13; 84035: 13; 85260: 15; 86983: 18; 87709: 18; 87892: 15; 88261: 18; 88272: 19; 88436: 18; 88995: 19; 89096: 18; 89456: 13; 89486: 17; 89736: 17; 90112: 17; 90194: 15; 90356: 19; 90420: 13; 90914: 18; 91061: 17; 91127: 15; 91743: 18; 91942: 18; 92001: 18; 92046: 15; 92162: 18; 92352: 18; 93188: 15; 93827: 7; 93977: 7; 94233: 13; 94842: 7; 94871: 18; 94925: 18; 94951: 13; 94979: 18; 95010: 7; 95722: 18; 95855: 18; 95937: 17; 96008: 17; 96470: 13; 96513: 13; 96518: 19; 96544: 13; 96669: 18; 96720: 15; 96756: 13; 96765: 17; 97160: 13; 97293: 15; 97415: 15; 97569: 18; 99440: 17; 99465: 15; 99691: 17; 99722: 7; 100278: 13; 101399: 15; 101819: 15; 103638: 18; 103641: 3; 104311: 7; 105305: 7; 106669: 13; 106906: 19; 106994: 18; 107109: 15; 107151: 17; 107154: 15; 107268: 13; 107360: 15; 107432: 18; 107984: 17; 108285: 15; 108286: 15; 108287: 17; 108331: 7; 108392: 13; 108395: 15; 108579: 13; 108691: 17; 108770: 18; 108777: 7; 109164: 13; 109183: 15; 109549: 15; 109590: 13; 109751: 4; 109953: 19; 109987: 18; 110050: 18; 110111: 13; 110123: 18; 110570: 13; 111067: 15; 111070: 13; 111543: 15; 111801: 15; 111851: 17; 111918: 13; 112349: 15; 113027: 7; 113634: 15; 114290: 13; 114480: 7; 114518: 13; 114533: 17; 114536: 15; 116021: 13; 116459: 19; 116665: 7; 116770: 17; 116777: 18; 116941: 18; 116953: 15; 117054: 19; 117457: 13; 117630: 18; 117647: 15; 117981: 4; 117986: 17; 118187: 15; 118455: 7; 119119: 15; 119304: 13; 119686: 7; 119776: 15; 119777: 15; 120544: 15; 120712: 17; 121055: 13; 121779: 7; 122111: 4; 122761: 15; 123685: 18; 123789: 18; 123888: 18; 123955: 18; 124613: 18; 125379: 18; 126294: 15; 126996: 15; 127951: 18; 127994: 7; 128263: 18; 128461: 17; 128537: 13; 128586: 13; 129328: 13; 130013: 13; 130188: 18; 130274: 7; 130639: 18; 130750: 15; 133495: 15; 133915: 7; 135448: 7 — Sands 2608: 18; 2867: 4; 2899: 18 — Sangkhachand 54: 17; 150: 17; 201: 17; 1351: 4; 1352: 4; 1570: 17; 1634: 17; 1692: 17; 1704: 17; 1919: 4; 1965: 17 — Santisuk et al. 319: 17 — Santos 5321: 4; 5322: 4 — Sarip 5: 4 — Sato et al. 991: 13 — Saunders 314: 4 — Sauveur K 3: 18; 100: 18; 132: 18; 3328: 4 — Scheffer 49: 17 — Schlechter 14467: 17; 14568: 17 — Schmidt 691: 17; 691a: 17 — Schmutz 576: 17; 613: 17; 905: 17; 2860: 11 — Schodde 2937: 4; 3055: 18 — Schwabe 1987: 17 — Scortechini 378: 18; 1776: 12 — Seidenfaden 2172: 17; 2877: 17 — Seimund 332: 18 — SF series 152: 17; 438: 17; 1758: 17; 3232: 17; 4266: 17; 7074: 17; 9301: 13; 9859: 17; 10158: 17; 10306: 17; 10598: 17; 10881: 17; 11555: 17; 11603: 17; 12406: 17; 12718: 17; 13590: 17; 13762: 4; 13788: 4; 14926: 18; 14957: 15; 15759: 4; 16525: 17; 16551: 17; 16991: 17; 18672: 18; 18707: 15; 18747: 15; 18961: 13; 19357: 17; 19543: 15; 21121: 7; 21327: 17; 21490: 17; 21691: 18; 21872: 17; 22415: 17; 22981: 17; 23012: 17; 23808: 18; 24032: 17; 24090: 17;

- 24269: 17; 24286: 17; 24332: 15; 24390: 17; 24513: 4; 24548: 17; 24667: 17; 24757: 17; 24827: 4; 25007: 17; 25923: 4; 29255: 17; 30144: 12; 30385: 12; 31618: 4; 31992: 17; 32757: 17; 33540: 17; 35173: 17; 35298: 15; 35442: 4; 35660: 18; 36235: 4; 37308: 4; 37685: 17; 38940: 17; 38941: 17; 38974: 15; 39522: 18; 40093: 17; 40181: 18; 40347: 4; 40574: 7; 40578: 18; 40901: 17; 40991: 18; 41011: 17 — Shah 1539: 12; 1558: 12; 1567: 12; 1615: 12; 2517: 18; 2578: 7 — Shah & Kadim 518: 18 — Shah & Noor 1912: 18; 1943: 18 — Shah & Tan 5050: 17 — Shimizu & Nalampoon 7781: 17 — Shiu 9342: 10; 10472: 10; 10677: 10 — Sidek bin Kiah 330: 17; 398: 18 — Sidiyasa PBU 307: 18; PBU 503: 18; PBU 653: 18; S 436: 15; S 438: 13; S 835: 17; S 1140: 17; S 1141: 17; S 1157: 13; S 1171: 13; S 1172: 15; S 1246: 18; S 1668: 7 — Sidiyasa & Ambriansyah S 1667: 3 — Sidiyasa & Kochummen 557: 18 — Sidiyasa et al. 3621: 18; B 1223: 15 — Simpson 2025: 7; 2113: 7; 2348: 19 — Sinclair et al. 9301: 13 — Sinit 2593: 18 — Slooder 390: 4 — Smith 406: 17 — Smitinand 731: 17; 3357: 17 — Smitinand & Cheke 10841: 17 — Soedarsono 408: 17; 411: 17 — Soejarto 7684: 4 — Soejarto & Fernando 7615: 15 — Soejarto et al. 6632: 15; 7727: 13; 8535: 18; 8750: 15; 9114: 4; 9121: 4 — Soepadmo 328: 4; 744: 15 — Soepadmo & Suhaimi 269: 18 — Squires 175: 4 — Stevens et al. 401: 15; 458: 18 — Stone 5850: 17; 6958: 17; 13736: 4; 13846: 15 — Stone & Sidek 12414: 12 — Stone et al. 6855: 18; 15193: 4; 15279: 7 — Suksakorn 897: 21 — Sutrisno 43: 4 — Suvarnakoses 375: 17; 492: 17; 1656: 17 — Suzuki K 11683: 18 — Symington 24098: 12.
- Taam 1550: 10 — Tachun 29864: 12 — Tadong 449: 4; 492: 13 — Tahir 750: 4 — Takeuchi 4905: 18; 5058: 17; 6741: 4 — Teijsmann HB 320: 4; HB 1868: 17; HB 3667: 17; HB 3829: 18; HB 4191: 17; HB 4194: 4; HB 4198: 15; HB 4200: 4; HB 4203: 15; HB 4286: 15; HB 4399: 18; HB 10879: 18; HB 11326: 4; HB 12570: 17; HB 12687: 17; HB 14210: 4 — TFB series 281: 17 — Tha Myaing 172: 17 — Thaworn 41: 17; 620: 4; 700: 4 — Thothathri & Nair 1070: 17 — Ting & Shih 574: 10 — Tsang 292: 17; 314: 17; 557: 17; 621: 10; 722: 17; 16120: 10; 16519: 10; 22677: 10; 29561: 10 — Tsang et al. 116: 17 — Tsiang Ying 1014: 17; 2115: 17 — Tsoong 1180: 10 — Tuke P15 403: 18 — Tukirin Partomihardjo 304 B: 3; K 3352: 3.
- Valera 4696: 18 — Van Balgooy 2348: 17; 2415: 15; 2416: 15; 2466: 7; 4622: 17; 4664: 17; 4862: 17; 6907: 17; 7198: 17 — Van Balgooy & Keßler 5965: 18 — Van Balgooy & Van Setten 5609: 18 — Van Balgooy et al. 5426: 19 — Van Beusekom & Charoenphol 1871: 17; 1915: 17 — Van Beusekom & Geesink 3290: 17 — Van Beusekom & Phengkhilai 641: 17; 650: 17; 1038: 17 — Van Beusekom & Santisuk 2702: 17; 2742: 17 — Van Borssum Waalkes 264: 4; 1555: 17 — Van Royen & Sleumer 6203: 16; 6399: 18 — Van Slooten 2121: 15; 2137: 15; 2308: 17 — Van Steenis 2390: 17; 3218: 17; 3224: 17; 3299: 4; 3375: 17; 7692: 4; 9896: 19; 17362: 17 — Van Welzen 737: 15; 740: 15; 865: 15 — Veldkamp 8320: 18; 8535: 17 — Verheijen 1170: 17; 1171: 17; 1172: 17; 1363: 17; 1364: 17; 1365: 17; 2806: 17; 3112: 17; 3203: 17; 3309: 17 — Vermeulen 1196: 17 — Vidal 895: 4; 895C: 4; 896: 4; 1784: 17; 2248: 17; 3759: 17 — Voort 19: 4.
- Wallich 8576: 18 — Wang 33314: 10; 33440: 10; 34297: 10; 36045: 10; 36303: 17 — Warburg 17272: 17; 17274: 17; 20514: 17; 20515: 17 — Waterhouse 170: 4; 661: 4; 811: 4 — Waturandang 465: 4; 495: 4 — Webber 23311: 17 — Wenzel 84: 13; 144: 4; 497: 4; 1222: 4; 2697: 22; 2718: 22; 2898: 4; 3198: 4 — West & Maxwell 5: 17 — Whitmore & Sidiyasa 3445: 4; 3485: 4 — Widjaja 1880: 17 — Wilford 408: 10 — Wiljes-Kissink 3: 17 — Wilkie 93401: 18 — Wilkie & Latupeirissa 94342: 18 — Williams 2081: 4; 2783: 4 — Winit 602: 17; 611: 4; 1703: 17 — Winkler 2218: 15 — Wirawan 321: 17 — Wiriadinata 289: 15; 324: 18 — Wiriadinata & Maskuri 498: 18 — Wiriadinata et al. 578: 18 — Witt 30: 21 — Wong 1077: 7; 1191: 3; 1421: 18; 1668: 18 — Wood 451: 7; 1881: 15; 2017: 15; 2162: 4; 2656: 15 — Wray Jr. 743: 4; 1357: 7; 1388: 17; 2270: 17; 2437: 17; 2853: 17; 3164: 17; 3381: 12; 3387: 12; 3510: 17; 3520: 17; 3530: 4; 3563: 12; 3570: 17 — Wray & Robinson 5324: 18 — Wright 438: 10.
- Yates 755: 17; 850: 4; 1044: 17; 1051: 17; 1694: 4; 1788: 17; 1947: 4; 2664: 4 — Yulita & Wilkie 93316: 3.
- Zainudin 2678: 18; 4835: 18; 4900: 17; 5588: 17 — Zollinger 245: 17; 582: 4; 848: 17; 1143: 4; 1549: 17; 1583: 17; 1810: 15; 1812: 17; 1813: 17.

INDEX

The number after each name refers to the numbered species under which the name is included. Roman is accepted name; *italics* is synonym; **bold** is new.

- Adisca* Blume [p. 31]
acuminata Blume 16
floribunda Blume [p. 31], 13
Aleurites peltatus Geiseler 16
Buettneria uncinata Mast. 4
Coelodiscus annamiticus (Kuntze) Gagnep. 13
Diplochlamys Müll. Arg. [p. 4]
griffithianus Müll. Arg. [p. 4], 4
Hancea Seem. [p. 4]
hookeriana Seem. [p. 4], 6
muricata Benth. 16
Mallotus
sect. *Diplochlamys* [p. 4]
sect. *Hancea* (Seem.) Pax & K. Hoffm.
[p. 4]
sect. *Stylanthus* (Rchb. f. & Zoll.)
Pax & K. Hoffm. [p. 31]
acuminatus (Blume) Müll. Arg. 16
alternifolius Merr. 16
amentiformis Müll. Arg. 13
anisophyllus Hook. f. 22
annamiticus Kuntze 13
beccarii Airy Shaw 19
brachythyrus Merr. 19
camiguinensis Merr. 16
columnaris Warb. 16
cordatifolius Slik 1
echinatus Elmer 10
eucastus Airy Shaw 2
floribundus (Blume) Müll. Arg. [p. 31], 13
var. *genuinus* Pax & K. Hoffm. 13
var. *pilosus* Pax & K. Hoffm. 13
furetianus Müll. Arg. 16
garrettii Airy Shaw 14
grandistipularis Slik 3
griffithianus (Müll. Arg.) Hook. f. [p. 4], 4
havilandii Airy Shaw 20
helferi Müll. Arg. 16
hirsutus Elmer 5
hookerianus (Seem.) Müll. Arg. [p. 4], 6
var. *papuanus* J.J. Sm. 9
impar Pax & K. Hoffm. 4
insularum (Airy Shaw) Slik 21
kingii Hook. f. 7
lackeyi Elmer 15
lambertianus Müll. Arg. 16
leptophyllus Pax & K. Hoffm. 10
longifolius (Rchb. f. & Zoll.) Müll. Arg. 16
var. *genuinus* Müll. Arg. 16
var. *pubescens* Müll. Arg. 16
(Mallotus)
longystylus Merr. 8
maclurei Merr. 16
miquelianus (Scheff.) Boerl. 22
var. *insularum* Airy Shaw 21
oblongifolius (Miq.) Müll. Arg. 16
var. *genuinus* Pax & K. Hoffm. 16
var. *helferi* (Müll. Arg.) Pax & K. Hoffm.
16
var. *rubriflorus* Chakrab. 16
var. *siamensis* Pax & K. Hoffm. 16
var. *villosulus* Pax & K. Hoffm. 16
odoratus Elmer 16
papuanus (J.J. Sm.) Pax & K. Hoffm. 9
var. *glabrescens* Pax & K. Hoffm. 10
var. *intermedius* Pax & K. Hoffm. 10
peekelii Pax & K. Hoffm. 16
peltatus (Geiseler) Müll. Arg. 16
var. *rubriflorus* Chakrab. 16
penangensis Müll. Arg. 10
var. *grandifolia* Ridl. 10
porterianus Müll. Arg. 16
pseudopenangensis Pax & K. Hoffm. 10
puberulus Hook. f. 16
sanchezii Merr. 15
sarawakensis Pax & K. Hoffm. 10
stipularis Meijer ex Airy Shaw 11
stylaris Müll. Arg. 16
surculosus P.I. Forst. 17
tenuipes Airy Shaw 10
tenuispicus Pax & K. Hoffm. 16
thorelii Gagnep. 18
wenzelianus Slik 12
woodii Merr. 4
xylacanthus Pax & K. Hoffm. 10
Mappa acutifolia (Hassk.) Zoll. & Mor. 16
floribunda (Blume) Zoll. & Mor. 13
Ricinus tanarius Lour. 13
Rottlera
sect. *Stylanthus* Rchb. f. & Zoll. [p. 31]
acuminata (Blume) Baill. 16
acutifolia Hassk. 16
flavigutta Miq. 16
floribunda (Blume) Hassk. 13
hookeriana (Seem.) Scheff. 6
lambertiana (Müll. Arg.) Scheff. 16
longifolia Rchb. f. & Zoll. 16
miqueliana Scheff. 22
oblongifolia Miq. 16
stylaris (Müll. Arg.) Scheff. 16