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Series I – Seed Plants

Volume 23 – 2019

Lamiaceae (Labiatae)

(G.L.C. Bramley)

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ABSTRACT

Flora Malesiana. Series I, Volume 23 (2019) iv + 1 – 424, by G.L.C. Bramley (edited by P.C. van Welzen), published by Naturalis Biodiversity Center, The Netherlands, under the auspices of Foundation Flora Malesiana.[1]

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Contains a taxonomic revision of Lamiaceae (Labiatae) for Malesia, i.e. the area covering the countries Indonesia, East Timor, Malaysia, Singapore, Brunei Darussalam, The Philippines, and Papua New Guinea.

G.L.C. Bramley, Bongcheewin, B., Davies, N., de Kok, R.P.J., Mabberley, D.J., Suddee, S., Walsingham, L.J., Wearn J.A. **Lamiaceae (Labiatae)**, pp. 1–424.

The Lamiaceae of Malesia is presented here, following its expanded circumscription, including genera formerly recognised as Verbenaceae and serving as an update to H. Keng's 1978 Flora Malesiana Labiatae account. Fifty genera and 304 species are recognised as native or naturalised; the largest genera are Callicarpa (55 species), Clerodendrum (54 species), Teijsmanniodendron (23 species) and Vitex (21 species).

The introductory part includes a section on wood anatomy (by P. Baas). The genus and species treatments comprise keys, descriptions, drawings, references, synonyms, typifications, distribution, habitat and miscellaneous notes.

Index to accepted names and synonyms, pp. 425 – 442.

List of revised families in Flora Malesiana, pp. 443 – 444.

[1] Desk-editing: C.G.G. Baak.

Flora Malesiana, Series I, Volume 23 (2019) 1–424

LAMIACEAE (LABIATAE)

(Editor: G.L.C. Bramley, Kew, United Kingdom)[1]

Lamiaceae Martinov, Tekhno-Bot. Slovar (1820) 355, nom. cons.; Adans., Fam. Pl. 2 (1763) 180 (as Labiatae s.s., nom. alt.); King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74, 2 (1908) 802; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 45; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 9; Ridl., Fl. Malay Penins. 2 (1923) 611 (as Verbenaceae), 642 (as Labiatae); M.R.Hend., Malay. Wild Fls., Dicot. (1959) 287 (as Labiatae), 380 (as Verbenaceae); Backer & Bakh.f., Fl. Java 2 (1965) 594 (as Verbenaceae), 614 (as Lamiaceae); Kochummen, Tree Fl. Malaya 3 (1978) 297 (as Verbenaceae); H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 301 (Labiatae); H.Keng, Order Fam. Malay. Seed Pl. (1983) 287 (as Verbenaceae), 289 (as Labiatae); Corner, Wayside Trees Mal. 2 (1988) 740 (as Verbenaceae); Kochummen, Tr. Fl. Pasoh For. (1997) 433 (as Verbenaceae); Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 167 (as Labiatae); Bramley, Rusea & de Kok in Soepadmo et al., Tree Fl. Sabah & Sarawak 7 (2011) 1.

Trees, shrubs, subshrubs, perennial or annual herbs or climbers, aromatic or not. *Stems* often quadrangular, erect to prostrate, sometimes forming stolons or large or slender rhizomes. *Indumentum* usually present, of glandular and non-glandular trichomes, often hair-like, rarely scale-like, usually multicellular-uniseriate, simple, branched, dendroid or stellate, sometimes gland-tipped, large-headed subsessile glands rarely absent. *Leaves* opposite, often decussate, sometimes whorled, very rarely alternate, simple, entire, toothed or lobed, sometimes palmate, petiolate or sessile, rarely forming a basal rosette, exstipulate. *Inflorescences* often bracteate, bracts persistent or deciduous, leaf-like, rarely spirally arranged, composed of cymes, bracteolate or not, and often arranged in a terminal, lax or congested indeterminate thyrse, latter paniculate, raceme-like (with cymes often 1-flowered), spike-like, or rarely congested into a capitulum, with or without a distinct involucre of bracteoles, sometimes conspicuous. *Flowers* hypogynous, usually bisexual, actinomorphic to more often slightly to strongly zygomorphic, often 2-lipped. *Calyx* actinomorphic to zygomorphic, sometimes 2-lipped, lobes 2–many, often 5, equal or unequal, often accrescent, rarely inflated or fleshy in fruit. *Corolla* with petals connate, rarely 1-lipped, lobes (2–)4–5(–16), equal or unequal. *Stamens* epipetalous, attached within corolla-tube, usually 4 or 2 by abortion and then staminodes often present, or stamens 5(–18), when 4 often didynamous (rarely a fifth, posterior vestigial staminode present), free or rarely monodelphic, filaments short or often elongate, usually exserted from corolla-tube and sometimes long-exserted from corolla; parallel, divergent or ascending and sometimes included within or lying under the upper corolla-lip, or declinate and then sometimes included within the lower corolla-lip, anthers usually dithecous, tetrasporangiate or monothecous by abortion, thecae parallel or divergent, occasionally widely separated by an elongate connective, or apically confluent or synthecous, opening by longitudinal slits or rarely by pores.

1) See the various treatments for responsible authors.

Disc at base of ovary often present, usually fleshy, entire or irregularly or often 4-lobed, lower lobe sometimes longer than others, nectariferous. *Gynoecium* superior, 2-carpellate, often 4-locular by intrusion of carpel wall forming 'false septum', (or rarely imperfectly 2-locular and free towards apex), ovary usually 4-ovuled (2-locular ovaries generally with loculi 2-ovuled), 4-locular ovaries with 1 ovule per loculus, rarely 5–8 locules with 1 or 2 ovules per loculus (*Callicarpa*), ovary entire or lobed, with terminal style, or deeply 4-lobed, the loculi often separated and with style gynobasic; style not persistent, usually with 2 equal or unequal stigma-lobes, or stigma capitate. *Ovules* anatropous to hemi-anatropous, usually basal or subbasal, erect, rarely orthotropous, apical, pendulous, borne laterally or submarginally on the placenta, unitegmic, tenuinucellate. *Fruit* drupaceous, often with pyrenes, or dry, indehiscent, or four 1-seeded mericarps, sometimes fewer by abortion, rarely up to 14. *Mericarps* (nutlets) often with sculptured, tuberculate, hairy or rarely winged pericarp, mucilage cells often present. *Seeds* albuminous or exalbuminous, epigeal; embryo straight or bent, investing or spathulate.

DISTRIBUTION[2]

Almost cosmopolitan, but absent from the coldest regions of high latitude or altitude; c. 240 genera and over 7 000 spp. In Malesia, 50 genera and 304 species are recognised as native or naturalized.

All native genera are distributed following one of five patterns, broadly speaking. Thirteen are from the Old World (Africa, Asia, including Australia): *Anisomeles*, *Basilicum*, *Clerodendrum*, *Faradaya*, *Isodon*, *Leucas*, *Ocimum*, *Orthosiphon*, *Platostoma*, *Plectranthus* s.l., *Pogostemon*, *Premna*, *Rotheca*. Twenty-two make a group of Indo-Malesian genera, a few of which can also occur in Australia and/or the Pacific: *Achyrospermum* (also occurs in Africa), *Acrymia*, *Congea*, *Cymaria*, *Elsholtzia*, *Eurysolen*, *Garrettia*, *Glossocarya*, *Gomphostemma*, *Gmelina*, *Hosea*, *Microtoena*, *Mosla*, *Oxera*, *Paraphlomis*, *Peronema*, *Petraeovitex*, *Pseudocaryopteris*, *Sphenodesme*, *Symphorema*, *Tectona*, *Teijsmanniodendron*. Three are found in the tropics and subtropics (and China): *Callicarpa* (not Africa), *Vitex*, *Volkameria*. Nine are more cosmopolitan and common in temperate areas: *Ajuga*, *Clinopodium*, *Leonurus*, *Melissa*, *Mentha*, *Salvia*, *Scutellaria*, *Stachys*, *Teucrium*. *Hyptis*, *Mesosphaerum* and *Cantinoa* are New World genera that are represented by a few weedy species in Malesia.

HABIT AND ECOLOGY

There is a general divide between the genera traditionally recognised as Labiatae, and the genera that were once recognised as Verbenaceae. Keng (1978) gives an overview of the habit and ecology of the genera of Labiatae s.s.; these are generally herbaceous, and are found in almost all Malesian vegetation types, with exception of distinctly oligotrophic soil types. The genera newly treated here tend to be woody and are found in various vegetation types. *Vitex* and *Teijsmanniodendron* in particular are large trees

2) For authorities of taxon names see the different genera.

usually found growing in primary or secondary lowland rainforest, but they can also be found in coastal habitats and submontane forests (de Kok 2007, 2008, de Kok et al. 2009). *Premna*, *Gmelina*, *Clerodendrum* and *Callicarpa* are of mixed habit, being small to medium trees to shrubs or climbers. These genera are found in mixed vegetation types, from primary and secondary lowland to submontane forest, to grasslands, riverbanks and coastal areas; they are also found in disturbed areas (Wearn & Mabberley 2011, Bramley 2009, 2013, de Kok 2012, 2013). The Symphorematoideae (*Congea*, *Sphenodesme*, *Symphorema*) are all climbers found in forest habitats.

References: Bramley, G.L.C., The genus Callicarpa (Lamiaceae) on Borneo. Bot. J. Linn. Soc. 159 (2009) 416–455. — Bramley, G.L.C., The genus Callicarpa (Lamiaceae) in the Philippines. Kew Bull. 68 (2013) 369–418. — de Kok, R.P.J., The genus Vitex (Labiatae) in New Guinea and the South Pacific islands. Kew Bull. 62 (2007) 587–603. — de Kok, R.P.J., The genus Vitex (Labiatae) in the Flora Malesiana region, excluding New Guinea. Kew Bull. 63 (2008) 17–40. — de Kok, R.P.J., A revision of the genus Gmelina (Lamiaceae). Kew Bull. 67 (2012) 293–329. — de Kok, R.P.J., The genus Premna (Lamiaceae) in the Flora Malesiana area. Kew Bull. 68 (2013) 1–30. — de Kok, R.P.J., G. Rusea & A. Latiff, The genus Teijsmanniodendron Koord. (Lamiaceae). Kew Bull. 64 (2009) 587–625. — Keng, H., Labiatae, in: C.G.G.J. van Steenis (ed.), Fl. Males., Ser. I, 8 (3) (1978): 301–394. Sijthoff & Noordhoff International Publishers, Alphen aan den Rijn. — Wearn, J.A. & D.J. Mabberley, Clerodendrum (Lamiaceae) in Borneo. Syst. Bot. 36 (2011) 1050–1061.

TAXONOMY

The Lamiaceae, as presented here, follows the recently published classification of the family by Li et al. (2016), based on molecular data. This updates the former widely accepted classification of Harley et al. (2004: 167). The Harley et al. (2004) classification formally altered the traditional circumscription of the Lamiaceae and Verbenaceae families, and was the first world-wide account of the family since Briquet's 1895 treatment. The polyphyly of the Lamiaceae and the Verbenaceae had been recognised as early as 1934, when Junell published a study of gynoecial structure of the two families. Decades later, palynological data (Abu-Asab 1990, Abu-Asab & Cantino 1992), morphological cladistics (Cantino 1992a, b) and analyses of molecular data (Wagstaff & Olmstead 1997, Wagstaff et al. 1998) supported Junell's (1934) findings. Historically, the Verbenaceae were subdivided into 7 subfamilies and 13 tribes (Briquet 1895). Of these only the Verbenoideae (except tribe Monochileae), with its characteristic racemose inflorescences, represented in SE Asia by *Verbena* L. and several introduced genera (*Citharexylum*, *Duranta*, *Lantana*, *Lippia*, *Petrea*, *Stachytarpheta*) are now considered truly verbenaceous. Based on the increased understanding of morphological and anatomical characters, and molecular phylogenetic relationships in these groups, a total of about 50 genera were transferred to the Lamiaceae, representing the former Verbenaceae subfamilies Caryopteridoideae, Chloanthoideae, Symphoremoideae, Viticoideae (all *sensu* Briquet). Harley et al. (2004) followed this expanded classification, recognising seven subfamilies and listing ten genera as *incertae sedis*, including *Callicarpa* and *Tectona* (see Harley et al. 2004, for a detailed overview). Since the account by Harley et al. (2004), the monophyly of all subfamilies except the Symphorematoideae and Viticoideae has been confirmed by various molecular systematics studies (e.g., Scheen et al. 2010, Yuan et al. 2010, Bendiksby et al. 2011, Li et al. 2012, Wilson et al. 2012, Chen

et al. 2014). Li et al. (2016) tested the monophyly of the Viticoideae and Symphorematoideae, and describe three new subfamilies; they also classify all formerly *incertae sedis* genera. Li & Olmstead (2017) formally established *Callicarpa* and *Tectona* as two further subfamilies; these genera had been left without rank by Li et al (2016) to avoid monogeneric subfamilial names.

Although the Labiatae s.str. was treated for the Flora Malesiana series by Keng (1978), in order to represent the expanded circumscription of the Lamiaceae, we offer here an update to Keng's generic treatments as well as new accounts of the genera formally included in the Verbenaceae. The Malesian Lamiaceae genera and their current subfamilies are listed below;

Callicarpoideae Bo Li & R.G.Olmstead - *Callicarpa*
Prostantheroideae Luerss. — endemic to Australia.
Symphorematoideae Briq. — *Congea*, *Sphenodesme*, *Symphorema*.
Viticoideae Briq. — *Teijsmanniodendron*, *Vitex*.
Nepetoideae (Dumort.) Luerss. — *Basilicum*, *Cantinoa*, *Clinopodium*, *Elsholtzia*, *Hyptis*, *Isodon*, *Melissa*, *Mentha*, *Mesosphaerum*, *Mosla*, *Ocimum*, *Orthosiphon*, *Platostoma*, *Plectranthus*, *Salvia*.

Tectonoideae Bo Li & R.G.Olmstead - *Tectona*
Premnoideae Bo.Li, Olmstead & P.D.Cantino — *Gmelina*, *Premna*.
Ajugoideae Kostel. — *Ajuga*, *Clerodendrum*, *Glossocarya*, *Hosea*, *Oxera*, *Pseudocaryopteris*, *Rotheca*, *Teucrium*, *Volkameria*.
Peronematoideae Bo.Li, Olmstead & P.D.Cantino — *Garrettia*, *Peronema*, *Petraeovitex*.
Scutellarioideae (Dumort.) Caruel — *Scutellaria*.
Cymarioideae Bo.Li, Olmstead & P.D.Cantino — *Acrymia*, *Cymaria*.
Lamioideae Harley — *Achyrospermum*, *Anisomeles*, *Eurysolen*, *Gomphostemma*, *Leonotis*, *Leonurus*, *Leucas*, *Microtoena*, *Pogostemon*, *Stachys*.

Taxonomic changes to genera

Since Keng's (1978) first Labiatae Flora Malesiana account, a number of taxonomic changes have occurred at the genus level.

Clerodendrum: *Clerodendrum* is now found in Africa and Asia only, and *Volkameria*, *Oveida* and *Rotheca* have been resurrected (Yuan et al. 2010).

Clinopodium: Keng's precursor (1969) treated two Malesian species under the generic concept *Calamintha*; later Keng (1978) treated them as *Satureja*. More recent evidence, both morphological and molecular (e.g., Cantino & Wagstaff 1998, Harley et al. 2004, Bräuchler et al. 2006) has led to a much narrower definition of *Satureja*: it is now restricted to the Old World, especially the Mediterranean region, and is distinguished by its conduplicate, obovate to spathulate leaves. *Micromeria* and *Clinopodium* are recognised, the latter containing most New World taxa. The two taxa present in Malesia are part of the enlarged *Clinopodium*.

Hyptis: *Hyptis*, a New World genus that is represented in Malesia by five weedy species that have become naturalized, was shown to be paraphyletic by Harley & Pastore

(2012). Species formerly recognised as *Hyptis* in Malesia are now recognised as *Hyptis*, *Mesosphaerum* or *Cantinoa*.

Isodon: *Isodon* was not recognised by Keng (1978); since Keng's account, generic relationships in Lamiaceae tribe Ocimeae have been subject to numerous studies (e.g., Paton & Ryding 1998: 723, Harley et al. 2003: 485), and a number of changes have been published. Two of the *Isodon* species recognised here were considered *Plectranthus* species by Keng; the third species is a new record for the Flora.

Oxera: A combination of molecular and anatomical data gave convincing evidence to support the inclusion of *Faradaya* in *Oxera*: the two species of *Faradaya* found in Malesia are now transferred to *Oxera* (Barrabé et al. 2015).

Platostoma: following Paton (1997: 272), *Platostoma* in Malesia is enlarged (6 species), to include the genera *Acrocephalus*, *Ceratanthus*, *Mesona* and *Nosema*, all treated separately by Keng (1978).

Vitex: on the basis of molecular data, and shared morphological characters, the large genus *Vitex* has been expanded to include *Paravitex*, *Tsoongia* (both found on continental Asia) and *Viticipremna* (Philippines to New Guinea, Australia and Fiji) (Bramley et al. 2009).

References: Abu-Asab, M.S, Phylogenetic implications of pollen morphology in subfamily Lamioideae (Labiatae) and related taxa (PhD thesis) (1990). Ohio University, Athens. — Abu-Asab, M.S. & P.D. Cantino, Pollen morphology in subfamily Lamioideae (Labiatae) and its phylogenetic implications, in: R.M. Harley & T. Reynolds (eds.), Advances Labiate Sci. (1992) 97–112. Royal Botanic Gardens, Kew. — Barrabé, L., G. Karnadi-Abdelkader, J. Ounemoa, R.P.J. de Kok, N. Robert & G. Gateble, Recircumscription of Oxera (Lamiaceae: Ajugoideae) to include Faradaya based on molecular and anatomical data. Bot. J. Linn. Soc. 179 (2015) 693–711. — Bendiksby, M., L. Thorbek, A.C. Scheen, C. Lindqvist & O. Ryding, An updated phylogeny and classification of Lamiaceae subfamily Lamioideae. Taxon 60 (2011) 471–484. — Bramley, G.L.C., F. Forest & R.P.J. de Kok, Troublesome tropical mints: re-examining Vitex (Lamiaceae) and its relations in South East Asia. Taxon 58 (2009) 500–510. — Bräuchler, C., H. Meimberg & G. Heubl, New names in Old World Clinopodium – the transfer of the species of Micromeria sect. Pseudomelissa to Clinopodium. Taxon 55 (2006) 977–981. — Briquet, J., Verbenaceae, in: A. Engler & K. Prantl (eds.), Die Naturlichen Pflanzenfamilien 4, 3a (1895) 132–182. Engelmann, Leipzig. — Cantino, P.D., Evidence for a polyphyletic origin of the Labiatae. Ann. Missouri Bot. Gard. 79 (1992a) 361–379. — Cantino, P.D., Toward a phylogenetic classification of the Labiatae, in: R.M. Harley & T. Reynolds (eds.), Advances Labiate Sci. (1992b) 27–37. Royal Botanic Gardens, Kew. — Cantino, P.D. & S.J. Wagstaff, A re-examination of North American Satureja s.l. (Lamiaceae) in light of molecular evidence. Brittonia 50 (1998) 63–70. — Chen, Y.P., B. Li, R.G. Olmstead, P.D. Cantino, E.D. Liu & C.L. Xiang, Phylogenetic placement of the enigmatic genus Holocheila (Lamiaceae) inferred from plastid DNA sequences. Taxon 63 (2014) 355–366. — Harley, R.M. & J.F.B. Pastore, A generic revision and new combinations in the Hyptidinae (Lamiaceae) based on molecular and morphological evidence. Phytotaxa 58 (2012) 1–55. — Harley R.M., S. Atkins, A.L. Budantsev, P.D. Cantino, B.J. Conn., R. Grayer, M.M. Harley, R.P.J. de Kok, T. Krestovskaja, R. Morales, A.J. Paton, O. Ryding & T. Upson, Labiatae, in: K. Kubitzki (ed.), Fam. Gen. Vasc. Pl. (2004) 167–275. Springer, Heidelberg, etc. — Harley, R.M., A.J. Paton & O. Ryding, New synonyms and taxonomic changes in the Labiatae. Kew Bull. 58 (2003) 485–489. — Junell, S, Zur Gynaceummorphologie und Systematik der Verbenaceen und Labiaten. Symb. Bot. Upsal. 4 (1934) 1–219. — Keng, H., Flora Malesianae precursors 48: A revision of Malesian Labiatae. Gard. Bull. Singapore 24 (1969) 13–180. — Keng, H., Labiatae, in: C.G.G.J. van Steenis (ed.), Fl. Males., Ser. I, 8 (1978) 301–394. Sijthoff & Noordhoff International Publishers, Alphen aan den Rijn. — Li, B., P.D. Cantino, R.G. Olmstead, G.L.C. Bramley, C.-L. Xiang, Z.-H. Ma, Y.-H. Tan & D.-X. Zhang, A large-scale chloroplast phylogeny of the Lamiaceae sheds new light on its subfamilial classification. Sci. Rep.

6 (2016) 34343; doi: https://doi.org/10.1038/srep34343. — Li, B. & R.G.Olmstead, Two new subfamilies in Lamiaceae. Phytotaxa 313 (2017) 222–226; https://doi.org/10.11646/phytotaxa.313.2.9. — Li, B., W.-X. Xu, T.-Y. Tu, Z.-S. Wang, R.G. Olmstead, H. Peng, J. Francisco-Ortega, P.D. Cantino & D.-X. Zhang, Phylogenetic position of Wenchengia (Lamiaceae): a taxonomically enigmatic and critically endangered genus. Taxon 61 (2012) 392–401. — Paton, A.J., Classification and species of Platostoma and its relationship with Haumaniastrum. Kew Bull. 52 (1997) 257–292. — Paton, A.J. & O. Ryding, Hanceola, Siphocranion and Isodon and their position in the Ocimeae (Labiatae). Kew Bull. 53 (1998) 523–731. — Scheen, A.C., M. Bendiksby, O. Ryding, C. Mathiesen, V.A. Albert & C. Lindqvist, Molecular phylogenetics, character evolution, and suprageneric classification of Lamioideae (Lamiaceae). Ann. Missouri Bot. Gard. 97 (2010) 191–217. — Wagstaff, S.J., L. Hickerson, R. Spangler, P.A. Reeves & R.G. Olmstead, Phylogeny of Lamiaceae s.l. inferred from cpDNA sequences. Pl. Syst. Evol. 209 (1998) 265–274. — Wagstaff, S.J. & R.G. Olmstead, Phylogeny of Labiatae and Verbenaceae inferred from rbcL sequences. Syst. Bot. 22 (1997) 165–179. — Wilson, T.C., B.J. Conn & M.J. Henwood, Molecular phylogeny and systematics of Prostanthera (Lamiaceae). Austral. Syst. Bot. 25 (2012) 341–352. — Yuan, Y-W., D.J. Mabberley, D.A. Steane & R.G. Olmstead, Further distintegration and redefinition of Clerodendrum (Lamiaceae): Implications for the understanding of the evolution of an intriguing breeding strategy. Taxon 59 (2010) 125–133.

POLLINATION AND DISPERSAL

An overview of pollination biology in the Labiatae s.s. was published by Huck (1992), and of the Lamiaceae s.l. in Harley et al. (2004). In Malesia the majority of species are pollinated by insects, although there is little published information. Keng (1978) noted that the honey bird *Cinnuris pectoralis* Horsf. was observed visiting *Leonotis nepetifolia* (L.) R.Br. by W.M. Docters van Leeuwen.

Dispersal of Lamiaceae nutlets has often linked to the accrescent calyx; some species have rigid, spiny calyces that may adhere to dispersers (e.g., *Mesosphaerum suaveolens* (L.) Kuntze); in other species, the pedicels can become rigid and springy allowing any slight movement of the plant by wind or animal to dislodge the nutlets (Harley et al. 2004). Harley et al. (2004) also report that the presence of hairs in the calyx throat can trap the nutlets within the calyx until the whole structure becomes so brittle that any small movement allows the nutlets to be dispersed. Some nutlets have hairs, which may assist wind dispersal; others become mucilaginous when wet (subfamily Nepetoideae) which may anchor the nutlet to soil (Hedge 1970), or allow them to stick to animal fur, therefore aiding dispersal (Ryding 2002). In *Gomphostemma*, nutlets have a fleshy pericarp which presumably attract birds or mammals. Among the indehiscent fruited genera, such as *Vitex*, *Callicarpa* and *Clerodendrum*, the drupes with fleshy pericarps are likely to attract birds. This has been recorded in *Callicarpa*, *Gmelina* and *Vitex* (Snow 1981).

References: Harley R.M., S. Atkins, A.L. Budantsev, P.D. Cantino, B.J. Conn., R. Grayer, M.M. Harley, R.P.J. de Kok, T. Krestovskaja, R. Morales, A.J. Paton, O. Ryding & T. Upson, Labiatae, in: K. Kubitzki (ed.), Fam. Gen. Vasc. Pl. (2004) 167–275. Springer, Heidelberg, etc. — Hedge, I.C., Observations on the mucilage of Salvia fruits. Notes Roy. Bot. Gard. Edinburgh 30 (1970) 79–95. — Huck, R.B., Overview of the pollination biology in the Lamiaceae, in: R.M. Harley & T. Reynolds (eds.), Advances Labiate Sci. (1992) 167–181. Royal Botanic Gardens, Kew. — Keng, H., Labiatae, in: C.G.G.J. van Steenis (ed.), Fl. Males., Ser. I, 8 (1978) 301–394. Sijthoff & Noordhoff International Publishers, Alphen aan den Rijn. — Ryding, O., Myxocarpy in the Nepetoideae (Lamiaceae) with notes on myxodiaspory in general. Syst. & Geogr. Pl. 71 (2002) 503–514. — Snow, D.W., Tropical frugivorous birds and their food plants: A world survey. Biotropica 13 (1981) 1–14.

SEXUAL CONDITION

Flowers are usually bisexual, or less often unisexual due to gynodioecy or gynomonoecy. Owens & Ubera-Jiménez (1992) provide a comprehensive review of breeding systems in the Labiatae s.s. In general, self-compatibility is widespread, and there is no convincing evidence of self-incompatibility. Gynodioecy is relatively common. Dioecy is rare in Lamiaceae: it has been reported in *Callicarpa* species from the Bonin Islands (Kawakubo 1990).

References: Kawakubo, N., Dioecism of the genus Callicarpa (Verbenaceae) in the Bonin (Ogasawara) Islands. Bot. Mag. (Tokyo) 103 (1990) 57–66. — Owens, S.J. & J.L. Ubera-Jiménez, Breeding systems in the Labiatae, in: R.M. Harley & T. Reynolds (eds.), Advances Labiate Sci. (1992) 257–280. Royal Botanic Gardens, Kew.

VEGETATIVE FEATURES

Stems of herbaceous plants and even the young stems of woody plants are characteristically square in cross-section. Lamiaceae leaves are invariably decussate, lacking stipules, but are sometimes whorled and very rarely alternate. They can be simple, or palmately or pinnately compound (rare: *Peronema canescens* Jack, *Salvia scapiformis* Hance (not all plants)). Simple leaves or the leaflets of compound leaves are often toothed or highly lobed.

Almost all Lamiaceae bear hairs, both non-glandular and glandular. The glandular hairs have capitate heads that are distinctly raised or they frequently appear as sessile (subsessile in cross-section; Cantino 1990). The latter are referred to in descriptions as sessile glands and are especially prevalent on the lower leaf surface, drying yellow or red in colour. The hairs are simple, unicellular or multicellular (usually a mixture of both), or they can be branched in various ways, often appearing stellate or plumose. Branched hairs tend to be typical of the Symphorematoideae, and certain genera such as *Gomphostemma* and *Callicarpa*. Large glands, referred to variously as discoid glands in gland fields or cup-like glandular structures (de Kok 2012), or extrafloral nectaries (Harley et al. 2004) are recorded in the leaves of *Clerodendrum*, *Gmelina* and *Callicarpa*.

Many Lamiaceae are aromatic due to the presence of terpenoids (subfam. Nepetoideae); see also phytochemistry.

References: Cantino, P.D., The phylogenetic significance of stomata and trichomes in the Labiatae and Verbenaceae. J. Arnold Arbor. 71 (1990) 323–370. — de Kok, R.P.J., A revision of the genus Gmelina (Lamiaceae). Kew Bull. 67 (2012) 293–329. — Harley R.M., S. Atkins, A.L. Budantsev, P.D. Cantino, B.J. Conn, R. Grayer, M.M. Harley, R.P.J. de Kok, T. Krestovskaja, R. Morales, A.J. Paton, O. Ryding & T. Upson, Labiatae, in: K. Kubitzki (ed.), Fam. Gen. Vasc. Pl. (2004) 167–275. Springer, Heidelberg, etc.

INFLORESCENCE AND FLOWERS

The inflorescence in Lamiaceae is typically cymose, but the form varies according to the degree of reduction of the numbers of flowers and contraction or elongation of the

axes within the inflorescence that has occurred. Cymes are monochasial or dichasial, and frequently are arranged into thyrses (cymes are aggregated towards the end of an indeterminate flowering stem). Another common arrangement is the verticillaster, where the peduncles of opposite cymes have been reduced so that the flowers are fasciculate.

Bracts are important features of Lamiaceae inflorescences and are frequently referred to in species descriptions. Following Harley et al. (2004), throughout the account, the term 'bracts' is used to describe the foliar structures that occur at the base of the inflorescence unit; these bracts are usually reduced or slightly modified leaves. 'Bracteole' refers to the reduced foliar structures that occur within the inflorescence or which form conspicuous structures such as involucres, surrounding inflorescences in the form of capitula, for example, that are themselves subtended by bracts.

Lamiaceae flowers are hypogynous. The calyx is actinomorphic to zygomorphic, usually connate, often 2-lipped with 2–5 lobes (rarely up to 10 lobes in Malesia; e.g., *Leonotis*, *Leucas*). The calyx varies in shape from cylindrical, campanulate to infundiliform, rarely urceolate. Sometimes the tube can be straight or curved, sometimes gibbous, and the throat straight or oblique. Generally, the calyx is accrescent, often surrounding the fruit, or at least some remnants of the calyx subtending the fruit.

The corolla typically has 4 or 5 petals, and is usually zygomorphic. Actinomorphic flowers with abnormal lobe numbers (up to 16) occur in the climbing genera *Sphenodesme* and *Symphorema*; *Mentha*, *Callicarpa*, *Tectona* and *Clerodendrum* are also examples of genera with actinomorphic flowers but lobes are usually 4 or 5 (*Tectona* and some *Callicarpa* species are 5–7-lobed). Zygomorphic flowers are generally 2-lipped, with the 4 or 5 corolla lobes in various arrangements but typically with upper and lower lips unequal. Upper or lower lips (flowers can be resupinate, especially in tribe Ocimeae), are variously galeate, concave or hooded. The corolla tube is straight or curved, short to elongate; it can be constricted and then gibbous or geniculate or have a sigmoid shape.

Stamens are attached within the corolla tube and are usually equal or less in number than the corolla lobes. Most stamens ascend towards the upper corolla lip, but in a number of groups, resupinate flowers are found. For example, in *Clerodendrum*, *Ocimum* and *Plectranthus*, the stamens are directed towards the lower lip thus favouring bees with different foraging behaviour (Harley et al. 2004). In *Salvia* the stamen number has been reduced to two, with the two upper stamens aborted, and the connective separating the thecae of the two expressed stamens significantly elongated. Through the elongation of the stamina connective a lever mechanism that acts during pollination has developed, and is characteristic for *Salvia* (see Claßen-Bockhoff et al. 2003).

The gynoecium in the Lamiaceae is 2-carpellate and often 4-locular by the intrusion of the carpel margin forming a 'false septum', with one ovule per locule, but can rarely be 2-locular. The stylar position is variable: either the style is gynobasic with the ovary deeply 4-lobed (subfamilies Lamioideae and Nepetoideae), or the style is terminal or subterminal, and the ovary unlobed or lobed less deeply. A fleshy disc on the outside of the gynoecium base is present in many Lamiaceae.

References: Claßen-Bockhoff R., P. Wester & E. Tweraser, The staminal lever arm mechanism in Salvia – a review. Pl. Biol. 5 (2003) 33–41. — Harley R.M., S. Atkins, A.L. Budantsev, P.D. Cantino, B.J. Conn, R. Grayer, M.M. Harley, R.P.J. de Kok, T. Krestovskaja, R. Morales, A.J. Paton, O. Ryding & T. Upson, Labiatae, in: K. Kubitzki (ed.), Fam. Gen. Vasc. Pl. (2004) 167–275. Springer, Heidelberg, etc.

FRUIT

There are two major fruit forms in the Lamiaceae. Either the fruit splits into two or four (rarely more) mericarps (nutlets), or the fruit is drupaceous. A third, less common form, is a dry and indehiscent fruit. In genera with a gynobasic style the fruit is a schizocarp and the nutlets have a small attachment scar. Genera with a subterminal style (e.g., *Acrymia*, *Ajuga*, *Cymaria*, *Teucrium*) usually have a schizocarpic fruit with nutlets with a larger, more prominent lateral attachment scar. In drupaceous fruits (terminal style) the number of pyrenes/seeds is variable: the typical number of seeds is 4, but it can be fewer by abortion, or up to 16 in some atypical genera (e.g., *Callicarpa*). Drupaceous fruits are often fleshy due to the modification of the mesocarp (Harley et al. 2004). Ryding (1995) made a detailed study of the pericarp structure in the Lamiaceae-Verbenaceae complex (predating the split into the currently recognised families).

References: Harley R.M., S. Atkins, A.L. Budantsev, P.D. Cantino, B.J. Conn, R. Grayer, M.M. Harley, R.P.J. de Kok, T. Krestovskaja, R. Morales, A.J. Paton, O. Ryding & T. Upson, Labiatae, in: K. Kubitzki (ed.), Fam. Gen. Vasc. Pl. (2004) 167–275. Springer, Heidelberg, etc. — Ryding, O., Pericarp structure and phylogeny of the Lamiaceae-Verbenaceae complex. Pl. Syst. Evol. 198 (1995) 101–141.

CHROMOSOMES

There is no general review of chromosomes in the Lamiaceae, but Harley et al. (2004) provides a useful summary of what has been found in the various studies on particular genera or geographical areas. In general, chromosomes of Lamiaceae are small (c. 0.75–6 μm). Polyploidy, especially allopolyploidy is common within the family.

References: Harley R.M., S. Atkins, A.L. Budantsev, P.D. Cantino, B.J. Conn, R. Grayer, M.M. Harley, R.P.J. de Kok, T. Krestovskaja, R. Morales, A.J. Paton, O. Ryding & T. Upson, Labiatae, in: K. Kubitzki (ed.), Fam. Gen. Vasc. Pl. (2004) 167–275. Springer, Heidelberg, etc.

USES

Lamiaceae are used in a number of different ways, and as such are a family of some economic importance. Most famous are the plants used for culinary purposes, including in Asian cooking. In addition, judging from the literature and notes on herbarium specimens, many species are used in traditional medicines. Horticulturally, the family is also important. A number of species included here are present in the region due to their introduction as garden plants. *Tectona* is one of the most important commercial timber trees, and a number of other genera are also used on a smaller scale for construction (*Gmelina*, *Peronema*, *Vitex*). See further data under the genera and species.

WOOD ANATOMY
(P. Baas)

Wood anatomy of the Lamiaceae in the old and narrow sense has been monographed by Carlquist (1992), who studied 42 species in 27 genera (including *Hyptis*) with an emphasis on the ecological adaptations in the xylem of the mostly small woody shrubs. The information summarized below is all on tree genera formerly classified in the Verbenaceae: *Callicarpa*, *Clerodendrum*, *Congea*, *Gmelina*, *Peronema*, *Premna*, *Tectona*, *Teijsmaniodendron* and *Vitex*. For these woods the following wood anatomical description has been abstracted from InsideWood (2004 onwards; see also Wheeler 2011), and sources such as the PROSEA Timber Volume 5 (1–3) (In: Lemmens et al. 1995, Soerianegara & Lemmens 1993, Sosef et al. 1998), Ogata & Kalat (1997), Ogata et al. (2008), and older literature listed by Gregory (1994).

Growth rings are absent, indistinct, and in the latter case marked by marginal parenchyma and/or (semi-)ring porosity. Woods are mostly diffuse-porous, but (semi-) ring porous wood occurs in *Clerodendron* p.p., *Peronema*, *Premna* p.p. and *Tectona*. Teak (*Tectona grandis*) has been the subject of the first classical tree ring studies in a tropical species (Coster 1927, 1928, Berlage 1931). Vessels are solitary and in mostly short radial multiples, with simple perforations and alternate intervessel pits which are usually small (4–7 μm), but range from minute (< 4 μm) in *Peronema* to large (> 10 μm) in *Gmelina* p.p. Vessel-ray pits are typically similar in shape and size to the intervessel pits, but in addition pits with strongly reduced borders occur in *Clerodendron*, *Gmelina*, *Teijsmanniodendron* and *Vitex*. Fine helical sculpturing (grooves) occur in the vessels of *Peronema*. Tyloses occur in many of the species. Fibres have simple to minutely bordered pits (libriform), are mostly septate or occur in various proportions of septate and nonseptate fibres; *Clerodendrum trichotomum* Thunb. and *Peronema* are recorded as having exclusively nonseptate fibres. Axial parenchyma is usually inconspicuous and scanty paratracheal to vasicentric. Marginal parenchyma is usually present in species with distinct growth rings. More elaborate aliform to confluent parenchyma patterns are present in *Clerodendron* p.p., *Gmelina* p.p. and *Peronema*. Rays range from narrow (1–3-seriate) to broad (> 4-seriate) and are usually heterocellular with 1 or 2–4 rows of square to erect marginal cells, but homocellular and composed of procumbent cells only occur in *Clerodendron* p.p., *Congea, Gmelina* p.p. and *Tectona*. Mineral inclusions show an interesting pattern, possibly of systematic significance: crystals are absent from most genera, but present as acicular to styloid crystals in *Congea* p.p., *Gmelina* p.p. and *Premna*. Styloid crystals are rare in woody dicots (Wheeler et al. 2007), and their occurrence in *Premna* and *Gmelina* supports their close affinity in the robust clade of the Premnoideae (Li et al. 2016). Prismatic crystals (presumably of Ca-Oxalate) have been recorded for *Premna serratifolia* L. and *Vitex altissima* Blanco (= *Vitex parviflora* A.Juss.) only. *Peronema* has silica bodies in ray cells. Vitreous silica casts sometimes occur as variable features in *Tectona* p.p. and *Teijsmanniodendron* p.p. The wood anatomy of *Faradaya* and *Petraeovitex* – as far as known – is typical of that of lianas, with numerous very wide vessels.

A comparison of the wood anatomy of the arborescent Lamiaceae with the pre-APG Lamiaceae s.s. yields some interesting differences, mostly related to ecology and habit.

Vessels are typically much more numerous and narrower in the shrubby to herbaceous Lamiaceae. Features such as vascular or vasicentric tracheids and dendritic vessel patterns are typical of some Lamiaceae of Mediterranean climates. Helical vessel wall grooves and helical thickenings also are virtually restricted to Lamiaceae s.s. (cf. Carlquist 1992).

References: Berlage H.P., Over het verband tusschen de dikte der jaarringen van djatibomen (Tectona grandis L.f.) en den regenval op Java. Tectona 24 (1931) 939–953. — Carlquist, S, Wood anatomy of Lamiaceae. A survey, with comments on vascular and vasicentric tracheids. Aliso 13 (1992) 309–338. — Coster, C., Zur Anatomie und Physiologie der Zuwachszonen- und Jahresringbildung in den Tropen. Ann. Jard. Bot. Buitenzorg 37 (1927) 49–160; 38 (1928) 1–114.. — Gregory, M., Bibliography of systematic wood anatomy of Dicotyledons. IAWA J. Suppl. 1 (1994) 1–265. — InsideWood database, http://insidewood.lib.ncsu.edu (2004 onwards). — Lemmens, R.H.J.M., I. Soerianegara & W.C. Wong (eds.), Plant Resources of Southeast Asia 5, 2. Timber Trees: minor commercial timbers (1995). Backhuys Publishers, Leiden. — Li, B., P.D. Cantino, R.G. Olmstead, G.L.C. Bramley, C-L. Xiang, Z-H. Ma, Y-H. Tan & D-X. Zhang, A large-scale chloroplast phylogeny of the Lamiaceae sheds new light on its subfamilial classification. Nature Scientific Reports 6, Article number: 34343 (2016) doi: https://doi.org/10.1038/srep34343. — Ogata, K., T. Fujii, H. Abe & P. Baas, Identification of the timbers of Southeast Asia and the Western Pacific (2008). Kaisei Press, Otsu. — Ogata, K. & A. Kalat, Wood anatomy of some trees, shrubs and climbers in Brunei Darussalam. After-care programme, Brunei Forestry Research Project Special Publication No. 3 (1997). Japan International Cooperation Agency (JICA) and Forestry Department, Ministry of Industry and Primary Resources, Brunei Darussalam. — Soerianegara, I. & R.H.M.J. Lemmens (eds.), 1993. Plant Resources of South-East Asia. No. 5 (1). Timber trees: major commercial timbers (1993). Pudoc Scientific Publishers, Wageningen. — Sosef, M.S.M., L.T. Hong & S. Prawidrohatmodjo (eds.), 1998. Plant Resources of Southeast Asia 5, 3. Timber trees: Lesser known timbers (1998). Backhuys Publishers, Leiden. — Wheeler, E.A., InsideWood – a web resource for hardwood anatomy. IAWA J. 32 (2011) 199–212. — Wheeler, E.A., P. Baas & S. Rodgers, Variations in dicot wood anatomy: A global analysis of the InsideWood database, IAWA J. 28 (2007) 229–258.

POLLEN

A comprehensive review of pollen morphology in the Lamiaceae is provided by M.M. Harley in Harley et al. (2004).

References: Harley R.M., S. Atkins, A.L. Budantsev, P.D. Cantino, B.J. Conn, R. Grayer, M.M. Harley, R.P.J. de Kok, T. Krestovskaja, R. Morales, A.J. Paton, O. Ryding & T. Upson, Labiatae, in: K. Kubitzki (ed.), Fam. Gen. Vasc. Pl. (2004) 167–275. Springer, Heidelberg, etc.

PHYTOCHEMISTRY

Detailed notes on the phytochemistry of the Lamiaceae are provided by Grayer in Harley et al. (2004).

References: Harley R.M., S. Atkins, A.L. Budantsev, P.D. Cantino, B.J. Conn, R. Grayer, M.M. Harley, R.P.J. de Kok, T. Krestovskaja, R. Morales, A.J. Paton, O. Ryding & T. Upson, Labiatae, in: K. Kubitzki (ed.), Fam. Gen. Vasc. Pl. (2004) 167–275. Springer, Heidelberg, etc.

KEY TO THE GENERA
(G.L.C. Bramley)

1a. Fruit drupaceous or dry, indehiscent, undivided. Style terminal 2
b. Fruit a schizocarp, divided into 4 nutlets. Style usually gynobasic, sometimes subterminal 17
2a. Leaves pinnate often with winged leaf rachis. Fertile stamens 2 . **33. Peronema**
b. Leaves simple, unifoliolate or digitately compound (leaflets 3–9), ternate or biternate. Fertile stamens 4–5(–16) 3
3a. Fruiting calyx with 5 greatly enlarged lobes (wings). Fruit dry **34. Petraeovitex**
b. Calyx without enlarged wing-like lobes. Fruit fleshy to dry 4
4a. Leaves digitately compound (leaflets 3–9) 5
b. Leaves simple or unifoliolate 6
5a. Petiole conspicuously swollen or thickened at both ends. Fruit with only one 1-seeded mericarp, dry or leathery . . . . . **47. Teijsmanniodendron**
b. Petiole not swollen. Fruit with 1–4 1-seeded mericarps, usually somewhat fleshy . . . . . **49. Vitex**
6a. Base of leaf with conspicuous glands. Corolla widely funnel-shaped, greatly enlarged at throat . . . . . **16. Gmelina**
b. Base of leaf not as above, any glands present match those on rest of lamina. Corolla usually narrowly funnel-shaped, cylindric or hypocrateriform, not greatly enlarged at throat, less often campanulate or more widely funnel-shaped 7
7a. Inflorescence cymose to paniculate, cymes capitate, subtended by involucre of 3–6 bracteoles, often coloured 8
b. Inflorescence cymose, thyrsoid or paniculate but not capitate, bracteoles inconspicuous, or if conspicuous not usually forming an involucre 10
8a. Outer involucral bracteoles 3–4, sometimes 1–2 inner bracteoles much narrower and inconspicuous. Corolla zygomorphic, 2-lipped and 5-lobed . . . . **10. Congea**
b. Involucral bracteoles 6, all similar in size and shape. Corolla actinomorphic, lobes 5–16. 9
9a. Calyx 5- or 10-lobed; corolla 5- or 6-lobed . . . . . **43. Sphenodesme**
b. Calyx 3- or 4-lobed; corolla 6- or 7-lobed . . . . . **45. Symphorema**
10a. Petiole conspicuously swollen or thickened at both ends . . . . . **47. Teijsmanniodendron**
b. Petiole not swollen or thickened at either end 11
11a. Corolla tube hypocrateriform. Fruit often somewhat lobed, when dry the shrunken surface (was fleshy) revealing the shape of the mericarps within 12
b. Corolla tube funnel-shaped. Fruit not lobed, pyrenes/mericarps within not revealed even when fruit dry. 14
12a. Corolla blue or white, buds markedly asymmetrical; corolla expanding on lower side only, lower lobe usually much larger than the others. Calyx not accrescent; anthers basifixed . . . . . **40. Rotheca**
b. Corolla red, yellow, pink or white; buds usually symmetrical; lower lobe same size as others. Calyx sometimes accrescent, or not. Anthers versatile 13

13a. Small trees to shrublets to lianas to subherbaceous perennials, inland. Inflorescences axillary and/or (usually) terminal. Calyx accrescent in fruit. Corolla white, pink, red or yellow . . . . . **8. Clerodendrum**
b. Lianoid coastal shrub; inflorescences wholly axillary; calyx not accrescent (or rarely fleshy-accrescent); corolla white or tinged purple . . . . . **50. Volkameria**
14a. Corolla actinomorphic, 4–7(–8)-lobed 15
b. Corolla zygomorphic, strongly to weakly 2-lipped, usually with entire to 2-lobed upper lip and 3-lobed lower lip 16
15a. Fruit subtended by, or partially to fully enclosed by persistent calyx, calyx never inflated, fruit apex usually visible . . . . . **6. Callicarpa**
b. Fruit surrounded by enlarged, inflated calyx or calyx not inflated, but pinched in around top of fruit then expanding slightly, apex of fruit not easily visible . . . . . **46. Tectona**
16a. Leaves simple. Corolla usually 4-lobed with upper lip entire, rarely 5-lobed with upper lip 2-lobed . . . . . **38. Premna**
b. Leaves unifoliolate. Corolla 5-lobed with upper lip 2-lobed . . . . . **49. Vitex**
17a. Style subterminal. Nutlet attachment scar large, covering at least half of nutlet length, usually more, lateral 18
b. Style gynobasic. Nutlet/mericarp attachment scar small, covering less than half the nutlet length, usually much less, often basal 24
18a. Corolla marcescent, persisting as a sheath around developing fruit . . . **3. Ajuga**
b. Corolla deciduous, not persisting as a sheath around developing fruit 19
19a. Corolla usually split dorsally to near base of tube giving 1-lipped appearance . . . . . **48. Teucrium**
b. Corolla not split, 2-lipped appearance 20
20a. Subshrub, stems prostrate, less than 0.1 m long. Leaves crowded . . . **2. Acrymia**
b. Subshrub or shrub, stems erect, 0.2–3 m long. Leaves spaced in opposite pairs 21
21a. Nutlets clavate, basally winged . . . . . **15. Glossocarya**
b. Nutlets boat-shaped, globose to subglobose or ovoid, not basally winged . . . 22
22a. Inflorescence of dichasial cymes or terminal thyrse . . . **39. Pseudocaryopteris**
b. Inflorescence of monochasial cymes 23
23a. Leaves simple. Fruiting calyx urceolate or campanulate . . . . . **11. Cymaria**
b. Leaves trifoliate to simple, often on same plant. Fruiting calyx truncate . . . . . **14. Garrettia**
24a. Stamens divergent or ascending under upper corolla lip 25
b. Stamens declinate, held over or included within lower corolla lip 44
25a. Calyx with two entire lips, pressing together in fruit to form a capsule . . . . . **42. Scutellaria**
b. Calyx with (2, 4) 5–10 lobes 26
26a. Fertile stamens 2[4], staminodes present or not 27
b. Fertile stamens 4, sometimes one staminode present 28

4) Outside the region, *Oxera* spp. can have two rather than four fertile stamens, and would key out here.

27a. Corolla weakly 2-lipped; fertile stamen pair the upper pair, shorter than corolla, lower pair reduced to staminodes; connective distinct but not elongate . . . . . **28. Mosla**
b. Corolla strongly 2-lipped; fertile stamen pair the lower pair, shorter than or much longer than corolla, upper pair vestigial or absent; connective elongate, often longer than filament . . . . . **41. Salvia**
28a. Stamens divergent, corolla actinomorphic to weakly 2-lipped, 4-lobed 29
b. Stamens ascending under upper lobe or divergent when upper corolla lip flatter, corolla weakly to strongly 2-lipped, 4- or 5-lobed 32
29a. Herbs or shrubs. Nutlets/mericarps usually ≤ 0.1 cm long 30
b. Lianas, shrubs to small trees. Nutlets/mericarps usually > 1 cm long 31
30a. Filaments not bearded; plants aromatic with a mint smell . . . . . **25. Mentha**
b. Filaments bearded; plants aromatic with a patchouli smell or otherwise . . . . . **37. Pogostemon**
31a. Big glands on leaf lamina lacking. Bracts orange . . . . . **18. Hosea**
b. Big glands on leaf lamina, 0.2–2.2 mm diam. Bracts green . . . . . **31. Oxera**
32a. Calyx with 6–10 lobes 33
b. Calyx with 5 lobes 34
33a. Corolla with reddish, orange or cream hairs, lower lip shorter than upper lip, soon withering . . . . . **21. Leonotis**
b. Corolla with whitish hairs, lower lip longer or shorter than upper lip, not withering . . . . . **23. Leucas**
34a. Calyx zygomorphic, 2-lipped, the upper 2- or 3-lobed, the lower 2- or 3-lobed, lobes unequal or subequal (*Microtoena*) 35
b. Calyx more or less actinomorphic or sometimes slightly lipped but the lobes equal to subequal 37
35a. Corolla with upper lip strongly hooded . . . . . **27. Microtoena**
b. Corolla with upper lip not strongly hooded, flatter or spreading 36
36a. Corolla 3–6 mm long (Java: rarely 10–15 mm long). Nutlets glabrous . . . . . **9. Clinopodium**
b. Corolla 9–10 mm long. Nutlets with fine hairs . . . . . **24. Melissa**
37a. Leaves lobed or deeply divided . . . . . **22. Leonurus**
b. Leaves entire to serrate, crenate to remotely dentate 38
38a. Indumentum with some branched hairs next to simple ones . . . . . **17. Gomphostemma**
b. Indumentum with simple hairs only, or sometimes (also) capitate-glandular hairs 39
39a. Stamens far projecting from below upper corolla lip; corolla white or with a purple lower lip . . . . . **4. Anisomeles**
b. Stamens not projecting, or scarcely projecting from below upper corolla lip; corolla white or pale yellow to light violet to pink to reddish violet, not variegated 40
40a. Corolla < 7 mm long 41
b. Corolla ≥ 8 mm long 42

41a. Corolla tube tubular; stamens divergent from corolla, upper lip not hooded . . . . . **12. Elsholtzia**
b. Corolla tube saccate then ventrally abruptly widened; stamens ascending under hooded upper lip . . . . . **13. Eurysolen**
42a. Nutlets with scales in upper half . . . . . **1. Achyrospermum**
b. Nutlets without scales 43
43a. Petioles ≥ 4 cm long; corolla light yellow or white (with pink or dark purple centre) . . . . . **32. Paraphlomis**
b. Petioles ≤ 1 cm long; corolla reddish violet . . . . . **44. Stachys**
44a. Corolla with upper lip 2-lobed, lower lip 3-lobed with median lobe saccate, deflexed at anthesis with a basal transverse ridge; calyx teeth subregular 45
b. Corolla with upper lip 3- or 4-lobed, lower lip 1-lobed, flattened or concave but not deflexed nor with a basal transverse ridge as above; calyx teeth subregular or bilabiate 47
45a. Flowers sessile to subsessile, in hemispherical capitula; bracteoles subulate, ligulate, or lanceolate to ovate, forming an involucre . . . . . **19. Hyptis**
b. Flowers subsessile to long-pedicellate, in pedunculate or subsessile, congested or lax cyme, not a capitulum; bracteoles not forming an involucre or if involucre present, small and cymes ± ovoid, or inflorescence broadly spiciform 46
46a. Flowers in elongate spiciform or racemose thyrse; cymes pedunculate or sessile, not forming cincinni; bracteoles subulate, forming a small involucre around cymules . . . . . **7. Cantinoa**
b. Flowers in diffuse leafy panicle of pedunculate, often cincinnate cymes or shortly pedunculate, few-flowered cymes in axils of leaf-like bracts; bracteoles small never forming an involucre . . . . . **26. Mesosphaerum**
47a. All stamens attached to corolla throat around the base of lower lobe; upper pair inappendiculate . . . . . **36. Plectranthus**
b. Lower stamens attached to corolla throat around the base of lower lobe; upper stamens varying in attachment between just above the midpoint and the base of corolla tube, appendiculate or inappendiculate 48
48a. Calyx actinomorphic or 2-lipped, upper lip with 3 ± equal lobes, lower lip 2-lobed, lobes of upper lip similar in shape and size or median lobe only slightly broader; bracteoles present in pedunculate, lax to dense cymes. . . . . **20. Isodon**
b. Calyx usually 2-lipped with upper lip 1-lobed, or 3-lobed with median lobe usually broader, if lobes equal then cymes sessile, condensed and lacking bracteoles. 49
49a. Stigma capitate-clavate with stigma lobes connivent. 50
b. Stigma bifid with stigma lobes diverging. 51
50a. Corolla slightly exserted from calyx tube. Fruiting calyx not reflexed against the inflorescence axis, upper lip slightly decurrent on tube . . . . . **5. Basilicum**
b. Corolla long-exserted from calyx tube. Fruiting calyx reflexed against the inflorescence axis, upper lip strongly decurrent on tube . . . . . **30. Orthosiphon**
51a. Fruiting calyx reflexed against the inflorescence axis; upper lip of fruiting calyx 1-lobed, margin strongly decurrent on tube. Disc equally 4-lobed. Upper stamens always appendiculate (in Malesia) . . . . . **29. Ocimum**

b. Fruiting calyx declinate or suberect, never reflexed against the inflorescence axis; upper lip of fruiting calyx 1- or 3-lobed, if 1-lobed margin not decurrent on tube. Disc with lower side well-developed. Upper stamens appendiculate or inappendiculate . . . . . **35. Platostoma**

1. ACHYROSPERMUM

(G.L.C. Bramley, updated from Keng 1978)

Achyrospermum Blume, Bijdr. (1826) 840; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1896) 268; J.K.Morton, J. Linn. Soc., Bot. 58 (1962) 261; H.Keng, Gard. Bull. Singapore 24 (1969) 23; in Steenis, Fl. Males., Ser. I, 8 (1978) 326; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 187; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 216. — Lectotype (designated here): *Achyrospermum densiflorum* Blume.

Undershrubs or herbs. *Stems* terete to obscurely 4-angled, pubescent. *Indumentum* of simple hairs only. *Leaves* simple, margin serrate or crenate-dentate. *Inflorescences* of verticillasters, few-flowered, usually terminal, spike-like. *Calyx* 10-nerved, tubular-campanulate, ± 2-lipped, the upper lip slightly longer, 5-lobed, the lobes subequal. *Corolla* slender, 2-lipped, the upper lip short, erect, notched; the lower lip 3-lobed, the mid-lobe often concave. *Stamens* 4, ascending under the upper lip in 2 pairs, the lower pair longer; anthers 2-celled, cells parallel. *Disc* equal-sided. *Style* gynobasic; stigma briefly 2-fid. *Fruit* a schizocarp consisting of 4 nutlets. *Nutlets* scaly and chaffy on the ventral surface and on the top, rough and pubescent on the dorsal surfaces; attachment scar small, covering less than half the nutlet length, basal.

Distribution — Up to about 25 species from tropical Africa, Madagascar, Mascarenes, Comores and the Seychelles through Nepal, NE India to S China, Thailand and parts of Malesia; in *Malesia*, one species in Sumatra, Java, the Lesser Sunda Islands, the Philippines.

1. Achyrospermum densiflorum Blume

Achyrospermum densiflorum Blume, Bijdr. (1826) 840; Benth. in A.DC., Prodr. 12 (1848) 458; Miq., Fl. Ned. Ind. 2 (1859) 989; Hook.f., Fl. Brit. India 4 (1885) 673; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 412; Backer & Bakh.f., Fl. Java 2 (1965) 624; H.Keng, Gard. Bull. Singapore 24 (1969) 23, f. 1; Steenis, Mountain Fl. Java (1972) pl. 24-2; H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 328; Press, K.K.Shrestha & D.A.Sutton, Annot. Checkl. Flower. Pl. Nepal (2000) 151. — Type: *Blume 1561* (holo L; iso BO, L), Indonesia, Java.

Achyrospermum phlomoides Blume, Bijdr. (1826) 841; Miq., Fl. Ned. Ind. 2 (1859) 990. — Lectotype (designated here): *Blume 1437* (holo L), Java.

Teucrium wallichianum Benth. in Wall., Pl. Asiat. Rar. 2 (1830) 19. — *Achyrospermum wallichianum* (Benth.) Benth. ex Hook.f., Fl. Brit. India 4 (1885) 673. — Type: *Wallich Cat. 2758* (K-W), Silhet.

Achyrospermum philippinense Benth. in A.DC., Prodr. 12 (1848) 458; Miq., Fl. Ned. Ind. 2 (1859) 990; Fern.-Vill., Nov. App. (1880) 165; S.Vidal, Phan. Cuming. Philipp. (1885) 136; Revis. Pl. Vasc. Filip. (1886) 214. — Type: *Cuming 1884* (K), Philippines.

Suberect herb, 10–60 cm. *Stems* and *branches* sparsely to densely pubescent. *Leaves* thin, narrowly elliptic to ovate, 6–8 by 2.5–4 cm, apex acute, base cuneate or attenuate, sparsely to evenly hirsute or pilose on both surfaces; petiole 0.5–6 cm long, hirsute. *Inflorescences* thyrsoid, terminal, spike-like, 4–6 (or more) cm long; pedicels 1–3

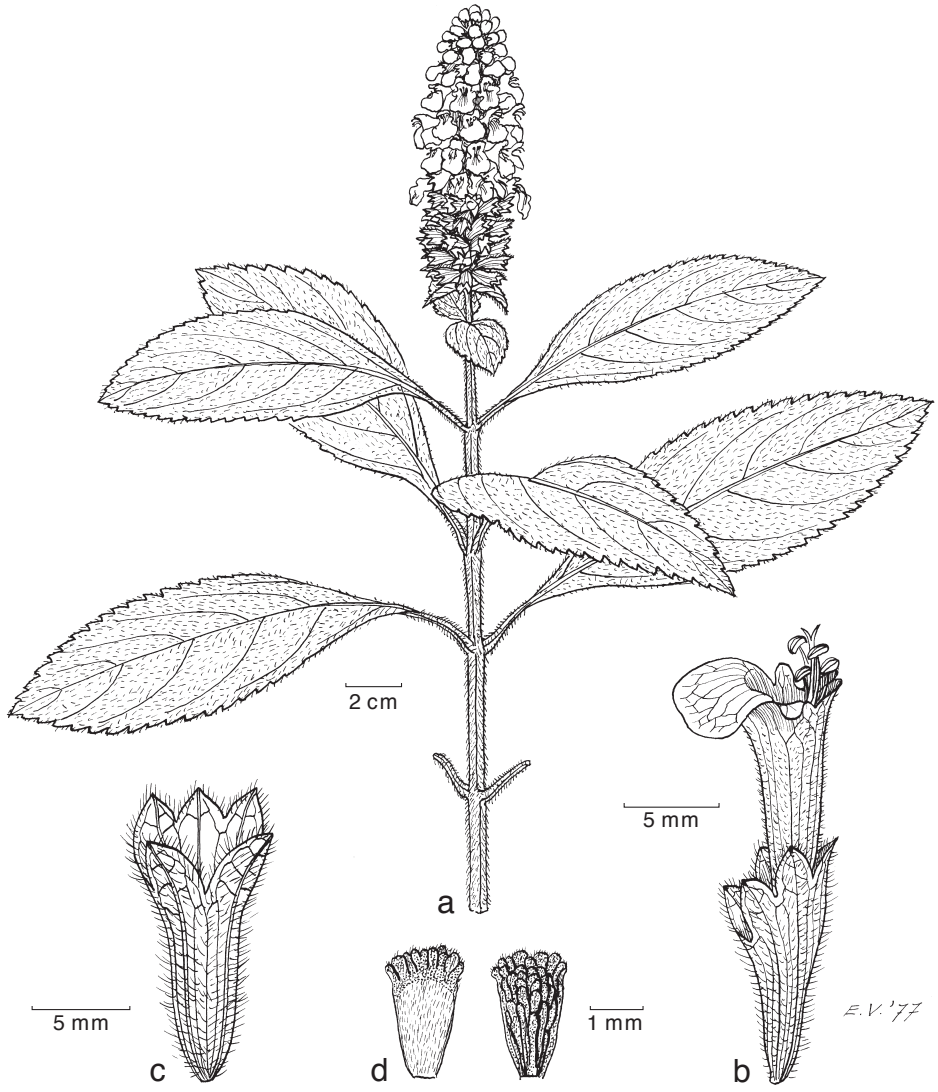

Fig. 1. *Achyrospermum densiflorum* Blume. a. Habit; b. flower; c. fruiting calyx; d. nutlet, left from outside, right from inside (a, b: *Popta 4316*; c, d: *Backer 4818*, all L). Drawing by Ed Vijsma, 1977.

mm long; bracts pale greenish yellow to pink, narrowly to broadly ovate or spathulate, 3–8 mm long, becoming smaller towards inflorescence apex, pilose and ciliate. *Calyx* campanulate, 5–8 mm long, in fruit 8–10 mm long, more or less 2-lipped, the upper lip 2-lobed, slightly longer than the lower lip, the lobes straight (in fruit often slightly recurved), broadly triangular, obtuse to rounded, more rarely acute at apex; outer surface sparsely to evenly pubescent, particularly along venation and margins. *Corolla* white to light violet or pink, 8–12 mm long, 3–4 mm exceeding the calyx, upper lip erect, emarginate, lower lip c. 2 mm long, longer than the upper one, c. 0.5–1 mm long,

straight or decurved; outer surface sparsely pubescent. *Stamens* in 2 pairs, the lower pair longer, exserted. *Nutlets* obtusely trigonous, c. 1–2 mm long, scaly and chaffy on the sides, the top rough and pubescent. — **Fig. 1.**

Distribution — C and S Sumatra, W Java (E as far as Mt Tjeremai and Banjumas), Philippines (Luzon, Mindoro, Leyte, Mindanao), Lesser Sunda Islands (Bali, Lombok, W Sumbawa, Timor, Flores).

Habitat & Ecology — In forests often along streams and in damp, shaded places at low and medium altitudes from c. 500–2000 m, rarely reported down to 150 m, confined to everwet climatic conditions. Flowering: February to September.

Vernacular names — Tjutjung leuweung (Sundanese).

Note — Hooker (1885) stated that he suspected that the two varieties of *Achyrospermum wallichianum* he recognised, may prove to be forms of *A. densiflorum*. Keng (1978) did not list *A. wallichianum* as a synonym of *A. densiflorum*, commenting that he "rather wanted to keep them apart". Wearn and Bramley have examined specimens under both names, including types, and concluded that it is not possible to convincingly separate the two species, hence *A. wallichianum* is listed as a synonym here. This also follows the Annot. Checkl. Flower. Pl. Nepal (Press et al. 2000).

2. ACRYMIA

(G.L.C. Bramley, updated from Keng 1978)

Acrymia Prain, Bull. Misc. Inform. Kew (1908) 1114; H.Keng, Gard. Bull. Singapore 24 (1969) 29; in Steenis, Fl. Males., Ser. I, 8 (1978) 311; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 269. — Type: *Acrymia ajugiflora* Prain.

Subshrub. *Stems* prostrate, less than 10 cm long. *Indumentum* of simple hairs only. *Leaves* simple, crowded, clustered towards end of stems, margins irregularly dentate. *Inflorescences* axillary, cymose, lax, with secund monochasial branches. *Calyx* ± actinomorphic, campanulate in flower, urceolate in fruit, 5-lobed, lobes triangular, subequal. *Corolla* white to yellowish, with some red-purple coloration in throat, 2-lipped (2/3), deciduous, upper lip 2-lobed, lower lip 3-lobed, the midlobe largest. *Stamens* 4, ascending under upper lip, exserted, in 2 pairs, the lower pair slightly longer; anthers reniform, 2-celled, at length confluent. *Disc* absent. *Style* subterminal; stigma briefly 2-fid, lobes unequal. *Fruit* a schizocarp with 4 nutlets. *Nutlets* obovoid, rugose and hirsute, lateral abscission scar about half the size of the nutlet.

Distribution — Monotypic; Peninsular Malaysia.

Habitat & Ecology — Forest understorey.

Conservation status — Listed as Endangered in Walter & Gillett (1997; IUCN Red List).

Taxonomy — Currently unplaced in the Lamiaceae (Harley et al. 2004).

1. Acrymia ajugiflora Prain

Acrymia ajugiflora Prain, Bull. Misc. Inform. Kew (1908) 1114; Ridl., Fl. Malay Penins. 2 (1923) 654. — Type: *King's collector 10709* (holo CAL; iso K), Malay Peninsula, Perak.

Fig. 2. *Acrymia ajugiflora* Prain. a. Flower; b. habit (all *Van Steenis 18509*, L). Drawing by Anita Walsmit Sachs, 2012.

Leaves thin chartaceous, elliptic to broadly elliptic, 15–20 by 10–12 cm, apex obtuse, base broadly acute or subtruncate, hirsute on both sides, especially along the nerves; petiole 3–6 cm long, hirsute. *Inflorescences* with slender peduncle, 6–8 cm long; bracteoles subulate, shorter than the pedicels; pedicels slender, 2–3 mm long. *Calyx* 2.5–3 mm long in flower, in fruit 3–4 mm long; lobes ciliate. *Corolla* 6–7 mm long, glabrous. *Nutlets* 1.2–1.5 by c. 1 mm. — **Fig. 2.**

Distribution — Peninsular Malaysia (Perak, Selangor).

Habitat & Ecology — Undergrowth in dipterocarp forest on distinctly sandy soil at the foot of quartzite ridges (Klang Gates). A rare lowland plant. Flowering: January to February.

Note — A rather unique plant resembling *Gomphostemma* in habit, *Ajuga* in corolla structure and *Cymaria* in inflorescence and fruit.

3. AJUGA

(G.L.C. Bramley, updated from Keng 1978)

Ajuga L., Sp. Pl. (1753) 561; Hook.f., Fl. Brit. India 4 (1885) 702; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 408; Quisumb., Medic. Pl. Philip. (1951) 811; H.Keng, Gard. Bull. Singapore. 24 (1969) 31; in Steenis, Fl. Males., Ser. I, 8 (1978) 312; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 63; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 201. — Type: *Ajuga pyramidalis* L.

Annual or perennial herbs. *Stems* and branches from the rootstock, erect or ascending. *Indumentum* of simple hairs. *Leaves* arranged in opposite pairs, margin entire to serrate. *Inflorescences* of dense, verticillastrate cymes, sometimes reduced to solitary flowers or merging to form a terminal, spiciform or subcapitate thyrse (not in Malesia). *Calyx* actinomorphic or rarely zygomorphic; not accrescent, 5-lobed, lobes subequal. *Corolla* 2-lipped, upper lip usually much shorter than lower, 2-fid, lower lip long and spreading or slightly concave, 3-lobed, middle lobe the largest, often notched at apex, or 1-lipped and then with only lower lip present; marcescent, withering and persisting as a sheath around the fruit. *Stamens* 4, in 2 pairs, ascending under and out from upper lip, exserted; anthers 2-celled, divaricate, often confluent at length. *Disc* poorly to well developed, usually asymmetrical. *Ovary* shortly 4-lobed; style subterminal; stigma 2-fid, arms subequal. *Fruit* a schizocarp with 4 nutlets. *Nutlets* elliptic or obovoid, reticulately ridged to foveolate; attachment scar very large, lateral.

Distribution — About 50 species, throughout the Old World; in *Malesia* 2 species.

Habitat & Ecology — Mainly temperate, but in the Malesian tropics also in the lowland.

KEY TO THE SPECIES

1a. Leaves narrowly obovate to spatulate, 4–9 by 1–3 cm. Inflorescence with many flowers in axillary verticillasters or in a terminal spike-like inflorescence. Corolla with very short upper lip, 1 mm long or less, not obviously bifid . . . . . **1. A. integrifolia**

b. Leaves elliptic, 1.5–2 by 1–1.4 cm. Inflorescence with single flowers in axils of leaf-like bracts. Corolla with 1–2 mm long upper lip, markedly bifid . . . . . **2. A. novoguineensis**

1. **Ajuga integrifolia** Buch.-Ham. ex D.Don

Ajuga integrifolia Buch.-Ham. ex D.Don, Prodr. Fl. Nepal. (1825) 108. — Type: *Buchanan s.n.* (holo BM), Nepal.

Ajuga bracteosa Wall. ex Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 59, nom. superfl.; H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 312; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 63. — Type: *Wallich Cat. 2032* (holo K-W; iso K 2 sheets), Nepal.

Ajuga remota Wall. ex Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 59. — Type: *Wallich Cat. 2033* (holo K-W; iso K 2 sheets), India, Kumaon.

Ajuga densiflora Wall. ex Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 59. — *Ajuga bracteosa* Wall. ex Benth. var. *densiflora* (Wall. ex Benth.) Hook.f., Fl. Brit. India 4: (1885) 703. — Type: *Wallich Cat. 2031* (holo K-W; iso K 2 sheets), Nepal.

Ajuga macrosperma auct. non Wall. ex Benth.: Miq., Fl. Ned. Ind. 2 (1859) 991.

Perennial herb, erect, stoloniferous, usually less than 20 cm long. *Stems* generally hispid. *Leaves* narrowly obovate or spatulate, 4–9 by 1–3 cm, apex obtuse or rounded, base cuneate or gradually attenuate, margin undulate, hirsute on both surfaces; upper

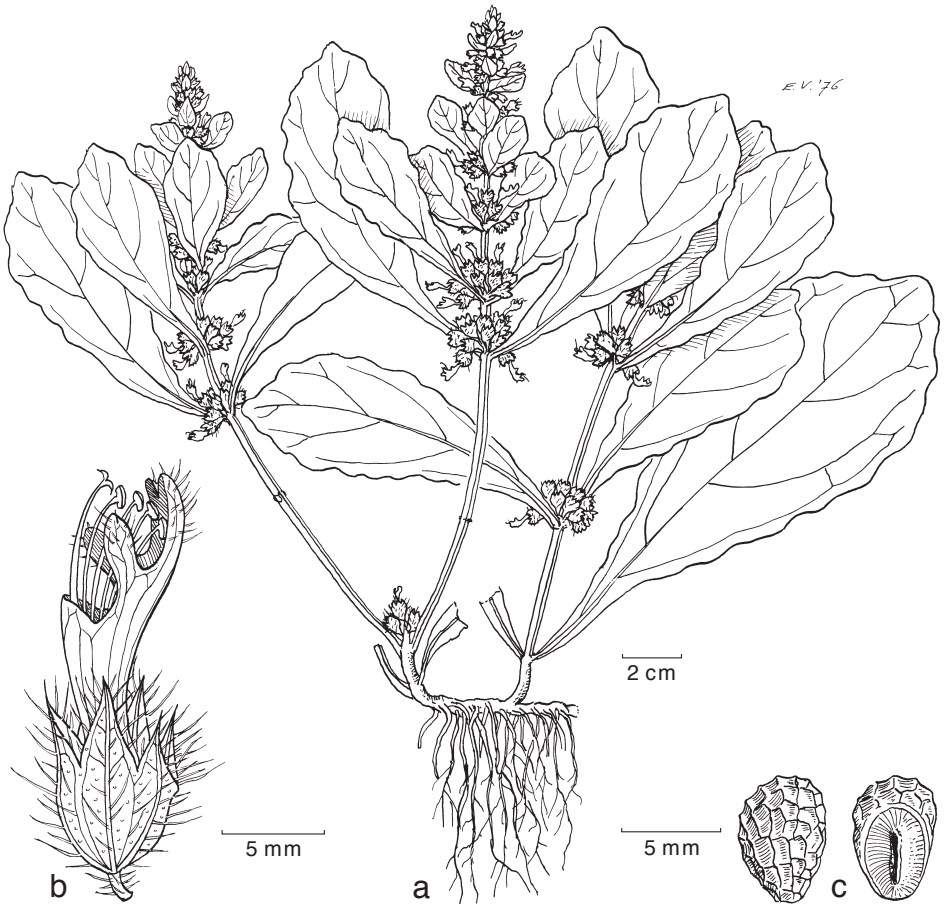

Fig. 3. *Ajuga integrifolia* Buch.-Ham. ex D.Don. a. Habit; b. flower; c. nutlet in two views, one showing the large hilum (a: *Forsten s.n.*; b, c: *Pleyte 171*; all L). Drawing by Ed Vijsma, 1976.

leaves sessile, lower ones shortly petioled, although petiole difficult to determine due to attenuate leaf base. *Inflorescences* with many flowers in axillary verticillasters, sometimes crowded in a terminal, spike-like inflorescence, with ovate or cuneate-obovate, entire or toothed prominent leaf-like bracts. *Calyx* campanulate, 3–5.5 mm long, outer surface hirsute, tube 2–3.5 mm long, lobes triangular, 1–2 mm long. *Corolla* white or pale blue (Quisumb., Medic. Pl. Philip. (1951) 811), 7–8 mm long, the tube straight, 4–5 mm long; upper lip very short, 1 mm long or less, not obviously bifid, lower lip c. 2 mm long, 3-lobed, middle lobe notched, outer surface hirsute. *Stamens* exserted, often hairy. *Nutlets* obovoid, 1.5–2 by c. 1 mm, shallowly rugose-reticulate, yellowish. — **Fig. 3.**

Distribution — From Afghanistan through continental SE Asia (India, Burma, Thailand, Indo-China, S China to Taiwan and the Ryu Kyu Is.); in *Malesia*: Philippines (Batan Is., Luzon, Mindanao), Talaud Is., N and E Sulawesi, Moluccas (Ternate, Halmaheira), and W. New Guinea (Japen Is.)

Habitat & Ecology — Stream banks and shaded ravines, also in open grassland, clearings, rice-fields and coffee estates, mostly in damp places, in Indonesia below c. 200 m but in the Philippines from 600–1700 m (Merrill, Enum. Philipp. Fl. Pl. 3 (1923) 408). Flowering: January, December.

Vernacular names — Sulawesi: Tilad. New Guinea, Japen Island: Sabasasi.

Uses — Unknown in Malesia; in India and China leaves are said to be used medicinally (Kirtikar & Basu, Indian Medic. Pl. (1918) 1048, Li & Hedge in Wu & Raven, Fl. China 17 (1994) 67) and recorded to have a peculiar resinous odour and bitter taste.

Note — *Ajuga integrifolia* is the accepted name for *A. bracteosa*, the name historically applied to this taxon across the region. *Ajuga bracteosa* is treated as a synonym here, following other recent flora treatments (e.g., Lukhoba in Fl. Trop. E. Africa (2009) 15). In comparison with the type specimens of both *A. integrifolia* (*Buchanan s.n.*) and *A. bracteosa* (*Wallich Cat. 2032*), as noted by Keng (1978), Malesian specimens have more elongate and less hairy leaves and a shorter corolla. They match better the type of *A. remota* (*Wallich Cat. 2033*), but there are intermediates and the latter is unanimously reduced to the former.

2. Ajuga novoguineensis A.J.Paton & R.J.Johns

Ajuga novoguineensis A.J.Paton & R.J.Johns, Kew Bull. 59 (2004) 154. — Type: *ANU (G.S. Hope) 16107* (holo CANB, unicate; photo K), Papua New Guinea, Kemabu Plateau.

Perennial herb, to 8–10 cm tall. *Stems* villose. *Leaves* elliptic, 1.5–2 by 1–1.4 cm; apex obtuse or rounded, base cuneate or gradually attenuate, margins crenate-serrate, densely villose on both surfaces; petiole to 0.4 cm long. *Inflorescences* with single flowers in axils of leaf-like bracts, rachis villose, bracts leaf-like. *Calyx* campanulate, c. 4.5 mm long, outer surface pilose, tube c. 3 mm long; lobes 5, triangular, c. 1.5 mm long. *Corolla* pink, 8–10 mm long, the tube straight, c. 6 mm long, the upper lip ascending, markedly bifid, 1–2 mm long, the lower lip c. 3 mm long, 3-lobed, middle lobe largest and notched at apex. *Stamens* 4, shortly exserted. *Nutlets* (immature) obovoid, reticulate.

Distribution — Endemic to the Kemabu Plateau, Mt Jaya, Papua. This species is known only from the southern regions of Kemabu Plateau below the North Wall of Mt Jaya.

Habitat & Ecology — In soggy area of open subalpine tussock grassland at 3 420 m.

4. ANISOMELES

(G.L.C. Bramley, updated from Keng 1978)

Anisomeles R.Br., Prodr. (1810) 503, prop. nom. cons.; Ridl., Fl. Malay Penins. 2 (1923) 649; H.Keng, Gard. Bull. Singapore 24 (1969) 33; in Steenis, Fl. Males., Ser. I, 8 (1978) 328; Bhatti & Ingr., Fontqueria 44 (1966) 77; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 217; A.R.Bean, Austrobaileya 9 (2015b) 321. — Lectotype (designated by Subramanyam & Henry, Taxon 18 (1969) 595): *Anisomeles moschata* R.Br.

Epimeredi Adans., Fam. Pl. 2 (1763) 192, prop. nom. rej.; P.G.Parkinson, Taxon 36 (1987) 603; Subr. & A.N.Henry, Taxon 18 (1969) 595; A.R.Bean, Taxon 64 (2015a) 640. — Lectotype (designated by Subramanyam & Henry, Taxon 18 (1969) 595): *Epimeredi malabaricus* (L.) Rothm. (= *Anisomeles malabarica* (L.) R.Br. ex Sims).

Perennial herbs or subshrubs. *Stems* and branches softly pubescent or woolly. *Indumentum* of simple hairs. *Leaves* spaced evenly in opposite pairs, entire to crenate-serrate. *Inflorescences* thrysoid with 5 to many-flowered cymes, in axillary whorls or forming a loose terminal spicate or paniculate inflorescence. *Calyx* ± actinomorphic, tubular to campanulate, 10-nerved, almost equally 5-lobed. *Corolla* white or white with purple lower lip, tube with a dense ring of hairs within; strongly 2-lipped (1/3), upper lip short, entire, slightly hooded; lower lip much longer, 3-lobed, midlobe retuse or notched. *Stamens* 4, ascending under and projected from upper lip, in 2 pairs, those of the lower pair often ± longer, filaments bearded. *Disc* equal-sided. *Style* gynobasic; stigma subequally 2-fid. *Fruit* a schizocarp with 4 nutlets. *Nutlets* smooth, flattened, bluntly angular, with a basal scar.

Distribution — 26 species, through the Old World, from southern Asia through *Malesia* to northern Australia; in *Malesia*: 4 species.

Habitat & Ecology — Open, often waste places, and secondary growth, not a constituent of the primary forest; in the lowland and hills.

Notes — 1. Keng (1978), in the first treatment of the Labiatae for Flora Malesiana, recognised two species of *Anisomeles* in the region. He notes the difficulties reported by Bentham (Fl. Austral. 5 (1870) 89) in species delimitation in the group, and elaborates on this after his own experience. After Keng, Bhatti & Ingrouille (1996) published a revision of *Anisomeles*. In addition to *A. indica* and *A. malabarica*, they recognise *A. salviifolia* R.Br., a species described from Australia by Robert Brown. According to Bhatti & Ingrouille, *A. salviifolia* occurs in NE Australia, New Guinea and the Lesser Sunda Islands, and can be distinguished from the other two species by its larger corolla. Bean (2015) revised the genus across the whole of its distribution. He increased the number of species recognised from five or six, to 26, 18 of which were newly described, two of which are found in Malesia. Bean's revision clarifies the complicated history of the application of the name *A. salviifolia*, which he now recognises as being a species endemic to Australia.

2. The generic name *Epimeredi* is included as a synonym here, following Bean (2015b). As summarised by Bean (2015a), and earlier by Parkinson (1987), there has been controversy over the status of the name *Epimeredi*: should it be recognised as congeneric with *Anisomeles*, or not. The most recent conclusion (Bean 2015b) is that it is indeed congeneric with *Anisomeles*. Bean (2015a) submitted a proposal to conserve *Anisomeles* over *Epimeredi* to the Nomenclature Committee for Vascular Plants, which is currently under consideration.

KEY TO THE SPECIES

1a. Stems densely villose or woolly, appearing white . . . . . **2. A. malabarica**
b. Stems sparsely to densely hairy, not appearing white 2
2a. Fruiting calyces campanulate, lobes broadly triangular . . . . . **1. A. indica**
b. Fruiting calyces cylindrical to narrowly campanulate, lobes narrowly triangular . . 3
3a. Calyx surface with eglandular hairs only (next to sessile yellow glands) . . . . . **3. A. papuana**
b. Calyx surface with a mixture of glandular and eglandular hairs . . **4. A. principis**

1. Anisomeles indica (L.) Kuntze

Anisomeles indica (L.) Kuntze, Revis. Gen. Pl. 2 (1891) 512; Merr., F1. Manila (1912) 411; Sp. Blancoan. (1918) 336; Enum. Philipp. Fl. Pl.3 (1923) 412; Backer, Onkruidfl. Jav. Suikerrietgr. (1931) 560; Mukerjee, Rec. Bot. Surv. India 14 (1940) 152; Quisumb., Medic. Pl. Philip. (1951) 812; Backer & Bakh.f., F1. Java 2 (1965) 624; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 63. — *Nepeta indica* L., Sp. Pl. (1753) 571. — *Marrubium indicum* (L.) Burm.f., Fl. Ind. (1768) 127. — *Anisomeles ovata* R.Br. in W.T.Aiton, Hort. Kew., ed. 2, 3 (1811) 364 nom. illeg., superfl. pro *Nepeta indica* L.; Miq., Fl. Ned. Ind. 2 (1859) 975, incl. var. β *mollissima* Miq. and var. γ *serratifolia* Miq.; Hook.f., Fl. Brit. India 4 (1885) 672; Ridl., Fl. Malay Penins. 2 (1923) 649. — *Epimeredi indicus* (L.) Rothm., Feddes Repert. Spec. Nov. Regni Veg. 53 (1944) 12. — Lectotype (designated by Cramer in Dassanayake & Fosberg, Revis. Handb. Fl. Ceylon 3 (1981) 176): *Linnean herbarium Specimen 726.28* (lecto LINN), 'India'.

Ballota disticha L., Mant. Pl. Altera (1767) 83. — *Ajuga disticha* (L.) Roxb., Hort. Bengal. (1814) 44. — *Anisomeles disticha* (L.) B.Heyne ex Roth, Nov. Pl. Sp. (1821) 254. — *Nepeta disticha* (L.) Blume, Bijdr. (1826) 823. — Lectotype (designated by Cramer in Dassanayake & Fosberg, Revis. Handb. Fl. Ceylon 3 (1981) 177): *Linnean herbarium Specimen 737.7* (lecto LINN), Surat, India.

Monarda zeylanica Burm.f., Fl. Ind. (1768) 12. — Type: *Linn. Zeyl. 24* (Ceylon herb at P), Ceylon [Sri Lanka].

Nepeta amboinica L.f., Suppl. Pl. (1781) 273. — Type: *Nepeta indica rotundiore folio*, in Morison, Pl. Hist. Univ. 3 (1699) 415, illustr. sect. 11, tab. 6: 7.

Ballota mauritiana Pers., Syn. Pl. 2 (1806) 126. — Type: *Commerson s.n.* (P), Isle de France [Mauritius].

[*Anisomeles mollissima* Wall., Numer. List (1829) 2039, nom. nud.]

[*Anisomeles glabrata* Benth. ex Wall., Numer. List (1829) 2041, nom. nud.]

Phlomis alba Blanco, Fl. Filip. (1837) 474, nom. illeg., non Forrsk., Fl. Aegypt.-Arab. (1775) 107. — Neotype (designated here): *Merrill Species Blancoanae 612* (neo K; isoneo US), Philippines, Luzon, Antipolo, Rizal prov.

Anisomeles malabarica (L.) R.Br. ex Sims var. *albiflora* Hassk., Pl. Jav. Rar. (1848) 485. — *Anisomeles albiflora* (Hassk.) Miq., Fl. Ned. Ind. 2 (1859) 976. — *Anisomeles indica* (L.) Kuntze var. *albiflora* (Hassk.) Backer in Backer & Bakh.f., Fl. Java 2 (1965) 624. — Type: *Hasskarl s.n.* (not located), Java, bij Weltevreden.

Fig. 4. *Anisomeles indica* (L.) Kuntze. a. Habit; b. flower; c. fruiting calyx (all *Boerlage s.n.*, L). Drawing by Ed Vijsma, 1977.

Anisomeles tonkinensis Gand., Bull. Soc. Bot. France 65 (1918) 65. — Type: *d'Alleizette 184* (P), Tonkin [Vietnam], ad Hanoi.

Anisomeles indica (L.) Kuntze var. *biflora* Steenis, Bull. Jard. Bot. Buitenzorg 17 (1948) 389. — Type: *Van Steenis 7659* (not located at BO or L), Bali, NW Bali, Prapatagoeng Peninsula.

Herbaceous or shrubby, 0.5–2 m. *Stems* and *branches* acutely 4-angled, sparingly hairy to densely pubescent. *Leaves* ovate to broadly ovate, 4.5–6 by 3–3.5 cm, thin- to thick-membranaceous, apex acute, margin serrate to crenate-serrate, sometimes serration irregular, becoming deeper towards apex, base rounded or truncate, sparsely to densely hairy on both surfaces; petiole 1.5–4 cm long, tomentose. *Inflorescences* with flowers usually numerous (over 20), in a dense verticillaster, shortly branching once or twice, the whorls distant below, approximate above in a terminal dense spicate inflorescence, rarely very few-flowered with solitary flowers in the leaf-axils; bracts linear to spathulate, 3–5 mm long, hairy. *Calyx* (in fruit) campanulate, tube 6–7 mm long, lobes broadly triangular, 2–4 mm long, outer surface with an even covering of short hairs, inner surface with longer hairs in the bottom half of the tube, shorter hairs on the lobes and lobe margins. *Corolla* greenish to whitish, with dark reddish lines inside, sometimes purple or blue, tubular, 12–14 mm long, tube 5–6 mm long; upper lip c. 5 mm long; lower lip 7–8 mm long, with dense hairs on upper surface. *Nutlets* broadly ovoid, 1.8–2 by 1.4–1.5 mm, subcompressed, black. — **Fig. 4.**

Distribution — India, China, Japan, Ryukyu Is., Taiwan, Bismarck Arch., Fiji Is.; in *Malesia*: throughout.

Habitat & Ecology — Open and waste lands, sunny places, grasslands, in settled areas, also in teak-forests; common, under everwet and seasonal climatic conditions, l–600(–c. 1700) m. Flowering: throughout the year.

Vernacular names — Sumatra: Batu-babra (Malay); Sibo, Tibo. Java: Babadotan beureum, Babadotan bodas, Bandotan putih, Patuk bangkong (Sundanese); Daun salangkeng (Madurese); Kihileud (Javanese); Rumput ati-ati, R. upuh, (Malay). Philippines: Kabling-laláke, Kadlingpárang, Talingharap (Tagalog); Lilitan, Litalit, Subasuba (Iloko); Sauang sauang (Manobo). Sulawesi: Balotji, Mankuru-im-parab.

Uses — According to Ridley (1923) this is an excellent plant for hive bees. Heyne (Nutt. Pl. Ned.-Ind. (1927) 1327) mentions that in Java a decoction of the leaves is internally used for gravel, and in the Philippines it is said to be antirheumatic and stomachic, and good for gastric catarrh and intermittent fever (Quisumbing 1951). The leaves would contain a volatile oil and a bitter alkaloid, in the Malay Peninsula the plant is commonly used in cakes of sago (Burkill, Dict. Econ. Prod. Malay Penins., 1935: 160). From Sumba reported to be a fetid herb with aromatic-scented flowers.

Note — The flower colour varies considerably.

2. **Anisomeles malabarica** (L.) R.Br. ex Sims

Anisomeles malabarica (L.) R.Br. ex Sims, Bot. Mag. 46 (1819) 2071; Ridl., Fl. Malay Penins. 2 (1923) 649. — *Nepeta malabarica* L., Mant. Pl. Altera (1771) 566. — *Epimeredi malabaricus* (L.) Rothm., Feddes Repert. Spec. Nov. Regni. Veg. 53 (1944) 12. — Lectotype (designated by Cramer in Dassanayake & Fosberg, Revis. Handb. Fl. Ceylon 3 (1981) 178): *Linné Hortu Upsalensi, specimen 726.26* (LINN).

Subshrub, 0.5–1.5 m. *Stems* and *branches* densely villose or woolly, appearing white. *Leaves* oblong to narrowly ovate, 5–11 by 2–3.5 cm, membranaceous to thick-chartaceous, apex acute, margin shallowly serrate, base shortly cuneate, densely hairy to woolly beneath, more velutinous above; petiole 0.5–2.5 cm long, softly woolly. *Inflorescences* with verticils widely to narrowly spaced along the rachis; peduncle short, less than 0.5 cm long; branching twice at first, then branching twice again or no further; bracteoles linear-lanceolate to lanceolate, 4–10 mm long. *Calyx* (in fruit) narrowly campanulate, widening slightly at throat, 10–12 mm high, lobes very narrowly triangular, acuminate, 4–5 mm long, outer surface hirsute or densely villose, including lobes of margins, inner surface with dense long hairs between the lobes and the nutlets. *Corolla* (based on Sri Lankan specimens) lilac or pale blue, c. 14 mm long, tube c. 7 mm long; upper lip c. 5 mm long; lower lip c. 9 mm long, with dense hairs along centre of upper surface. *Nutlets* ellipsoid, c. 2 by 1.5 mm, smooth, shining. — **Plate 1a.**

Distribution — Mauritius, Sri Lanka and southern India; in *Malesia*: Penang (2 Wallich sheets, cat. 2037/2).

Habitat & Ecology — Open, often waste places, mostly under seasonal climatic conditions, at low altitude. Flowering: February to September.

Note — Keng's (1978) circumscription of this species included all Australian material of *Anisomeles* and the names *A. salviifolia*, *A. moschata* and *A. inodora* R.Br. This followed Bentham's (1870) early reference to difficulties in species delimitation in the group, and his remarks on similarities between the Australian and Indian specimens that he had observed. Bean (2015) considers the Robert Brown names to represent species endemic to Australia, and *A. malabarica* to be restricted to continental Asia; it is represented in Malesia by two Wallich specimens from Penang only.

3. **Anisomeles papuana** A.R.Bean

Anisomeles papuana A.R.Bean, Austrobaileya 9 (2015) 368. — Type: *R. Pullen 7199* (holo BRI; iso A, CANB, K, L, LAE), Papua New Guinea, Western prov., near Morehead Patrol Post.

Erect or spreading shrub, 1.2–2 m high. *Stems* and *branches* moderately to densely hairy with downward pointing hairs, not appearing white. *Leaves* oblong to narrowly ovate, 6–11 by 2.5–6 cm, apex acute, margin crenate to crenate-serrate, base cuneate to obtuse, with an even, dense covering of erect hairs below, these less dense above, eglandular, also with yellow sessile glands on lamina surface; petioles 0.5–2.5 cm long. *Inflorescences* in verticils widely to narrowly spaced along the rachis; penduncle 2–4 mm long; branching twice at first, then branching twice again or no further; bracteoles linear to spathulate, 1–4 mm long. *Calyx* (in fruit) more or less cylindric, widening slightly towards apex, tube 4–5 mm long, lobes narrowly triangular, 1–2 mm long, sometimes slightly reflexing as calyx matures, outer surface with dense eglandular hairs and yellow sessile glands, inner surface with a ring of long hairs halfway down the tube, long hairs also present on the inside of the lobes and on the lobe margins. *Corolla* c. 11 mm long, tube c. 5 mm long, upper lip c. 4 mm long, lower lip c. 5 mm long, a ring of hairs present about half way down the inner surface of the corolla tube, lower surface of lower lip hairy and with dense yellow sessile glands, upper surface papillose. *Nutlets* c. 1.5 by 1 mm.

Distribution — Queensland, Torres Strait, New Ireland; in *Malesia*: southern Moluccas (Yamdena island), New Guinea.

Habitat & Ecology — Mostly lowland woodland at low altitude, but as recognised by Bean (2015: 369) a few specimens are known from higher altitudes: the fructescences in these specimens tend to be more compact.

Note — The name *A. papuana* represents most *Anisomeles* specimens found on New Guinea, previously determined as *A. malabarica* following Keng (1978).

4. Anisomeles principis A.R.Bean

Anisomeles principis A.R.Bean, Austrobaileya 9 (2015) 369. — Type: *P.G.Wilson 11152* (holo PERTH), Australia, Western Australia, South-west Osborne Island, Bonaparte Archipelago.

Erect or spreading shrub to 1.5 m high. *Stems* and *branches* moderately hairy, not appearing white, hairs downward pointing (in region). *Leaves* narrowly ovate, 55–65 by 30–34 mm (in region), apex acute, margins crenate-serrate, base obtuse to cuneate, evenly hairy above and below, hairs erect, eglandular, also with yellow sessile glands on lamina surface; petioles 1–3 cm long. *Inflorescences* of verticils widely spaced along the rachis; peduncles c. 0.5 cm long; branching twice at first then no further; bracteoles linear to spathulate, 2–3 mm long. *Calyx* (in fruit) more or less cylindric, widening slightly towards apex, tube 5–6 mm long, lobes narrowly triangular, 2–2.5 mm long, reflexing as calyx matures, outer surface with shorter eglandular hairs and fewer longer glandular hairs, inner surface with a ring of long hairs halfway down the tube, long hairs also present on the inside of the lobes, lobe margins with shorter hairs. *Corolla* c. 11 mm long, tube c. 5 mm long, upper lip c. 4 mm long, lower lip c. 5 mm long, lower lip hairy. *Nutlets* c. 1.5 by 1.2 mm.

Distribution — Western Australia (Kimberly region); in *Malesia*: Timor and Timur Laut (Pulau Selaru; 3 records).

Habitat & Ecology — Recorded from grassy fields, in light shade on Pulau Selaru. Bean (2015) records the habitat as sandstone hills, grassland and woodland in Australia, where it is relatively common.

5. BASILICUM

(G.L.C. Bramley, updated from Keng 1978)

Basilicum Moench, Suppl. Meth. (1802) 143; H.Keng, Gard. Bull. Singapore 24 (1969) 38; in Steenis, Fl. Males., Ser. I, 8 (1978) 366; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 295; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 262; Suddee, A.J.Paton & J.Parn., Kew Bull. 60 (2005) 3. — Type: *Basilicum polystachyon* (L.) Moench.

Moschosma Rchb., Consp. Regn. Veg. (1828) 171. — Type: *Moschosma polystachyon* (L.) Benth. (= *Basilicum polystachyon* (L.) Moench).

Erect, annual herb, branched, aromatic. *Inflorescences* thyrsoid, cymes sessile, usually 3- or more flowered; bracts inconspicuous; flowers very small. *Calyx* strongly 2-lipped, 5-lobed (1/4), lobes unequal, upper lobe broadest, rounded, curving upwards, slightly decurrent on tube, lateral lobes deltoid, lower lobes subulate, more or less equal in length to upper lip, throat of calyx open, glabrous; fruiting calyx patent to in-

florescence axis. *Corolla* 2-lipped, 5-lobed (4/1), white, purple or bluish, only slightly exserted from calyx tube, tube straight, upper lip ascending, 4-lobed, lower lip horizontal, concave tubular-campanulate. *Stamens* 4, declinate, held over lower lip, upper pair inappendiculate, attached above midpoint of corolla tube, lower pair attached at throat; filaments not appendiculate; anthers 2-celled. *Style* gynobasic; stigma capitate-clavate, lobes equal, rounded, connivent. *Disc* equal-sided. *Fruit* a schizocarp with 4 nutlets. *Nutlets* ovoid, compressed, smooth; attachment scar small, basal.

Distribution — One species, widespread in Old World tropics, especially in seasonally flooded areas and watersides.

1. Basilicum polystachyon (L.) Moench

Basilicum polystachyon (L.) Moench, Suppl. Meth. (1802) 143 (‘*polystachyion*’). — *Ocimum polystachyon* L., Mant. Pl. Altera (1771) 567 (‘*Ocymum*’). — *Lumnitzera polystachyum* (L.) J.Jacq. ex Spreng., Syst. Veg. 2 (1825) 687. — *Moschosma polystachyum* (L.) Benth. in Wall., Pl. Asiat. Rar. 2 (1830) 13; Hassk., Cat. Hort. Bot. Bogor. (1844) 129; Miq., Fl. Ned. Ind. 2 (1858) 942; Hook.f., Fl. Brit. India 4 (1885) 612; S.Vidal, Phan. Cuming. Philipp. (1885) 135; Revis. Pl. Vasc. Filip. (1886) 212; Merr., Sp. Blancoan. (1918) 339; Enum. Philipp. Fl. Pl. 3 (1923) 421; Ridl., Fl. Malay Penins. 2 (1923) 644; Backer & Bakh.f., Fl. Java 2 (1965) 638 (‘*polystachyon*’). — Lectotype (Paton & Cafferty, Kew Bull. 53 (1998) 466): *Linnean Herbarium 749.15*, right hand specimen (LINN), India.
Ocimum tenuiflorum auct. non L.: Burm.f., Fl. Ind. (1768) 129 (‘*Ocymum*’).
Moschosma tenuiflorum auct. non (L.) Heynh.: Merr., Fl. Manila (1912) 408.

Erect herb, 0.4–1 m tall. *Stems* much branched, prominently quadrangular with hairs at angles and at nodes, otherwise glabrous. *Leaves* membranaceous, ovate to narrowly ovate, 1.3–4.8 by 0.5–2.8 cm, apex acuminate or caudate, base acute or attenuate, margin serrate to crenate-serrate, glabrous above, with short hairs on veins and yellow sessile glands below; petiole 0.5–4 cm long. *Inflorescences* terminal or axillary, up to 10 cm long; bracts minute, lanceolate, aristate, 1–2 mm long; pedicels 1–2 mm long, persistent. *Calyx* tubular-campanulate, pubescent, 1–2 mm long (in fruit 2.5–3 mm, slightly inflated at base). *Corolla* pale lilac to purple or flesh-coloured, sometimes white, 2–2.5 mm long. *Stamens* slightly exserted from corolla tube. *Nutlets* minute, broadly ellipsoid, compressed, c. 0.5 mm long, smooth. — **Fig. 5.**

Distribution — Tropical Africa, India, Himalaya, Burma, China, Indochina to Australia; throughout *Malesia*.

Habitat & Ecology — Fallow rice-fields, watersides, swampy grasslands, open waste places, largely in settled areas, with a preference for seasonal climatic conditions, therefore in Java largely in areas subject to a dry climate, and scarce in most of Sumatra, Malay Peninsula and Borneo. Flowering: throughout the year. Flowers are often galled, and inflorescences bear sometimes large red galls, caused by a gall-midge (Keng 1978).

Vernacular names — Musk basil (English). Sumatra: Main-main, Sulaseh dulang, Tapua djatten (Malay). Java: Bajem ball (Malay); Sangket(an), Wangon, Wangun (Javanese); Surawung gunung, Surawung teuweung, Wanggung langit (Sundanese). Philippines: Bauing (Magindanao); Lodokong (Pangasinan); Loktokong, Pansi-pansi (Tagalog).

Uses — According to Heyne (Nutt. Pl. Ned.-Ind. ed. 3 (1950) 1335) the crushed leaves are used in Java for sprains. Decoctions are used externally and internally for epilepsy, palpitations of the heart, neuralgia and convulsions.

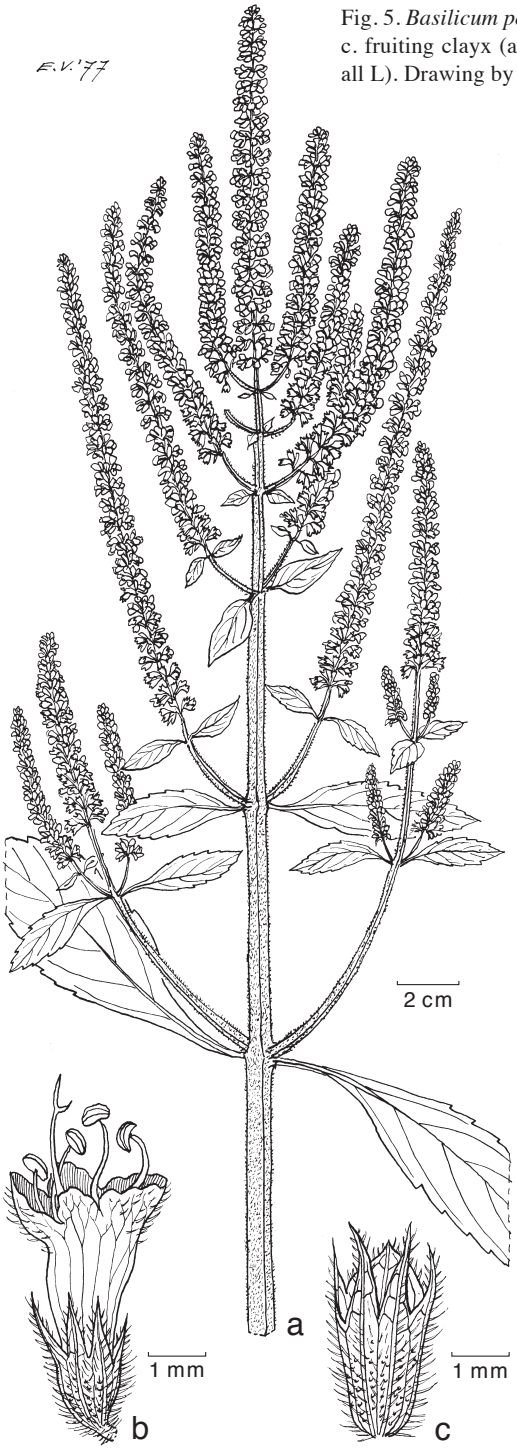

Fig. 5. *Basilicum polystachyon* (L.) Moench. a. Habit; b. flower; c. fruiting clayx (a. *Rahmat si Boeea 463*; b, c: *Backer 35568*; all L). Drawing by Ed Vijsma, 1977.

6. CALLICARPA

(G.L.C. Bramley)

Callicarpa L., Sp. Pl. (1753) 111; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 45; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 9; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 382; Munir, J. Adelaide Bot. Gard. 6 (1982) 5; S.L.Chen & M.G.Gilbert in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 4; Coode et al., Checkl. Fl. Pl. Gymnosperms Brunei Darussalam (1996) 329; Argent et al., Man. non-Dipterocarp Trees C. Kalimantan (1997) 653; Tien T.Chen et al., Taiwania 43 (1998) 330; Kessler, Second. Forest Trees Kalimantan (2000) 191; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 267; Bramley, Bot. J. Linn. Soc. 159 (2009) 416; Bramley, Rusea & de Kok, Tree Fl. Sabah & Sarawak 7 (2011); Bramley, Kew Bull. 67 (2012) 213; 68 (2013) 369. — Type: *Callicarpa americana* L.

Geunsia Blume, Catalogus (1823) 11. — Type: *Geunsia farinosa* Blume (= *Callicarpa pentandra* Roxb.).

Shrubs, small trees, erect to weakly climbing or scandent. *Leaves* simple, opposite, decussate, sometimes with one apparently alternate leaf[5] between opposite pairs, rarely pseudoverticillate, internode length often variable; petiolate or decurrent to stem. *Inflorescences* an indeterminate thyrse with opposite dichasial cymes and occasionally alternate dichasial cymes (e.g., *C. pentandra*); dichasial cymes axillary or supra-axillary, pedunculate, ramiflorous or cauliflorous; subtended by leaf-like bracts. *Flowers* bisexual, actinomorphic. *Calyx* cupular or ± tubular, divided into 4–5(–8) lobes near the apex, persistent, sometimes remaining intact, accrescent, surrounding mature fruit, sometimes breaking open and partly falling away but subtending mature fruit. *Corolla* white, yellow, pale blue, pink or purple, narrowly funnel-shaped, actinomorphic, with as many lobes as calyx, lobes erect, patent or reflexed, inner surface glabrous or with scattered hairs. *Stamens* 4–5(–8), epipetalous, inserted at or near the base of the corolla tube, part of the filament and the anther exserted or the anther exserted only, anthers with numerous yellow sessile glands at connective attachment, either ovate or elliptic and dehiscing through longitudinal slits, or oblong and dehiscing through a pore-like opening at the apex then splitting longitudinally towards the base as anther matures. *Style* terminal; stigma capitate or with (3–)4–5(–8) symmetric lobes, glandular. *Ovary* 4–5(–8)-celled, unlobed, 1 or 2 ovules in each cell. *Fruit* a drupe with a fleshy exocarp, subtended by, or partially to fully enclosed by persistent calyx (not inflated), apex usually visible, maturing white, red, purple or black; over 4–10(–16) 1-seeded pyrenes.

Distribution — There are about 140 species of *Callicarpa*, occurring in both temperate and tropical regions, although this number may be inflated due to currently unrecognised synonyms (World Checklist of Lamiaceae: http://apps.kew.org/wcsp/home.do – last checked May 2017; personal estimates). In the New World there are 33 species recognised, particularly in the Caribbean Islands (24 species currently recognised on Cuba). The genus is more species rich in the Old World; based on my own estimates and the literature there is one species in Madagascar (Moldenke, Bull. Torrey Bot. Club 77

5) These alternate 'leaves', since they are subtending cymes, are strictly bracts, not leaves, but are included here to avoid confusion, since they are identical in structure to the leaves, and are likely to be understood as such.

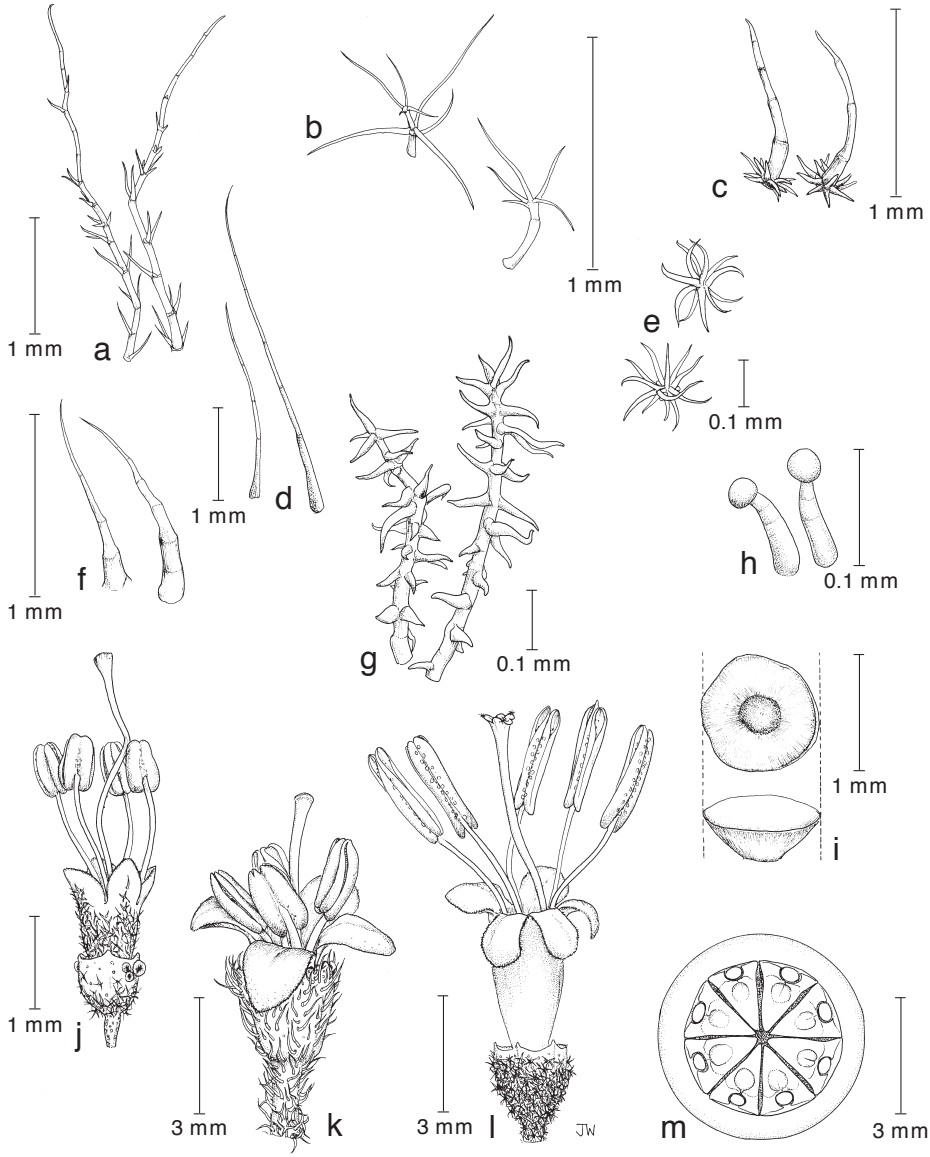

Fig. 6. *Callicarpa* L. hair types. – a. *C. barbata* Ridl., lower leaf surface. – b. *C. havilandii* (King & Gamble) H.J.Lam, lower leaf surface. – c. *C. fulvohirsuta* Merr., lower leaf surface. – d. *C. argentii* Bramley, stem. – e. *C. longifolia* Lam., lower leaf surface. – f. *C. hispida* (Moldenke) Bramley, upper leaf surface. – g. *C. scandens* (Moldenke) Govaerts, stem/lower leaf surface. – h. *G. superposita* Merr., calyx. – i. *C. fulvohirsuta* Merr., peltate scale. – j. *C. longifolia* Lam., flower. – k. *C. havilandii* (King & Gamble) H.J.Lam, flower. – l. *C. pentandra* Roxb., flower. – m. *C. havilandii* (King & Gamble) H.J.Lam, fruit cross-section. (a: *S (Othman et al.) 41314*; b: *S (Mohtar) 47173*; c: *SAN (Madani) 128870*; d: *Argent 94104*; e: *SAN (Goh & Madani) 141160*; f: *SAN (Talip) 52788*; g: *SAN (Fedilis & Sumbing) 89702*; h: *Bakia 325*; i: *SAN (Madani) 128870*; j: *SAN (Goh & Madani) 141160*; k: *S (Bramley et al.) 96501*; l: *Beaman 9679*; m: *S (Bramley et al.) 96501*; all K). Drawing by Juliet Beentje.

(1950) 389) and there are c. 48 species in temperate Asia, particularly China (Chen & Gilbert 1994), 55 in Malesia, seven in Australia (Munir 1982), and three in the Pacific.

Habitat & Ecology — In general, the common and well-known species are shrubs or small trees found in disturbed areas such as secondary forest or roadsides, but a number of lesser known species inhabit primary forest only.

KEYS TO THE SPECIES

For ease of use, three identification keys are presented. This reflects the high proportion of endemic species on Borneo and the Philippines, as well as the apparent divide between species within the west and east of Malesia.

KEY TO THE SPECIES OF PENINSULAR MALAYSIA, SUMATRA AND JAVA

1a. Flowers mainly 5-merous; an apparently alternate leaf often present between opposite pairs . . . . . **40. C. pentandra**
b. Flowers 4-merous; no alternate leaf present between opposite pairs 2
2a. Filaments shorter than or scarcely exceeding corolla; anthers 1.5–2.5 mm long 3
b. Filaments at least 1.5 times longer than corolla; anthers 0.5–1.5 mm long 5
3a. Climber or scandent shrub. Ovary with branched hairs . . . . . **25. C. furfuracea**
b. Shrub or tree, not scandent. Ovary glabrous 4
4a. Leaves very narrowly to narrowly elliptic to ± oblong, 6–16 by 2–4 cm . . . . . **3. C. angustifolia**
b. Leaves elliptic to obovate, 15–30 by 9–16 cm . . . . . **34. C. maingayi**
5a. Leaf margins ± entire, rarely shallowly dentate . . . . . **7. C. arborea**
b. Leaf margins regularly serrate or dentate 6
6a. Leaf base cordate to oblique-cordate . . . . . **45. C. rubella**
b. Leaf base acute to attenuate 7
7a. Lower leaf surface with an even but not dense indumentum of branched hairs, not interwoven, the lamina surface easily visible. Mature fruit white **31. C. longifolia**
b. Lower leaf surface with a dense indumentum of branched or plumose hairs, these interwoven but the lamina surface not obscured. Mature fruit purple to black . . 8
8a. Stem with ± stellate hairs. Fruit without stellate hairs . . . . . **13. C. candicans**
b. Stem with plumose hairs. Fruit with stellate hairs . . . . . **21. C. erioclona**

KEY TO THE SPECIES OF BORNEO

1a. Mature leaves ± glabrous on lower surface (rarely a few randomly scattered hairs present) 2
b. Mature leaves densely to sparsely hairy on lower surface, the hairs not randomly scattered 4
2a. Conspicuous ovate bracts forming an involucre around each young cyme . . . . . **29. C. involucrata**
b. Bracts and bracteoles linear, often inconspicuous 3

3a. Inflorescence a lax pedunculate cyme, pedicels part of open branching pattern . . . . . **26. C. glabrifolia**
b. Inflorescence ± sessile cyme, pedicels arising from congested base **55. C. woodii**
4a. Leaf bases auriculate, the lobes sac-like and inhabited by ants . . **46. C. saccata**
b. Leaf bases not auriculate, ants absent 5
5a. Flowering calyx usually c. 1–1.5 mm long. Fruit usually ≤ 2 mm wide, more rarely up to 4 mm wide 6
b. Flowering calyx 2–6 mm long. Fruit usually 3–7 mm wide 13
6a. Corolla usually 5-merous; stamens usually 5; anthers oblong, 1.5–3 mm long. . . . . **40. C. pentandra**
b. Corolla 4-merous; stamens 4; anthers usually elliptic, 0.5–1.5 mm long, rarely oblong, 2 mm long 7
7a. Leaves obovate or rarely elliptic, 25–48 by 11–21 cm; lower surface obscured by dense indumentum of greyish brown plumose hairs . . . . . **47. C. scandens**
b. Leaves (narrowly) ovate to elliptic to ± oblanceolate, usually less than 25 cm long and less than 11 cm wide; lower surface either visible or obscured by whitish hairs that are branched but not plumose, or with pale matted plumose hairs 8
8a. Lower leaf surface appearing whitish, distinctly different in colour to the upper; upper leaf surface usually more or less glabrous when mature. Calyx surface obscured by dense hairs 9
b. Lower leaf surface not distinctly different in colour to the upper; upper surface usually with hairs when mature. Calyx surface visible, hairs present but not dense 10
9a. Ovary glabrous; stem with ± stellate hairs . . . . . **13. C. candicans**
b. Ovary with stellate hairs; stem with plumose hairs . . . . . **21. C. erioclona**
10a. Inflorescence inserted c. 5 mm above leaf axil. Outer surface of calyx with gland-tipped hairs . . . . . **52. C. superposita**
b. Inflorescence inserted in leaf axil, ramiflorous or cauliflorous. Outer surface of calyx with at least scattered branched hairs 11
11a. Mature fruit white. — Widespread . . . . . **31. C. longifolia**
b. Mature fruit red to dark blue 12
12a. Twigs with short branched and longer spreading red-brown hairs. — Endemic to Sabah . . . . . **24. C. fulvohirsuta**
b. Twigs with stellate white to pale brown hairs. — Endemic to Kalimantan Barat . . . . . **54. C. teneriflora**
13a. Corolla usually 5-merous, purple; stamens usually 5, pink or purple. Shrub or tree up to 20 m . . . . . **40. C. pentandra**
b. Corolla 4(–7)-merous, white to green, yellow or pale pink; stamens 4(–7). Climber, shrub or small tree up to 10 m 14
14a. Climber or vine, leaf base rounded to ± cordate . . . . . **9. C. badipilosa**
b. Shrub or small tree, leaf base acute, attenuate or decurrent, obtuse to truncate, sometimes (slightly) asymmetric 15
15a. Leaves ± obovate, base decurrent, ≥ 33 cm long . . . . . **10. C. barbata**
b. Leaves elliptic, ovate or obovate, base obtuse to acute to attenuate or truncate, sometimes (slightly) asymmetric, < 33 cm long 16

16a. Calyx subtending mature fruit like a saucer (or enclosing less than a third) . . . . . **27. C. havilandii**
b. Calyx surrounding and partially enclosing half or more of the mature fruit . . 17
17a. Flowers congested in globose to almost globose cymes, inflorescence distinctly pedunculate, 25–35 mm long 18
b. Flowers more laxly spaced in bifurcating cymes, inflorescence sessile or with peduncle 5–20(–80) mm long 19
18a. Plant with a dense indumentum of branched hairs, these interwoven and matted. Calyx 2–4 mm long. Corolla 4–5 mm long . . . . . **16. C. clemensorum**
b. Plant with a dense indumentum of simple and short-branched hairs, these patent or erect. Calyx c. 5 mm long. Corolla 6–8 mm long . . . . . **30. C. kinabaluensis**
19a. Bracts and bracteoles narrowly ovate . . . . . **5. C. anomala**
b. Bracts and bracteoles linear 20
20a. Inflorescence sessile, the axes scarcely visible 21
b. Inflorescence pedunculate, at least the lower axes visible 22
21a. Hairs on stems patent . . . . . **8. C. argentii**
b. Hairs on stems upwards pointing, appressed . . . . . **17. C. coriacea**
22a. Calyx and corolla with 6 or 7 lobes . . . . . **28. C. hispida**
b. Calyx and corolla with 4 lobes 23
23a. Outer surface of calyx evenly hairy, hairs simple . . . . . **20. C. endertii**
b. Outer surface of calyx covered with hair but hairs more dense on ridges leading up to lobe tips, hairs short and stellate as well as longer and simple . . . . . **48. C. subaequalis**

KEY TO THE SPECIES OF THE PHILIPPINES, SULAWESI, LESSER SUNDA ISLANDS, MOLUCCAS AND NEW GUINEA

1a. Flowers 4–5(–8)-merous. Anthers ≥ 2 mm long. Fruit with more than 4 pyrenes 2
b. Flowers 4-merous. Anthers 0.3–1.5 mm long (unknown for *C. albidotomentella*, *C. magnifolia*, *C. pachyclada*). Fruit with 4 pyrenes (unknown for *C. longipetiolata*, *C. platyphylla*) 13
2a. Inflorescence ramiflorous or cauliflorous, appearing on the branches where the leaves have fallen 3
b. Inflorescence axillary, appearing when the leaves are present 6
3a. Leaf margins ± entire 4
b. Leaf margins shallowly dentate to dentate 5
4a. Calyx c. 3 mm long . . . . . **11. C. basilanensis**
b. Calyx 6–7 mm long . . . . . **22. C. fasciculiflora**
5a. Leaf lower surface with erect hairs branched towards the apex, more dense along the midrib and venation. Calyx subglabrous, occasionally with some hairs, surface visible . . . . . **11. C. basilanensis**
b. Leaf lower surface appearing vesiculose, the venation raised, the lamina with stellate and plumose hairs, the larger veins with more densely branched plumose hairs. Calyx outer surface with plumose hairs, these so dense the surface obscured . . . . . **44. C. ramiflora**

6a. Inflorescence ± sessile 7
b. Inflorescence pedunculate, peduncles 0.5–9 cm long 8
7a. Leaf margins ± entire. Calyx 6–7 mm long . . . . . **22. C. fasciculiflora**
b. Leaf margins dentate. Calyx c. 3 mm long . . . . . **44. C. ramiflora**
8a. Leaves without apparently alternate leaves present between opposite pairs; margins serrate or dentate (not shallowly so). 9
b. Leaves often with apparently alternate leaves between opposite pairs; margins more or less entire to shallowly dentate. 10
9a. Calyx with 5 lobes, 3 completely divided, 2 fused for about half their length. Inflorescence penduncles c. 0.5 cm long . . . . . **4. C. anisodonta**
b. Calyx with 4 equal lobes. Inflorescence peduncles 1.2–3 cm long . . . . . **53. C. surigaensis**
10a. Stamens 5–8, enclosed, filaments c. 2 mm long . . . . . **23. C. flavida**
b. Stamens (4–)5(–6) exserted for 1–5 mm, filaments 3–8.5 mm long 11
11a. Leaves in pseudowhorls of four, three leaves ± equal in size, the fourth much smaller . . . . . **43. C. pseudoverticillata**
b. Leaves in opposite pairs but with apparently alternately leaves present between the pairs, these clearly separated and not appearing whorled 12
12a. Calyx c. 3 mm long, ridged, with 5 triangular lobes, almost completely to completely enclosing fruit, up to 2 mm longer than fruit; 5 1-seeded pyrenes . . . . . **15. C. cinnamomea**
b. Calyx 1–2(–3) mm long, not ridged, ± truncate or with (4–)5(–6) shallow triangular lobes, usually breaking open as fruit matures or only partially enclosing fruit if remaining intact; (8–)10(–12) 1-seeded pyrenes . . . . . **40. C. pentandra**
13a. Terminal parts of inflorescence congested, the flowers more or less sessile, pedicels difficult to determine, or subsessile, subtended by linear, narrowly obovate, ovate or oblong bracteoles 14
b. Terminal parts of inflorescence lax, or if congested flowers more obviously pedicellate, subtended by linear, usually inconspicuous bracteoles 21
14a. Lower leaf surface paler than upper surface and appearing glabrous to the naked eye but hairs visible under magnification 15
b. Lower leaf surface paler than upper surface or syncolorous, with dense covering of plumose or branched hairs visible to the naked eye 17
15a. Leaves elliptic, 16–20 by 7.5–9 cm; petioles c. 3 cm long . . . . . **6. C. apoensis**
b. Leaves narrowly ovate to narrowly elliptic, 4.2–15 by 1–5 cm; petioles 0.8–2.2 cm long 16
16a. Leaves 13.5–15 by 4.3–5 cm. Corolla outside glabrous . . . . . **49. C. subalbida**
b. Leaves 4.2–10 by 1–2 cm. Corolla outside with some hair on the lobes . . . . . **51. C. subintegra**
17a. Leaves > 16 cm wide . . . . . **37. C. pachyclada**
b. Leaves ≤ 14 cm wide 18
18a. Flowers congested in compact, almost globose heads . . . . **32. C. longipetiolata**
b. Flowers congested in terminal parts of inflorescence but not in almost globose heads 19

19a. Peduncles 2 cm long or less . . . . . **42. C. plumosa**
b. Peduncles 3 cm long or more 20
20a. Lower leaf surface occasionally scarcely visible or ± obscured by a dense indumentum of interwoven branched hairs, surface not vesiculose . . . **7. C. arborea**
b. Lower leaf surface with venation covered by plumose hairs, the hairs also present on the lamina but apparently rubbing off in places, surface somewhat vesiculose . . . . . **50. C. subglandulosa**
21a. Leaf blades broadly elliptic to ovate or rarely obovate, usually > 8.5 cm wide 22
b. Leaf blades very narrowly ovate, very narrowly elliptic to narrowly elliptic or elliptic to ± oblanceolate, usually < 8 cm wide 26
22a. Lower leaf surface paler than upper surface and appearing glabrous to the naked eye but hairs visible under magnification . . . . . **41. C. platyphylla**
b. Lower leaf surface paler than upper surface or syncolorous, with dense covering of plumose or branched hairs visible to the naked eye 23
23a. Leaf blades 15–20 cm wide . . . . . **33. C. magnifolia**
b. Leaf blades ≤ 11 cm wide 24
24a. Margins crenate-serrate in the upper half, ± entire in the lower half. Lower leaf surface with sparse indumentum of branched hairs . . . . . **18. C. denticulata**
b. Margins dentate. Lower leaf surface with matted plumose hairs or dense branched hairs 25
25a. Ovary glabrous; stem with ± stellate hairs . . . . . **13. C. candicans**
b. Ovary with stellate hairs; stem with plumose hairs . . . . . **21. C. erioclona**
26a. Lower leaf surface glabrous, or paler than upper surface and appearing glabrous to the naked eye but hairs visible under magnification 27
b. Lower leaf surface with a sparse to dense covering of simple or branched hairs visible to the naked eye 31
27a. Leaves markedly dentate to crenate or serrate 28
b. Leaves entire or minutely dentate 30
28a. Corolla outer surface with a dense indumentum of interwoven plumose and stellate hairs, the surface obscured. Leaf blades very narrowly elliptic, 5–15 by 0.7–3 cm, margins serrate . . . . . **2. C. angusta**
b. Corolla outer surface with a few branched hairs present only on each lobe. Leaf blades elliptic to narrowly elliptic, (2.5–)4.5–13.5 by (1.4–)2–6.5 cm, margins markedly dentate to crenate 29
29a. Leaf margins markedly dentate to crenate; upper surface with mealy branched hairs when young, soon glabrous except along midrib, drying dark brown to black, lower surface drying paler . . . . . **12. C. bicolor**
b. Leaf margins serrate to serrate dentate; upper surface with erect stellate and branched hairs even when mature, drying brownish, lower surface drying a similar colour or slightly paler . . . . . **39. C. pedunculata**
30a. Leaves in opposite pairs, no apparently alternate leaves present; blades very narrowly elliptic, 7.5–11.5 by 1.7–2.3 cm. Shrub to 2 m high . . . . . **1. C. albidotomentella**
b. Leaves often with apparently alternate leaves between opposite pairs, sometimes ternate, petiolate; blades narrowly elliptic, 9.5–17 by 3.5–6.5 cm. Erect tree, 9–15 m by 30 cm . . . . . **38. C. paloensis**

31a. Lower leaf surface with dense plumose hairs, surface obscured **21. C. erioclona**
b. Lower leaf surface with simple or branched or glandular hairs, surface usually still visible 32
32a. Petioles shorter than peduncles 33
b. Petioles the same length as, or longer than the peduncles 36
33a. Calyx c. 3 mm long in bud, with 4 narrowly triangular lobes. Peduncles 22–27 mm long. Leaf blades 16.5–22.5 cm long . . . . . **35. C. mendumiae**
b. Calyx 0.5–1.2 mm long in bud, with 4 shallowly to narrowly triangular lobes. Peduncles 6–21 mm long. Leaf blades 5–20 cm long. 34
34a. Leaf base cordate or oblique-cordate . . . . . **45. C. rubella**
b. Leaf base acute, attenuate, cuneate, obtuse, rounded or truncate 35
35a. Inflorescence typically lax, even at terminal points, few-flowered; peduncle glabrous or with scattered hairs, delicate, much finer than petiole. Leaves typically only with a small amount of hair on the veins below. . . . . **36. C. micrantha**
b. Inflorescence typically congested at terminal points, many-flowered; peduncle almost as thick as petiole, usually with an even covering of hairs. Leaves typically with an even covering of hairs on the venation and surface below . . . . . **39. C. pedunculata**
36a. Inflorescence with branched hairs and yellow sessile glands. Fruit maturing white . . . . . **31. C. longifolia**
b. Inflorescence with branched hairs and/or glandular hairs and red or yellow sessile glands. Fruit maturing purple (unknown for *C. dolichophylla*) 37
37a. Outer surface of calyx conspicuously pale due to dense indumentum of branched hairs, glandular hairs absent. Leaf margins dentate . . . . . **13. C. candicans**
b. Outer surface of calyx not conspicuously pale, but with some branched hairs and/or glandular hairs, sometimes hairs sparse. Leaf margins serrate 38
38a. Stems either with an indumentum of stellately branched hairs, plumose hairs, glandular hairs or a mixture of longer simple and branched hairs, with yellow, orange or red sessile glands. Petioles 3–11 mm long . . . . . **14. C. caudata**
b. Stems with sparse hairs when young, these remaining around the interpetiolar nodes as a ring of hairs, the rest of the stem becoming glabrous, copious sessile red glands present throughout. Petioles 10–25 mm long. . **19. C. dolichophylla**

1. Callicarpa albidotomentella Merr.

Callicarpa albidotomentella Merr., Philipp. J. Sci., C 12 (1917) 300; Enum. Philipp. Fl. Pl. 3 (1923) 382; Moldenke, Phytologia 49 (1981) 476. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 374): *BS (Ramos) 26976* (lecto K; isolecto A), Philippines, Luzon, Abra prov., Mt Posuey [Posooy].

Shrub, to 2 m high. *Stems* pale, indumentum of hairs densely branching from a short central axis obscuring the surface, also with yellow sessile glands. *Leaves* opposite; blades very narrowly elliptic, 7.5–11.5 by 1.7–2.3 cm, margins ± entire or minutely dentate, teeth widely spaced, apex shortly acuminate, base acute, occasionally asymmetric, upper surface with few branched hairs along the impressed midrib only, scattered peltate scales near the base, lower surface pale due to dense indumentum of densely branched

hairs (as stems), not visible to the naked eye; venation raised with fewer hairs, also with scattered peltate scales; petioles 0.3–0.5 cm long. *Inflorescences* axillary, peduncles 12–15 mm long, delicate, lax even in terminal parts, indumentum as stems; bracts linear, 1.5–2 mm long; pedicels 0.5–1 mm long; bracteoles linear, usually inconspicuous, 1–2 mm long. *Calyx* cupular, seen in bud and in fruit only, c. 1.5 mm long in bud, with 4 shallow triangular lobes, outer surface with pale branched hairs except towards the edges, inner surface glabrous. *Corolla*, *stamens*, *stigma* not seen. *Fruit* maturing purple, c. 3 mm wide (on dry specimen, those seen possibly not mature), outer surface glandular, subtended by calyx (1–1.5 mm high); 4 1-seeded pyrenes.

Distribution — Philippines (Luzon, Abra prov.). Known only from the type collection.

Habitat & Ecology — Along small streams in forests (Merrill 1917). Altitude: 120 m.

Note — *Callicarpa albidotomentella* is apparently closely similar to *C. micrantha*, sharing with it a laxly branched delicate inflorescence and similar leaf shape. However, *C. albidotomentella* is immediately recognisable due to its conspicuous pale, thick indumentum on the lower leaf surface, and to a lesser extent on the stems.

2. **Callicarpa angusta** Schauer

Callicarpa angusta Schauer in A.DC., Prodr. 11 (1847) 643; Miq., Fl. Ned. Ind. 2 (1856) 889; Merr., Philipp. J. Sci., C 7 (1912) 341; Philipp. J. Sci., C 12 (1917) 301; Enum. Philipp. Fl. Pl. 3 (1923) 382; Moldenke, Phytologia 13 (1966) 498; Phytologia 14 (1967) 220; Phytologia 20 (1971) 493; Phytologia 22 (1971) 20, 192; Phytologia 33 (1976) 388; Phytologia 49 (1981) 481; Phytologia 50 (1981) 375; Phytologia 50 (1982) 481. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 375): *Cuming 1425* (lecto K; isolecto BM, NY, P), Philippines, Luzon, Albay [Nueva Ecija], 1841.

Callicarpa rivularis Merr., Philipp. J. Sci., C 7 (1912) 340. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 375): *BS (Foxworthy) 660* (lecto NY), Philippines, Palawan, Mt Victoria.

Shrub. *Stems* with dense pale indumentum of highly branched plumose hairs, the surface obscured, some yellow sessile glands visible, slight interpetiolar ridge present. *Leaves*: blades very narrowly elliptic, 5–15 by 0.7–3 cm, margins serrate, apex acuminate, base attenuate, upper surface with midrib and some nerve pairs impressed, the grooves filled with plumose hairs, the remaining lamina with scattered stellate hairs, also with yellow sessile glands, lower surface with a pale indumentum of matted plumose hairs, these difficult to determine with the naked eye, more visible under magnification, the hairs on the venation standing more erect, some yellow sessile glands visible, occasional peltate scales present; petioles 0.3–1.3 cm long, indumentum as stems. *Inflorescences* axillary, lax to more congested in terminal parts, peduncles 3–10 mm long; bracts 2–4 mm long, inconspicuous, upper surface glabrous, lower surface as stems; pedicels 1–2 mm long; bracteoles linear, c. 1 mm long, otherwise as bracts. *Calyx* cupular, 1–1.2 mm long, with 4 lobes marked by thickened tips, outer surface with dense indumentum of interwoven stellate hairs, the surface obscured, this thinning towards the ± glabrous rim, inner surface glabrous. *Corolla* c. 2 mm long, divided into 4 lobes, these 0.75–1 mm long, outer surface with dense indumentum of interwoven plumose and stellate hairs, the surface obscured, inner surface ± glabrous. *Stamens* 4, exserted for c. 1 mm; filaments c. 2.5 mm long, arising from very near the base of the corolla tube; anthers elliptic, 0.3–0.5 mm long. *Stigma* capitate, c. 1 mm wide; ovary

with stellate hairs. *Fruit* seen only when immature, c. 2 mm wide (on dry specimen), outer surface with scattered stellate hairs, glandular, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Philippines (mostly Luzon, Mindoro, Palawan).

Habitat & Ecology — Brushland/openland.

Vernacular name — Dirik-dirik (Negritos) (Merrill 1923).

Note — *Callicarpa angusta* is somewhat similar in indumentum to *C. erioclona*, although the hairs tend to be shorter; it more obviously differs by its narrow leaves, its calyx which is glabrous around the rim, and its corolla which is densely covered in stellate/plumose hairs. It also bears a resemblance to the Indochinese and Thai/Malay peninsula species *C. angustifolia* Ridl., but that species has a larger corolla (3–4 mm), and much larger anthers (c. 2 mm long).

3. Callicarpa angustifolia King & Gamble

Callicarpa angustifolia King & Gamble, Bull. Misc. Inform. Kew (1908) 106; J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 804; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 66; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 19; Ridl., Fl. Malay Penins. 2 (1923); H.R.Fletcher, Bull. Misc. Inform. Kew (1938) 413; Moldenke, Fifth Summary Verbenac. 1 (1971) 294; Phytologia Mem. II (1980) 284; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 301; Leerat. et al., Thai Forest Bull., Bot. 35 (2007) 75. — Lectotype (designated by Leeratiwong et al. 2007): *King's collector 7036* (lecto K), Peninsular Malaysia, Perak.

Shrub, to 3 m. *Stems* becoming woodier and more glabrous as they mature; indumentum dense, hairs with many short branches along their whole length, obscuring the surface, a conspicuous interpetiolar ridge present. *Leaves*: blades very narrowly to narrowly elliptic to ± oblong, 6–16 by 2–4 cm, base shortly attenuate, margins ± entire, rarely shallowly dentate, apex acute to shortly acuminate, upper surface with a mealy indumentum of ± stellate hairs when young, soon becoming glabrous except along the midrib, lower surface appearing white or silver, the surface obscured by a dense indumentum of flattened, interwoven branched hairs, some darkened towards the apices, also with occasional peltate scales on either side of the midrib and around the base; petioles 0.8–2 cm long. *Inflorescences* axillary, peduncles 8–10 mm long, indumentum as stem; bracts linear, 2–3 mm long; pedicels 2–3 mm long; bracteoles linear, c. 1 mm long. *Calyx* cupular, 1.5–2 mm long, with 4 slight lobes marked by thickened ridges, outer surface obscured by a dense indumentum of interwoven branched hairs. *Corolla* pinkish, 3–4 mm long, divided into 4 lobes, lobes 1–1.5 mm long, outer surface obscured by a dense indumentum of branched hairs, inner surface ± glabrous. *Stamens* 4, only the anthers and a small part of the filament exserted, arising c. 0.5 mm from the base of the corolla tube; anthers oblong, c. 2 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular; ovary glabrous. *Fruit* green, maturing black, 2–3 mm wide (on dry specimens), with yellow sessile glands and peltate scales, subtended by calyx; 4 1-seeded pyrenes.

Distribution — NE, S and SE Thailand; in *Malesia*: Peninsular Malaysia (Perak, Kedah including Langkawi, Selangor and Kelantan).

Habitat & Ecology — Limestone; sea-level to c. 350 m.

4. **Callicarpa anisodonta** Bramley

Callicarpa anisodonta Bramley, Kew Bull. 67 (2012) 214. — Type: *Coode 5987* (holo K; iso L 2 sheets, SING 2 sheets), Indonesia, Sulawesi Tengah, Luwuk area, inland from Batui and Seseba on Batui river, at Sinsing camp, S1°09' E122°31'.

Shrub, c. 3 m high. *Stems* with a layer of branched hairs covering the surface, interspersed with longer patent hairs that are branched at the base only. *Leaves* without alternate leaves between opposite pairs; blades narrowly elliptic, 9–21 by 3.5–8.3 cm, margins dentate, apex acuminate, base cuneate to obtuse, upper surface with erect simple hairs with thickened bases, these dense along the impressed midvein, also with scattered peltate scales, lower surface with branched and stellate hairs, sometimes the central hair longer than the lateral branches, yellow sessile glands on the leaf surface, the venation with longer hairs that are branched at the base only; petioles 0.5–1.5 cm long. *Inflorescences* axillary, peduncles c. 0.5 cm long, cymes few-flowered but congested; bracts linear, c. 8 mm long, indumentum as stems, with scattered peltate scales; pedicels to c. 0.5 mm long; bracteoles linear, 4–6 mm long. *Calyx* cupular, 4–4.5 mm long, divided into 5 linear lobes, 3 lobes c. 2 mm long, completely divided, 2 lobes c. 2 mm long but fused for about half their length, outer surface densely covered with longer hairs branched at the base only, surface obscured, lobes with some hairs on inner side but inner surface of tube ± glabrous. *Corolla* c. 5 mm long, divided into (4 or) 5 lobes, these c. 0.5 mm long, outer surface with adpressed branched hairs on the tube, also with yellow sessile glands, inner surface ± glabrous. *Stamens* (4 or) 5; filaments exserted c. 1 mm from corolla; anthers oblong, c. 2.5 mm long, yellow sessile glands on the connective. *Stigma* ± capitate, asymmetric with slightly more tissue on one side. *Fruit* red (*Coode 5987*), c. 3 mm wide (on dry specimen), stellate hairs on the apex, the persistent calyx splitting as the fruit matures; 9–(?10) 1-seeded pyrenes.

Distribution — Apparently endemic to Sulawesi (Luwuk area, Sulawesi Tengah (central), east Peninsula).

Habitat & Ecology — Riverside forest, very steep slopes; growing from near vertical riverbank. Altitude: 70 m.

5. **Callicarpa anomala** (Ridl.) B.L.Burtt

Callicarpa anomala (Ridl.) B.L.Burtt, Notes Roy. Bot. Gard. Edinburgh 29 (1969) 149; Moldenke, Phytologia 50 (1981) 59; Bramley, Bot. J. Linn. Soc. 159 (2009) 422. — *Geunsia anomala* Ridl., Bull. Misc. Inform. Kew (1929) 260. — Type: *Haviland 760* (holo K), Sarawak, 1st division, Penkuelen Ampat.

Small tree, 3–5 m high, 1–3 cm diam.; outer bark cracked, brownish. *Twigs* with patent simple red-brown hairs, 3–6 mm long, and shorter branched hairs when young, glabrescent. *Leaves* occasionally so congested that they appear ternate or quadrate; blades elliptic to ± obovate, 10–22 by 6–13 cm, margins shallowly dentate, apex acuminate, base ± acute, upper surface with simple or branched ± appressed hairs, midrib sunken, with hairs with short branches towards the base, lower surface with branched hairs, also with yellow sessile glands; petioles 1–2 cm long. *Inflorescences* cauliflorous or ramiflorous, individual cymes bifurcating, branching from a central axis 2–8 cm

long, flowers laxly spaced, axis with hairs 3–6 mm long; bracts narrowly ovate, 5–8 by 2–3 mm, especially hairy at the margins; pedicels 1–2 mm long, with hairs 3–6 mm long around base; bracteoles narrowly ovate, 5–6 by 2–3 mm, especially hairy at the margins, also with 3–6 mm long hairs around base. *Calyx* narrowly cupular, 4–5 mm long, divided into 4 triangular lobes, 0.5–1 mm long, outer surface with hairs especially conspicuous at lobe tips, also with numerous yellow sessile glands, inner surface ± glabrous. *Corolla* white, 7–8 mm long, divided into 4 lobes, these c. 2 mm long, outer surface with numerous yellow sessile glands, the edges of the lobes with short papillae, inner surface ± glabrous. *Stamens* 4, anthers exserted for 2–3 mm; filaments only just exserted, 5–6 mm long; anthers oblong, 2–2.5 mm long. *Stigma* capitate, glandular. *Fruit* green, maturing red, 4–5 mm wide (on dry specimen), enclosed in the persistent calyx, the lobes almost closed over the upper surface; 8 1-seeded pyrenes.

Distribution — Endemic to Borneo (Kalimantan Timur and Sarawak (Kuching division)).

Habitat & Ecology — Secondary forest; logged over dipterocarp forest; margin of primary forest. Altitude: 30–120 m.

6. Callicarpa apoensis Elmer

Callicarpa apoensis Elmer, Leafl. Philipp. Bot. 3 (1910) 861; Moldenke, Phytologia 5 (1954) 29; Phytologia 50 (1981) 60; Phytologia 50 (1982) 369. — *Callicarpa pentandra* Roxb. forma *apoensis* (Elmer) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 14. — *Geunsia apoensis* (Elmer) Moldenke, Phytologia 5 (1954) 8. — Lectotype (designated by Bramley, Kew Bull. 68, 2013: 376): *Elmer 11491* (lecto GH; isolecto BM, BO, GH, L, NY, Z), Philippines, Mindanao, Davao dist., Todaya, Mt Apo.

Tree, 13 m high, c. 45 cm diam. *Stems* with branched hairs when young, the hairs appressed, obscuring the surface, stems soon becoming woody; conspicuous interpetiolar ridge present. *Leaves*: blades elliptic, 16–20 by 7.5–9 cm, margins entire, apex very shortly acuminate, base attenuate, upper surface with few branched hairs along the midrib near the base, lower surface appearing paler, with a dense appressed indumentum of pale interwoven hairs obscuring the surface, individual hairs not visible to the naked eye, the venation raised, also with yellow sessile glands; petioles c. 3 cm long, indumentum as stems. *Inflorescences* probably axillary, peduncles 40–70 mm long, indumentum as young stems, laxly branching at first but flowers congested in terminal, densely hairy clusters almost appearing sessile; bracts linear, 2–5 mm long; pedicels difficult to determine; bracteoles linear to very narrowly obovate, 1–3 mm long, fringed by branched hairs and subtending the terminal clusters of flowers when very narrowly ovate. *Calyx* cupular, c. 1 mm long, with 4 shallow triangular lobes, marked by small thickened tips, outer surface with branched hairs, covering but not obscuring surface, also with yellow sessile glands, inner surface glabrous. *Corolla* white, divided into 4 lobes, outer surface with branched hairs on the back of the lobes, also with yellow sessile glands, inner surface glabrous. *Stamens* 4; filaments seen before anthesis only; anthers elliptic, c. 1 mm long, with numerous yellow sessile glands on the connective, dehiscing through longitudinal slits. *Ovary* with dense hairs when young; stigma capitate. *Fruit* reddish when mature, c. 2 mm wide (on dry specimen), with scattered hairs, yellow sessile glands and peltate scales; 4 1-seeded pyrenes.

Distribution — Philippines (Mindanao, apparently endemic to Mt Apo).

Habitat & Ecology — Damp woods. Altitude: 1750 m.

Vernacular names — Layaupan (Bagobos) (Elmer 1910).

Note — Recognised as a form of *C. pentandra* by Bakhuizen (1921), but clearly distinct (Bramley 2013).

7. **Callicarpa arborea** Roxb.

Callicarpa arborea Roxb., Fl. Ind. 1 (1820) 405; C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 567; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 803; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 21; Ridl., Fl. Malay Penins. 2 (1923) 614, f. 128; C.H.Chang, Acta Phytotax. 1 (1951) 282; Moldenke, Fifth Summary Verbenac. 1 (1971) 294; Phytologia Mem. II (1980) 284; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 301; Leerat. et al., Thai Forest Bull., Bot. 35 (2007) 76. — *Premna arborea* (Roxb.) Roth, Nov. Pl. Sp. (1821) 287. — Type: Roxburgh illustration in Icon. Roxb. t. 2033 (K).

Aganon umbellata Raf., Sylva Tellur. (1838) 161. — Type: unknown collector, Anam [Annam] (not located).

[*Callicarpa tectonifolia* Wall., Numer. List (1829) 1827, nom. nud.]

Callicarpa magna Schauer in A.DC., Prodr. 11 (1847) 641; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 386. — *Callicarpa tomentosa* (L.) L. var. *magna* (Schauer) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 22. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 378): *Cuming 1266* (lecto K; isolecto BM, E, K, L, MICH, MO), Philippines, Luzon, prov. Albay [Cagayan].

Callicarpa arborea Roxb. var. *villosa* King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 803. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 378): *Scortechini s.n.* (lecto K; isolecto CAL), Peninsular Malaysia, Perak.

Callicarpa villosissima Ridl., J. Fed. Malay States Mus. 10 (1920) 110. — Lectotype (designated by Leeratiwong et al., Thai Forest Bull., Bot. 35 (2007) 76): *C.B. Kloss 6851* (lecto K; isolecto SING), Thailand, Surat Thani.

Callicarpa tomentosa auct. non (L.) L.: H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 20.

Shrub or tree, to 6 m high. *Stems* with a dense indumentum of plumose hairs, obscuring the surface, becoming woodier and more glabrous as they mature; interpetiolar ridge present. *Leaves*: blades ovate to narrowly ovate, elliptic or obovate, 12–25 by 5–14 cm, margins ± entire, rarely shallowly dentate, apex acuminate, base shortly attenuate, upper surface with a mealy indumentum of ± stellate hairs when young, soon becoming glabrous except for along the sunken midrib and secondary nerve pairs, also with yellow sessile glands, lower surface appearing pale, the surface occasionally scarcely visible or ± obscured by a dense indumentum of interwoven branched hairs, the hairs more densely branched along the thick and conspicuously raised midrib, also with occasional peltate scales on either side of the midrib; petioles 2.5–6.5 cm long, indumentum as stems. *Inflorescences* axillary, large, up to 12 cm across, flowers congested in terminal parts of inflorescence, peduncles 3–7 cm long, indumentum as stem; bracts very narrowly ovate, 3–6 mm long, glabrous above, indumentum as stems below; pedicels c. 1 mm long, indumentum as stems; bracteoles very narrowly ovate, 1–3 mm long, indumentum as bracts. *Calyx* cupular, c. 1 mm long, with 4 slight lobes marked by thickened ridges, outer surface with branched hairs, these either so dense and the surface obscured, or only scattered and the surface clearly visible. *Corolla* purple,

3–4 mm long, divided into 4 rounded lobes, these 1–1.5 mm long, usually reflexed, the edges fringed with papillae, outer surface glabrous, rarely with scattered branched hairs, glandular, inner surface ± glabrous. *Stamens* 4; filaments 4–6 mm long, exserted 2–3 mm; anthers elliptic, 1–1.5 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular; ovary with branched hairs when immature. *Fruit* purple when mature, 2.5–3 mm wide (on dry specimen), glabrous, with yellow sessile glands, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Pakistan, Nepal, Bhutan, India, Sri Lanka, Bangladesh, Myanmar, China, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Malay Peninsular, Sumatra, Philippines, New Guinea.

Habitat & Ecology — In open lowland or hill forests or disturbed areas. Altitude: sea-level to 1800 m.

Vernacular names — Philippines: Atimla, Magilig (Tagalog) (Merrill 1923 under *C. magna*).

Notes — 1. Close to *C. tomentosa* (L.) L., a species described from Sri Lanka, the range of which extends to India. Confusion between these two species exists because Lam & Bakhuizen van den Brink (1921) used the name *C. tomentosa* to refer to what is actually *C. arborea*. However, *C. arborea* can be distinguished by its peduncles, which are generally longer than the petioles (in *C. tomentosa* peduncles are shorter than petioles) and by its indumentum which, although variable, tends to be shorter and less woolly than that of *C. tomentosa*.

2. The calyx indumentum in *C. arborea* varies: specimens from mainland Asia and Sumatra tend to have calyces with dense hair covering the outer surface, but those originally described as *C. magna* from the Philippines tend to have more or less glabrous calyces. They agree in all other characters.

8. Callicarpa argentii Bramley

Callicarpa argentii Bramley, Bot. J. Linn. Soc. 159 (2009) 424. — Type: *Argent 94104* (holo K; iso A, BO, E, L), Indonesia, Kalimantan, Central Kalimantan (Kalimantan Tengah), Kec. Kapuas Hulu, Kab. Kapuas, Gunung Meranti concession, S0°43' E113°56'.

Small tree, 3–10 m high, 3–6 cm diam. *Twigs* with patent red-brown hairs, 3–10 mm long, branched at base only, also with red or yellow sessile glands. *Leaves*: blades elliptic to obovate, 10–30 by 7–13.5 cm, margins dentate, apex acute to acuminate, base slightly asymmetric, ± attenuate, upper surface with simple ± appressed hairs and scattered red or yellow sessile glands, lower surface with simple and branched hairs, the simple hairs longer, also with red or yellow sessile glands, often appearing multicellular; petioles 1–3 cm long. *Inflorescences* cauliflorous or ramiflorous, appearing sessile, with dense hairs at the base; bracts obscured by hairs surrounding inflorescence base, linear, to 4 mm long, with short hairs; pedicels to 1(–4) mm long; bracteoles linear, as bracts. *Calyx* narrowly cupular, 5–6 mm long, divided into 4 triangular lobes, c. 1 mm long, outer surface glabrous but with hairs up to 4 mm long especially conspicuous towards lobe tips, also with numerous red or yellow sessile glands and peltate scales, inner surface ± glabrous. *Corolla* white, c. 6 mm long, divided into 4 lobes, these c. 3 mm long, outer surface with numerous red or yellow sessile glands, the edges of the lobes with

short papillae, inner surface ± glabrous. *Stamens* 4, exserted c. 2 mm; filaments 4–5 mm long; anthers oblong, 2–2.5 mm long. *Stigma* capitate, glandular. *Fruit* green, maturing red, c. 4 mm wide (on dry specimen), covered with sessile glands, semi-enclosed by the calyx; 8 1-seeded pyrenes.

Distribution — Borneo (apparently endemic to Kalimantan Tengah).

Habitat & Ecology — Primary dipterocarp forest, sometimes disturbed. Altitude: 150–400 m.

9. Callicarpa badipilosa S.Atkins

Callicarpa badipilosa S.Atkins, Kew Bull. 52 (1997) 228; Bramley, Bot. J. Linn. Soc. 159 (2009) 426. — Type: *J. Dransfield, S. Dransfield, Prance, Joffre, Jang Ibrahim, Han & Niga JD 7172* (holo K; iso K, BRUN), Brunei, Temburong district, Bukit Belalong.

Climber or vine. *Stems* with a rust-brown coloured indumentum of simple short erect hairs and longer hairs, c. 2–3 mm, with thickened bases. *Leaves*: blades narrowly ovate, 10–18 by 5–7.5 cm, margins shallowly dentate, apex acuminate, base rounded to ± cordate, upper surface with erect brown hairs with thickened bases, also with yellow sessile glands, lower surface with brown hairs with thickened bases and some shorter colourless hairs, the hairs more dense on the raised venation, also with yellow sessile glands and occasional peltate scales; petioles 0.5–1 cm long. *Inflorescences* axillary, peduncles (seen in fruit only) 4–7.5 cm long; bracts linear, 3–4 mm long, with brown hairs; pedicels (fruiting) 3–5 mm long; bracteoles linear, 1–3 mm long, with brown hairs. *Calyx* seen only in fruit, with brown hairs, flattening to subtending fruit. *Corolla* not seen, reported as being white (*G.T.Prance 30558*, K). *Stamens* and *stigma* not seen. *Fruit* maturing red, 5–6 mm wide when dry, outer surface with yellow sessile glands, subtended by the calyx; 8 1-seeded pyrenes.

Distribution — Borneo (apparently endemic to Brunei, Temburong area).

Habitat & Ecology — Hill dipterocarp forest, lower montane forest. Altitude: 850–900 m.

10. Callicarpa barbata Ridl.

Callicarpa barbata Ridl., Bull. Misc. Inform. Kew (1929) 260; Bramley, Bot. J. Linn. Soc. 159 (2009) 427. — Type: *Haviland 3043* (holo K), Sarawak, Rejang, Kapit.

Callicarpa borneensis Moldenke, Phytologia 4 (1953) 285. — Type: *Endert 3723* (holo BO; iso K, L), Central East Borneo (Kalimantan Timur), W Koetai (Kutai), near the Kemoel.

Small tree, 3–8 m high, 3–6 cm diam.; outer bark smooth, brownish. *Twigs* with a dense red-brown indumentum of branched hairs, some shorter with many branches and some longer hairs with short branches near the apex only, becoming less pubescent and more woody with age. *Leaves*: blades ± obovate, 33–52 by 14–32 cm, margins shallowly dentate, ciliate with branched hairs, apex acuminate, base decurrent, upper surface with simple or branched, ± appressed hairs with thickened bases, the midrib sunken and with dense branched hairs especially towards the leaf base, also with yellow sessile glands, lower surface with short hairs with many branches and longer hairs that have short branches near the apex, the hairs especially dense on the midrib and raised

venation, also with yellow sessile glands; petiole 1–3 cm long (leaf often decurrent to stem). *Inflorescences* cauliflorous or ramiflorous, individual cymes either congested on a short woody axis, or sometimes axis longer and inflorescence more lax, axis 1–17 cm long; bracts linear, c. 3 mm long; pedicels up to 2 cm long; bracteoles linear, 1–2 mm long. *Calyx* cupular, 2–3 mm long in flower, with 5 shallow lobes marked by slight tips, outer surface with branched hairs, inner surface glabrous. *Corolla* white, seen only in bud, 6–7 mm long, divided into 5 lobes, these c. 2 mm long, outer surface with short papillae/hairs, inner surface not seen. *Stamens* 5, seen in bud only; filaments c. 3 mm long; anthers oblong, 3–4 mm long. *Stigma* capitate, glandular. *Fruit* green, maturing red, 5–7 mm wide (on dry specimen), outer surface glandular; 4 1-seeded locules.

Distribution — Endemic to Borneo (possibly found in Kalimantan Timur, based on unclearly annotated old collection) and Sarawak (Kapit Division).

Habitat & Ecology — Disturbed forest, mixed dipterocarp forest, on slopes, sandy-clay loam/clay rich alluvium. Altitude: 160–1100 m.

11. *Callicarpa basilanensis* Merr.

Callicarpa basilanensis Merr., Philipp. J. Sci., C 3 (1908) 263; Enum. Philipp. Fl. Pl. 3 (1923) 382; Moldenke, Phytologia 14 (1966) 44; Phytologia 21 (1971) 330; Phytologia 40 (1978) 431; Phytologia 49 (1981) 474; Phytologia 50 (1981) 52, 144; Phytologia 50 (1982) 257, 371, 470. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 378): *FB (Hutchinson) 6124* (lecto NY; isolecto K, US), Philippines, Basilan.

Small tree, to 6 m high, to 8 cm diam. *Stems* when young with a dense indumentum of branched hairs, ± obscuring the surface, thinning as the stems become woodier. *Leaves*: blades narrowly ovate to elliptic, 12.5–26 by 5–10.5 cm, margins entire to shallowly dentate, apex shortly acuminate, base rounded to ± attenuate, occasionally slightly asymmetric, upper surface with erect simple hairs, more dense on the young leaves and in older leaves along the sunken midrib and secondary nerve pairs, lower surface with erect hairs branched towards the apex, more dense along the midrib and venation, copious yellow sessile glands visible on the surface; petioles 1.5–2.5 cm long, indumentum as young stems. *Inflorescences* on the stems where the leaves have fallen, several pedunculate cymes arising from each former leaf axil, usually laxly branched, occasionally congested on a thicker, woody peduncle; axes with branched hairs; bracts linear, c. 1 mm long; pedicels c. 1 mm long, the lower parts with branched hairs but becoming glabrous towards the calyx; bracteoles linear, c. 1 mm long or less. *Calyx* narrowly cupular, c. 3 mm long, with 4 lobes marked by tiny tips, outer surface glabrous or with some hairs leading up to the lobe tips, also with peltate scales, inner surface glabrous. *Corolla* c. 6 mm long in bud, divided into 4 oblong lobes, these c. 2.5 mm long, outer and inner surfaces glabrous. *Stamens* 4; filaments seen only in bud, at this stage c. 1.5 mm long; anthers oblong, c. 3 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular; ovary with yellow sessile glands. *Fruit* up to 5 mm wide (when dry), the centre somewhat sunken, glabrous, with yellow sessile glands, enclosed by the calyx up to about half its height; 8 1-seeded pyrenes.

Distribution — Endemic to the Philippines (Basilan Island, Mindanao (Zamboanga Peninsula)).

Habitat & Ecology — Edge of high montane forest. Altitude: 2145 m (*L.Co 3756*).
Vernacular names — Limayup; Linagop (Merrill 1923); Solonano 'tabag'.

12. **Callicarpa bicolor** Juss.

Callicarpa bicolor Juss., Ann. Mus. Natl. Hist. Nat. 7 (1806) 77; Moldenke, Phytologia 4 (1952) 123; Phytologia 13 (1966) 499; Phytologia 14 (1966) 36, 109, 179, 220; Phytologia 16 (1968) 360; Phytologia 20 (1971) 495; Phytologia 21 (1971) 36, 330; Phytologia 22 (1971) 19, 193; Phytologia 33 (1976) 393; Phytologia 50 (1982) 492. — Type: *Commerson s.n.* (holo P-JU, scanned image seen), New Britain, Port Praslin.

Callicarpa bicolor Juss. var. *subintegrifolia* Moldenke, Phytologia 14 (1967) 399. — Type: *BS (Ramos) 39880* (holo US), Philippines, Luzon, Laguna, Pangil.

Callicarpa bicolor Juss. var. *bermejosi* Moldenke, Phytologia 15 (1967) 17. — Type: *BS (Bermejos) 1534* (holo US; iso NY), Philippines, Mindoro, Bulalacao.

Callicarpa cana auct. non L.: Merr., Enum. Philipp. Fl. Pl. 3 (1923) 382.

Shrub, 1–4 m high. *Stems* with an indumentum of appressed, short, densely branched hairs, the surface ± obscured, becoming woodier and ± glabrous as they mature, a slight to conspicuous interpetiolar ridge present. *Leaves*: blades elliptic to narrowly elliptic, (5–)6.5–13 by 2.2–6.5 cm, margins markedly dentate to crenate, when dentate the teeth with mucronate tips, apex shortly acuminate, base attenuate, upper surface with a mealy indumentum of branched hairs when young, soon becoming glabrous except for along the sunken midrib, with occasional peltate scales near the base, drying dark brown to black, lower surface paler, drying greyish yellow to yellow-brown, hairs not obvious to the naked eye, tiny appressed branched hairs becoming apparent when viewed under magnification, the venation raised, also with yellow sessile glands and scattered peltate scales; petioles 0.8–1.4 cm long, indumentum as stems, often drying with wrinkled ridges. *Inflorescences* axillary, generally lax, peduncles 5–10 mm long, indumentum as stems; bracts linear, up to 1–1.5 mm long, inconspicuous; pedicels 1–1.5 mm long, indumentum as stems; bracteoles as bracts. *Calyx* narrowly cupular, c. 1 mm long, apically subtruncate to slightly lobed, the 4 shallow lobes marked with thickened tips, outer surface pale due to indumentum of appressed branched hairs, the rim often glabrous, inner surface ± glabrous. *Corolla* purple, c. 3 mm long, divided into 4 lobes, these c. 1 mm long, outer surface with a few branched hairs and yellow sessile glands present only on each lobe, inner surface ± glabrous. *Stamens* 4, exserted for 3–4 mm; filaments 5–6 mm long; anthers elliptic, c. 1 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* green, maturing purple, c. 2 mm wide when mature (on dry specimen), outer surface glandular, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Philippines, northern Sulawesi, Palau, Papua New Guinea, New Britain.

Habitat & Ecology — Often in open areas, thickets or disturbed areas; often recorded on limestone; found on coral beaches and rocks, and open sea shore habitat on the islands off the coast of New Guinea, around New Britain.

Note — *Callicarpa bicolor* was described by Jussieu based on a Commerson collection from the island of New Britain. The name was upheld by Schauer, in his account of *Callicarpa* in De Candolle's Prodromus, but sometime after it became linked to *C. candicans* (Burm.f.) Hochr. (or *C. cana* L.), and treated as a synonym by most. The

typical *C. candicans*, found in India, Indo-China, Peninsular Malaysia, Sumatra, Borneo (rare), Java, the Moluccas and Australia is easy to distinguish from the other species in the genus due to its dentate, discolorous leaf, the lower surface of which is covered with more or less stellately branched hairs, and an almost tomentose calyx. *Callicarpa bicolor*, present in the Philippines, northern Sulawesi, Palau, New Guinea and New Britain, has discolorous leaves, but the lower leaf surface has branched hairs that form a layer appressed to the surface, so that it is not easy to see the individual hairs unless viewed under magnification. When dry, the hairs take on a more yellowish hue than those of *C. candicans*, which tend to be greyish white. Leaf margins vary from markedly dentate forms, as in *C. candicans*, to crenate. The calyx has similar indumentum to the lower leaf surface, having only appressed hairs and not appearing tomentose as in *C. candicans*.

13. Callicarpa candicans (Burm.f.) Hochr.

Callicarpa candicans (Burm.f.) Hochr., Candollea 5 (1934) 190. — *Urtica candicans* Burm.f., Fl. Ind. (1768) 197. — Type: unknown collector (holo G), Indonesia, Java.
Callicarpa cana L., Mant. Pl. Altera (1771) 198. — Neotype (designated by Bramley, Bot. J. Linn. Soc. 159 (2009) 429): *Linnean herbarium specimen 136.3* (neo LINN), East Indies.
Callicarpa tomentosa Lam., Encycl. 1 (1785) 562, nom. illeg., superfl. — Type: not indicated.
Callicarpa adenanthera R.Br., Prodr. (1810) 513. — Type: *R. Brown s.n.* (holo K), Australia, Queensland.
Callicarpa sumatrana Miq., Fl. Ned. Ind. 2 (1858) 888. — Type: *Teysmann HB 1159* (holo U, scanned image seen), Sumatra, Padang.
?*Callicarpa macrocarpa* Raeusch., Nomencl. Bot. (1797) 37. — Type: not located, India.
?*Callicarpa heynii* Roth, Nov. Pl. Sp. (1821) 82. — Type: *Heyne s.n.* (holo B†), India Orientalis.
?*Callicarpa sinensis* Steud., Nomencl. Bot., ed. 2, 1 (1840) 257. — Type: not located.
Callicarpa pedunculata auct. non R.Br.: King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 807.

Shrub, 1–4 m high. *Stems* with a mealy indumentum of closely packed branched hairs, the surface ± obscured, becoming woodier and ± glabrous as they mature, a slight interpetiolar ridge present. *Leaves*: blades elliptic to narrowly ovate, 7–15 by 2.5–10 cm, margins dentate, sometimes the teeth with mucronate tips, apex acuminate, base shortly attenuate, upper surface with a mealy indumentum of branched hairs when young, soon becoming glabrous except for along the sunken midrib, with occasional peltate scales near the base, lower surface with an indumentum of dense interwoven branched hairs but lamina not obscured, also with yellow sessile glands and scattered peltate scales; petioles 0.6–1.5 cm long, indumentum as stems. *Inflorescences* axillary, peduncles 5–15 mm long, indumentum as stem; bracts linear, to 3 mm long; pedicels c. 0.5 mm long, indumentum as stems; bracteoles linear, up to 1 mm long, inconspicuous. *Calyx* cupular, c. 1 mm long with 4 shallow lobes marked with thickened tips, outer surface conspicuously pale and obscured due to dense indumentum of branched hairs, inner surface ± glabrous. *Corolla* purple, c. 3 mm long, divided into 4 lobes, these c. 1 mm long, outer surface glabrous apart from a patch of branched hairs on each lobe, inner surface ± glabrous. *Stamens* 4, exserted for 1–2 mm; filaments 4–5 mm long; anthers elliptic, c. 0.5 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit*

green, maturing purple then black, c. 2 mm wide when mature (on dry specimen), outer surface glandular, glabrous, subtended by calyx; 4 1-seeded pyrenes.

Distribution — China, Indo-China; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo (Kalimantan, Sabah, rare), Java, Moluccas; ?Australia.

Habitat & Ecology — Along streams and in evergreen and dry evergreen forests and in the open secondary, dry evergreen, and mixed deciduous forest.

Note — As stated by Ridley (Fl. Malay Penins. 2 (1923) 617), *Callicarpa pedunculata* in King & Gamble (1908) from Penang (*Wallich Cat. 1834.2*) is a misidentified *C. candicans*. *Callicarpa candicans* is often misidentified as *C. bicolor* (see notes under that species).

14. **Callicarpa caudata** Maxim.

Callicarpa caudata Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 31 (1887) 76; Merr., Philipp. J. Sci. 1 (1907) 299; Merr. & Merritt, Philipp. J. Sci., C 5, 5 (1910) 381; Elmer, Leafl. Philipp. Bot. 3 (1910) 862; W.H.Br., Minor Prod. Philipp. For. 3 (1921) 229; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 383; Moldenke, Phytologia 3 (1948) 464; Phytologia 4 (1952) 123; Phytologia 13 (1966) 433; Phytologia 14 (1967) 140, 228; Phytologia 16 (1968) 363; Phytologia 21 (1971) 33, 233, 332, 382; Phytologia 22 (1971) 15, 195; Phytologia 33 (1976) 399; Phytologia 40 (1978) 432; Phytologia 50 (1982) 476. — Type: *Cuming 1095* (holo LE; iso K 2 sheets, NY), Philippines, Luzon, Albay [?Zambales].

Callicarpa stenophylla Merr. in Merr. & Merritt, Philipp. J. Sci., C 5, 5 (1910) 380. — Lectotype (designated in Bramley, Kew Bull. 68 (2013) 381): *M. Ramos 5739* (lecto K), Philippines, Luzon, Benguet.

Callicarpa merrillii Moldenke, Bull. Torrey Bot. Club 60 (1932) 55. — *Callicarpa lancifolia* Merr., Philipp. J. Sci., C 10 (1915) 70, nom. illeg. — Type: *BS (Ramos) 11078* (holo PNH†), Philippines, Cebu. — Neotype (designated by Bramley, Kew Bull. 68 (2013) 381): *R.S. Williams 2307* (lecto NY; isolecto A, K, US), Philippines, Mindanao, Zamboanga, Sax river, N7°00' E121°55'.

Shrub, to 6 m high. *Stems* 1–5 cm diam., either with an indumentum of stellately branched hairs, often with short glandular hairs forming a layer close to the surface, these often surrounded by a mixture of longer simple and branched hairs (with multiple longish branches at every cell division), also with yellow, orange or red sessile glands, or with a dense covering of plumose hairs, the stem surface obscured, in all cases becoming woodier and ± glabrous as they mature, a slight interpetiolar ridge present. *Leaves* very narrowly to narrowly elliptic or very narrowly to narrowly ovate, 7–17 by 1.5–4.5(–6) cm, margins serrate, the teeth with mucronate tips, apex long acuminate to caudate, base obtuse to truncate, upper surface with erect simple hairs with thickened bases, usually intermingled with glandular hairs of various lengths, the midrib sunken and filled with hairs, lower surface with a sparse to dense covering of branched hairs, the lamina visible to partly obscured with yellow, orange or red sessile glands usually visible on the surface; petioles 0.3–1.1 cm long, indumentum as stems, although the glandular hairs longer and more visible. *Inflorescences* axillary, generally lax, peduncles 5–12(–20) mm long, indumentum as stem; bracts linear, 2–5 mm long, with simple and glandular hairs, yellow sessile glands; pedicels c. 1 mm long, with glandular and simple hairs; bracteoles linear, 1–2 mm long, as bracts. *Calyx* cupular, c. 1 mm long, with 4 shallow lobes marked with thickened tips, outer surface with some branched hairs and glandular hairs, to having a dense indumentum of branched and glandular

hairs, inner surface ± glabrous. *Corolla* purple, c. 3 mm long, divided into 4 lobes, these c. 1 mm long, outer surface glabrous apart from a patch of branched hairs on each lobe, inner surface ± glabrous. *Stamens* 4, exserted for 1–2 mm; filaments 4–5 mm long; anthers elliptic, c. 0.5 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* green, maturing purple, c. 2 mm wide when mature (on dry specimen), outer surface glandular, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Australia; in *Malesia*: Philippines, Moluccas (Ambon), New Guinea.

Habitat & Ecology — Secondary forest, forest understorey, disturbed areas and grasslands. Altitude: up to 2000 m.

Vernacular names — Philippines: Amgup, Anayup (Benguet district); Haraihai (Palaui island) (Merrill 1923).

Uses — Brown (1921) reports for the Philippines that a decoction from the fresh or dried leaves is used as a cure for stomach trouble.

Notes — 1. Variable morphologically, especially in its indumentum, and the size and shape of the leaves. Indumentum follows a gradient from a sparse, even covering of hairs, to a dense covering of hairs that obscures the underlying leaf or stem surface. Most often this indumentum consists of simple hairs, especially on the leaf upper surface, mixed with branched hairs, which range from a stellate to plumose structure, and gland-tipped hairs. On the stems, the gland-tipped hairs often form a short layer under the branched hairs, but on the leaves, they are erect and often longer than the branched or simple hairs. Sessile glands can be yellow, orange or red. There are a few examples of specimens with copious red sessile glands (e.g., *BS (Ramos & Edaño) 38850* (A, US)). There does not seem to be any strong geographical patterning associated with this variation.

2. Lam & Bakhuizen van den Brink (Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 23) treated *C. caudata* as a synonym of *C. cuspidata* Roxb., along with *C. rubella* Lindl. *Callicarpa cuspidata* was described by Roxburgh (Fl. Ind. 1 (1820) 409) as a native of the Moluccas. He makes special note of its woolly indumentum and acutely dentate leaves ending in 'a long taper, acute point'. Although this description matches those of *C. rubella* or *C. caudata* in part, it is too vague to be certain, and there is no illustration to accompany it. Munir (J. Adelaide Bot. Gard. 6 (1982) 31) lists *C. cuspidata* as a synonym of *C. pedunculata*, citing an unnumbered Heyne collection as its type, although he did not see the specimen and is unsure of its location. Given this uncertainty, I cannot be sure to what this name applies, so *C. cuspidata* is listed under doubtful names here.

3. *Callicarpa caudata* is most similar to *C. rubella*, but its indumentum and leaf base set it apart: unlike *C. rubella* it usually has glandular hairs, and its leaf base is obtuse to truncate rather than cordate.

4. *Callicarpa superposita* Merr., apparently endemic to Borneo, is also allied to this group (e.g., Bramley, Bot. J. Linn. Soc. 159 (2009) 416), but it lacks branched hairs in its indumentum, which is also less dense than is typical for *C. caudata*.

15. Callicarpa cinnamomea (Hallier f.) Govaerts

Callicarpa cinnamomea (Hallier f.) Govaerts, World Checkl. Seed Pl. 3, 1 (1999) 12. — *Geunsia cinnamomea* Hallier f., Meded. Rijks-Herb. 37 (1918) 30. — Lectotype (designated here): *Elbert 3461* (lecto L; isolecto K, NY, SING), Indonesia, Sulawesi, Kabaena island, Mt Sangiawita.

Tree, 5–10 m high, 2.5–15 cm diam. (only recorded once). *Young branches*/twigs with a dense indumentum of brown plumose hairs. *Leaves* often with apparently alternate leaves between opposite pairs; blades narrowly elliptic to narrowly ovate, 8–16 by 3.5–6.7 cm, margins ± entire to shallowly dentate, apex acuminate, base obtuse to rounded, rarely asymmetric, upper surface farinose, with branched hairs, these present especially when young, when mature only remaining in the impressed midrib, lower surface with venation raised, venation and lamina covered with short plumose hairs, lamina surface not completely obscured, yellow sessile glands visible; petioles 1.4–4 cm long, indumentum as twigs, drying wrinkled. *Inflorescences* axillary, peduncles 25–30 mm long, indumentum in all parts as stems; bracts conspicuous, linear, 10–15 mm long; pedicels 1–3 mm long; bracteoles conspicuous, linear, 2–10 mm long. *Calyx* cupular to tubular, c. 3 mm long, ridged, with 5 triangular lobes, outer surface densely covered with ± plumose hairs, the surface obscured, also with yellow sessile glands and occasional peltate scales around the rim, inner surface ± glabrous. *Corolla* purple, 5–6 mm long, divided into 5 lobes, these 1–2 mm long, outer surface with or without some adpressed hairs, down the centre of each lobe, also with yellow sessile glands, inner surface ± glabrous or papillose, especially on the lobes. *Stamens* 5, exserted for 2–4 mm; filaments purple, 5–6 mm long; anthers oblong, c. 2 mm long. *Stigma* capitate, divided into 5 small lobes, surface glandular. *Fruit* 3–3.5 mm wide (on dry specimen), outer surface glandular, almost completely to completely enclosed by the calyx, calyx up to 2 mm longer than fruit; 5 1-seeded pyrenes.

Distribution — South-east Sulawesi, including Pulau Kabaena.

Habitat & Ecology — Primary forest, riverside or mixed habitat with grasslands and short forest; ultramafic soil recorded on one specimen label. Altitude: 40–700 m.

Notes — 1. Close to *C. pentandra* but differing in the ridged calyx, which is generally longer and more accrescent in fruit, enclosing and sometimes overtopping the fruit for up to 2 mm. In addition, fruits have apparently five rather than ten 1-seeded pyrenes.

2. *Elbert 3461* has been selected over the other syntypes designated by Hallier following Moldenke (Phytologia 50 (1981) 64), who notes that the other syntypes have been regarded as *G. farinosa* (= *C. pentandra*).

16. **Callicarpa clemensorum** Moldenke

Callicarpa clemensorum Moldenke, Phytologia 5 (1954) 7; Bramley, Bot. J. Linn. Soc. 159 (2009) 429. — Type: *Clemens & Clemens 34036* (holo BO; iso K, L), Malaysia, Sabah, Penataran river basin.

Shrub or tree, 1.5–3 m high, to 7 cm diam. *Twigs* with an indumentum of many-branched densely matted hairs, with scattered warty growths 2–3 mm long protruding, also with yellow sessile glands. *Leaves*: blades elliptic to narrowly ovate, thick and leathery, 11–17 by 5–9 cm, margins dentate, the teeth with thickened apices, apex acute, base obtuse to almost truncate, sometimes slightly asymmetric, when young both surfaces densely covered with branched hairs, when more mature upper surface ± glabrous except where midrib and lateral nerve pairs sunken, these areas with some branched hairs, with peltate scales around the midrib and base, lower surface variable, with a dense indumentum of branched hairs on the lamina and the venation, this either appearing matted or longer and more woolly, the lamina surface below vesicu-

lose and with many yellow sessile glands, also with scattered peltate scales; petioles (1.5–)3–5.5 cm long, indumentum as young twigs. *Inflorescences* axillary, sometimes with two per axil, peduncles 25–35 mm long, indumentum as young twigs, individual cymes congested, globose to almost globose; bracts very narrowly ovate, 5–10 mm long, with branched hairs; pedicels 0.5–1 mm long, not easily visible due to congested inflorescence; bracteoles 3–5 mm long, with branched hairs. *Calyx* funnel-shaped, can appear rather rigid, 2–4 mm long, with 4 triangular lobes, 0.5–1 mm long, outer surface densely covered with interwoven branched hairs, also with occasional yellow sessile glands, inner surface ± glabrous. *Corolla* white or green, 4–5 mm long, divided into 4 lobes, these c. 1.5 mm long, outer surface glabrous except for hairs along the lobe margins, also with yellow sessile glands on the lobes, inner surface ± glabrous. *Stamens* 4, exserted for c. 3 mm; filaments c. 4 mm; anthers oblong, c. 2 mm long. *Stigma* capitate, surface glandular. *Fruit* green, maturing blue to purple, 2–4 mm wide (on dry specimen), slight depression near apex, outer surface glandular, the calyx growing to surround it; 8 1-seeded pyrenes.

Distribution — Borneo, Sabah (apparently endemic to Mt Tambuyukon and the area surrounding Kinabalu peak).

Habitat & Ecology — Ultrabasic; upper montane forest and primary forest under shade. Altitude: 2500 m, recorded once.

Note — As noted under *C. kinabaluensis*, this species and the former are endemic to the Kinabalu area. Although they share an interesting inflorescence structure, in which the peduncles are distinct and individual cymes are almost globose and, in addition, stems with odd warty outgrowths and often vesiculose lower leaf surfaces, *C. clemensorum* has a shorter, paler and more matted indumentum, and the calyx and corolla are smaller.

17. **Callicarpa coriacea** Bramley

Callicarpa coriacea Bramley, Bot. J. Linn. Soc. 159 (2009) 430. — Type: *SAN (Sugau) 134293* (holo K; iso A, BO, L, SAN, SING), Malaysia, Sabah, Kinabatangan, summit of Bukit Tawai.

Shrub, 3 m tall (recorded once). *Twigs* markedly quadrangular, with an indumentum of adpressed, upward pointing, simple hairs, becoming woody and more glabrous as they mature. *Leaves*: blades ± elliptic, 9.5–21 by 5.5–12 cm, thick and leathery, margins dentate, the teeth with thickened apices, apex shortly acuminate, base obtuse, upper surface ± glabrous except where midrib and lateral nerve pairs sunken, these areas with simple hairs, also with peltate scales clustered along and around the base of the midrib, lower surface with adpressed simple hairs on the venation, especially on the raised midrib and secondary nerve pairs, also with many yellow sessile glands; petioles 2–3.5 cm long, indumentum as young twigs. *Inflorescences* axillary, sessile; bracts linear, 4–5 mm long, with simple hairs; pedicels 1–2 mm long; bracteoles as bracts. *Calyx* narrowly cupular, c. 6 mm long, with 4 triangular lobes, c. 1 mm long, outer surface densely covered with appressed simple hairs, also with yellow sessile glands and occasional peltate scales, inner surface ± glabrous. *Corolla* white, 6.5–7 mm long, divided into 4 lobes, these c. 2 mm long, outer surface glabrous except for simple hairs, the upper part of the tube and the lobes with yellow sessile glands, inner

surface ± glabrous. *Stamens* 4, the anthers exserted; filaments c. 6 mm long; anthers oblong, c. 3 mm long. *Stigma* capitate, surface glandular. *Fruit* seen when immature only, c. 4 mm wide, enclosed in calyx.

Distribution — Borneo, endemic to Sabah (known only from three collections: Telupid dist.: Bukit Tawai; Beluran dist.: Ulu Tungud forest reserve and Mt Meliau).

Habitat & Ecology — Hill forest.

18. Callicarpa denticulata Merr.

Callicarpa denticulata Merr., Philipp. J. Sci., C 3 (1908) 430; Enum. Philipp. Fl. Pl. 3 (1923) 383; Moldenke, Phytologia 14 (1967) 156; Phytologia 16 (1968) 363; Phytologia 50 (1982) 478. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 384): *BS (Fenix) 3622* (lecto K), Philippines, Batan, Santo Domingo de Basco.

Shrub, 2–3 m high. *Stems* with a mealy indumentum of tiny branched hairs when young, the indumentum thinning as stems mature, stems becoming woody, lenticellate, a slight interpetiolar ridge present. *Leaves*: blades elliptic to obovate, 13–17 by 8.5–11 cm, margins crenate-serrate in the upper half, more or less entire in the lower half, apex shortly acuminate, base rounded to almost cordate, upper surface with fine covering of branched hairs when young, soon becoming glabrous, lower surface evenly covered with a sparse indumentum of branched hairs, the lamina surface clearly visible, also with yellow sessile glands throughout, with peltate scales scattered near the midrib; petioles 1.5–1.9 cm long, indumentum as young stems. *Inflorescences* axillary, confined to the upper axils, peduncles 20–25 mm long, indumentum as young stems; bracts linear, 1–3 mm long, inconspicuous; pedicels 1–2 mm long, indumentum as young stems; bracteoles as bracts. *Calyx* cupular, 1–1.5 mm long, with 4 shallow to narrowly triangular lobes marked with thickened tips, outer surface with stellate and branched hairs, the surface still visible, also with yellow sessile glands, inner surface ± glabrous. *Corolla* purplish, c. 3 mm long, divided into 4 lobes, these c. 1 mm long, the edges with tiny papillae, outer surface glabrous, rarely with a few stellate hairs on the lobes, also with yellow sessile glands, inner surface ± glabrous. *Stamens* 4, exserted for c. 2 mm; filaments c. 5 mm long; anthers elliptic, c. 0.5 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* c. 2 mm wide when mature (on dry specimen), outer surface glandular, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Apparently endemic to the Philippines (Batan Island, the type locality, but protologue lists one other collection that has not been located (*BS (Fenix) 4023*), collected from Camiguin).

Habitat & Ecology — Not recorded.

19. Callicarpa dolichophylla Merr.

Callicarpa dolichophylla Merr., Philipp. J. Sci., C 7 (1912) 339; Enum. Philipp. Fl. Pl. 3 (1923) 384; Moldenke, Phytologia 22 (1971) 197; Phytologia 33 (1976) 402; Phytologia 50 (1982) 480. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 384): *Cuming 1330* (lecto K; isolecto A, K, L, NY), Philippines, Luzon, Albay Prov. (Cagayan).

Callicarpa longifolia Lam. var. *longissima* Hemsl., J. Linn. Soc., Bot. 26 (1890) 253. — *Callicarpa longissima* (Hemsl.) Merr., Philipp. J. Sci., C 12 (1917) 108. — Type: *Hance 4956* (holo BM), China, Kwang Tung, near Canton.

Small tree. *Stems* with sparse hairs when young, these remaining around the interpetiolar nodes as a ring of hairs, the rest of the stem becoming glabrous, copious sessile red glands present throughout. *Leaves*: blades very narrowly elliptic, 12–19 by 3–4.6 cm, margins serrate, apex acuminate, base attenuate, both surfaces with hairs along the impressed midrib and occasionally along other venation above, both surfaces with copious red sessile glands, the lower surface with peltate scales scattered around the midrib; petioles 1–2.5 cm long, indumentum as stems. *Inflorescences* axillary, terminal parts generally lax, peduncles 15–22 mm long, indumentum with short glandular hairs and red sessile glands; bracts linear, 1–5 mm long; pedicels 1–1.5 mm long, indumentum as other axes; bracteoles linear, 1–2 mm long. *Calyx* narrowly funnel-shaped, c. 1 mm long, with 4 short triangular lobes, outer surface with red sessile glands and sometimes glandular hairs, inner surface ± glabrous. *Corolla* c. 2 mm long, divided into 4 lobes, these 0.75–1 mm long, outer surface with red sessile glands on the backs of the lobes, inner surface ± glabrous. *Stamens* 4, exserted for c. 2 mm; anthers elliptic, c. 0.5 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* 1.5–2 mm wide when mature (on dry specimen), outer surface glandular, the sides enclosed by the calyx; 4 1-seeded pyrenes.

Distribution — Southern China (Szechuan, Fujian (Fukien), Guangdong (Kwangtung), Hainan), Taiwan; in *Malesia*: Philippines (Luzon).

Habitat & Ecology — Not recorded.

20. *Callicarpa endertii* (Moldenke) Bramley

Callicarpa endertii (Moldenke) Bramley, Bot. J. Linn. Soc. 159 (2009) 430. — *Callicarpa kinabaluensis* Bakh. & Heine var. *endertii* Moldenke, Phytologia 4 (1952) 127. — Type: *Endert 2913* (holo BO; iso K, L), Indonesia, Kalimantan, Kalimantan Timur, west Kutai (Koetai), no. 26, Long Iboet.

Small tree, to 3 m high. *Twigs* with patent yellow-brown hairs branched at the base only. *Leaves*: blades elliptic to narrowly elliptic, 9–24 by 5–12 cm, margins dentate, apex acuminate, base attenuate, upper surface with simple, ± erect hairs, the midrib depressed with dense hairs in the furrow, lower surface with simple hairs, some with small branches at the base, also with yellow sessile glands; petioles 1.5–4 cm long, indumentum as stems. *Inflorescences* axillary, peduncles up to 1.5 cm long, axes with dense simple hairs, 2–3 mm long obscuring the detailed structure; bracts linear, 2–3 mm long, with dense hairs; pedicels c. 1 mm long; bracteoles as bracts. *Calyx* narrowly cupular, c. 4 mm long, divided into 4 triangular lobes, c. 0.5 mm long, outer surface evenly hairy with simple hairs that have small branches around the base and shorter ± stellate hairs, also with some peltate scales near the lobes, inner surface ± glabrous. *Corolla* white, c. 4 mm long, divided into 4 lobes, these c. 1.5 mm long, outer surface with hairs and numerous yellow sessile glands on the lobes, the edges of the lobes with short papillae, inner surface ± glabrous. *Stamens* 4, exserted 0.5–1 mm; filaments 2.5–3 mm long; anthers oblong, c. 1.5 mm long. *Stigma* capitate, glandular. *Fruit* green, maturing red, c. 4 mm wide (on dry specimen), covered with sessile glands, half enclosed by the persistent calyx; 8 1-seeded pyrenes.

Distribution — Borneo (apparently endemic to west Kutai, Kalimantan). Hilliard & Burtt (Edinburgh J. Bot. 61 (2005) 140) note: "L. (Long) Iboet not traced but well up

the Sungei Mahakam (S Kutai) in what was the Dutch district of Kutai c. N1°), Gunung Kemal".

Habitat & Ecology — Forest, on slopes. Altitude: 100–200(–1000) m.

21. *Callicarpa erioclona* Schauer

Callicarpa erioclona Schauer in A.DC., Prodr. 11 (1847) 643; Merr., Philipp. J. Sci. 1 (1906) 121; Elmer, Leafl. Philipp. Bot. 3 (1910) 866; W.H.Br., Minor Prod. Philipp. For. 3 (1921) 229; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 384; Moldenke, Phytologia 14 (1967) 175; Phytologia 16 (1968) 364; Phytologia 21 (1971) 36, 152; Phytologia 22 (1971) 197; Phytologia 33 (1976) 402; Fosberg & Sachet, Phytologia 41 (1979) 363; Moldenke, Phytologia 50 (1982) 481; Bramley, Bot. J. Linn. Soc. 159 (2009) 432; Kew Bull. 68 (2013) 385. — Lectotype (designated by Fosberg & Sachet 1979): *Cuming 911* (lecto G; isolecto BM, E, G, L, NY, P, TCD n.v.), Philippines, Luzon, Albay.

Callicarpa subcandida Elmer, Leafl. Philipp. Bot. 10 (1938) 3798. — Lectotype (designated by Bramley 2013): *Elmer 15124* (lecto NY; isolecto BM, L), Philippines, Luzon, Irosin (Mt Bulusan).

Shrub or small tree, to 9 m high, to 3 cm diam. *Stems* with dense pale indumentum of plumose hairs, the hairs sometimes becoming darker near the tips, the surface obscured, slight interpetiolar ridge present. *Leaves*: blades elliptic to ± oblanceolate, 9.5–27 by 3.5–10.5 cm, margins dentate, sometimes irregularly so, apex acute to shortly acuminate, base shortly attenuate, upper surface ± glabrous, almost shiny when dry, lower surface with a pale indumentum of matted plumose hairs, the hairs on the venation standing more erect, some becoming darker near the tips, surface obscured; petioles 1.5–2.5 cm long, indumentum as stems. *Inflorescences* axillary, terminal parts generally lax, peduncles 10–20 mm long, indumentum as stems; bracts linear, 1–2 mm long; pedicels 1–2 mm long, indumentum as stems; bracteoles linear, 1–2 mm long, inconspicuous. *Calyx* cupular, c. 1 mm long, with 4 shallowly triangular lobes, outer surface with dense indumentum as stems and inflorescence axes, the surface obscured, inner surface glabrous. *Corolla* white, 1.5–2.5 mm long, divided into 4 lobes, these 0.5–1 mm long, outer surface glabrous with the occasional branched hair, the edges of the lobes with tiny papillae, inner surface ± glabrous. *Stamens* 4, exserted for 1–3 mm; filaments 3–4 mm long; anthers elliptic, c. 0.5 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* green when immature, maturing purple then black, c. 2 mm wide when mature (on dry specimen), outer surface with stellate hairs, glandular, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Vietnam; in *Malesia*: Java, Borneo (Sabah only, rare), Sulawesi, Philippines, New Guinea.

Habitat & Ecology — Primary and secondary forests. Altitude: 100–500 m.

Vernacular names — Philippines: Tambalabasi, Tigau, Tubang-dalag, Palis (Tagalog) (Merrill 1923).

Uses — Leaves used as fish poison (Brown 1921).

Note — In the Philippines, *C. erioclona* is most likely to be confused with *C. plumosa*, which is rare in comparison, has entire leaf margins and a larger corolla. Outside the Philippines it is confused with *C. candicans*, but it can be distinguished from that species due to its ovary and fruit, which have scattered branched hairs; in *C. candicans* the ovary and fruit are glabrous. In addition, *C. erioclona* has a stem and lower leaf indumentum of plumose hairs.

22. Callicarpa fasciculiflora Merr.

Callicarpa fasciculiflora Merr., Philipp. J. Sci. 17 (1920) 313; Enum. Philipp. Fl. Pl. 3 (1923) 384; Moldenke, Phytologia 33 (1976) 404; Phytologia 50 (1982) 482. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 387): *BS (Ramos & Pascasio) 35123* (lecto A; isolecto K, P), Philippines, Bucas Grande Island.

Shrub. *Stems* with a dense indumentum of shorter hairs close to the surface and longer patent hairs, 2–3 mm long, heavily branched at base only, the longer hairs eventually breaking off, the stems becoming woody and more glabrous. *Leaves* opposite, although sometimes apparently alternate on young shoots; blades narrowly elliptic, 11.5–19 by 4.3–6.5 cm, margins ± entire, apex acuminate, base acute, occasionally slightly asymmetric, upper surface with stellate hairs, and thickened hairs that are branched towards the base, lower surface with venation raised, both lamina and venation with stellate hairs, both surfaces with dense yellow sessile glands; petioles 0.7–1.5 cm long, indumentum as young stems. *Inflorescences* on the stems where the leaves have fallen, rarely axillary, ± sessile; bracts linear to very narrowly ovate, up to 4 mm long; pedicels less than 1 mm long, flowers almost sessile; bracteoles as bracts. *Calyx* cupular, 6–7 mm long, with 4 triangular lobes, c. 1.5–2 mm long, outer surface with branched hairs, some longer and branched at the base only, inner surface glabrous. *Corolla* c. 7 mm long, divided into 4 lobes, these c. 2 mm long, outer surface with dense branched appressed hairs except towards the base which is glabrous, inner surface ± glabrous; corolla persisting on top of the developing fruit until it is nearly mature. *Stamens* 4; filaments c. 5 mm long, exserted for c. 2 mm; anthers oblong, c. 2 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* 3–4 mm wide (on dry specimen), glabrous, with yellow sessile glands, surrounded and almost enclosed by calyx as it matures; 8 1-seeded pyrenes.

Distribution — Philippines (only known from the type collection, apparently endemic to Bucas Grande Island).

Habitat & Ecology — Open forests at low altitudes. Altitude: 20 m.

23. Callicarpa flavida Elmer

Callicarpa flavida Elmer, Leafl. Philipp. Bot. 3 (1910) 863; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 384; Moldenke, Phytologia 50 (1982) 225, 363; Bramley, Kew Bull. 68 (2013) 388. — *Geunsia flavida* (Elmer) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 39. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 388): *Elmer 11851* (lecto K; isolecto BM, E, L, NY), Philippines, Mindanao, Davao dist., Todaya (Mt Apo).

Callicarpa epiphytica Elmer, Leafl. Philipp. Bot. 8 (1915) 2871. — *Geunsia epiphytica* (Elmer) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 38. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 388): *Elmer 13822* (lecto K; isolecto C, E, L, NY, CAS), Mindanao, Agusan, Cabadbaran (Mt Urdaneta).

Geunsia epiphytica (Elmer) H.J.Lam var. *apiculata* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 39. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 388): *Elmer 13861* (lecto K; isolecto BM, E, L, NY), Mindanao, Agusan, Cabadbaran (Mt Urdaneta).

A tree-like or epiphytic shrub, to 10 m high, to 12 cm diam. *Stems* with a dense indumentum of densely branched hairs, obscuring the surface; an interpetiolar ridge present. *Leaves* often with apparently alternate leaves between opposite pairs; blades elliptic to

narrowly elliptic to narrowly or very narrowly ovate, 9–18 by 2–6 cm, margins ± entire, apex acuminate to caudate, 1.5–4 cm long, base attenuate to cuneate, sometimes markedly asymmetric, with one side up to 4 mm longer, upper surface ± glabrous but with branched hairs along the impressed veins and midrib, especially towards the base of the midrib, lower surface with an indumentum of interwoven densely branched hairs, the surface obscured, the venation raised and also covered with hairs, a yellowish brown colour when dry; petioles 1–2.5 cm long, indumentum as stems. *Inflorescences* axillary, peduncles 25–50 mm long, indumentum as stem; bracts inconspicuous, linear 3–5 mm long; pedicels c. 1 mm long, indumentum as stems; bracteoles inconspicuous, 1–2 mm long. *Calyx* cupular, 2.5–3 mm long, with 5–8 lobes, either shortly triangular or almost mucronate, also marked by slight ridges on outer surface, outer surface densely covered and obscured by the same densely branched hairs found on the stems and lower leaf surface, also with yellow sessile glands, inner surface ± glabrous. *Corolla* pale blue, c. 5 mm long, divided into 5–8 oblong lobes, these 1.5–2 mm long with acute tips, outer surface with branched hairs in the centre of the lobes, margins glabrous or with papillae, sometimes the hairs also present on the tube below the lobes, also with yellow sessile glands, the portion enclosed within the calyx usually glabrous, inner surface ± glabrous. *Stamens* 5–8, enclosed; filaments c. 2 mm long; anthers oblong, c. 2 mm long. *Stigma* capitate. *Fruit* maturing red, 3–4 mm wide (on dry specimen), slight depression near apex, sometimes the stigma persisting, outer surface glandular, about three-quarters enclosed by the calyx; 10–16 1-seeded pyrenes.

Distribution — Endemic in the Philippines (Mindanao (Agusan and Davao), Dinagat Island).

Habitat & Ecology — Found as an epiphytic shrub or small tree within forests, near rivers. Altitude: 50–1200 m.

Vernacular name — Lai-au-pan (Bagobo) (Elmer 1910).

24. Callicarpa fulvohirsuta Merr.

Callicarpa fulvohirsuta Merr., J. Straits Branch Roy. Asiat. Soc. 76 (1917) 113; Bramley, Bot. J. Linn. Soc. 159 (2009) 433. — Type: *Clemens 9846* (holo PNH†; iso A, K), Sabah, Mt Kinabalu, Kibayo to Keung.

Small shrub or tree, to 5 m high, to 3 cm diam.; outer bark grey-brownish or yellowish, inner bark greenish, sapwood white. *Twigs* with a dense indumentum of short branched (± stellate) red-brown hairs, and longer spreading red-brown hairs (branched at the base only) when young, becoming woodier and ± glabrous as they mature. *Leaves* occasionally with pairs markedly subequal; blades ± obovate, 5–17 by 2–7 cm, margins minutely to shallowly dentate, apex shortly acuminate, base attenuate, upper surface with short stiff appressed hairs, the midrib sunken and covered with short branched hairs and longer hairs that are branched at the base only, lower surface with an indumentum of short branched hairs close to the surface, also with longer spreading hairs branched at the base only, to 1 mm long, scattered on the lamina but dense on the raised midrib and secondary venation, also with yellow sessile glands and peltate scales clustered near the midrib, occasionally dense around the leaf base; petioles 1–2 cm long, indumentum as twigs. *Inflorescences* axillary, sometimes in axils where leaves have fallen,

peduncles 5–7 mm long, indumentum as stem; bracts linear, 2–3 mm long; pedicels 2–5 mm long, indumentum as stems; bracteoles linear, 0.5–1 mm long. *Calyx* cupular, 1–1.5 mm long, with 4 shallow lobes, outer surface with simple hairs especially on the nerve ridges that lead to the lobe tips, also with yellow sessile glands and the occasional peltate scale, inner surface with scattered simple hairs. *Corolla* white, c. 3 mm long, divided into 4 lobes, these c. 1 mm long, outer surface with yellow sessile glands, especially on the lobes, inner surface of lobes papillose, the tube ± glabrous. *Stamens* 4, barely exserted up to 1 mm; filaments c. 2 mm long; anthers oblong, c. 1 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* green, maturing red, 3–4 mm wide (on dry specimen), outer surface glandular, subtended by calyx, calyx enclosing less than a third of fruit; 8 1-seeded pyrenes.

Distribution — Borneo, Sabah (Sandakan, Lamag, Tawau, Keningau and Ranau districts).

Habitat & Ecology — Found on hillsides, disturbed areas such as roadsides or burnt forest, ultramafic areas (Bidu Bidu Forest Reserve).

Note — Close to *C. havilandii* but with numerous peltate scales on the leaves, generally less hairy, and parts of inflorescence smaller.

25. Callicarpa furfuracea Ridl.

Callicarpa furfuracea Ridl., J. Fed. Malay States Mus. 10 (1920) 150; Fl. Malay Penins. 2 (1923) 615; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 301; Leerat. et al., Thai Forest Bull., Bot. 35 (2007) 73. — Type: *I.H.N. Evans s.n.* (holo K; iso SING), Peninsular Malaysia, Pahang, Gunung Senyum.

Callicarpa rudis S.Moore, J. Bot. 63, Suppl. (1925) 80. — Type: *H.O. Forbes 1355C* (holo BM; L 2 sheets, NY fragment), Sumatra, Kotta Djawa, Lampongs.

Callicarpa inaequalis Teijsm. & Binn. ex Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 18. — Lectotype (designated here): *Teijsmann & Binnendijk s.n.* (lecto BO), Java, Tjampea.

Climber or scandent shrub, to 3 m high. *Branches* with an indumentum of brown plumose hairs, the surface obscured, becoming woodier and more glabrous as they mature; the smaller twigs, petioles and inflorescence axes appearing grooved and somewhat shrunken in dried specimens; a conspicuous interpetiolar ridge resembling a stipule scar present. *Leaves* opposite, petiolate; blades elliptic, rarely narrowly obovate, 9–22 by 4–9 cm, margins dentate, often minutely so, apex acute to shortly acuminate, base obtuse, rounded or shortly attenuate, occasionally asymmetric, upper surface with a mealy indumentum of branched hairs when young, soon becoming glabrous except for along the sunken midrib, lower surface appearing pale with darkened spots, the surface obscured by a dense indumentum of flattened, interwoven branched hairs, some darkened towards the apices, the hairs darker and more densely branched on the venation which is raised; petioles 1.5–3.5 cm long, indumentum as stems. *Inflorescences* axillary, peduncles 5–12 mm long, indumentum as stem; bracts linear, 5–6 mm long; pedicels 1–2.5 mm long, indumentum as stems; bracteoles linear, 1–5 mm long. *Calyx* cupular, c. 1 mm long, with 4 slight lobes marked by thickened ridges, outer surface obscured by an indumentum of hairs with many short branches along their whole length. *Corolla* purple inside, the outer surface pale, c. 4 mm long, divided into 4 lobes, these c. 1 mm long, outer surface obscured by a dense, pale indumentum of flattened and interwoven

branched hairs, inner surface ± glabrous, with yellow sessile glands. *Stamens* 4, the anthers and a small part of the filament scarcely exserted; anthers oblong, c. 2 mm long. *Ovary* with branched hairs; stigma capitate, c. 1 mm wide, surface glandular. *Fruit* green, becoming red-purple and eventually black, c. 3 mm wide (on dry specimen), with tiny branched hairs, also with yellow sessile glands, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Java.

Habitat & Ecology — Primary forest or disturbed forested areas. Altitude: 100–500 m.

Note — Closely related to *C. maingayi* but differing due to its climbing or scandent habit, smaller leaves, and by its ovary and fruit, which have an indumentum of tiny branched hairs. *Callicarpa maingayi* is a small tree or large shrub endemic to Thailand and Peninsular Malaysia with a glabrous ovary and fruit. *Callicarpa rudis* described from Sumatra, and *C. inaequalis* described from Java are reduced to synonymy here.

26. Callicarpa glabrifolia S.Atkins

Callicarpa glabrifolia S.Atkins, Kew Bull. 52 (1997) 227; Bramley, Bot. J. Linn. Soc. 159 (2009) 434. — Type: *J. Dransfield, S. Dransfield, Prance, Joffre, Jang Ibrahim, Han & Niga 7160* (holo K; iso BRUN, L), Brunei, Temburong district, Bukit Belalong.

Shrub or small tree, to 8 m high, 1–3 cm diam.; outer bark smooth, grey-brown, inner bark creamy green, sapwood orange. *Twigs* ± glabrous, a conspicuous interpetiolar ridge resembling a stipule scar present, also with yellow sessile glands. *Leaves*: blades ± elliptic, 11–33 by 3.5–12 cm, margins almost entire or with minute, broadly spaced teeth, apex long-acuminate to 6 cm, base acute, upper surface glabrous, lower surface glabrous, the venation all raised, conspicuous when dry, both surfaces with numerous yellow sessile glands; petioles 1–3.5 cm long. *Inflorescences* axillary, a lax pedunculate cyme, open branching pattern; peduncles 5–20 mm long, indumentum as twigs; bracts linear, 2–5 mm long; pedicels 4–7 mm long; bracteoles linear, 1–3 mm long. *Calyx* cupular to almost square, c. 2 mm long, with 4 shallow lobes marked with thickened tips, outer surface glabrous, with yellow sessile glands, inner surface ± glabrous. *Corolla* white, 4–5 mm long, divided into 4 lobes, these 2 mm long, outer surface glabrous, with yellow sessile glands, inner surface ± glabrous. *Stamens* 4, exserted for c. 0.5 mm; filaments c. 3 mm long; anthers oblong, c. 1.5 mm long. *Stigma* capitate. *Fruit* green, maturing white, 3–4 mm wide when mature (on dry specimen), outer surface glandular, subtended by calyx; 8 1-seeded pyrenes.

Distribution — Endemic to Borneo (Brunei, Sarawak and Kalimantan, one record from western Sabah).

Habitat & Ecology — Mixed dipterocarp forest, often along rivers or on steep banks, or from disturbed areas. Altitude: 50–1600 m.

27. Callicarpa havilandii (King & Gamble) H.J.Lam

Callicarpa havilandii (King & Gamble) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 52; Bramley, Bot. J. Linn. Soc. 159 (2009) 436. — *Geunsia havilandii* King & Gamble, Bull. Misc. Inform. Kew (1908) 105. — Lectotype (designated by Bramley 2009): *Haviland & Hose 3549* (lecto K; isolecto L), Sarawak.

[*Geunsia beccariana* Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1895) 165, nom. nud.]
Callicarpa kinabaluensis Bakh. & Heine var. *tonsa* Moldenke, Phytologia 4 (1952) 127. — Type: *Endert 4489* (holo BO; iso K, L, NY fragment), Central East Borneo (Kalimantan Timur), W Koetai (Kutai), no. 39, Kemoel.

Small shrub or tree, to 8 m high, 1–7 cm diam.; outer bark smooth, grey-brown, inner bark brown or yellow-green, sapwood yellow. *Twigs* with a dense indumentum of short branched red-brown hairs, and longer spreading simple red-brown hairs, 2–4 mm long, when young, becoming woodier and ± glabrous as they mature. *Leaves* occasionally with pairs subequal; blades elliptic to narrowly elliptic, more rarely obovate, 9–28 by 3–8 cm, margins minutely to shallowly dentate, apex acuminate, base acute to shortly attenuate, upper surface with short stiff hairs, the midrib sunken and covered with short branched hairs and longer simple hairs, or hairs branching at base only, lower surface with an indumentum of short, branched hairs close to the surface, also with longer, spreading, simple hairs, 1–3 mm long, especially dense on the raised midrib and secondary venation, also with yellow sessile glands; petioles 1.5–3 cm long, indumentum as stems. *Inflorescences* axillary, sometimes in axils of fallen leaves, peduncles 5–15 mm long, indumentum as stem; bracts linear, 2–3 mm long; pedicels 3–7 mm long, indumentum as stems; bracteoles 0.5–1 mm long, inconspicuous. *Calyx* cup-shaped, c. 2 mm long, with 4 or 5 shallow lobes, outer surface densely covered with short-branched hairs, also with longer simple hairs c. 1–2 mm long, also with yellow sessile glands, inner surface ± glabrous. *Corolla* white, 3–5 mm long, divided into 4 or 5 lobes, these 1–2 mm long, outer surface with yellow sessile glands, inner surface ± glabrous. *Stamens* 4 or 5, barely exserted up to 1 mm; filaments c. 2 mm long; anthers oblong, c. 2 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* green, maturing red, 3–4 mm wide (on dry specimen), outer surface glandular, subtended by calyx, calyx enclosing less than a third of fruit; 8 1-seeded pyrenes. — **Plate 1b, c.**

Distribution — Endemic to Borneo.

Habitat & Ecology — Common in disturbed forest, roadsides or along riversides in mixed dipterocarp forest. Altitude: 50–1800 m.

28. Callicarpa hispida (Moldenke) Bramley

Callicarpa hispida (Moldenke) Bramley, Bot. J. Linn. Soc. 159 (2009) 437. — *Callicarpa havilandii* (King & Gamble) H.J.Lam var. *hispida* Moldenke, Phytologia 43 (1979) 222. — Type: *Kowaka & Hotta 1245* (holo SAN; iso L), Sabah, Lahad Datu district, between Kampong Silah and summit of Mt Silam.

Small shrub or tree, to 6 m high, 1–3 cm diam.; outer bark smooth, pale brown, inner bark pale grey, sapwood pale brown. *Twigs* with a dense indumentum of short, branched, red-brown hairs close to the surface, and longer simple, patent, red-brown hairs when young, becoming woodier and ± glabrous as they mature. *Leaves* occasionally with an alternate leaf present close to opposite pair so appearing pseudo-ternate, sometimes pairs subequal; blades elliptic to obovate, 8–22 by 4–10 cm, margins dentate, teeth irregular, apex acute to acuminate, base acute to shortly attenuate, often asymmetric, upper surface with stiff simple hairs with enlarged bases, these especially dense along the sunken midrib, lower surface with an indumentum of short branched hairs and longer

hairs with few branches, 2–4 mm long, on the margins and raised midrib, also with yellow sessile glands; petioles 1–2.5 cm long, indumentum as stems. *Inflorescences* axillary, sometimes in axils of fallen leaves, not generally congested, peduncles 5–20 mm long, indumentum as stem; bracts inconspicuous, linear, 3–5 mm long; pedicels 2–5 mm long, indumentum as stems; bracteoles inconspicuous, linear, 1–3 mm long. *Calyx* cupular, 4–5 mm long with 6 or 7 shallow subulate lobes, outer surface densely covered with branched hairs of varying lengths, also with yellow sessile glands, inner surface ± glabrous. *Corolla* white, 6–7 mm long, divided into 6 or 7 lobes, these c. 2 mm long, often patent to the tube, outer surface with yellow sessile glands, inner surface ± glabrous. *Stamens* 6 or 7, exserted for 1.5–2 mm; filaments c. 5 mm long; anthers oblong, c. 2 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* green, maturing red, 6–7 mm wide (on dry specimen), outer surface glandular, surrounded by to almost enclosed in the persistent calyx; 12–14 1-seeded pyrenes. — **Plate 1d.**

Distribution — Endemic to Borneo, Sabah (Lahad Datu district, Gunung Silam and surrounding area).

Habitat & Ecology — Ultrabasic forest, within forest and along roadsides.

29. *Callicarpa involucrata* Merr.

Callicarpa involucrata Merr., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 31; Bramley, Bot. J. Linn. Soc. 159 (2009) 438. — Type: *Ramos 1395* (holo PNH†; iso A, K, L), Sabah, Batu Lima nr Sandakan.

Small tree, to 10 m high, 1.5–5 cm diam.; outer bark greenish brown, verrucose. *Twigs* ± glabrous, becoming woody, with scattered lenticels, a conspicuous interpetiolar ridge present. *Leaves*: blades obovate, 14–45 by 5.5–15 cm, margins shallowly dentate, apex shortly acuminate, base cuneate to attenuate, upper surface with scattered hairs when very young, soon becoming ± glabrous, also with yellow sessile glands, lower surface ± glabrous, with yellow sessile glands and peltate scales of c. 1 mm diam. concentrated at the leaf base, but occasionally scattered near the midrib; petioles 1.5–2.5 cm long. *Inflorescences* cauliflorous or ramiflorous, thyrsoid, with individual cymes very congested on a woody (c. 1 cm wide) axis, at first appearing almost sessile but extending until up to 25 cm long, often with prominent scars marking the position of fallen cymes; when young, inflorescence apex often covered with a jelly-like mucous; peduncles 1–5 mm long; pedicels 1–2 mm long; bracts ovate, forming an involucre around each young cyme, caducous, 5–8 mm long, ± glabrous, with peltate scales. *Calyx* ± tubular, 3–5 mm long with 4 or 5 shallow triangular lobes, outer surface with scattered hairs, also with yellow sessile glands and some peltate scales as found on lamina, inner surface ± glabrous, venation pattern conspicuous when dry. *Corolla* white, 5–6 mm long, divided into 4 (or 5) lobes, these c. 2.5 mm long, outer surface with occasional hairs, yellow sessile glands, inner surface ± glabrous, with some papillae on the lobes, especially the margins. *Stamens* 4, the anthers exserted or partly exserted for 1–3 mm; filaments 2.5–3.5 mm long; anthers oblong, c. 3 mm long. *Stigma* ± capitate, c. 1 mm wide, surface glandular. *Fruit* green, maturing red, c. 3–5 mm wide (on dry specimen), outer surface glandular, subtended by calyx, most of which has broken away, sometimes remaining more intact; 8 1-seeded pyrenes. — **Plate 1g.**

Distribution — Endemic to Borneo (Sabah, Sarawak and Kalimantan).

Habitat & Ecology — In primary dipterocarp forest or in areas of secondary regrowth, often on stream banks or hillsides, on sandy clay loams. Altitude: to 1200 m.

30. **Callicarpa kinabaluensis** Bakh. & Heine

Callicarpa kinabaluensis Bakh. & Heine, Feddes Repert. Spec. Nov. Regni Veg. 54 (1951) 246; Bramley, Bot. J. Linn. Soc. 159 (2009) 440. — Type: *Clemens & Clemens 31348* (holo BO; iso A, BO, K, L, NY fragment), Malaysia, Sabah, Penibukan.

Callicarpa kinabaluensis Bakh. ex Moldenke, Phytologia 4 (1952) 42, nom. illeg. — Type: *Clemens & Clemens 33200* (holo BO; iso K, L), Malaysia, Sabah, Mt Kinabalu, Marai Parai.

Callicarpa kinabaluensis Bakh. ex Moldenke var. *gibotii* Moldenke, Phytologia 43 (1979) 222, nom. illeg. — Type: *SAN (Aban Gibot) 55432* (holo SAN), Malaysia, Sabah, Ranau district, Mt Tambayukan.

Shrub or tree, 1.5–10 m high, to 7 cm diam. *Twigs* with a dense indumentum of yellow-brown hairs, simple or with short branches near the apex, patent or erect, the surface obscured, with scattered warty, protruding growths 2–3 mm long, also with yellow sessile glands, becoming woody and more glabrous as they mature. *Leaves*: blades elliptic to narrowly ovate, 11–19 by 5–10.5 cm, margins dentate, the teeth with thickened apices, apex acute, base acute to obtuse, when young both surfaces densely covered with yellow-brown hairs, these simple or with short branches near the apex, patent or erect, when more mature upper surface ± glabrous except where midrib and lateral nerve pairs sunken, these areas with some branched hairs, lower surface variable, either with a dense indumentum of branched hairs, the lamina surface obscured, vesiculose and with many yellow sessile glands; petioles 2–5 cm long, indumentum as young twigs. *Inflorescences* axillary, flowers congested in more or less globose cymes, peduncles 25–35 mm long, indumentum as young twigs, the hairs so dense the surface obscured; bracts narrowly ovate, 10–20 mm long, with dense hairs 2–3 mm long; pedicels 0.5–1 mm long, not easily visible due to congested inflorescence and dense indumentum; bracteoles 4–6 mm long, with dense simple or scarcely-branched hairs 2–3 mm long. *Calyx* cupular, c. 5 mm long, with 4 triangular lobes, c. 1 mm long, outer surface densely covered with simple or scarcely-branched hairs, also with yellow sessile glands, inner surface ± glabrous. *Corolla* white, sometimes with a pinkish tinge, 6–8 mm long, divided into 4 lobes, these c. 2 mm long, outer surface glabrous except for 2–3 mm long hairs and yellow sessile glands on the lobes, inner surface ± glabrous or papillose, especially on the lobes. *Stamens* 4, exserted for 4–6 mm; filaments 5–6 mm long; anthers oblong, pale yellow, 2.5–3 mm long. *Stigma* capitate, divided into four small lobes, surface glandular. *Fruit* green, maturing purple, 2–3 mm wide (on dry specimen), slight depression near apex, outer surface glandular, surrounded by the calyx; 8 1-seeded pyrenes.

Distribution — Endemic to Borneo, Sabah (known only from Mt Kinabalu area).

Habitat & Ecology — Ultrabasic scrub; upper montane forest; exposed sedge dominated vegetation; forest area on open plateau. Altitude: 1600–1700 m.

Vernacular names — Lengegan (Kiau Dusun).

31. **Callicarpa longifolia** Lam.

Callicarpa longifolia Lam., Encycl. 1 (1785) 563; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 385; Moldenke, Phytologia 21 (1971) 48, 376; Phytologia 22 (1971) 201; Phytologia 33 (1976) 491; Phytologia 50 (1982) 492. — Type: *Sonnerat s.n.* (holo P-LA), Malacca.

Callicarpa lanceolaria Roxb. ex Hornem., Hort. Bot. Hafn. Suppl. (1819) 121. — *Callicarpa longifolia* Lam. var. *lanceolaria* (Roxb. ex Hornem.) C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 570. — Type: *Wallich Cat. 1829* (holo K-W).

?*Callicarpa albida* Blume, Bijdr. (1826) 818. — Type: unknown (not found at BO or L), crescit in montosis.

?*Callicarpa roxburghiana* Schult., Mant. Pl. Altera (1827) 54. — Type: unknown, no material cited.

?*Callicarpa oblongifolia* Hassk., Cat. Hort. Bot. Bogor. (1844) 136. — Type unknown, no material cited.

Callicarpa attenuata Wall. ex Walp., Repert. Bot. Syst. 4 (1845) 129. — Type: *Wallich Cat. 1835* (BM, K-W).

Callicarpa blumei Zoll. & Moritzi, Syst. Verz. (1846) 53. — Type: *Zollinger 156* (holo K), Indonesia, Java.

Callicarpa longifolia Lam. var. *floccosa* Schauer in A.DC., Prodr. 11 (1847) 645. — Syntypes: *Gaudichaud s.n.* (DC-G), Prince of Wales peninsula; *Roxburgh s.n* (DC-G), Singapore & Manila; *Thunberg s.n.* (DC-G), Indonesia, Java; *Blume s.n.* (not located) & *Junghuhn s.n.* (not located), Indonesia, Java; *R. Brown s.n.* (not located), Northern Hollandia tropical.

Callicarpa rhynchophylla Miq., Fl. Ned. Ind. 2 (1858) 888. — Type: *Korthals s.n.* (holo L; iso U), Borneo.

Callicarpa horsfieldii Turcz., Bull. Soc. Nat. Mosc. 36 (1863) 217. — *Callicarpa longifolia* Lam. var. *horsfieldii* (Turcz.) Moldenke, Phytologia 7 (1959) 77. — Type: *Horsfield s.n.* (holo K), Indonesia, Java.

Callicarpa attenuifolia Elmer, Leafl. Philipp. Bot. 8 (1915) 2870. — Lectotype (designated here): *Elmer 13536* (lecto K; isolecto NY), Mindanao, Agusan, Cabadbaran (Mt Urdaneta).

?*Callicarpa japonica* Thunb. var. *rhombifolia* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 90. — Type: *Korthals s.n.* (not located), Borneo.

?*Callicarpa longifolia* Lam. var. *areolata* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 90. — Type: *Docters van Leeuwen-Reijnvaan 1349* (holo L), Kalao Toa Island.

Callicarpa nigrescens Merr., Philipp. J. Sci. 30 (1926) 425. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 389): *BS (Ramos & Edaño) 44297* (lecto K; isolecto NY, UC), Philippines, Sulu Archipelago, Tawi Tawi.

Shrub, to 8 m high, occasionally scrambling over other vegetation, 1–3 cm diam. *Stems* with a mealy indumentum of branched hairs, also with yellow sessile glands, usually becoming woodier and ± glabrous as they mature, a conspicuous interpetiolar ridge present. *Leaves* in equal to subequal pairs; blades elliptic to narrowly ovate, 7–20 by 3–6(–9) cm, margins serrate, apex acuminate, base acute to shortly attenuate, upper surface with scattered branched hairs and yellow sessile glands, lower surface with an even indumentum of stellate or short branched hairs close to the surface, not interwoven, lamina surface easily visible, hairs especially dense on the raised midrib and venation, also with numerous yellow sessile glands; petioles 1–2.5 cm long, indumentum as stems. *Inflorescences* axillary, lax, peduncles 5–10 mm long, indumentum as stem; bracts linear, 0.5–2 mm long; pedicels c. 0.5 mm long; bracteoles linear, less than 1 mm long, inconspicuous. *Calyx* narrowly cupular, c. 1 mm long with 4 shallow lobes marked with thickened tips, outer surface with stellate or short branched hairs, also with yellow sessile glands and occasional peltate scales, inner surface ± glabrous.

Corolla pale pink to lilac, c. 2–2.5 mm long, divided into 4 lobes, these 0.5–0.75 mm long, outer surface with appressed branched hairs, the edges of the lobes with papillae, also with yellow sessile glands, inner surface ± glabrous. *Stamens* 4, exserted for 2–3 mm; anthers elliptic, 0.5–1 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* green, maturing white, 2–3 mm wide when mature (on dry specimen), outer surface glandular, subtended by reduced calyx most of which has broken away; 4 1-seeded pyrenes. — **Plate 1e, f.**

Distribution — India, Indochina, and northern Australia; throughout *Malesia* (only reaching as far north as Catanduanes in the Philippines).

Habitat & Ecology — Secondary forest and disturbed areas such as roadsides or open patches in primary forest. Altitude: 0–1200 m.

Note — *Callicarpa longifolia* is a widespread species, variable especially in its indumentum across its distribution. It is especially common in Sundaland and New Guinea, but comparatively rare in the Philippines. Distinguished from other common species by its fruit which matures white.

32. Callicarpa longipetiolata Merr.

Callicarpa longipetiolata Merr., Publ. Bur. Sci. Gov. Lab. 29 (1905) 47; Enum. Philipp. Fl. Pl. 3 (1923) 386; Moldenke, Phytologia 22 (1971) 202; Phytologia 33 (1976) 494; Phytologia 50 (1982) 495; Bramley, Kew Bull. 68 (2013) 391. — *Callicarpa tomentosa* (L.) L. var. *longipetiolata* (Merr.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 22. — Lectotype (designated by Bramley 2013): *Elmer 6266* (lecto K; isolecto NY), Philippines, Luzon, Benguet, Mt Santo Tomas.

Callicarpa longipetiolata Merr. var. *glabrescens* Moldenke, Phytologia 4 (1952) 43. — Type: *Vanoverbergh 1376* (holo U; iso NY fragment), Philippines, Luzon, Bontoc.

Shrub or tree, 6–7 m high. *Stems* with a dense indumentum of erect plumose hairs, obscuring the surface, apparently rubbing away as the stems become woodier, lenticels developing; an interpetiolar ridge present. *Leaves*: blades narrowly ovate to narrowly elliptic, 4.5–9 by 1.5–4 cm, margins ± entire, apex acute to shortly acuminate, base asymmetric, acute to rounded, upper surface with a dense covering of brownish plumose hairs when young, these apparently rubbing away, some hairs remaining in older leaves especially along the sunken midrib and secondary nerve pairs, lower surface appearing paler, the surface obscured by interwoven branched hairs, the venation raised; petioles 0.7–2 cm long, indumentum as stems. *Inflorescences* axillary, peduncles 16–35 mm long, the internal axes becoming consistently shorter, the flowers congested in compact almost globose heads, indumentum as stem; bracts linear to very narrowly ovate, 3–5 mm long; pedicels not easily visible, flowers ± sessile; bracteoles linear to very narrowly ovate, 1–4 mm long. *Calyx* cupular, 1.5–2 mm long with 4 triangular lobes, outer surface with plumose hairs, these so dense the surface obscured, inner surface glabrous. *Corolla* c. 3 mm long, divided into 4 rounded lobes, these c. 1 mm long, the edges fringed with papillae, outer surface with dense branched hairs along the centre of the lobes, the rest of the tube glabrous, inner surface ± glabrous. *Stamens* 4; filaments c. 3 mm long, exserted 1–1.5 mm; anthers elliptic, c. 1 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular; ovary with branched hairs when immature. *Fruit* not seen when mature, 3 mm wide (on dry specimen), glabrous, with yellow sessile glands, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Endemic in the Philippines (Luzon, Benguet province: Mt Santo Tomas and Baguio).

Habitat & Ecology — Montane forest. Altitude: 2145 m.

Note — Apparently endemic to high altitude forest, *C. longipetiolata* bears similar adaptations to other high altitude species such as *C. kinabaluensis* (Borneo): the inflorescence is congested into more or less globose heads, and the leaves are thick, with a dense indumentum. *Callicarpa longipetiolata* was reduced to a variety of *C. tomentosa* (*sensu* H.J.Lam & Bakh.) by Lam & Bakhuizen van den Brink (1921) [= *C. arborea* Roxb.], it clearly does not belong here. Although the general indumentum is similar, the inflorescence structure and vegetative characters are completely different.

33. Callicarpa magnifolia Merr.

Callicarpa magnifolia Merr., Philipp. J. Sci. 20 (1922) 437; Enum. Philipp. Fl. Pl. 3 (1923) 386; Moldenke, Phytologia 21 (1971) 228. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 392): *BS (Ramos & Edaño) 37563* (lecto US; isolecto K), Philippines, Luzon, Kalinga subprovince, Lubuagan, Mt Masingit.

Shrub or small tree. *Stems* and young growth with a dense indumentum of patent plumose hairs, obscuring the surface, apparently rubbing away as the stems become woodier. *Leaves*: blades broadly elliptic to ovate, 22–27 by 15–20 cm, margins shallowly dentate, apex shortly acuminate, base rounded to obtuse, occasionally slightly asymmetric, upper surface ± glabrous but with plumose hairs along the sunken midrib, especially towards the base where the midrib thickens, some peltate scales scattered around base, lower surface with a dense covering of branched hairs, the venation raised, the larger veins with more densely branched plumose hairs; petioles 3–5 cm long, indumentum as young stems. *Inflorescences* apparently from the axils of fallen leaves, lax, in fruit c. 6 cm long; bracts not seen; pedicels not seen; bracteoles linear, pubescent, 3–5 mm long. *Calyx* membranaceous, cup-shaped, c. 3 mm long, shortly 4-lobed. *Corolla*, *stamens*, *stigma* and *ovary* not seen. *Fruit* globose, glabrous, c. 3 mm wide, nearly surrounded by the densely fulvous-tomentose, greatly enlarged disc, latter subglobose and up to 10 mm diam.; 4 1-seeded pyrenes.

Distribution — Endemic to the Philippines (Luzon, Kalinga subprovince: Mt Masingit).

Habitat & Ecology — In forests. Altitude: c. 1200 m.

Note — *Callicarpa magnifolia* is known only from the type collection. Merrill (1922) states its unique feature to be the densely fulvous-tomentose disc that surrounds and nearly encloses the fruit.

34. Callicarpa maingayi King & Gamble

Callicarpa maingayi King & Gamble, Bull. Misc. Inform. Kew (1908) 106; J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 804; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 63; Ridl., Fl. Malay Penins. 2 (1923) 615; Moldenke, Fifth Summary Verbenac. 1 (1971) 294; Phytologia Mem. II (1980) 284; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 302, f. 2; Corner, Wayside Trees Mal., 3rd ed. (1988) 744; Kochummen, Tr. Fl. Pasoh For. (1997) 433; Leerat. et al., Thai. Forest Bull., Bot. 35 (2007) 75. — Lectotype (designated by Leerat. et al. 2007): *Maingay KD 1192* (lecto K; isolecto K, L), Peninsular Malaysia, Malacca.

Shrub or tree, to 15 m tall. *Bark* greyish brown, inner bark yellow. *Branches* becoming woodier and more glabrous as they mature; the smaller twigs and petioles appearing grooved and somewhat shrunken in dried specimens. *Indumentum* of branches, petioles, inflorescences and pedicels with very densely branched hairs hiding the central axis, the surface obscured. *Leaves*: blades elliptic to obovate, 15–30 by 9–16 cm, margins shallowly and sometimes irregularly dentate, base shortly attenuate, apex acute to obtuse, upper surface with a mealy indumentum of branched hairs when young, soon becoming glabrous except for along the sunken midrib and secondary nerve pairs, lower surface appearing pale with darkened spots, the surface obscured by a dense indumentum of flattened, interwoven branched hairs, some darkened towards the apices, also with occasional peltate scales either side of the midrib and around the base; the venation raised; petioles 2.5–8 cm long. *Inflorescences* axillary, peduncles 15–20 mm long; bracts linear, 1–5 mm long; pedicels c. 1 mm long; bracteoles linear, 1–4 mm long. *Calyx* cupular, 1–1.5 mm long with 4 slight lobes marked by thickened ridges, outer surface ± obscured by an indumentum of interwoven branched hairs. *Corolla* purple, c. 4 mm long, divided into 4 lobes, these 1–1.5 mm long, outer surface obscured by a dense indumentum of branched hairs, inner surface ± glabrous, with yellow sessile glands. *Stamens* 4 (or 5), the anthers and a small part of the filament exserted; anthers oblong, 1.5–2 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular; ovary glabrous. *Fruit* green, becoming red-purple, 2–3 mm wide (on dry specimen), with yellow sessile glands and rare peltate scales, subtended by calyx; 4 1-seeded pyrenes.

Distribution — S Thailand; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — Primary or secondary forest, roadsides. Altitude: 50–750 m.

Vernacular names — Malaysia: Chuglak, Uglak (Temuan); Tampang besi (Malay).

35. **Callicarpa mendumiae** Bramley

Callicarpa mendumiae Bramley, Kew Bull. 67 (2012) 217. — Type: *Hendrian, Newman, Scott, Nazre Saleh & Supriadi 979* (holo E; iso BO, L), Central Sulawesi, Luwuk district, Bunta subdistrict, Sumber Agung, Gunung Hek, Sungai Hel, S1°01' E122°10'.

Scandent to weakly climbing shrub. *Twigs* with a layer of branched hairs covering the surface, interspersed with longer patent hairs that are branched at the base only, and densely branched hairs. *Leaves* opposite or appearing ternate; blades very narrowly ovate, 16.5–22.5 by 3.5–4 cm, margins shallowly dentate, apex strongly caudate, base rounded to asymmetric, upper surface with shorter branched hairs close to the surface and longer erect hairs some of which branched at the base, these dense along the midrib and venation, lower surface with branched hairs of varying lengths on the venation, venation raised, yellow sessile glands on the surface, occasional peltate scales; petioles 1–1.5 cm long. *Inflorescences* axillary, peduncles 2.2–2.7 cm long, cymes laxly branched; bracts linear, c. 7 mm long, indumentum as stems; pedicels 0.5–1 mm long; bracteoles linear, 2–5 mm long. *Calyx* seen only in bud and in fruit, in bud narrowly cupular, c. 3 mm long, divided into 4 narrowly triangular lobes, c. 0.5 mm long, outer surface with branched hairs covering the surface, interspersed with longer hairs branched at the base only, these especially dense on the lobes, inner surface ± glabrous. *Corolla* white, seen only in bud, c. 2.5 mm long, divided into 4 lobes, outer

surface glabrous except for a few branched hairs on the back of the lobes, lobes also with yellow sessile glands, inner surface ± glabrous. *Stamens* 4, seen only in bud when filaments undeveloped; anthers oblong, c. 1.5 mm long. *Stigma* too immature to describe accurately. *Fruit* pink, not seen intact, subtended by the persistent calyx, calyces seen on fruiting specimen with 5 lobes; apparently breaking up into 4 1-seeded pyrenes.

Distribution — Apparently endemic to C and eastern C Sulawesi; known from two collections only.

Habitat & Ecology — Montane evergreen forest. Altitude: 980–1000 m

36. **Callicarpa micrantha** S.Vidal

Callicarpa micrantha S.Vidal, Phan. Cuming. Philipp. (1885) 187; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 386; Moldenke, Phytologia 21 (1971) 235; Phytologia 33 (1976) 498; Phytologia 50 (1982) 498; Bramley, Kew Bull. 68 (2013) 392. — Lectotype (designated by Calabrese & Velayos, Bot. J. Linn. Soc. 159 (2009) 292): *Vidal 1641* (lecto K; isolecto L, MA), Philippines, Abra [Misamis, Mindano].

Callicarpa elegans Hayek, Repert. Spec. Nov. Regni Veg. 2 (1906) 88; Merr., Philipp. J. Sci., C 7 (1912) 228; Enum. Philipp. Fl. Pl. 3 (1923) 384; Moldenke, Phytologia 50 (1982) 480. — Type: *Cuming 1460* (holo W; iso K 2 sheets, NY), Philippines, Luzon, prov. Batangas [Camarines sur].

Callicarpa phanerophlebia Merr., Philipp. J. Sci., C 12 (1917) 301; Enum Philipp. Fl. Pl. 3 (1923) 387. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 392): *BS (Ramos) 26233* (lecto NY; isolecto K), Philippines, Luzon, Nueva Ecija prov., Mt Umingan.

Shrub, 2–6 m tall, 1–5 cm diam. *Stems* with an indumentum of hairs that are densely branched from a short central axis when young, this thinning as stems mature, lenticellate, a slight interpetiolar ridge present. *Leaves*: blades very narrowly to narrowly ovate or narrowly elliptic, 5–17.5 by 1.2–4.5(–5.8) cm, margins serrate, apex acuminate to caudate, base acute to shortly attenuate (rarely obtuse *Loher 4438*), both surfaces with simple and branched or stellate hairs when young, the upper surface either retaining an even covering of simple or laxly branched erect hairs or becoming ± glabrous, the lower surface either with branched and stellate hairs on the lamina, the hairs more densely branched and almost plumose on the veins, or with scattered stellate hairs remaining around the midrib or glabrous, both surfaces with numerous yellow sessile glands, the midrib and secondary nerve pairs raised; petioles 0.3–0.7 cm long, often with scattered hairs similar to those on young stems. *Inflorescences* positioned c. 1–3 mm above axil, peduncles 6–20 mm long, delicate, laxly branched, few-flowered, glabrous or with scattered hairs as stems and yellow sessile glands; bracts linear, 1–3 mm long; pedicels 1–3 mm long; bracteoles linear, up to 1 mm long. *Calyx* cupular, c. 1 mm long, with 4 very shallow lobes marked with slightly thickened tips, outer surface glabrous or with scattered stellate hairs, also with yellow sessile glands, inner surface glabrous. *Corolla* pinkish white, 2–3 mm long, divided into 4 lobes, these c. 1 mm long, often the edges of the lobes slightly fimbriate, outer surface glabrous, with yellow sessile glands, inner surface ± glabrous. *Stamens* 4, exserted for 1.5–2 mm; filaments 3–3.5 mm long; anthers elliptic, c. 1 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* maturing purple, 2–3 mm wide when mature (on dry specimen), outer surface glandular, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Philippines.

Habitat & Ecology — Hill forest, secondary forest, often on slopes. Altitude: 200–1200 m.

Notes — 1. *Callicarpa micrantha* can be distinguished by its delicate inflorescence, with long penduncles and fewer flowers, in combination with its narrow leaves. A number of different species names have been published with these characteristics (*C. elegans, C. phanerophlebia, C. albidotomentella*). Careful examination of the type material of these species, and other conspecific material, shows variation in leaf indumentum within these species, but via a continuum, making identification troublesome when all species are recognised. As a result, they are treated as synonyms of *C. micrantha* following Bramley (2013).

2. *Callicarpa micrantha* bears a strong resemblance to *C. japonica*, a species described by Thunberg for his Flora Japonica (for more detail see Atkins, Bot. Mag. 16 (1999) 79). *Callicarpa japonica* is one of the *Callicarpa* species popular in horticulture, and is characterised by its delicate inflorescence, stamens which dehisce by terminal pores (Chang's *Callicarpa* sect. *Verticirima*, Acta Phytotax. Sin. 1 (1951) 269) and serrate, glabrous to sparsely hairy leaves. The leaves of the type specimen are more or less elliptic in shape, acuminate at the apex and more or less attenuate at the base. Although there is much variation in leaf shape across the distribution of *C. japonica*, leaves can be elliptic, matching the Thunberg type, or very narrowly elliptic, matching more typical Philippine material. *Callicarpa micrantha* remains distinct since its anthers are smaller and more elliptic than those of *C. japonica*, and do not appear to dehisce through a terminal pore. Vegetatively, the Philippine material most closely matches the type of *C. japonica* var. *angustata* Rehder, since this variety has narrower leaves than the typical variety, but var. *angustata* has not been recognised in recent publications (e.g., Chen & Gilbert, Fl. China 17 (1994) 4–16), most likely due to the apparent variation in leaf shape between the typical and narrow-leaved forms.

37. Callicarpa pachyclada Quisumb. & Merr.

Callicarpa pachyclada Quisumb. & Merr., Philipp. J. Sci. 37 (1928) 195; Moldenke, Phytologia 21 (1971) 383; Phytologia 51 (1982) 165. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 394): *BS (Ramos & Edaño) 45640* (lecto K; isolecto A, B, BM, BO, NY), Philippines, Luzon, Nueva Vizcaya prov., Mt Alzapan.

Shrub or tree, to 3 m high (*PNH 78070*), 4 cm diam. (only recorded once). *Stems* with a dense indumentum of patent plumose hairs, the hairs with very short branches, obscuring the surface on younger stems, apparently rubbing away as the stems becomes woodier. *Leaves*: blades ovate to broadly elliptic, 24–32.5 by 19–20 cm, margins shallowly dentate to dentate, apex acute to shortly acuminate, base asymmetric or obtuse, upper surface ± glabrous, lower surface appearing paler, with a dense covering of pale interwoven branched hairs obscuring the surface, some hairs lengthening, becoming plumose and darkening as they do so, the venation raised; petioles 5–9 cm long, thick, indumentum as stems. *Inflorescences* inserted 0.5–1.5 cm above axils, peduncles 1.5–2 cm long, indumentum as stem, laxly branched at first but flowers then congested in terminal clusters, pedicels short; bracts 5–7 mm long, narrowly obovate, indumentum as stems, persistent, conspicuously subtending the congested terminal parts of the

inflorescence; pedicels c. 1 mm long; bracteoles narrowly obovate, 3–5 mm long, as bracts. *Calyx* cupular, 1.2–1.5 mm long, with 4 slight lobes marked by thickened tips, these tips with clusters of plumose hairs, the rest of the outer surface with scattered hairs and rarely peltate scales, inner surface glabrous. *Corolla* c. 2.5 mm long, divided into 4 lobes, these c. 1 mm long, the edges and outer surfaces fringed with papillae, otherwise outer surface glabrous, inner surface ± glabrous. *Stamens*, *stigma* and *ovary* not seen intact. *Fruit* c. 2 mm wide (on dry specimen), glabrous, with yellow sessile glands, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Endemic in the Philippines, Luzon (Nueva Vizcaya prov., Isabela prov., Sierra Madre Mts).

Habitat & Ecology — Dipterocarp forest undergrowth. Altitude: 150–1600 m.

38. *Callicarpa paloensis* Elmer

Callicarpa paloensis Elmer, Leafl. Philipp. Bot. 1 (1908) 336; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 387. — *Callicarpa pentandra* Roxb. var. *paloensis* (Elmer) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 14. — *Geunsia paloensis* (Elmer) H.J.Lam ex Moldenke, Phytologia 50 (1982) 361. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 394): *Elmer 7370* (lecto K; isolecto BO, GH, NY), Philippines, Leyte, Palo.

Erect tree, 9–15 m high, 30 cm diam. (only recorded once). *Stems* with a dense indumentum of branched hairs when young, the hairs appressed, obscuring the surface, when older stems woody, some remains of indumentum apparent; interpetiolar ridge present. *Leaves* often with apparently alternate ones between opposite pairs, sometimes ternate; blades narrowly elliptic, 9.5–17 by 3.5–6.5 cm, margins entire, apex acuminate, base attenuate, upper surface ± glabrous or occasionally with some branched hair along the sunken midrib especially on younger leaves, lower surface appearing paler, with a dense appressed indumentum of pale interwoven hairs obscuring the surface, individual hairs not visible to the naked eye, the venation raised, the larger veins with some appressed hair, peltate scales scattered on either side of midrib; petioles 1.5–3.5 cm long, drying wrinkled, indumentum as stems. *Inflorescences* axillary, subtended by alternate leaf, or in axils of opposite leaf pairs, or terminal, peduncles (1.5–)3–5.5 cm long, indumentum as young stems, laxly branching become more congested in terminal clusters; bracts linear, 1–4 by 0.5–1 mm; pedicels 1–1.5 mm long, with branched hairs; bracteoles as bracts. *Calyx* cupular, c. 1 mm long, margin undulate with 4 rounded lobes, outer surface with branched hairs except around the margin, covering but not obscuring surface, also with yellow sessile glands, inner surface glabrous. *Corolla* c. 2.5 mm long, divided into 4 lobes, these c. 0.5 mm long, outer surface glabrous, with yellow sessile glands, inner surface glabrous. *Stamens* 4; filaments c. 2.5 mm long, exserted 1–1.5 mm; anthers elliptic, c. 1 mm long. *Stigma* capitate. *Fruit* c. 4 mm wide when mature (on dry specimen), subtended by calyx, glabrous, with branched hairs appressed to surface and copious yellow sessile glands, also with occasional peltate scales; 4 1-seeded pyrenes.

Distribution — Endemic to the Philippines (Luzon: Mt Bulusan; Leyte).

Habitat & Ecology — In forests. Altitude: 300–350 m.

Notes — 1. *Callicarpa paloensis* was considered as *C. pentandra* var. *paloensis* by Bakhuizen van den Brink (1921). However, Bramley (2009) recognises *C. pentandra*

by its (4 or) 5 (or 6)-merous flowers, and 2-seeded cells in the ovary, characters which this 4-merous taxon does not apparently share. Where *C. pentandra* occasionally bears 4-merous flowers, they are usually rare and within inflorescences of predominately 5-merous flowers.

2. *Callicarpa paloensis* bears a greater resemblance to *C. subalbida* and allies in its leaf morphology, and although it shares some inflorescence characters, the terminal parts of the inflorescence are not so congested and the bracteoles are linear and less conspicuous than the narrowly obovate bracteoles in *C. subalbida* and allies.

39. Callicarpa pedunculata R.Br.

Callicarpa pedunculata R.Br., Prodr. (1810) 513; Moldenke, Phytologia 21 (1971) 376, 470; Phytologia 22 (1971) 202; Phytologia 33 (1976) 502; Phytologia 40 (1978) 473; Phytologia 51 (1982) 165. — Lectotype (designated by Munir, J. Adelaide Bot. Gard. 6 (1982) 30): *R.Brown s.n.* (*J.J. Bennett 2331*) (lecto BM; isolecto E, K, MEL, NSW), Australia, Coast of Northern Queensland.

Callicarpa formosana Rolfe, J. Bot. 20 (1882) 358; Moldenke, Phytologia 14 (1967) 223; Phytologia 15 (1967) 24; Phytologia 22 (1971) 198; Phytologia 50 (1982) 483; Tien T.Chen et al., Taiwania 43 (1998) 332. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 396): *R. Oldham 389* (lecto K), Taipei, Tamsui.

Callicarpa blancoi Rolfe, J. Linn. Soc., Bot. 21 (1884) 315. — Type: *plate in Blanco, Fl. Filip. (1837) Pl. 417*, labelled *C. americana*.

Callicarpa ovata C.B.Rob., Philipp. J. Sci., C 3 (1908) 215. — Type: *R.S. Williams 2577* (holo NY; iso NY, US), Philippines, Mindanao, Davao, Darong.

Callicarpa obtusifolia Merr., Philipp. J. Sci. 14 (1919) 451. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 396): *BS (Ramos) 32921* (lecto K; isolecto A), Philippines, Luzon, Ilocos Norte prov., Burgos.

Shrub, to 5 m high. *Stems* with an indumentum of dense plumose hairs, the surface ± obscured when young, the indumentum thinning as stems mature, a slight interpetiolar ridge resembling a stipule scar present. *Leaves* opposite; blades elliptic to narrowly elliptic to narrowly ovate, (2.5–)4.5–13.5 by (1.4–)2–6.5 cm, margins serrate to serrate-dentate, the teeth often with mucronate tips, apex shortly acuminate to acuminate to almost caudate, base shortly attenuate, cuneate, obtuse, less often rounded or truncate, sometimes slightly uneven, upper surface with erect stellate and branched hairs, evenly spaced, drying brownish, lower surface similar in colour or slightly paler, with an indumentum of dense stellate, branched and plumose hairs, either so interwoven and matted the lamina almost obscured, or less interwoven and the lamina visible, yellow sessile glands visible on the surface, sometimes with peltate scales scattered near the leaf base; petioles (0.3–)0.5–1.2 cm long, indumentum as stems. *Inflorescences* axillary, or inserted 1–2 mm above axil, general laxly branched, more congested in terminal parts, many-flowered, peduncles 8–21 mm long, almost as thick as petiole, indumentum as stem; bracts linear, 1–3 mm long, inconspicuous; pedicels 1–2 mm long, indumentum as stems; bracteoles as bracts. *Calyx* cupular, 0.5–1 mm long, with 4 shallow to narrowly triangular lobes marked with thickened tips, outer surface with stellate and branched hairs, rarely so thick the surface obscured, also with yellow sessile glands, inner surface ± glabrous. *Corolla* purple, 2–3 mm long, divided into 4 lobes, these c. 0.5 mm long, the edges of the lobes with tiny papillae, outer surface

glabrous, rarely with a few stellate hairs on the lobes, also with yellow sessile glands, inner surface ± glabrous. *Stamens* 4, exserted for 1.5–3 mm; filaments 4–5 mm long, arising near the base of the corolla tube; anthers elliptic, 0.3–0.75 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* green, maturing purple or reddish purple, c. 2 mm wide when mature (on dry specimen), outer surface glandular, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Thailand, Laos, Vietnam, Hainan, China, Taiwan, Okinawa island, Australia; in *Malesia*: Philippines, Moluccas, New Guinea.

Habitat & Ecology — Secondary and primary forest; forest edges and grasslands.

Notes — 1. *Callicarpa pedunculata* is one of few species in the genus with an extensive distribution in the Flora Malesiana region, although it is not present in the Malay Peninsula, Sumatra, Java and Borneo, unlike the two mostly widely distributed species, *C. longifolia* and *C. pentandra*. As found in the latter two species, there is significant variation in leaf shape within *C. pedunculata*, as well as a large number of synonyms.

2. *Callicarpa pedunculata* is most likely to be confused with *C. caudata* or *C. rubella*, from which it differs by its generally wider leaves and lack of glandular hairs; it also bears a resemblance to *C. longifolia*, but its inflorescence is more compact, its petioles shorter relative to its peduncles, and its fruits mature purple-pink, not white.

40. Callicarpa pentandra Roxb.

Callicarpa pentandra Roxb., Fl. Ind. 1 (1820) 409; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 387; Moldenke, Phytologia 50 (1982) 365; Bramley, Bot. J. Linn. Soc. 159 (2009) 443. — *Geunsia pentandra* (Roxb.) Merr., Philipp. J. Sci., C 11 (1916) 309. — *Callicarpa pentandra* Roxb. var. *typica* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 12, nom. inval., not autonym. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398): *collector uncertain* (lecto G-DC, barcode G00312486), Indonesia, Moluccas.

Geunsia farinosa Blume, Catalogus (1823) 12. — *Callicarpa pentandra* Roxb. forma *farinosa* (Blume) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 13. — Type: *Blume s.n.* (L), Indonesia

Callicarpa cumingiana Schauer in A.DC., Prodr. 11 (1847) 644. — *Geunsia cumingiana* (Schauer) Rolfe, J. Linn. Soc., Bot. 21 (1884) 315. — *Callicarpa pentandra* Roxb. var. *cumingiana* (Schauer) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 16. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398: *Cuming 1707* (lecto K; isolecto P), Philippines.

Callicarpa hexandra Teijsm. & Binn., Cat. Hort. Bot. Bogor. (1863) 410. — *Geunsia hexandra* (Teijsm. & Binn.) Koord., Meded. Lands Plantentuin 19 (1898) 559. — *Callicarpa pentandra* Roxb. forma *hexandra* (Teijsm. & Binn.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 13. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398): *de Vriese & Teijsmann s.n.* (lecto L), Celebes [Sulawesi], Menado, Minahassae.

Callicarpa affinis Elmer, Leafl. Philipp. Bot. 3 (1910) 864. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398): *Elmer 11102* (lecto K; isolecto GH, L 2 sheets, NY, US), Mindanao, Davao district, Todaya (Mt Apo).

Geunsia hookeri Merr., Philipp. J. Sci., C 7 (1912) 342. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398): *Cuming 1773* (lecto K; isolecto GH, K, L), Philippines, Cebu.

Callicarpa weberi Merr., Philipp. J. Sci., C 12 (1917) 298. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398): *Weber 68* (lecto A), Philippines, Bancalan Island.

Geunsia subternata Hallier f., Meded. Rijks-Herb. 37 (1918) 25. — *Callicarpa subternata* (Hallier f.) Govaerts, World Checkl. Seed Pl. 3, 1 (1999) 12. — Type: *Amdjah 973* (holo L; iso BO), Borneo, Sungei Tikung.

Geunsia serrulata Hallier f., Meded. Rijks-Herb. 37 (1918) 27. — *Callicarpa serrulata* (Hallier f.) Govaerts, World Checkl. Seed Pl. 3, 1 (1999) 12. — Type: *Hallier f. 801* (holo L; iso BO 3 sheets), Borneo, Gebiet des Sambasstromes [area of Sambas rivers].

Geunsia anisophylla Hallier f., Meded. Rijks-Herb. 37 (1918) 29. — *Geunsia serrulata* Hallier f. forma *anisophylla* (Hallier f.) Moldenke, Phytologia 50 (1982) 378. — Type: *Hallier f. B2741* (holo L; iso BO 3 sheets), Borneo, Müllergebirge.

Geunsia pullei H.J.Lam, Verbenaceae Malayan Archipel. (1919) 35. — *Callicarpa pullei* (H.J.Lam) Govaerts, World Checkl. Seed Pl. 3, 1 (1999) 12. — Type: *Pulle 261* (holo L; iso BO, Z), West Papua [West Irian], near Kloofbivak.

Geunsia cumingiana (Schauer) Rolfe var. *pentamera* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 36. — Syntypes: *Unknown* (not found), Philippines, Daraga, Com. d.l. Fl. for. no 844 (not found); *Gjellerup 416a*, *416b*, *416c* (all BO n.v.), New Guinea, Hollandia; *Nyman 52* (BO n.v.), Stephansort; *Weinland s.n.* (BO n.v.), Kaiser Wilhelmsland.

Callicarpa longivillosa Merr., Philipp. J. Sci. 17 (1920) 313. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398): *BS (Ramos & Pascasio) 34538* (lecto K; isolecto BM, BO) Philippines, Mindanao, Surigao prov.

Callicarpa pentandra Roxb. var. *paloensis* (Elmer) Bakh. forma *furfuracea* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 15. — *Geunsia furfuracea* (Bakh.) Moldenke, Amer. J. Bot. 32 (1945) 612. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398): *L. van Vuuren & Noerkas 425* (lecto BO; isolecto K, L), Indonesia, Celebes [Sulawesi], Kp. Tapalang Mamoedjoe.

Callicarpa pentandra Roxb. var. *cumingiana* (Schauer) Bakh. forma *dentata* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 17. — *Callicarpa cumingiana* Schauer var. *dentata* (Bakh.) Moldenke, Phytologia 5 (1954) 8. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 398): *Backer 4611* (lecto BO; isolecto BO), Java, Noesa Kembangan.

Callicarpa ridleyi S.Moore, J. Bot. 63, Suppl. (1925) 80. — Type: *H.O.Forbes 272* (holo BM), Java, Mt Salak.

Geunsia hexandra (Teijsm. & Binn.) Koord. var. *macrophylla* Moldenke, Phytologia 49 (1981) 430. — Type: *SAN (Fedilis & Sumbing) 89702* (holo SAN; iso K), Malaysia, Sabah, Tawau district, Luasong.

Geunsia farinosa Blume var. *callicarpoides* H.J.Lam ex Moldenke, Phytologia 50 (1982) 220. — Type: *unknown collector 1343* (holo L), Kalimantan.

Shrub or tree, to 20 m high, 2–35 cm diam.; outer bark light brown, ± smooth; inner bark yellowish, fibrous. *Young branches/twigs* with a dense indumentum of brown plumose or short-branched hairs, often farinose, or longer, patent hairs that appear simple but with numerous short branches at the base, also with yellow sessile glands. *Leaves* often with apparently alternate ones between opposite pairs; blades narrowly elliptic to elliptic to narrowly ovate to almost ovate, 11–29 by 4–15 cm, margins ± entire to shallowly dentate, apex markedly to shortly acuminate, base acute to attenuate, rarely almost rounded, truncate or cordate, upper surface variable, either ± glabrous, or with hairs present along the midvein only, or with simple hairs and hairs that are branched near the base, or farinose, with scattered branched hairs, these present especially when young, lower surface variable, either with an indumentum of short-branched hairs on the venation only (including tertiary), or on the lamina and the venation, forming a raised layer but not obscuring the lamina surface, or with a dense pale coloured indumentum of matted plumose hairs on the lamina, often the individual hairs not visible to the naked eye, in this case the leaves discolorous, in all cases also with yellow sessile glands, occasionally peltate scales present on either side of the midrib towards the leaf base; petioles 1.5–3.5 cm long, indumentum as twigs. *Inflorescences* axillary, sometimes appearing terminal, peduncles 40–90 mm long, indumentum as stem; pedicels 2–2.5 mm long,

indumentum as stems; bracts and bracteoles inconspicuous, linear, 0.2–10 mm long. *Calyx* cupular, 1–2(–3) mm long, ± truncate or with (4 or) 5 (or 6) shallow triangular lobes, outer surface densely covered with short-branched or ± plumose hairs, in the latter case the surface obscured, also with yellow sessile glands and occasional peltate scales, inner surface ± glabrous. *Corolla* purple, sweetly scented, 4–6 mm long, divided into (4 or)5(or 6) lobes, these 1–2 mm long, often reflexed, outer surface with short hairs or papillae and yellow sessile glands, sometimes also with longer branched hairs, inner surface ± glabrous or papillose, especially on the lobes. *Stamens* (4 or) 5 (or 6), exserted for 4–5 mm; filaments purple, 5.5–8.5 mm long; anthers oblong, 1.5–3 mm long. *Stigma* capitate, divided into (4 or) 5 (or 6) small lobes, surface glandular. *Fruit* green, maturing red, 2–5 mm wide (on dry specimen), slight depression near apex, outer surface glandular, subtended by the calyx, calyx usually breaking open as fruit matures or only partially enclosing fruit if remaining intact; (8 or) 10 (or 12) 1-seeded pyrenes. — **Plate 1h.**

Distribution — Southern Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo, Java, the Philippines, Sulawesi, the Moluccas, New Guinea, ?Solomon Islands.

Habitat & Ecology — Grows mainly in disturbed areas such as roadsides, occasionally found in secondary forest or along margins of primary forest. Altitude: 15–1500 m. Birds have been observed eating the fruits.

Vernacular name — Philippines: Layaupan [Bagubo] (Merrill, Enum. Philipp. Fl. Pl. 3 (1923) 387).

Uses — Wood is used for parang handles and in construction across its distribution. Some collectors record fruit as being edible.

Notes — 1. *Callicarpa pentandra* has traditionally been distinguished by its 5-merous flowers; as noted previously (Bramley 2009: 443), it is not uncommon to find both 4-merous, 5-merous and 6-merous flowers on the same tree; 4-merous flowers are more common in the south of the Philippines and New Guinea.

2. *Callicarpa pentandra* is a variable species, especially in the leaf shape and indumentum. In order to make sense of this variation, Bakhuizen (1921) recognised three varieties in *C. pentandra*, each consisting of various forms, all based on differences in indumentum. According to Bakhuizen (1921), '*C. pentandra* var. *typica'* has glabrous upper leaf surfaces, with lower leaf surfaces with a farinose indumentum that can be rubbed off; var. *cumingiana* has hairs on both upper and lower leaf surfaces; var. *paloensis* has glabrous upper leaf surfaces and lower leaf surfaces with stellate hairs which can easily be rubbed off and appressed hairs that cannot easily be removed.

These differences in leaf indumentum are evident across the broad distribution of *C. pentandra*, and can be often linked to leaf shape: leaves that are elliptic or narrowly elliptic have more of a tendency to bear a shorter, matted, less conspicuous indumentum; leaves that are narrowly ovate to almost ovate tend to be markedly acuminate and bear a conspicuous indumentum of longer hairs: this form represents what Schauer described as *C. cumingiana* from the southern Philippine islands, and is more common in the eastern parts of the species range; Merrill's *C. longivillosa* also matches this form, having particularly long hairs. On first examination of the extreme forms it is tempting to conclude that more than one taxon is represented; however, intermediates displaying various combinations of these characters exist, linking the extremes, diminishing the

possibility of applying intraspecific ranks that are easy to distinguish. I therefore do not consider Bakhuizen's division of *C. pentandra* to be useful and do not recognise it here.

The '*cumingiana*' form of *C. pentandra* has its most westerly distribution in the south of the Philippines, and becomes the dominant form in the eastern part of the species range. Most specimens examined from New Guinea can be characterised by their ovate or narrowly ovate, markedly acuminate leaves, and by their indumentum, which is plumose on the stems, petioles and inflorescence axes, and branched on the lower leaf surfaces, the hairs forming a raised layer over, but not obscuring the lamina surface. This form tends to have a greater proportion of 4-merous flowers, and hence 8-seeded fruit, than those found in the west of the distribution, which have more 5-merous flowers and 10-seeded fruits. Material seen from the Solomon Islands is distinct to the material seen from New Guinea: the indumentum is not as described above, the leaves only having some short hairs on the venation, and the leaves are more often elliptic than ovate in shape. In addition, some specimens examined appeared to have 6 stamens and 6 seeds in the fruit: this implies the character thought to apply to those species once considered as '*Geunsia*', that of bimerous ovules, does not apply to these plants.

I have not seen much material collected from Sulawesi, but from my observations there are two forms here: the typical form with elliptic leaves and a matted, less conspicuous indumentum and a form similar to the '*cumingiana*' form described above. I have seen two examples of the typical form which have three corolla lobes but five stamens; in these specimens the corolla is smaller than typical being c. 3 mm rather than 4–6 mm long.

3. For notes on the typification of *C. pentandra* I refer to Bramley (2013).

41. Callicarpa platyphylla Merr.

Callicarpa platyphylla Merr., Philipp. J. Sci., C 13 (1918) 57; Enum. Philipp. Fl. Pl. 3 (1923) 387. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 402): *FB (Velasco) 26967* (lecto A; isolecto US), Luzon, Cagayan prov., Pamplona.

Tree, to 14 m high, to 20 cm diam. *Stems* woody and quadrangular when mature, lenticellate, some remains of an appressed brownish indumentum of branched hairs present, younger stems not seen; distinct ridges resembling stipule scars visible between the petioles. *Leaves* in equal to subequal pairs; blades elliptic to broadly elliptic, 21–30 by 9–18 cm, margins entire or shallowly dentate, apex shortly acuminate, base shortly attenuate, forming a slight wing down the petioles, or markedly asymmetric, upper surface ± glabrous, lower surface appearing paler, with a dense appressed indumentum of pale interwoven hairs obscuring the surface, individual hairs not visible to the naked eye, the venation raised, the larger veins with some appressed hairs, peltate scales scattered on either side of midrib and the larger veins; petioles 3–6.5 cm long, indumentum as stems. *Inflorescences* axillary, peduncles 0.5 (in tight bud)–3 cm long, indumentum as stem; bracts not seen clearly; pedicels c. 1 mm long; bracteoles linear, 1–3 mm long. *Calyx* cupular, c. 1.5 mm long, ± truncate or with 4 slight lobes barely visible, marked by veins running down the tube from tiny tips, outer surface with some branched hairs especially around the base near the top of the pedicel, inner surface glabrous. *Corolla*

greenish yellow (*Co 3464*), seen in bud only (*PNH (Castro) 6496*), 2.5–3 mm long, divided into 4 lobes, the edges and outer surfaces fringed with papillae, otherwise outer surface glabrous, inner surface ± glabrous. *Stamens* seen in bud only; anthers c. 1.5 mm long. *Stigma* seen in bud only, capitate. *Fruit* not seen.

Distribution — Philippines (Polillo Islands; Isabela province of Luzon (Sierra Madre mountains)).

Habitat & Ecology — In forests. Altitude: 30–50 m.

42. Callicarpa plumosa Quisumb. & Merr.

Callicarpa plumosa Quisumb. & Merr., Philipp. J. Sci. 37 (1928) 196; Moldenke, Phytologia 21 (1971) 463; Phytologia 22 (1971) 205; Phytologia 33 (1976) 504; Phytologia 40 (1978) 473; Phytologia 51 (1982) 167. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 403): *BS (Ramos & Edaño) 46928* (lecto K; isolecto A, B, BM, BO, NY, US), Philippines, Luzon, Isabela prov., San Mariano.

Shrub, to 2 m high. *Stems* with dense grey-brown indumentum of patent plumose hairs, the hairs sometimes becoming darker near the tips, the surface obscured. *Leaves*: blades narrowly elliptic, 22–27 by 7.7–8.5 cm, margins entire or rarely shallowly dentate, apex acuminate, base acute to rounded, upper surface ± glabrous, lower surface completely obscured by a pale indumentum of branched interwoven hairs, some becoming longer and plumose, darkening towards the tips; petioles 2.5–3 cm long, indumentum as stems, drying wrinkled. *Inflorescences* axillary, laxly branched at first but flowers then congested in terminal clusters, pedicels short; peduncles 15–20 mm long, indumentum as stems; bracts very narrowly ovate, 5–7 mm long; pedicels up to 1 mm long, obscured by indumentum; bracteoles very narrowly ovate or very narrowly obovate, 1–5 mm long, conspicuously subtending the congested terminal parts of the inflorescence. *Calyx* cupular, 1–1.5 mm long, almost truncate, sometimes 4 shallow triangular lobes visible but indumentum generally obscuring apex, outer surface with dense indumentum as stems and inflorescence axes, the surface obscured, inner surface glabrous. *Corolla* c. 5 mm long, divided into 4 rounded lobes, these c. 1 mm long, outer surface glabrous with the occasional branched hair, the edges of the lobes with tiny papillae, inner surface ± glabrous. *Stamens* 4, exserted for 1–2 mm; filaments 3–5 mm long; anthers elliptic, c. 1.5 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* seen only when immature, c. 1.5 mm wide (on dry specimen), glandular, subtended by calyx; 4 1-seeded pyrenes.

Distribution — Endemic to the Philippines (Luzon: Isabela province).

Habitat & Ecology — Along forested streams. Altitude: c. 50 m.

Note — Resembling *C. erioclona*, indeed the type specimen was determined as that species by Bakhuizen (in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 19). However, the leaves of *C. plumosa* are generally entire rather than dentate, the indumentum on its lower leaf surface is much thicker, and its corolla is larger (c. 5 mm vs 1.5–2.5 mm long).

43. Callicarpa pseudoverticillata Bramley

Callicarpa pseudoverticillata Bramley, Kew Bull. 67 (2012) 219. — Type: *E.F. de Vogel 5703* (holo K; iso L), South Sulawesi, Soroako, S Shore of Lake Matano, S2°31' E121°21'.

Treelet to small tree, up to 6 m high. *Twigs* with a dense indumentum of patent brown hairs, 2–3 mm long, branched at the base only or with small branches occurring along the length of the hair. *Leaves* in pseudo-whorls of four, three leaves ± equal in size, the fourth much smaller; larger blades ± elliptic, rarely ovate, 9.5–19 by 4.5–8.5 cm, the fourth smaller blade ovate, 3–8.5 by 1.3–4.3 cm, in all blades the margins entire to minutely dentate, apex acuminate, base obtuse to rounded, upper surface with scattered erect simple hairs with thickened bases, these dense along the impressed venation, with peltate scales scattered over the surface but more regularly clustered around the base, lower surface with branched hairs and copious yellow sessile glands on the surface, darker brown and more densely branched hairs covering the venation, venation raised, also with scattered peltate scales more apparent near leaf base; petioles of larger leaves 1–1.5 cm long, of the fourth smaller leaf 0.5–0.8 cm long. *Inflorescences* in the axils of each of the four leaves in a pseudowhorl, peduncles 1–4.5 cm long; bracts linear, 7–15 mm long, indumentum as stems; pedicels 1–1.5 mm long; bracteoles linear, 1–7 mm long. *Calyx* cupular, c. 2 mm long, with 5 or 6 (or 8) shallowly triangular lobes, outer surface densely covered with branched hairs, not dense enough to obscure the surface, yellow sessile glands and occasional peltate scales; inner surface glabrous. *Corolla* purple, 6–7 mm long, divided into 5 or 6 lobes, these 1–2 mm long, outer surface with a few hairs and yellow sessile glands on the backs of the lobes, the lobe edges papillose, the remainder of the corolla tube glabrous, inner surface ± glabrous. *Stamens* 5 or 6; filaments exserted c. 1–2 mm from corolla; anthers oblong, c. 2–2.5 mm long, yellow sessile glands on the connective. *Stigma* capitate, sometimes with three lobes obvious. *Fruit* green maturing red or orange, 2–4 mm wide (on dry specimen), with scattered short branched hairs and copious yellow sessile glands, subtended by persistent calyx; 6 1-seeded pyrenes.

Distribution — Endemic in Sulawesi Selatan (Southern) (area around Lake Matano and Lake Towuti).

Habitat & Ecology — Ultramafic soils; disturbed *Lithocarpus* forest, alluvial flat, waterfront along lake and coastal forest. Altitude: 400–500 m.

Note — It is the leaf arrangement that sets this species apart from the others in the genus: leaves are in pseudowhorls of four, three of them being more or less equal in size, and one being significantly smaller. The inflorescence is similar to the widespread and variable *C. pentandra*, especially the form of the corolla. However, although the corolla morphology is similar, the fruit of *C. pseudoverticillata* apparently has only 6 1-seeded pyrenes, rather than the typical 8 or 10 1-seeded pyrenes of *C. pentandra*. In addition, there is variation in the number of calyx lobes that does not always correspond with the number of corolla lobes, or the number of anthers: for example, a calyx has been found with 8 lobes but the associated corolla has only 6 lobes, and 6 stamens. The 3-lobed stigma is also unusual.

44. Callicarpa ramiflora Merr.

Callicarpa ramiflora Merr., Philipp. J. Sci., C 3 (1908) 262; Enum. Philipp. Fl. Pl. 3 (1923) 387; Moldenke, Phytologia 21 (1971) 469; Phytologia 40 (1978) 474; Phytologia 51 (1982) 167. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 403): *M.S. Clemens 1167* (lecto US), Philippines, Mindanao, Lanao del Sur, Lake Lanao, Camp Keithley.

Callicarpa cauliflora Merr., Philipp. J. Sci., C 7 (1912) 338; Enum. Philipp. Fl. Pl. 3 (1923) 383; Moldenke, Phytologia 16 (1968) 363; Phytologia 21 (1971) 332, 470; Phytologia 33 (1976) 399; Phytologia 50 (1982) 293; Phytologia 51 (1982) 206. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 403): *FB (Whitford & Hutchinson) 9321* (lecto US), Philippines, Mindanao, Zamboanga, Port Banga.

Shrub. *Stems* with a dense indumentum of plumose hairs, obscuring the surface, apparently rubbing away as the stems becomes woodier. *Leaves*: blades ± elliptic, 16–23 by 6.5–13 cm, margins dentate, apex shortly acuminate, base rounded to obtuse, occasionally slightly asymmetric, upper surface ± glabrous but with plumose hairs along the sunken midrib and secondary nerve pairs, lower surface appearing vesiculose, the venation raised, the lamina with stellate and plumose hairs, the larger veins with more densely branched plumose hairs; petioles 1–2 cm long, indumentum as young stems. *Inflorescences* rarely axillary, more often on the stems in axils of fallen leaves, ± sessile, congested; bracts inconspicuous, linear to very narrowly ovate, up to 2 mm long, indumentum as stems; pedicels c. 2 mm long; bracteoles linear to very narrowly ovate, up to 2 mm long. *Calyx* cupular, c. 3 mm long, with 4 subulate to narrowly triangular lobes, outer surface with plumose hairs, these so dense the surface obscured, inner surface glabrous. *Corolla* 7–8 mm long, divided into 4 lobes, these c. 2 mm long, outer surface with dense branched appressed hairs except towards the base and the edges of the lobes which are glabrous, inner surface ± glabrous. *Stamens* 4; filaments c. 4.5 mm long, exserted 1–1.5 mm; anthers oblong, c. 2 mm long, at connective attachment with numerous yellow sessile glands. *Stigma* capitate, c. 1 mm wide, surface glandular; ovary with branched hairs when immature. *Fruit* 3–4 mm wide (on dry specimen), glabrous, with yellow sessile glands, subtended by calyx; 8 1-seeded pyrenes.

Distribution — Endemic to the Philippines (Mindanao, Leyte, Samar, Catanduanes).

Habitat & Ecology — In forest. Altitude: low to 700 m.

Note — *Callicarpa ramiflora* is distinct because of its congested, cauliflorous/ramiflorous inflorescence and its large, ferruginously hairy leaves. Merrill also described *C. cauliflora* (1912), which he distinguished using similar characters; he recognised its resemblance with *C. ramiflora* but said it had a quite different indumentum. The type specimen of *C. ramiflora* was collected from Lake Lanao, Mindanao, and the type specimen of *C. cauliflora* collected from Port Banga, an anchorage at the start of the southern coastline of the Zamboanga peninsula. Merrill (1923) identifies two further collections as *C. ramiflora*, but these are from further North (Catanduanes, Leyte). Merrill does not identify any further collections of *C. cauliflora*, but a number of other collections examined have been labelled with this name: they are also from islands to the north of Mindanao (Samar, Catanduanes, Leyte). Although Merrill (1912) distinguishes *C. cauliflora* and *C. ramiflora* on the basis of indumentum, I have not noticed any significant difference between the types, or within the specimens matching both types. Given that there is no apparent difference between specimens and that both species are similarly distributed, I treat *C. cauliflora* as a synonym of *C. ramiflora* (the earlier published name).

45. **Callicarpa rubella** Lindl.

Callicarpa rubella Lindl., Bot. Reg. 11 (1825) t. 883; Walp., Repert. Bot. Syst. 4 (1845) 130; Schauer in A.DC., Prodr. 11 (1847) 645; C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 569; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 53; H.R.Fletcher, Bull. Misc. Inform. Kew (1938) 414; C.H.Chang, Acta Phytotax. 1 (1951) 296; Moldenke, Fifth Summary Verbenac. 1 (1971) 294; Phytologia Mem. II (1980) 284; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 302. — Lectotype (designated by Leerat. et al., Thai Forest Bull., Bot. 37 (2009) 55): *Potts s.n.* (lecto CGE), China.

Callicarpa brevipetiolata Merr., Philipp. J. Sci. 14 (1919) 249. — Type: *Bartlett & La Rue 323* (iso GH, L, US), Indonesia, Sumatra, East Coast, Karoland, Kampong Bintang Mariah.

Shrub or scandent shrub, 1–3 m high; bark, greyish brown or brown, scaly. *Branches* greenish violet or pale violet, obtusely 4-angled, with dense pale brownish violet branched hairs and shorter stellate hairs when young, becoming brownish grey or brown, the hairs becoming less dense, also with several large lenticels. *Leaves*: blades very narrowly elliptic to broadly elliptic, or oblong, 7–20 by 2–5 cm, margins serrate, apex caudate or acuminate, base cordate or oblique-cordate, entire towards base, upper surface with moderate to sparse indumentum of brown simple and branched hairs, sometimes the hairs bifid, also with yellow sessile glands, the midrib flattened or shallowly sunken with dense brown branched hairs, the lower surface with dense to moderate indumentum of yellowish brown or brown branched and shorter stellate hairs or simple hairs and gland-tipped hairs, also with yellow sessile glands or scattered brown peltate scales, midrib and venation prominent; petiole 0.2–1 cm long, shallowly furrowed on upper part, or sometimes leaves sessile. *Inflorescences* axillary, lax, 1.5–4 cm long, peduncles slender, 1–2 cm long, longer than petiole, pale violet; bracts linear, 3–4 mm long, caducous; pedicels slender, 0.5–1.5 mm long; bracteoles linear or elliptic-linear, 0.2–2 mm long. *Calyx* greenish violet or pale violet, cup-shaped, 1–1.2 mm long, divided into 4 minute ovate-triangular teeth 0.1–0.2 mm long, outer surface with stellate hairs, also with yellow sessile glands, inner surface glabrous. *Corolla* violet or pinkish violet, 2–2.7 mm long, divided into 4 lobes, these ovate or oblong-ovate, 0.5–1 mm long, outer surface with scattered simple and stellate hairs, also with scattered yellow sessile glands, the lobes ciliate or with glandular hairs at margins. *Stamens* 4, long exserted, filaments violet-white, slender, 3–6 mm long, anthers yellow, elliptic, 0.7–1 mm long. *Stigma* capitate. *Fruit* green or violet green when young, ripening pinkish violet or violet, 2–3.5 mm long, glabrous, outer surface with yellow sessile glands; subtended by saucer-shaped persistent calyx; 4 1-seeded pyrenes.

Distribution — India, Bangladesh, Bhutan, Myanmar, China, Taiwan; in *Malesia*: Peninsular Malaysia (Pahang), Singapore, Sumatra, Java, Sulawesi.

Habitat & Ecology — Forest edges and wooded hillsides.

46. **Callicarpa saccata** Steenis

Callicarpa saccata Steenis, Blumea 15 (1967) 147; Bramley, Bot. J. Linn. Soc. 159 (2009) 446. — Type: *S (Sibat ak. Luang) 23637* (holo L), Malaysia, Sarawak, Bukit Iju, Ulu Arip, Balingian.

Small tree, to 5 m high, 5–25 cm diam. *Stems* when young with a dense indumentum of short branched red-brown hairs, and longer spreading red-brown hairs of 3–6 mm long, becoming woody and ± glabrous as they mature, often encrusted with bryophytes.

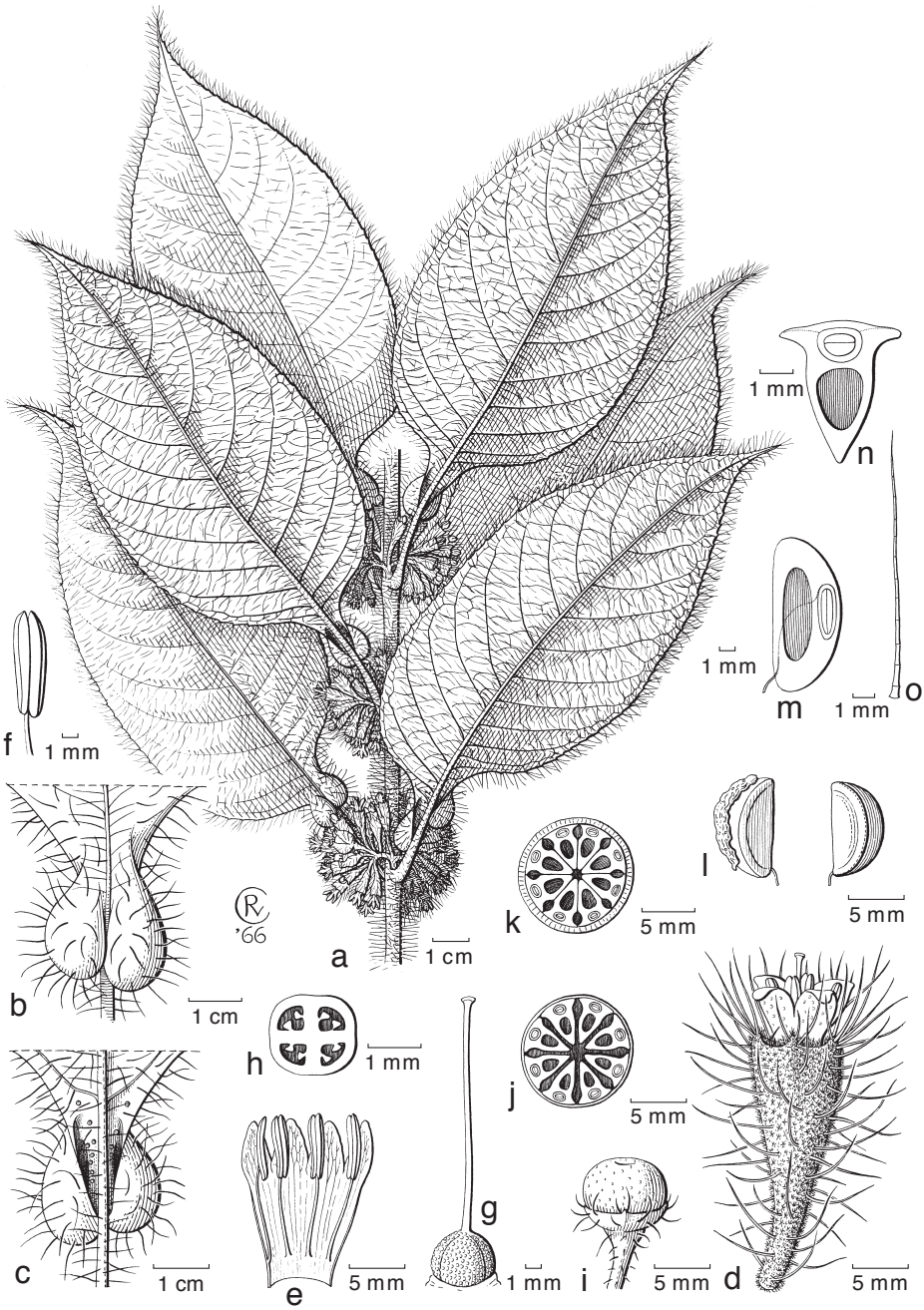

Fig. 7. *Callicarpa saccata* Steenis. a. Habit; b, c. leaf base with glands; d. flower; e. opened corolla; f. stamen; g. ovary and style; h. section of young ovary; i. fruit; j, k. sections of fruit; l. mericarps (pyrene), one with remains of pericarp; m. lengthwise section of pyrene; n. cross-section of fruit; o. hair (a–h, j, l–o: *S (Sibat ak Luang) 23637*; i: *S (Ashton) 18286*; k: *Haviland 3549*; all L). Drawing by Ruth van Crevel, 1966.

Leaves in equal or subequal pairs; blades ± elliptic, rarely cordate, 7–30 by 4.5–12 cm, margins minutely dentate, ciliate, apex acute to acuminate, base auriculate, the lobes sac-like and inhabited by ants, upper surface with long appressed hairs of 3–6 mm long and thickened at the base, lower surface with an indumentum of short branched hairs close to the surface, also with longer spreading hairs of 3–6 mm long, especially dense on the raised midrib and secondary venation, also with yellow sessile glands and peltate scales scattered around the midrib and the base; petioles 0.8–3 cm long, indumentum as stems. *Inflorescences* axillary or cauliflorous on mature stems, when cauliflorous the main axis condensed, thick and corky, close to stem, when axillary (on younger stems) more lax, peduncles up to 5 cm long, indumentum as stem; bracts inconspicuous; pedicels variable in length, 3–10 mm long, tending to be longer on cauliflorous inflorescences, indumentum as stems; bracteoles 0.5–1 mm long, inconspicuous. *Calyx* cup-shaped, 2–5 mm long, with 4 or 5 shallow lobes, outer surface densely covered with short branched hairs, also with longer simple hairs to 5 mm long, these more dense on venation, inner surface ± glabrous, with some sessile glands. *Corolla* white, 6–7 mm long, divided into 4 or 5(–7) lobes, these c. 2.5 mm long, outer surface with yellow sessile glands, inner surface ± glabrous. *Stamens* 4 or 5(–7), only the anthers exserted for c. 2 mm; filaments 4 mm long; anthers oblong, c. 2 mm long. *Stigma* capitate, c. 1.5 mm wide, surface glandular. *Fruit* green, maturing red, 2–5 mm wide, outer surface glandular, subtended by calyx or sometimes the calyx remaining more intact and surrounding the fruit; 8 1-seeded pyrenes. — **Fig. 7.**

Distribution — Endemic to Borneo (Kalimantan Barat and Sarawak).

Habitat & Ecology — Primary forest, sometimes near streams. Altitude: 50–500 m.

Note — This species is remarkable due to the enlarged leaf bases which are inhabited by ants.

47. Callicarpa scandens (Moldenke) Govaerts

Callicarpa scandens (Moldenke) Govaerts, World Checkl. Seed Pl. 3, 1 (1999) 12; Bramley, Bot. J. Linn. Soc. 159 (2009) 447. — *Geunsia scandens* Moldenke, Phytologia 49 (1981) 430. — Type: *SAN (Aban & Petrus) 90680* (holo SAN; iso K), Sabah, Kinabatangan, Ulu Sungei Lokan.

Shrub or small tree, to 6 m high, 2–7 cm diam.; outer bark brown, lenticellate; inner bark green-yellow to grey-brown; sapwood pale yellow or white. *Twig* surface obscured by a dense grey-brown indumentum of short stellate hairs and longer plumose hairs when young, becoming woodier and ± glabrous as they mature. *Leaves*: blades ± obovate, less commonly elliptic, 25–48 by 11–21 cm, margins ± entire, apex acuminate to acute, base attenuate almost to stem, upper surface ± glabrous, lower surface with an indumentum of short, ± stellate hairs close to the surface of the lamina, the venation raised, with greyish brown plumose hairs, surface obscured, also with yellow sessile glands; petioles 1–3 cm long, indumentum as young twigs. *Inflorescences* cauliflorous or ramiflorous, peduncles 1.5–3 cm long, indumentum as young twigs; bracts linear, 2–3 mm long; pedicels 1–2 mm long, indumentum as young stems; bracteoles linear, c. 1 mm long. *Calyx* narrowly cupular, c. 1 mm long with 4 shallow lobes, outer surface with some short hairs at lobe tips, occasional peltate scales, these c. 0.5 mm diam., also with yellow sessile glands, inner surface ± glabrous. *Corolla* pale pink, 2–5 mm long,

divided into 4 lobes, these 0.5–1 mm long, outer surface with tiny papillae, inner surface ± glabrous. *Stamens* 4, exserted for 2–2.5 mm; filaments 2.5–6 mm long; anthers yellow, narrowly ovate, 0.8–1.5 mm long, elliptic. *Stigma* capitate, surface glandular. *Fruit* greenish pink, maturing purple, 2–3 mm wide (on dry specimen), outer surface glandular, subtended by the calyx, most of which broken away, sometimes the calyx remaining more intact; 4 1-seeded pyrenes.

Distribution — Endemic to Borneo (Kalimantan: Nunukan island); Sabah (Lahad Datu, Kinabatangan, Sandakan, Kalabakan).

Habitat & Ecology — Usually found in primary dipterocarp forest, occasionally on forest margins.

Note — Moldenke described this species as a climber, based on the type only. Actually it is a small tree, often with rather arching branches. The grey-brown plumose indumentum is conspicuous, as are the large leaves and pale pink flowers.

48. *Callicarpa subaequalis* Bramley

Callicarpa subaequalis Bramley, Bot. J. Linn. Soc. 159 (2009) 449. — Type: *Kessler PK 2650* (holo L; iso A, BO, E), Indonesia, Kalimantan Timur, Long Iram subdistrict, Maruwai, block Lampunut.

Small tree, 4–5 m high, 2–5 cm diam. *Twigs* with patent red-brown hairs, 3–10 mm long, with many short hairs arising from the hair bases, woodier thicker stems less hairy. *Leaves* often in subequal pairs; blades elliptic, 10–30 by 7–16 cm, margins dentate, apex acute, base somewhat asymmetric, acute, upper surface with simple ± erect hairs, the midrib depressed with dense hairs in the furrow, lower surface with pale stellate hairs on the lamina, darker longer simple hairs on the raised veins, also with yellow sessile glands; petioles 1–5 cm long, indumentum as stems. *Inflorescences* axillary or in axils of fallen leaves, shortly pedunculate, peduncles up to 1 cm long, axes with short brown stellate hairs and occasional longer simple hairs, flowers generally laxly spaced; bracts linear, 1–2 mm long, with short hairs; pedicels 2–5 mm long; bracteoles as bracts. *Calyx* narrowly cupular, 4–5 mm long, divided into 4 triangular lobes, c. 0.5 mm long, outer surface with stellate hairs and occasional longer simple hairs, the hairs more dense on the slight ridges that lead to lobe tips, this becoming more conspicuous as fruit matures, also with some peltate scales near the lobes, inner surface ± glabrous. *Corolla* white, c. 5 mm long, divided into 4 lobes, these c. 2 mm long, outer surface with numerous yellow sessile glands on the lobes, the edges of the lobes with short papillae, inner surface ± glabrous. *Stamens* 4, exserted 0.5–1 mm; filaments c. 3 mm long; anthers oblong, 2–2.5 mm long. *Stigma* capitate, glandular. *Fruit* green, maturing red, 4–5 mm wide (on dry specimen), covered with sessile glands, half enclosed by the persistent calyx; 8 1-seeded pyrenes.

Distribution — Apparently endemic to Borneo (Kalimantan Timur: Gunung Namuk).

Habitat & Ecology — Primary dipterocarp forest with kerangas patches, sometimes disturbed. Altitude: 280–310 m.

Note — Vegetatively resembling *C. argentii*, but differing in the calyx indumentum and inflorescence structure. Could be confused with *C. saccata*, but lacks the auriculate, ant-inhabited leaf bases and has tougher leaves and a different calyx structure and indumentum. Only known from two collections.

49. Callicarpa subalbida Elmer

Callicarpa subalbida Elmer, Leafl. Philipp. Bot. 1 (1908) 337; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 388; Moldenke, Phytologia 22 (1971) 16; Phytologia 51 (1982) 207; Bramley, Kew Bull. 68 (2013) 404. — *Callicarpa erioclona* Schauer var. *subalbida* (Elmer) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 19. — Lectotype (designated by Bramley 2013): *Elmer 9184* (lecto K; isolecto L, NY, Z), Luzon, prov. Tayabas, Lucbon.

Suberect shrub, c. 4 m high. *Stems* with a dense pale indumentum of branched hairs when young, the hairs appressed, obscuring the surface, older stems woody, some remains of indumentum apparent; interpetiolar ridge present. *Leaves* narrowly ovate to narrowly elliptic, 13.5–15 by 4.3–5 cm, margins entire or with small irregular serrations especially in the upper half, apex acuminate, base acute, upper surface ± glabrous except for some branched hairs along the midrib near the base, also with peltate scales around the midrib and base, lower surface appearing paler, with a dense appressed indumentum of pale interwoven hairs obscuring the surface, individual hairs not visible to the naked eye; venation raised, the larger veins with some appressed hair, peltate scales scattered on either side of midrib; petioles 1.7–2.2 cm long, drying wrinkled, indumentum as stems. *Inflorescences* axillary, peduncles 0.6–0.8 cm long, indumentum as stem, laxly branching at first but flowers congested in terminal clusters, almost appearing sessile; bracts linear, 2–3 mm; pedicels difficult to determine; bracteoles linear to very narrowly ovate, 1–3 mm long, fringed by branched hairs and conspicuously subtending the terminal clusters of flowers when very narrowly ovate. *Calyx* cupular, c. 1 mm long, with 4 shallow triangular lobes, marked by small thickened tips, outer surface with branched hairs, covering but not obscuring surface, also with yellow sessile glands, inner surface glabrous. *Corolla* yellowish white, seen in bud only, outer surface glabrous, with yellow sessile glands, inner surface not seen. *Stamens* 4; filaments seen only in bud; anthers elliptic, c. 1.5 mm long. *Stigma* capitate. *Fruit* not seen when mature, c. 1.5 mm wide when immature (on dry specimen), glabrous, with copious yellow sessile glands; 4 1-seeded pyrenes.

Distribution — Philippines: Luzon (Laguna, Nueva Vizcaya (although collecting locality Mt Alzapan not located), Tayabas); Mindoro.

Habitat & Ecology — In woods. Altitude: at 500 m.

Note — Its bracteoles (when very narrowly ovate) and congested, clustered flowers put *C. subalbida* in a group with *C. longipetiolata* and *C. subintegra* (see further notes under this species). *Callicarpa subalbida* also bears a resemblance to *C. paloensis*, but that species has entire leaf margins and does not share the congested inflorescence and bracteole structure of *C. subalbida*.

50. Callicarpa subglandulosa Elmer

Callicarpa subglandulosa Elmer, Leafl. Philipp. Bot. 2 (1908) 513; Bramley, Kew Bull. 68 (2013) 404. — Lectotype (designated by Bramley 2013): *Elmer 9739* (lecto K; isolecto BO, GH, L, US, Z), Philippines, Negros, Cuernos mountains, Dumaguete.

Callicarpa megalantha Merr., Philipp. J. Sci., C 10 (1915) 71. — Neotype (designated by Bramley 2013): *BS (Ramos & Edaño) 37718* (neo K; isoneo A), Philippines, Luzon, Ifugao, Mt Polis.

Treelet or tree, to 15 m high, to 18 cm diam. *Stems* with a dense indumentum of dense plumose hairs, obscuring the surface when young, apparently glabrescent as the stems becomes woodier, often quadrangular. *Leaves*: blades narrowly ovate to narrowly elliptic, 8–15 by 4–8 cm, margins ± entire, apex acute, base rounded, truncate or asymmetric, upper surface with a dense covering of brownish plumose hairs when young, apparently glabrescent, some hairs remaining in older leaves especially along the sunken midrib and secondary nerve pairs, lower surface with venation covered by plumose hairs, the hairs also present on the lamina but apparently rubbing off in places, surface somewhat vesiculose, copious yellow sessile glands present, peltate scales scattered along the edges of the midrib and veins; petioles 1.5–3.5 cm long, indumentum as stems. *Inflorescences* axillary or occasionally up to 5 mm above axils; peduncles 35–70 mm long, the internal axes becoming consistently shorter; the flowers congested in terminal parts, subtended by promiment bracteoles, indumentum as young stems; bracts very narrowly ovate to oblanceolate to oblong, 10–15 by 1.5–4 mm, the margins with plumose hairs; pedicels not easily visible, c. 1 mm long; bracteoles very narrowly ovate to oblanceolate to oblong, 3–5 by 1.5–2 mm, the margins with plumose hairs, conspicuously subtending the congested terminal parts of the inflorescence. *Calyx* cupular, 2–2.5 mm long with 4 (or 5) triangular lobes, outer surface with plumose hairs, the surface obscured, inner surface glabrous. *Corolla* white, 4–5 mm long, divided into 4 (or 5) rounded lobes, these c. 1.5 mm long, outer surface with branched hairs and yellow sessile glands along the centre of the lobes, the rest of the tube glabrous, inner surface ± glabrous. *Stamens* 4 (or 5); filaments 6–9 mm long, exserted 2–4 mm; anthers elliptic, c. 1 mm long. *Stigma* capitate, c. 1 mm wide, surface glandular. *Fruit* 3–4 mm wide when dry, semi-enclosed by calyx; 4 1-seeded pyrenes.

Distribution — Endemic in the Philippines (Luzon, Negros).

Habitat & Ecology — Montane forest. Altitude: 1700–2400 m.

Note — Found in similar montane habitats to other species such as *C. longipetiolata* and *C. subglandulosa*; all displaying similar adaptations such as a dense indumentum and a similar compact arrangement of the flowers.

51. Callicarpa subintegra Merr.

Callicarpa subintegra Merr., Philipp. J. Sci., C 12 (1917) 299; Enum. Philipp. Fl. Pl. 3 (1923) 388; Moldenke, Phytologia 22 (1971) 20; Phytologia 51 (1982) 207. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 407): *BS (Ramos & Edaño) 26619* (lecto K; isolecto BO, L, NY, US), Philippines, Luzon, Tayabas prov., Mt Dingalan.

Callicarpa subintegra Merr. var. *parva* Merr., Philipp. J. Sci., C 12 (1917) 300. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 407): *BS (Ramos & Edaño) 26465* (lecto K; isolecto A, NY, US), Philippines, Luzon, Nueva Ecija prov., Mt Umingan.

Geunsia ramosi Moldenke, Phytologia 5 (1954) 12. — Type: *BS (Ramos & Edaño) 33838* (holo NY; iso L), Philippines, Luzon, Camarines prov., Mt Bagacay.

Tree, 3–5 m high (Merrill 1917). *Stems* with a dense pale indumentum of branched hairs when young, the hairs appressed and almost plumose but the branches long and lax, older stems woody, lenticellate, some remains of indumentum apparent; interpetiolar ridge present. *Leaves*: blades very narrowly elliptic, 4.2–10 by 1–2 cm, margins entire throughout or occasionally with small widely spaced serrations in the upper

half towards the apex, apex acuminate, base acute or occasionally slightly asymmetric, upper surface ± glabrous, lower surface appearing paler, with a dense appressed indumentum of pale interwoven hairs obscuring the surface, individual hairs not visible to the naked eye, the venation raised, the larger veins with some appressed hair, peltate scales scattered either side of midrib; petioles 0.8–1.8 cm long, indumentum as stems. *Inflorescences* axillary, peduncles 0.25–0.7 cm long, indumentum as stem, laxly branching at first but flowers congested in terminal clusters almost appearing sessile; bracts leaf-like; pedicels difficult to determine; flowers ± sessile; bracteoles linear to very narrowly ovate, 1–6 mm long, fringed by branched hairs and conspicuously subtending terminal congested parts of inflorescence when very narrowly ovate. *Calyx* cupular, c. 1–1.5 mm long, with 4 slight lobes, marked by veins running down the tube from tiny tips, outer surface with branched hairs, covering but not obscuring surface, also with yellow sessile glands, inner surface glabrous. *Corolla* colour not recorded, c. 2.5 mm long, divided into 4 lobes, these with few hairs, the edges fringed with papillae, otherwise outer surface glabrous, with yellow sessile glands, inner surface ± glabrous. *Stamens* 4; filaments c. 2.5 mm long, exserted 1–1.5 mm; anthers elliptic, c. 1 mm long. *Stigma* capitate. *Fruit* c. 3 mm (on dry specimen), glabrous, with copious yellow sessile glands; 4 1-seeded pyrenes.

Distribution — Endemic in the Philippines (Luzon).

Habitat & Ecology — Dry or forested slopes. Altitude: 200–350 m.

Vernacular name — Marataringao (Merrill 1923).

Note — The relatively wide bracteoles (very narrowly ovate) and congested, clustered flowers put this species in a group with *C. longipetiolata* and *C. subalbida*. On the basis of its indumentum and inflorescence *C. subintegra* looks more like *C. subalbida* than *C. longipetiolata*, although Moldenke (1971) links it to the latter species. Further study of *C. subalbida* and *C. subintegra* may reveal them to be conspecific: the major character distinguishing them is leaf shape and size, and given that the material of both species is sparse, new collections may reveal a continuous variation between the two extremes: the two species are reported from similar habitat in southern Luzon.

52. Callicarpa superposita Merr.

Callicarpa superposita Merr., Philipp. J. Sci. 30 (1926) 86; Bramley, Bot. J. Linn. Soc. 159 (2009) 451. — Lectotype (designated here): *Evangelista* (*D.D.Wood) 1227* (lecto K; isolecto A), Malaysia, Sabah, Simporna.

Small shrub or tree, 2–5 m high, to 3 cm diam. *Stems* with simple gland-tipped hairs and sessile glands when young, becoming woodier and ± glabrous as they mature. *Leaves*: blades very narrowly elliptic to very narrowly ovate (lanceolate), 9.5–16 by 2.3–4.7 cm, margins serrate, the serrations with mucronate tips, apex markedly acuminate, base truncate, occasionally somewhat asymmetric, upper surface with simple gland-tipped hairs, lower surface with simple gland-tipped hairs, somewhat more dense on the raised midrib and secondary venation, also with yellow sessile glands; petioles 0.6–0.8 cm long, indumentum as stems. *Inflorescences* inserted c. 5 mm above leaf axils, peduncles 10–20 mm long, indumentum as stem; bracts inconspicuous, 2–3 mm long; pedicels 0.5–1 mm long, indumentum as stems; bracteoles 0.5–1 mm long, incon-

spicuous. *Calyx* cup-shaped, c. 1 mm long (corolla in bud) with 4 shallow lobes, outer surface with simple gland-tipped hairs, also with yellow sessile glands and occasional peltate scales, inner surface ± glabrous. *Corolla* pink or purple, 2–2.5 mm long, divided into 4 lobes, these 0.5–1 mm long, outer surface with occasional gland-tipped hairs, inner surface ± glabrous. *Stamens* 4, exserted for 2–2.5 mm; filaments 3–3.5 mm long; anthers yellow, elliptic, c. 0.5 mm long. *Stigma* capitate. *Fruit* maturing purple, c. 2 mm wide (on dry specimen), depression at the apex, outer surface with yellow sessile glands, subtended by saucer shaped calyx.

Distribution — Borneo (Kalimantan Timur and Sabah: Semporna, Lahad Datu, Kota Marudu districts).

Habitat & Ecology — Disturbed areas, secondary forest, primary forest hillside. Altitude: 30–100 m.

Note — Closely related to *C. caudata* (Philippines) and *C. rubella* (Indo-China, Peninsular Malaysia, Sumatra, Sulawesi), but unlike those species it has an indumentum of simple rather than branched hairs and a truncate to cuneate rather than cordate leaf base.

53. **Callicarpa surigaensis** Merr.

Callicarpa surigaensis Merr., Philipp. J. Sci., C 3 (1908) 262. — *Callicarpa pentandra* Roxb. var. *cumingiana* (Schauer) Bakh. forma *surigaensis* (Merr.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 16. — Lectotype (designated by Bramley, Kew Bull. 68 (2013) 408): *Ahern 318* (lecto BO; isolecto BO, US 2 sheets), Philippines, Mindanao, Surigao.

Small tree, to 8 m high, to 10 cm diam. *Stems* when young with a dense ferruginous indumentum of short branched hairs, forming a layer close to the surface, ± obscuring the surface, longer patent hairs arising from this, apparently branched around the base, thinning as the stems becomes woodier. *Leaves*: blades narrowly elliptic to narrowly ovate, 10–16.5 by 3.2–5.5 cm, margins with tiny serrations, apex long acuminate to caudate, base shortly attenuate, both surfaces densely hairy when young, then upper surface with erect simple hairs with thickened bases, even spaced except where more dense along the sunken midrib and secondary nerve pairs, lower surface with a base layer of paler branched hairs, dense but the lamina surface remaining visible, longer darker hairs present on the larger veins, most venation raised, yellow sessile glands visible on the lamina surface; petioles 0.9–1.3 cm long, indumentum as young stems. *Inflorescences* in the axils of leaf-like bracts; axes with indumentum as young stems, peduncles 1.2–3 cm long; bracts linear, 2–6 mm long; pedicels c. 1 mm long, indumentum as young stems; bracteoles as bracts. *Calyx* cupular, 1.5–2 mm long with 4 small triangular lobes, outer surface with indumentum as stems and lower leaf surface, inner surface glabrous. *Corolla* red, c. 5 mm long, divided into 4 obtuse lobes, these c. 2 mm long, outer surface glabrous. *Stamens* 4; filaments c. 4 mm long; anthers c. 2 mm long, oblong. *Stigma* capitate, c. 1 mm wide, surface glandular; ovary with yellow sessile glands. *Fruit* growing up to 4 mm wide (when dry), glabrous, with yellow sessile glands, enclosed by the calyx for more than half its height when immature, then calyx rupturing and enclosing the lower half only; 8 1-seeded pyrenes.

Distribution — Endemic in the Philippines (Mindanao: Surigao district).

Habitat & Ecology — Primary and secondary forest.

Notes — 1. *Callicarpa surigaensis* was treated by Lam & Bakhuizen van den Brink (1921) as *C. pentandra* var. *cumingiana* forma 2 *surigaensis*; following Bramley (2013) it is recognised as a distinct species here. It is distinguished from *C. pentandra* by its leaf morphology and the indumentum covering all parts of the plant, although it belongs in a group of species clearly related to *C. pentandra*. The indumentum of *C. pentandra*, although variable, does not consist of a shorter layer of branched hairs, with longer hairs arising from amongst it. The serrations and long acuminate-caudate apex of the leaves of *C. surigaensis* also differ from the usually entire, acute to shortly acuminate apices of *C. pentandra* (although the Southern Philippines form with ovate leaves tends to have acuminate apices).

2. Herbarium determinations show that *C. longivillosa* has been considered as conspecific with *C. surigaensis*, but it is treated here, following Bramley (2013), as a synonym of *C. pentandra*, most closely matching the southern Philippine members of that species which were once recognised as *C. cumingiana*.

54. Callicarpa teneriflora Bramley

Callicarpa teneriflora Bramley, Bot. J. Linn. Soc. 159 (2009) 452. — Type: *Church, Mahyar & Afriastini 2062* (holo K; iso A, BO, L), Indonesia, Kalimantan, Kalimantan Barat, Serawai, Sungei Merah, 2 km to SW along perennial stream of S Labang.

Small tree, 4–5 m high, c. 4 cm diam.; outer bark beige. *Twigs* with dense stellate hairs when young, white to pale brown, rarely with occasional plumose hairs, becoming glabrous, a conspicuous interpetiolar ridge resembling a stipule scar present. *Leaves* in equal or subequal pairs; blades elliptic, rarely obovate, 11–27 by 4–11 cm, margins finely dentate, apex markedly acuminate to 3 cm, base shortly attenuate, upper surface ± glabrous, the midrib depressed with stellate hairs in the furrow, lower surface with stellate hairs on the venation and lamina, rarely with some darker plumose hairs, also with yellow sessile glands, some scattered peltate scales; petioles 1–2 cm long, indumentum as stems. *Inflorescences* cauliflorous or ramiflorous, finely branching, peduncles 1–2 cm long, axes with stellate hairs; bracts inconspicuous, linear, 0.5–1 mm long, with stellate hairs; pedicels 1–2 mm long; bracteoles as bracts. *Calyx* cupular, c. 1 mm long, with 4 tiny lobes distinguishable, outer surface ± glabrous or with scattered stellate hairs, inner surface ± glabrous. *Corolla* yellow-orange, 3–3.5 mm long, divided into 4 lobes, these c. 1 mm long, outer surface with scattered yellow sessile glands, the edges of the lobes with short papillae, inner surface ± glabrous. *Stamens* 4, exserted for the length of the anthers if corolla lobes reflexed; filaments c. 2 mm long; anthers oblong, c. 1 mm long. *Stigma* capitate, glandular. *Fruit* yellow turning red to dark blue, c. 3 mm wide (on dry specimen), covered with sessile glands, subtended to half enclosed by the persistent calyx; 4 1-seeded pyrenes. — **Fig. 8.**

Distribution — Apparently endemic to Indonesian Borneo (Kalimantan Barat).

Habitat & Ecology — Primary forest. Altitude: 300–600 m.

Note — The leaf shape is distinctive with its long acuminate tip, as well as the stellate indumentum. The species most closely resembles *C. scandens*, but the leaves are usually elliptic rather than obovate and the indumentum is less dense.

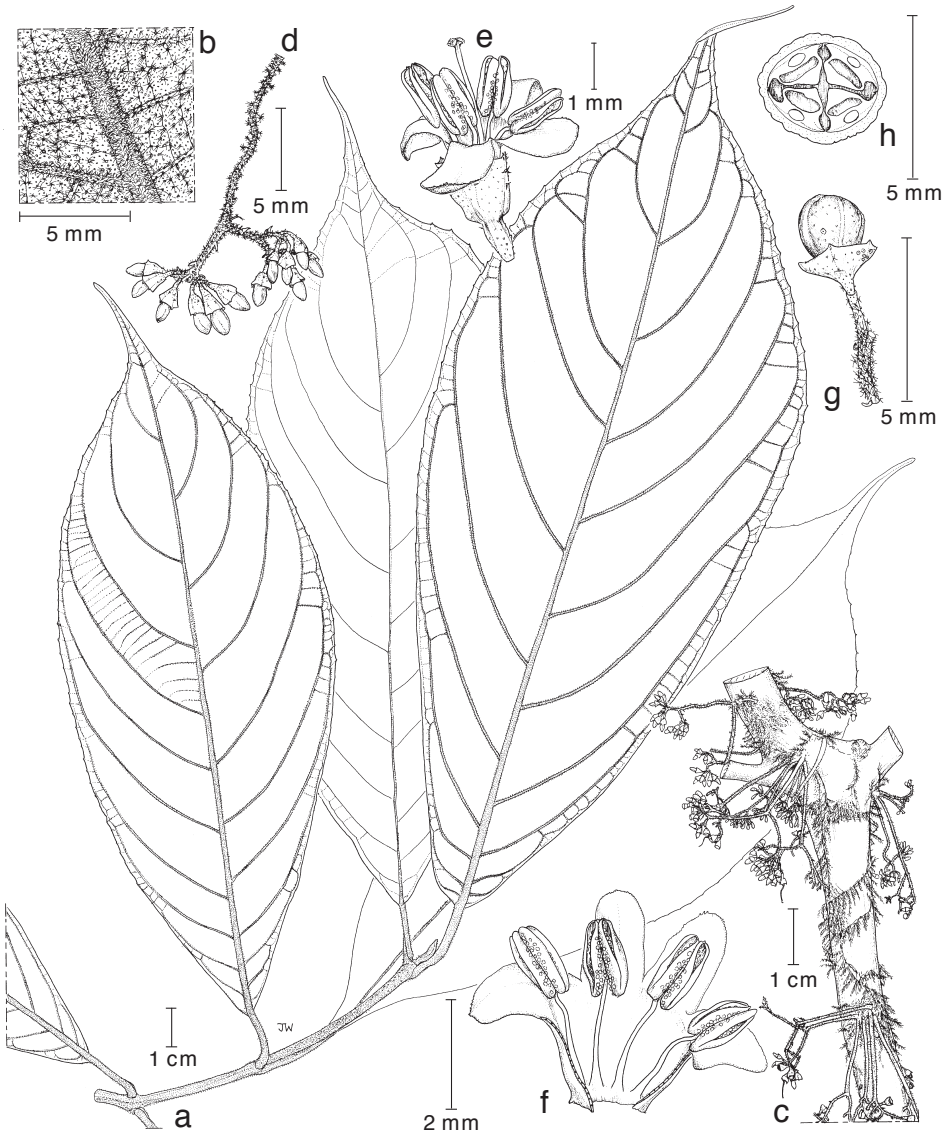

Fig. 8. *Callicarpa teneriflora* Bramley. a. Habit showing leaf morphology; b. detail of lower leaf surface; c. detail of inflorescence structure and position; d. detail of inflorescence indumentum; e. calyx and corolla; f. corolla dissected between two lobes, inner surface; g. fruit with persistent calyx; h. cross-section of fruit showing four developing ovules (a, e, f: *Church et al. 2045*, E; b–d, g: *Church et al. 2062*, K; h: *Church 207*, L). Drawing by Juliet Beentje.

55. Callicarpa woodii Merr.

Callicarpa woodii Merr., Philipp. J. Sci. 30 (1926) 86. — Type: *D.D. Wood 1194* (holo A), Borneo, Sabah, 'Limbo'.

Premna cauliflora Stapf, Trans. Linn. Soc. London, Bot. 4 (1894) 215. — *Callicarpa stapfii* Moldenke, Phytologia 43 (1979) 222 (non *C. cauliflora* Merr.); Bramley, Bot. J. Linn. Soc. 159 (2009) 448. — Lectotype (designated by Bramley 2009): *Haviland 1305* (lecto K; isolecto K, SAR), Borneo, Sabah, Mt Kinabalu.

Small tree, 1–6 m high, 1–5 cm diam.; outer bark smooth, greenish brown; inner bark reddish; sapwood yellowish. *Twigs* ± glabrous, becoming woody, with scattered lenticels, a conspicuous interpetiolar ridge resembling a stipule scar present. *Leaves* occasionally ternate; blades narrowly elliptic to narrowly obovate to oblanceolate, 8.5–30 by 3–10 cm, margins shallowly dentate, apex acuminate, base cuneate to shortly attenuate, upper surface ± glabrous, also with yellow sessile glands, peltate scales c. 1 mm diam., clustered around leaf base, lower surface ± glabrous, with yellow sessile glands and peltate scales concentrated at the leaf base but occasionally scattered near the midrib; petioles 1–2 cm long. *Inflorescences* cauliflorous or axillary, axis almost completely reduced, cymes arising from this congested base, either sessile or on a peduncle up to 1 cm long; bracts not seen; pedicels delicate, 5–15 mm long, occasionally with white lenticels; bracteoles linear, not easily visible. *Calyx* cupular, c. 2 mm long in flower, with 4 shallow lobes, outer surface with a short and sparse stellate indumentum, also with yellow sessile glands and occasional peltate scales. *Corolla* white, 4–6 mm long, divided in 4 lobes, these 1.5–2 mm long, outer surface glabrous, inner surface not seen. *Stamens* 4, the anthers exserted or partly exserted for 1–3 mm; filaments 2.5–3.5 mm long; anthers oblong, c. 3 mm long. *Stigma* capitate. *Fruit* green, maturing red, c. 6 by 5 mm (on dry specimen), depression in surface and sometimes appearing lobed when dry, outer surface glandular, subtended by remains of calyx; 8 1-seeded pyrenes. — **Plate 1i.**

Distribution — Apparently endemic to Borneo, Sabah (Ranau, Penampang and Labuk Sugut).

Habitat & Ecology — Mossy dipterocarp forest, often near rivers or at higher altitudes in oak-laurel forests. Altitude: 1000–1500 m.

Note — This species was treated using the name *C. stapfii* in Bramley (2009): the taxon had originally been described by Stapf as *Premna cauliflora*, and was later given the new name *C. stapfii* by Moldenke (1979) since *C. cauliflora* had earlier been described by Merrill (1912). However, since then, *C. woodii* has been discovered to be synonymous with *C. stapfii*, and because Merrill had described *C. woodii* in 1926, this is the earliest valid epithet within *Callicarpa*, and becomes the accepted name.

DOUBTFUL AND EXCLUDED NAMES

Callicarpa cuspidata Roxb., [Hort. Beng. (1814) 83, nom. nud.] Fl. Ind. (1820) 409. — Type: *E.B. Heyne s.n.* (not located), Eastern India.

Note — Munir (J. Adelaide Bot. Gard. 6 (1982) 30) lists *C. cuspidata* as a synonym of *C. pedunculata*, citing an unnumbered Heyne collection as its type, although he did not

see the specimen and is unsure of its location. Given this uncertainty, I cannot be sure to what this name applies, so am listing *C. cuspidata* under doubtful names here (see further notes under *C. caudata* and *C. pedunculata*).

Callicarpa dentata Roth ex Roem. & Schult. in L., Syst. Veg. (1818) 98. — Type: *E.B. Heyne s.n.* (not located), Eastern India.

Note — The same situation as with *C. cuspidata* applies to *C. dentata* as to *C. cuspidata* in reference to *C. pedunculata*.

CULTIVATED

Callicarpa nudiflora Hook. & Arn. (also known as *Callicarpa reevesii* Wall. (nom. nud.)) has been recorded from various botanic gardens, including Singapore Botanic Gardens (collected four times between 1878–1897). This species is known to occur from India to China and Indo-China. No evidence has been found to suggest this species has naturalized in the region.

7. CANTINOA

(G.L.C. Bramley)

Cantinoa Harley & J.F.B.Pastore, Phytotaxa 58 (2012) 8. — Type: *Cantinoa carpinifolia* (Pohl ex Benth.) Harley & J.F.B.Pastore.

Herbs, subshrubs or shrubs, often aromatic. *Leaves* mesomorphic, sessile to long-petiolate. *Inflorescences* of congested 12–26-flowered, more or less ovoid cymes (cymules), cymes pedunculate or sessile, not forming cincinni, in an elongate spiciform or racemose thyrse; bracteoles subulate, sometimes scarious, equal in number to and usually forming a small involucre around cymules; flowers subsessile to pedicillate. *Calyx* 5-lobed, lobes subequal, more or less subulate, rarely absent or reduced. *Corolla* 5-lobed, 2-lipped, lobes spreading, upper lip 2-lobed, lower lip 3-lobed. *Stamens* 4, declinate, exserted; filaments free, without basal appendages; anther-cells confluent. *Disc* entire, equal-sided to weakly 4-lobed. *Style* gynobasic with stylopodium absent. *Fruit* a schizocarp with four nutlets. *Nutlets* narrowly ellipsoid or ovoid, smooth or rugose, sometimes only one or two developed, mucilaginous or not, attachment scar basal.

Distribution — SE United States to Caribbean and S America, 23 species; in *Malesia*: one species, a weed of cultivation.

Note — *Cantinoa* was described as a result of the reduction in size of *Hyptis*, discovered to be non-monophyletic in its old sense (see notes under *Hyptis*, and Harley & Pastore 2012).

1. Cantinoa americana (Aubl.) Harley & J.F.B.Pastore

Cantinoa americana (Aubl.) Harley & J.F.B.Pastore, Phytotaxa 58 (2012) 9. — *Nepeta americana* Aubl., Hist. Pl. Guiane 2 (1775) 623. — *Hyptis americana* (Aubl.) Urb., Repert. Spec. Nov. Regni Veg. 15 (1918) 322, nom. illeg., non *H. americana* (Poir.) Briq. — Lectotype (designated by Harley

& Pastore 2012): Plum., Pl. Amer. 2 (1758) t. 162, f. 2, Antilles. Epitype (designated by Harley & Pastore 2012): *Pringle 6559* (epi K), Mexico, Morelos, Cuernavaca.

Hyptis spicigera Lam., Encycl. 3 (1789) 185; Miq., Fl. Ned. Ind. 2 (1858) 958; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 417; H.Keng, Gard. Bull. Singapore 24 (1969) 95; in Steenis, Fl. Males., Ser. I, 8 (1978) 386. — *Mesosphaerum spicigerum* (Lam.) Kuntze, Revis. Gen. Pl. 2 (1891) 527. — Type: *Smeathman s.n.* (holo P-LAM), origin unknown, West Indies or Sierra Leone.

Pycnanthemum elongatum Blanco, Fl. Filip., ed. 2 (1845) 333; ed. 3, 2 (1878) 252. — Neotype (designated here): *Merrill Species Blancoanae 108* (neo K; isoneo L), Philippines, Luzon, Antipolo, Rizal prov.

Erect annual herb, 1–1.5 m high, strongly aromatic. *Stems* 4-angled with short retrorse hairs on the sides and small recurved hispid hairs on the angles. *Leaves*: blades very narrowly ovate to narrowly elliptic-ovate, 2.5–6 by 1.2–3 cm, apex acute, base cuneate to decurrent on petiole, margin coarsely serrate, glabrous or glabrescent on both surfaces or with short hairs below on venation only; petiole 0.5–2.5 cm long. *Inflorescences* terminal, spiciform, 1–1.5 cm long, in fruit 3–4.5 cm long, composed of many overlapping subsessile cymules, cymules 10–20-flowered, congested, slightly 1-sided; bracteoles subulate, 3–4 mm long, setaceous, giving bristly appearance. *Calyx* tubular, 4–5 mm long, in fruit 6–7 mm long, becoming urceolate; lobes subulate, c. 2 mm long, long hairs around mouth and towards apex. *Corolla* white to purplish, pale blue or violet, 3–4 mm long, some hairs on the lower lobe. *Nutlets* pale to dark brown, oblong-ellipsoid, slightly compressed, slight median ridge, 1–1.5 mm long, smooth.

Distribution — Native of tropical America, naturalized in various tropical countries; in *Malesia*: SE Borneo, Philippines (Luzon, Mindoro, Palawan, Mindanao), Sulawesi (incl. Buton & Muna Is.), Lesser Sunda Islands (Sumba, Alor, Timor), Moluccas (Buru). Also in the Marianas.

Habitat & Ecology — Waste places, wet rice-paddies, coastal coral limestone, open dry grasslands, locally sometimes abundant. Altitude: from the lowland to 900 m. Flowering: throughout the year.

Vernacular names — Philippines: Ikugkuting (Sulu); Kalu-ui (Cebu Bisaya). Sulawesi: babalii bug is. Lesser Sunda Islands: Mossolan.

8. CLERODENDRUM

(J.A. Wearn, D.J. Mabberley & G.L.C. Bramley)

Clerodendrum L., Sp. Pl. (1753) 637; Schauer in A.DC., Prodr. 11 (1847) 658; Hook.f., Fl. Brit. India 4 (1885) 589; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 238; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 1; Moldenke, Phytologia 57 (1985) 334; Phytologia 58 (1985) 178; Phytologia 59 (1986) 325; Phytologia 61 (1986) 169, 317; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 199; Y.W.Yuan et al., Taxon 59 (2010) 125. — Type: *Clerodendrum infortunatum* L.

Siphonanthus L., Sp. Pl. (1753) 109. — Type: *Siphonanthus indicus* L. (‘*indica*’) [= *Clerodendrum indicum* (L.) Kuntze].

Cryptanthus Osbeck, Dagb. Ostind. Resa (1757) 215. — Type: *Cryptanthus chinensis* Osbeck [= *Clerodendrum chinense* (Osbeck) Mabb.].

Siphoboea Baill., Bull. Soc. Linn. Paris 1 (1888) 722. — Type: *Siphoboea commersonii* Baill. [= *Clerodendrum minahassae* Teijsm. & Binn.].

Archboldia E.Beer & H.J.Lam, Blumea 2 (1936) 31. — Type: *Archboldia ericoides* E.Beer & H.J.Lam [= *Clerodendrum longiflorum* Decne.].

Trees, shrubs (sometimes suckering), lianes or subherbaceous perennials. *Leaves* simple (occasionally lobed), decussate or (rarely) whorled, never spiny. *Inflorescences* cymose, usually terminal; flowers bisexual; buds usually symmetric. *Calyx* campanulate to tubular, 3- or 5-lobed (occasionally 6, likely aberrant), often coloured, accrescent. *Corolla* red to yellow, pink or white, hypocrateriform, 5-lobed, the lobes usually unequal, usually symmetrical in bud. *Stamens* 4 (rarely 5), didynamous, inserted within corolla tube, versatile, usually long-exserted. *Ovary* imperfectly 4-locular, each locule with 1 ovule, style terminal, elongate, shortly 2-lobed. *Fruit* a drupe, often 4-sulcate or 4-lobed; endocarp tough, separating into 4 (or 2 pairs of) pyrenes (sometimes only two maturing), each with one seed.

Distribution — About 150 species, distributed within the Old World from tropical to subtropical Africa and Asia with some species found as far south as Australia and as far north as central China and Japan. In *Malesia*, at least 54 species, of which the diversity and endemicity are highest in the Philippine Archipelago (22 *Clerodendrum* taxa, of which 7 (32 %) are endemic) and Borneo (23 taxa, of which 6 (26 %) are endemic (Wearn & Mabberley, Syst. Bot. 36 (2011) 1050).

N.B. The distribution of *Clerodendrum fortunatum* L. has been thought to include Java (Moldenke, Fifth Summary Verbenac. 1 (1971) 322; Govaerts, World Checkl. Seed Pl. 3, 1 (1999) 330). However, this was corrected by Moldenke (Phytologia 59 (1986) 467), with whose revised conclusion we agree. It is only cultivated in Java, not naturalized.

Habitat & Ecology — Primary and secondary forests, along forest margins and river banks, as understorey shrubs, and as opportunists at roadsides and on previously cultivated land. Altitudinal range varies between species with characteristic lowland (e.g., *C. longiflorum* Decne.) and mountain (e.g., *C. kinabaluense* Stapf) taxa, although the genus as a whole in Malesia occupies an altitudinal range from sea-level to c. 2400 m. Symbiotic relationships have evolved between a few *Clerodendrum* species (*C. fistulosum* Becc., *C. myrmecophilum* Ridl., and occasionally *C. speciosissimum* Van Geert ex Drapiez) and some ant species. For example, Maschwitz et al. (Blumea 39 (1994) 143) found that five ant taxa within four genera are intimately associated with *C. fistulosum*. Globally, more than 120 fungi are known to be associated with *Clerodendrum* species. In Malesia, several species of genus-specific fungi are found on and within *Clerodendrum* organs. These include the obligate parasite *Meliola clerodendricola* Henn. (see https://nt.ars-grin.gov/fungaldatabases/ (USDA database) and http://www.cybertruffle.org.uk/robigalia/eng (Cybertruffle's Robigalia database), both last accessed May 2017).

Clerodendrum species in New Guinea and northern Australia appear susceptible to flower galling, induced by hemipteran parasites. These attacks cause the formation of much-enlarged flower buds, which fail to develop past the bud stage and therefore, render the flower sterile. Where attacked, affected flower buds are often sporadic, appearing among normal ones in an inflorescence, such that the effect is obvious from direct comparison of galled and normal structures. However, when the majority of flower buds on a single plant is attacked in this way, monstrous inflorescences result. These have sometimes been referred to entirely different species or even genera (e.g., *Archboldia* E.Beer & H.J.Lam – see synonymy above). The flower parasites have been

identified as belonging to the family Tingidae ('lace bugs'; De Kok & Atkins, Kew Bull. 52 (1997) 503).

Uses — Many species of *Clerodendrum* are important ornamentals due to their striking, often brightly-coloured, inflorescences and attractive foliage and fruits. Several have been introduced to Europe and North America for use as greenhouse ornamentals (such as *C. speciosissimum*), while hardier species (such as *C. trichotomum* Thunb.) can be grown outdoors. In the American vernacular, they are known collectively as 'glorybowers', and this is the name under which they are widely sold in horticulture.

Several species are rapid colonizers of degraded land and could be used in habitat restoration. Recent work has shown that *C. trichotomum* is suitable for phytoremediation of contaminated soils (Mahmud et al., Intl. J. Phytoremed. 10 (2008) 119). Others, such as *C. chinense* can become pernicious weeds through root-suckering, and so correct identification is critical to such restoration work.

The medicinal use of compounds isolated from *Clerodendrum* species has been reported in the scientific literature for some 50 years (Bird, Nature 191 (1961) 292), although the plants have been used locally in Asia for centuries, and have been closely associated with healing and magic in India and Malaysia (Burkill, Econ. Prod. Malay Pen. (1935) 581).

Taxonomy — In older literature, the generic name is often misspelled as its Greek form, '*Clerodendron*', rather than Linnaeus's originally latinized form, '*Clerodendrum*'.

There has been no major revisionary work on *Clerodendrum* since Lam (1919), and during the last two centuries the circumscription of this large genus has changed, with taxa being added or, less frequently, removed to other genera.

Three sections are recognized here, delimiting taxa principally according to corolla length and the number of calyx lobes (following Schauer (1847) and Lam (1919), with modifications by us). Further division of Asian taxa into subsections was attempted by Schauer (1847) and adjusted by Lam (1919) and, of African taxa, by Verdcourt (Fl. Trop. E. Africa, Verben. (1992) 84). However, following the modern circumscription of the genus (Yuan et al. 2010), which showed support for the sectional level classification, reassessment of characters revealed that there are overlaps between the subsections used historically, and so subsections are not recognized here.

KEY TO THE SECTIONS

1a. Calyx with 5 (or 6) lobes 2
b. Calyx with 3 lobes . . . . . Sect. **Tridens**
2a. Corolla tube < 4 cm long . . . . . Sect. **Clerodendrum**
b. Corolla tube > 4 cm long . . . . . Sect. **Siphonanthus**

Section Clerodendrum

Clerodendrum L. sect. *Clerodendrum*: Schauer in A.DC., Prodr. 11 (1847) 666 (as *Euclerodendron*, nom. illeg.); H.J.Lam, Verbenaceae Malayan Archipel. (1919) 248. — Type: *Clerodendrum infortunatum* L.

This section includes the majority of *Clerodendrum* taxa in *Malesia* (42 of the 54 species), and can be distinguished from the other two sections in that corolla tubes are less than 4 cm long (the range is 0.8–3.8 cm) and there are 5 calyx lobes.

Section Siphonanthus

Clerodendrum L. sect. *Siphonanthus* (L.) Schauer in A.DC., Prodr. 11 (1847) 666; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 248. — Type: *Clerodendrum indicum* (L.) Kuntze (as *Clerodendrum siphonanthus* R.Br.).

Species within this section are characterised by long corolla tubes (4.5–12 cm long), beyond the lengths of the proboscides of most Lepidoptera, likely as a result of co-evolution with specific pollinators (see Yuan et al. (2010) and Wearn & Mabberley (Syst. Bot. 36 (2011) 1050). In *Malesia*, there are eight species.

Section Tridens

Clerodendrum L. sect. *Tridens* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 316. — Type: *Clerodendrum elbertii* Hallier f. (see Insufficently Known Taxa).

Three species; shrubs, 1–3 m tall. Calyces with 3 lobes rather than the usual 5, one of them often apically notched. Although similar to *Faradaya* in this respect, the flowers and fruit of that genus are much larger than those of *Clerodendrum* species, and the leaves are distinctly coriaceous. Appearing restricted to Lesser Sunda Islands and New Guinea.

KEY TO THE SPECIES IN SECTION CLERODENDRUM
FOR PENINSULAR MALAYSIA, SUMATRA AND JAVA

1a. Herb or subshrub, 25–90 cm tall (rarely to 1 m) 2
b. Shrub or tree, ≥ 1 m tall 4
2a. Calyx lobes united c. half way up the calyx tube . . . . . **53. C. villosum**
b. Calyx lobes united near base 3
3a. Leaf blades oval to ± rhomboid, 5–12(–15) by 2.5–7(–10.5) cm . . . . . **8. C. calamitosum**
b. Leaf blades oblong-lanceolate to oblanceolate, 6.5–12(–20) by 1.2–2.5(–4.3) cm . . . . . **28. C. lankawiense**
4a. Inflorescence pendulous, nodding, deflexed or suberect, often delicately branched 5
b. Inflorescence erect, not nodding or pendulous, more robust 11
5a. Inflorescence ± orbicular or corymbiform, congested 6
b. Inflorescence thyrsoid, elongate, lax 7
6a. Corolla tube 25–32(–38) mm long. Inflorescences with leaf-like bracts . . . . . **5. C. bracteatum**
b. Corolla tube 13–23 mm long. Inflorescences with small bracts . **12. C. deflexum**
7a. Inflorescence lateral, in axils of upper leaves . . . . . **52. C. umbratile**
b. Inflorescence terminal, or terminal and axillary (may or may not appear ‘leafy’ due to bracts) 8

8a. Leaves subsessile, petioles 1–6(–9) mm long. Calyx 8–11 mm long . . . . . **26. C. laevifolium**
b. Leaves petiolate, petioles 8–75 mm long. Calyx 4–8 mm long 9
9a. Inflorescence densely pubescent . . . . . **27. C. lanceoliferum**
b. Inflorescence glabrous to subglabrous 10
10a. Height 2–12(–14) m. Inflorescence 'leafy' due to presence of conspicuous leaf-like bracts . . . . . **13. C. disparifolium**
b. Height 1(–3) m. Inflorescence not appearing leafy, bracts usually not conspicuous within inflorescence . . . . . **37. C. nutans**
11a. Flowers red, orange or dark yellow 12
b. Flowers white, almost white, at least the lobes (tube can be pinkish to reddish), or pale yellow to greenish 18
12a. Branches or stems fistulose, inhabited by ants 13
b. Branches or stems non-fistulose, not inhabited by ants 14
13a. Leaf blades broadly elliptic to oblong-lanceolate, margins entire to weakly crenate-denticulate . . . . . **36. C. myrmecophilum**
b. Leaf blades ovate, ovate-rotund to almost deltoid, margin repand or irregularly denticulate-dentate . . . . . **48. C. speciosissimum**
14a. Leaf margins distinctly lobed . . . . . **38. C. paniculatum**
b. Leaf margins never lobed 15
15a. Thyrse rounded to somewhat corymbose . . . . . **48. C. speciosissimum**
b. Thyrse pyramidal to spike-like 16
16a. Calyx 3–6 mm long . . . . . **21. C. intermedium**
b. Calyx > 7 mm long 17
17a. Corolla uniformly red-orange to red . . . . . **22a. C. japonicum** var. **japonicum**
b. Corolla red, four lobes with a purple mark and white basal markings and one lobe bearing a large white spot . . . . . **22b. C. japonicum** var. **bethuneanum**
18a. Leaves 5–10 times as long as wide. Treelet, usually unbranched . . . . . **23. C. johorense**
b. Leaves < 5 times as long as wide. Shrub, treelet or tree 19
19a. Corolla usually 'double', petals largely replacing stamens. Flowers densely clustered . . . . . **9. C. chinense**
b. Corolla never 'double', no replacement of stamens by petals. Flowers clustered or not 20
20a. Leaf margins distinctly lobed . . . . . **38. C. paniculatum** ('citrinum form')
b. Leaf margins never lobed 21
21a. Leaf margins crenate-dentate to serrate 22
b. Leaf margins (sub)entire 23
22a. Leaves oval to ± rhomboid; both surfaces ± glabrous except puberulent abaxial venation and margin . . . . . **8. C. calamitosum**
b. Leaves elliptic to oblong, both surfaces very hispid including venation . . . . . **16. C. haematolasium**
23a. Calyx lobes divided to base . . . . . **39. C. phyllomega**
b. Calyx lobes united for at least half of the length of the calyx 24

24a. Calyx 3–7 mm long; corolla c. three times longer than flowering calyx . . . . . **10. C. colebrookianum**
b. Calyx 7–15 mm long, corolla tube < three times as long as flowering calyx . . 25
25a. Plant with whitish to pale yellow tomentose-villose indumentum . . . . . **53. C. villosum**
b. Plant subglabrous to pubescent, hairs brown to purplish 26
26a. Calyx tubular, lobes lanceolate, 0.5–1 mm wide at lobe base . . . . . **1. C. adenophysum**
b. Calyx campanulate, lobes triangular, c. 2 mm wide at lobe base . . . . . **17. C. hendersonii**

KEY TO THE SPECIES IN SECTION CLERODENDRUM FOR BORNEO

1a. Herb or subshrub, up to c. 1 m tall 2
b. Shrub or tree, ≥ 1 m tall 5
2a. Semi-prostrate habit, 5–25 cm tall, stem unbranched to 15 cm **42. C. pygmaeum**
b. Upright habit, ≥ 25 cm tall, stem unbranched 3
3a. Leaf blades oval to ± rhomboid, 5–12(–15) by 2.5–7(–10.5) cm, margins crenate-dentate or serrate . . . . . **8. C. calamitosum**
b. Leaf blades elliptic to ovate to deltoid, 9–22 by 5–14 cm, margins entire to repand or dentate 4
4a. Calyx lobes lanceolate, united close to base, with dark red indumentum . . . . . **46. C. sarawakanum**
b. Calyx lobes ovate to lanceolate, united c. half way up tube, with pale indumentum . . . . . **53. C. villosum**
5a. Corolla red, orange or dark yellow 6
b. Corolla white or almost white (pinkish to pale lemon yellow or greenish) . . . 13
6a. Fistulose branches or stems, inhabited by ants 7
b. Non-fistulose branches or stems, not inhabited by ants 8
7a. Leaf blades broadly elliptic to oblong-lanceolate, margins entire to weakly crenate-denticulate . . . . . **36. C. myrmecophilum**
b. Leaf blades ovate, ovate-rotund to almost deltoid, margin repand or irregularly denticulate-dentate . . . . . **48. C. speciosissimum**
8a. Leaf blades oval to slightly obovate, base ± rounded . . . . . **47. C. sayapense**
b. Leaf blades cordate 9
9a. Leaf margins distinctly lobed . . . . . **38. C. paniculatum**
b. Leaf margins never lobed 10
10a. Calyx lobes united for about half the length of the calyx tube . . . . . **48. C. speciosissimum**
b. Calyx lobes united at the base only 11
11a. Calyx 3–6 mm long. Corolla tube 9–13 mm long . . . . . **21. C. intermedium**
b. Calyx 9–13 mm long. Corolla tube 13–20 mm long 12
12a. Corolla uniformly red-orange to red . . . . . **22a. C. japonicum** var. **japonicum**
b. Corolla red, four lobes bearing purple and white basal markings and one bearing a large white spot . . . . . **22a. C. japonicum** var. **bethuneanum**

13a. Corolla usually 'double', petals largely replacing stamens ..... **9. C. chinense**
b. Corolla never 'double', no replacement of stamens by petals 14
14a. Leaves cordate, ovate or deltoid 15
b. Leaves elliptic or oblong, oblanceolate/obovate, oval/rhombic 19
15a. Leaf margins lobed ..... **38. C. paniculatum** ('citrinum form')
b. Leaf margins never lobed. 16
16a. Calyx (narrowly) campanulate, lobes triangular, apices acute 17
b. Calyx tubular, lobes narrowly triangular to lanceolate, apices acuminate 18
17a. Calyx 5–7(–9) mm long; outer surface without peltate scales; lobes united for two-thirds of the length of the tube ..... **50. C. tracyanum**
b. Calyx (7–)9–10(–13) mm; outer surface with peltate scales; lobes united for half of the length of the tube ..... **53. C. villosum**
18a. Calyx minutely puberulent. Corolla tube 11–17 mm long. Leaf blades below subglabrous to sparsely pubescent. ..... **1. C. adenophysum**
b. Calyx densely pubescent. Corolla tube (15–)18–21 mm long. Leaf blades below pubescent to villose ..... **29. C. lanuginosum**
19a. Calyx lobes united at the base only, or just above it 20
b. Calyx lobes united for a third to two-thirds of the length of the calyx tube... 23
20a. Calyx pubescent to shortly hispid ..... **24. C. kinabaluense**
b. Calyx glabrous to minutely puberulent 21
21a. Bracts and bracteoles small, linear. ..... **39. C. phyllomega**
b. Bracts and bracteoles leaf-like 22
22a. Shrub, 0.5–1.5 m tall. Leaf margins crenate-dentate to serrate ..... **8. C. calamitosum**
b. Treelet to small tree, 2–12(–14) m tall. Leaf margins entire, subentire or shallowly serrate ..... **13. C. disparifolium**
23a. Leaves subglabrous to puberulous ..... **41. C. pubiflorum**
b. Leaves hispid or pubescent 24
24a. Calyx hispid, hairs reddish ..... **16. C. haematolasium**
b. Calyx pubescent to villous, pale ..... **53. C. villosum**

KEY TO THE SPECIES IN SECTION CLERODENDRUM FOR THE PHILIPPINES, SULAWESI, LESSER SUNDA ISLANDS, MOLUCCAS AND NEW GUINEA

1a. Branches or stems fistulose, inhabited by ants 2
b. Branches or stems non-fistulose, not inhabited by ants 3
2a. Leaf blades broadly elliptic to oblong-lanceolate, margins entire to weakly crenate-denticulate ..... **36. C. myrmecophilum**
b. Leaf blades cordate or deltoid, margin repand or irregularly denticulate-dentate ..... **48. C. speciosissimum**
3a. Corolla red, orange or yellow 4
b. Corolla white or almost white (e.g., pinkish outside or with pink spots, or greenish) 10
4a. Leaf blades oblanceolate, base cuneate to rounded ..... **54. C. williamsii**
b. Leaf blades cordate 5

5a. Leaf margins distinctly lobed. . . . . **38. C. paniculatum**
b. Leaf margins never lobed. 6
6a. Thyrse rounded to somewhat corymbose. . . . . **48. C. speciosissimum**
b. Thyrse pyramidal to spike-like 7
7a. Inflorescence a dense spike-like structure, flowers so congested pedicels and axis not easily visible . . . . . **45. C. rumphianum**
b. Inflorescence pyramidal and not dense, pedicels and axis visible 8
8a. Calyx 3–6 mm long. . . . . **21. C. intermedium**
b. Calyx > 7 mm long 9
9a. Corolla uniformly red-orange to red . . . . . **22a. C. japonicum** var. **japonicum**
b. Corolla red, four lobes with a purple mark and white basal markings and one lobe bearing a large white spot . . . . . **22b. C. japonicum** var. **bethuneanum**
10a. Corolla usually 'double', petals largely replacing stamens . . . . . **9. C. chinense**
b. Corolla never 'double', no replacement of stamens by petals 11
11a. Leaf margins lobed . . . . . **38. C. paniculatum** ('citrinum form')
b. Leaf margins never lobed 12
12a. Inflorescence with conspicuous white to pink or purple leaf-like bracts 13
b. Inflorescence with greenish leaf-like greenish bracts or bracts inconspicuous 14
13a. Corolla tube 24–31 mm long. Floral bracts 2.5–5 cm long . . . . . **31. C. macrostegium**
b. Corolla tube c. 7 mm long. Floral bracts 2–3 cm long **35. C. multibracteatum**
14a. Leaf margins serrate, crenate-serrate, dentate or denticulate 15
b. Leaf margins entire or subentire 19
15a. Calyx lobes united at base only . . . . . **8. C. calamitosum**
b. Calyx lobes united for at least a third of the calyx length 16
16a. Calyx tubular, lobes acuminate . . . . . **29. C. lanuginosum**
b. Calyx broadly obconical to campanulate, lobes ovate to lanceolate to triangular, acute. 17
17a. Calyx somewhat loosely surrounding corolla . . . . . **3. C. apayaoense**
b. Calyx more tightly surrounding corolla, especially at the base 18
18a. Calyx turning dark red. Corolla tube 12–23 mm long . . . **20. C. infortunatum**
b. Calyx remaining pale. Corolla tube 7–10(–13) mm long. . . . . **53. C. villosum**
19a. Leaf blades elliptic(-oblong) or obovate 20
b. Leaf blades ovate, cordate or deltoid 25
20a. Calyx ≤ 5 mm long, lobes up to 1 mm long. 21
b. Calyx > 6 mm long, lobes > 2 mm long. 22
21a. Corolla tube 12–15 mm long. — New Guinea . . . . . **2. C. albiflos**
b. Corolla tube 20–30 mm long. — Philippines, Sulawesi, Morotai Island. . . . . **34. C. mindorense**
22a. Leaves and inflorescence axes with red to purplish hairs **40. C. porphyrocalyx**
b. Leaves and inflorescence axes with white to yellow to brown hairs or glabrous to subglabrous 23
23a. Corolla tube 7–10(–13) mm long . . . . . **53. C. villosum**
b. Corolla tube (15–)18–30(–35) mm long 24

24a. Leaves and peduncles glabrous to subglabrous. Calyx 3–5 mm long . . . . . **15a. C. floribundum** var. **floribundum**
b. Leaves and inflorescence axes with white to yellow to brown hairs. Calyx 7–9 mm long . . . . . **49. C. tomentosum**
25a. Calyx lobes united near base . . . . . **51. C. trichotomum**
b. Calyx lobes united half way or more 26
26a. Leaves adaxially glabrous . . . . . **15b. C. floribundum** var. **ovatum**
b. Leaves adaxially subglabrous, puberulous, pubescent to villose 27
27a. Inflorescence axes with red-purple hairs . . . . . **40. C. porphyrocalyx**
b. Inflorescence axes with white to yellow or brown hairs, or glabrous 28
28a. Corolla tube 15–21 mm long 29
b. Corolla tube 7–13 mm long 30
29a. Flowering calyx 6–10 by 3–4 mm . . . . . **7. C. brunfelsiiflorum**
b. Flowering calyx 13–17 by 5–7 mm. . . . . **29. C. lanuginosum**
30a. Calyx without peltate scales/glands. . . . . **50. C. tracyanum**
b. Calyx with peltate scales/glands 31
31a. Calyx purple, even when dry. — Philippines. . . . . **4. C. brachyanthum**
b. Calyx pale greenish, even when dry. — Sulawesi, Moluccas and New Guinea. . . . . **53. C. villosum**

KEY TO THE SPECIES IN SECTION SIPHONANTHUS

1a. Internodes clavately fistulose, inhabited by ants . . . . . **14. C. fistulosum**
b. Internodes not clavately fistulose, not inhabited by ants 2
2a. Leaves in whorls, > 5 times as long as wide . . . . . **19. C. indicum**
b. Leaves decussate/opposite, < 5 times as long as wide. 3
3a. Calyx ≥ 16 mm long 4
b. Calyx ≤ 11.5 mm long 5
4a. Calyx 25–37 mm long, lobes united for 1/3 or more of tube **33. C. minahassae**
b. Calyx 16–21 mm long, lobes united at base only . . . . . **44. C. ridleyi**
5a. Leaves lanate/tomentose abaxially . . . . . **11. C. costatum**
b. Leaves glabrous to puberulent abaxially 6
6a. Calyx lobes 5–6 mm long . . . . . **30. C. longiflorum**
b. Calyx lobes 1.5–2.5 mm long 7
7a. In fruit, calyx lobes becoming incorporated as calyx expands, visible as tips on apiculate rim. Corolla tube 4.5–6 cm long . . . . . **25. C. klemmei**
b. In fruit, calyx lobes widening to become broadly triangular. Corolla tube (4.5–) 6–9(–11) cm long . . . . . **43. C. quadriloculare**

KEY TO THE SPECIES IN SECTION TRIDENS

1a. Calyx lobes united for 3/4 of their length; stamens extending 2.5–2.8 cm beyond corolla tube. — Lesser Sunda Islands . . . . . **18. C. hettae**
b. Calyx lobes united at, or near to, their bases; stamens extending > 3 cm beyond corolla tube. — New Guinea 2

2a. Corolla tube 14–18(–21) mm long; calyx (10–)14–17(–19) mm long, weakly accrescent, elongating to 15–16(–18) mm in fruit . . . . . **6. C. brassii**
b. Corolla tube 20–26 mm long; calyx 18–25 mm long, strongly accrescent, elongating to 24–30 mm in fruit . . . . . **32. C. magnificum**

1. Clerodendrum adenophysum Hallier f. (Section *Clerodendrum*)

Clerodendrum adenophysum Hallier f., Meded. Rijks-Herb. 37 (1918) 66; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 272; Moldenke, Phytologia 57 (1985) 465; Kessler, Second. Forest Trees Kalimantan (2000) 193, 194, 398 (f. 195); Bramley et al. in Soepadmo, Tree Fl. Sabah & Sarawak 7 (2011) 34; Wearn & Mabb., Syst. Bot. 36 (2011) 1051. — Lectotype (designated by Wearn & Mabberley 2011): *Korthals s.n.* (lecto L, L0062788), Borneo, Kalimantan, Martapura.

Shrub to small tree, 2–6(–12) m tall; trunk to 12 cm diam. *Branchlets* subquadrangular, puberulent to pubescent with brown to purplish hairs. *Leaves* decussate; blade subcordate-ovate, cordate or deltoid, 12–32 by 8–29 cm, 1.1–1.4 times as long as wide, apex broadly, often abruptly, acuminate, base cordate to truncate, subglabrous to sparsely pubescent, margin entire to repand; venation pubescent, 5–10 pairs of lateral veins, basal one(s) agrophic, tertiary venation scalariform and abaxially-prominent; petioles 3–28 cm long, pubescent. *Inflorescences* erect, a thyrse with paired axillary compound cymes with subtending leaf-like or reduced bracts (often caducous), pyramidal to rounded, individual cymes 3–10 cm diam., inflorescences up to 30 cm long, axes trichotomous; pedicels 4–16 mm long, puberulent to pubescent; primary branches from the main axis to the lower cymes 5–8 cm long, pubescent. *Calyx* tubular, (7–)8–13(–15) by 2–4 mm, with 5 lanceolate, acuminate lobes of 2–4 by 0.5–1 mm wide at their bases, united for about 2/3 to 3/4 of the tube, minutely puberulent, accrescent to 11–15 by 5–11 mm and enclosing fruit. *Corolla* white (sometimes with a pinkish tint); tube 11–17 mm long, glabrous or occasionally subglabrous; lobes ovate, 6–7.5 mm long. *Stamens* 4, extending up to 2.5 cm from the corolla tube. *Ovary* cylindrical/globose, glabrous. *Fruit* globose, weakly 4-lobed, 7–9 mm diam.

Distribution — Sumatra, Borneo.

Habitat & Ecology — Varied, mixed primary and secondary forest habitats or open land and roadsides. Altitude: up to 1430 m.

Notes — 1. On *Haviland s.n.* (Sarawak, 1890) it was noted that the flowers are sweet-scented.

2. Lam (1919) retained this species, but Lam & Bakhuizen van den Brink (Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 91) erroneously reduced it to *C. infortunatum* L. However, *C. adenophysum* has a tubular calyx with narrow lobes, contrasting with the campanulate calyx and much wider lobes of *C. infortunatum*, which are united only half-way or only near the base.

3. *Clerodendrum adenophysum* and *C. tracyanum* (syn. *C. buruanum*) are commonly confused due to their similar morphology (see Wearn & Mabberley 2011).

2. Clerodendrum albiflos H.J.Lam (Section *Clerodendrum*)

Clerodendrum albiflos H.J.Lam, Verbenaceae Malayan Archipel. (1919) 287; Moldenke, Phytologia 57 (1985) 472. — *Clerodendrum albiflos* H.J.Lam var. *puberulum* H.J.Lam, Verbenaceae Malayan

Archipel. (1919) 287, nom. inval. — Type: *Zippel s.n.* (‘*908*’) (holo L 2 sheets), New Guinea [West Papua].

Clerodendrum albiflos var. *glabrior* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 288. — Type: *Gibbs 6264* (holo L), New Guinea, Humboldt Bay.

Small tree, 4–5 m tall. *Branchlets* quadrangular, densely pubescent with brownish hairs. *Leaves* decussate; blade elliptic-oblong, 13.5–33.5 by 5–12 cm, 2.7–2.8 times as long as wide, apex acuminate, base ± truncate to rounded; margin entire; lateral veins 8–10 pairs; petioles 1.5–9.5 cm long, pubescent to subglabrous. *Inflorescences* erect, a terminal thyrse, 10–14 cm long by c. 8 cm wide, bracts inconspicuous; pedicels 4–6 mm long, puberulent/pubescent; primary branches from the main axis to the lower cymes 2–5 cm long. *Calyx* tubular-campanulate, c. 4 mm long, apex with 5 lanceolate lobes c. 1 mm deep, externally (sparsely) puberulous. *Corolla* white; tube 12–15 mm long, sparsely puberulous; lobes oval, 8–9 mm long. *Stamens* 4, extending 15–18 mm from corolla tube. *Ovary* glabrous. *Fruit* globose, ± black, 9–10 mm diam.

Distribution — New Guinea (West Papua).

Habitat & Ecology — Forest (*Agathis* forest (Kanehira & Hatusima, Bot. Mag. (Tokyo) 56 (1942) 113)). Altitude: 400–500 m.

Note — *Clerodendrum albiflos* is known only from the type and two other collections (*Kanehira & Hatusima 1942*). Although very similar to *C. tracyanum*, this species differs in having a longer corolla tube (12–15 mm vs 8–10 mm). *Clerodendrum albiflos* differs from *C. brunfelsiiflorum* in having a calyx half as long (c. 4 mm long vs 6–10 mm long) and longer than corolla lobes. *Clerodendrum albiflos* was also described as a ‘small tree’ whereas *C. brunfelsiiflorum* is a shrub.

3. Clerodendrum apayaoense Quisumb. (Section *Clerodendrum*)

Clerodendrum apayaoense Quisumb., Philipp. J. Sci. 41 (1930) 343, f. 15. — Type: *Vanoverbergh 17592* (holo PNH†; iso NY), Luzon, Apayao Province, Allokapan.

Shrub, 1–3 m tall; all parts pubescent/sericeous with rather short, soft, brownish hairs. *Branchlets* somewhat quadrangular, densely pubescent, hairs somewhat appressed. *Leaves* decussate; blade ovate, 10–37 by 8.5–18.5 cm, 1.2–2 times as long as wide, apex shortly acuminate, base obtuse to rounded, both surfaces with short pubescence, margin broadly and shallowly serrate (often irregularly); lateral veins 8–11 pairs; petioles 4–9 cm long, densely pubescent. *Inflorescences* a terminal thyrse, 11–12 cm long and wide; shortly pubescent; primary branches to the lower cymes 6–9 cm long, ± squarrose, pubescent, bracts inconspicuous. *Calyx* broadly obconical (‘bag-like’, such that the corolla tube appears loose within the calyx as if the calyx is too wide for it, at least when dried), 10–16 by c. 10 mm, pubescent externally; lobes 5, triangular, acute, united for c. half of the length, with a few glands externally, tips recurved (at least when dried). *Corolla* pinkish white; tube 18–22 mm long, puberulous; lobes oval, 6–7 mm long. *Stamens* 4, extending c. 15 mm from the corolla tube. *Ovary* ± globose, shallowly 4-lobed, glabrous. *Fruit* unconfirmed (see below).

Distribution — Philippines (Luzon).

Habitat & Ecology — Lowland forest. Altitude: 50–200 m.

Note — This species is known to us from only four specimens (and possibly one other – see below). *Clerodendrum apayaoense* was not covered by Moldenke in his 'Notes of the genus *Clerodendrum*' series during the 1980s but was included in his Fifth Summary Verbenac. 1 (1971) 315) as an accepted name for a plant endemic to Luzon. Quisumbing considered it allied to *C. infortunatum*, but it bears a greater resemblance to *C. macrostegium*, though lacking its characteristic coloured bracts. Quisumbing recorded that the calyx is 'funnel-shaped', and we interpret as obconical ('bag-like'), which, with the shallowly serrated margins, readily distinguish it from other *Clerodendrum* species. The fruit was not described in the protologue, but a previously undetermined fruiting specimen (*Fuentes & de la Rosa PPI 38845*, K), collected from Calayan Island (northern Luzon) is likely to be conspecific.

4. Clerodendrum brachyanthum Schauer (Section *Clerodendrum*)

Clerodendrum brachyanthum Schauer in A.DC., Prodr. 11 (1847) 668; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 291; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 400; Moldenke, Phytologia 58 (1985) 207. — Type (designated here): *Cuming 816* (syn B†, KIEL†; lecto OXF; isolecto BM 2 sheets, DBN, K 4 sheets, L), Philippines, Tayabas.

Small tree, 4–10 m tall; dbh to 5–10(–20) cm. *Branchlets* quadrangular, thickly sericeous-tomentose with tawny-brown hairs. *Leaves* decussate; blade ± cordate, 13–35 by 7–24 cm, 1.2–1.9 times as long as wide, apex broadly acuminate, base cordate, adaxially pubescent, abaxially villose; margin entire; venation abaxially prominent, lateral veins 7–9 pairs; petioles 5–18 cm long, villose. *Inflorescences* an erect, terminal, robust and sericeous thyrse to 18 cm long and wide, pyramidal to rounded; bracts leaf-like, bracteoles elliptic; peduncle ≥ 5 mm diam.; pedicels less than 10 mm long, pubescent; primary branches from the main axis to the lower cymes 2–4 cm long, pubescent/villose, hairs yellow to brown. *Calyx* narrowly campanulate, 6–10 by 3–4.5 mm, apex with 5 triangular acute lobes 2–4 mm deep, united for about 2/3 of the length of the calyx tube, pubescent except for the lobes, these sparsely puberulent to nearly glabrous and purple (remaining a good character when dried) with some glands, accrescent to 10–12 by 7–8 mm and enclosing the fruit. *Corolla* white; tube 9–12 mm long, puberulous; lobes oval, c. 5 mm long. *Stamens* 4, extending up to 10 mm from the corolla tube. *Ovary* obovoid, glabrous. *Fruit* globose, 6–7 mm diam.

Distribution — Philippines.

Habitat & Ecology — A fairly common species in primary and secondary forests. Altitude: 400–2000 m.

Uses — Used for fencing (*PNH (Conklin & Rosario) 72697*, K).

Notes — 1. This species is similar to *C. tracyanum* and, to a lesser extent, to *C. adenophysum*.

2. The type is cited as *Cuming 816* but, as Schauer stated in the protologue that he had seen dried material in B and KIEL ('*v.s. in h. reg. berol. et cl. Lucae*'), the type material has certainly been lost as both Lucae's herbarium at KIEL and *Clerodendrum* material at B were destroyed (Stafleu & Cowan, Taxon. Lit., ed. 2, 3 (1981) 179). Because two specimens are cited in the protologue, they are technically syntypes, and so a lectotype was selected here from the extant isosyntypes. The duplicate at OXF was chosen as

it includes flowering and fruiting inflorescences, and a sericeous-thickly tomentose branchlet, all on a single sheet.

5. Clerodendrum bracteatum Wall. ex Walp. (Section *Clerodendrum*)

Clerodendrum bracteatum Wall. ex Walp., Repert. Bot. Syst. 4 (1845) 106; Schauer in A.DC., Prodr. 11 (1847) 665; Moldenke, Phytologia 58 (1985) 209. — Type: *Wallich s.n.* in EIC *1800* (holo Hb. Walp.†; iso BM, K-W), India, Pundua.

Clerodendrum condensatum Miq., Fl. Ned. Ind. 2 (1858) 874. — Type: *Teijsmann HB 1167* (holo U), Sumatra, Mohan Pandjang.

Clerodendrum bracteatum Wall. ex Walp. var. *sumatranum* Ridl., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 84 ('*Clerodendron*'), syn. nov. — Type: *Ridley s.n.* (holo K), Sumatra, Berastagi.

Clerodendrum bracteatum Wall. ex Walp. var. *buennemeijeri* Moldenke, Phytologia 4 (1952) 45, syn. nov. — Type: *Bünnemeyer 8869* (holo U, fragment of holo NY), Sumatra, West Coast, Gunung Koerintji [Barisan range].

Shrub or small tree, 1.5–4(–8) m tall. *Branchlets* grey-brown, round to subquadrangular, tomentose with dense pale to mid-brown hairs. *Leaves* decussate; blade ovate to deltoid, 8–19 by 5–13 cm, 1.2–2 times as long as wide, apex acute or acuminate; base subtruncate to truncate, shortly-attenuate at petiole, chartaceous (frequently fragile once dried), adaxially darker green than abaxially, sparsely softly pilose-pubescent, abaxially densely softly pubescent to tomentose, margin entire; lateral veins 5–7 pairs; petioles 3–12 cm long, densely short-pubescent. *Inflorescences* axillary, dense, many-flowered with subtending leaf-like persistent (occasionally caducous) elliptic to ovate bracts and bracteoles, appearing as a corymboid conspicuously-bracteose cyme, each terminal on a long peduncle, somewhat lax ('nodding'); pedicels less than 1 cm long, densely pubescent; peduncles 7–16.5 cm long, densely short-pubescent, brown to green-brown. *Calyx* narrowly funnel-shaped, (7–)8–11(–13) mm long; lobes 5, rounded triangular to narrowly ovate (c. 1.5 mm wide at anthesis), acuminate, united for c. half of the length of the calyx, puberulent to pubescent, accrescent, calyx increasing to 13–15 mm long. *Corolla* white; tube narrow, 2.5–3.2(–3.8) cm long, externally puberulent to pubescent; lobes spreading, c. 5 mm long. *Stamens* 4, exserted, extending up to 2.8 cm from the corolla tube. *Ovary* globose, glabrous. *Fruit* globose to slightly obovate, 4-lobed, blue-black to purple, 6–8 mm diam.

Distribution — Bangladesh, north-eastern India, Nepal, Burma, Tibet; in *Malesia*: Sumatra.

Habitat & Ecology — Forests and forest clearings, in valleys or on hillsides. Reported as regionally to locally abundant or scattered within open forests. Altitude: 600–1830 m.

Note — Lam (Verbenaceae Malayan Archipel. (1919) 262) maintained *C. condensatum* but Lam & Bakhuizen van den Brink (Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921)) reduced it to *C. bracteatum*. Moldenke (1985) recognised *C. bracteatum* with two further infraspecific varieties, Ridley's var. *sumatranum* (under which he placed *C. condensatum*) and var. *buennemeijeri* (which had been described by Moldenke himself). Ridley separated var. *sumatranum* largely by the bracts which were regarded as 'much smaller than the Indian form'. However, a range of bract sizes and shapes

(from elliptic to ovate) can be found on specimens across the geographical range from India to Sumatra (for example, small or larger bracts on various specimens collected within the Sikkim region of India); so this character alone is not suitable to distinguish a Sumatran variety. Moldenke's type specimen of var. *buennemeijeri* is in very poor fragmented condition. The recognition of this variety is based upon slightly different corolla indumentum, glabrescent abaxial leaf surfaces and elliptic rather than ovate calyx lobes, which are slightly recurved. On examination of a range of specimens from wide-ranging localities, all these characters were found to vary between individuals of the species. Recurving of the sepals is often a result of the drying process of specimens and Moldenke did not see this 'variety' *in vivo*.

6. Clerodendrum brassii E.Beer & H.J.Lam (Section *Tridens*)

Clerodendrum brassii E.Beer & H.J.Lam, Blumea 2 (1936) 222; Moldenke, Phytologia 58 (1985) 215. — Type: *Brass 3867* (holo NY; iso A, L), Papua New Guinea, Central Division, Dieni, Ononge Road.

Shrub, 1–2(–3) m tall; all parts ± glabrous. *Branchlets* quadrangular, dark brown, lenticellate, often slightly fistular. *Leaves* decussate; blade oval to subcordate, 10–30 by 7–16 cm, 1.4–1.9 times as long as wide, apex acute or shortly acuminate, base obtuse, rounded or subcordate, membranaceous, both surfaces ± glabrous, much paler green abaxially, often with a few glands close to the midrib, margin entire (to minutely dentate basally); lateral veins 9–12 pairs; petioles 2.5–14 cm long. *Inflorescences* erect, terminal thyrse, low-pyramidal shape, entirely red, 11–28 by 12–20 cm; primary branches to the lower cymes 3.5–5 cm long with reduced leaf-like bracts. *Calyx* (10–)14–17(–19) mm long; lobes 3, united at bases, with a V-shaped notch apically in 2 of the 3 (bidentate lobe apex), slightly accrescent, elongating to 15–16(–18) mm in fruit, lobes enclosing immature fruit and parting when mature. *Corolla* scarlet externally, paler internally; tube 14–18(–21) mm long, glabrous; lobes oval, 13–15(–17) mm long. *Stamens* 4, extending 4–5.5 cm from the corolla tube. *Ovary* globose, glabrous. *Fruit* globose, blue-black, 7–8 mm diam.

Distribution — New Guinea.

Habitat & Ecology — A lowland species, found in secondary forest and at roadsides. Fairly common throughout New Guinea. Some specimens have branchlets that are slightly fistulose with holes (likely myrmecophilous). Altitude: sea-level up to 500 m.

Note — This species resembles *C. magnificum* Warb., although, based on material currently available, it can be delimited by the smaller corollas and calyces (the latter especially noticeable when fruiting – see entry for *C. magnificum*), and ovary shape. Calyx tissue is also somewhat thicker in *C. brassii* than in *C. magnificum*. However, the corolla tube length of *C. brassii* is described by Beer & Lam (1936) as 2.5 cm but the corollas on their type specimens are no more than 2.1 cm long. We have not seen any material of this species with corolla tubes 2.5 cm long. Material with larger corolla tubes (among other character differences) is referable to *C. magnificum*. Strangely, Beer & Lam (1936) did not make a comparison between their species and *C. magnificum*.

7. Clerodendrum brunfelsiiflorum Hallier f. (Section *Clerodendrum*)

Clerodendrum brunfelsiiflorum Hallier f., Meded. Rijks-Herb. 37 (1918) 68; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 275; Moldenke, Phytologia 58 (1985) 280. — Lectotype (designated here): *de Vriese & Teijsmann s.n.* (lecto L, sheet no. 908.267-1093; isolecto L), Moluccas, Buru.

Clerodendrum catalpifolium Hallier f., Meded. Rijks-Herb. 37 (1918) 67; Moldenke, Phytologia 58 (1985) 280. — Lectotype (designated here): *de Vriese & Teijsmann s.n.* (lecto L, sheet no. 908.267-381; isolecto L), Moluccas, Buru.

Shrub. *Branchlets* quadrangular, densely and softly pubescent with brownish hairs. *Leaves* decussate; blade ovate to ± deltoid or weakly cordate, 8–28 by 4.5–16 cm, 1.7–1.8 times as long as wide, apex acuminate, base ± truncate to weakly cordate, adaxially subglabrous to puberulent, abaxially puberulous to pubescent, slightly glandular, margin entire; lateral veins 8 or 9 pairs; petioles 2–16 cm long, densely pubescent. *Inflorescences* erect, a terminal thyrse, 10–18 cm long, puberulent/pubescent; primary branches from the main axis to the lower cymes 5–6 cm long; pedicels 10–16 mm long; bracts leaf-like, bracteoles elliptic to linear. *Calyx* tubular-cyathiform, 6–10 by 3–4 mm, apex with 5 lanceolate lobes 2–3.5 mm long, lobes united for 2/3 to 3/4 of the calyx tube, externally hispid-pubescent. *Corolla* white; tube 16–20 mm long, puberulent; lobes oval, 5.5–8 mm long. *Stamens* 4, extending 20–25 mm from the corolla tube. *Ovary* ± globose, glabrous. *Fruit* not seen.

Distribution — Moluccas (Buru only?).

Habitat & Ecology — Unknown.

Notes — 1. Moldenke (1985) included *C. catalpifolium* in *C. brunfelsiiflorum* but commented that it seemed 'most likely' that the types (as he had seen no other material) of these two species were actually varieties or forms of *C. buruanum* (i.e., *C. tracyanum*); yet he did not transfer them to that species. Nevertheless, based on the type specimens alone, which have significantly longer corolla tubes than those of *C. tracyanum* (16–20 mm vs 8–10 mm), slightly larger calyces and more open inflorescences, we cannot include them within that species (this was the opinion of Hallier f. (1918) when he described them). More material from Buru and neighbouring islands is required to see if these specimens represent a localised form. Thus, we have maintained *C. brunfelsiiflorum*.

2. *Clerodendrum albiflos* from New Guinea, also known only from type material, appears very similar to *C. brunfelsiiflorum* (see discussion notes under that species).

8. Clerodendrum calamitosum L. (Section *Clerodendrum*)

Clerodendrum calamitosum L., Mant. Pl. Altera (1767) 90; Schauer in A.DC., Prodr. 11 (1847) 663; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 256; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 400; Burkill, Econ. Prod. Malay Pen. (1935) 583; Backer & Bakh.f., Fl. Java 2 (1965) 610; Moldenke, Phytologia 58 (1985) 401; Wearn & Mabb., Syst. Bot. 36 (2011) 1051. — Lectotype (designated by Moldenke (1985) 404): *Anonymous s.n.* (lecto LINN 810.4, upper two specimens), Java.

Volkameria alternifolia Burm.f., Fl. Ind. (1768) 137, t. 44. — Type: *Anonymous s.n.* (holo G (Hb. Delessert)), Java.

Volkameria fastigiata Hunter ex Ridl., J. Straits Branch Roy. Asiat. Soc. 53 (1909) 102. — *Clerodendrum fastigiatum* (Hunter ex Ridl.) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 317; Moldenke, Phytologia 59 (1986) 409; Forman, Kew Bull. 44 (1989) 159; Noltie, Raffles' Ark Redrawn

(2009) 19, 138 (as '*Clerodendrum* cf. *longiflorum*'), syn. nov. — Type: [icon] *Hunter illustration No. 16* (original owned by a 'private collector' in London (see Forman 1989); copies at BM and Wellesley Coll. [in Brit. Lib.]), Peninsular Malaysia ('brought from Amboyna'), Penang, Prince of Wales Island.

Clerodendrum phlomidis auct. non L.: Koord. in Exkurs.-Fl. Java 3 (1912) 138.

Shrub, 0.5–1.5 m tall, usually highly-branched. *Branchlets* slender, ± rounded, pale grey-brown, puberulent. *Leaves* decussate; blade oval to ± rhomboid, 5–12(–15) by 2.5–7(–10.5) cm, 1.4–2 times as long as wide, submembranaceous to chartaceous, apex acute or shortly acuminate, base acute to attenuate; both surfaces ± glabrous except abaxial venation and margins, these often puberulent, margin crenate-dentate to serrate; lateral veins 6 or 7 pairs; petioles 1.5–3.5(–5) cm long. *Inflorescences* erect, cymose, 5–15 cm long, cymes clustered at the ends of branches but often appearing axillary due to the abundance of leaf-like bracts surrounding them; primary branches to the lower cymes 2–6 cm long with leaf-like bracts. *Calyx* 7–10 mm long; lobes 5, narrowly lanceolate to almost linear (c. 1 mm wide basally), united at their bases only, slightly accrescent, widening to 2–3 mm at their bases in fruit, lobes spreading, minutely puberulent. *Corolla* white, entirely puberulent; tube 23–25 mm long; lobes oval, c. 6 mm long. *Stamens* 4, exserted, extending c. 1 cm from the corolla tube. *Ovary* subglobose, glabrous. *Fruit* globose, violet-black, c. 6 mm diam., often only 2 pyrenes maturing. — **Plate 2a.**

Distribution — Indo-China; in *Malesia*: Sumatra, Java and Borneo (found escaped from cultivation in Peninsular Malaysia, and possibly only locally naturalized in the Philippines (also see Merrill 1923), Sulawesi and Moluccas). Moldenke (1985: 404) noted that this species tends to escape readily from cultivation in tropical regions. Therefore, its native distribution is uncertain.

Habitat & Ecology — Found in grasslands, along paths and roadsides, forest edges and abandoned land. Altitude: 5–600 m.

Note — Vegetatively, this species bears much similarity to *C. phlomidis* (Indian subcontinent). However, the latter is separated easily by its much broader, rather inflated calyx and dense pubescence (Jafri & Ghafoor, Fl. W. Pakistan 77 (1974) 31). Lam (1919: 256) included *C. phlomidis* in his account based upon evidence from Koorders, including in the distribution 'Java (Koord.)', in addition to India. However, *C. phlomidis* does not occur naturally in Malesia and was erroneously included in a key to the Javan *Clerodendrum* in Koorders (Exkurs.-Fl. Java 3 (1912) 138), likely as a result of confusion with *C. calamitosum*. Koorders' collections (detailed under Verbenaceae in Koorder-Schumacher, Syst. Verz. (1912)), shows that he never collected any material from Java that had been identified as *C. phlomidis*, and no other regional or systematic account includes Java within the distribution of that species.

9. **Clerodendrum chinense** (Osbeck) Mabb. (Section *Clerodendrum*)

Clerodendrum chinense (Osbeck) Mabb., Pl.-Book, corr. repr. (1989) 707; Wearn & Mabb., Syst. Bot. 36 (2011) 1051. — *Cryptanthus chinensis* Osbeck, Dagb. Ostind. Resa (1757) 215. — Lectotype (designated here by Mabberley): *Osbeck s.n.* (lecto S (photo FHO); isolecto LINN), China, Huang-Pu District, near Huang-Pu [Whampoa].

Volkameria japonica Jacq., Pl. Rar. Hort. Schoenbr. 3 (1798) t. 338. — *Clerodendrum fragrans* Willd., Enum. Pl. (1809) 659, nom. illeg., nom superfl. — Type: Jacq., Pl. Hort. Schoenbr. 3 (1798) t. 338.

Volkameria fragrans Vent., Jard. Malmaison 2 (1804) t. 70. — *Agricolaea fragrans* (Vent.) Schrank, Denkschr. Königl. Akad. Wiss. München (1808) 98. — *Clerodendrum fragrans* (Vent.) R.Br. in W.T.Aiton, Hort. Kew., ed. 2, 4 (1812) 63, nom. illeg. (non Willd., Enum. Pl. (1809) 659); Schauer in A.DC., Prodr. 11 (1847) 666; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 318; Burkill, Econ. Prod. Malay Pen. (1935) 584. — *Ovieda fragrans* (Vent.) Hitchc., Mem. Torrey Bot. Club 12 (1902) 63. — *Clerodendrum fragrans* (Vent.) R.Br. forma *pleniflorum* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 88, nom. superfl. — Type: cult. France, Paris, Malmaison, ex Hort. Noisette (?not preserved).

Clerodendrum fragrans (Vent.) R.Br. var. *multiplex* Sweet, Hort. Brit. 2 (1826) 322. — *Clerodendrum philippinum* Schauer forma *multiplex* (Sweet) Moldenke, Revis. Handb. Fl. Ceylon 4 (1984) 469. — Type: J.Walker, Bot. Mag. 43 (1816) t. 1834.

Clerodendrum fragrans (Vent.) R.Br. var. *pleniflorum* Schauer in A.DC., Prodr. 11 (1847) 666. — *Clerodendrum japonicum* (Thunb.) Sweet var. *pleniflorum* (Schauer) Maheshw., Taxon 15 (1965) 44. — Type: *Anonymous s.n.* (holo G-DC), Martinique.

Clerodendrum philippinum Schauer in A.DC., Prodr. 11 (1847) 667. — Neotype (designated by Howard & Powell, Taxon 17, 1968: 54): *Cuming 1096* (syn B†, KIEL†; neo GH; isoneo K, OXF), Philippines.

Clerodendrum macradenium Miq., Fl. Ned. Ind. 2 (1856) 874. — Type: *Horsfield s.n.* (holo U; iso K), Java, Soerakarta, Kediri.

Clerodendrum roseum Poit., Rev. Hort. (1876) 80; Moldenke, Fifth Summary Verbenac. 1 (1971) 454. — Type: described from Hort. Rogier Chauvière, Paris (cult.); no preserved specimen found.

Clerodendrum riedelii Oliv., J. Linn. Soc., Bot. 15 (1876) 100. — *Clerodendrum fragrans* (Vent.) R.Br. forma *corymbosum* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 88. — *Clerodendrum philippinum* Schauer forma *corymbosum* (Bakh.) Moldenke, Phytologia 20 (1970) 338. — Type: *Riedel s.n.* (holo BO; iso K), Celebes [Sulawesi].

Clerodendrum philippinum Schauer var. *simplex* Moldenke, Phytologia 20 (1970) 338. — *Clerodendrum chinense* (Thunb.) Sweet var. *simplex* (Moldenke) S.L.Chen, Novon 1 (1991) 58. — Type: *Floto 7634* (holo LL), Thailand, between Tak and Mae Sot, Ban Musseo.

Clerodendrum philippinum Schauer forma *subfertile* Moldenke, Phytologia 25 (1973) 368. — Type: *Rahmat Si Boeea 8394* (holo MICH; iso L), Sumatra, Serbangan, Asahan.

Shrub, to 2 m tall, thicket-forming, sappy, foetid when bruised, spreading by root suckers. *Branchlets* subquadrangular, pubescent when young. *Leaves* decussate; blade subcordate to ovate, 9–22 by 8–21 cm, 1–1.5 times as long as wide, apex acuminate, base ± truncate, membranaceous, with green disc-shaped glands at base, adaxial surface glabrous to subglabrous, abaxially pubescent, especially on veins, margin weakly irregularly dentate; lateral veins 5–7 pairs; petioles 3–17 cm long, ± pubescent. *Inflorescences* erect, a terminal corymbose cyme to 9 cm wide; peduncles to 2 cm long, subglabrous; bracts 1.5–3 cm long; flowers densely clustered. *Calyx* narrowly funnel-shaped, 13–20 mm long, deeply lobed, lobes 5, narrowly triangular, acuminate, sparsely pubescent, pinkish purple with several green glands externally. *Corolla* usually 'double', white, pinkish outside; tube 15–18 mm long; lobes 5, 8–11 mm long, oval to somewhat spatulate. *Stamens* and *carpels* largely replaced by petals. *Ovary* lobed, glabrous. *Fruit* rarely formed as flowers usually sterile; flowers with a single whorl of petals producing a 4-lobed blackish drupe ('var. *simplex*').

Distribution — Burma, southern China, Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Java, Borneo, Philippines, Sulawesi, Moluccas. Widely cultivated and naturalized in Malesia such that the original native distribution is now unclear.

Habitat & Ecology — Common on abandoned cultivated land, roadsides and general waste-ground. A noxious weed. This species is capable of spreading rapidly via root suckers and by seeds ('var. *simplex*') and can form large stands (e.g., Wagner et al., Manual of the Flowering Plants of Hawaii 2 (1997) 1319).

10. Clerodendrum colebrookianum Walp. (Section *Clerodendrum*)

Clerodendrum colebrookianum Walp., Repert. Bot. Syst. 4 (1845) 114; Schauer in A.DC., Prodr. 11 (1847) 672; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 271; Moldenke, Phytologia 58, 7 (1985) 454; Phytologia 59 (1986) 102; S.L.Chen & M.G.Gilbert in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 47. — *Clerodendrum glandulosum* Colebr. ex Wall., Numer. List (1829) 49, nom. nud. (non *C. glandulosum* Lindl., Edwards's Bot. Reg. 30 (1844) sub t. 19). — Type: *Wallich s.n., 1806* (holo Hb. Walp.†; iso BM, K-W), India, Pundua.

Clerodendrum ixoriflorum Hassk., Retzia 1 (1855) 60. — *Clerodendrum foetidum* Bunge var. *integrifolium* Hassk., Retzia 1 (1855) 60. — Type: unknown (lecto BO, barcode BO-1610708), Indonesia, Java, cult. at Bogor Botanic Garden from material from Singapore.

Clerodendrum microcalyx Ridl., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 84, syn. nov. — Type: *Nur 7447* (holo K), Sumatra, Bukit Semiak, Sibolangit.

Shrub to small tree, 1.5–4(–6.5) m tall. *Branchlets* distinctly quadrangular and pithy, often with acute angles, pubescent with brownish hairs when young, subglabrous to glabrous when mature. *Leaves* decussate; blade broadly ovate to shallowly cordate, 9–26 by 7.5–25 cm, 1.1–1.4 times as long as wide, apex acute, base shallowly cordate to truncate, glabrous to subglabrous, abaxial venation often puberulent, margin entire or subentire; lateral veins 6–8 pairs; petioles 2–20 cm long, usually glabrous (sometimes puberulent). *Inflorescences* erect, compact, comprising ± capitate axillary compound cymes, 6–13 cm diam., each terminal on a long stout peduncle; pedicels less than 1 cm long, sericeous-puberulent; peduncles 7–19 cm long, subglabrous to puberulent. *Calyx* narrowly campanulate, 3–7 mm long; lobes 5, 0.6–3 mm long, united for about half the length of the tube, triangular to lanceolate, slightly puberulent, each lobe with a few dark glands externally, accrescent, lobes becoming somewhat obscured, only enclosing base of fruit. *Corolla* white or less commonly pinkish white; tube 19–25 mm long, glabrous. *Stamens* 4, exserted, extending up to 12 mm from the corolla tube. *Fruit* 4-lobed (sometimes subglobose when only two pyrenes mature), 6–7 mm diam. — **Plate 2d, e.**

Distribution — Nepal, north-eastern India, Bangladesh, Vietnam, Burma, southern China, Thailand; in *Malesia*: Sumatra. Apparently only cultivated in Peninsular Malaysia and Singapore, though may have escaped locally (see notes).

Habitat & Ecology — A diverse range of habitats including primary and secondary forests, edges of clearings, open slopes, scrub and roadsides. Altitude: 50–1800 m.

Notes — 1. *Clerodendrum colebrookianum* is conspecific with *C. microcalyx*, yet the two had been separated by plant stature and calyx size, and therefore, had been maintained historically as separate species, despite the name *C. microcalyx* hardly having been used since its coining almost 90 years ago. Indeed, the view of *C. colebrookianum* has become less restricted over time as Clarke (in Hook.f., Fl. Brit. India 4 (1885) 594) refers to a shrub of 4–8 feet (i.e., 1.2–2.4 m), while later accounts include a greater height range. For example, Chen & Gilbert (1994: 40) state that it can be

1.5–3(–6) m tall, agreeing with Moldenke (1985: 456). Upon thorough examination of material from Nepal to Sumatra, the small calyx of Ridley's species forms one end of a continuum, inseparable from specimens collected from Thailand or Burma. There is a tendency for calyx size to decrease slowly from NE India (including the type locality of *C. colebrookianum*, now in northern Bangladesh) to Sumatra (the type locality of *C. microcalyx*) and combined with the lack of inter-regional floral treatments, this pattern appears not to have been realized previously. Ironically, it was Clarke (1885) who first noted that the calyx lobes could be triangular or lanceolate. The range is shown well by comparison of the 19th-century illustration by W.E. Trevithick at K with Fl. China Illus. 17 (1998) f. 109; these show contrasting illustration calyx forms, representative of each end of the range for the species.

We have only seen material fitting this description, which has been collected from the modern political region of North Sumatra. It may, therefore, be restricted to the northern part of the island. It has sometimes been collected from Peninsular Malaysia and Singapore, largely from cultivation, but occasionally it has escaped on a local scale, yet it has not become naturalized and so was not included by Mabberley (ms. Fl. Pen. Malay.).

2. *Clerodendrum colebrookianum* has sometimes been associated with *C. glandulosum* Lindl. (e.g., Clarke 1885), the latter being of uncertain taxonomic position (Schauer (1847) 672) as Lindley gave no indication of where the plant was growing, simply stating 'in English gardens'. Lindley did not mention whether the flowers where white or red when he attempted to distinguish his plant from the red-flowered species *C. speciosissimum* (which it had apparently been 'absurdly called' according to Lindley, Edwards's Bot. Reg. 30 (1844) sub t. 19). Lindley also stated that *C. glandulosum* Lindl. had calyx 'teeth extended into long narrow tongues', which is quite unlike the short calyx lobes of *C. colebrookianum*. The description of Lindley's plant led to placement under *C. philippinum* Schauer (i.e., *C. chinense* (Osbeck) Mabb.) by Lam & Bakhuizen van den Brink (Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 88). It was omitted from Lam's (1919) account of Malesian taxa, so it may be a species restricted to India. It is not *C. glandulosum* Colebr., the unpublished name on Wallich collection sheet 1806, from which *C. colebrookianum* was derived (Leeratiwong et al., Trop. Nat. Hist. 11 (2011) 185).

3. *Clerodendrum colebrookianum* Walp. var. *forbesii* King & Gamble, the only infraspecific taxon of this species described from the Malesian region, is referred to *C. speciosissimum* (see there).

4. *Clerodendrum ixoriflorum* was placed within *C. colebrookianum* by Lam & Bakhuizen van den Brink (Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 87), which reduction has been accepted by Moldenke (1985: 454) and by us.

11. Clerodendrum costatum R.Br. (Section *Siphonanthus*)

Clerodendrum costatum R.Br., Prodr. (1810) 511; Schauer in A.DC., Prodr. 11 (1847) 671; Moldenke, Resume Geogr. Distr. & Syn. (1959) 208; Munir, J. Adelaide Bot. Gard. 11 (1989) 161. — Lectotype (designated by Munir 1989): *Banks & Solander s.n.* (lecto BM; isolecto BM), Australia, Queensland, Endeavour River.

Clerodendrum ingratum K.Schum. & Lauterb., Fl. Schutzgeb. Südsee (1900) 526; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 308; Moldenke, Phytologia 61 (1986) 270, syn. nov. — Type: *Lauterbach 810* (holo B†; iso BO, L, SING, WRSL), Papua New Guinea, Finschhafen.

Clerodendrum longiflorum Decne. var. *pubescens* Moldenke, Phytologia 4 (1952) 51; Phytologia 62 (1987) 84, syn. nov. — *Clerodendrum longitubum* Valeton, Bull. Dépt. Agric. Indes Néerl. 10 (1907) 52 ('*longituba*'), nom. illeg. (non *C. longitubum* De Wild. & T.Durand, Bull. Soc. Roy. Bot. Belgique, Compt. Rend. 39 (1900) 74). — Syntypes: *Koch 718* (BO, L); *Koch 719* (BO, L); *Koch 720* (BO, L); all: New Guinea, West Irian.

Erect shrub or small tree, 1–4 m tall. *Branchlets* quadrangular, bark grey-brown. *Leaves* decussate; blade ovate, 8.5–17 by 5.5–11.5 cm, 1.1–1.6 times as long as wide, apex shortly acuminate, base truncate to obtuse, short-attenuate at petiole (uppermost leaves often basally acute), thickly chartaceous, adaxially sparsely puberulous to pubescent, abaxially lanate/tomentose with soft hairs, margin entire; lateral veins 6 or 7 pairs; petioles 1–5(–7) cm long. *Inflorescences* erect, a corymbose thyrse, terminal but sometimes appearing axillary due to large leaf-like bracts through the inflorescence, pubescent/tomentose. *Calyx* campanulate, 9–11.5 mm long, densely pubescent; lobes 5 (occasionally 6 – attributable to a rare mutation), 4–6.5 mm long, ovate-lanceolate to triangular, united for c. half of the calyx length, accrescent, calyx elongating to 12–16 mm and lobes widening to 6–8 mm at their bases, lobes parting to expose fruit and often (at least partially) relaxing once fruit is mature. *Corolla* white; tube (4.5–)5–8 cm long, puberulent to pubescent; lobes oval, 7–9 mm long. *Stamens* 4, extending 3–4 cm from the corolla tube. *Ovary* elongate-globose, shallowly 4-lobed, glabrous. *Fruit* ± globose to obovoid, blue-black, (6–)7–10(–11) mm diam. (the size is largely dependent on whether 2 or 4 of the pyrenes mature).

Distribution — Northern Australia; in *Malesia*: New Guinea.

Habitat & Ecology — Grasslands, open forest or forest margins, banks of rivers, frequently on sandy soils. A lowland species. Altitude: below 400 m.

Notes — 1. This species is variable, and has been confused with *C. longiflorum*, with the subsequent creation of pubescent and glabrous varieties of the latter, which included a heterogenous group of material (see notes under *C. longiflorum*).

2. Lam (1919) recognised the illegitimate name, *C. longitubum*, citing material later used by Moldenke as the types of his *C. longiflorum* var. *pubescens*. Moldenke's concept of this variety (Phytologia 62 (1987) 84) was actually that of *C. costatum*, with material cited by Moldenke (1987) falling under this species.

3. *Clerodendrum costatum* is distinct from *C. longiflorum* in its lanate/tomentose abaxial leaf surfaces; generally broader leaves and calyces; and thicker leaves (see the key). *Clerodendrum costatum* and *C. longiflorum* appear to be sister taxa, sharing many of their characters.

4. Although Moldenke (1986: 270) commented that *C. ingratum* is sometimes misidentified as *C. disparifolium*, he too must have been confused as to its identity as he cited specimens referable to *C. disparifolium* (from Borneo) and a corolla tube length of only c. 2 cm (compared with c. 6 cm in the protologue and 4.5–5 cm in Lam (1919: 308). The type material of *C. ingratum* at BO may have been confused with *C. disparifolium* vegetatively, because in fact, only bracts are present, whereas that at L includes the true leaves. *Clerodendrum ingratum* clearly differs from *C. dispari-*

folium in having much larger calyces and corolla tubes. Munir (in herb. K in 1989) transferred several sheets of New Guinea material, previously determined as *C. ingratum*, to *C. longiflorum* var. *pubescens* – so he had clearly seen the link, but his concepts of *C. longiflorum* and the closely allied *C. costatum* were somewhat confused (for example, he had placed even slightly puberulent material of *C. longiflorum* in *C. costatum*). *Clerodendrum ingratum* is considered here to be conspecific with *C. costatum*, although the type material may not be a good representation of this species as it was from cultivated land.

12. Clerodendrum deflexum Wall. (Section *Clerodendrum*)

Clerodendrum deflexum Wall., [Numer. List n. 1808 (1829), nom. nud.] Pl. Asiat. Rar. 3 (1831) 10; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 263; Schauer in A.DC., Prodr. 11 (1847) 665; Burkill, Econ. Prod. Malay Pen. (1935) 583; Corner, Wayside Trees Mal. 3, 1st ed. (1940) 700; Moldenke, Phytologia 59 (1986) 243. — Lectotype (designated here by Mabberley): *Porter s.n., in Wallich Cat. 1808/1* (lecto K-W; isolecto K, L, P), Peninsular Malaysia, Penang, Pulo Brissar.

Clerodendrum deflexum Wall. var. *bracteatum* Ridl., Fl. Malay Penins. 2 (1923) 626. — Lectotype (designated here by Mabberley): *Ridley s.n.* (lecto SING), Singapore, Reservoir Woods.

Clerodendrum deflexum Wall. var. *villosulum* Moldenke, Phytologia 33 (1976) 372. — Type: *Poore 57* (holo KLU (photo K)), Peninsular Malaysia, Pahang, Fraser's Hill.

Clerodendrum nodosum LaFrankie, Trees of Tropical Asia (2010) 672, nom. nud.

Treelet, to 3 m tall; trunk sympodial, to 4 cm diam. *Branchlets* subquadrangular to quadrangular, pale brown, pubescent, with white lenticels, sometimes inhabited by ants. *Leaves* decussate; blade elliptic, oblong-ovate or oblanceolate, 12–40 by 4.5–15 cm, 2.6–4.4 times as long as wide, apex acuminate, ± glabrous adaxially, may be pubescent abaxially, margin entire to weakly undulate; lateral veins 10–13 pairs; petioles 2.5–5.5 cm long, pubescent, grooved adaxially. *Inflorescences* terminal or sometimes axillary, deflexed, usually at a right angle to the terminal axis, corymbose (± orbicular), to 5 cm across; peduncle (2–)3–10(–20) cm long, pedicels subglabrous to puberulent; bracts and bracteoles dark red, elliptic to linear. *Calyx* 6–9 mm long, lobes 5, united near the base only, narrowly lanceolate (almost linear), puberulent to pubescent, accrescent with lobes widening, crimson red during flowering and fruiting. *Corolla* white (often with greenish, yellowish or pinkish hints); tube c. 13–23 mm long, puberulent; lobes spatulate, c. 6 mm long. *Stamens* 4, white, extending up to 15 mm from the corolla tube. *Ovary* globose to subglobose, glabrous. *Fruit* bright green when immature, ripening to blue-black, globose, 6–8 mm diam. — **Plate 2c.**

Distribution — Thailand; in *Malesia*: Peninsular Malaysia, Sumatra.

Habitat & Ecology — Common treelet in forests, including heath forest. Often on stream banks or at track sides. Altitude: up to 1300 m. Branches and branchlets often have hollow internodes, which are sometimes ant-inhabited (Maschwitz et al., Blumea 39 (1994) 149).

Notes — 1. Pubescence and leaf texture varies greatly with habitat ('var. *villosulum*' being separated by Moldenke as a hairy plant). However, as these characters are relatively continuous within the species and such variants have not been recognised by Mabberley (ms.) or here. Similarly, forms with bracts at the upper limit of their size range described here have formerly been recognised as 'var. *bracteatum*'.

2. This species has been classified as vulnerable in Singapore (Chong et al., Checklist of the Total Vascular Plant Flora of Singapore 2009).

3. The name *C. nodosum* was used by LaFrankie (2010) but we cannot find any evidence of this name being published. The photographs to which LaFrankie referred depicted *C. deflexum*.

13. Clerodendrum disparifolium Blume (Section *Clerodendrum*)

Clerodendrum disparifolium Blume, Bijdr. (1826) 809; Schauer in A.DC., Prodr. 11 (1847) 672; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 250; Burkill, Econ. Prod. Malay Pen. (1935) 583; Backer & Bakh.f., Fl. Java 2 (1965) 609; Moldenke, Phytologia 59 (1986) 325; Kessler, Second. Forest Trees Kalimantan (2000) 193, 194, 399, f. 196; Wearn & Mabb., Syst. Bot. 36 (2011) 1051. — *Clerodendrum jackianum* Wall., Numer. List (1828) n. 1794, nom. superfl. pro *C. disparifolium* Blume. — Lectotype (designated here by Mabberley): *Blume* '*795*' (lecto L; isolecto L, NY), Indonesia, Java, G. Seribu.

Clerodendrum acuminatum Wall. ex Schauer in A.DC., Prodr. 16 (1847) 662. — Type: *Wallich s.n.* in *Wallich Cat. 1792* (holo G-DC (microfiche); iso A fragment, G, K-W), Singapore.

Clerodendrum eriosiphon Schauer in A.DC., Prodr. 16 (1847) 662. — Type: *Zollinger 1968* (holo G-DC (microfiche seen)), Java.

Clerodendrum obtusidens Miq., Fl. Ned. Ind. 2 (1858) 870. — Type: unknown collector (holo U), Sumatra.

Clerodendrum disparifolium Blume forma *prianganense* Bakh. ex Moldenke, Resume Geogr. Distr. & Syn. (1959) 190, 449, nom. nud.

Clerodendrum laevifolium auct. non Blume: Kochummen in Ng, Tree Fl. Malaya 3 (1978) 305; Corner, Wayside Trees Mal. 3rd ed., 2 (1988) 740, f. 257 & 746 + t. 225 right; C.M. Boo et al., 1001 Gard. Pl. Singapore ed. 2 (2006) 553.

Treelet to small tree, 2–12(–14) m tall, trunk to 15 cm diam. *Branches* slender and pendent. *Branchlets* subquadrangular to round, grey-brown, glabrous to puberulent, lenticellate. *Leaves* decussate, sometimes pairs of different-sized ones; blade broadly to narrowly elliptic, rarely obovate; 5–19 by 2–8 cm, 1.9–2.7 times as long as wide, membranaceous, apex acute to acuminate (sometimes abruptly), base acute to obtuse, adaxial surface glabrous to subglabrous, abaxially paler and glabrous to puberulent, margin entire, subentire or shallowly serrate; sometimes with sparsely pubescent venation; lateral veins 5 or 6 pairs; petioles 0.8–7.2 (mostly about 3) cm long, slender. *Inflorescences* terminal, lax, with a tendency to nod, thyrsoid, comprising paired cymes with subtending leaf-like or reduced bracts (basal ones usually leaf-like), sometimes caducous, giving delicate appearance; axes trichotomous; pedicels 6–16 mm long, pedicels and peduncles subglabrous. *Calyx* lobes 5, united at the base only, narrowly triangular to narrowly lanceolate, 4–7 by 1.5–2 mm, glabrous to subglabrous lobes, accrescent to 8–13 by 2.5–4 mm, dark red and reflexed when fruit mature. *Corolla* pale yellow (green in bud); tube 16–24 mm long, glabrous to subglabrous; lobes obovate/spatulate, 4–6 mm long. *Stamens* 4, exserted, extending up to 1.3 cm from the corolla tube. *Ovary* ovoid-subglobose, glabrous. *Fruit* at first olive, then ripening to blue-black, globose, c. 6 mm diam. — **Plate 3a.**

Distribution — Thailand; in *Malesia*: Malay Peninsula, Sumatra, Java, Borneo.

Habitat & Ecology — Common in lowland and hillside forests and forest-edges. Altitude: up to 1280 m.

Note — Most of the synonyms of this morphologically variable species are discussed in Wearn & Mabberley (2011). In addition, the type of *C. sumatranum* Moldenke, although possessing some obovate leaves, is probably another example of natural variation within the morphologically variable *C. disparifolium*.

14. Clerodendrum fistulosum Becc. (Section *Siphonanthus*)

Clerodendrum fistulosum Becc., Malesia 2 (1884) 48; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 311; Moldenke, Phytologia 59 (1986) 415; Wearn & Mabb., Syst. Bot. 36 (2011) 1053. — Lectotype (designated by Wearn & Mabberley 2011): *Beccari P.B. 3574* (lecto FI; isolecto K), Borneo, Sarawak, Kuching.

Herb or subshrub, c. 1 m tall; erect, with simple unbranched stem; internodes fistulose, up to 14 cm long with up to 10 per plant, clavately inflated, frequently with one or two holes laterally towards the apical end, inhabited by ants. *Leaves* decussate; blade elliptic, 10–25(–30) by 2.5–10 cm, 2.9–4.2 times as long as wide, apex acute to acuminate, base acute, membranaceous, abaxial surface paler, sometimes with purplish tinge and subglabrous, with extrafloral nectaries appearing as small dots along midrib, margin entire with pale puberulent indumentum; lateral veins 6–8 pairs, with distinct brochidodromous pattern (arcuate anastomosing veins); petioles very short, 4–12 mm long, minutely puberulous. *Inflorescences* erect, a compact terminal compound cyme, 3–4 cm diam. (excluding corolla tubes); pedicels 5.5–10 mm long, pedicels and peduncles puberulous; bracts and bracteoles linear, inconspicuous. *Calyx* lobes 5, united at the base only, lanceolate, acuminate, 8–13 mm long (shrinking significantly to this size upon drying), subglabrous to puberulent, bright pink, lobes adaxially glandular near their bases, accrescent to 11–15 by 3.5–4.5 mm. *Corolla* white-pink; tube 7.5–9 cm long, subglabrous; lobes c. 10 mm long, narrowly spatulate. *Stamens* 4, extending up to 10 mm from the corolla tube. *Ovary* ovoid, glabrous. *Fruit* deep purple, 6–7 mm diam., 2–4-lobed, depending on whether 2, 3 or 4 pyrenes mature.

Distribution — Borneo (not commonly collected).

Habitat & Ecology — Localised populations in lowland heath forest and peat swamp forest. Altitude: 5–50 m. The hollow internodes have holes which develop spontaneously and independently of the presence of ants, as ascertained by Maschwitz et al., Blumea 39 (1994) 143. The cavities provide chambers that facilitate nesting.

Note — This species is quite unlike the other commonly encountered myrmecophyte, *C. myrmecophilum*, differing widely in the form of the inflorescence, inflated internodes and the plant as a whole. Despite these distinctions, material of *C. fistulosum* seen by Munir during the 1980s was identified in herbaria as *C. phyllomega* Steud. var. *myrmecophilum* (Ridl.) Moldenke (= *C. myrmecophilum* Ridl.).

15. Clerodendrum floribundum R.Br. (Section *Clerodendrum*)

Clerodendrum floribundum R.Br., Prodr. (1810) 511; Schauer in A.DC., Prodr. 11 (1847) 671; Moldenke, Phytologia 59 (1986) 419; Munir, J. Adelaide Bot. Gard. 11 (1989) 123; Hopkins & Menzies, Fl. Motupore Island (1995) 180. — Lectotype (designated by Munir 1989): *Brown s.n.* [*Iter Austral. 2314*] (lecto BM; isolecto BM, K 2 sheets), 'Littora Novae Hollandiae intra tropica, one of Harvey's Islands'.

Tall shrub or small tree, 1.5–6(–8) m tall. *Branchlets* round to subquadrangular, with grey-brown, smooth bark. *Leaves* decussate; blade ovate to narrowly elliptic, 3–15 by 2–10 cm, 0.9–2.7 times as long as wide, apex acute to shortly/broadly acuminate, base cuneate/attenuate, truncate or shallowly cordate, chartaceous to coriaceous, adaxially glabrous, abaxially subglabrous, hairs often restricted to abaxial venation, margin entire to subentire; lateral veins 5–7 pairs; petioles 2–6 cm long. *Inflorescences* terminal or in axils of upper leaves, somewhat open, comprising decussate compound cymes with subtending large, leaf-like bracts (deciduous during fruiting), almost as large as the leaves in many specimens, individual cymes to 8 cm diam., inflorescence extending up to 25 cm from the branch apex, axes trichotomous; pedicels and peduncles glabrous to puberulent; primary branches from the main axis to the lower cymes 2.5–9 cm long. *Calyx* campanulate, 6–10 mm long; lobes 5, 3–5 by 3–4 mm, united for a third to a half of the length of the tube, ovate to lanceolate, acute, glabrous to subglabrous; accrescent, calyx increasing to 9–10(–12) mm long and lobes widening to 5–8 mm, pale green, turning bright red. *Corolla* white or pale cream; tube slender, (15–)20–30(–35) mm long, outside glabrous to subglabrous, inside with some glands; lobes ovate/oblong, 7–8 mm long. *Stamens* extending up to 17 mm from the corolla tube. *Ovary* ± globose, shallowly 4-lobed, glabrous. *Fruit* ripening to purple-black, subglobose to shallowly 4-lobed, 4.5–7(–10) mm diam.

Distribution — Northern and eastern Australia; in *Malesia*: New Guinea.

Habitat & Ecology — Found on 'stony slopes' and 'rocky outcrops' in savannah grassland and, more occasionally, in forest clearings alongside rivers. Frequently associated with sandy soils. Altitude: c. 680 m.

Notes — 1. A very variable and much-confused species, closely similar to *C. tomentosum*. The variability between specimens and even between leaves (the organs upon which most emphasis for varietal delimitation had been placed) on individual specimens has shown that some of the varieties formerly recognised (see Munir 1989) were too narrow and too weak to enable easy categorisation of collections and two have therefore been combined here.

2. Over-reliance upon the abundance of hairs on specimens by Munir has in our opinion diverted attention from more important floral morphology. The morphology of the inflorescence, as originally stated by Brown (1810), is 'congested' in *C. tomentosum* but open in *C. floribundum*. This is the main difference between the two species apart from the frequently denser indumentum of *C. tomentosum*. However, both species can be found with puberulous states, which has added confusion where keys rely upon this character.

3. The highly variable and quite similar phenotypes of *C. floribundum* and *C. tomentosum* are indicative of two taxa which have evolved in parallel within similar habitats, as they are strongly supported in a monophyletic clade of Asian *Clerodendrum*, along with *C. indicum*, *C. minahassae* and *C. quadriloculare* (Yuan et al., Taxon 59 (2010) 131), all of which possess long, narrow corolla tubes, probably an adaptation to a particular type of pollinator. *Clerodendrum longiflorum* is probably also in this clade but material of this species was not available to Yuan et al. (2010).

4. Synonyms originating from Australian material, which have not been used in New Guinea, were not included here. For extra-Malesian names see Munir (1989).

5. Immature flowering shoots or individual flower buds of both species are sometimes subject to attack by heteropteran bugs inducing gall formation (nymphs dissected from much-enlarged flower buds, up to 20 by 12 mm, and which appear darker), which causes malformation of the plant (see Habitat & Ecology in Introduction).

KEY TO THE VARIETIES

1a. Leaves narrowly to broadly elliptic, apex acute to acuminate, base cuneate to attenuate . . . . . **a.** var. **floribundum**
b. Leaves broadly ovate, apex acute or shortly acuminate, base broadly cuneate/concave, truncate or subcordate . . . . . **b.** var. **ovatum**

a. var. **floribundum**

Clerodendrum attenuatum R.Br., Prodr. (1810) 511; Schauer in A.DC., Prodr. 11 (1847) 671. — *Clerodendrum floribundum* R.Br. var. *attenuatum* (R.Br.) Moldenke, Phytologia 39 (1978) 236; Munir, J. Adelaide Bot. Gard. 11 (1989) 128, syn. nov. — Type: *Brown s.n.* [*Iter Austral. 2311*] (holo BM), Australia, New South Wales, Newcastle, Hunter River.

Clerodendrum floribundum R.Br. var. *angustifolium* Moldenke, Phytologia 37 (1977) 22, syn. nov. — Type: *White 8675* (holo NY; iso NY), Australia, North Queensland, Torrens Creek.

This variety can be distinguished from var. *ovatum* by its narrowly to broadly elliptic leaves, which are 1.7–2.7 times as long as wide and have cuneate-attenuate bases.

Note — The continuous variability in this variety (especially leaf shape and inflorescence indumentum) has led to the synonymy here of two additional previously upheld 'varieties' which, upon examination of a wide range of material, fall along this continuum. As a cautionary note, the congested inflorescence depicted as an illustrative representation of var. *attenuatum* in Munir (1989) is not representative of the holotype or of Brown's species-level description of it and would seem to more-closely represent the inflorescence morphology of *C. tomentosum* (Brown 1810, clearly stated that the inflorescence of his *C. tomentosum* is congested and omits this from the description of *C. attenuatum*).

b. var. **ovatum** (R.Br.) Domin

Clerodendrum floribundum R.Br. var. *ovatum* (R.Br.) Domin, Biblioth. Bot. 89 (1928) 1112; Munir, J. Adelaide Bot. Gard. 11 (1989) 135. — *Clerodendrum ovatum* R.Br., Prodr. (1810) 511; Schauer in A.DC., Prodr. 11 (1847) 671. — Lectotype (designated by Munir 1989): *Brown s.n.* [*Iter Austral. 2317*] (lecto BM; isolecto BM, K, LE, MEL), Australia, Queensland, Carpentaria Islands, North Coast

Clerodendrum coriaceum R.Br., Prodr. (1810) 511; Schauer in A.DC., Prodr. 11 (1847) 671, syn. nov. — *Clerodendrum floribundum* R.Br. var. *coriaceum* (R.Br.) Moldenke, Phytologia 39 (1978) 236. — Lectotype (designated by Munir 1989): *Brown s.n.* [*Iter Austral. 2316 p.p.*] (lecto BM; isolecto BM, K), Australia, North Coast Islands.

Clerodendrum populneum E.Beer & H.J.Lam, Blumea 2 (1936) 224. — Type: *Brass 3781* (holo L; iso NY), Papua New Guinea, Central Division, Baroka.

This variety can be distinguished from var. *floribundum* by its broader, ovate leaves with shortly acuminate apices, which are 0.9–1.6 times as long as wide. The distribution of this variety overlaps that of var. *floribundum*.

Notes — 1. The types of var. *ovatum* differed insufficiently from the types of var. *coriaceum* to enable us to uphold its delimitation. Moreover, examination of c. 150 specimens from New Guinea and Australia shows that the variability is so continuous as to support this conclusion. Several specimens, in particular from the Northern Territory of Australia, show all the variation of this variety on a single branch.

2. *Ovieda ovalifolia* A.Juss. (= *Volkameria inermis* L.; see Yuan et al., Taxon 59 (2010) 131) was erroneously synonymised under *C. floribundum* (specifically, under the *nomen nudum*, *C. floribundum* var. *latifolium* F.Muell.) by Moldenke (Phytologia 59 (1986) 427) and was superfluous in any case as Moldenke also cited the earlier name *C. floribundum* var. *ovatum* in synonymy. Munir (1989: 136) addressed this.

16. Clerodendrum haematolasium Hallier f. (Section *Clerodendrum*)

Clerodendrum haematolasium Hallier f., Meded. Rijks-Herb. 37 (1918) 69; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 286; Moldenke, Phytologia 60 (1986) 138; Wearn & Mabb., Syst. Bot. 36 (2011) 1053. — Lectotype (designated here by Mabberley): *Hallier 2934* (lecto L; isolecto L), Borneo, Kalimantan, Gg Liang Gagang.

Clerodendrum hispidum M.R.Hend., Gard. Bull. Straits Settlem. 7 (1933) 118. — Type: *SFN (Henderson) 25805* (holo SING; iso K, KEP), Peninsular Malaysia, Pahang, Kuantan, near Bt. Sagu.

Treelet, to 4 m tall. *Branchlets* terete, densely red- to yellow-hispid, multicellular hairs to 2 mm long. *Leaves* decussate; blade elliptic to oblong, 10–34 by 4.5–17.5 cm, 1.9–2.5 times as long as wide, apex acuminate, base usually rounded, very hispid, often purplish abaxially, margin serrate (to subentire); petiole 3–8 cm long, densely hispid, subgeniculate. *Inflorescences* erect, terminal, a pyramidal thyrse to 25 cm long, densely hispid; basal bracts leafy, bracteoles linear. *Calyx* campanulate, 9.5–12.5 mm long, hispid, hairs reddish, lobes 5, ovate-lanceolate, acuminate, united for about a third of the length of the calyx tube, 6–9 mm long, widening as fruit matures. *Corolla* whitish to pale lemon yellow; tube c. 13 mm long; lobes c. 4.5 mm long, oblong or subobovate. *Stamens* extending 20–25 mm from the corolla tube, filaments white. *Ovary* globose, glabrous. *Fruit* globose, black, 5–6 mm diam.

Distribution — Thailand; in *Malesia*: Peninsular Malaysia (Terengganu and Pahang, though rarely collected) and Borneo.

Habitat & Ecology — Lowland to lower montane forests, including limestone. Altitude: 160–1400 m.

17. Clerodendrum hendersonii Moldenke (Section *Clerodendrum*)

Clerodendrum hendersonii Moldenke, Phytologia 33 (1976) 372; Phytologia 60 (1986) 151; Kiew, Malayan Nat. J. 42 (1989) 257. — Type: *SFN (Henderson) 23299* (holo NY; iso K, SING), Pahang, Cameron Highlands.

Clerodendrum colebrookianum auct. non Walp.: Ridl., Fl. Malay Penins. 2 (1923) 629, *p.p.*, non Walp., Repert. Bot. Syst. 4 (1845) 114.

Small tree, to 4 m tall; trunk to 5 cm diam.; bark smooth, grey; shoots, leaves and inflorescences minutely brown puberulent. *Branchlets* quadrangular and lenticellate when young. *Leaves* decussate; blade ovate-deltoid (never cordate), 12–17 by 6.5–9 cm, 1.8–1.9 times as long as wide, apex cuspidate, base truncate, sometimes asymmetric, bullate when fresh, subglabrous, margin subentire; petiole 2.5–9 cm long, adaxially flattened. *Inflorescences* subcorymbose, 1.5–3.5 cm across, erect, usually axillary, not marcescent; peduncle 2.5–12 cm long, bearing cymes with 30–50 flowers; pedicel to 1 mm long; bracteoles leafy, c. 10 by 5 mm. *Calyx* 7–10 mm long, campanulate, pale green to dull red; lobes 5, triangular, united for just over half to two-thirds of the tube, 2–4 mm long, basally c. 2 mm wide, acute, sometimes with glands externally. *Corolla* white; tube 18–22 by 1–2 mm; lobes c. 6 by 3 mm, spatulate, obtuse to rounded. *Stamens* extending 10–12 mm beyond corolla lobes. *Ovary* c. 2 mm tall, subglobose, glabrous. *Fruit* depressed-globose, blue-black, c. 8 mm diam., separating into 4 pyrenes, surrounded by crimson-red accrescent calyx.

Distribution — Peninsular Malaysia (Pahang), one record from Sumatra (Aceh).

Habitat & Ecology — Montane forests (*Pandanus klossii* thicket on G. Ulu Kali), especially at edges, roadsides. Altitude: 1200–1930 m.

Note — This species is very similar to *C. colebrookianum*, from which it differs by having larger calyces and leaf bases that are never cordate. Kiew (1989) also separated the two species based on presence/absence of calyx glands, but the use of this additional character for delimitation was found not to hold true upon examination of a wider range of material than that available to her.

18. Clerodendrum hettae Hallier f. (Section *Tridens*)

Clerodendrum hettae Hallier f., Meded. Rijks-Herb. 37 (1918) 82; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 316; Moldenke, Phytologia 60 (1986) 189. — Lectotype (designated here): *Elbert 644* (lecto L), [Indonesia, Lesser Sunda Islands,] Lombok.

Clerodendrum speciosissimum Van Geert ex Drapiez forma *macrocalyx* Bakh. ex Moldenke, Resume Geogr. Distr. & Syn. (1959) 269, nom. inval., in syn.

Shrub, 1–2 m tall; all parts ± glabrous. *Branchlets* subquadrangular with pale brown, longitudinally ribbed bark, sometimes slightly fistular, older ones lenticellate. *Leaves* decussate; blade subcordate, 9–28 by 7–20 cm, 1–1.4 times as long as wide, apex acutely short acuminate, base ± widely cordate, chartaceous, both surfaces glabrous with a few glands close to the midrib, margin entire; lateral veins 8 pairs; petioles 4–12 cm long. *Inflorescences* erect, a terminal thyrse, low-pyramidal shape, entirely red, 9–12 cm long by nearly as wide; primary branches to the lower cymes 3–4 cm long with reduced leaf-like, 1 cm long bracts. *Calyx* (15–)19–22 mm long; lobes 3, united for 3/4 of their length, (rarely with a V-shaped notch apically in two of the three), slightly accrescent. *Corolla* red to orange-red; tube 22–27(–31) mm long, glabrous; lobes oblong, 19–22 mm long. *Stamens* extending 2.5–2.8 cm from the corolla tube. *Ovary* ± globose, glabrous. *Fruit* globose, blue-black, 6–7 mm diam.

Distribution — Lesser Sunda Islands (Lombok and Sumba).

Habitat & Ecology — Altitude: 500–700 m.

Notes — 1. This species is similar to *C. brassii* and *C. magnificum* (also, see Insufficiently Known Taxa for another apparently allied species, *C. elbertii*) but differs from both in form of the calyx and from *C. brassii* in size of the flowers. This species has been collected infrequently and apparently not since 1939 (*Bloembergen 3023*; K, L).

2. The Elbert type material listed as at L (above) is on long-term loan from FR (see Steenis-Kruseman in Steenis, Fl. Males., Ser. I, 1 (1950) 150, and http://www.nationaalherbarium.nl/fmcollectors/E/ElbertJ.htm).

19. Clerodendrum indicum (L.) Kuntze (Section *Siphonanthus*)

Clerodendrum indicum (L.) Kuntze, Revis. Gen. Pl. 2 (1891) 506; Burkill, Econ. Prod. Malay Pen. (1935) 584; (1966) 592; Backer & Bakh.f., Fl. Java 2 (1965) 608; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 304; Moldenke & A.Moldenke in Dassan. & Fosberg, Revis. Handb. Fl. Ceylon 4 (1983) 426; Moldenke, Phytologia 60 (1986) 281; Phytologia 61 (1986) 23; S.L.Chen & M.G.Gilbert in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 36; C.M. Boo et al., 1001 Gard. Pl. Singapore ed. 2 (2006) 180 + f.; Wearn & Mabb., Syst. Bot. 36 (2011) 1053. — *Siphonanthus indicus* L., Sp. Pl. 1 (1753) 109. — *Clerodendrum siphonanthus* R.Br. in W.T.Aiton, Hort. Kew. ed. 2, 4 (1812) 65, nom. illeg.; Schauer in A.DC., Prodr. 11 (1847) 670; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 306. — Lectotype (designated by Moldenke & A.Moldenke (1983) 427): Amman, Comm. Acad. Sci. Imp. Petrop. 8 (1741) t. 15.

Subherbaceous sappy shrub or treelet, to 3 m tall (but usually much less), with suckering stolons. *Stems* usually unbranched, arching, quadrangular, subglabrous. *Leaves* in whorls of (2–)3–5(–6); blade narrowly lanceolate to oblong-lanceolate, 10–21 by 1–2.8 cm, 5.2–14 times as long as wide, apex shortly acuminate, base attenuate, glabrous, margin sinuate to entire; secondary brochidodromous veins 9–12 pairs; sessile or with petioles to 8 mm long. *Inflorescences* erect, a terminal leafy thyrse to 45 by 10–15 cm, glabrous; cymes few-flowered, peduncle to 3 cm long; bracts lanceolate to linear lanceolate. *Calyx* 8–10 mm long, divided to c. 3/4 of its length, densely minutely glandular, lobes 5, 8–15 by 3–6 mm, ovate-lanceolate, accrescent, opening to 3.8 cm across and becoming crimson and 'leathery' as fruit matures. *Corolla* yellow-white; tube 5–9 cm long, funnel-shaped, curved/pendulous; lobes 8–15 by 3–6 mm, lanceolate to ovate-oblong. *Stamens* long-exserted. *Ovary* glabrous. *Fruit* often globose when a single pyrene matures but 2–4-lobed if the other pyrenes mature (sometimes partially, appearing as vestigial lobes aside a large globose fruit), light to dark blue as it matures, c. 1.2 cm diam.

Distribution — India, Nepal, southern China, Thailand, Vietnam; in *Malesia*: Peninsular Malaysia, Sumatra, Java, Borneo, Sulawesi, Moluccas. Widely introduced in Malesia such that the original native distribution is now unclear. Probably merely naturalized in Borneo and further to the east.

Habitat & Ecology — River banks, other damp and open land, including waste ground. The scentless flowers close in the morning.

Note — The leaf shape and venation of *C. indicum* is very similar to that of *C. johorense*, but the inflorescences of the two species are quite different.

20. Clerodendrum infortunatum L. (Section *Clerodendrum*)

Clerodendrum infortunatum L., Sp. Pl. (1753) 637; Schauer in A.DC., Prodr. 11 (1847) 667; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 284; Moldenke, Phytologia 61 (1986) 169. — *Clerodendrum viscosum* Vent., Jard. Malmaison 5 (1803) t. 25, nom. superfl. — Lectotype (designated by Jarvis, Order Out of Chaos (2007) 427): *Hermann s.n.* (lecto BM-HERM 4: 46, No. 232), Sri Lanka.

Clerodendrum cordatum D.Don, Prodr. Fl. Nepal (1825) 103; Schauer in A.DC., Prodr. 11 (1847) 674. — Neotype (designated here): *Wallich s.n.* (all original material†), Nepal; *Royle '8984x'* (neo LIV).

?*Clerodendrum vanoverberghii* Merr., Philipp. J. Sci., C 7 (1912) 98; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 286, syn. nov. — Type: *Vanoverbergh 838* (holo PNH†; iso A, G image seen, L, LD image seen, U, US), Philippines, Luzon, 1910.

Clerodendrum philippinense Elmer, Leafl. Philipp. Bot. 9 (1934) 3223, syn. nov. — Type: *Elmer 22379* (holo PNH†; iso A, BM, C, GH, HUH, K, L, NY, US), Luzon, Pampanga, Zambales Mountains, Mt Pinatubo.

Shrub or small tree, 0.5–5(–8) m tall. *Branchlets* quadrangular to subquadrangular, villose with dull yellowish to tawny hairs. *Leaves* decussate; blade ovate to deltoid or elliptic, 11–22 by 7–19 cm, 1.1–2.2 times as long as wide, apex acute to acuminate, base obtuse to cordate, thickly chartaceous to coriaceous, both surfaces pubescent with abaxially distinctly raised veins, margin denticulate, dentate or sometimes serrate; lateral veins 6 or 7 pairs, simple agrophic, tertiary venation often prominent scalariform; petioles 2–12.5 cm long. *Inflorescences* terminal pyramidal thyrse, cymes with subtending leaf-like bracts, giving the appearance of a terminal paniculate inflorescence, individual thyrses 5–7 cm diam., inflorescence extending up to 30 cm up to the branch apex, axes trichotomous; pedicels and peduncles villose; bracteoles lanceolate or leaf-like (sometimes caducous). *Calyx* campanulate, 9–14 mm long; lobes 5, united for ≤ half of the calyx length, 5–6 by 2–5 mm, ovate to lanceolate, pubescent to villose with peltate glands on outer side, accrescent, calyx increasing to 16–20 mm long and lobes widening to 7–11 mm, turning dark red and (at least partially) reflexing, coriaceous. *Corolla* white (usually with pink/purple marking in the throat); tube 12–23 mm long, outside pubescent; lobes oval, 7–12 mm long. *Stamens* extending 2–3 cm from the corolla tube. *Ovary* ± cylindrical to slightly obovate, glabrous. *Fruit* green, ripening to dark purple, globose, (8–)9–10(–11) mm diam. with 2, 3 or 4 pyrenes maturing.

Distribution — India, Sri Lanka, Nepal, S China (Yunnan), Burma, Laos, Thailand; in *Malesia*: Philippines.

Habitat & Ecology — Primary and secondary forest, lowland and hillsides, forest edges and sometimes roadsides. Altitude: sea-level to 1500 m.

Notes — 1. *Clerodendrum infortunatum* and its synonyms have been the subject of lengthy discussions (including Moldenke & A.Moldenke in Dassan. & Fosberg, Fl. Ceylon 4 (1983) 461–466, 473–476; Moldenke (1986) 169–188; Nicolson et al., Interpr. Van Rheede's Hort. Malab. (1988) 260–261).

2. *Clerodendrum cordatum*, although described from Nepal, is a name occasionally used in Malesia, and has, therefore, been included here. Following discussions with Henry Noltie (E) and John Edmondson (LIV), all herbaria likely to hold David Don's Wallich material were consulted. As none possessed any original material of *C. cordatum*, neotypification is required. The specimen which clearly shows the characters of the species and also had the best provenance to become the neotype was a sheet accessioned as *8984x* in the Roylean Herbarium at LIV. The specimen bears a label deter-

mined as *C. cordatum* in Royle's younger hand. Don worked on specimens in Royle's herbarium and it is clearly an early-collected and good-quality specimen (even though it was determined post-publication of Don's work). The name was first reduced to *C. infortunatum* by Clarke (in Hook.f., Fl. Brit. India 4 (1885) 594) and was followed by Lam (1919: 284).

3. *Clerodendrum vanoverberghii* is known only from the type collection, which appears to be material of *C. infortunatum*. It has therefore been included tentatively in synonymy here, pending the collection of further similar material from Luzon.

4. *Clerodendrum philippinense* is known only from the type, which resembles *C. infortunatum* as the plant is covered with dark, ferruginous hairs and has longer corolla tubes than those of the similar *C. villosum*.

21. Clerodendrum intermedium Cham. (Section *Clerodendrum*)

Clerodendrum intermedium Cham., Linnaea 7 (1832) 150; Schauer in A.DC., Prodr. 11 (1847) 669; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 298; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 402; Moldenke, Phytologia 61 (1986) 272; Phytologia 63 (1987) 126; Kessler, Second. Forest Trees Kalimantan (2000) 193, 194; Wearn & Mabb., Syst. Bot. 36 (2011) 1053. — Type: *Chamisso s.n.* (holo LE), Philippines, Luzon.

Volkameria cassopangil Blanco, Fl. Filip. (1845) 356. — Neotype (designated here): *Quisumbing 651* (= *Merrill Species Blancoanae 43*) (neo US; isoneo L), Philippines, Luzon, Laguna, Los Baños.

Clerodendrum illustre N.E.Br., Gard. Chron. (1884) 424; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 303, syn. nov. — Type: *Riedel s.n.* (holo K), N Celebes [Sulawesi], Gorontalo.

Clerodendrum puberulum Merr., Philipp. J. Sci., C 10 (1915) 72; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 283; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 404, syn nov. — Syntypes: *Copeland 414* (erroneously as '*404*') (K, NY, PNH†, US), Philippines; *De Vore & Hoover 177* (PNH†), Philippines.

Shrub, 2 m tall, occasionally a small tree to 5 m. *Branchlets* pale to mid-brown or greenish brown, quadrangular, pithy/hollow, glabrous to subglabrous with variable rings of interpetiolar and interpedicelular hairs. *Leaves* decussate; blade cordate, 11–25 by 9–20 cm, 1.1–1.3 times as long as wide, apex acute or sometimes shortly acuminate, often almost triangular (especially upper leaves), base cordate, sometimes with deep sinuses, membranaceous, surfaces ± glabrous to sparsely puberulous, abaxially also with peltate/patelliform glands (extra-floral nectaries), margin denticulate to serrulate, denticulations mucronulate; lateral veins 5–7 pairs; petioles of variable length corresponding to leaf size, 2.5–12 cm long. *Inflorescences* erect, a terminal pyramidal thyrse with subtending leaf-like persistent bracts, often with the appearance of a terminal paniculate inflorescence, up to 28(–38) cm long by up to 19(–26) cm wide, axes trichotomous with central determinate; pedicels 1.5–3 cm long, bracteolate, ± glabrous to puberulent; branches to the lower cymes 4–7 cm long, glabrous, red. *Calyx* 3–6 mm long, lobes united at the base only, lobes 5, small, narrowly elliptic, 3–5 by c. 1.5 mm, glabrous to subglabrous, slightly accrescent to 6–8.5 by 2–3 mm, spreading and only covering base of fruit. *Corolla* red; tube slender, 9–13 mm long; lobes 6–8 mm long, spreading, glabrous (to subglabrous). *Stamens* 4, extending up to 4 cm from the corolla tube. *Fruit* blue-black, shallowly to deeply 4-lobed, 7–8 mm diam.

Distribution — India, Sri Lanka, Thailand, Taiwan; in *Malesia*: Sumatra, Borneo, Philippines, Sulawesi.

Habitat & Ecology — Often grows on open land, along river banks and trails, and occasionally on swampy land. Altitude: to 500 m.

Notes — 1. *Clerodendrum intermedium* is somewhat similar to *C. japonicum* but distinct in its floral and foliar morphology. Flowers of *C. japonicum* are more than twice as wide with calyces three times larger than *C. intermedium* and are supported by more robust pedicels, whilst the leaves of *C. japonicum* are more rounded. Chamisso (1832) noted in his description of the plant that it was intermediate in morphology between *C. japonicum* and *C. paniculatum*. This is an accurate conclusion. Vegetatively, *C. intermedium* is also similar to *C. speciosissimum*, but that species has much longer corolla tubes and corolla lobes, and inflorescences which are more rounded.

2. A variant with a denser covering of indumentum on the leaves and inflorescence, collected from Davao (Philippines), was described as *C. puberulum*. This character is also shown, to a lesser extent, by *Loher 4423* (K!), also from Davao, and is considered to be local variation producing an increase in indumentum, less usual in the species across its range within Malesia, but seen on some of the material which we examined from Thailand. The Copeland collection had originally been determined as *C. intermedium* and it is in this species that we now include it. Although Merrill (1915) stated that the collection number was '404' in his description, we have not found a *Clerodendrum* collection with this number and Moldenke (1986) annotated the 'probable isosyntypes' of collection '414' with a note saying that '404' was apparently an error. There is certainly no doubt that *Copeland 414* is conspecific with what Merrill described as *C. puberulum*.

3. Rueda (Ann. Missouri Bot. Gard. 80 (1993) 879) erroneously designated a sheet (*Cuming 480*) at L as the lectotype for this species. His explanation was that Schauer (1847) stated *Cuming 480* to be the type but the specimen was merely listed as seen by Schauer. Additionally, Rueda's decision seems more inexplicable since three years earlier he had correctly labelled the holotype at LE. Moreover, *C. intermedium* was published by Chamisso in 1832 but it was not until 1836 that Cuming even set sail for the Philippines so it is chronologically impossible for it to be a type collection.

4. *Clerodendrum illustre* was previously included in *C. squamatum* (i.e., *C. japonicum*) by Lam & Bakhuizen van den Brink (Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 93), probably through the guidance of the latter as Lam, two years earlier (1919: 304), had maintained *C. illustre*, stating that 'it perhaps will appear that this species is identical with *C. squamatum* or one of its allies'.

22. Clerodendrum japonicum (Thunb.) Sweet (Section *Clerodendrum*)

Clerodendrum japonicum (Thunb.) Sweet, Hort. Brit. 2 (1826) 322; Backer & Bakh.f., Fl. Java 2 (1965) 609; Moldenke, Phytologia 61 (1986) 282, 317; Rueda, Ann. Missouri Bot. Gard. 80 (1993) 880; S.L.Chen & M.G.Gilbert in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 36. — *Volkameria japonica* Thunb., Nova Acta Regiae Soc. Sci. Upsal. 3 (1780) 203, 208. — Lectotype (designated by Rueda 1993): *Thunberg s.n.* (lecto UPS, in Hb. Thunb. 14579); *Thunberg s.n.* (isolecto in Herb. Thunb. 14580), Japan, Nagasaki (cult.).

Shrub to small tree, 2–5(–9) m tall, trunk 2–5(–15) cm diam. *Branchlets* quadrangular, pithy/hollow, glabrous to subglabrous with variable rings of interpetiolar and interpedicelular hairs. *Leaves* decussate; blade rounded-cordate, 11–40 by 10–38 cm, 0.9–1.2 times as long as wide, apex acute to shortly acuminate, base cordate, mem-

branaceous or chartaceous, adaxial surface subglabrous, abaxially often with pubescent venation and peltate/patelliform glands (extra-floral nectaries), margin subentire to denticulate/shallowly dentate; lateral veins 6 or 7 pairs, simple agrophic; petioles of variable length corresponding to leaf size, 2–18 cm long, often minutely pubescent, sometimes appearing tapered on dried specimens. *Inflorescences* erect, a terminal, pyramidal thyrse with subtending, often caducous, leaf-like bracts; robust; up to 30 cm long and wide, axes trichotomous; pedicels 2–4 cm long, bracteolate, glabrous to subglabrous; peduncles of the lower cymes 3–8 cm long, fairly robust, glabrous to subglabrous, red. *Calyx* red, campanulate, lobes 5, united at base, variable, usually somewhat leaf-like, ovate, 9–13 by 3–7 mm, ± glabrous, enclosing the majority of the length of the corolla tube during anthesis, accrescent to 12–17 by 6–10 mm and parting once fruit is ripe. *Corolla* stout, orange-red to red, lobes with or without white or purple spots; tube to 13–20 mm long, often half-enclosed by calyx, glabrous to subglabrous; lobes elliptic. *Stamens* 4, exserted up to 4 cm from the corolla tube. *Ovary* ± cylindrical, shallowly 4-lobed, glabrous, surface often become ridged on drying. *Fruit* blue, shallowly to deeply 4-lobed, although sometimes only two or three of the four pyrenes mature, 8–10 mm diam., surface often irregularly reticulated when dry.

Distribution — Assam, Nepal, Eastern Himalayas, Bangladesh, Tibet, China (central and south), Japan, Taiwan; in *Malesia*: Malay Archipelago and Malay Peninsula, Borneo, Philippines, Sulawesi.

Notes — 1. Often confused with *C. paniculatum* and *C. intermedium* (and sometimes with *C. speciosissimum*) despite the much smaller calyces of these species. The corolla lobes of *C. paniculatum* are much smaller and paler and the leaves are lobed unlike *C. japonicum*.

2. For detailed explanation of the typification of *Volkameria japonica* see Mabberley (ms.). Unfortunately, both of the UPS-THUNB type specimens are in poor condition and not considered here as a good representation of the species. Fortunately, several good sheets (the types of *C. squamatum* Vahl – see below) are present in the Danish and French herbaria. These specimens were collected by Sonnerat (see Lamarck, Encycl. 5 (1804) 166) as Commerson never visited the Philippines.

3. Taxa identified as *C. bethuneanum*, *C. intermedium*, *C. japonicum* or *C. squamatum* have been frequently confused. Lam (Verbenaceae Malayan Archipel. (1919) 250) and Moldenke (1986) maintained them as separate species (although *C. japonicum* was absent from Lam's account). Conversely, Lam & Bakhuizen van den Brink (Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 91) grouped all four with various other names. Reliance historically has been placed upon vegetative characters and slight (but variable) differences in calyx size to separate them. The presence of 'crateriform scales' on the abaxial surface of *C. bethuneanum* and rings of interpetiolar hairs on *C. intermedium* were used by Lam (1919) and Moldenke (1986). However, both of these characters were found to occur on both and, although varying in density between individuals, on specimens of all of the aforementioned 'species'. Additionally, hairs are also frequently present around the bases of branches of the inflorescence. The differences between the inflorescence of *C. intermedium* (as described by Chamisso, Linnaea 7 (1832) 150) and the other species warrant it being maintained as a separate, but closely related species. The present authors believe that *C. japonicum* and *C. squamatum* do not differ

sufficiently to be separated (Moldenke argued that larger calyces of *C. japonicum* were sufficient) and so the synonymy in Backer & Bakhuizen van den Brink f. (1965) and Chen & Gilbert (1994) is maintained. The other synonymy follows Lam's accounts.

4. *Clerodendrum urticifolium* (Roxb.) Wall. ex Voigt has also been grouped with *C. japonicum* and other species (Lam 1919, Lam & Bakhuizen van den Brink 1921), but it differs in having strongly serrate leaf margins and smaller calyces, seemingly closer in affinity to *C. intermedium*. Moldenke (Sixth Summary Verbenac. (1980) 314) included western Malesia in the distribution of *C. urticifolium*, but we have been unable to corroborate this. The taxon is likely to be native outside Malesia (India, Burma) though cultivated in Java.

KEY TO THE VARIETIES

1a. Corolla uniformly red-orange to red . . . . . **a.** var. **japonicum**
b. Corolla red, four lobes bearing purple and white basal spots and one bearing a large white spot . . . . . **b.** var. **bethuneanum**

a. var. **japonicum**

Clerodendrum squamatum Vahl, Symb. Bot. 2 (1791) 74; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 302. — *Clerodendrum squamatum* Vahl var. *typicum* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 303, nom. illeg. — Type: *Sonnerat s.n.* (holo C; iso MPU, P-JU '*Herb. Commerson*', P-LA), Philippines, 'Habitat in India Orientali', ex Herb. Lamarck.

Volkameria coccinea Loisel., Herb. Amat. Fl. 8 (1827) t. 519. — *Clerodendrum coccineum* (Loisel.) D.Dietr., Syn. Pl. 3 (1842) 616. — Type: Loisel., Herb. Amat. Fl. 8 (1827) t. 519.

Clerodendrum scopiferum Miq., Fl. Ned. Ind. 2 (1858) 881, syn. nov. — Type: *Teijsmann HB 1162* (holo U; iso BO), Sumatra, Singalang.

Clerodendrum singalense Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 568. — Type: *Teijsmann HB 1163* (holo U; iso BO), Sumatra, Singalang.

Clerodendrum coccineum H.J.Lam, Verbenaceae Malayan Archipel. (1919) 296. — Syntypes: *Buijsman 74* (U) Java, Tengger Mt, near Nongho Djadjar, 10 July 1907; *H.A.R.T. 049914* (BO), Japan.

Material referred to this variety differs from var. *bethuneanum* by possessing a uniformly red-orange to red corolla. Calyx lobes are often slightly narrower (3–5 mm wide).

Distribution — Original distribution now unclear as widely cultivated. Probably native from India to China and central *Malesia* (Sumatra, Java, Borneo, Philippines) and introduced to Japan and Peninsular Malaysia.

Habitat & Ecology — Riverbanks in primary or secondary forest (frequently where forest cover is not dense), roadsides, waste ground. Altitude: 70–450(–900) m (–1200 m in China; Chen & Gilbert 1994).

Note — *Clerodendrum scopiferum* was known only from the type specimen, which is actually poor material of typical *C. japonicum*.

b. var. **bethuneanum** (H.Low) Wearn & Mabb.

Clerodendrum japonicum (Thunb.) Sweet var. *bethuneanum* (H.Low) Wearn & Mabb., Syst. Bot. 36 (2011) 1054. — *Clerodendrum bethuneanum* H.Low, Sarawak (1848) 66, 378 ('*Clerodendron*

bethuniana'); Bot. Mag. 74 (1848) 30; J.Sm., Bot. Mag. 75 (1849) t. 4485; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 297; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 400; Moldenke, Phytologia 58 (1985) 192. — *Clerodendrum squamatum* Vahl var. *bethunianum* (H.Low) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 94 ('*bethuniana*'). — Lectotype (designated by Wearn & Mabberley 2011): J.Sm., Bot. Mag. 75 (1849) t. 4485, 'Hort. & Borneo.', *anon. s.n.* (neo K), described from live plant(s) collected from the bank of the Sarawak River; no dried material found. — England, Devon, Exeter, Lucombe, Pince & Co. Nursery (cult.).

Material referred to this variety differs from var. *japonicum* in that the four lateral lobes of the corolla are red with purple and white basal marks and the upper lobe has a large white spot partially divided by a vertical red line. Calyx lobes are often slightly wider (4–7 mm wide). — **Plate 2b, f, g.**

Distribution — *Malesia*: Borneo, Philippines.

Habitat & Ecology — Riverbanks in open situations or riverine forest (where forest canopy cover not dense) and roadsides in secondary growth where escaped from cultivation. Altitude: 40–450(–800) m.

Notes — This variety appears to be locally abundant in Borneo (Wearn & Mabberley 2011). Apparently present in the Philippines (Merrill 1923, Moldenke 1985) but we have not seen any recent collections of this variety from these islands, although other *Clerodendrum* species have been among material collected during the Flora of the Philippines Project (Philippine Plant Inventory collections), including the morphologically similar species, *C. intermedium*. Thus, presence in the archipelago is based largely upon material from the late 19th and early 20th centuries and that does not appear to be from cultivated sources.

23. Clerodendrum johorense Moldenke (Section *Clerodendrum*)

Clerodendrum johorense Moldenke, Phytologia 33 (1976) 373; Phytologia 61 (1986) 337. — Type: *Phillips 1640* (holo KLU), Peninsular Malaysia, Johor, Mt Ophir [= G. Ledang].

Clerodendrum oblongifolium Kochummen, Malaysian Forester 41 (1978) 29, f. 2; in Whitmore, Tree Fl. Malaya 3 (1978) 305, f. 2. — Type: *FRI (Ng) 5263* (holo KEP), Johor, 24th mile Kota-Tinggi-Jemaluang Road.

Clerodendrum nutans auct. non Wall. ex Jack: Ridl., J. Straits Medic. Assoc. 5 (1897) 138; Agric. Bull. Straits Fed. Malay States 5 (1906) 247.

Treelet, 1–3 m tall; trunk to 3 cm diam., usually unbranched; bark grey. *Branchlets* quadrangular. *Leaves* decussate; blade narrowly oblong to narrowly oblanceolate, 15–32.5 by 1.8–4.5(–5.5) cm, 5–10 times as long as wide, apex acuminate with acumen to 2.4 cm long, base cuneate, glabrous, margin entire/repand; secondary veins 8–15 pairs, brochidodromous; petiole 2.5–5 cm long, angled, constricted at junction with lamina. *Inflorescences* erect, terminal, delicately branched thyrse to 30 cm long and 10 cm across, branches decussate, subtended by leafy bracts intermediate between leaves and linear bracteoles, c. 4.5 mm long. *Calyx* 4–6(–7) mm long; lobes 5, united for half of the calyx length, lanceolate, densely short brown hairy, apex acute. *Corolla* white; buds clavate; tube 10–18 by c. 0.5 mm, densely short brown-hairy outside; lobes 5–6.5 by c. 2.5 mm wide, spatulate, apex rounded. *Stamens* 4, extending from the tube by c. 15 mm. *Fruit* globose, black, c. 4 mm diam.

Distribution — Apparently endemic to Peninsular Malaysia (Selangor, Negeri Sembilan, Malacca, Pahang, Johor).

Habitat & Ecology — Lowland rainforest, especially forest-edge. Altitude: to 350 m. Vulnerable.

Note — The leaf shape and venation of *C. johorense* are very similar to those of *C. indicum*, but the inflorescences of the two species are quite different.

24. Clerodendrum kinabaluense Stapf (Section *Clerodendrum*)

Clerodendrum kinabaluense Stapf, Trans. Linn. Soc. London, Bot. 4 (1894) 216; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 279; Moldenke, Phytologia 63 (1987) 405; Wearn & Mabb., Syst. Bot. 36 (2011) 1055. — Type: *Haviland 1307* (holo K), Borneo, Sabah, Mt Kinabalu, Penokok, 3200 feet [975 m].

Shrub, c. 1(–1.5) m tall. *Branchlets* subquadrangular with longitudinally striated grey bark, pubescent/hispid (hairs often shed with maturity). *Leaves* decussate; blade oblanceolate to elliptic, 10–30 by 4–8(–14) cm, 2–4.7 times as long as wide, apex acuminate, base attenuate (sometimes rounded on immature leaves), adaxially subglabrous to pubescent, abaxially subglabrous to pubescent, margin denticulate/serrulate, denticulations often mucronate (to serrate on oldest leaves); lateral veins 9–13 pairs; petioles 4–7 cm long, shortly hispid-pubescent. *Inflorescences* erect, a terminal thyrse, comprising decussate compound cymes with subtending, linear bracts 14–17 mm long and c. 6 mm long bracteoles, inflorescences to 20 cm long by 13 cm wide but frequently smaller, axes trichotomous; pedicels and peduncles shortly hispid/pubescent with reddish coloration, primary branches from the main axis to the lower cymes 3–5 cm long. *Calyx* lobes 5, joined just above the base, elliptic to lanceolate, 10–18 by 3–4.5 mm, pubescent to shortly hispid with reddish hairs; accrescent, lobes increasing to 16–21 by 6–7 mm, reflexed and glossy red at fructescence. *Corolla* white; tube (10–)12–18 mm long, outside pubescent; lobes 11–13(–15) mm long, subequal, spatulate with bluntly acuminate apex. *Stamens* 4, extending up to 25 mm from the corolla tube. *Ovary* globose, glabrous. *Fruit* globose, 6.5–8.5 mm diam., glossy, dark purple/black. — **Plate 3d.**

Distribution — Borneo (Sabah: Kinabalu).

Habitat & Ecology — Locally common in hill forest and montane forest (especially among *Tristania* trees), sometimes on ultramafic substrate. Altitude: 600–2400 m. There is a negative correlation between shrub height and altitude (Beaman & Anderson, Pl. Mt. Kinabalu 5 (2004) 454).

Notes — 1. Sometimes described as a 'straggly' or 'weak-stemmed' shrub. This species was maintained by Lam (1919: 279), but then tentatively placed in synonymy (denoted by '(?)') under *C. disparifolium* by Lam & Bakhuizen van den Brink (Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 83). It differs from *C. disparifolium* in its larger leaves and calyces and in the form and size of the corolla.

2. In its leaf form and slightly hispid nature it is also similar to *C. haematolasium*. However, several characters of *C. haematolasium* differ significantly, including its form, much denser hispidity, smaller calyx and leafy bracts.

3. *Clerodendrum kinabaluense sensu* Beaman p.p. (Pl. Mt. Kinabalu 5 (2004) 454, t. 39A, 39B) conforms to the characters of this species. One collection (*Beaman 9797*)

included by Beaman in the flora (454, t. 38E) is not *C. kinbaluense* but *C. sayapense* Wearn & Mabb. (see entry for that species, below).

25. Clerodendrum klemmei Elmer (Section *Siphonanthus*)

Clerodendrum klemmei Elmer, Leafl. Philipp. Bot. 2 (1908) 514; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 209; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 402; Moldenke, Phytologia 63 (1987) 408. — Type: *Elmer 8679* (holo PNH†; iso A, K, L, NY, US), Philippines, Luzon, Benguet Province, Baguio.

Clerodendrum luzoniense Merr., Philipp. J. Sci. 20 (1922) 436, syn. nov. — Type: *BS (Ramos & Edaño) 33784* (holo PNH†; iso K, L, US), Philippines, Luzon, Camarines Province, Paracale.

Small slender tree, 2–4(–5) m tall. *Branchlets* with pale grey-brown bark. *Leaves* decussate; blade elliptic, 7–18 by 3–7 cm, 2–3.3 times as long as wide, apex acuminate, base acute, submembranaceous, adaxially dark green, abaxially paler green, both surfaces ± glabrous, abaxial venation sometimes puberulent, margin entire, repand or irregularly and weakly dentate apically; lateral veins 6–8 pairs; petioles 1.2–5 cm long, subglabrous. *Inflorescences* a slender terminal thyrse to c. 14 cm wide; primary branches from main axis to lower cymes 2–4 cm long, subtended by linear bracts c. 5 mm long, axial cymes trichotomous; peduncles glabrous, 4–7 cm long, often yellowish; pedicels minutely puberulent, bracteate at the middle, bearing c. 1.5 mm long linear bracts. *Calyx* 4–7(–8) mm long; lobes 5, acute, 1.5–2.5 mm long, ± subglabrous; calyx accrescent, elongating to 13–15 mm and widening to hold fruit, lobes becoming more or less incorporated, visible by short tips on rim of calyx. *Corolla* white; tube 4.5–6 cm long, minutely puberulent; lobes 6–8.5 mm long. *Stamens* 4, exserted up to 14 mm from the corolla tube. *Ovary* ovoid, glabrous. *Fruit* ellipsoid, olive ripening to bluish-mauve, 10–14 mm long, 7–9 mm diam.

Distribution — Philippines (Luzon).

Habitat — Rainforest, sometimes found in gulleys. Altitude: 350–650 m.

Notes — 1. This species is vegetatively somewhat similar to *C. disparifolium*, but differs in the united calyx lobes (separate in *C. disparifolium*) and much longer corolla tubes. Also, the infundibuliform shape of the fruiting calyces and ellipsoid fruits are most similar to *C. quadriloculare*.

2. *Clerodendrum klemmei* differs from *C. mindorense* in its slender and more open inflorescences, slightly longer calyx lobes and much longer corolla tube.

3. The type of *C. luzoniense* was found by us to be conspecific with *C. klemmei* as its flowers and vegetative organs are within the ranges of the characters of *C. klemmei*.

4. This species appears similar to *C. fortunei* Hemsl. However, little appears to be known about *C. fortunei* beyond the type collection (see Insufficiently Known Taxa).

26. Clerodendrum laevifolium Blume (Section *Clerodendrum*)

Clerodendrum laevifolium Blume, Bijdr. (1826) 808; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 266; Moldenke, Phytologia 63 (1987) 419; Wearn & Mabb., Syst. Bot. 36 (2011) 1052. — Type: *Blume s.n.* (holo L, L0003667), Java.

Clerodendrum nutans Wall. ex D.Don, Prodr. Fl. Nepal. (1825) 103, nom. illeg. (non Jack, Malayan Misc. 1 (1820) 17). — *Clerodendron nutans* Wall., Numer. List (1828) n. 1793, nom. nov., nom. nud. (non Ridl., J. Straits Medic. Assoc. 5 (1897) 138) (see Wall. in Hook., Bot. Mag. 58 (1831)

t. 3049). — *Clerodendrum wallichii* Merr., J. Arnold Arbor. 33 (1952) 220. — Type: *Wallich s.n.* in *Wallich Cat. 1793.1* (holo K-W; iso BM), Bangladesh, Sylhet (as Silhet).

Shrub, 1–2.5 m tall. *Branchlets* subquadrangular to rounded; bark mid-brown, drying longitudinally striated. *Leaves* decussate, subsessile; blades oblanceolate (occasionally ± elliptic), 5–22 by 1.2–7 cm, 3–5.5 times as long as wide, apex acuminate, base attenuate, glabrous, margin repand (occasionally weakly serrate distally); secondary veins 7–10 pairs; petioles 1–6(–9) mm long, grooved above. *Inflorescences* terminal, (15–)20–50 by 9–15 cm, lax, pendent; branches opposite, bearing few-flowered cymes with peduncles 10–55 mm long, slender; bracts c. 3 mm long, linear. *Calyx* 8–11 mm long; lobes 5, united near the base only, (2.5–)3–4 mm wide at their bases, ovate, accrescent, red. *Corolla* white; tube 10–13 mm long; lobes as long as tube, 10–13 mm long, spatulate, rounded. *Stamens* extending beyond corolla tube for c. 3 cm. *Ovary* cylindric, glabrous. *Fruit* globose, c. 6 mm diam., dark purple to black, fleshy; pyrenes 4.

Distribution — India, Nepal; in *Malesia*: Sumatra, Java (possibly only cultivated and escaped in Malesia).

Habitat & Ecology — Lowland forest margins, roadsides and ex-cultivated land.

Note — *Clerodendrum laevifolium* has been much confused with *C. disparifolium* and *C. nutans* (see Wearn & Mabberley 2011), but is distinct in its subsessile leaves and broad calyx lobes. This is the 'Indian form' (Merrill 1952), which he thought was only introduced to Malesia in the 1820s and appears to have been present in Java by 1826 (hence Blume's plant, which is conspecific). Whether *C. laevifolium* is native or merely escaped from cultivation in Malesia is not clear, and it is the plant widely grown in cultivation as *C. wallichii* or '*C. nutans*'.

27. Clerodendrum lanceoliferum S.Moore (Section *Clerodendrum*)

Clerodendrum lanceoliferum S.Moore, J. Bot. 63, Suppl. (1925) 81. — Type: *H.O.Forbes 2813* (holo BM; iso A fragment), Sumatra, Palembang, Tandjong-Ning, R. Bliti.

Clerodendrum sumatranum Moldenke, Phytologia 4 (1952) 52, syn. nov. — Type: *De Voogd 595* (holo BO; iso NY), Sumatra, Bengkulu, Kepahiang.

Treelet to ?tree (Moore 1925), from 1 m tall. *Branchlets* subquadrangular to round, grey-brown, pubescent. *Leaves* decussate, sometimes pairs of different-sized ones; blade oblong to very narrowly elliptic, 8–20 by 2.5–5 cm, 3–4 times as long as wide, apex acuminate, base obtuse, adaxial surface pubescent, abaxially paler pubescent and with yellow sessile glands, margin entire; venation densely pubescent, 3 veins conspicuous at leaf base, lateral veins 5–7 pairs; petioles variable, (1–)5.5–7 cm long, slender, pubescent. *Inflorescences* terminal and axillary, lax, with a tendency to nod, comprising paired cymes with subtending leaf-like bracts gradually reducing in size through inflorescence; axes trichotomous; pedicels about same length as calyx, densely pubescent, peduncles 5.5–8 cm long, when axillary often about same length as petiole, densely pubescent. *Calyx* lobes 5, united at the base only, narrowly triangular to narrowly lanceolate, 7–8 by c. 1 mm, densely pubescent and with yellow sessile glands, not seen in fruit. *Corolla* greenish white; tube 20–23 mm long, densely pubescent; lobes slightly spatulate, c. 7 mm long. *Stamens* 4, extending c. 7 mm from the corolla tube. *Ovary* not seen. *Fruit* not seen.

Distribution — Sumatra (Sumatera Selatan and Bengkulu provinces).

Habitat & Ecology — 'In virgin forest' (Moore 1925). Altitude: 180 m [600 ft] (Moore 1925).

Note — This species is most similar to *C. disparifolium*, but differs from it by its densely pubescent inflorescence and pubescent leaves.

28. Clerodendrum lankawiense King & Gamble (Section *Clerodendrum*)

Clerodendrum lankawiense King & Gamble, Kew Bull. (1908) 110; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 249; Moldenke, Phytologia 63 (1987) 464. — Type: *Curtis, C. 3789* (holo K; iso SING), Peninsular Malaysia, Langkawi Island, Terutan, Kedah.

Woody-based subherbaceous plant, 25–90 cm (rarely to 1 m) tall. *Branchlets* quadrangular, grooved adaxially. *Leaves* decussate; blade oblong-lanceolate to oblanceolate, 6.5–12(–20) by 1.2–2.5(–4.3) cm, 4–5.8 times as long as wide, apex acute, base attenuate, sparsely hispid, venation pubescent abaxially, margins entire to denticulate; lateral veins 9–16 pairs; petiole c. 6 mm long, rough-hairy. *Inflorescences* erect, terminal, pyramidal, to 25 cm long, leafy, scabrid, comprising pedunculate trichotomous cymes (each tri- or pentaflorous); bracts lanceolate, bracteoles small; pedicels c. 5 mm long. *Calyx* 6–8 mm long, scabrid-hispid, reddish brown; lobes 5, united near the base. *Corolla* white to yellow; buds clavate; tube 2.2–3 cm long, cylindric, pubescent; lobes obovate, spreading, the middle lobe of lower lip the longest. *Stamens* extending from corolla tube by c. 15 mm. *Ovary* rounded, stigmatic lobes very short. *Fruit* globose to subglobose, 5–6 mm diam.

Distribution — Islands off south-west Peninsular Thailand and northwest Peninsular Malaysia (only known from Langkawi, Kedah).

Habitat & Ecology — Very rare in Peninsular Malaysia, known only from sandstone at Telaja Tujoh and from Telok Borau ['Burau'], Langkawi. Vulnerable (critically endangered in Malaysia).

29. Clerodendrum lanuginosum Blume (Section *Clerodendrum*)

Clerodendrum lanuginosum Blume, Bijdr. (1826) 810; Schauer in A.DC., Prodr. 11 (1847) 672; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 294; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 402; Moldenke, Phytologia 63 (1987) 466; Yuzammi & Hidayat, The unique, endemic and rare flora of Sulawesi (2002) 142; Wearn & Mabb., Syst. Bot. 36 (2011) 1055. — Type: *Anonymous* [?*Reinwardt*] *s.n.* (holo L), Moluccas, Ternate.

Bignonia comosa Roxb., Fl. Ind. 3 (1832) 103 (non Cham., Linnaea 7 (1833) 693 = *Adenocalymma comosum* (Cham.) DC.); DC., Prodr. 9 (1845) 144; see Steenis, Acta Bot. Neerl. 2 (1953) 305; Fl. Males., Ser. I, 8 (1977) 179. — Type: *Anonymous s.n.* ('*2652*' added in Roxburgh's hand) (holo BR, v. Martius), Moluccas.

Clerodendrum cumingianum Schauer in A.DC., Prodr. 11 (1847) 666, syn. nov. — Lectotype (designated here): *Cuming 1760* ('*1761*') (syn B†, KIEL†; lecto OXF; isolecto BM, TCD, K), Philippines, Cebu.

Clerodendrum wenzelii Merr., Philipp. J. Sci., C 9 (1914) 385; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 285. — Type: *Wenzel 627* (holo PNH†; iso A, US), Philippines, Leyte, Jaro.

Clerodendrum macrocalyx H.J.Lam, Verbenaceae Malayan Archipel. (1919) 293, syn. nov. — Type: *Elmer 11338* (holo PNH†; iso K, L, U, US), Philippines, Mindanao, Todaya, Mt Apo.

Clerodendrum lanuginosum Blume var. *adpressipilum* Moldenke, Phytologia 4 (1952) 49, syn. nov. — Type: *Elmer 13559* (holo PNH†; iso BO, NY, US, W), Philippines, Mindanao, Agusan del Norte, Cabadbaran, Mt Urdaneta.

Clerodendrum leparense Moldenke, Phytologia 4 (1952) 49; Phytologia 61 (1987) 476, syn. nov. — Type: *Bünnemeijer 2414* (holo BO; iso NY fragment), Philippines, Lepar.

Shrub to small tree, 1.5–5(–7) m tall, trunk to 7.5 cm diam. *Branchlet*s grey-brown, subquadrangular to quadrangular, pubescent to densely villose/lanuginose with yellowish to pale brown hairs. *Leaves* decussate; blade subcordate to cordate; 9–23 by 7–19.5 cm, 1.2–1.4 times as long as wide, subchartaceous, apex acuminate, base subcordate to cordate (broadly obtuse to truncate in younger leaves), adaxial surface sparsely to densely pubescent, abaxially pubescent to villose with pubescent venation and sparsely-distributed glands, often located basally and near the midrib, margin denticulate to shallowly dentate/serrate (less frequently subentire), denticulations mucronulate; lateral veins 6–8 pairs; petioles 1.5–8 cm long, pubescent to villose. *Inflorescences* erect, a thyrse, cymes with subtending greenish leaf-like bracts (upper ones often caducous), fairly robust appearance, up to 18 cm long; pedicels 9–16 mm long, pubescent/lanuginose, hairs yellowish to pale brown; primary branches from the main axis to the lower cymes 2–4 cm long, fairly robust, pubescent. *Calyx* tubular, 13–17 by 5–7 mm, apex with 5 acuminate lobes divided for a third to half of the total calyx length, lanceolate to narrowly triangular, often densely pubescent during florescence, becoming more sparsely pubescent during fruiting (variable), accrescent to 18–25(–29) by 9–11(–13) mm, elongated lobes enclosing fruit until the fruit is mature, whereupon usually reflexing. *Corolla* white, sometimes with a lilac/purple mark in the throat; tube (15–)18–21 mm long, sparsely to densely pubescent; lobes broadly obovate-spatulate, c. 1 cm long. *Stamens* 4, extending up to c. 1 cm from the corolla tube. *Fruit* green, ripening to purplish, globose, 9–11 mm diam.

Distribution — Borneo (Sabah), Philippines (much less common on north-eastern islands), Moluccas (Banda, Halmahera, Seram, Ternate).

Habitat & Ecology — Primary and secondary lowland and montane forest habitats, mixed dipterocarp and damp mossy forest (but recorded on 'open terrain' on Halmahera). Altitude: 300–1550 m. It is seldom found in Borneo and we have only seen material from Sabah, collected from primary forest.

Notes — 1. The branches, leaves and inflorescences of this species are all covered with c. 1 mm long multicellular hairs (although the density of the indumentum is variable). A variant described by Lam (1919) as *C. macrocalyx* is likely to represent local variation in Mindanao and the adjacent island of Bohol, forming the upper limit of a continuous range of calyx sizes for *C. lanuginosum*, and therefore, has not been maintained.

2. Lam (1919) foreshadowed inclusion of *C. cumingianum*, but he did not make the formal synonymy. Schauer (1847) stated in the protologue of *C. cumingianum* that he had seen dried material in B and KIEL ('*v.s. in h. reg. berol. et cl. Lucae*'). The type material has certainly been lost as Lucae's herbarium at KIEL and *Clerodendrum* material at B was destroyed in World War II (Stafleu & Cowan, Taxon. Lit. 3 (1981) 179). As two specimens are cited in the protologue, they are technically syntypes so a lectotype was selected from the extant isosyntypes.

3. The type material of *C. lanuginosum* bears a label with '*Clerodendron montanum, Ternate*' in an unknown hand and, below, '*C. lanuginosum* Bl.' in the hand of Blume, with a note at the bottom ('herb. Blume') stating that it is from his herbarium. Blume never collected from the Moluccas, so the collector is unknown. Nevertheless, Van Steenis states: "when he [Blume] left Java, he took with him the greater part of the herbaria of Reinwardt, Kuhl, and van Hasselt" (Steenis-Kruseman in Steenis, Fl. Males., Ser. I, 1 (1950) 65). Reinwardt is the only collector listed by Blume (Enum. Pl. Javae (1827) 5) who is known to have collected on Ternate (15–27 August 1821). Thus, it is likely the type material was collected by Reinwardt.

4. Lam based his *C. macrocalyx* on a fruiting specimen of *C. lanuginosum*, so that the distinction between the two, made by him, on this character alone, was due to observation of insufficient flowering and fruiting material of *C. lanuginosum*.

5. *Clerodendrum leparense* by Moldenke's own admission was based on 'fragmentary' material with only one small pair of leaves just below the inflorescence. Bakhuizen van den Brink had previously determined the specimen in BO (on which Moldenke based his description) as *C. lanuginosum*. The fragments indeed appear to represent *C. lanuginosum* (see also *C. preslii*, under Insufficiently Known Taxa).

30. Clerodendrum longiflorum Decne. (Section *Siphonanthus*)

Clerodendrum longiflorum Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 400; Schauer in A.DC., Prodr. 11 (1847) 670; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 310; Moldenke, Phytologia 62 (1987) 81; Munir, J. Adelaide Bot. Gard. 11 (1989) 120; Mabb., Sci. New Guinea 19 (1992) 38. — *Clerodendrum longiflorum* Decne. var. *glabrum* Munir, J. Adelaide Bot. Gard. 11 (1989) 120, nom. illeg., nom. superfl. pro var. *longiflorum*. — Type: *Anonymous s.n.* (holo P; iso K, L, NY), Indonesia, Timor.

Clerodendrum kalaotoense H.J.Lam, Verbenaceae Malayan Archipel. (1919) 307; Moldenke, Phytologia 61 (1986) 399, syn. nov. — Type: *Docters van Leeuwen-Reijnvaan 1373* (holo U; iso L), Kalaotoa Island [south of Celebes].

Archboldia ericoides E.Beer & H.J.Lam, Blumea 2 (1936) 31 (see De Kok & Atkins, Kew Bull. 52 (1997) 503), syn. nov. — Type: *Brass 6025* (holo L, [photo of holo K]; iso NY), Papua New Guinea, Western Division, Oriomo River, Wuroi.

Erect shrub or small tree, 1.5–9 m tall. *Branchlets* ± rounded to subquadrangular, bark grey-brown. *Leaves* decussate; blade elliptic to narrowly ovate, 8–22 by 5.5–10 cm, 1.7–2.4 times as long as wide, membranaceous to thinly chartaceous, apex attenuate/acuminate, base usually attenuate, adaxially ± glabrous (occasionally sparsely puberulent), abaxially usually glabrous to subglabrous (occasionally puberulent), margin entire; lateral veins 4–7 pairs, tertiary and quarternary venation often finely reticulate; petioles 1–6(–8) cm long. *Inflorescences* a corymbose thyrse, erect, terminal and axillary, reduced leaf-like bracts often caducous. *Calyx* campanulate, 8–11 mm long, glabrous to ± puberulent; lobes 5, ovate-lanceolate to triangular, 5–6 mm long, united for a third to half of the calyx length, accrescent, calyx elongating to 13–16 mm and lobes widening to 7–10 mm at their bases, lobes parting to expose fruit and usually relaxing once fruit is mature. *Corolla* white; tube 6–7(–8.2) cm long, ± glabrous to slightly puberulous; lobes oval, 7–10 mm long. *Stamens* 4, extending 3–4.5 cm from the corolla tube. *Ovary* subglobose, shallowly 4-lobed, glabrous. *Fruit* ± globose to obovoid, very

shallowly 4-lobed, blue-black or dark purple, 6–11 mm diam., the size dependent on the number of maturing pyrenes, (1–)2–4.

Distribution — Northern Australia; in *Malesia*: Sulawesi (Kalaotoa), Lesser Sunda Islands (Timor, Jamdena), New Guinea.

Habitat & Ecology — Found in long-grass savannah and in rainforest understorey, especially on sandy and gravelly soils. Altitude: 5–200(–640) m.

Notes — 1. This species is variable morphologically, and its delimitation has been much confused. Despite Moldenke (1952) describing a pubescent variety of the *C. longiflorum*, Munir (1989: 120) then described a glabrous variety, based on the type of the species (synonym of *C. costatum*, see there). Thus, Munir's variety is superfluous and should instead refer to the autonym. Moldenke (1987) stated that the type of *C. longiflorum* was collected by Decaisne, but Decaisne never collected from Timor. It is likely that the collection was made by Gaudichaud (Decaisne 1834). Munir (1989) placed any material with slight indumentum under *C. costatum* in his account of *Clerodendrum* in Australia (yet had separated some of the pubescent New Guinea material as *C. longiflorum* var. *pubescens* in herbaria), ignoring Moldenke's circumscription (see entry for *C. costatum*) and even confusing his own. Despite the historical nomenclatural problems, there exists a range of morphology (including puberulent and glabrous plants), so the varieties of both species are redundant.

2. Dissection of flowers showed that a possible difference in ovary shape between *C. costatum* and *C. longiflorum* (c.f., Munir (1989) f. 3, f. 12) is not useful as a delimiting character.

3. The corolla tubes of this species are often inhabited by hemipteran bugs (see Habitat & Ecology in the Introduction), confusion of which had led to Beer & Lam's description of *Archboldia ericoides*, in fact a galled plant of *C. longiflorum*.

31. **Clerodendrum macrostegium** Schauer (Section *Clerodendrum*)

Clerodendrum macrostegium Schauer in A.DC., Prodr. 11 (1847) 666; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 286; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 403; Moldenke, Phytologia 62 (1987) 136. — Lectotype (designated here): *Cuming 1541* (syn B†, KIEL†; lecto K; isolecto BM, K, L, OXF), Philippines, Luzon, Batangas Province.

Volkameria grandiflora Blanco, Fl. Filip. (1837) 512 (non *Clerodendrum grandiflorum* Schauer). — Type: unknown collector (holo PNH†; iso unknown), Philippines. — Illustrative specimen: *Merrill Species Blancoanae 1026* (K, L, US image seen; see Merrill, Sp. Blancoan. (1918) 334), Philippines, Luzon, Rizal Province, Santa Inez.

Clerodendrum ceramense Moldenke, Phytologia 4 (1952) 46, syn. nov. — Type: *Rutten 1865* (holo BO; iso L, U), Moluccas, western Ceram, Kawagebied, Vai-veti.

Large shrub or small tree, 3–4(–6) m tall. *Branchlets* with brown bark covered in soft, dense, whitish to yellowish indumentum. *Leaves* decussate; blade deltoid to cordate, 10–30 by 5–20 cm, 1.5–2 times as long as wide, apex acuminate, base truncate to shallowly cordate (often rounded on immature leaves), subchartaceous, adaxial and abaxial surfaces villose-sericeous, abaxial surface paler, margin entire (rarely serrate), often with a 'skirt' of pale sericeous marginal hairs; lateral veins 6–9 pairs, tertiary

venation abaxially-prominent scalariform (bracts lack this and so can be easily distinguished from true leaves); petioles 3–10 cm long, sericeous/villose. *Inflorescences* erect, terminal, distinctly trichotomous at branchlet apex, central branch (1.5–8 cm long) often slightly shorter than the two side-branches (2.5–10 cm long) creating one domed inflorescence 12–25 cm wide; bracts leaf-like, pink to lilac with greenish veins, 2.5–5 by 1–3.5 cm, pubescent, lower ones oval/acuminate and the upper ones more lanceolate, abaxial irregularly bearing disc-shaped glands (0–9(–20) per bract); pedicels and peduncles villose. *Calyx* 14–18 mm long, lobes 5, united for about half the length of the tube, lanceolate, acuminate, pubescent, accrescent, widening to hold fruit and becoming purple. *Corolla* white; tube 24–31 mm long, pubescent; lobes oval to slightly spatulate, 5–6 mm long. *Stamens* 4, extending up to 15 mm from the corolla tube. *Ovary* globose, glabrous. *Fruit* globose, glossy, blue-black, 6–7 mm diam., separating into 4 pyrenes (sometimes only 3 maturing), c. 7 by 4 mm, each with one seed.

Distribution — Philippines, Moluccas.

Habitat & Ecology — Lowland secondary growth, open ground, riverbanks, and in forests. Altitude: (100–)500–650(–800) m. This species is capable of spreading locally via root suckers and by seeds (Starr et al., Rep. Pl. Hawai'i, *Clerodendrum macrostegium* (2003) 1). Material does not appear to have been commonly collected from Malesia but it has become a noxious weed (similarly to *C. chinense*) within some neighbouring island groups, having spread from cultivation in Hawai'i and naturalized on islands such as Kaua'i during the last 15 years (Lorence & Flynn, Bishop Mus. Occas. Pap. 49 (1997) 9).

Notes — 1. This species is almost entirely covered by a soft indumentum and is commonly referred to as 'velvety'. The highly coloured bracts are likely to serve as strong visual stimuli for attracting pollinators.

2. The type of *C. macrostegium* is cited as *Cuming 1541* but, as Schauer (1847) stated in the protologue that he had seen dried material in B and KIEL ('*v.s. in h. reg. berol. et cl. Lucae*'), the type material has certainly been lost as Lucae's herbarium at KIEL and *Clerodendrum* material at B have been destroyed (Stafleu & Cowan, Taxon. Lit. 3 (1981) 179). Because specimens at two different institutions are cited in the protologue, they are technically syntypes. A lectotype was selected here from the extant syntypes (now isolectotypes). One of two sheets at K was chosen as it has good flowering material.

3. By the time Merrill's book (1918) was published, the synonymy of *V. grandiflora* had already been established: 'this reduction was made by Fernandez-Villar and is certainly the correct disposition of Blanco's species' (Merrill (1918) 334). It should be noted that the specimen cited by Merrill as 'illustrative' material of *V. grandiflora* does not represent Blanco's concept of the species as Blanco had added a note (see Blanco (1837) 513) stating that there was another similar species known with dentate/serrate leaves (this 'form', now acknowledged as conspecific, was represented by the collection chosen by Merrill (1918)). Interestingly, it seems that the serrate margins may be localised variation, as they have only been seen on material collected from Rizal Province.

4. Moldenke's *C. ceramense* is simply a specimen with underdeveloped bracts, which had previously been determined as *C. macrostegium* by Bakhuizen van den Brink.

32. Clerodendrum magnificum Warb. (Section *Tridens*)

Clerodendrum magnificum Warb., Bot. Jahrb. Syst. 13 (1891) 428; Pulle, Nova Guinea 8 (1914) 687; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 273; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 94; Moldenke, Phytologia 62 (1987) 142. — Type: *Hellwig 239* ['~~Hollrung~~' on label] (holo B†; iso K), Papua New Guinea, (Morobe Province, vicinity of Finschhafen). — Epitype (designated here): *Cruttwell 862* (epi K), Papua, Gwadagwada.

Clerodendrum utakwense Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 137. — Type: *Boden-Kloss s.n.* (holo BM), New Guinea (West Papua), Utakwa River to Mt Carstensz, Canoe Camp.

Shrub, 1–2(–3) m tall; all parts ± glabrous. *Branchlets* quadrangular, dark brown, lenticellate. *Leaves* decussate; blade oval to ovate, 11–30 by 6–18 cm, 1.4–1.8 times as long as wide, apex acute or shortly acuminate, base rounded or subtruncate, subchartaceous, both surfaces ± glabrous, much paler green abaxially with some glands close to basal region of midrib, margin entire; lateral veins 9 or 10 pairs; petioles 3–15 cm long. *Inflorescences* terminal thyrse, low-pyramidal shape, entirely red, 15–18 cm long and wide; primary branches to the lower cymes 5–7 cm long with leaf-like bracts. *Calyx* 18–25 mm long; lobes 3, united at bases, with a V-shaped notch apically in two of the three (bidentate lobe apex), accrescent, elongating to 24–30 mm in fruit, lobes enclosing fruit. *Corolla* pale red to scarlet; tube 20–26 mm long, glabrous; lobes oval, (18–)21–26 mm long. *Stamens* 4, extending 4.5–6.5 cm from the corolla tube. *Ovary* ± ovoid, glabrous. *Fruit* globose, blue-black, 8–10 mm diam.

Distribution — New Guinea.

Habitat & Ecology — Lowland forests. Altitude: 450–1000 m.

Notes — 1. The Hellwig collection cited above is the type according to Munir (label on isotype at K but no corresponding publication) rather than a Warburg specimen (no type cited in protologue). Warburg also published 'Plantae Hellwigianae' (Bot. Jahrb. Syst. 18 (1894) 184), but this does not contain any *Clerodendrum* species. It must be noted that the 'isotype' at K, apparently the only surviving original material, has an extremely poorly-preserved inflorescence and is unsuitable for diagnostic purposes. No further material of this collection has been found amongst the few duplicates of Hellwig's material that were distributed by Kaernbach, the latter being entrusted with them after the former botanist's death while collecting in New Guinea (Steenis-Kruseman in Steenis, Fl. Males., Ser. I, 1 (1950) 224). We have, therefore, selected a suitable epitype.

2. Most of the material we have seen that has been identified as *C. magnificum* is actually *C. brassii*. Although similar, *C. magnificum* has distinctly larger calyces and corollas than *C. brassii*. This difference is in line with Warburg's (1891) original concept of the species and not that of Pulle (1914) or Lam (1919), who amalgamated material of the two species but did not make the synonymy, so their resultant delimitations of each were poor. Moldenke (Phytologia 61 (1986) 415) maintained the species but seemed even more confused regarding the true dimensions of *C. magnificum*, citing Lam's measurements (e.g., 'calyx 1.3–1.7 cm long') in the key to the *Clerodendrum* species but using Warburg's '[calyx] 2–2.5 cm long' in the description of *C. magnificum* (Moldenke 1986) – perhaps he constructed the key before reading the protologue! Moldenke was as inconsistent with the corolla lengths.

We have only found material, corresponding to Warburg's description of *C. magnificum*, with 3-lobed calyces (vs 5-lobed as stated by Warburg (1891), and repeated by

Lam (1919), etc.). When Warburg (1891) described 'the points' of the calyx lobes, he must have been referring to the bidentate tips of two of the three lobes which have this form (see also *C. brassii* and *C. hettae*). Misinterpretation of this character has caused additional confusion and the misplacement of *C. magnificum* in Schauer's 'Section *Paniculata*' by Lam (1919) vs Section *Tridens* (Lam (1919) 316).

3. *Clerodendrum utakwense* was described as having 2-lobed calyces but examination of the type material of *C. utakwense* shows that it has 2- or 3-lobed calyces and is likely to be a mutated specimen. Thus, its placement here has been maintained.

33. Clerodendrum minahassae Teijsm. & Binn. (Section *Siphonanthus*)

Clerodendrum minahassae Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 25 (1863) 409; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 315; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 85; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 403; Burkill, Econ. Prod. Malay. Pen. (1935) 582; Backer & Bakh.f., Fl. Java 2 (1965) 608; Moldenke, Phytologia 62 (1987) 200, 309. — Lectotype (designated here): *Teijsmann HB 5868* (lecto L; isolecto BO), Celebes [Sulawesi], Menado Province, Minahassa District.

Clerodendrum mabesae Merr., Philipp. J. Sci., C 12 (1917) 302, syn. nov. — Type: *FB* (*Mabesa*) *26796* (holo PNH†; iso K, US), Philippines, Luzon, Laguna Province, forest at back of Paete.

Clerodendrum minahassae Teijsm. & Binn. var. *grandicalyx* Moldenke, Phytologia 23 (1972) 315. — Type: *Wenzel 261* (holo US), Philippines, Leyte.

Clerodendrum fortunatum auct. non L.: Blanco, Fl. Filip. (1837) 508. — *Clerodendrum blancoi* Náves ex Fern.-Vill. in Blanco, Fl. Filip., ed. 3, 4 [Nov. App. 13A] (1880) 161, t. 223. — *Clerodendrum minahassae* Teijsm. & Binn. var. *brevitubulosum* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 315, syn. nov. — Type: unknown collector (holo PNH†; iso unknown), Philippines. — Illustrative specimens: *Ramos s.n.* (= *Merrill Species Blancoanae 80*) (K, US not found), Philippines, Luzon, Rizal Province, Antipolo; *Ramos s.n.* (= *Merrill Species Blancoanae 432*) (K, US not found), Philippines, Luzon, Batangas Province.

Clerodendrum infortunatum auct. non L.: Fern.-Vill., Fl. Filip., ed. 3, 4 [Nov. App. 13A] (1880) 161.

Shrub to small tree, 2–4(–7) m tall. *Branchlets* with mid to dark brown bark, often lenticellate. *Leaves* decussate; blade obovate or broadly elliptic, 12–30 by 6–14.5 cm, 1.9–2.1 times as long as wide, apex shortly acuminate, base acute to rounded, membranaceous to subchartaceous, adaxially dark green, abaxially mid green, both surfaces glabrous to subglabrous, abaxial venation often puberulous, margin sinuate or subentire (occasionally shallowly serrate apically); lateral veins 8–11 pairs; petioles 2–6.5 cm long, glabrous. *Inflorescences* erect terminal thyrse to c. 25 cm wide; axial cymes simple trichotomous subtended by large leaf-like bracts 5–13.5 cm long; pedicels and peduncles subglabrous to sparsely pubescent. *Calyx* 25–37 mm long, lobes 5, narrowly triangular, united for about 2/3 of the length during anthesis (each 5–11 mm long), pale reddish green (or green with reddish tips to the lobes), ± glabrous to minutely puberulent, enveloping basal portion of corolla tube during anthesis, accrescent, lobes elongating to c. 30 mm long as calyx splits down seams of lobe unition, widening and spreading to hold fruit centrally surrounded by the star-shaped open calyx lobes, turning bright red. *Corolla* white; tube (5–)6–10(–12) cm long, minutely puberulent; lobes 17–28 mm long, ligulate to slightly spatulate. *Stamens* 4, extending up to 20 mm from the corolla tube. *Ovary* ovoid, shallowly 4-lobed. *Fruit* subglobose, shallowly 4-lobed,

blue, 9–10 mm diam., separating into 4 pyrenes (sometimes only 3 maturing), c. 8 by 6 mm, each with one seed. — **Plate 3g.**

Distribution — Java (cult. only?), Philippines, Sulawesi, Moluccas.

Habitat & Ecology — Primary and secondary forest, thickets, sometimes along rivers. Altitude: up to 650 m. 'Very common in the Philippines' (Merrill, in herb. K, c. 1907).

Notes — 1. The calyx of *C. minahassae* during fruiting contrasts with *C. quadriloculare* as the lobes of the latter are almost completely excluded by calyx enlargement. Calyx lobes of *C. minahassae* enlarge during fruiting to form a structure contrasting with that of *C. quadriloculare*.

2. *Clerodendrum blancoi*: Van Steenis-Kruseman (in Steenis, Fl. Males., Ser. I, 1 (1950) 164) stated that Fernandez-Villar and A. Náves preserved their Philippine plant collections in the convent of Guadelupe near Manila, which was burnt down in 1899. Thus, their type specimens were lost. Merrill (Publ. Bur. Sci. Gov. Lab. 35 (1905) 62) had previously dealt with the synonymy of their names.

3. Lam (1921) placed *C. blancoi* under his new variety *C. minahassae* var. *brevitubulosum* although Moldenke (1987) stated that the variety is based upon *C. fortunatum* Blanco *non* L. but he also included *C. blancoi*, and indeed the majority of Philippine material, under this variety. Moldenke appears to have believed that *C. minahassae* is a species native to the Moluccas and Celebes (from where it was described) and states "the Philippine collections cited … are placed here tentatively" (Moldenke 1987). Yet, Merrill had made a clear inclusion of *C. blancoi* (and related names) under *C. minahassae* nearly 65 years earlier. It is Merrill's concept that we have followed here. Delimitation of var. *brevitubulosum* based solely on a slightly shorter corolla tube (which, astonishingly, overlaps the range given by Lam for *C. minahassae*) cannot be upheld. Merrill (*in herb.* K) noted that although corolla tube length and duration in anthesis was variable, *C. blancoi* was the same as *C. minahassae*.

4. The date 1916 on the label of the *C. minahassae* type material at BO refers to the determination of the specimens by Backer and not to the collection date (Teijsmann died in 1882). Two specimens at BO bear co-type labels (= syntype). However, one (*Teijsmann '5868'*) was collected in Menado [Manado], in northern Sulawesi, as stated in the protologue, the other (*Teijsmann '12146'*) states 'Pangkadjene Celebes' on the original handwritten label. The latter is a locality in south-western Sulawesi and therefore not type material, so *Teijsmann 5868* is designated as lectotype here.

5. *Clerodendrum mabesae* was separated by Merrill (1917) and retained by Moldenke (1987: 130) on the basis of its height and longer corolla tube in comparison with material of *C. minahassae*, which he had seen. Moldenke (1987) stated that *C. mabesae* is known 'only from the original collection'. Although the type collection of *C. mabesae* is a 'large form', we believe it is conspecific with *C. minahassae*. Of note, the venation of *C. mabesae* was initially thought by us, to differ from that of *C. minahassae* (although not mentioned in literature), but upon examination of a range of material, the apparent difference is thought to be attributable to drying/pressing as the fine, quaternary vein reticulation sometimes becomes 'invisible' during this process.

34. Clerodendrum mindorense Merr. (Section *Clerodendrum*)

Clerodendrum mindorense Merr., Philipp. J. Sci., C 7 (1912) 342; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 309; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 404; Moldenke, Phytologia 62 (1987) 314. — *Clerodendrum simile* Merr., Publ. Bur. Sci. Gov. Lab. 35 (1905) 64, nom illeg. (non H.Pearson, Fl. Cap. 5 (1901) 224 = *C. ternatum* Schinz, Verh. Bot. Vereins Prov. Brandenburg 31 (1890) 205). — Type: *Merrill 1192* (holo PNH†; iso L, NY, US), Philippines, Mindoro, Baco.

?*Clerodendrum elliptifolium* Merr., Philipp. J. Sci., C 7 (1912) 341; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 361; Merr., Enum. Philipp. Fl. Pl. (1923) 401; Moldenke, Phytologia 59 (1986) 343, syn. nov. — Type: *BS (Ramos) 14463* (holo PNH†), Philippines, Camiguin de Dininao, Panatayum.

Clerodendrum sahelangii Koord. ex Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 77, syn. nov. — Lectotype (designated here): *Jaheri 197* (lecto L), Moluccas, Kei [Kai Islands].

Clerodendrum pubifolium Quisumb. & Merr., Philipp. J. Sci. 37 (1928) 197, syn. nov. — Type: *BS (Ramos & Edaño) 49416* (holo PNH†; iso BM, NY, UC), Philippines, Mindanao, Davao Province, Mt Mayo.

Shrub, 2–2.5(–4?) m tall. *Branchlets* glabrous with grey-green bark. *Leaves* decussate; blade elliptic to obovate, 9–20 by 3–8 cm, 1.6–3 times as long as wide, apex acuminate, base acute, subchartaceous, adaxially dark green, abaxially paler green, adaxially glabrous to subglabrous, abaxially glabrous, with puberulent venation or occasionally entirely puberulous, margin entire to repand; venation brochidodromous, lateral veins 6–8 pairs; petioles 1.5–8 cm long, glabrous to subglabrous. *Inflorescences* an erect compact terminal thyrse, 6–11 cm long and wide; primary branches from main axis to lower cymes 1–3 cm long, subtended by linear bracts c. 5 mm long, bracts sometimes caducous; pedicels subglabrous to puberulous. *Calyx* campanulate, 4–5 mm long; lobes 5, 0.5–1 mm long, subglabrous to puberulent; calyx accrescent, elongating to (6–)7–10(–12) mm and widening to hold base of fruit, becoming cupuliform-infundibuliform without an apically distinct rim, lobes becoming ± obscured. *Corolla* white; tube 2–3 cm long, glabrous to minutely puberulent; lobes 4–7 mm long. *Stamens* 4, extending up to 14 mm from the corolla tube. *Ovary* ovoid, glabrous. *Fruit* ovoid, dark blue-purple, 10–13 by c. 9 mm diam.

Distribution — Philippines, northern Sulawesi (Minahassa), northern Moluccas (Morotai Island).

Habitat & Ecology — Primary and secondary lowland forest and on hillsides. Altitude: to c. 980 m.

Notes — 1. Merrill in 1950 (*in herb.* K) had decided that his *C. mindorense* was conspecific with *C. fortunei* Hemsl., an older name described from Chinese material (see notes under *C. klemmei*). However, we can find no publication of his conclusion, possibly as he died only six years later. Merrill noted: "As *Clerodendrum simile* [i.e., *C. mindorense*] has never shown up in Chinese collections since Fortune's time I suspect that the type was from a cultivated plant probably in the Fahti gardens in Canton, and introduced from the Philippines; see *C. mindorense* Merr! EDM VIII.1950" (*in herb.* K, label attached to holotype of *C. fortunei*). Although the type material of the two species is vegetatively similar, there are two distinct differences between Merrill's and Hemsley's type material and protologues; the inflorescence form and calyx lobes. Merrill's type specimens have much denser inflorescences (confirmed in his description) and the calyces have shorter lobes than those of *C. fortunei*. Merrill determined several sheets

of Philippine material in 1950 as *C. fortunei* (with his own *C. mindorense* in brackets after it on each label), providing further evidence that his concept of the species had broadened from the 'crowded … panicles' he described 45 years earlier to include the more open inflorescence of Hemsley's type. However, such a concept is too broad as a distinct delimitation can be made between the taxa. It seems that Merrill had actually confused *C. mindorense* and *C. klemmei* as the latter is much more similar to *C. fortunei*. However, we believe that Merrill's conclusions regarding the origin of *C. fortunei* were correct (see entry for *C. fortunei* in the section 'Insufficiently Known Taxa').

2. This species is similar to *C. quadriloculare* (as correctly stated by Lam 1919). *Clerodendrum mindorense* has shorter corolla tubes than those in *C. quadriloculare*, where they are white with no mauve coloration, and the abaxial surface of the leaves is never purple. The fruiting calyx of *C. mindorense* is rather more cupuliform with lobes excluded, contrasting with those of *C. klemmei* and *C. quadriloculare*. *Clerodendrum mindorense* is also similar to another Philippine species, *C. klemmei*, but the inflorescences are much more compact and 'woody', and the corolla tubes are only half as long. A puberulous form, found at the upper end of the altitudinal range (≥ 700 m) was described as *C. pubifolium* but this is identical in all but the indumentum and so has been included here in *C. mindorense*. Other high-altitude material shows similar increases in indumentum coverage.

3. Bakhuizen van den Brink (1921: 78) stated that his *C. sahelangii* (included here within *C. mindorense*) was likely to be the same as *C. elliptifolium*, but he was unable to find any material of *C. elliptifolium* (for comparison see below). The corollas on the type material of *C. sahelangii* appear shorter than those within the range of *C. mindorense* as they are immature and, therefore, not fully elongated. The leaves are also slightly thicker, but this may be local variation. We cannot see any morphological characters, from the material available, that would permit clear separation of *C. sahelangii* from *C. mindorense*, so the former has been included within the latter here. An extension of the southern limit of the distribution of this species has been revealed by the inclusion of *C. sahelangii* (to Minahassa, the northern region of Sulawesi) and re-evaluation of three, previously unidentified, *Kostermans* collections from a single expedition in 1949 (from Morotai, northernmost island of the Moluccas).

4. From the description of *C. elliptifolium*, we think that it may be conspecific with *C. mindorense* Merr. (cf. Lam & Bakhuizen van den Brink, Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 78). The holotype of *C. elliptifolium* was destroyed and there does not appear to be any duplicate material at any of the herbaria that are likely to contain Ramos duplicates (A, BO, K, L, US) or Merrill's collections (including E, G, K, L, NY, SING, U, US). Therefore, we have placed it tentatively in synonymy here.

35. Clerodendrum multibracteatum Merr. (Section *Clerodendrum*)

Clerodendrum multibracteatum Merr., Philipp. J. Sci., C 7 (1912) 98; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 270; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 95; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 404; Moldenke, Phytologia 62 (1987) 326. — Type: *Vanoverbergh 777* (holo PNH†; iso A, K, L, US), Philippines, Luzon, Bontoc Subprovince.

Tree, 4–10 m tall. *Branchlets* densely pubescent with short appressed hairs, bark pale brown. *Leaves* decussate; blade elliptic-lanceolate, 8–15.5 by 3–6 cm, 2.4–2.7 times as long as wide, apex acuminate, base acute, chartaceous to subcoriaceous, both surfaces glabrous to subglabrous, pubescent on lower midrib, margin entire or sparsely and irregularly denticulate; secondary veins 6 or 7 pairs, raised abaxially; petioles 1–3 cm long, pubescent. *Inflorescences* an erect terminal, bracteate thyrse, 10–15 by 8–12 cm; primary branches from main axis to lower cymes c. 4 cm long, subtended by leaf-like bracts 2–3 cm long; pedicels pubescent, bracteate; bracts surrounding corolla subsessile, ovate to lanceolate, 10–18 by 6–10 mm, puberulous, covered with disc-shaped glands abaxially, whitish during anthesis, later pink and turning purplish when in fruit. *Calyx* lobes 5, united near the base, appearing similar to the surrounding bracts but red in colour, broadly ovate, acute, 5–7 mm long, ± glabrous; calyx slightly accrescent. *Corolla* white; tube c. 7 mm long, subglabrous; lobes elliptic-ovate 3–5 mm long. *Stamens* 4, extending 6–7 mm from the corolla tube. *Ovary* globose, glabrous. *Fruit* globose, 5–6 mm diam., ± enclosed by calyx and the persistent bracts.

Distribution — Philippines (central Luzon & Mindoro).

Habitat & Ecology — Mossy forests. Altitude: 1550–2000 m.

Note — This species could be mistaken for *C. macrostegium* in having numerous inflorescence bracts, but differs from that species through its much smaller, elliptic leaves, smaller whitish bracts and very short corolla tube. It has been collected only rarely.

36. **Clerodendrum myrmecophilum** Ridl. (Section *Clerodendrum*)

Clerodendrum myrmecophilum Ridl., J. Bot. 33 (1895) 42 (‘*myrmecophila*’); H.J.Lam, Verbenaceae Malayan Archipel. (1919) 280; Wearn & Mabb., Syst. Bot. 36 (2011) 1055. — *Clerodendrum phyllomega* Steud. var. *myrmecophilum* (Ridl.) Moldenke, Phytologia 4 (1952) 51. — Lectotype (designated here by Mabberley): *Ridley 6700a* (lecto SING; isolecto K), Singapore, Choa, Chu Kang.

Clerodendrum breviflorum Ridl., J. Bot. 33 (1895) 43 (‘*breviflora*’). — Type: *Lake & Kelsall s.n.* (holo SING), Malaysia, Johor, Ulu Bata Pahat, Kampung Chin Chin.

Clerodendrum curtisii H.Pearson, Bull. Misc. Inform. Kew (1901) 142. — Type: *Curtis 3441* (holo K; iso SING), Malaysia, Perak, Dindings, Bruas Road to Sg. Rotan.

Clerodendrum brookeanum W.W.Sm., Notes Roy. Bot. Gard. Edinburgh 8 (1915) 320 (see Wearn & Mabb., Syst. Bot. 36 (2011) 1055). — Type: *Native Collector 142* (holo E), Borneo, Sarawak, near Gunong Bayat.

Clerodendrum flavum Merr., Philipp. J. Sci. 30 (1926) 424, syn. nov. — Type: *BS (Ramos & Edaño) 43899* (holo PNH†; iso UC), Philippines, Sulu Archipelago, Jolo.

Shrub, sparsely-branched, 1–1.5 m tall. *Branchlets* with pale greyish brown bark; internodes fistulose, often with ant entry holes. *Leaves* decussate; blade broadly elliptic to oblong-lanceolate, 15–30 by 6–16 cm, (1.6–)2.1–3.5 times as long as wide, apex broadly acuminate to obtuse, base cuneate to obtuse, membranaceous, glabrous, abaxial surface paler, margin entire to weakly crenate-denticulate; venation brochidodromous, secondary veins 7–11 pairs; petioles 2–10 cm long, subglabrous. *Inflorescences* erect terminal pyramidal thyrse, 15–30 by 7–12 cm; bracts and bracteoles small; pedicels 6–8 mm long, pedicels and peduncles puberulous, appearing densely-flowered. *Calyx* lobes 5, lanceolate, acuminate, 5–8 by 1–1.5 mm, united near to the base, puberulent,

accrescent to 8.5–14 by 3.5–5 mm and becoming bright red. *Corolla* dull yellow to orange-red; tube 1.2–2.3 cm long, minutely puberulent; lobes 8–10 mm long. *Stamens* 4, extending up to 3.5 cm from the corolla tube. *Ovary* ± globose, glabrous. *Fruit* ± globose, 7–7.5 mm diam., purple-black.

Distribution — Peninsular Malaysia, Singapore, Sumatra, [Java?], Borneo, south-western Philippines (Sulu Archipelago and Zamboanga Peninsula of Mindanao only).

Habitat & Ecology — Lowland forest, frequently in wet and swampy areas. Altitude: up to 450 m. The thin-walled hollow branches (domatia) are penetrated by ants and provide chambers that facilitate nesting.

Notes — 1. This species has quite variable corolla and calyx lengths. Lam (1919) commented upon the discrepancy between Ridley's and King & Gamble's perception of corolla lengths (2.5 cm and 1.2 cm, respectively). We have measured a range of material and found that these figures represent both ends of the range, so both authors were partially correct.

2. We have seen a single specimen of this species, supposedly collected by Lobb from Java (*Lobb 393*, K!). However, owing to the uncertainty of Lobb's collection localities (Clokie, An account of the herbaria of the Department of Botany in the University of Oxford (1964) 202) and the lack of other Javan material, this could not be confirmed.

3. Merrill (1926) stated that *C. flavum* is 'closely allied to *C. myrmecophilum* Ridl.' and its characters do fit this species so it has been included in *C. myrmecophilum* here. However, the type collection was of a seemingly non-myrmecophilous plant. We have seen only one collection, other than the type, that has been identified as *C. flavum* (*Ebalo 685*, Philippines, western Mindanao, Zamboanga Peninsula, at MICH), which aided confirmation of this placement. Importantly, the inclusion of *C. flavum* extends the eastern limit of the range of *C. myrmecophilum* to the western most tip of the Philippines.

37. Clerodendrum nutans Wall. ex Jack (Section *Clerodendrum*)

Clerodendrum nutans Wall. ex Jack, Malayan Misc. 1 (1820) 17 (non Wall. ex D. Don, Prodr. Fl. Nepal. (1825) 103 = *C. laevifolium* Blume) (see Wearn & Mabb., Syst. Bot. 36 (2011) 1052). — Type: *Jack s.n.* (holo unknown), Penang.

Clerodendrum penduliflorum Wall. [Numer. List (1828) nr. 1795, nom. nud.] ex *S*chauer in A.DC., Prodr. 11 (1847) 664. — Type: *Gomez s.n.* in *Wallich Cat. 1795* (holo G-DC; iso K-W [1795/1]), Myanmar, Tenasserim, Tavoy.

Clerodendrum wallichii auct. non Merr.: Ng, Trop. Hort. Gard. (2006) 301 + f.

Shrub or treelet, to 1(–3) m tall. *Branchlets* ± quadrangular. *Leaves* decussate, occasionally ternate; blades oblong-lanceolate, 9–20 by 2.5–7.5 cm, 2.6–3.7 times as long as wide, apex long-acuminate, base acute, glabrous, margin entire to distally crenulate; secondary veins 6–8 pairs; petioles 12–75 mm long, grooved above. *Inflorescences* to 45(–60) by c. 10 cm, terminal, lax, pendent; thyrsoid, glabrous to subglabrous, branches distal, opposite, bearing few-flowered umbellate cymules with red peduncles, latter 3 (apically)–15(–25) (proximally) mm long, slender; bracteoles c. 5 mm long, linear. *Calyx* 4–7 mm long; lobes united near the base, glabrous to minutely puberulent, oblong-lanceolate, accrescent, reflexed when fruit mature, red. *Corolla* white; tube 8–12 mm long, often curving upwards, ± puberulent; lobes 5, as long or slightly longer than tube, 11–14 mm long, four lobes obovate and 6–7 mm wide, upper one broadly elliptic and

4–4.5 mm wide. *Stamens* extending from corolla tube by c. 25 mm; filaments white. *Ovary* subglobose to cylindric, truncate. *Fruit* globose, 6–8.5 mm diam., dark purple to black, fleshy; pyrenes 4. — **Plate 3b.**

Distribution — Thailand, Nicobar Islands; in *Malesia*: Peninsular Malaysia (Kedah, Penang, Perak, Selangor, Terengganu, Pahang, Johor), Sumatra.

Habitat & Ecology — Forest, sometimes on limestone. Altitude: to 670 m (higher altitudes outside Malesia).

Note — *Clerodendrum nutans* is frequently confused with *C. laevifolium* and *C. disparifolium* (see Wearn & Mabberley 2011).

38. Clerodendrum paniculatum L. (Section *Clerodendrum*)

Clerodendrum paniculatum L., Mant. Pl. Altera (1771) 90; Schauer in A.DC., Prodr. 11 (1847) 668; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 295; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 81; Burkill, Econ. Prod. Malay Pen. (1935) 585; Backer & Bakh.f., Fl. Java 2 (1965) 609; Moldenke, Phytologia 63 (1987) 51; Rueda, Ann. Missouri Bot. Gard. 80 (1993) 881; S.L.Chen & M.G.Gilbert in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 36; Ng, Trop. Hort. Gard. (2006) 300, f.; Boo et al., 1001 Gard. Pl. Singapore ed. 2 (2006) 182, f.; Wearn & Mabb., Syst. Bot. 36 (2011) 1055. — Lectotype (designated by Moldenke & A.Moldenke in Dassan. & Fosberg, Revis. Handb. Fl. Ceylon 4 (1983) 412): *Anonymous s.n.* in LINN 810.5 (lecto LINN).

Clerodendrum diversifolium Vahl, Symb. Bot. 2 (1791) 75. — *Clerodendrum paniculatum* L. var. *diversifolium* (Vahl) C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 593. — Type: unknown ('ded. de la Mark' (i.e., ex-Herb. Lamarck) in Vahl's hand) (holo C (Hb. Vahl); iso P-LAM), 'India Orientali'.

Clerodendrum pyramidale Andrews, Bot. Repos. 10 (1811) t. 628. — Lectotype (designated here by Mabberley): Andrews, Bot. Repos. 10 (1811) t. 628, based on plant cultivated in Stepney, London, grown from material collected by *Evans's Collector*, Penang, 1808–9.

Clerodendrum citrinum Ridl., J. Fed. Malay States Mus. 5 (1915) 165 ('*Clerodendron*'); Moldenke, Phytologia 58 (1985) 452. — Type: *Robinson 5753* (holo K), Thailand, Peninsular, Koh Pennan.

Sappy shrub, to c. 3 m tall, often with one or a few hollow stems, with root suckers. *Stems* stout, tetragonal, subglabrous to puberulent, green. *Leaves* decussate; blade cordate, 8–40 by 8–38 cm, 3–7-lobed (occasionally weakly), the lobes ovate-triangular, variable but middle one largest, apex acute to obtuse, base cordate, but grading distally into subentire bracts with ± hastate bases, bright green, shiny above, subglabrous to sparsely puberulent, margins subentire to crenate or dentate, apically acute; petioles 1.5–4 cm long. *Inflorescences* an erect terminal, pyramidal thyrse (lower branches sometimes appearing as lateral inflorescences) to 45 cm long and wide, comprising groups of bracteate cymes, usually long-pedunculate, glabrous to minutely hairy; peduncles 1.5–12 cm long, reddish; pedicels 4–15 mm long; bracteoles 1–10 mm long, linear. *Calyx* 3–5 mm long, campanulate, red or orange to greenish, lobes 5, united near base only, lobes triangular, apices acute, erect and spreading. *Corolla* red or orange to pale lemon/cream; tube 12–20 mm long, slender; lobes 5–8 mm long, upper pair shorter and narrower than lower 3. *Stamens* exserted 2.5–3.5 cm. *Ovary* glabrous, slightly obovate, shallowly lobed apically. *Fruit* blue to black (seen rarely). — **Plate 3e, f.**

Distribution — Throughout tropical and subtropical Asia from Bangladesh to the Moluccas. Original distribution obscured by widespread cultivation and selection of different colour forms which are all becoming naturalized.

Habitat & Ecology — Often found on waste-ground and in degraded forest.

Notes — 1. A common colour form, '*Clerodendrum citrinum*' (as 'Album' in Boo et al. (2006) 182), is striking in its pale yellow corollas 'with a ring of stout hairs at the nodes just above the leaf-axils' (Moldenke 1987).

2. Some (as in Java and New Guinea) are sterile with malformed pollen, so are propagated vegetatively as they strike readily from cuttings (Mabberley ms.).

39. Clerodendrum phyllomega Steud. (Section *Clerodendrum*)

Clerodendrum phyllomega Steud., Nomencl. Bot. 2 (1840) 383; Schauer in A.DC., Prodr. 11 (1847) 668; Burkill, Econ. Prod. Malay Pen. (1935) 582; Backer & Bakh.f., Fl. Java 2 (1965) 609; Wearn & Mabb., Syst. Bot. 36 (2011) 1056. — *Clerodendrum macrophyllum* Blume, Bijdr. (1826) 808, nom. illeg. (non Sims, Bot. Mag. 52 (1824) t. 2536). — Type: *Blume s.n.* (holo L, L0763899; iso BO), Java, Salak.

Clerodendrum diepenhorstii Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 568. — Type: *Diepenhorst HB 2539* (holo BO; iso U), Sumatra, Priaman.

?*Clerodendrum brooksii* Ridl., Bull. Misc. Inform. Kew (1925) 88; Moldenke, Phytologia 58 (1985) 279, syn. nov. — Type: *Ridley 9240* (holo K), Sumatra, Bengkulu, Lubok Tandai.

Clerodendrum elmeri Merr., Univ. Calif. Publ. Bot. 15 (1929) 264. — Type: *Elmer 20534* (holo PNH†; iso DS, UC), Borneo, Sabah, near Tawao.

Shrub, 1–2 m tall. *Branchlets* with pale grey bark. *Leaves* decussate; petioles (2.8–) 4–8 cm long, glabrous; blade broadly elliptic or oblanceolate, 20–39 by 7–13 cm, 2.2–3.5 times as long as wide, apex long acuminate, base obtuse to narrowly obtuse, membranaceous, glabrous on both sides, abaxial surface paler green, margin entire; lateral veins 9–13 pairs, venation somewhat arcuate. *Inflorescences* an erect, terminal thyrse, 14–34 by 7–13 cm; bracts and bracteoles small, linear; pedicels 7–13 mm long, pedicels and peduncles pubescent with multicellular hairs. *Calyx* lobes 5, united at their bases only, acuminate, 5.5–8 by 1.5–2 mm, glabrous to minutely puberulent, slightly accrescent to 9–15 by c. 2.5 mm. *Corolla* lobes white, tube pinkish to reddish; tube to 2–2.3 cm long, minutely puberulous; lobes spatulate, c. 10 mm long. *Stamens* 4, extending up to 1.4 cm from the corolla tube. *Ovary* ± globose, glabrous. *Fruit* black, 7–7.5 mm diam.

Distribution — Sumatra, Java, Borneo.

Habitat & Ecology — Found occasionally in mixed lowland rainforest.

Notes — 1. This species is similar to, and sometimes confused with, *C. myrmecophilum*, but lacks the fistulose branches, is not swamp-inhabiting and has white rather than orange-red flowers. Although the corolla was described simply as white in the protologue, labels on conspecific material that we have examined have stated that the corolla lobes are white and the tube is reddish. This species has been collected rarely.

2. *Clerodendrum brooksii* is known only from the type collection. It is thought by us to be closely allied to *C. phyllomega* but perhaps not conspecific as it appears to have more delicate inflorescences than *C. phyllomega*, although it may just represent a diminutive example of that species. It has been placed here tentatively.

40. Clerodendrum porphyrocalyx Lauterb. & K.Schum. (Section *Clerodendrum*)

Clerodendrum porphyrocalyx Lauterb. & K.Schum. in K.Schum. & Lauterb., Fl. Schutzgeb. Südsee (1900) 526; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 276. — *Clerodendrum porphyro-*

calyx Lauterb. & K.Schum. var. *typicum* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 277, nom. illeg. — Lectotype (designated here): *Lauterbach 3140* (lecto WRSL), Papua New Guinea, Hochwald, Bismarck-Gebirge [Madang Province, Bismarck Range].

Clerodendrum rhytidophyllum K.Schum. in K.Schum. & Lauterb., Nachtr. Fl. Schutzgeb. Südsee (1905) 371. — Syntypes: *Hollrung 631* (B†, BO), Papua New Guinea, Finschhafen [Morobe Province], between Babuk and Wollembik; *Schlechter 14136* (B†), Papua New Guinea [Morobe Province], route along the coast from Ramu.

Clerodendrum rhytidophyllum K.Schum. var. *angustior* K.Schum. in K.Schum. & Lauterb., Nachtr. Fl. Schutzgeb. Südsee (1905) 371. — *Clerodendrum porphyrocalyx* Lauterb. & K.Schum. var. *angustius* (K.Schum.) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 277, syn. nov. — Type: *Rodatz & Klink 233* (holo B†), [Papua New Guinea,] along Ramu River.

Clerodendrum porphyrocalyx Lauterb. & K.Schum. var. *reflexum* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 277, syn. nov. — Syntypes: *Moszkowski 388* (B†, L), New Guinea, West Papua, van Rees Mountains, Naumoni station; *Unknown collector 280* (L), New Guinea, West Papua, Tana station.

Clerodendrum porphyrocalyx Lauterb. & K.Schum. var. *dentatum* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 278 (‘*dentata*’), syn. nov. — Lectotype (designated here): *Gjellerup 420a* (lecto BO), New Guinea, West Papua.

Shrub to treelet, 1–3(–6 or more?) m tall. *Branchlets* round to subquadrangular, hispid with erect hairs, often glabrescent. *Leaves* decussate; blade elliptic (to ovate), 10–32 by 3–12 cm, 1.6–3.3 times as long as wide, apex acute to acuminate, base acute or rounded, coriaceous, paler green abaxially, both surfaces puberulous, especially veins, margin entire/repand to subentire apically; lateral veins 6–8 pairs, abaxially pronounced; petioles 2–10 cm long, densely puberulous to hispid. *Inflorescences* a terminal thyrse, narrowly pyramidal, 6–12 cm long and wide; hispid with maroon red/purplish hairs; bracts inconspicuous, not leaf-like; pedicels ≤ 10 mm long; primary branches from the main axis to the lower cymes 1–2 cm long. *Calyx* campanulate, (7–)9–11 mm long; lobes 5, united for half of calyx length, 4–5.5 mm long, accrescent, expanding to partially enclose fruit. *Corolla* white; tube 15–20 mm long, puberulous; lobes ± oval, 8–11 mm long. *Stamens* 4, extending up to 2 cm from the corolla tube. *Ovary* ± cylindrical, shallowly 4-lobed apically, glabrous. *Fruit* subglobose to shallowly 4-lobed, (7–)8–9.5 mm diam., separating into 4 pyrenes.

Distribution — New Guinea.

Habitat & Ecology — Mature lowland ridge forests and foothill forests, sometimes close to rivers and occasionally on the edge of forest clearings. Altitude: 75–340 m.

Notes — 1. This species is somewhat similar to *C. tracyanum*, but the indumentum is hispid (similar to *C. haematolasium*) and the leaf bases are never cordate or truncate. There is another Lauterbach collection at WRSL (*Lauterbach 1119*) which, although not mentioned in the protologue, is good contemporary material of this species. Moldenke (Fifth Summary Verbenac. 1 (1971) 323) included Sumatra in addition to New Guinea but we have seen no specimens from there.

2. It should be noted that the *Moszkowski 388* collection (syntype of *C. poryphyrocalyx* var. *reflexum*) is apparently conspecific but is described as a large tree with yellow flowers, which seems rather strange for this species, normally a white-flowered shrub. It is possible there has been a mix-up of labels. Therefore, the other specimen should be used for reference.

41. Clerodendrum pubiflorum (Bakh. ex Moldenke) Wearn (Section *Clerodendrum*)

Clerodendrum pubiflorum (Bakh. ex Moldenke) Wearn in Wearn & Mabb., Syst. Bot. 36 (2011) 1056. — *Clerodendrum laevifolium* Blume var. *pubiflorum* Bakh. ex Moldenke, Phytologia 61 (1987) 461. — Type: *Richards 1838* (holo BO; iso K 2 sheets), Sarawak, Baram District, Ulu Koyan, Mt Dulit.

[‘*Clerodendrum* ‘*album*’ Ridl. ined.’ in Coode et al., Checklist Fl. Pl. Gymnosperms Brunei Darussalam (1996) 330, nom. nud.]

Shrub to small tree, 2–3(–6) m tall. *Branchlets* acutely-angled upward, quadrangular to subquadrangular, pale brown to grey-brown. *Leaves* decussate; blade elliptic; 4–13 by 2–6 cm, 1.8–2.4 times as long as wide, apex acuminate, base acute (occasionally rounded), membranaceous to chartaceous, adaxially subglabrous to puberulous, abaxially ± glabrous with puberulous venation and few to many discoid scales (probably extrafloral nectaries), margin entire; lateral veins 7–10 pairs, tertiary venation distinctive, reticulate; petioles 1–5.5 cm long. *Inflorescences* erect, terminal, low pyramidal to rounded, rather compact thyrse, 4–10 cm long and wide, axes trichotomous; pedicels and peduncles densely puberulent to scabrid. *Calyx* campanulate, 5–6.5 mm long, purplish and green; lobes 5, united for half to two thirds of the calyx length, each 2–3 mm long, narrowly acute, puberulent/scabrid externally, accrescent, widening to hold basal region of fruit, darkening; large discoid scales (likely extra floral nectaries), c. 130 μm diam., on external surface of calyx lobes. *Corolla* white, externally puberulent/scabrid; tube 12–16 mm long; lobes oval, 4–5(–6.5) mm long. *Stamens* 4, exserted 19–27 mm from the corolla tube. *Ovary* ± globose, glabrous. *Fruit* ± globose, smooth, 11–12 mm diam. with 4 pyrenes.

Distribution — Borneo (Brunei; northern Sarawak, and one collection from Labuan).

Habitat & Ecology — This species apparently favours acidic soils (pH ≤ 4) as it has been collected from heath forests and peat swamp forests, and in secondary regrowth in areas previously covered by peat swamp forest. Altitude: 5–800 m.

Note — *Clerodendrum pubiflorum* bears some similarity to *C. floribundum*. *Clerodendrum floribundum* is only native to New Guinea and Australia and so these two species do not overlap. It has also, occasionally, been confused with *C. disparifolium* as the two species are somewhat similar vegetatively, but *C. pubiflorum* is smaller, does not have completely divided, narrowly lanceolate calyx lobes and lacks the extremely slender (≤ 1 mm wide) corolla tubes of *C. disparifolium*. The inflorescence of *C. pubiflorum* is also much more robust and erect.

42. Clerodendrum pygmaeum Merr. (Section *Clerodendrum*)

Clerodendrum pygmaeum Merr., Univ. Calif. Publ. Bot. 15 (1929) 265; Wearn & Mabb., Syst. Bot. 36 (2011) 1056. — Type: *Elmer 20091* (holo PNH†; iso BM, K, NY), Borneo, Sabah, Myburgh Province, Sandakan.

Subshrub (appearing subherbaceous), 5–25 cm tall; unbranched stem to 15 cm tall, weak and often semiprostrate in habit, with pale longitudinally-ribbed bark. *Leaves* 2–5; blade broadly ovate to obovate, 7–18 by 4–12 cm, 1.5–1.9 times as long as wide, apex broadly acuminate to acute, base obtuse, rounded or shallowly cordate, with multicellular hairs on both sides; margin repand/undulate to dentate, with ‘skirt’ of pale hairs;

lateral veins 5 or 6 pairs; petioles 1–4 cm long, sparsely pubescent. *Inflorescences* erect, a short, terminal thyrse, 4–8 cm long and wide; pedicels 3–10 mm long, pubescent. *Calyx* lobes 5, lanceolate, 5–7 by 1–1.5 mm, united close to the base, red with dark red indumentum, glands often externally on lobes, accrescent to 13–18 by 4–7 mm, turning dark red. *Corolla* tube whitish yellow with pale yellow lobes, tube to 1.4 cm long, lobes oval to obovate, puberulous. *Stamens* 4, extending up to 16 mm from the corolla tube, crimson. *Ovary* ± globose, glabrous. *Fruit* black, 6–8 mm diam.

Distribution — Borneo (Sabah).

Habitat & Ecology — A lowland species found in rainforest, and frequently on open land and on low hills. Altitude: 3–750 m.

Note — See Wearn & Mabberley (2011) for discussion of this species.

43. Clerodendrum quadriloculare (Blanco) Merr. (Section *Siphonanthus*)

Clerodendrum quadriloculare (Blanco) Merr., Publ. Bur. Sci. Gov. Lab. 35 (1905) 63; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 85; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 404. — *Ligustrum quadriloculare* Blanco, Fl. Filip. (1837) 10. — *Clerodendrum blancoanum* Fern.-Vill. in Blanco, Fl. Filip., ed. 3, 4 [Nov. App. 13A] (1880) 161, nom. illeg. — Type: unknown collector (holo PNH†), Philippines. — Neotype (designated here): *Ramos s.n.* (= *Merrill Species Blancoanae 434*) (neo US; isoneo K, L), Philippines, Rizal Province, Antipolo.

[*Clerodendrum longiflorum* Decne. var. *speciosum* Náves, Fl. Filip., ed. 3 (1880) t. 244 (‘*speciosa*’), nom. nud.]

Clerodendrum navesianum S.Vidal, Cat. Prov. Manila (1880) 398; Revis. Pl. Vasc. Filip. (1886) 210; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 313. — Type: *Vidal y Soler 490* (holo PNH†; iso K, MA), Philippines, Luzon, Manila, San Mateo.

Shrub, 1–2(–4) m tall. *Branchlets* with pale brown bark, subglabrous to minutely puberulent, often lenticellate. *Leaves* decussate (the uppermost, with nodes closely-spaced on the branch, often presenting a whorled appearance as if supporting the domed inflorescence); blade broadly elliptic to narrowly ovate, 7–26 by 3–10 cm, 1.9–2.9 times as long as wide, apex acuminate or acute, base acute to rounded, subchartaceous, adaxially dark green and ± glabrous, abaxially frequently purplish and ± glabrous, margin sinuate to slightly dentate; venation brochidodromous, lateral veins 6–8 pairs; petioles 2.5–9 cm long, minutely puberulent. *Inflorescences* erect, terminal, dense, a corymbose cyme, 14–23 cm wide; bracts 1–2 mm long, linear, caducous; pedicels and peduncles minutely puberulent. *Calyx* campanulate to often somewhat urceolate, 5–6 mm long, lobes 5, forming about a third of the length (each c. 2 mm long), lanceolate, minutely puberulent, strongly accrescent, elongating to 14–18 mm, widening to hold fruit and becoming infundibuliform, lobes becoming broadly triangular, dark magenta. *Corolla* tube pinkish mauve to almost completely white, (4.5–)6–9(–11) cm long, minutely puberulent; lobes 7–10 mm long, reflexed exposing white inner surface, ligulate. *Stamens* 4, extending up to 14 mm from the corolla tube. *Ovary* subglobose, slightly 4-lobed at apex only. *Fruit* ellipsoid, sometimes shallowly 4-lobed at apex, glossy, blue-black, 8–9 mm diam. — **Plate 3h.**

Distribution — Philippines, New Guinea.

Habitat & Ecology — Secondary forest, lowland. Altitude: 120–300 m. Few recent collections from Malesia (most date from the period 1891–1916, and bear no habitat or

altitudinal information). Categorised as a weedy invasive on nearby Pacific islands of Micronesia to the east of the Philippines. It is an invasive species on the island Pohnpei but "is not as aggressive as in Kosrae, probably, due to poorer soil and drier climatic conditions in Kosrae" (Josecutty et al., Micronesica Suppl. 6 (2002) 64).

Notes — 1. The corolla length of *C. quadriloculare* is comparable with that of *C. costatum* and *C. longiflorum* but it differs in leaf form/colour, calyx form and flower colour. The flowers of *C. quadriloculare* are also similar to those of *C. minahassae* but the two are easily distinguished by the very different calyx sizes.

2. Although Merrill listed other earlier material in the publication of his combination, the material forming his 'Species Blancoanae' set is more complete and better lends itself to identification of the species, and has, therefore, been chosen as most suitable for the neotypification. Of note from the citations in the recombination is *Merrill 3746*, which shows the typical rather more elongate fruit than other *Clerodendrum* taxa found in Malesia.

3. Van Steenis-Kruseman (in Steenis, Fl. Males., Ser. I, 1 (1950) 164) stated that Fernandez-Villar and Náves (and Blanco) preserved their Philippine plant collections in the convent of Guadelupe near Manila, which was burnt down in 1899. Therefore, their type specimens were lost.

44. Clerodendrum ridleyi King & Gamble (Section *Siphonanthus*)

Clerodendrum ridleyi King & Gamble, Bull. Misc. Inform. Kew (1908) 111; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 312; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 85; Wearn & Mabb., Syst. Bot. 36 (2011) 1057. — Lectotype (designated here by Mabberley): *Ridley 11862* (lecto K; isolecto SING), Peninsular Malaysia, Selangor, Batu Tiga.

Shrub to treelet, 1.5–5 m tall. *Branchlets* glabrous, grey-green. *Leaves* opposite or decussate; blade elliptic, 12–27 by 2.5–6 cm, 3–4.5 times as long as wide, glabrous, apex acuminate, base cuneate, margin entire to slightly sinuate; lateral veins 8–11 pairs; petioles 1–3 cm long, glabrous. *Inflorescences* terminal, a dense compound subcapitate cyme, up to 10 cm long by 15 cm wide; bracts reduced, leaf-like, only at base of inflorescence, each 1–1.3 cm long. *Calyx* 16–21 mm long; lobes 5, united at their bases only, narrowly acuminate, basally 3–4 mm wide, pale green becoming crimson when in fruit, accrescent to 25–30 by 4–7 mm. *Corolla* white to cream; tube 7–8 cm long; lobes narrowly oval to spatulate, 10–13 mm long. *Stamens* 4, brown. *Ovary* globose, glabrous. *Fruit* blue-black, 7–9.5 mm diam.

Distribution — Peninsular Malaysia (but not collected since c. 1935 and so possibly extinct there, Mabberley ms.), Sumatra, Borneo (Sarawak and Kalimantan; not collected from Sabah).

Habitat & Ecology — Disturbed primary forest or secondary forest at low altitude.

45. Clerodendrum rumphianum de Vriese & Teijsm. (Section *Clerodendrum*)

Clerodendrum rumphianum de Vriese & Teijsm. apud Teijsm., Flora (1860) 622; Miq., Ann. Mus. Bot. Lugduno-Batavi 3 (1867) 252; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 294; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 93; Burkill, Econ. Prod. Malay Pen. (1935) 582. — [*Petasites ambonensis* '*Bonga puan*' Rumph., Herb. Amboin. 4 (1743) 107, t. 48, nom. in-

val., prelinnean]. — *Clerodendrum squamatum* Vahl var. *rumphianum* (de Vriese & Teijsm.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 93. — Type: Rumphius, Herb. Amboin. 4 (1743) t. 48. — Epitype (designated here): *de Vriese s.n.* (epi L, sheets no. 908.267-606, 908.267-1313), Moluccas, Amboina [Ambon].

Clerodendrum spectabile Moldenke, Amer. J. Bot. 32 (1945) 612. — Type: *Curran 317* (holo A; iso NY fragment, US 2 sheets), Moluccas, Manipa Island.

Shrub, 1.5–2 m tall, sparsely branched. *Branchlets* stout, medullose/fistulose, ± glabrous. *Leaves* decussate; blade cordate, 12–40 by 10–35 cm, 0.9–1.3 times as long as wide, apex shortly acuminate, acute or obtuse, base cordate with deep sinuses, both surfaces glabrescent, chartaceous when dried, margin dentate; lateral veins 8 or 9 pairs; petioles 3–27(–45) cm long, sparsely puberulent to glabrous. *Inflorescences* erect, terminal, densely flowered, spike-like, axis not visible, 15–60 by 6–13 cm, glabrous, densely bracteate, bracts lanceolate and reddish. *Calyx* campanulate, 15–20 mm long, lobes 5, lanceolate, united for about a third of the length of the calyx tube, ± glabrous, accrescent, widening but not enclosing fruit, red. *Corolla* flesh-coloured to red; tube 2.5(–4) cm long; lobes ± ovate. *Stamens* 4, exserted up to c. 20 mm from the corolla tube. *Ovary* 4-lobed, glabrous. *Fruit* 4-lobed, blue-black, c. 8 mm diam. — **Plate 3c.**

Distribution — Moluccas (Ambon, Buru, Manipa, Saparua, Seram and Ternate).

Habitat & Ecology — Lowland forest.

Notes — 1. A geographically restricted and unusual *Clerodendrum* species with an inflorescence form unlike that of any other Malesian *Clerodendrum* species, perhaps more akin to the diverse forms found in Madagascar.

2. The name *Clerodendrum rumphianum* was validly published by Teijsmann as he cited the earlier, pre-Linnean name, *Petasites ambonensis*, and the place of publication by Rumphius, which had included a Latin description. The authority has sometimes been attributed erroneously to de Vriese alone, through citation of Miquel's account as the place of publication. Although de Vriese & Teijsmann collected material of this species (which is cited by Miquel) it is not cited in the protologue and so the type material is Rumphius's illustrative plate. However, Teijsmann stated that Rumphius's illustration is "so bad that it is almost impossible to recognise". We have, therefore, chosen material collected by de Vriese, contemporary with Teijsmann's publication, as an epitype. The two accession numbers listed for the epitype designated here refer to two sheets with duplicates.

Merrill (Interpr. Herb. Amboin. (1917) 456) noted that 'nothing resembling this plant occurs in our Ambon collections' (i.e., material collected by Robinson for Merrill). Lam (1919) recognised *C. rumphianum* and indicated that the species had a strictly Moluccan distribution, but Lam & Bakhuizen van den Brink (1921) confused it as a variety of *C. squamatum* (i.e., *C. japonicum*). *Clerodendrum rumphianum* was first brought into cultivation in Britain from a collection from Java (Nicholson, Suppl. Dict. Gard. 2 (1900) 246), probably from cultivated material. Moldenke (Fifth Summary Verbenac. 1 (1971) 335) also lists it as occurring in Papua, but we have not found material to support this claim. It is certainly a rarely collected but very striking species. '*C. rumphianum* Bull, Cat. 9 (1887)', cited by Lam (1919: 319) is erroneous, because Bull did not publish a new name for this taxon.

3. Curran (*Curran 317*, A [image seen]) noted that many of the flowers in the dense inflorescence were aborted, producing an abundance of bracts between the open flowers.

46. Clerodendrum sarawakanum H.J.Lam (Section *Clerodendrum*)

Clerodendrum sarawakanum H.J.Lam, Verbenaceae Malayan Archipel. (1919) 248; Wearn & Mabb., Syst. Bot. 36 (2011) 1057. — *Clerodendrum pumilum* Ridl., J. Straits Branch Roy. Asiat. Soc. 1 (1908) 126, nom. illeg. (non (Lour.) Spreng.). — Lectotype (designated by Wearn & Mabberley 2011): *Ridley 12300* (lecto SING), Borneo, Sarawak, Kuching Division, Matang.

Subshrub, 25(–90) cm tall, upright; unbranched stem with pale longitudinally-ribbed bark. *Leaves* 4–6; blade broadly elliptic to ovate, 10–22 by 5–14 cm, 2–2.2 times as long as wide, apex acuminate, base ± obtuse, with multi-cellular hairs on both sides, margin repand/undulate to dentate, pubescent with pale hairs; lateral veins 6–8 pairs; petioles 1.2–8 cm long, sparsely pubescent. *Inflorescences* erect terminal thyrse, 4–10 by 4–8 cm, pubescent. *Calyx* lobes 5, united close to base, lanceolate, 4–6(–7) by 1–1.5 mm, red with dark red indumentum, accrescent to 12–16 by 4–7 mm, turning dark red. *Corolla* tube pinkish with white to pale yellow lobes (sometimes with pinkish marks on the lobes); tube c. 1.5 cm long; lobes 6–7 mm long, obovate, rounded. *Stamens* 4, exserted up to 12 mm from the corolla tube, dark red. *Ovary* oblate, glabrous. *Fruit* subglobose to obscurely 4-lobed, dark purple-black, 6–8 mm diam.

Distribution — Borneo (Sarawak). It has been collected solely from southern Sarawak, near to the type locality (around Matang/Kuching).

Habitat & Ecology — A lowland species, found in dipterocarp rainforest and on hillsides. Altitude: to 400 m.

Note — See Wearn & Mabberley (2011) for a discussion of this species.

47. Clerodendrum sayapense Wearn (Section *Clerodendrum*)

Clerodendrum sayapense Wearn in Wearn & Mabb., Syst. Bot. 36 (2011) 1058. — Type: *Beaman 9797* (holo MSC; iso K), Borneo, Sabah, Kota Belud District, south of Sayap on northwest side of Mt Kinabalu, close to Wariu River, N06°11' E116°34'.

Shrub or treelet, c. 1.4 m tall. *Branchlets* glabrous with grey-brown bark, drying in a longitudinally-striated pattern. *Leaves* decussate; blade oval to slightly obovate, 19.5–32.5 by 13.5–20 cm, 1.4–1.8 times as long as wide, apex shortly acuminate, base ± rounded, glabrous, margin entire; secondary veins 8–10 pairs, brochidodromous, tertiary venation distantly-spaced; petioles 2.5–3 cm long, glabrous. *Inflorescences* a slenderly-branched thyrse to c. 18 cm long, cymes with subtending lanceolate bracts up to 3 cm long and bracteoles up to 15 mm long, axes trichotomous; pedicels 11–20 mm long with bracteoles attached half-way along the pedicel, minutely puberulent; primary branches from the main axis to the lower cymes 16–22 mm long. *Calyx* greenish red, lobes 5, narrowly to broadly lanceolate, united only at bases, 13–22 by 4–8 mm, with distinct midrib, with abundant minute glands (likely extra-floral nectaries) externally, lobe margins minutely puberulent/scabrid. *Corolla* scarlet-red; tube to 16 by 2–3 mm; lobes 11–13 by c. 6 mm, minutely puberulent/scabrid, very stout in bud. *Stamens* 4, exserted c. 2 cm from the corolla tube. *Ovary* slightly obovoid, shallowly 4-lobed. *Fruit* not seen. — **Fig. 9.**

Distribution — Restricted to Sabah and known only from the Sayap-Kinabalu area of the Gunung Kinabalu National Park.

Habitat & Ecology — Lowland dipterocarp forest. Altitude: 800–1000 m.

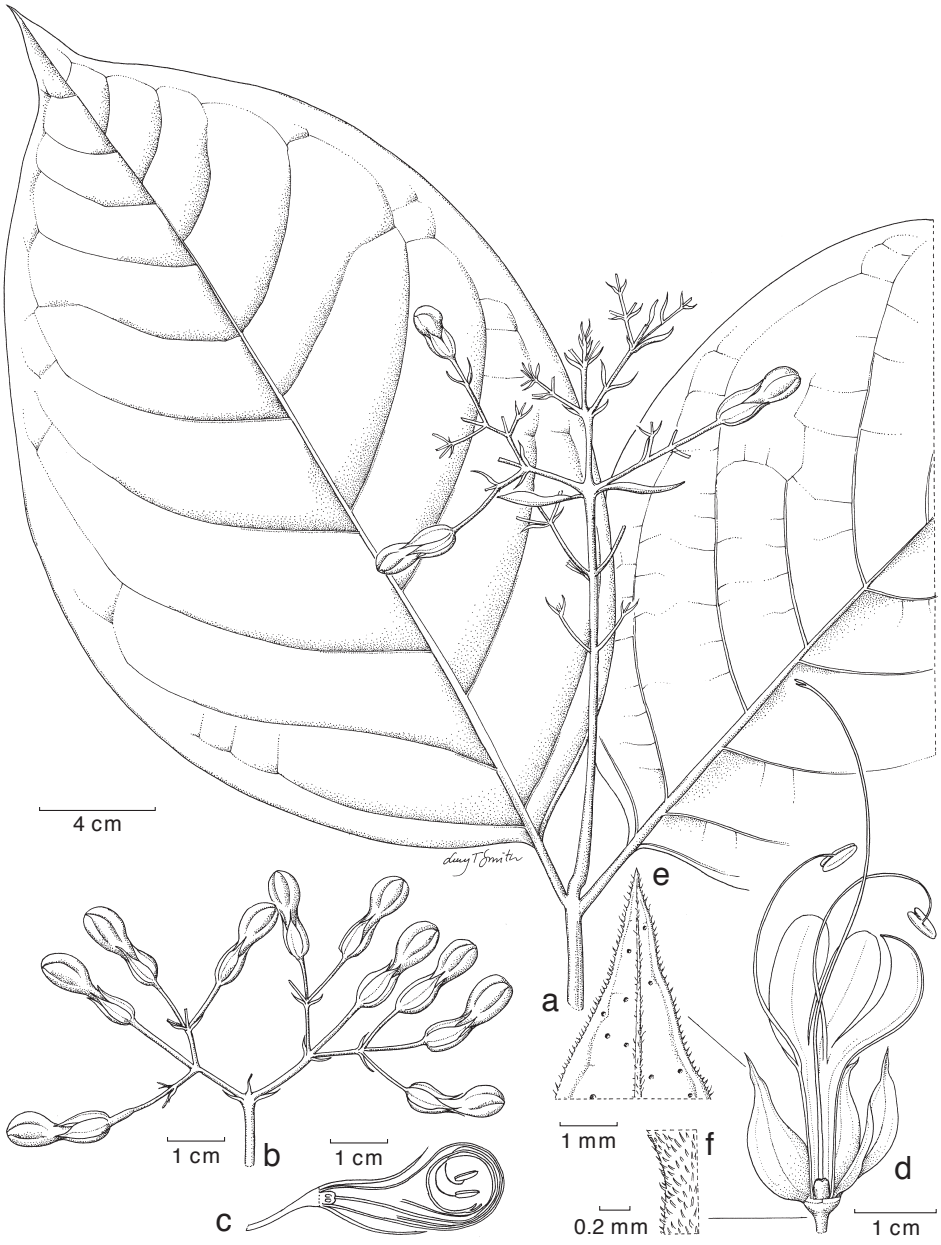

Fig. 9. *Clerodendrum sayapense* Wearn (prepared from Beaman 9797). a. Leaves and inflorescence; b. partial inflorescence; c. flower bud; d. flower, corolla with two calyx lobes removed; e. detail on calyx lobes; f. detail on pedicel (*Beaman 9797*, K). — Scale bars: a = 40 mm, b = 25 mm, c = 20 mm, d = 14 mm, e = 2 mm, f = 0.8 mm. — Drawn by Lucy Smith.

48. Clerodendrum speciosissimum Van Geert ex Drapiez (Section *Clerodendrum*)

Clerodendrum speciosissimum Van Geert ex Drapiez, Hort. Belge 3 (1836) 322; Backer & Bakh.f., Fl. Java 2 (1965) 610; Mabb., Fl. Nouv.-Calédonie 25 (2004) 54; Wearn & Mabb., Syst. Bot. 36 (2011) 1060. — [*C. speciosissimum* Van Geert, Verzeichniss und Preiscourant für 1835 und 1836, der Sammlung von Pflanzen des Gärtners J. Van Geert (1835) 3, nom. nud.] — Lectotype (designated by Rueda, Ann. Missouri Bot. Gard. 80 (1993) 880): Van Geert ex Drapiez, Hort. Belge 3 (1836) t. 68.

Clerodendrum fallax Lindl., Edwards's Bot. Reg. 30 (1844) t. 19; Schauer in A.DC., Prodr. 11 (1847) 666. — *Clerodendrum blumeanum* Schauer var. *typicum* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 300, nom. illeg. — *Clerodendrum buchananii* (Roxb.) Walp. var. *fallax* (Lindl.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 92. — Type: *Anonymous s.n.* (holo CGE), England, Syon, cult.

Clerodendrum blumeanum Schauer in A.DC., Prodr. 11 (1847) 669; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 299; Burkill, Econ. Prod. Malay Pen. (1935) 582. — Syntypes: *Zollinger 747* (G-DC), Java; *Anonymous s.n.* (Herb. Nees, not found).

Clerodendrum horsfieldii Miq., Fl. Ned. Ind. 2 (1858) 880; Moldenke, Phytologia 60 (1986) 267. — Type: *Horsfield s.n.* (holo K; iso BM, U), Java, West Java, 'op den G. Prahoe' [up Mt Prahu].

Clerodendrum papuanum Scheff., Ann. Jard. Bot. Buitenzorg 1 (1876) 41; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 283. — Type: *Teijsmann 7793* (holo BO), New Guinea, Ins. Mansinam.

Clerodendrum pulchrum Fawc. in H.O.Forbes, Naturalist's Wanderings E. Archipel. (1885) 514. — Type: *Forbes 3604* (holo BM; iso BO, L), Timor.

Clerodendrum colebrookianum Walp. var. *forbesii* King & Gamble, Mat. Fl. Malay. Penins. (1907) 1048, syn. nov. — Type: *Forbes 1786* (holo BM; iso K), Sumatra, Lampongs, near Kagoengan Ratoe.

Clerodendrum speciosum Teijsm. & Binn., Cat. Hort. Bot. Bogor (1866) 386, nom. nud. — *Clerodendrum speciosum* Teijsm. & Binn. ex Wigman, Teysmannia 23 (1912) 285, t. III (non *C.* × *speciosum* W.Bull, Cat. 44 (1869) 4), syn. nov. — Type: unknown 'No. 7' (Teijsmann?) (holo BO; iso L), Java, 'Cult. in Hort. Bogor'.

Clerodendrum buchananii (Roxb.) Walp. var. *typicum* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 91 ('*typica*'), nom. illeg. — *Clerodendrum buchananii* auct. non (Roxb.) Walp.: Corner, Gard. Bull. Singapore, Suppl. 1 (1978) 159, 223.

Shrub 1–4 m tall, stems often fistulose and often with foetid smell when bruised, occasionally ant-inhabited, or stems not fistulose. *Branchlets* quadrangular, short-pubescent. *Leaves* decussate; blade ovate, ovate-rotund to almost deltoid, 9–35 by 8–26 cm, 1–1.5 times as long as wide, apex acute (apical half of blade sometimes almost spear-shaped), base usually cordate, chartaceous when dried, sparsely short-pubescent adaxially, densely pubescent abaxially, margin repand or irregularly denticulate-dentate; lateral veins 6–8 pairs, the two lowest pairs often close to the base; petioles 2–25 cm long. *Inflorescences* an erect terminal, rounded, and often somewhat corymbose thyrse, (9–)14–30(–38) cm long, 10–25 cm across, composed of decussate, red branches of divaricate cymes; pedicels red, pubescent. *Calyx* campanulate, 4–9(–12) mm long, lobes 5, united c. half of the length of the calyx tube, acuminate 2–5 mm long, slightly accrescent, scabrid. *Corolla* bright orange-red; tube (1.3–)2–2.3(–2.7) cm long, slender, outer surface scabrid; lobes oval-weakly spatulate, 8–14 mm long. *Stamens* 4, exserted, extending 2–3 cm from the corolla tube. *Ovary* ± ovoid, shallowly 4-lobed, glabrous. *Fruit* green turning vivid blue, distinctly 4-lobed, 7–8 mm across, (2 or) 4 pyrenes maturing.

Distribution — Peninsular Malaysia, Sumatra, Java, Borneo, New Guinea. Reaches as far east as the Solomon Islands and Vanuatu.

Habitat & Ecology — Found in a wide range of habitats from primary and secondary forests to open land and waysides. Altitude: 100–400(–700) m.

Notes — 1. Occasionally ant-inhabited (first reported from Java by Jolivet, Bull. Mens. Soc. Linn. Lyon 54 (1985) 122, for '*C. fallax*') and further observed by Wearn during work executed for this account.

2. No preserved original material of this species has been found from the plant which was cultivated at the Van Geert nursery in Ghent, Belgium and bloomed in August 1835, forming the basis of the description.

3. *Clerodendrum colebrookianum* var. *forbesii* is here included in *C. speciosissimum* following examination of the type. Its leaves have denticulate margins and cordate bases and the flowers are red and on a short terminal inflorescence (much unlike those of true *C. colebrookianum*). A note in pencil on the type sheet of this variety (probably in the hand of C.B.Clarke) has "*C. forbesii* not *colebrookianum* wh[ich] has white flowers". The name *C. forbesii* was never published, but clearly Clarke has realised the material should not be associated with *C. colebrookianum*. Moldenke (Phytologia 58 (1985) 462) commented: "it is possible that this taxon [var. *forbesii*] is the same as the controversial *C. glandulosum* Lindl." (see notes under *C. colebrookianum*).

4. The type specimen of *C. speciosum* Teijsm. & Binn. ex Wigman, a species which was described from cultivation in the Bogor Botanic Garden in Java and has caused much confusion with similar names in use (in Asia, with the hybrid taxon *C.* × *speciosum* Bull, and with the illegitimate name, *C. speciosum* Gürke, of Africa), is actually material of *C. speciosissimum*.

5. *Clerodendrum horsfieldii*, described from W Java, has been thought closely allied to *C. speciosissimum* and has been maintained as separate by several authors, based on its apparently larger calyces (as 10–12 mm long in the former species, compared with 5–9 mm long in the latter), and 'broader' corolla tube of the former (e.g., Lam (1919) 304; Moldenke, Phytologia 58 (1985) 196). However, a complete assessment of all material of *C. speciosissimum* (including cultivated specimens), reveals much morphological variability, as was acknowledged by Lam & Bakhuizen van den Brink (1921: 92) when they placed *C. horsfieldii* in synonymy of '*C. speciosissimum* Paxton.'.

49. Clerodendrum tomentosum (Vent.) R.Br. (Section *Clerodendrum*)

Clerodendrum tomentosum (Vent.) R.Br., Prodr. (1810) 510; Schauer in A.DC., Prodr. 11 (1847) 662; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 96; Munir, J. Adelaide Bot. Gard. 11 (1989) 152. — *Volkameria tomentosa* Vent., Jard. Malmaison 2 (1804) t. 84. — Type: cult. France, Paris, Malmaison (?not preserved).

[*C. splendens* G.Manetti, Cat. Pl. Hort. Modic., Suppl. 2 (1845) 9, nom. nud. (non *C. splendens* G.Don, Edinburgh Philos. J. 11 (1824) 349)].

Clerodendrum manettii Vis., [Index Seminum 1848–1849 (1849) 2, nom. nud.] Extr. ex Actis I.R. Inst. Ven. Scient. Liter. et Artium, Série 3, 1 (1855) 6; Ill. Piante Orto Padova 3 (1856) 20, t. 3. — Lectotype (designated by Verdcourt, Kew Bull. 44 (1989) 695): *Anonymous s.n.* (lecto PAD), Italy, cult. in Padua Botanic Garden.

Shrub or small tree, 1.5–7 m tall. *Branchlets* pubescent to tomentose. *Leaves* decussate; blade ± elliptic, 4–16 by 2–6.5 cm, 1.8–2.7 times as long as wide, apex shortly acuminate or acute, base attenuate, chartaceous, thinly white to yellow-brown

pubescent-tomentose on both surfaces, margin entire (sometimes slightly repand); lateral veins 5–9 pairs; petioles 1–5 cm long. *Inflorescences* a corymbose thyrse (often compact), terminal (occasionally axillary), white to yellow-brown pubescent/tomentose; bracts leaf-like. *Calyx* campanulate, 7–9 mm long, pubescent; lobes 5, c. 3 mm long, ovate to triangular, united for about a third (to half) of the calyx length, internally glandular (usually abundantly so), accrescent, calyx elongating to 11–15 mm and lobes widening to 5–6 mm at their bases, lobes reflexing once fruit is mature. *Corolla* white; tube 18–25 mm long, subglabrous or puberulous (often contrasting with the much hairier lobes); lobes oval, 4–6 mm long, pubescent externally. *Stamens* 4, extending c. 2 cm from the corolla tube. *Ovary* elongate-globose, 4-lobed, glabrous. *Fruit* subglobose to almost prolate or obovoid, blue-black or dark purple, c. 6 mm diam. by 9–11 mm long.

Distribution — Northern and Eastern Australia; in *Malesia*: Papua New Guinea.

Habitat & Ecology — Found at forest margins or in disturbed and open forests. A lowland species. Altitude: up to 200 m, though it has been collected from altitudes up to 720 m in Australia.

Notes — 1. The presence of this species in New Guinea was first recognised by Bakhuizen van den Brink (J. Arnold Arbor. 10 (1929) 72), although it has only been collected a few times more since then (we are aware of four collections, deposited at BRI, CANB and LAE – note that the fruiting specimen of *NGF 268* at BRI, cited by Munir as *C. tomentosum* is thought by us to be *C. costatum* due to its ovate leaves and indumentum characters). It is unknown whether the species is scarce/undercollected in New Guinea or has escaped from cultivation. It is clearly defined by its often congested, softly hairy inflorescences and 'downy' leaves, and is closely related to *C. costatum*, which has longer corolla tubes, larger calyces and broader leaves. Several varieties of this species are recognised in Australia (Munir 1989: 153) but these have not been assessed for this account as the names do not appear to have been used for New Guinea material.

2. *Clerodendrum manettii*, a name placed in synonymy of *C. tomentosum* by Verdcourt (1989), was published without a description in 1849 (and included in synonymy of *C. splendens* Manetti, another nom. nud.), but was validated by De Visiani in 1855. This is one year earlier than the publication cited in the paper by Verdcourt (1989).

50. Clerodendrum tracyanum (F.Muell.) Benth. (Section *Clerodendrum*)

Clerodendrum tracyanum (F.Muell.) Benth., Fl. Austral. 5 (1870) 62; Wearn & Mabb., Syst. Bot. 36 (2011) 1060. — *Premna tracyana* F.Muell., Fragm. 5 (1865) 61. — Lectotype (designated by Munir, J. Adelaide Bot. Gard. 11 (1989) 149): *Dallachy s.n.* (lecto K; isolecto MEL), Australia, Queensland, Rockingham Bay.

Clerodendrum buruanum Miq., Ann. Mus. Bot. Lugduno-Batavi 3 (1867) 252; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 274; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 90; Moldenke, Phytologia 58 (1985) 348. — *Clerodendrum buruanum* Miq. forma *typicum* Bakh., Nova Guinea 14 (1924) 171, nom. illig. — Syntypes: *Teijsmann HB 1874* (BO, U), Moluccas, Buru Island, Kageli; *Teijsmann HB 5250* (U), Moluccas, Buru Island, Oki.

Clerodendrum lindawianum Lauterb. in K.Schum. & Lauterb., Nachtr. Fl. Schutzgeb. Südsee (1905) 372; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 292. — *Clerodendrum buruanum* Miq. forma

lindawianum (Lauterb.) Bakh., Nova Guinea 14 (1924) 171. — Type: *Schlechter 14455* (holo B†; iso BO, K, NY), New Guinea, Torricelli.

Clerodendrum versteegii Pulle, Nova Guinea 8 (1910) 403. — Type: *Versteeg 1396* (holo U; iso BO 2 sheets, K 2 sheets, L), New Guinea.

Clerodendrum membranifolium H.J.Lam, Verbenaceae Malayan Archipel. (1919) 318; Moldenke, Phytologia 62 (1987) 191, syn. nov. — Type: *Forsten s.n.* (holo L), Moluccas, Ambon, Luha [Laha?].

Shrub to small tree, 2–6(–20) m tall. *Branchlets* quadrangular, puberulous to pubescent-villose. *Leaves* decussate; blade ovate, deltoid or cordate, 13–30 by 7–24 cm, 1.4–2.2 times as long as wide, apex broadly acuminate, base cordate, truncate or obtuse, both surfaces puberulous to pubescent, margin entire; lateral veins 7–9 pairs; petioles 2.5–14 cm long, weakly or strongly pubescent. *Inflorescences* a terminal thyrse, 7–16 cm long and wide, rather compact at anthesis; bracts inconspicuous; pedicels less than 10 mm long, pubescent, hairs yellowish brown; primary branches from the main axis to the lower cymes 1.5–4.5 cm long. *Calyx* narrowly campanulate, 5–7(–9) by c. 3 mm wide at apex, with 5 triangular acute lobes, apically 1–3 mm deep, united for about two-thirds of the length of the tube, externally puberulous to pilose-villose, without peltate scales, accrescent to enclose lower third to two thirds of fruit, lobes widening and calyx becoming cupulate with acute, triangular teeth, holding fruit. *Corolla* white; tube 8–10 mm long, ± glabrous to puberulent; lobes oval, to 5 mm long. *Stamens* 4, extending 15–18 mm from the corolla tube. *Ovary* globose, apex shallowly 4-lobed, glabrous. *Fruit* ± globose to very shallowly 4-lobed, 6.5–8(–9) mm diam., with 4 pyrenes.

Distribution — Northern Australia (NE Queensland); in *Malesia*: Borneo (occasional in Sarawak and Kalimantan), Sulawesi, Moluccas, New Guinea.

Habitat & Ecology — Common in mixed forests and along roadsides. Altitude: up to c. 750 m.

Notes — 1. This is a variable species with regard to its indumentum and leaf shape, previously known commonly in Malesia as '*C. buruanum*', from which *C. tracyanum* cannot be clearly separated (see Lam 1919: 274, Wearn & Mabberley 2011). *Clerodendrum tracyanum* is similar to *C. brachyanthum* from the Philippines, but lacks the thickly sericeous indumentums of that species.

2. '*Clerodendrum lindawianum*' was described as differing slightly in leaf pubescence and corolla tube length, but has since been reduced to a form of *C. buruanum* and sunk within that species completely. It is considered here as conspecific, because these characters are not delimitable within the range of variation. Lam (1919: 318) was not certain that his *C. membranifolium* was distinct from previously described species but provided a brief description based upon a single collection.

51. **Clerodendrum trichotomum** Thunb. (Section *Clerodendrum*)

Clerodendrum trichotomum Thunb., Nova Acta Regiae Soc. Sci. Upsal. 3 (1780) 201; in Murray, Syst. Nat., ed. 14 (1784) 578; Schauer in A.DC., Prodr. 11 (1847) 668; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 265; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 87; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 405; S.L.Chen & M.G.Gilbert in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 48. — Syntypes: *Thunberg s.n.* (UPS, in Herb. Thunb. 14598), Japan; *Thunberg s.n.* (UPS, in Herb. Thunb. 14599). Other original material is '*Kusaggi*' in Kaempfer (Am. Exot. (1712) 827) based on Kaempfer illus. in ms (Brit. Lib. [Sloane 2914, CXLVI / fol. 127]).

Shrub, to 3 m tall in Malesia (sometimes larger in China and Japan). *Branchlets* pubescent; bark grey-brown, sometimes lenticellate and somewhat longitudinally striated. *Leaves* decussate; blade triangular-ovate or ovate, 6.5–16 by 3.5–12 cm, apex acuminate, base cuneate-obtuse to cuneate-truncate, chartaceous, both surfaces subglabrous to sparsely puberulous, abaxial venation usually distinctly pubescent, producing fetid smell when bruised (resembling unsweetened peanut butter), margin entire or rarely repand; secondary veins 3–5 pairs; petioles 2–8 cm long, rather woolly, at least when young. *Inflorescences* axillary or terminal, lax, corymbose cymes, dichotomous, 8–25 cm wide; primary branches 3–6 cm long; bracts narrowly elliptic, 10–16 mm long, deciduous, puberulent, pedicels pubescent. *Calyx* campanulate, 12–13 mm long; lobes 5, united near to the base, elliptic to ovate, apically acute, with ± parallel longitudinal veins, greenish becoming purple. *Corolla* white or pale pinkish, fragrant; tube 15–20 mm long; lobes oblong/spatulate, 10–13 by 3–5 mm. *Stamens* 4, extending by up to 33 mm from the corolla tube; style a little shorter than stamens. *Ovary* globose, glabrous. *Fruit* blue-purple, subglobose, 6–7 mm diam.

Distribution — Native north of Malesia (China, Japan, Korea and Taiwan) but extending to the Batanes (or Batan) Islands, just north of Luzon and Cagayan Province in the northeast of Luzon, the Philippines (first recognised by Merrill (1923), and supported by more recent collections from the 1990s Philippine Plant Initiative). This species is also found locally as an escape from cultivation on land near abandoned gardens, but it does not appear to have become naturalized further south in Malesia (see also Mabberley, ms.).

Habitat & Ecology — In thickets at low altitudes.

Note — The other currently-accepted variety of this species, var. *ferrugineum* Nakai, appears to have a non-Malesian distribution (Taiwan). Despite also being listed under the Philippines by Moldenke (Fifth Summary Verbenac. 1 (1971) 316) we have not seen any collections of that variety in Malesia.

52. Clerodendrum umbratile King & Gamble (Section *Clerodendrum*)

Clerodendrum umbratile King & Gamble, Bull. Misc. Inform. Kew (1908) 110; Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1909) 831; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 265; Ridl., Fl. Malay Penins. 2 (1923) 627; Burkill, Econ. Prod. Malay Pen. (1935) 586; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 304; Leerat. & Chantar., Thai Forest Bull., Bot. 31(2003) 45. — Lectotype (Leeratiwong & Chantaranothai 2003): *King's collector 722* (?*922*) (lecto K; isolecto CAL), Malaysia, Perak, Gopeng.

Shrub or treelet to 5 m. *Branches* smooth, fistular. *Leaves* decussate; blade oblong to obovate or oblanceolate, 20–40 by 5–15 cm, 2.7–4 times as long as wide, apex acuminate, base rounded to attenuate, glabrous, margin entire; petioles 2.5–7 cm long, constricted at junction with blade. *Inflorescences* lateral, in upper axils, 15–30 cm long, c. 7–8 cm across, lax, suberect, a little curved, with flowers in distal half; branches squarrose, somewhat flattened or winged when dried, bearing few-flowered cymules; peduncles 10–18 cm long; bracts to c. 2.5 cm long, leafy, intergrading with linear bracteoles 2–12 mm long. *Calyx* c. 14 mm long, cup-shaped; lobes 5, c. 6 mm wide, ovate-acuminate, united near to their bases, weakly puberulous, pale green to white;

accrescent calyx c. 2.5 cm across, bright pink-red. *Corolla* white; buds spatulate; tube 10–14 mm long, slender, cylindrical; lobes almost or as long as tube, spatulate, apex rounded. *Stamens* 4, exserted by c. 2 cm. *Ovary* obtuse, glabrous, stigma lobes short. *Fruit* globose, c. 12 mm diam., fleshy; pyrenes (2–)4, triangular-convex.

Distribution — Southern Thailand; in *Malesia*: Peninsular Malaysia (Perak, Selangor, Negeri Sembilan, Malacca, Terengganu, Pahang and Johor, but no collections made in Malaysia since 1967).

Habitat & Ecology — Lowland to hill forest, including on limestone. Endangered (?extinct in Malaysia).

53. **Clerodendrum villosum** Blume (Section *Clerodendrum*)

Clerodendrum villosum Blume, Bijdr. (1826) 811; Schauer in A.DC., Prodr. 11 (1847) 667; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 289; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 89; Burkill, Econ. Prod. Malay Pen. (1935) 582, 587; Corner, Wayside Trees Mal. 3, 1st ed. (1940) 701; Backer & Bakh.f., Fl. Java 2 (1965) 611. — Lectotype (designated here by Mabberley): *Blume '1069'* (lecto L; isolecto L), Java, Sadjra.

Clerodendrum molle Jack, Malayan Misc. I (1820) 15, nom. illeg. (non Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 2 (1818) 244). — *Clerodendrum velutinum* Wall., Numer. List (1828) n. 1797, nom. nov.; Lam, Verbenaceae Malayan Archipel. (1919) 289. — Type: *Jack s.n.* (holo †; iso E), Malay Islands.

Clerodendrum confusum Hallier f., Meded. Rijks-Herb. 37 (1918) 65; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 290; Moldenke, Phytologia 59 (1986) 103. — Syntypes: *Boerlage s.n.* (L), Java, Buitenzorg; *Boerlage s.n.* (L), Java, Kampong Baruh, near Buitenzorg; *Teijsmann s.n.* (L), Cult. Bogor, material originating from Sumatra?

Clerodendrum curranii Elmer, Leafl. Philipp. Bot. 5 (1913) 1847, syn. nov. — Type: *Elmer 12860* (holo PNH†; iso A, BM, GH, L, U, US), Philippines, Palawan, Puerto Princesa, Mt Pulgar.

Shrub or small tree, 0.5–5 m tall. *Branchlets* quadrangular to subquadrangular, covered in whitish (to pale yellow), tomentose-villose indumentum. *Leaves* decussate; blade ovate to deltoid or elliptic; 9–20 by 5–14 cm, 1.4–1.8 times as long as wide, apex acuminate, base obtuse to shallowly cordate, both surfaces pubescent with distinctly raised veins abaxially, margin entire to slightly repand (occasionally distantly, weakly dentate); lateral veins 6 or 7 pairs, simple agrophic, often prominent scalariform tertiary venation; petioles 1.5–11 cm long. *Inflorescences* an erect terminal pyramidal thyrse, cymes with subtending leaf-like bracts, greenish, giving the appearance of a terminal paniculate inflorescence, individual thyrses 5–7 cm diam., inflorescence extending up to c. 20 cm up to the branch apex, axes trichotomous; pedicels and peduncles villose, lanceolate or leaf-like bracteoles (sometimes caducous). *Calyx* campanulate, (7–)9–10(–13) mm long, lobes 5, usually 4–5 mm long, united c. half way up, ovate to lanceolate, acute, pubescent to villose with peltate glands on outer side; calyx slightly accrescent to 11–15 mm, pale. *Corolla* white (usually with pink marking in the throat), tube 7–10(–13) mm long, outside pubescent, lobes oval, c. 6 mm long. *Stamens* 4, exserted, extending up to 16 mm from the corolla tube. *Ovary* ± subglobose-cylindrical to slightly obovate, glabrous. *Fruit* green, ripening to dark purple, globose, 6–8 mm diam. with 2, 3 or 4 pyrenes maturing.

Distribution — Southern China (Yunnan), Burma, Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Java, Borneo, and the Philippines.

Habitat & Ecology — Common in secondary forest (inland or coastal) and on 'waste ground', but has also been collected from primary forest. Altitude: 20–400 m.

Notes — 1. *Clerodendrum villosum* has sometimes been confused with *C. adenophysum*, but can easily be distinguished by the tubular calyces of the latter. The corolla colour and markings of *C. villosum* are similar to those of *C. infortunatum* and the two species are undoubtedly closely related. Markings in the centre of the corollas of *C. villosum* are usually much paler than in those of *C. infortunatum*.

2. *Clerodendrum confusum* was a name for specimens with less indumentum (puberulent-puberulous) from Java (and possibly Sumatra), and had been included in *C. viscosum* (i.e., *C. infortunatum*) by Backer & Bakhuizen van den Brink f. (1965). Backer also suggested *in herb*. "? *C. infortunatum* × *villosum*" (*Backer 22055*, K!). However, this is likely to represent an occasional variation in *C. villosum* rather than *C. infortunatum* as the floral morphology fits closely with former species.

3. The type of *C. curranii* appears to be material of *C. villosum*, but is slightly unusual as it has distantly, weakly dentate leaf margins.

54. Clerodendrum williamsii Elmer (Section *Clerodendrum*)

Clerodendrum williamsii Elmer, Leafl. Philipp. Bot. 2 (1910) 684; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 281; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 81, 82. — *Clerodendrum macrophyllum* Sims var. *sinuatolobatum* Hallier f., Meded. Rijks-Herb. 37 (1918) 73 ('*sinuatolobata*'). — Type: *Elmer 11149* (holo PNH†; iso A, BM, GH, K, L, NY, U, US), Philippines, Mindanao, Todaya, Mt Apo.

Undershrub, 1.5–2 m tall, lax. *Branchlets* round with smooth greenish grey bark. *Leaves* decussate; blade oblanceolate, 25–40 by 9–15 cm at lobes, 2.7–3.4 times as long as wide, apex acute, base cuneate to rounded, submembranaceous, adaxially dull green and glabrous, abaxially much paler green (or reddish?) and subglabrous, hairs often restricted to abaxial venation, margin with 3–6 dentate lobes unevenly positioned on the apical half of the blade, otherwise entire; secondary veins 7–11 pairs, arcuate; petioles 7.5–11 cm long, glabrous to subglabrous. *Inflorescences* terminal thyrse, to 40 by 20 cm, comprising decussate compound cymes with subtending small, 5–7 mm long, linear bracts, axes trichotomous; pedicels and peduncles puberulent, primary branches from the main axis to the lower cymes 4–5 cm long. *Calyx* lobes 5, united just above the base, lanceolate, 8–10 by c. 3 mm wide basally, puberulent. *Corolla* brick red; tube to 20 mm long, outside slightly puberulent; lobes c. 10 mm long, 'salmon' coloured. *Stamens* 4 (5 according to protologue), extending up to 20 mm from the corolla tube. *Fruit* not seen.

Distribution — Philippines (Mindanao).

Habitat & Ecology — 'A rare undershrub in stony soil of humid woods along streamlets' (Elmer 1910). Altitude: c. 533 m.

Note — A rare yet extremely distinctive species, and one of only two *Clerodendrum* species in Malesia that possess large, lobed leaves (the other, *C. paniculatum*, is easily separable by the lack of leaf elongation). Only three collections have been seen, and all have flowers only. Elmer stated that there were 4 calyx lobes and 5 stamens. Lam (1919) noted that Elmer had erroneously counted the former, although we have observed

4 stamens vs 5. In concurrence with Lam (1919), we have seen no transition in form between this species and *C. macrophyllum*.

INSUFFICIENTLY KNOWN TAXA

Clerodendrum barba-felis Hallier f.

Clerodendrum barba-felis Hallier f., Meded. Rijks-Herb. 37 (1918) 74. — Syntypes: *Foxworthy 239* (PNH†, WRSL†), Borneo, Sarawak; *Foxworthy 489* (PNH†, WRSL†), Borneo, Sarawak.

Note — The difficulty of assigning this species is discussed by Wearn & Mabberley (Syst. Bot. 36 (2011) 1060).

Clerodendrum elbertii Hallier f.

Clerodendrum elbertii Hallier f., Meded. Rijks-Herb. 37 (1918) 83. — Type: *Elbert 3977* (holo L), Sumbawa.

Note — *Clerodendrum elbertii* may be conspecific with *C. brassii* but too little is currently known about Hallier's plant. We have placed a discussion of *C. elbertii* here rather than altering the synonymy in the entry for *C. brassii* because the name *C. brassii* would have to give way to *C. elbertii* if the inclusion was made, and this is currently uncertain. *Clerodendrum elbertii* is a plant known only from the type. Lam (Verbenaceae Malayan Archipel. (1919) 316) recognised *C. elbertii* and later maintained the species as distinct from *C. brassii*, the two differing 'only in some minor points' (Beer & Lam, Blumea 2 (1936) 222), including *C. brassii* having 'bidentate' calyx lobe apices and slightly broader corolla lobes. The two species were also upheld by Moldenke (Phytologia 59 (1986) 339), largely based upon the conclusions of Beer & Lam (1936). Examination of the type of *C. elbertii* shows that it does have a few calyces which appear slightly notched, although less obviously than is usual in material previously identified as *C. brassii*. Considering the lack of material for comparison with *C. brassii* (one collection of '*C. elbertii*', more than a century old) and geographical separation of the two species (Sumbawa to New Guinea), it is unclear whether *C. elbertii* and *C. brassii* are conspecific. Collection of more *Clerodendrum* material from Sumbawa and neighbouring islands is required to resolve this.

Clerodendrum preslii Elmer

Clerodendrum preslii Elmer, Leafl. Philipp. Bot. 2 (1908) 515. — Type: *Elmer 10223* (holo PNH†; iso A, BM, K, L, US), Philippines, Negros, Dumaguete, Cuernos Mountains.

Note — Known only from the type, *C. preslii* appears very close to *C. lanuginosum*: vegetatively similar and sharing the very long, tubular calyx and flower form. However, the calyces (25–27 mm long) and corolla tubes (26–30 mm long) of *C. preslii* are longer than those of *C. lanuginosum*. *Clerodendrum preslii* was discovered in mossy woods at an altitude of c. 1448 m, and so this collection may represent a high altitude variant of *C. lanuginosum* or a highly localised endemic. No similar material has been collected for more than a century, and its correct placement and status is uncertain.

EXCLUDED TAXA

1. *Clerodendrum friesii* K.Schum. in K.Schum. & Lauterb., Nachtr. Fl. Schutzgeb. Südsee (1905) 372. — Type: *Nyman 730* (holo B†; iso UPS 2 sheets), New Guinea, 'Kaiser-Wilhelmsland', Sattelberg. = *Hulemacanthus novoguineensis* (Lindau) Bremek. (Acanthaceae, see Wearn & Darbyshire, Blumea 57 (2013) 215).

Note — According to Moldenke (Phytologia 59 (1986) 472) this species was described from material now destroyed. He was unable to find any isotypes but we have found two at UPS. This species is misplaced in *Clerodendrum* due to the broad (vs slender) tubular flowers, which widen at the apex with small lobes and the form of the inflorescence, which is a subspicate raceme (as described in the protologue).

2. *Clerodendrum fortunei* Hemsl., J. Linn. Soc., Bot. 26 (1890) 259. — Type: *Fortune 20* (holo K), China, [Hong Kong?].

Notes — 1. This species was described from China, but Merrill concluded that this was probably based on a plant originating from the Philippines (see notes under *C. mindorense*). *Clerodendrum fortunei*, although listed as present in China in Moldenke's geographical list of taxa (Fifth Summary Verbenac. 1 (1971) 287) was omitted from the recent account by Chen & Gilbert (Fl. China 17 (1994) 1). Moldenke (Fifth Summary Verbenac. 1 (1971) 315; Phytologia 59 (1986) 471) does not list *C. fortunei* as present in the Philippines and we have not found any evidence of synonymy elsewhere. Moldenke (1986), under his entry for *C. fortunei* also cited *Fortune 45*, which is conspecific and was collected in Hong Kong. Thus, it is believed that, with additional reference to Fortune's biographical chronology in Coates (The Plant Hunters (1969) 101), this low numbered type specimen was collected in Hong Kong and not in Canton as presumed by Merrill *in herb.* at K (see notes under *C. mindorense*), as numerous specimens, numbering at least up to '45', had already been collected by the time Fortune visited Canton in 1844.

2. This species is most similar to *C. klemmei* but the type material of *C. fortunei* has more lax inflorescences and narrower calyx lobes. Until further evidence is found, we have insufficient material on which to delimit *C. fortunei* or confirm its geographical placement.

3. [*Clerodendrum violaceum* J.Zeyh., Verz. Gew. Gart. Schwetzingen (1818) 54, nom. nud.; Link, Enum. Hort. Berol. Alt. 2 (1822) 127, nom. nud., (non *C. violaceum* Gürke, Bot. Jahrb. Syst. 28 (1900) 303 (= *Rotheca violacea* (Gürke) Verdc., Kew Bull. 55, 2000: 154).] — *Clerodendrum zeyheri* Moldenke, Phytologia 5 (1955) 225, nom. inval.

Note — This name was never accompanied by a description (only the letter 'D', an abbreviation for 'shrub or tree') and so, when Moldenke coined a *nomen novum* for it (realising that *C. violaceum* was homonymous with Gürke's name), he did not validate Zeyher's name. Zeyher listed this plant as cultivated in the botanic garden at Schwetzingen but no original material appears to have been preserved. Lam (Verbenaceae

Malayan Archipel. (1919) 320) included it without a description, as a 'species with unknown native country'. However, given Zeyher's collecting localities, it is most likely that the plant was from Africa rather than from Malesia.

4. *Vitex erioclona* H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 51; de Kok, Kew Bull. 63 (2008) 35. — Type: *Heyne 2563* (holo BO; iso NY), [Indonesia, Sulawesi,] Menado, Lako-Poso.

Note — This species is not a *Clerodendrum* (cf. de Kok, Kew Bull. 63 (2004) 36). It is listed as an unplaced name in Govaerts' World Checklist online (http://apps.kew.org/wcsp/namedetail.do?name_id=213438, accessed 12.xi.2010) and is undoubtedly a *Vitex* plant with a galled inflorescence.

CULTIVATED

Clerodendrum thomsoniae Balf., Gard. Chron. (1872) 70. — Type: cult. in Edinburgh from African material by Rev. W.C. Thomson from Old Calabar, unknown if exsiccate exists.

An ornamental plant found in cultivation; originally from west tropical Africa. A climber with white calyx and bright red corolla.

9. CLINOPODIUM

(G.L.C. Bramley, updated from Keng 1978)

Clinopodium L., Sp. Pl. (1753) 587; P.D.Cantino & Wagstaff, Brittonia 50 (1998) 63; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 241; Bräuchler, Meimberg & Heubl, Taxon 55 (2006) 977. — Type: *Clinopodium vulgare* L.

Calamintha auct. non Mill.: H.Keng, Gard. Bull. Singapore 24 (1969) 41 (see note).

Satureja auct. non L.: H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 361 (see note).

Often slender and prostrate herbs. *Leaves* crenate-serrate or entire. *Inflorescences* of small or medium-sized flowers, in dense axillary verticillasters often forming loose spicate or racemose terminal inflorescences. *Calyx* campanulate or tubular, straight (slightly gibbous at the base in the fruiting stage); usually (11–)13(–15)-nerved, 2-lipped, 5-lobed; upper lip 3-lobed, lobes often partially fused; lower lip 2-lobed, lobes usually free, subulate; throat naked or villous. *Corolla* tube nearly straight or curved, 2-lipped, upper lip usually notched; lower lip spreading, 3-lobed. *Stamens* 4, in 2 pairs, ascending under the upper lip; upper pair smaller; anthers 2-celled, cells parallel or divaricate. *Disc* uniform, entire. *Style* gynobasic, lobes equal or the upper lobe smaller. *Fruit* a schizocarp with four nutlets. *Nutlets* minute, subglobose, smooth, glabrous, attachment scar basal.

Distribution — About 100 species, mostly in the New World (temperate and tropical) and temperate Eurasia, but a few in Africa, tropical Asia and *Malesia* (2 species).

Note — Keng's precursor (1969) treated the two Malesian species under the generic concept *Calamintha*; later Keng (1978) treated them as *Satureja*. More recent evidence, both morphological and molecular (e.g., Cantino & Wagstaff 1998, Harley et al. 2004,

Bräuchler et al. 2006) has led to a much narrower definition of *Satureja*: it is now restricted to the Old World, especially the Mediterranean region and is distinguished by its conduplicate, obovate to spatulate leaves. *Micromeria* and *Clinopodium* are recognised, the latter containing most New World taxa, although the two taxa present in Malesia are part of the enlarged *Clinopodium*.

KEY TO THE SPECIES

1a. Flowering calyx 2–3 mm long, fruiting calyx 4–4.5 mm long; calyx tube hairy on venation; upper three lobes fused then free for less than 0.5 mm; lower two lobes 1–1.5 mm long. Corolla 3–4 mm long. . . . . **1. C. gracile**
b. Flowering calyx 4–4.5(–9) mm long, fruiting calyx 4.5–6(–10) mm long; calyx tube with spreading hairs all over; upper three lobes fused then free for 1 mm long; lower two lobes c. 2 mm long. Corolla 5–6(–15) mm long. . . . **2. C. umbrosum**

1. Clinopodium gracile (Benth.) Kuntze

Clinopodium gracile (Benth.) Kuntze, Revis. Gen. Pl. 2 (1891) 514. — *Satureja gracilis* (Benth.) Nakai, J. Coll. Sci. Imp. Univ. Tokyo 31 (1911) 149; Merr., Brittonia 5 (1943) 29; Backer & Bakh.f., Fl. Java 2 (1965) 630. — *Calamintha gracilis* (Benth.) Benth. in A.DC., Prodr. 12 (1848) 232; Miq., Fl. Ned. Ind. 2 (1859) 968, incl. var. γ *rubella* Miq., excl. var. β *pilosior* Miq.; Ridl., Fl. Malay Penins. 2 (1923) 648; H.Keng, Gard. Bull. Singapore 24 (1969) 42. — Syntypes: *Zollinger 332* (G-DC), Java; *Zollinger 1841* (G-DC), Java.
Calamintha moluccana Miq., Fl. Ned. Ind. 2 (1859) 968. — Type: *Zippel. s.n.* (L 4 sheets), Moluccas.

Slender, prostrate herb. *Stem* with short erect hairs, rooting on the lower nodes. *Leaves*: blade membranaceous, broadly ovate or subrounded, 1–2.2 by 0.8–2 cm, apex acute, base rounded or broadly cuneate, margin crenate-serrate, glabrous on both sides except on the nerves, short hairs most visible on the midrib towards the petiole; petiole 0.5–1 cm long, with short hairs. *Inflorescences* with flowers in lax, many-flowered verticillasters in the axils of upper leaves, sometimes aggregated to form racemose or subcapitate, terminal inflorescence; axes with short hairs; bracts subulate, puberulous, 1–2 mm long; pedicels slender, 1–4 mm long. *Calyx* tubular-campanulate, 2–3 mm long, in fruit 4–4.5 mm long, with short hairs on the nerves and inside the upper part; tube slightly inflated below; upper lobes recurved, highly connate, free for less than 0.5 mm, slightly shorter than the lower ones; lower lobes subulate, 1–1.5 mm long, ciliate, slightly incurved. *Corolla* violet or pink, 3–4 mm long, outer surface with short hairs, barely exserted. *Stamens* with anther cells parallel, connivent. *Nutlets* rounded, compressed, 0.5–0.6 mm wide, pale brown, finely reticulate. — **Fig. 10.**

Distribution — Tropical and subtropical Asia: continental SE Asia (Assam, Myanmar, Thailand, Laos, Vietnam) to E Asia (China, Japan, Taiwan); in *Malesia*: Malay Peninsula, Central W Sumatra (Gunung Malintang) , W Java (Preanger Mts), Borneo (Sabah, Kinabalu area), Sulawesi (Masamba, Bonthain), Moluccas (Ambon).

Habitat & Ecology — Damp open places, in grassland, moist roadsides, streamside in forest. Altitude: 600–1400 m. Flowering: April to October.

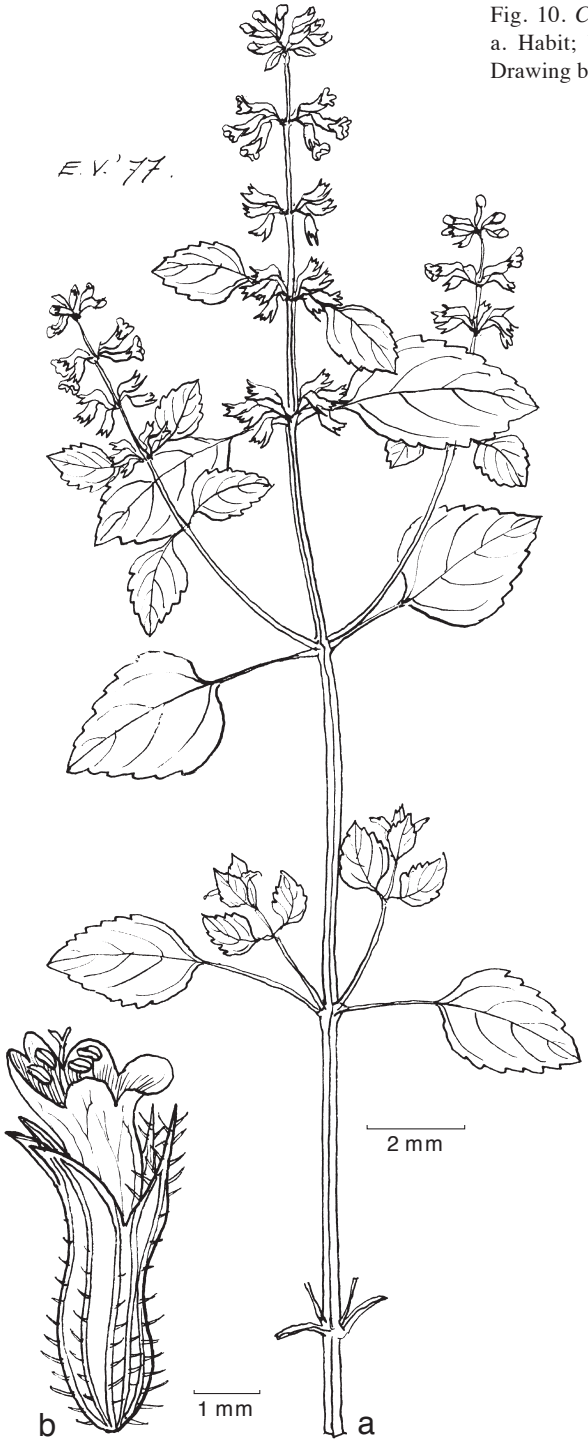

Fig. 10. *Clinopodium gracile* (Benth.) Kuntze. a. Habit; b. flower (all *Holstvoogd 523*, L). Drawing by Ed Vijsma, 1977.

2. **Clinopodium umbrosum** (M.Bieb.) Kuntze

Clinopodium umbrosum (M.Bieb.) Kuntze, Revis. Gen. Pl. 2 (1891) 514. — *Melissa umbrosa* M.Bieb., Fl. Taur.-Caucas. 2 (1808) 63. — *Thymus umbrosus* (M.Bieb.) Spreng., Novi Provent. (1818) 41. — *Calamintha umbrosa* (M.Bieb.) Rchb., Fl. Germ. Excurs. (1831) 329; Miq., Fl. Ned. Ind. 2 (1859) 968; Hook.f., Fl. Brit. India 4 (1885) 450; Merr. & Rolfe, Philipp. J. Sci., C 3 (1908) 123; Merr., Enum. Philipp. Fl. Pl. 33 (1923) 410; H.Keng, Gard. Bull. Singapore 24 (1969) 43, f. 7. — *Faucibarba umbrosa* (M.Bieb.) Dulac, Fl. Hautes-Pyrénées (1867) 402. — *Satureja umbrosa* (M.Bieb.) Greuter & Burdet, Willdenowia 14 (1984, '1985') 306.— Type: *?Bieberstein s.n.* (LE?, not seen), Ibrice (as 'Iberiae'), Turkey.

Ziziphora javanica Blume, Bijdr. (1826) 822. — Type: *Blume 1595* (holo L), Java, Tjeremai.

Calamintha repens (Buch.-Ham. ex D.Don) Benth. var. *javanica* Benth. in A.DC., Prodr. 12 (1848) 233; Miq., Fl. Ned. Ind. 2 (1859) 968. — Type: *Zollinger 2586* (G-DC?), Java.

Calamintha repens (Buch.-Ham. ex D.Don) Benth. var. *colorans* Miq., Fl. Ned. Ind. 2 (1859) 968. — Type: *Horsfield s.n.* (K), Java, op de G. Praoe.

Stachys rubisepala Elmer, Leafl. Philipp. Bot. 1 (1908) 338. — Type: *Elmer 8408* (holo PNH†; iso GH, K, L, NY), Philippines, Luzon, Benguet prov., Baguio.

Leucas urticifolia auct. non R.Br.: Koord., Exkurs.-Fl. Java 3 (1912) 147.

Slender herb, profusely branched, often prostrate. *Stem* 0.25–1 m tall, pubescent, sometimes rooting at the lower nodes. *Leaves*: blade membranaceous, with short appressed hairs above and below, sometimes hairs more dense below, also with yellow sessile glands, ovate to broadly ovate, l–1.5(–4.5) by 0.8–1.2(–3) cm, apex acute, base rounded or cuneate, margin serrate; petiole 0.3–1 cm long, pubescent. *Inflorescences* with flowers in dense verticils, subcapitate, terminal and in axils of upper leaves; bracts subulate, hirsute, 3–4 mm long, often 2–4 in groups; pedicels 3–6 mm long, with short hairs. *Calyx* 4–4.5(–9) mm long, in fruit 4.5–6(–10) mm, with spreading long hairs; tube slightly inflated below; upper lobes joined then free for c. 1 mm in flower, only slightly recurved, lower lobes subulate, c. 2 mm long, with long hairs on the margins. *Corolla* reddish violet or pinkish to purple, with white spots inside the lip, 5–6(–15) mm long, outer surface with short hairs. *Stamens* 4 (Keng 1978, reports that only the 2 larger ones are functional). *Nutlets* subrounded, c. 0.8(–1) mm wide, compressed, smooth. — **Plate 4a.**

Distribution — Continental S Asia (Caucasus to Afghanistan and India to S China), Taiwan; in *Malesia*: Sumatra (Mt Kerinci), Java (from Mt Patuha in W to Mt Idjen in E), Philippines (N Luzon), Lesser Sunda Islands (Bali, Lombok) and New Guinea (Lake Habbema near Mt Wilhelmina; Kokoda Distr., Lake Myola).

Habitat & Ecology — Shaded ravines, glades, open slopes, moist grasslands, rocky plains, in E Java in tjemara (*Casuarina*) forest and in Luzon often in pine forest and savannah. Altitude: 1200–3200 m. Flowering: March to November.

Vernacular names — Java: Legattan (Javanese). Philippines: Pupuguk (Igorot).

Note — The type specimen of *Melissa umbrosa* was from Ibrice (as 'Iberiae'), Turkey. Specimens of this plant from Western Asia to the Far East and to Malesia are essentially homogeneous. Keng (1969) originally included var. *javanica*, following Bentham, Boerlage and others who had recognised it as distinct (sometimes as var. *repens*), but in his 1978 Flora Malesiana treatment, he included it in *Satureja umbrosa*. The specimens upon which this var. *javanica* was based do have longer calyces and corollas (up to 15 mm; e.g., *Gisius 115* [L0883564]), but in all other characters they are conspecific with the typical *Clinopodium umbrosum*, so var. *javanica* is not recognised here.

CULTIVATED

Satureja hortensis L., Sp. Pl. (1753) 568; Backer & Bakh.f., Fl. Java 2 (1965) 629.

Distribution — A native of the Mediterranean region and still considered part of *Satureja* s.str.; sometimes cultivated in the mountains of Java as a condiment.

Vernacular name — Summer savory (English); Bonenkruid (Dutch).

10. CONGEA

(L.J. Walsingham & S. Suddee)

Congea Roxb., Pl. Coromandel 3 (1819) 90, t. 293; C.B.Clarke in Hook.f., Fl. Brit. India 4 (1855) 602; Miq., Fl. Ned. Ind. 2 (1858) 911; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 864; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 336; Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 100; Ridl., Fl. Malay Penins. 2 (1923) 640; Munir, Gard. Bull. Singapore 21 (1966) 277; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 193. — Type: *Congea tomentosa* Roxb.

Woody climbers or scandent shrubs. *Branches* almost cylindric, usually tomentose with mixed simple and stellate hairs. *Leaves* simple, decussate, entire, petiolate. *Inflorescences* terminal and axillary, pedunculate capitate cymes, 3–9-flowered, involucral outer bracteoles (sometimes referred to as bracts) 3 or 4, spatulate to narrowly oblong or oblanceolate, rounded at apex, rarely bilobed, very showy, purple or white-tomentose on adaxial surface, rarely with 2 inner bracteoles, inconspicuous, linear to subulate; flowers sessile or shortly pedicellate. *Calyx* actinomorphic, weakly accrescent in fruit, tubular or narrowly infundibuliform, 5-lobed, lobes equal, triangular, calyx-tube longer than lobes, 10-nerved, densely hairy within, especially in throat. *Corolla* lilac or pink, zygomorphic, 2-lipped, 5-lobed (2/3), longer or shorter than calyx, upper lip with 2 rounded lobes, lower lip much shorter, with 3 lobes, rounded, slightly spreading, corolla-tube cylindrical, straight, slightly expanded around ovary near base, exserted from calyx, densely villous within throat. *Stamens* 4 (posterior stamen absent), didynamous, divergent, exserted, filaments sometimes very long, becoming curled, thecae rounded, parallel, separate. *Ovary* obovoid, glabrous, glandular at apex; style terminal, exserted, stigma-lobes 2, very short. *Fruit* dry, indehiscent, obovoid, 1-seeded.

Distribution — Seven to ten species from India (Assam), Bangladesh, Burma, SW China, Thailand, Cambodia, Laos, Vietnam. In *Malesia*: two species in Peninsular Malaysia and Sumatra. *Congea tomentosa* Roxb. and *C. griffithiana* Munir are widely cultivated.

Habitat & Ecology — Mixed forest, forest edges.

Uses — Ornamental climbers. *Congea tomentosa*, although not native to Malesia, is widely cultivated, and can be used as a hedge plant (Burkill, Econ. Prod. Malay Pen. (1966) 656). *Congea griffithiana* is widely cultivated in the Malesian region (Munir 1966: 287).

Taxonomy — The genus was revised by Munir (1966: 259). Based on Munir's account, and the material available to examine, two species are recognised in the Flora Malesiana area.

KEY TO THE SPECIES

1a. Outer bracteoles narrowly oblong to oblanceolate, gradually narrowing to base; two additional inner bracteoles present between flower and outer bracteoles, these short, linear, and setaceous. Calyx 7–8 mm long; corolla tube c. 7 mm long .... **1. C. forbesii**

b. Outer bracteoles spatulate to oblanceolate, abruptly narrowing to base, no additional bracteoles between flower and involucral bracts. Calyx 4–5 mm long; corolla tube 3–5 mm long .... **2. C. griffithiana**

1. Congea forbesii King & Gamble

Congea forbesii King & Gamble, Bull. Misc. Inform. Kew (1908) 114; Moldenke, Resume Geogr. Distr. & Syn. (1959) 188, f. 4. — Type: *Forbes 1567* (holo CAL; iso A, K, L, SING), Sumatra, Gunong Trang, Lampongs.

Congea forbesii King & Gamble var. *ridleyana* Munir, Gard. Bull. Singapore 21 (1966) 292. — Type: *Ridley 6993* (holo SING; iso CAL), Peninsular Malaysia, Arakuda Woods, Province Wellesley.

Congea velutina auct. non Wight: H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 101.

Congea vestita auct. non Griff.: King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 865; Ridl., Fl. Malay Penins. 2 (1923) 640.

Stems slender, tomentose. *Leaves*: blade chartaceous, oblong or oblong lanceolate, 7–13 by 2.5–4 cm, acuminate at apex, rounded or slightly cordate at base, upper surface shiny and glabrous except for the puberulous nerves, lower surface much lighter colour in dried specimens, shortly golden brown pubescent; petioles up to 5 mm long, pubescent. *Inflorescences* lax, up to 30 cm long, tawny pubescent; cymes decussate, 3- or 4-flowered; peduncles 5–7 mm long, with 4 outer involucral bracteoles, 0.4–1 by 2–4 cm, free to the base, narrowly oblong or oblanceolate, gradually narrowing to base, grey tomentose, with two additional inner bracteoles, shorter than outer bracteoles, linear, setaceous, 6–13 mm long. *Calyx* tubular, 7–8 mm long, densely tomentose without, appressedly hairy within; lobes acute triangular, crispate, 2–3 mm long. *Corolla* tube c. 7 mm long, cylindric, slender, glabrous until a villous band in throat. *Stamens* much exserted; filaments filiform; anthers almost orbicular. *Style* slender, much exserted, c. 8 mm long. *Fruit* glabrous, glandular at apex.

Distribution — Peninsular Malaysia (Kedah, Penang, Kelantan), Sumatra.

Habitat & Ecology — Lowland forest, secondary forest or hill evergreen forest. Altitude: to 1500 m.

Vernacular name — Peninsular Malaysia: Keket.

Note — Involucral bracts of this species often appearing more densely grey-whitish than the other species.

2. Congea griffithiana Munir

Congea griffithiana Munir, Gard. Bull. Singapore 21 (1956) 285. — Type: *Curtis 2962* (holo SING; iso CAL, K 2 sheets), Thailand, Pungah.

Congea griffithiana Munir var. *elliptica* Munir, Gard. Bull. Singapore 21 (1966) 289. — Type: *Proudlock 36* (holo CAL), Burma, Tenasserim, Mergui.

Congea velutina auct. non Wight: Wight, Icon. Pl. Ind. Orient. 4 (1849) 15, p.p., quod t. 1479/B; C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 603.
Congea villosa auct. non Wight: H.R.Fletcher, Bull. Misc. Inform. Kew (1938) 440.

Stems golden brown tomentose. *Leaves*: blade subcoriaceous to chartaceous, elliptic, up to 12 by 6 cm, apex acuminate, base cuneate, glabrous above, velutinous below; petioles 5–10 mm long, also velutinous. *Inflorescences* up to 45 cm long, axes tawny tomentose; cymes 5-flowered; peduncles c. 1 cm long, tomentose; with four outer involucral bracteoles, up to 3 by 1.3 cm, free to the base, spatulate to oblanceolate, abruptly narrowed towards base, violet-pink, thickly tomentose above, pubescent below. *Calyx* campanulate, 4–5 mm long, densely hairy without, appressedly hairy within; lobes acute, crispate at margins, c. 1 mm long. *Corolla* tube 3–5 mm long, slightly longer than calyx, glabrous until a villous band in the throat; lobes rounded. *Stamens* exserted; filaments up to 1 cm long or more; anthers almost orbicular. *Style* longer than filaments. *Fruit* glabrous, glandular at apex.

Distribution — Burma, Thailand; in *Malesia*: Peninsular Malaysia (Perlis, Kedah).

Habitat & Ecology — Lowland forest.

Uses — Widely cultivated in Malesian region (Munir 1966: 287).

Note — Distinguished in the field by its strong violet-pink involucral bracts, dried specimens do not necessarily show this characteristic, sometimes only a hint of the colour is apparent.

CULTIVATED

Congea tomentosa Roxb., Pl. Coromandel 3 (1820) 90, t. 293. — Lectotype (designated here): *Roxburgh's illustration No. 2298* (lecto illustration in K, photo in capsule SING). Epitype (designated here): *Roxburgh s.n.* (epi BM).

Found cultivated throughout the region, and elsewhere in the tropics. — **Plate 4c.**

Vernacular names — Commonly referred to as Woolly Congea, Shower Orchid or Shower of Orchid (English).

Note — Roxburgh based the description of *C. tomentosa* on Roxburgh's illustration No. 2298 and a plant, a native of the forest of Chittagong, Bangladesh, which was probably cultivated in the Calcutta Botanic Garden. There is one Roxburgh specimen at BM that matches the typical form of *C. tomentosa* from Chittagong but it is not known whether this was the plant on which Roxburgh based his species description. Roxburgh's illustration No. 2298 at K is chosen here as the lectotype, and Roxburgh's specimen at BM is chosen as epitype.

11. CYMARIA

(G.L.C. Bramley, updated from Keng 1978)

Cymaria Benth., Edwards's Bot. Reg. 15 (1830) t. 1292; H.Keng, Gard. Bull. Singapore 24 (1969) 63; in Steenis, Fl. Males., Ser. I, 8 (1978) 315; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 268. — Type: *Cymaria dichotoma* Benth.
Anthocoma Zoll. & Moritzi, Natuur-Geneesk. Arch. Ned.-Indië 2 (1845) 569. — Type: *Anthocoma flavescens* Zoll. & Moritzi (= *Cymaria dichotoma* Benth.).

Shrubs and subshrubs; stems erect, 0.5–2 m long. *Indumentum* of simple hairs. *Leaves* simple, spread in opposite pairs, margin serrate, crenate to remotely dentate. *Inflorescences* axillary, lax, long-pedunculate, with secund, monochasial branches. *Calyx* actinomorphic, accrescent, campanulate in flower, in fruit urceolate or campanulate, 5-lobed, lobes triangular, equal. *Corolla* white to yellowish, 2-lipped (2/3), upper lip emarginate to entire, lower lip with mid-lobe larger than the lateral ones. *Stamens* 4, ascending under the upper lip, in 2 pairs, upper pair shorter; anthers 2-celled, divaricate, cells connivent, at length confluent. *Disc* absent. *Ovary* shallowly 4-lobed; style subterminal, 2-fid at apex, upper branch very short. *Fruit* a schizocarp with 4 nutlets. *Nutlets* subglobose or obovoid, apex hairy, abscission scar lateral, large, at least half the length of the nutlet.

Distribution — About 2 species in continental Asia (Burma, Thailand, Indo-China, Hainan) and *Malesia*.

Habitat & Ecology — Bound to a seasonal lowland tropical climate; thickets and forest edges.

Taxonomy — Currently unplaced in the Lamiaceae (Harley et al. 2004). The two species of *Cymaria* recognised here are similar, but differ in their calyx and corolla size, and indumentum on the vegetative parts.

KEY TO THE SPECIES

1a. Fruiting calyx urceolate, 2–3 mm long. Corolla 2–2.5 mm long. Leaves appressed pubescent below . . . . . **1. C. dichotoma**

b. Fruiting calyx campanulate, c. 5 mm long. Corolla 5.5–6 mm long. Leaves tomentose or densely woolly below . . . . . **2. C. elongata**

1. Cymaria dichotoma Benth.

Cymaria dichotoma Benth., Edwards's Bot. Reg. 15 (1830) t. 1292; Miq., Fl. Ned. Ind. 2 (1859) 992; Hook.f., Fl. Brit. India 4 (1885) 705; Ridl., Fl. Malay Penins. 2 (1923) 654. — Type: *Wallich Cat. 2080* (holo ?K-W; iso K), Burma, Taong Dong.

Cymaria acuminata Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 399 (= Herb. Timor. Descr. (1835) 71); Miq., Fl. Ned. Ind. 2 (1859) 992; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 408; Backer & Bakh.f., Fl. Java 2 (1965) 617. — Type: *Cuming 446* (iso K, 2 mixed sheets), Philippines, Luzon.

Anthocoma flavescens Zoll. & Moritzi, Natuur-Geneesk. Arch. Ned.-Indië 2 (1845) 570. — *Gomphostemma flavescens* (Zoll. & Moritzi) Miq., Fl. Ned. Ind. 2 (1859) 987. — *Phlomis flavescens* (Zoll. & Moritzi) Boerl., Handl. Fl. Ned. Ind. 2 (1899) 716, nom. illeg. — Type: *Zollinger s.n.* (?L), Java.

Cymaria mollis Miq., Fl. Ned. Ind. 2 (1859) 992 — Type: *Horsfield s.n.* (K), Java.

Gomphostemma dichotomum auct. non Benth.: Zoll. & Moritzi, in Moritzi, Syst. Verz. (1846) 54.

Shrub, 0.5–2 m high. *Stem* and *branches* finely pubescent. *Leaves*: blade membranaceous, sometimes very thin, narrowly elliptic, ovate to rhomboid, 5–11 by 3.5–6 cm, apex acute or subacute, rarely acuminate, margin serrate, crenate or remotely dentate, base cuneate or attenuate, entire; glabrous or finely hirsute above, appressed pubescent beneath; petiole 0.5–2 cm long, finely puberulent. *Inflorescences* with 4–15 flowers secundly arranged on the branches of axillary and terminal cymes; main peduncles

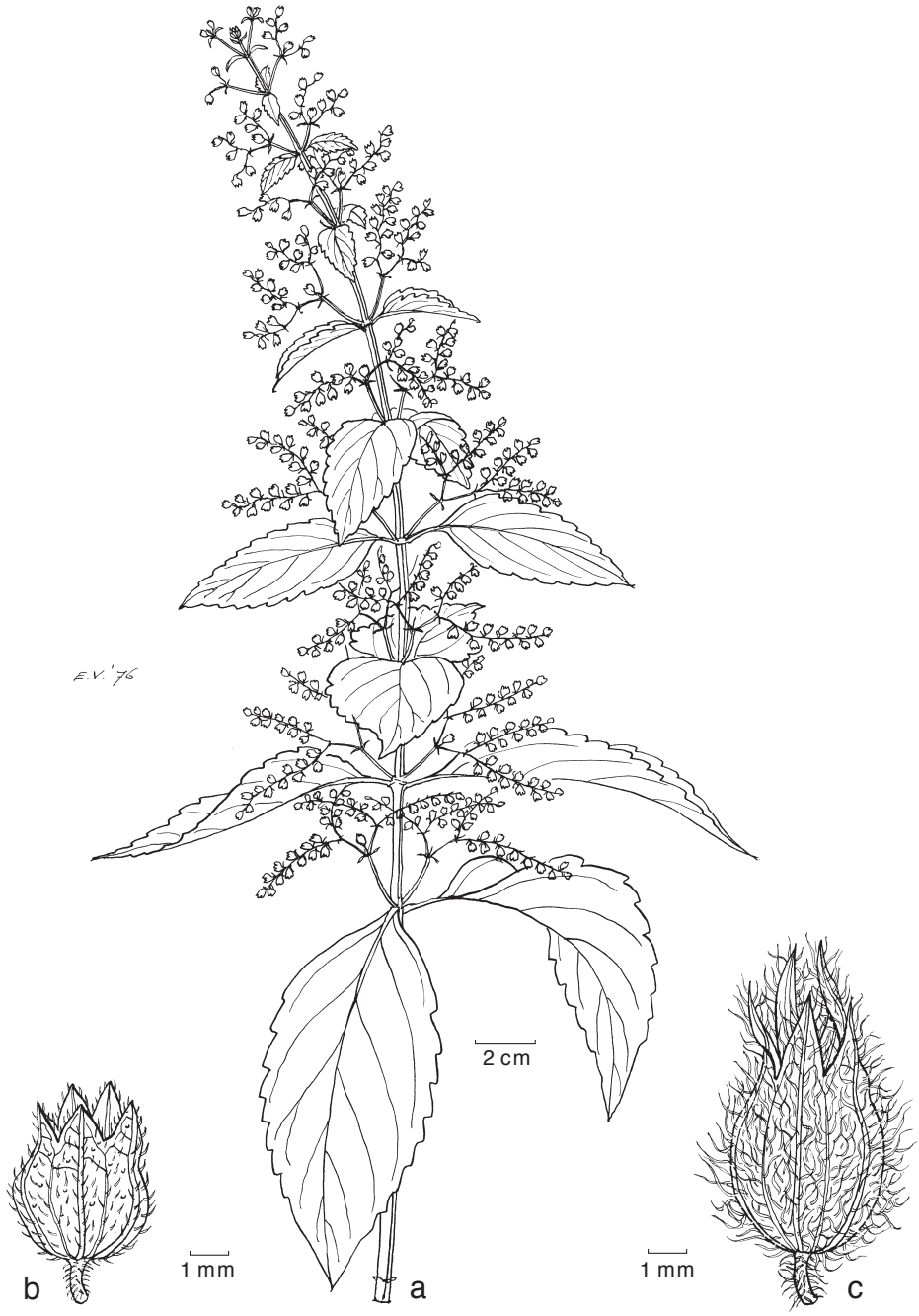

Fig. 11. *Cymaria dichtoma* Benth. a. Habit; b. fruiting calyx. — *C. elongata* Benth. c. Fruiting calyx (a, b: *Zippelius 439*; c: *Bogor Botanic Garden XV.K.B.XXVI.6*; all L). Drawing by Ed Vijsma, 1976.

0.5–3 cm long, finely pubescent; bracts ovate, spatulate to very narrowly ovate, 3–5 mm long; pedicels short and slender, finely pubescent. *Calyx* campanulate, c. 1.5 mm long (in fruit urceolate, 2–3 mm long, often crowned with the erect, deltoid lobes), glandular and pubescent; lobes deltoid. *Corolla* whitish, pale yellow or yellow, with a red basal spot in lower lip, 2–2.5 mm long, outside finely pubescent. *Nutlets* obovoid, 1.2–1.5 by c. 0.6 mm, reticulate, apex glandular, with short stiff hairs. — **Fig. 11a, b.**

Distribution — Continental SE Asia (Burma, Thailand, Indo-China, Hainan); in *Malesi*a: throughout but very rare in the Malay Peninsula, absent in Sumatra and western half of Java, one collection from Borneo (Bodgaya Island, Semporna), Sulawesi (S, SE), Lesser Sunda Islands (Bali, Timor), Moluccas (Babar and Tanimbar Is.), New Guinea.

Habitat & Ecology — Distinctly bound to a seasonal, lowland climate, in Malay Peninsula and Puger (SE Java) on limestone rocks, in open thickets and secondary growths, forest edges, deciduous forest. Altitude: below 500 m.

Vernacular names — Philippines: Lukut lukut. Sulu Is.: Nikut nikut.

Note — Variability in indumentum exists, especially of the inflorescence (sparsely to more densely hairy).

2. Cymaria elongata Benth.

Cymaria elongata Benth., Edwards's Bot. Reg. 15 (1830) t. 1292; Hook.f, Fl. Brit. India 4 (1885) 705. — Type: *Wallich Cat. 2079* (holo ?K-W; iso K), Burma, Taong Dong.

[*Cymaria timoriensis* Backer [in sched.] ex H.Keng, Gard. Bull. Singapore 24 (1969) 64, in note, nom. nud.]

Shrub. *Stem* and *branches* tomentose or densely villose. *Leaves*: blade thin- to thick-coriaceous, oblong-ovate or ovate, 4.5–7 by 2.5–3.5 cm, apex acute or obtuse, margin serrate or crenate, puberulent or densely villose above, tomentose or densely woolly beneath, base rounded, shortly attenuate, entire; petiole 0.5–1 cm long, tomentose. *Inflorescences* with 6–15 flowers secundly arranged on the branches of axillary and terminal cymes; main peduncles 2–5 mm long, densely villose; bracts and bracteoles subulate, minute; flowers almost sessile. *Calyx* tubular, 3.5–4 mm long (in fruit campanulate, slightly inflated below, c. 5 mm), glandular and woolly; lobes lanceolate. *Corolla* 5.5–6 mm long, outside finely pubescent. *Nutlets* obovoid-ellipsoid, subtriquetrous, c. 1.8 by 0.8 mm, coarsely reticulate, apex beset with soft hairs. — **Fig. 11c.**

Distribution — India (Burma), in *Malesia*: Lesser Sunda Islands (Timor: Atapupu).

Habitat & Ecology — Confined to regions with a distinctly seasonal climate.

Notes — 1. *Cymaria elongata* is upheld at specific rank because of differences in the calyx and corolla with *C. dichotoma*. Based on collections available, *C. elongata* is rare, being only known from a few specimens. The specimens at L labelled *C. timoriensis* (see note below from Keng 1978) can be distinguished from the typical *C. dichotoma* by their thicker leaves with a dense almost woolly indumentum, and by their more congested inflorescence with slightly larger calyx and corolla. However, this is the only record of *C. elongata* other than the type (from Burma): the disjunct distribution is unusual, and further investigation into this genus, preferably involving more, recent collections and molecular studies, may result in one, albeit variable, species being recognised (*C. dichotoma*).

2. Keng (1978) noted the following: "at Leiden there are two collections (*Teysmann HB 11672*) from Timor and a duplicate from a plant grown in Hort. Bog. *sub* XV.K.B. XXVI.6 said to come from Flores. The late Dr. Backer recognized this as a new species in a manuscript which I referred with doubt to *C. acuminata* in my precursor (Keng, 1969). However, it appears distinct and is supposed to be conspecific with *C. elongata*".

12. ELSHOLTZIA

(G.L.C. Bramley & B. Bongcheewin)

Elsholtzia Willd. in Roem. & Usteri, Bot. Mag. 11 (1790) 3; Benth., Labiat. Gen. Spec. (1833) 160; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1897) 327; H.Keng, Gard. Bull. Singapore 24 (1969) 13; in Steenis, Fl. Males., Ser. I, 8 (1978) 331; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 228. — Type: *Elsholtzia cristata* Willd.

Aphanochilus Benth., Edwards's Bot. Reg. 15 (1829) t. 1282. — Type: *Aphanochilus blandus* Benth. (= *Elsholtzia blanda* (Benth.) Benth.).

Cyclostegia Benth., Edwards's Bot. Reg. 15 (1829) t. 1282. — Type: *Cyclostegia strobilifera* Benth. (= *Elsholtzia strobilifera* (Benth.) Benth.).

Herbs or undershrubs. *Indumentum* usually simple hairs. *Leaves* entire to serrate at margins. *Inflorescences* often cylindric or capitate, verticillasters 2- to several-flowered, in axils of bracts; bracts linear to ovate, sometimes fused in pairs and flabellate (not in Malesia). *Calyx* tubular to campanulate, 5-lobed, lobes subequal. *Corolla* white to yellowish green, tubular, shortly exserted, straight or incurved, usually ≤ 7 mm long; limb 4- or 5-lobed, obliquely 2-lipped, upper lip erect, notched, lower lip spreading, 3-lobed. *Stamens* 4, divergent or distant, often slightly unequal, not projecting conspicuously from upper lip; anthers 2-celled, cells divaricate or at length confluent; filaments glabrous. *Disc* produced behind the ovary, oblique. *Style* gynobasic, subequally 2-fid with subulate lobes. *Fruit* a schizocarp with four nutlets. *Nutlets* minute, ovoid, glandular and (in Malesian species) pubescent, attachment scar basal.

Distribution — About 40 species, in the northern temperate to tropical part of the Old World, introduced in N America; in *Malesia*: 2 species in Sumatra, Java, SW Sulawesi and the Lesser Sunda Islands.

Habitat & Ecology — In Malesia characteristic of the montane to subalpine zone, sometimes gregarious.

KEY TO THE SPECIES

1a. Verticillasters consisting of 2–12 flowers, closely spaced, secund, forming a spike- or panicle-like inflorescence. Calyx 1.5–2 mm long, in fruit 2.5–3 mm long, tube gibbous, sparsely short-haired . . . . . **1. E. blanda**

b. Verticillasters consisting of many (20–30) flowers, closely approximate (or widely apart below), in dense spike-like or paniculate inflorescences. Calyx tubular, not gibbous, 2–4.5 mm long, in fruit 4–7.5 mm long, sparsely or densely covered with whitish hairs . . . . . **2. E. pubescens**

1. Elsholtzia blanda (Benth.) Benth.

Elsholtzia blanda (Benth.) Benth., Labiat. Gen. Spec. (1833) 162; Hook.f., Fl. Brit. India 4 (1885) 643; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 13 (1934) 222; H.Keng, Gard. Bull. Singapore 24 (1969) 73, f. 12. — *Aphanochilus blandus* Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 29; Bot. Mag. 58 (1831) t. 3091. — Lectotype (designated by Bongcheewin et al., Blumea 59 (2015) 210): *Wallich Cat. 1550.1* (lecto K (Herb. Benthamianum); isolecto G-DC, K (Herb. Hookerianum), K-W, P), Nepal.

Perilla elata D.Don, Prodr. Fl. Nepal (1825) 115 — Type: *Buchanan-Hamilton s.n.* (BM, not located; see Press & Shrestha, Bull. Nat. Hist. Mus. London, Bot. 30 (2000) 110), Nepalia.

Herb, woody below, c. 1 m high. *Stem* often branched, puberulous or hoary. *Leaves* elliptic to lanceolate, 3–5 by 0.5–1 cm, apex acuminate, base attenuate, narrowed into the petiole, margin coarsely serrate, glabrous above, puberulous and dark glandular beneath; petiole c. 0.5 cm long. *Inflorescences* in 2–12-flowered verticillasters, closely apart, secund, in spike- or panicle-like inflorescences, 5–12 cm long; bracts lanceolate, 1–2.5 mm long. *Calyx* urceolate, 1.5–2 mm long, in fruit 2–3 mm long, tube gibbous, sparsely short-haired, glandular pubescent without; mouth of fruiting calyx slightly contracted; lobes erect, lanceolate. *Corolla* campanulate, yellowish green or whitish, 2.5–3 mm long, 2-lipped, sparingly pubescent. *Stamens* in 2 pairs, subequal; filaments pubescent. *Nutlets* broadly ellipsoid, flattened, c. 0.7 mm long.

Distribution — Continental SE Asia (India, Burma, Thailand to S China); in *Malesia*: Sumatra (Sumatra Utara, Aceh).

Habitat & Ecology — Forest edges, light forest, glades, open heathland. Altitude: 1000–1800 m. Flowering: April to September. Shoots and inflorescences are sometimes galled by aphids.

Vernacular names — Sumatra: Ser ser, silassie.

2. Elsholtzia pubescens Benth.

Elsholtzia pubescens Benth., Labiat. Gen. Spec. (1833) 162; Miq., Fl. Ned. Ind. 2 (1859) 965; Steenis, Bull. Jard. Bot. Buitenzorg Ser. 3, 13 (1934) 222; Backer & Bakh.f., Fl. Java 2 (1965) 632; Fl. Java 3 (1968) 657; H.Keng, Gard. Bull. Singapore 24 (1969) 76. — Type: *Commerson s.n.* (holo P), Java.

Elsholtzia mollissima Benth., Labiat. Gen. Spec. (1833) 163. — Type: *Leschenault s.n.* (holo P), Java.

Elsholtzia elata Zoll. & Moritzi, Natuur-Geneesk. Arch. Ned.-Indië 2 (1845) 5; Miq., Fl. Ned. Ind. 2 (1859) 966; H.Keng, Gard. Bull. Singapore 24 (1969) 75. — Type: *Zollinger 2188* (holo L; iso L), East Java.

Elsholtzia eriantha Benth. in A.DC., Prodr. 12 (1848) 161; Miq., Fl. Ned. Ind. 2 (1859) 966. — Type: *Zollinger 474.7?* (holo P).

Anisochilus euneurus Miq., Fl. Ned. Ind. 2 (1858) 957. — Type: *Horsfield s.n.* (holo K 2 sheets), Java, op den G. Praoe [on Mt Prahu].

Erect herb, 1–2 m high or more. *Stem* and *branches* densely tomentose. *Leaves*: blade membranaceous, narrowly lanceolate, ovate or elliptic, 5–8 by 2.5–3.5 cm, apex acute or acuminate, margin serrulate or serrate, base acute or attenuate, sparingly hirsute above, velutinous or tomentose beneath; petiole 0.5–1.5 cm long. *Inflorescences* in 20–30-flowered verticillasters, closely approximate (or widely apart below), forming terminal, spike-like or paniculate inflorescences, 7–10 cm long; bracts linear, linear-lanceolate to ovate, 2.5–4 mm long, densely pubescent. *Calyx* tubular, narrowed at

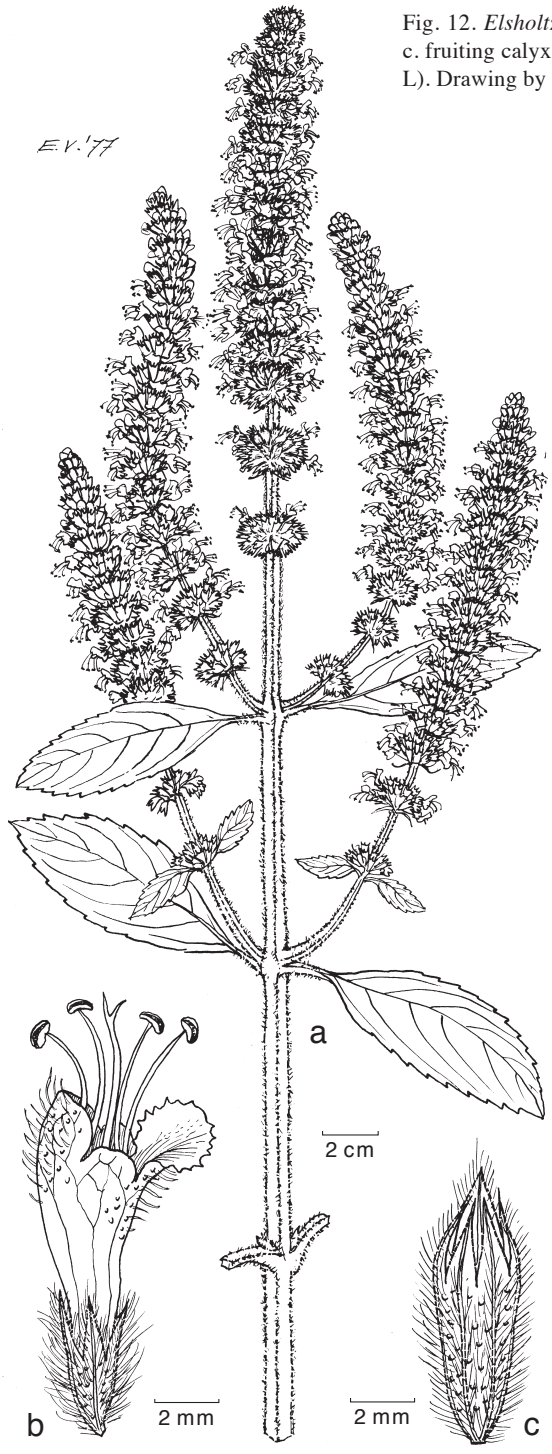

Fig. 12. *Elsholtzia pubescens* Benth. a. Habit; b. flower; c. fruiting calyx (a, b: *Karsten 32*; c: *Koorders 29143*; all L). Drawing by Ed Vijsma, 1977.

both ends, 2–4.5 mm long, in fruit 4–7.5 mm long, with soft curled, appressed whitish hairs, lobes sharply pointed. *Corolla* white, 4–7 mm long. *Stamens* exserted, filaments puberulent. *Style* apically shortly 2-fid. *Nutlets* narrowly ellipsoid, 1–1.2 by c. 0.5 mm, puberulent and gland-dotted. — **Fig. 12.**

Distribution — *Malesia*: Java, Lesser Sunda Islands (Bali, Lombok, Sumba, Flores, Timor), the tip of the SW Peninsula of Sulawesi (Mt Bonthain).

Habitat & Ecology — Open places, in grassfields, in *Casuarina junghuhniana* forest often in masses, also in Eucalypt forest in Timor. Altitude: 1000–2950 m. Flowering: June to November. An excellent honey producer for wild bees.

Vernacular names — Java: Djugul (Sundanese); Djungul. Bali: Kudeang (Javanese). Sumba: Kadangu.

Uses — Leaves sometimes used as a vegetable.

Note — *Elsholtzia elata*, recognised by Keng (1969) as distinct, is only a robust form with somewhat stouter, robust spikes and larger calyx (4–4.5 mm long).

13. EURYSOLEN

(G.L.C. Bramley, updated from Keng 1978)

Eurysolen Prain, Sci. Mem. Off. Med. Dept. Gov. India 11 (1898) 44; H.Keng, Gard. Bull. Singapore 24 (1969) 77; in Steenis, Fl. Males., Ser. I, 8 (1978) 333; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 215. — Type species: *Eurysolen gracilis* Prain.

Herb or shrub. *Indumentum* usually simple hairs. *Leaves*: blade membranaceous, ovate to rhomboid, apex acute or acuminate, margin serrate, base acute, glabrescent on both surfaces. *Inflorescences* thyrsoid, flowers in many-flowered verticillasters condensed in terminal and axillary spikes. *Calyx* tubular, ± actinomorphic, 5-lobed, lobes subequal, throat naked within. *Corolla* shortly exserted, tube annulate within, saccate in front above the annulus then abruptly widened, weakly 2-lipped, upper lip short, hooded, lower lip 3-lobed, spreading, midlobe broader than lateral ones. *Stamens* 4, in 2 pairs, the lower pair slightly longer, ascending under upper lip of corolla; anthers ellipsoid, 2-celled in bud, later confluent and 1-celled; filaments puberulous. *Disc* uniform. *Style* gynobasic, apically shortly 2-fid, upper branch very short. *Fruit* a schizocarp of 4 nutlets. *Nutlets* ovoid, subtriquetrous, papillose-glandular; scar of contact surface very large, lateral.

Distribution — Monotypic, from NE India to S China and Thailand; in *Malesia*: Central Sumatra, E Java, Sulawesi, and Lesser Sunda Islands

1. Eurysolen gracilis Prain

Eurysolen gracilis Prain, Sci. Mem. Off. Med. Dept. Gov. India 11 (1898) 43; H.Keng, Gard. Bull. Singapore 24 (1969) 77, f. 13. — Type: *Prain's collector s.n.* (holo CAL; iso CAL 6 sheets), Burma, Kachin Hills.

Herb or undershrub, 0.3–1 m high. *Stem* and *branches* puberulous. *Leaves*: blade 6–8 by 2.5–4 cm; petiole slender, 1.5–3 cm long. *Inflorescences* with 6–10(–30) flowers in a verticillaster, 8–15 cm long. *Calyx* tubular, 3–3.5 mm long, in fruit 4–5 mm long, sparsely puberulous and papillose-glandular externally, but hardly 2-lipped. *Corolla*

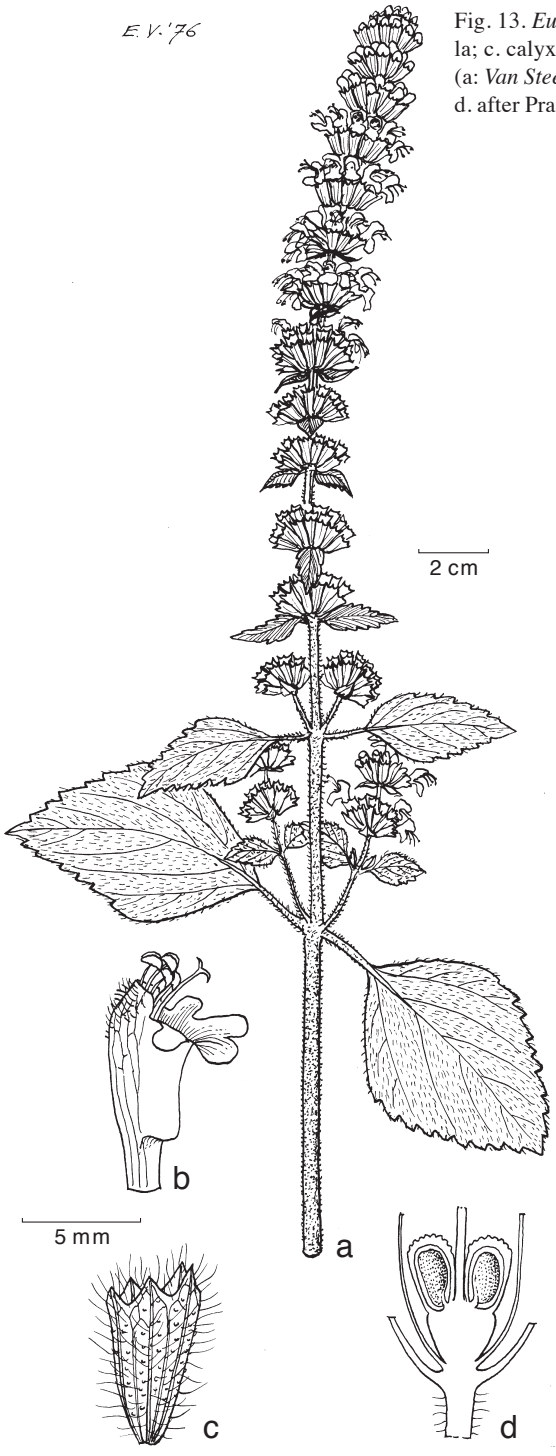

Fig. 13. *Eurysolen gracilis* Prain. a. Habit; b. corolla; c. calyx; d. longitudinal section of fruiting stage (a: *Van Steenis 11118*; b, c: *Bünnemeijer 9057*; all L; d. after Prain (1898)). Drawing by Ed Vijsma, 1977.

white, tubular, 5–6.5 mm long; upper lip short. *Stamens* exserted. *Ovary* very shortly stalked. *Nutlets* c. 1 mm long (immature). — **Fig. 13.**

Distribution — Tropical SE Asia; in *Malesia*: C Sumatra (Mt Kerinchi area), E. Java (Mt Jang), Sulawesi and Lesser Sunda Islands (W Sumbawa: Batu Lanteh; Sumba, Flores).

Habitat & Ecology — Open places in moist mountain valleys. Altitude: 700–1800 m. Flowering: April to January. Though in Java and Sumbawa occurring in a seasonal climate region, the two rare localities in the mountains are both almost certainly local 'everwet islands'.

Note — Keng (1978): the Malesian material slightly deviates from the Indo Chinese and Indian material in the more spaced verticillasters (internodes to 1.5 cm at the base of the spike) and the large number of flowers per verticillaster (30 or more).

14. GARRETTIA

(G.L.C. Bramley & R.P.J. de Kok)

Garrettia H.R.Fletcher, Bull. Misc. Inform. Kew (1937) 71; A.Meeuse, Blumea 5 (1942) 67; Backer & Bakh.f., Fl. Java 2 (1965) 612; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 268; Bendiksby et al., Taxon 60 (2011) 471. — Type: *Garrettia siamensis* H.R.Fletcher.

Shrubs. *Leaves* opposite, simple to trifoliolate (both forms often on same plant), blades/leaflets ovate, margin serrulate to subentire, petiolate. *Inflorescences* axillary cymes, lax, long-pedunculate, with monochasial branches. *Calyx* 5-lobed, actinomorphic, accrescent, campanulate in flower, cup-shaped and essentially truncate in fruit; lobes triangular, very short. *Corolla* 2-lipped, 5-lobed, white with yellowish posterior lip, upper lip 2-fid, lower lip 3-lobed, middle lobe the largest. *Stamens* 4, often didynamous; anthers 2-celled, divaricate, confluent at dehiscence; pollen tri-colpate, tectate-perforate, suprareticulate, columellae simple. *Disc* absent. *Ovary* 2-locular when young, becoming 4-locular, shallowly lobed; ovules 1 per locule; style subterminal, stigma 2-lobed, lobes short, unequal. *Fruit* a schizocarp with four nutlets. *Nutlets* globose, indehiscent, reticulately ridged, glabrous; attachment scar as long as nutlet.

Distribution — Two species, one in South China (Yunnan) and North Thailand; in *Malesia*: one species in Indonesia (a series of islands near Java).

Habitat & Ecology — In mixed or open forests on calcareous soil. Altitude: sea-level up to 1200 m.

1. Garrettia cymarioides (H.J.Lam & A.Meeuse) A.Meeuse

Garrettia cymarioides (H.J.Lam & A.Meeuse) A.Meeuse, Blumea 5 (1942) 67. — *Vitex cymarioides* H.J.Lam & A.Meeuse, Blumea 3 (1939) 248. — Type: *Backer 28867* (holo L; iso BO 3 sheets, K), [Indonesia,] Kangean Archipelago, Poeloe Sepandjang.

Shrub, 0.2–2 m tall; twigs densely hairy to velutinous, hairs yellow. *Leaves* single, bi- or trifoliolate, upper surface glabrous to sparsely hairy with densely hairy main veins, lower surface densely hairy to hairs on veins only, glands present, disc-shaped, > 0.1 mm diam., yellowish; blades/leaflets oblong to lanceolate, often ovate, 3–9 by 0.5–4 cm, apex acute to acuminated, rarely emarginate, base rounded to cuneate,

margin serrulate to subentire, pale beneath, veins hairy, covered with sessile glands; petiole 1.5–5 by 0.2–1.2 mm. *Inflorescences* axillary cymes, one or two per leaf axil, 1–6 cm long, lax, densely hairy to velutinous; bracteoles linear, 0.3–0.7 mm long. *Calyx* campanulate, slightly accrescent, 1–1.7 by 1–1.3 mm, green, 5-lobed or ribbed, sessile glands > 0.1 mm diam., reddish; lobes triangular, < 0.3 mm long; fruiting calyx 1.5–2 by 0.9–1.7 mm. *Corolla* glabrous to pubescent outside, glabrous inside, glandular, white; anterior lip 3-lobed, middle lobe broadly oval-orbicular, c. 1.7 by 1.7 mm, apex round, white with yellowish spot near base, row of white hairs at base; side lobes ovate, c. 1.2 by 0.65–0.75 mm, apex round, patent, pale yellow; upper lip 2-lobed, lobes oblong, 0.7–1 by c. 0.6 mm, erect, light yellow to greenish; tube 1.3–2 mm long. *Stamens* 4, subequal, inserted in upper half of corolla tube, velutinous in lower half, glands present in upper half, light yellow; anthers purple, smooth. *Ovary* covered with glands; style c. 15 mm long. *Fruit* 1.5–2 cm diam. *Nutlets* with apex truncated, grey-brown to brown; with sessile glands present, > 0.1 mm diam., reddish. — **Fig. 14.**

Distribution — Indonesia, restricted to a number of islands north (Madura-, Kangean- and Bawean Islands) and south (Nusabarung Island) of E Java.

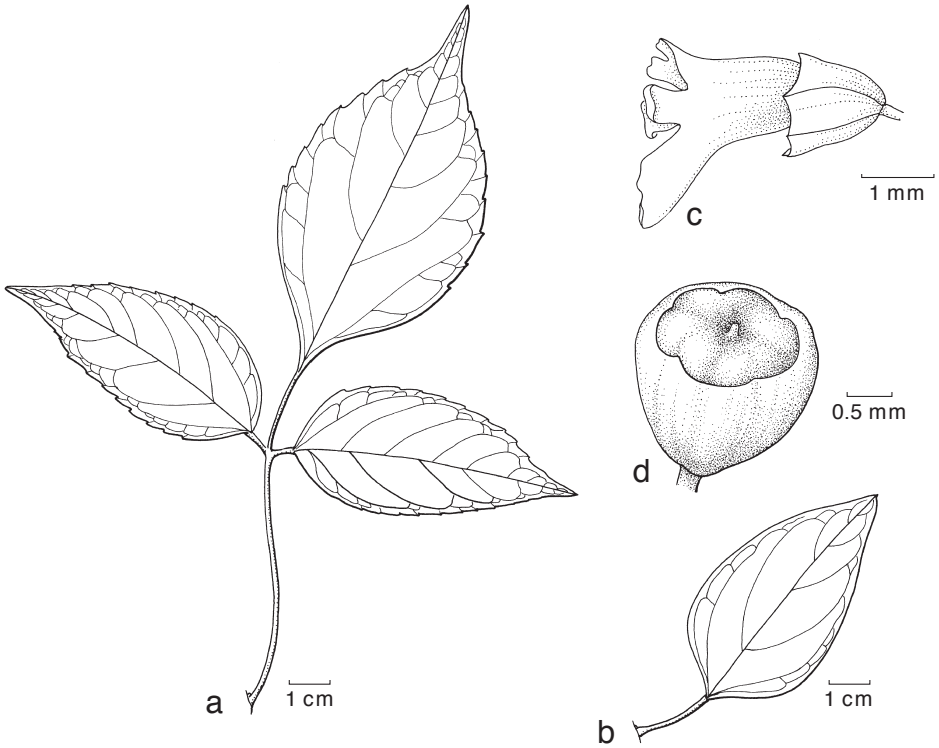

Fig. 14. *Garrettia cymarioides* (H.J.Lam & A.Meeuse) A.Meeuse. a. Trifoliolate leaf; b. simple leaf; c. flower; d. fruit (a, c: *Dilmy 1053*; b, d: *M. Jacobs 4726*; all L). Drawing by Anita Walsmit Sachs, 2012.

Habitat & Ecology — Growing in dry monsoon forest; soil: heavy black soil, sometimes on calcareous rocks. Altitude: sea-level up to 250 m. Flowering: April; fruiting: April to May.

Vernacular names — Madura: Meneer-meneeran. Bawean: Rokoh-rokoh.

Note — Early specimens of this species were distributed from BO with the unpublished name '*Cymaria triphylla* Backer'; it was later decided that the specimens did not belong in *Cymaria* and the name was never published.

15. GLOSSOCARYA

(G.L.C. Bramley & N. Davies)

Glossocarya Wall. ex Griff., Calcutta J. Nat. Hist. 3 (1843) 366; Ridl., Fl. Malay Penins. 2 (1923) 611; H.R.Fletcher, Bull. Misc. Inform. Kew (1938) 405; Moldenke, Phytologia 50 (1982) 413; Munir, J. Adelaide Bot. Gard. 13 (1990) 17; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 197. — Type: *Glossocarya mollis* Wall. ex Griff.

Scandent sprawling shrubs or woody climbers. *Leaves* simple, opposite, decussate, petiolate, broadly ovate to obovate or subrotund. *Inflorescences* terminal or axillary corymboid thryse; flowers small and numerous, bisexual. *Calyx* actinomorphic to weakly zygomorphic, 5-lobed, not accrescent to slightly accrescent. *Corolla* white to yellowish, 5-lobed, actinomorphic to weakly zygomorphic, deciduous in fruit, lobes similar or lower lobe slightly larger. *Stamens* 4, long-exserted from corolla, straight, anthers dorsifixed. *Ovary* unlobed, style subterminal, stigma lobes equal. *Disc* absent. *Fruit* a schizocarp splitting into 4 nutlets. *Nutlets* clavate, basally winged, attachment scar lateral, as long as nutlet; endosperm absent.

Distribution — Sri Lanka, Myanmar, Cambodia, Thailand, Vietnam and Australia (Queensland); in *Malesia*: 4 species, found in Peninsular Malaysia and New Guinea.

Habitat & Ecology — Found in limestone forests, and other forested areas or near rivers.

Note — *Glossocarya* is not a well-known genus in herbaria, few specimens exist. It is found in the more seasonal areas of Indochina and Malesia, often occurring on limestone. According to the herbarium specimens available, most of the species have a disjunct distribution, being present in continental S and SE Asia, then reappearing in New Guinea. Because there is little material to examine, species definitions have tended to be narrow. It may be that future study will result in a reduction in the number of species recognised in Malesia.

KEY TO THE SPECIES

1a. Fruit with thin indumentum of mealy hairs, hairs c. 0.1 mm long. — Peninsular Malaysia only. . . . . **3. G. premnoides**
b. Fruit with at least some longer hairs, 0.4–0.6 mm long, either restricted to apex or covering whole fruit. — Peninsular Malaysia and/or New Guinea 2
2a. Fruit with long hairs covering whole surface. . . . . **2. G. mollis**
b. Fruit with long hairs restricted to the apex. 3

3a. Fruiting calyx ± truncate. Leaf surfaces tomentose, not appearing crinkled when dry . . . . . **1. G. hemiderma**
b. Fruiting calyx distinctly lobed. Leaf surfaces pubescent, appearing crinkled when dry . . . . . **4. G. scandens**

1. Glossocarya hemiderma (F.Muell. ex Benth.) Benth. ex B.D.Jacks.

Glossocarya hemiderma (F.Muell. ex Benth.) Benth. ex B.D.Jacks., Index Kew. 1, 2 (1893) 1035. — *Clerodendrum hemiderma* F.Muell. ex Benth., Fl. Austral. 5 (1870) 61. — Lectotype (designated by Munir, J. Adelaide Bot. Gard. 13 (1990) 17): *Dallachy s.n.* (lecto MEL, no. 98216; isolecto MEL), Australia, Queensland, Rockhingham Bay.

Scandent shrub to woody climber, up to 7 m long. *Stems* weakly to strongly quadrangular, becoming woody as they mature, densely tomentose. *Leaves*: blade ovate, 3.5–10 by 2.5–5.5 cm, bases rounded to subcordate to ± truncate, margins entire to shortly toothed, apex acute-acuminate, surfaces tomentose, not appearing crinkled when dry; petioles 6–10 mm long. *Inflorescences* axillary, peduncles 0.6–5 cm long; bracts narrowly elliptic, 2–3 by 0.3–0.4 mm; pedicels 0.5–2 mm long; bracteoles narrowly elliptic, 0.5–0.8 by 0.1–0.2 mm. *Calyx* actinomorphic, slightly campanulate, 2–3 mm long, lobes c. 0.5 by 0.5 mm, outer surface tomentose; fruiting calyx 3–5.5 mm long, more or less truncate. *Corolla* funnel-shaped, white, cream, pale green or pale yellow, 3–4 mm long, lobes 1.5–3.5 mm long, outer surface with a dense mealy tomentose indumentum, inner surface ± glabrous. *Stamens* with filaments 4.5–7 mm long, white; anthers purple to black in appearance. *Style* up to 7 mm long. *Fruit* rounded to oblong, 5.5–7.5 mm long, with long (0.4–0.6 mm) pubescent hairs restricted to the apex, remainder of surface tomentose, enclosed within fruiting calyx.

Distribution — Sri-Lanka, Thailand, Australia, Fiji; in *Malesia*: Papua New Guinea.

Habitat & Ecology — Near to river/stream banks in vine forests on red soil, sandy clay loam and limestone forests.

2. Glossocarya mollis Wall. ex Griff.

Glossocarya mollis Wall. ex Griff., Calcutta J. Nat. Hist. 3 (1843) 366; Moldenke, Phytologia 50 (1982) 422. — Lectotype (designated by Fletcher, Bull. Misc. Inform. Kew (1938) 438): *Wallich Cat. 1741* (lecto K), [Myanmar,] Segarin Hills [Sagaing].

Glossocarya mollis Wall. ex Griff. var. *maxwellii* Moldenke, Phytologia 35 (1976, '1977') 111. — Type: *James F. Maxwell 75-889, 5* (holo AC; iso C), Thailand, Trang Province, Kao Chong.

Scandent-sprawling shrub or a woody climber, up to 6 m long. *Stems* quadrangular, becoming woody as they mature; densely tomentose. *Leaves*: blade oblong-rounded, 4.5–13 by 4–11 cm, bases rounded to slightly subcordate to ± truncate, margins entire to shortly toothed, apex acute-acuminate, surfaces with a dense mealy tomentose indumentum of simple hairs; petioles 5–12 mm long. *Inflorescences* terminal and/or axillary, peduncles (1–)2.1–2.2 cm long; bracts narrowly oblong to slightly foliaceous, (1.5–)3.4–5.5 by 0.5–0.6 mm; pedicels 0.5–1.5 mm long; bracteoles narrowly elliptic, (0.6–)1.5–1.8 by 0.2–0.3 mm. *Calyx* actinomorphic and slightly campanulate, 2.5–3.5 mm long, lobes c. 0.5 by 0.5 mm. *Corolla* funnel-shaped, white, cream, pale green or pale yellow, 3–6.5 mm long, lobes 1.5–4 mm long, outer surface with a dense

mealy tomentose indumentum of simple hairs, inner surface ± glabrous. *Stamens* with filaments 6.5–10.5 mm long, white; anthers purple to black in appearance. *Style* up to 12 mm long. *Fruit* rounded to oblong, 6–11 mm long, with long (0.4–0.6 mm) pubescent hairs covering the whole exserted fruit, enclosed within fruiting calyx 3.5–5 mm long, shortly lobed.

Distribution — Myanmar, Thailand, Vietnam; in *Malesia*: Peninsular Malaysia (Perlis) and Papua New Guinea.

Habitat & Ecology — Near to river/stream banks in rainforests on red soil or sandy clay loam but most commonly found in limestone forests (notes from specimens collected from Indochina).

Note — Only one collection seen from Peninsular Malaysia, locality information given as 'off coast of Perlis'; one further specimen label lists collecting locality as Burma to Malaysia. Moldenke (1976) also lists a specimen from Langkawi (*BC Stone 9130*), but this has not been located.

3. Glossocarya premnoides Ridl.

Glossocarya premnoides Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 157. — Type: *Ridley 15149* (holo K; iso BM, SING), Besih Hangat, Perlis.

Shrub or woody climber, to 7 m long. *Stems* slightly to strongly quadrangular, becoming woody as they mature; indumentum of stems, petioles and inflorescences densely tomentose. *Leaves*: blade oblong-ovate, 5–9 by 3–8 cm, bases rounded to subcordate to ± truncate, margins entire, apex acute-acuminate, surfaces pubescent to ± glabrous, lower leaf surface glandular-punctate; petioles 3.5–9 mm long. *Inflorescences* terminal and/or axillary, peduncles (1.4–)3.5–10 mm long; lowermost bracts slightly foliaceous, otherwise elliptic, (3–)4–7 by 0.5–1.5 mm long; pedicels 2.1–2.2 mm long; bracteoles narrowly elliptic, c. 1 by 0.2–0.3 mm. *Calyx* actinomorphic and slightly campanulate, persistent, 2.5–3.5 mm long, lobes c. 0.5 by 0.5 mm. *Corolla* funnel-shaped, white, cream, pale green or pale yellow, 3.5–8 mm long, lobes 2–4.5 mm long, outer surface with a densely mealy tomentose indumentum, inner surface ± glabrous. *Stamens* with filaments 8–12 mm long, white; anthers purple to black in appearance. *Style* 14–16 mm long. *Fruit* rounded, 7.5–11.5 mm long, with only a thin mealy tomentose indumentum covering the fruit, hairs c. 0.1 mm long, enclosed in fruiting calyx 3–4 mm long, distinctly lobed.

Distribution — Thailand, Vietnam; in *Malesia*: Peninsular Malaysia (Perlis) where it has only been collected once (see type locality).

Habitat & Ecology — Near riversides, or on limestone hills.

Note — Can be easily confused with the Thai species *Glossocarya siamensis* Craib, however, it is distinguished by the non-glabrous and punctate abaxial surface of the leaf, and its entire leaf margins.

4. Glossocarya scandens (L.f.) Trimen

Glossocarya scandens (L.f.) Trimen, Syst. Cat. Fl. Pl. Ceylon (1885) 69. — *Volkameria scandens* L.f., Suppl. Pl. (1782) 292. — Lectotype (designated by Moldenke, Phytologia 50 (1982) 429): *König* [17]*77* =?? *Linn 809.6* (lecto LINN), Sri Lanka.

Scandent-sprawling shrub or canopy liana, up to 7 m long. *Stems* weakly to strongly quadrangular, becoming woody as they mature. *Leaves*: blade oblong-ovate, 5–12 by 4–6.5 cm, appearing crinkled when dry, base rounded to subcordate to ± truncate, margins entire to shortly toothed, apex acute to acuminate, surfaces pubescent, lower surface also glandular-punctate; petioles 7–8.5 mm long. *Inflorescences* axillary, indumentum of axes densely mealy tomentose; peduncles 3.5–4 cm long; bracts foliaceous, 4–8 by 0.5–2.5 mm long; pedicels 0.5–5 mm long; bracteoles foliaceous, 2.5–6 by 0.8–5 mm. *Calyx* actinomorphic, slightly campanulate, angular in appearance, 2.5–3 mm long, lobes c. 0.5 by 0.5 mm, outer surface as inflorescence axes; fruiting calyx 2–4 mm long, distinctly lobed. *Corolla* white, cream or pale yellow, funnel-shaped to almost salver-shaped, c. 5 mm long, lobes c. 2 mm long, outer surface ± glabrous or with a slight mealy tomentose indumentum, inner surface ± glabrous. *Stamens* with filaments c. 3 mm long, white; anthers dorsifixed, black. *Fruit* oblong, appearing slightly angular, 0.5–1 cm long, with long (0.4–0.6 mm) pubescent hairs restricted to the apex, otherwise with a thin mealy tomentose indumentum, enclosed in fruiting calyx.

Distribution — Sri Lanka; in *Malesia*: Papua New Guinea.

Habitat & Ecology — Rainforest edge, bedside rock outcrop or in scrub, near river.

16. GMELINA

(R.P.J. de Kok)

Gmelina L., Sp. Pl. (1753) 626; Schauer in A.DC., Prodr. 11 (1847) 678; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 214; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 64; H.R.Fletcher, Bull. Misc. Inform. Kew (1938) 422; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 195; Bramley et al., Tree Fl. Sabah & Sarawak 7 (2011) 37; de Kok, Kew Bull. 67 (2012) 293. — Type: *Gmelina asiatica* L.

Trees, shrubs or rarely lianas, sometimes spiny, sometimes deciduous. *Leaves* simple, decussate, sometimes lower surface covered with hairs or with peltate scales, often with discoid glands at base, sometimes these glands concentrated in a cup-like structure. *Inflorescences* terminal, rarely axillary, dense to lax, panicle with cymose side branches; bracts leaf-like, decreasing in size towards apex; bracteoles present. *Calyx* usually weakly 2-lipped, 5-lobed, sometimes appearing fewer, persistent, usually accrescent, usually with large discoid glands without. *Corolla* zygomorphic, 2-lipped, 4- or 5-lobed, blue or purple-violet, white, yellow, brownish, mauve or purple pink, inside glabrous, tube widely funnel-shaped, greatly enlarged at throat, upper lip 1- or 2-lobed, lower lip 3-lobed, mid-lobe largest. *Stamens* 4 (or 5), didynamous, inserted usually from halfway to the apex of the corolla tube, only in one species at the base (*Gmelina basifilum*), anthers dorsifixed; lower pair longer, always fertile, included to exserted; upper pair rarely sterile; pollen 3-colpate. *Ovary* imperfectly 2-celled, unlobed, each cell 2-ovuled; only two ovules developing, the other two are suppressed. *Style* filiform, terminal; stigma lobes 2, unequal. *Fruit* drupaceous, with very fleshy mesocarp and tough endocarp, cavity present. *Seeds* 0–4, without endosperm. — **Plate 4b, d.**

Distribution — India and S China south to Australia, New Caledonia and Fiji, 31 species; 16 species in *Malesia*.

Habitat & Ecology — Growing in deciduous or evergreen forest or anthropogenic vegetation. Altitude: sea-level up to 1500(–3000) m.

Uses — Planted as ornamentals (*G. asiatica*, *G. elliptica* and *G. philippinensis*); used as light and medium-weight timbers (*G. arborea*). *Gmelina arborea* is used increasingly in SE Asia as a pioneer species in reforestation projects.

KEY TO THE SPECIES

1a. Shrubs or small trees, sometimes climbing. Twigs usually with spines. Corolla 4-lobed, bright yellow 2
b. Trees or lianas, rarely shrubs. Twigs always without spines. Corolla (4- or) 5-lobed, white to yellowish, bluish to purple or red. 4
2a. Lower leaf surface velutinous . . . . . **5. G. elliptica**
b. Lower leaf surface glabrous or with only a few simple hairs on the veins. 3
3a. Bracteoles linear to elliptic, ≤ 6 mm wide, caducous. . . . . **2. G. asiatica**
b. Bracteoles ovate-lanceolate, ≥ 10 mm wide, usually persistent . . . . . **12. G. philippinensis**
4a. Lower leaf surface covered with whitish peltate scales, sometimes also with simple hairs 5
b. Lower leaf surface without peltate scales 9
5a. Lianas or small trees. Inflorescence a single flower or few-flowered, axillary. Corolla pale yellow to white. — Endemic to Borneo. . . . . **16. G. uniflora**
b. Trees, rarely shrubs. Inflorescence usually many-flowered, terminal or axillary ones also present. Corolla bluish to (pale-reddish) yellow to reddish purple or white. — Widespread. 6
6a. Mature lower leaf surface velutinous, usually with yellow hairs . . **1. G. arborea**
b. Mature lower leaf surface glabrous to sparsely hairy with white hairs on veins 7
7a. Calyx without hairs when in flower; covered with peltate scales . **8. G. lepidota**
b. Calyx velutinous when in flower; sometimes with a glabrous margin, peltate scales absent or present 8
8a. Stamens inserted at base of corolla tube. Calyx covered with peltate scales . . . . . **3. G. basifilum**
b. Stamens inserted at apex of corolla tube. Calyx without peltate scales . . . . . **15. G. smithii**
9a. Mature lower leaf surface hairy 10
b. Mature lower leaf surface glabrous or with hairs on the veins only. 11
10a. Bracteoles lanceolate, 4–10 by 1–2.5(–5) mm. — Moluccas to New Guinea and the Solomon Islands . . . . . **9. G. moluccana**
b. Bracteoles rounded, 13–17 by 11–13 mm. — Eastern New Guinea and New Britain . . . . . **14. G. sessilis**
11a. Calyx glabrous when flowering 12
b. Calyx velutinous to sparsely to densely hairy when flowering 13
12a. Leaves with glands in a cup-like structure at base. Mature fruit with a truncate apex. — New Guinea and Australia . . . . . **4. G. dalrympleana**

b. Leaves with several discoid glands at base. Mature fruit with a rounded apex. — Sulawesi, including the Sangihe islands .... **10. G. palawensis** subsp. **celebica**
13a. Bracteoles without disc-like glands ..... **6. G. hollrungii**
b. Bracteoles with several disc-like glands 14
14a. Inflorescences dense without long side branches; apex of bracteoles rounded on the main axis, apex long acuminate on side branches ..... **11. G. papuana**
b. Inflorescences narrow with long side branches; apex of bracteoles long rounded to acuminate on main axis and side branches 15
15a. Bracteoles rounded (in particular on main axis) to lanceolate. Flowering calyx 3.5–5 by 3.5–4 mm. Corolla lower mid-lobe 7.5–10 mm long ..... **7. G. ledermannii**
b. Bracteoles on main inflorescence axis lanceolate. Flowering calyx 2.5–3 by 2.5–3 mm. Corolla lower mid-lobe 5–8 mm long ..... **13. G. schlechteri**

1. Gmelina arborea Roxb.

Gmelina arborea Roxb. ex Sm. in Rees, Cycl. 16 (1810); Roxb., Fl. Ind. ed. 3 (1832) 84; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 219. — *Gmelina arborea* Roxb. ex Sm. var. *arborea*: Moldenke & A.L.Moldenke in Dassan. & Fosberg, Revis. Handb. Fl. Ceylon 4 (1983) 390. — Lectotype (designated by de Kok, Kew Bull. 77 (2012) 297): Rheede, Hort. Malab. 1 (1678) t. 41.

Premna tomentosa Miq. ex C.B Clarke in Hook.f., Fl. Brit. India 4 (1885) 581, nom. illeg. (non Willd., 1802). — *Gmelina rheedei* Hook., Bot. Mag. 4 (1848) t. 4395 (‘*rheedii*’); H.J.Lam, Verbenaceae Malayan Archipel. (1919) 219. — Type: Hook., Bot. Mag. 4 (1848) t. 4395.

Tree, 3–30 m high, dbh 10–200(–450) cm, sometimes deciduous; bark smooth, whitish to greyish reddish brown. *Twigs* densely tomentose, spines absent. *Leaves*: blade broadly ovate to reniform, 8–25 by 4.5–20 cm, apex rounded to acuminate, base cuneate to (deeply) cordate, margins entire, sometimes slightly lobed, papery; upper surface with hairs on veins, dark green, shiny; lower surface glabrous to velutinous, hairs yellow, covered with whitish peltate scales, two cup-like glands clustered around the base; veins 3–5 pairs, sometimes 3-veined from base; petiole terete, 3.5–13 cm long, hairy. *Inflorescences* terminal or axillary, narrow, many-flowered; peduncle 10–30 cm long; bracteoles lanceolate to linear or triangular, 8–15 by 1.3–2 mm, deciduous. *Calyx* 2–7 by 4–5 mm, 5-lobed, velutinous, not accrescent, green; lobes 0.8–1 by 0.7–2 mm, acute, outer surface with scattered discoid glands. *Corolla* (pale-reddish) yellow, outer surface hairy, sparsely glandular, (4- or) 5-lobed; tube 15–20 mm long; upper lip 1- or 2-lobed, lobes 6–7 by 6–12 mm, apex rounded, reddish brown; lower lip 3-lobed; mid-lobe spatulate, 15–20 by 15–25 mm, (reddish) yellow, apex rounded; lateral lobes 10–15 by 9–12 mm, apex rounded, reddish brown. *Stamens* inserted at apex of tube, glabrous, sometimes with a few glands, yellow; lower pair 15–20 mm long, anthers 2–3 mm long, black; upper pair fertile, 12–14 mm long; anthers c. 1 mm long. *Ovary* glabrous; style 15–23 mm long, stigma c. 1 mm long. *Fruit* ellipsoid to obovoid-ellipsoid, 12–20 by 10–15 mm, glabrous, apex rounded, (dark) purple to yellow when mature, recorded as having a bitter sweet taste.

Distribution — Natural distribution: from Mirpur in India and Jamu in Pakistan east to S Yunnan in China and northern Vietnam, south to N Thailand and Sri Lanka.

Introduced into *Malesia* and most tropical countries as a timber- or shade tree as well as an ornamental.

Habitat & Ecology — Growing in deciduous or evergreen forest or anthropogenic vegetation. Altitude: 0–1500 m. It is a relatively short-lived tree that colonises openings in the forest, where the ground has been disturbed. Usually it is not common and it does not grow on poorly drained soils. Soil: (sandy) loam to clay. In the more seasonal areas it is reported to flower between April and May; fruiting occurs between May and July; in wet-tropical areas flowering and fruiting throughout the year. The seeds fail to germinate in the full shade, but germinate well in the open.

Vernacular names — Peninsular Malaysia: Bulang (Malay); Jemane. Borneo: Sabah: Jamaná (Dusun); Jemane (Malay).

Uses — Planted widely as an ornamental, shade and/or timber tree. The wood is used for various purposes including construction, furniture and musical instruments. The tree also has a wide range of medicinal uses (Burkill, Dict. Econ. Prod. Malay Penins., 2nd ed., 1966).

2. Gmelina asiatica L.

Gmelina asiatica L., Sp. Pl. (1753) 626; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 221; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 69. — *Gmelina asiatica* L. var. *typica* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 69, nom. illeg. — Type: *Herb. Linn. 780-2* (holo LINN).

Gmelina parviflora Roxb., Pl. Coromandel (1802) 32, t. 162. — *Gmelina asiatica* L. forma *parviflora* (Roxb.) Moldenke, Phytologia 55 (1984) 42. — Type: Roxburgh, Pl. Coromandel 2 (1802) t. 162.

Shrub, sometimes climbing, 2–4 m high, rarely deciduous. *Twigs* minutely hairy when young; spines usually present, up to 25 mm long. *Leaves*: blade ovate to elliptic or deltoid, 0.5–5(–13) by 0.5–3.3(–6) cm, papery, apex rounded to acute, base rounded to cuneate, margins entire to 5-lobed; upper surface glabrous or with a few hairs on veins, dark green, shiny; lower surface glabrous or with a few hairs on veins, covered with whitish peltate scales; veins 3 or 4 pairs, sometimes 3-veined from base, few discoid glands present; petiole 5–30 mm long, glabrous or with a few hairs, peltate scales absent to many. *Inflorescences* terminal, sometimes appearing axillary on short side shoots, 1.5–10 cm long, pendulous or erect, sparsely hairy, covered with white peltate scales; bracteoles linear to elliptic, 8–10 by 3.5–6 mm, cuspidate, caducous. *Calyx* 4- or 5-lobed, few hairs present, discoid glands sometimes present; flowering calyx 4–6 by 3.5–4 mm; lobes acute, 0–1 mm long; fruiting calyx 7–8 mm diam., erect to patent. *Corolla* 4-lobed, bright yellow, covered with yellow hairs, sparsely glandular; tube 10–23 mm long; upper lip 1-lobed, oblong, 1.5–3.5 by 1–6 mm, apex acute to rounded; lower lip 3-lobed, mid-lobe oblong, 12–35 by 10–15 mm, apex rounded, patent, cuspidate, margins sometimes reflexed; lateral lobes 4–10 by 5–8 mm, sometimes oblique, apex acute, erect to reflexed. *Stamens* inserted at apex of tube, glabrous, sometimes with a few glands; lower pair 10–20 mm long, anthers 2–3 mm long; upper pair, fertile, 8–11 mm long, anthers c. 1 mm long. *Ovary* glabrous with a few hairs at apex; style 20–32 mm long. *Fruit* (dried) 13–30 by 8–30 mm, clavoid, glabrous, apex rounded, yellow when mature.

Distribution — India and Sri Lanka east to N Thailand and N Vietnam; in *Malesia*: cultivated and often naturalized throughout the region.

Habitat & Ecology — In deciduous or evergreen forest, secondary and costal vegetations. Soil: sandy clay or a coarse gritty substrate often in poor soils, sometimes over granite or sandstone. Altitude: 0–1300 m. Flowering and fruiting: throughout the year.

Vernacular names — Peninsular Malaysia: Bulang, Bulongan (Malay). Java: Wareng (Javanese). Philippines: Banganga (Cebuano). Lesser Sunda Islands: West Timor: Hau bako (Dawan); Alor: Lombaul.

Uses — The species has a wide range of medicinal uses.

3. **Gmelina basifilum** de Kok

Gmelina basifilum de Kok, Kew Bull. 67 (2012) 300. — Type: *BW (Koster) 11115* (holo K; iso L, SING), [Indonesia,] Netherlands New Guinea, Geelvinkbaai, Japen Island, Soemberbaba.

Tree, 7–10 m high, dbh 7–10 cm; bark whitish brown to grey; wood (medium) hard, white to cream. *Twigs* hairy, spines absent. *Leaves*: blade elliptic to lanceolate, 13–17 by 5–8.5 cm, base cuneate to rounded, margins entire, apex acute; upper surface glabrous, dark green, lower surface glaucous, glabrous with simple hairs on veins of young leaves, covered with, whitish peltate scales, discoid glands absent; veins 7–10 pairs, sometimes 3-veined from base; petiole half-terete, channelled, 3–5 cm long, glabrous to sparsely hairy. *Inflorescences* terminal, many-flowered, 12–25 cm long, side branches up to 9 cm long, densely hairy, scales present; bracteoles ovate-lanceolate, 4–5 by 2–2.5 mm, sessile, apex acute, caducous. *Calyx* 3–4.5 by 3–4.5 mm, 5-lobed, velutinous when in flower, with a glabrous margin, glabrous when in fruit, surface covered with peltate scales, outer surface without discoid glands; lobes 0.8–1 by 1–1.2 mm, apex acute to rounded; fruiting calyx 5–12 mm diam., glabrous, patent. *Corolla* 5-lobed, purple to white, outer surface velutinous, inside velutinous on lobes, glabrous in tube; tube 2–5 mm long; upper lip 2-lobed, 3–4 by 3.5–4 mm, apex rounded; lower lip 3-lobed; mid-lobe oblong, 4–5 by 4–4.5 mm, apex rounded; lateral lobes 3–4 by 3–4 mm, apex rounded. *Stamens* inserted at base of tube, hairy at base; lower pair 7–8 mm long, anthers c. 1.5 mm long; upper pair fertile, 6–7 mm long, anthers c. 1 mm long. *Ovary* c. 2 mm diam., glabrous with tuft of hairs at apex; style 6.5–7 mm long, stigma 1–1.5 mm long. *Fruit* (dried) 12–25 by 13–30 mm, globose, apex rounded, glabrous, purple green to reddish purple when mature.

Distribution — New Guinea and New Britain.

Habitat & Ecology — Growing in primary and secondary forests, sometimes along rivers. Altitude: 0–500 m. Flowering: July; fruiting: May to July.

4. **Gmelina dalrympleana** (F.Muell.) H.J.Lam

Gmelina dalrympleana (F.Muell.) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 223. — *Vitex dalrympleana* F.Muell., Fragm. 4 (1864) 128. — Lectotype (designated by Munir, J. Adelaide Bot. Gard. 7 (1984) 109): *Dallachy s.n.* (lecto MEL; isolecto K 2 sheets), [Australia, Queensland,] Rockingham Bay.

Shrub or tree, 1–40 m high, dbh 5–70 cm; bark fissured or flaky, greyish to grey brown; wood dark straw coloured with yellow streaks. *Twigs* glabrous, spines absent. *Leaves*: blade broadly ovate to ovate-oblong or elliptic-obovate, 6–37 by 5–23 cm, base cordate to cuneate, margins entire, apex obtuse to obtuse acuminate; upper surface glabrous, dull or shiny (dark-olive) green; lower surface glabrous, peltate scales absent, with glands in a cup-like structure at base, pale or greyish green; veins 4–8 pairs; petiole half-terete, slightly channelled, 5–40 mm long, glabrous to hairy. *Inflorescences* terminal, 12–30 cm long, glabrous to hairy; bracteoles linear, 2–3 by 1–1.5 mm, apex acute, caducous. *Calyx* 5-lobed, sometimes appearing fewer, glabrous, with black discoid glands; flowering calyx 4–6 by 3–3.5 mm; lobes 0.5–1 by 1.5–4 mm, apex round; fruiting calyx 6–7 mm diam., erect to patent. *Corolla* 5-lobed, velutinous, white, pink-yellow to pink or (pale) purple; tube 10–22 mm long; upper lip 2-lobed, oblong, 5–9 by 4–5 mm, apex rounded; lower lip 3-lobed, mid-lobe oblong, 7–10 by 5–6 mm, apex rounded, dark pink to mauve with yellow spot at base; lateral lobes oblong-ovate, 5–9 by 3.5–6 mm, apex rounded. *Stamens* inserted at apex of tube, glabrous, sometimes with a few glands, white; lower pair 9–13 mm long, anthers c. 2 mm long; upper pair fertile, 7–9 mm long, anthers 1.5–2 mm long. *Ovary* 1–1.5 mm diam., glabrous, style 12–20 mm long, stigma c. 1.5 mm long. *Fruit* obovoid, 8–20 by 5–25 mm, apex truncate, glabrous, pinkish to red when mature.

Distribution — Australia (N Queensland); in *Malesia*: New Guinea.

Habitat & Ecology — Growing in rainforest to open forest, dunes or swamps (in Papua New Guinea sometimes associated with *Melaleuca* or *Eucalyptus-Banksia* woodland), sometimes a shrub in savannah woodlands. Soil: sometimes in sandy soil. Altitude: 0–450 m. Flowering: September to April; fruiting: February to October.

Vernacular names — Indonesia (New Guinea): Ara afa (Ayawasi).

5. Gmelina elliptica Sm.

Gmelina elliptica Sm. in Rees, Cycl. 16, 2 (1810). — Type: *Anon*. in Herb. Linn. *780-1* (holo LINN), East Indies.

Gmelina villosa Roxb., [Hort. Bengal. (1814) 46, nom. nud.] Fl. Ind. 3 (1832) 86; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 217. — *Gmelina asiatica* L. var. *villosa* (Roxb.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 70. — Lectotype (designated by Rajendran & Daniel, Indian Verbenec. (Taxonom. Revis.) (2002) 166): Rumph., Herb. Amboin. 3 (1743) t. 39.

Gmelina integrifolia Hunter ex Ridl., J. Straits Branch Roy. Asiat. Soc. 53 (1909) 101; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 70. — Type: *Hunter s.n*. (not located), [Peninsular Malaysia, Penang,] Prince of Wales Island.

Gmelina asiatica auct. non: A.Rajendran & P.Daniel, Indian Verbenec. (Taxonom. Revis.) (2002) 161; W.Zhengyi & P.H.Raven in C.Y.Wu & P.H.Raven, Fl. China ill. 17 (1988) 84.

Shrub to small tree, sometimes straggling, 1–5(–8) m high, dbh 2.5–20(–70) cm; bark smooth, (pale) grey; wood hard. *Twigs* villous; spines usually present, up to 30 mm long. *Leaves*: blade elliptic to ovate, rarely round, 2–9.5(–14) by 1.5–5(–8.5) cm, base rounded to cuneate, margins entire to rarely 1–5-lobed, apex rounded to acuminate; upper surface glabrous or with a few hairs on veins, green, pubescent when young; lower surface velutinous, hairs usually yellowish, covered with white peltate scales; sometimes with discoid glands at base; veins 3 or 4 pairs, sometimes 3-veined

from base; petiole half terete, 6–30 mm long, villous. *Inflorescences* terminal, 2.5–7 cm long, erect, villous; bracteoles lanceolate or ovate-lanceolate, 10–20 by (1.5–)4–8 mm, apex acuminate, caducous. *Calyx* 5-lobed, sometimes appearing fewer, densely pubescent, becoming more glabrous over time, discoid glands present, peltate scales present; flowering calyx 3–5 by 3–4 mm, lobes 0.5–1 mm long, apex rounded to acute; fruiting calyx 4–8 mm diam., margin undulate, patent. *Corolla* 4-lobed, covered with yellow hairs, bright yellow; tube 10–16 mm long, infundibulate; upper lip 5–9 by 2–10 mm, apex acute to emarginate, patent to reflexed; lower lip 3-lobed; mid-lobe 4.5–13 by 4.5–14 mm, apex acute, patent, sometimes reflexed; lateral lobes 3.5–7.5 by 3–7 mm, apex rounded to acute. *Stamens* inserted at apex of tube, yellow; lower pair 15–17 mm long, anthers 1.5–2.5 mm long; upper pair, fertile, 10–18 mm long, anthers 1.5–2 mm long. *Ovary* glabrous; style 20–25 mm long, stigma c. 2.5 mm long. *Fruit* (dried) 10–20 by 8–20 mm, globose to obovoid, glabrous, yellow when mature. — **Plate 4e.**

Distribution — India (Andaman and Nicobar Islands), Myanmar to S China, in *Malesia*: Peninsular Malaysia, Sumatra, Java, Borneo, Philippines (Basilan, Mindoro, Mindanao and Negros), Sulawesi, Lesser Sunda Islands, Moluccas; cultivated throughout the tropics.

Habitat & Ecology — Growing in primary and secondary vegetations. Soil: sandy or sandy loam or sandy clay, often in poor soils, sometimes over basalt or limestone. Altitude: 0–600 m. Flowering: January to October; fruiting: February to October.

Vernacular names — Peninsular Malaysia: Bulangan, Bulang, Pokok Buah dulang (Malay). Sumatra: Bariang, Pokak baelandga, Pakok boelang; Wareng (Javanese); Warengen (Medan area). Borneo: Sabah: Belingkot, Kutang (Murut); Bulangan (Malay); Kutang, Tangginang (Dusun); Taring pelandok (Kadayan). Sulawesi: Bidara, Kayu palapi, Pundanga, Rerubo, Tanggalasi, Wewenganga. Moluccas: South West Timor: Hau bako (Dawan); Ambon: Karanjam; Alor Ketjil: Lombaul.

Uses — In Peninsular Malaysia several medicinal uses are known.

Note — The differences between *G. elliptica* and *G. asiatica* are usually easy to determine, *G. elliptica* has leaves which are densely villous beneath, but *G. asiatica* has a glabrous leaf surface or with only a few hairs on the veins beneath. However, in Borneo, Sumatra, Java and the Lesser Sunda Islands there are specimens, which seem to be morphologically intermediate: these specimens have lobed, somewhat hairy leaves with many peltate scales on the lower surfaces, while the typical form has leaves with an entire margin, densely hairy and few peltate scales on the lower surfaces. Following the discussion in de Kok (2012: 308) all these specimens are placed under *G. elliptica*.

6. Gmelina hollrungii de Kok

Gmelina hollrungii de Kok, Kew Bull. 67 (2012) 308. — Type: *Hollrung 651* (holo K; iso P 2 sheets), [Papua New Guinea,] New Guinea, Augusta Station.

Gmelina macrophylla K.Schum. in K.Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 120, nom. illeg. (Wall. ex Schauer in A.DC., Prodr. 11 (1847) 680). — Type: *Hollrung 651* (holo B; iso K, P 2 sheets), [Papua New Guinea,] New Guinea, Augusta Station.

Tree, 6–40 m high, dbh 30–75 cm; bark smooth to fissured, grey to brown. *Twigs* velutinous, spines absent. *Leaves*: blade elliptic-round, oblong or obovate, 10–36 by 5–25 cm, coriaceous, base rounded to cuneate, margins entire, apex rounded to shortly

Fig. 15. *Gmelina hollrungii* de Kok. a. Habit; b. detail of leaf underside showing cup-like glands; c. flower in side view; d. calyx; e. corolla; f. style and ovary; g. stigma (*Takeuchi 6373*, K). Drawing by Juliet Beentjes.

acuminate; upper surface glabrous, few hairs on veins, (yellow) green, shiny; lower surface glabrous except few hairs on veins, pale green to yellow, peltate scales absent, with cup-like glands at base; veins 5–8 pairs, sometimes 3-veined from base; petiole half-terete, channelled, 15–80 mm long, sparsely hairy. *Inflorescences* terminal, 15–30 cm long, brown tomentose; bracteoles linear, 2.5–4 by 0.5–1 mm, sessile, apex acute, glands absent. *Calyx* 5-lobed, sparsely to densely hairy; with scattered black discoid glands; flowering calyx 3–5 by 3–4 mm; lobes 0.8–1 by 1–1.2 mm, apex rounded;

fruiting calyx up to 8 mm diam., patent. *Corolla* 5-lobed, velutinous, white, pale lilac to mauve or purple; tube 7–12 mm long; upper lip 2-lobed, oblong to ovate-oblong, 3–7 by 2–5 mm; lower lip 3-lobed, mid-lobe oblong, 5.5–10 by 3–4 mm, apex rounded to acute, lilac with a yellow spot at base; lateral lobes oblong, 3.5–8 by 2–5 mm, apex rounded to acute, oblique. *Stamens* inserted at apex of tube, few glands; lower pair 6–10 mm long, anthers 2–2.5 mm long; upper pair fertile, 6–8 mm long, anthers c. 2 mm long. *Ovary* 1–1.5 mm diam., glabrous with some glands at apex, style 12–20 mm long. *Fruit* (dried) 8–25 by 6–16 mm, obovoid, apex truncate, glabrous, shiny, blue or red to purple when mature. — **Fig. 15.**

Distribution — Northern Australia, Solomon Islands; in *Malesia*: Moluccas (Morotai and Aru Islands), New Guinea.

Habitat & Ecology — Growing in rainforest, sometimes as canopy tree, or in more open types of forest. Soil: sandy or clayey soil, sometimes over sandstone, limestone or ultrabasic rock. Altitude: 30–1400 m. Flowering: July to November; fruiting: July to February. Fruit eaten by cassowaries.

Vernacular names — Indonesia: Aru Islands: Adoen, Adun mangai laplabai; Bird's Head: Anjoes.

Uses — On the Aru Islands the species is considered a good tree for timber.

7. Gmelina ledermannii H.J.Lam

Gmelina ledermannii H.J.Lam, Verbenaceae Malayan Archipel. (1919) 226. — Lectotype (designated by de Kok, Kew Bull. 67 (2012) 311): *Ledermann 6537* (lecto K), [Papua New Guinea,] New Guinea, Malu, near Sepik-river.

Tree, 10–20 m high; bark dark, rough. *Twigs* sparsely hairy when young, with interpetiolar ridge present, spines absent. *Leaves*: blade elliptic to slightly obovate, 8–19 by 5.5–9.5 mm, slightly oblique, base rounded, rarely cuneate, margins entire, apex rounded to acute; upper surface glabrous, dull to glossy, dark green; lower surface glabrous with few simple hairs on veins, hairy when young, pale green, peltate scales absent, cup-like glands at base; veins 6–8 pairs, sometimes 3-veined from base; petiole half-terete, 2–4 cm long, sparsely hairy. *Inflorescences* terminal, narrow, up to 20 cm long, with long side branches, velutinous; bracteoles rounded (in particular on main axis) to lanceolate, 4–11 by 4.5–6.5 mm, apex long acuminate, sessile, with several disc-like glands present. *Calyx* 3.5–5 by 3.5–4 mm, 5-lobed, sometimes appearing fewer, velutinous, sometimes with a glabrous margin, outer surface with discoid glands; lobes up to 0.5 mm long, apex acute to rounded; fruiting calyx 5–6 mm diam., erect. *Corolla* 5-lobed, outer surface hairy, densely glandular on inside of lobes, cream to yellow; tube 6.5–7.5 mm long; upper lip, 2-lobed, 4.5–5 by 3.5–4 mm, apex rounded; lower lip 3-lobed; mid-lobe oblong, 7.5–10 by 3–5.5 mm, apex rounded, mauve with two yellow marks; lateral lobes 4.5–5 by 4.5–5 mm long, apex rounded. *Stamens* inserted at apex of tube, glabrous, glands present; lower pair 8–11 mm long, anthers c. 2 mm long; upper pair fertile, 6–8 mm long, anthers c. 1.5 mm long. *Ovary* glabrous with a few hairs at apex; style c. 10 mm long, stigma c. 1.5 mm long. *Fruit* (dried) 10–11 by 5–6 mm, tubular, apex rounded, glabrous, smooth, glossy, purple or bright blue when mature.

Distribution — W Papua, Papua New Guinea (Sandaun and East Sepik Province).

Habitat & Ecology — A tree in stunted or secondary forest, sometimes along rivers, in sandy or poor soil. Altitude: 90–800 m. Flowering: May to August; fruiting: March to August.

Vernacular names — Indonesia: Papua: Mimika: Boetao. Papua New Guinea: As Kobokim (Miyanmin); Boing, Bouwen (Waskuk); Yoni (Wagu).

Uses — Wood used for firewood and construction and canoe building (as it is easily worked).

8. Gmelina lepidota Scheff.

Gmelina lepidota Scheff., Ann. Jard. Bot. Buitenzorg 1 (1876) 41. — Type: *Teijsmann HB 6744* (holo BO; iso L, NY), [Indonesia, New Guinea,] Ile de Tow.

Gmelina misoolensis Moldenke, Phytologia 4 (1952) 54; de Kok, Kew Bull. 67 (2012) 313. — Type: *Pleyte 1087* (holo BO; iso BO, L, NY), [Indonesia,] New Guinea, Misool Island, Fakal.

Gmelina lepidota Scheff. var. *lanceolata* Moldenke, Phytologia 6 (1958) 325; de Kok, Kew Bull. 67 (2012) 313. — Type: *Mair1894* (holo LAE; iso L 2 sheets), Papua New Guinea, New Britain, Open Bay, Nantambu.

Tree, 7.5–30 m high, dbh 3–60 cm; bark (dark) grey-brown, fissured; wood light straw coloured. *Twigs* hairy when young, glabrous later, spines absent. *Leaves*: blade elliptic to lanceolate, rarely ovate, 4–18 by 2.3–7 cm, base cuneate, margins entire, apex rounded to acuminate; upper surface glabrous, dark green; lower surface glabrous with a few hairs on the veins, lightly brownish green or dull grey brown, covered with whitish peltate scales, with discoid glands clustered around the base and along the vein; veins 4–7 pairs; petiole half-terete, slightly channelled, 1–3 cm long, sparsely covered with peltate scales. *Inflorescences* terminal and axillary, with short side-cymes, many-flowered, 4–7 cm long, sparsely hairy; bracteoles lanceolate, 0.8–2 by 0.1–1.5 mm, apex acute, persistent. *Calyx* 5-lobed, glabrous, covered with peltate scales, olive, greenish purple or purple brown, outer surface with discoid glands; flowering calyx 2–3.5 by 2–3 mm; lobes triangular, 0.5–0.8 mm long, apex acute; fruiting calyx 5–6 mm diam., patent. *Corolla* 5-lobed, outer surface velutinous, inside glabrous, sparsely glandular, cream to yellow or (light) purple; tube 8–9 mm long; upper lip 2-lobed, 2–4 by 1.5–2 mm, apex rounded; lower lip 3-lobed; mid-lobe spatulate, 4.5–5 by 3–4 mm, apex rounded; lateral lobes 1.5–3 by 2–2.5 mm, apex rounded. *Stamens* inserted at apex of tube, white, base covered with hairs, mauve; lower pair 6–10 mm long, anthers c. 1 mm long; upper pair fertile, 5–8 mm long, anthers c. 0.8 mm long. *Ovary* c. 1 mm diam., glabrous; style 8–11 mm long, stigma c. 1.5 mm long. *Fruit* (dried) 9–20 by 6–25 mm, ellipsoid to clavoid, apex rounded, glabrous, red or pale purple when mature.

Distribution — Moluccas (Morotai Island), New Guinea, New Britain.

Habitat & Ecology — Growing from rainforest to xerophytic or open vegetation, sometimes dominated by Myrtaceae (notably *Eucalyptopsis papuana* C.T.White), clayey soil, sometimes over limestone, serpentine, or volcanic soils. Altitude: 10–1000 m. Flowering: August to May; fruiting: August to May.

Vernacular names — Indonesia, Papua: Rafah (Maibrat). Papua New Guinea, New Britain: Kanike'hua (Kutubu); Namavue.

Uses — Wood is used for dugout canoes.

9. **Gmelina moluccana** (Blume) Backer ex K.Heyne

Gmelina moluccana (Blume) Backer ex K.Heyne, Nutt. Pl. Ned.-Ind. 4 (1917) 118. — *Vitex moluccana* Blume, Bijdr. 14 (1826) 813; Merr., Interpr. Herb. Amboin. (1917) 452. — Lectotype (designated by de Kok, Kew Bull. 67 (2012) 314): Rumph., Herb. Amboin. 3 (1743) t. 20.

Volkameria obovata Roxb. [Hort. Bengal. (1814) 95, nom. nud.], Fl. Ind. 3 (1832) 62; de Kok, Kew Bull. 67 (2012) 314. — *Clerodendrum obovatum* (Roxb.) Walp., Repert. Bot. Syst. 4. (1845) 112. — Type: *Roxburgh s.n.* (holo BR), India.

Gmelina macrophylla Wall. ex Schauer in A.DC., Prodr. 11 (1847) 680; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 220; de Kok, Kew Bull. 67 (2012) 314. — Type: *Wallich Cat. 1819* (holo G; iso K-W), H.B.C. [Hortus Botanicus Calcutta], 1826, ex Amboyna [= Indonesia, Ambon].

Gmelina glandulosa Hallier f., Meded. Rijks-Herb. 37 (1918) 57; de Kok, Kew Bull. 67 (2012) 314. — *Gmelina moluccana* (Blume) Backer ex K.Heyne forma *glandulosa* (Hallier f.) Moldenke, Phytologia 56 (1984) 121, 155. — Syntypes: *Reinwardt 1362* (L 2 sheets), [Indonesia, Moluccas,] Banda-gruppe, Ay Insel; *de Vriese s.n.* (L), [Indonesia, Moluccas,] Insel Neira.

Gmelina sessilis C.T.White & W.D.Francis var. *ramiflora* Moldenke, Phytologia 4 (1953) 178; de Kok, Kew Bull. 67 (2012) 314. — *Gmelina sessilis* C.T.White & W.D.Francis forma *ramiflora* (Moldenke) Moldenke, Phytologia 56 (1984) 178. — Type: *Meijer Drees 371* (holo BO; iso NY), [Indonesia,] New Guinea, West Irian [= Papua], Hollandia, Bernhard Bivak.

Tree, 9–30 m high, dbh 15–100 cm; bark rough, fissured and peeling off in irregular scales, white to grey or light-dark brown; slash orange brown to creamy yellow, turning red-brown on exposure; wood soft to hard, creamy white, with pink tinge. *Twigs* hairy, spines absent. *Leaves*: blade elliptic to orbicular, 10–41 by 6–20 cm, coriaceous, base cordate to cuneate, margins entire, often shallowly lobed, apex rounded to acute; upper surface glabrous, with some hairs on veins, light to dark green, sometimes shiny; lower surface covered with rusty brown hairs, often with glands clustered around the base, peltate scales absent, (pale) green; veins 6–11 pairs, sometimes 3-veined from base, lower surface with strong ladder-like tertiary venation; petiole half-terete, channelled, 3–7 cm long, hairy. *Inflorescences* terminal, 8–30 cm long, velutinous, ochreous-golden; bracteoles lanceolate, 4–10 by 1–2.5(–5) mm wide, apex acute to acuminate, caducous. *Calyx* 5-lobed, sometimes appearing fewer, 3–5 by 3–5 mm, velutinous, olive green, outer surface with discoid glands; lobes triangular, 0–1 mm long, apex acute to rounded; fruiting calyx 4–15 mm diam., erect to patent. *Corolla* 5-lobed, outer surface hairy, inside glabrous, sparsely glandular, white to mauve, sometimes fragrant; tube 8–10 mm long; upper lip 2-lobed, 5–7 by 4–5 mm, apex rounded; lower lip 3-lobed; midlobe spatulate to oblong, 3–14 by 3.2–8 mm, apex rounded, blue to dark purple with yellow blotch at base; lateral lobes oblong, 7.5–8 by 4–5 mm, apex rounded. *Stamens* inserted at apex of tube, white; lower pair 10–12 mm long, anthers c. 1.5 mm long; upper pair fertile, 7–9 mm long, anthers 1–1.2 mm long. *Ovary* c. 1 mm diam., glabrous; style 11–14 mm long, white, stigma c. 1 mm long. *Fruit* (dried) 10–18 by 10–16 mm, globose, later cylindrical, apex truncate when mature, glabrous, blue or purple to red.

Distribution — Moluccas (Ambon, Ceram, Halmahera, Ternate, Morotai), New Guinea, Solomon Islands.

Habitat & Ecology — Growing in primary and secondary, well drained, (rain) forests, sometimes in clayey soil or sandy loam, sometimes over limestone; sometimes associated with *Araucaria hunsteinii* K.Schum. Altitude: 0–800 m. Flowering: January to October; fruiting: March to December.

Vernacular names — Moluccas: Ambon: Caju titti; Halmahera: Foehoe, Gal (North Galia). Indonesia: Papua: Angki-e-oe, Ankieève (Manikiong); Ainoe (Ambai); Ainoes (Biak); Anjoes; Bas (Mooi); Kaina (Karoon); Merkemmek (Arfak Sidai); Nakaoengga, Nassa-onggoe (Kamtoek); Sarot (Amberbaken); Tanee (Kho). Papua New Guinea: Aron gazo (Garaina); Omormi (Kikori); Ossogee (Warea); Gow, Waria. Solomon Islands: Arokoko (Kwara'ae).

Uses — The wood is used in making small boats and house panelling as it is reported to be soft, light and easy to work, but also durable in seawater, but not in fresh water. The species is reported to be cultivated in the Moluccas for this particular use (Rumphius (1743) 38). The pulverised bark is used to clean wounds and ulcers (Heyne, Nutt. Pl. Ned.-Ind. (1927) 1321).

10. *Gmelina palawensis* H.J.Lam subsp. *celebica* (Moldenke) de Kok

Gmelina palawensis H.J.Lam subsp. *celebica* (Moldenke) de Kok, Kew Bull. 67 (2012) 315. — *Gmelina palawensis* H.J.Lam var. *celebica* Moldenke, Phytologia 3 (1951) 417. — Type: *Kjellberg 2001* (holo BO, number 21308; iso BO, number 21309), [Indonesia, Selebes [= Sulawesi]], Malili.

Tree, 5–15 m high, dbh c. 10 cm; bark smooth, grey to brown. *Twigs* glabrous, spines absent. *Leaves*: blade elliptic to slightly obovate, 9–19 by 5–7.5 cm, base rounded to cuneate, margins entire, apex rounded to acute; upper surface glabrous, shiny; lower surface glabrous, with discoid glands clustered around the base, peltate scales absent; veins 7–9 pairs, sometimes triplinerved from base; petiole 2.5–4 cm long, glabrous, half-terete. *Inflorescences* terminal, narrow, up to 20 cm long, glabrous to sparsely hairy at apex; bracteoles lanceolate to spatulate, 6–15 by 1–7 mm, apex rounded to acute, sessile, caducous. *Calyx* 5-lobed, sometimes appearing fewer, glabrous, outer surface without discoid glands, green, sometimes dark red brown at apex; flowering calyx 3.5–5 by 4–4.5 mm; lobes triangular, 0–0.1 by 0–0.1 mm, apex acute; fruiting calyx 6–10 mm diam., patent. *Corolla* 5-lobed, outer surface hairy, (pale) pinkish to lilac or purple outside, white inside, fragrant; tube 10–13 mm long; upper lip 2-lobed, oblong, 5–6 by 3–4 mm, apex rounded; lower lip 3-lobed; mid-lobe oblong, 5–7 by 4–5 mm, apex rounded, cream pink with two longitudinal yellow honey marks; lateral lobes oblong, 4–6 by 3–4 mm, apex rounded, oblique. *Stamens* inserted at apex of tube; lower pair 8–12 mm long, anthers c. 2 mm long, brown; upper pair fertile, 7–10 mm long, anthers c. 2 mm long, brown. *Ovary* c. 2 mm diam., glabrous; style 13–20 mm long, stigma c. 1.5 mm long. *Fruit* 17–22 by 12–15 mm, clavoid, apex rounded, surface with bumps, glabrous, red or purple when mature.

Distribution — Endemic to Sulawesi, including the Sangihe islands.

Habitat & Ecology — Growing in secondary vegetation and rainforest or landside of mangrove. Soil: red clayey or podsolic soils, often over ultrabasic, limestone or schists. Altitude: 20–730 m. Flowering: June to January; fruiting: July to November.

Vernacular name — Kajoe poetih, Woeroko; Mahangparata (Sangihe).

11. Gmelina papuana Bakh.

Gmelina papuana Bakh., J. Arnold Arbor. 10 (1929) 71, pl. 16, 17. — *Gmelina sessilis* C.T.White & W.D.Francis var. *papuana* (Bakh.) Moldenke, Phytologia 4 (1953) 178. — Type: *Brass 695* (holo BO, number 1336416; iso BO, number 1336415), Papua, Iawarere.

Gmelina brassii Moldenke, Phytologia 6 (1958) 324. — Type: *Brass 21915* (holo LAE; iso K, L, US), Papua New Guinea, Milne Bay District, Cape Vogel Peninsula, Dabora.

Tree, 7–30 m high, dbh 10–40 cm; bark grey to pale brown, fissured to scaly; wood pale brown to whitish yellow or white. *Twigs* hairy, with ridge between petioles present, spines absent. *Leaves*: blade elliptic or lanceolate to ovate, 9–29 by 4.5–14 cm, base rounded to cordate, slightly oblique, margins entire, apex rounded to acuminate; upper surface glabrous with few simple hairs on veins, dark green, mat to glossy; lower surface glabrous with few simple hairs on veins, peltate scales absent, (pale) green, two cup-like glands clustered at the base; veins 3–9 pairs, sometimes 3-veined from base; petiole terete, channelled, 2–5 cm long, hairy. *Inflorescences* terminal, dense, up to 20 cm long, without long side branches, velutinous, brownish; bracteoles lanceolate, 7–15 by 2–8 mm, those on the main axis significantly bigger than those on the side-axes, bracteole apex rounded on the main axis; bracteole apex long acuminate on side branches, with several disc-like glands present. *Calyx* 5-lobed, 3.5–5 by 2.5–4 mm, velutinous, greenish brown, outer surface with discoid glands; lobes up to 0.5 mm long, apex long acuminate; fruiting calyx 5–6 mm diam., erect. *Corolla* 5-lobed, outer surface hairy, sparsely glandular, white or yellowish to pinkish/lilac; tube 7–13 mm long; upper lip 2-lobed, 4–6 by 3–4 mm, apex rounded; lower lip 3-lobed; mid-lobe oblong, 6–10 by 5–6 mm, apex acute, mauve or purple, with two yellow marks; lateral lobes 3.5–5 by 3–5 mm long, apex acute to rounded. *Stamens* inserted at apex of tube, glabrous, glands present; lower pair 9–12 mm long, anthers c. 1.5 mm long; upper pair fertile, 7–9 mm long, anthers 1.3–1.5 mm long. *Ovary* glabrous with a few hairs at apex; style 13–15 mm long, stigma c. 2 mm long. *Fruit* (dried) 7–10 by 4–6.5 mm, clavate, apex rounded, glabrous, apart from some hairs at apex, black or purple when mature.

Distribution — Southern part of Papua New Guinea.

Habitat & Ecology — A (sub)canopy tree in primary or secondary forest or in transition zone between rainforest and savannah, sometimes over limestone or on beaches. Altitude: 0–1400 m. Flowering: (November) March to June; fruiting: November to June.

Vernacular names — Alongaya (Upper Waria); Gow, Petapeta.

Uses — The wood is used for carving drums.

12. Gmelina philippinensis Cham.

Gmelina philippinensis Cham., Linnaea 7 (1832) 109. — *Gmelina asiatica* L. var. *philippinensis* (Cham.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 70. — Type: *Roman-Zoffiana s.n.* (holo LE), [Philippines,] Luçonia [Luzon], Manilla.

Gmelina asiatica Blanco, Fl. Filip. (1837) 492, nom. illig. (non *Gmelina asiatica* L.]; see Merr., Sp. Blancoan. (1918) 333. — Type: lost.

Gmelina inermis Blanco, Fl. Filip. (1837) 493; see Merr., Sp. Blancoan. (1918) 333. — Type: lost.

Gmelina hystrix Schult. ex Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 39 (1870) 81; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 306. — Type: *Teijsmann HB 5946* (holo L), Siam [= Thailand], Bangkok, in hortis.

Gmelina bracteata Burck, Ann. Jard. Bot. Buitenzorg 10 (1891) 98, t. VII, f. 5, 6. — Type: Burck, Ann. Jard. Bot. Buitenzorg 10 (1891) t. VII, f. 5, 6.

Gmelina philippinensis Cham. forma *transitoria* Moldenke, Phytologia 18 (1969) 210; de Kok, Kew Bull. 67 (2012) 318. — Type: *PNH (Sulit) 11741* (holo US; iso L 2 sheets), Philippines, Guimaras Island.

Climbing shrub or small tree, 2–8 m high, dbh 3–11 cm; bark light brown or grey to green, rough. *Twigs* sparsely hairy; spines usually present, up to 10 mm long. *Leaves*: blade elliptic to obovate, 2.5–11 by 1.4–5 cm, base cuneate to decurrent, margins entire, sometimes shallowly 3-lobed, apex rounded to acute; upper surface glabrous, with sometimes a few hairs on main vein, green; lower surface with some hairs on the veins, white stellate hairs present, green; sometimes with discoid glands at base; veins 3 or 4 pairs, sometimes 3-veined from base; petiole channelled, 9–30 mm long, sparsely hairy, pink. *Inflorescences* terminal, 3–13 cm long, erect to patent, sparsely hairy; bracteoles ovate-lanceolate, 9–30 by 10–50 mm, usually persistent, apex rounded to acute, cuspidate, light brown, pale green or purple or maroon outside, pale green with pink inside, sometimes with discoid glands. *Calyx* 5-lobed, sometimes appearing fewer, densely to sparsely pubescent, glabrescent, pale yellow green to green, discoid glands present, small white glands present; flowering calyx 3–4 by 2.5–3 mm, lobes c. 0.2 mm long, apex acute; fruiting calyx 4–10 mm diam., margin straight to undulated, patent. *Corolla* 4-lobed, yellow, velutinous, slightly fragrant; tube 10–16 mm long; upper lip 1-lobed, 4.5–15 by 6–14 mm, apex acute to rounded; lower lip 3-lobed, mid-lobe 3–9 by 6.5–12 mm, apex acute to rounded, patent; lateral lobes 3.5–7 by 6–8 mm, apex acute to rounded, slightly oblique. *Stamens* inserted at apex of tube, yellow; lower pair 18–22 mm long, anthers 1.5–3 mm long, yellow; upper pair fertile, 11–13 mm long, anthers c. 2 mm long. *Ovary* glabrous, sometimes with a few discoid glands; style 28–40 mm long. *Fruit* (dried) 15–20 by 9–12 mm, obovoid, apex rounded, glabrous, yellow when mature. — **Plate 4f.**

Distribution — Considered to be native to E Cambodia, C and S Vietnam, E Thailand; in *Malesia*: Philippines. As it is now also cultivated as a garden plant throughout the tropics and has become naturalized in many areas, the exact limits of its natural distribution may be impossible to determine.

Habitat & Ecology — Growing in secondary vegetation or (mixed) deciduous forests. Soil: clay. Altitude: 60–490 m. Flowering: January to October; fruiting: March to November.

Uses — The species is used extensively throughout the tropics as a garden plant. In Peninsular Malaysia the fruit is mixed with lime and applied externally to the throat as a remedy for coughs.

13. Gmelina schlechteri H.J.Lam

Gmelina schlechteri H.J.Lam, Verbenaceae Malayan Archipel. (1919) 226. — *Gmelina dalrympleana* (F.Muell.) H.J.Lam var. *schlechteri* (H.J.Lam) Moldenke, Phytologia 4 (1953) 178. — Neotype (designated by Munir, J. Adelaide Bot. Gard. 7 (1984) 106): *Pullen 7662* (neo CANB; isoneo BO, K, L 2 sheets), Papua New Guinea, Central District, c. 12 km north of Amazon Bay, Nunumai.

Gmelina palawensis H.J.Lam var. *novoguineënsis* Moldenke, Phytologia 4 (1952) 54; de Kok, Kew Bull. 67 (2012) 322. — Type: *NGF (Anonymous) 2922* (holo BO; iso K, L), [Papua New Guinea,] Morobe district, Morobe.

Tree, 6–32 m high, dbh 9–60 cm; bark (grey) brown, scaly or longitudinally fissured; wood (medium) hard, pale brown to (pale) pinkish. *Twigs* sparsely hairy when young, with interpetiolar ridge, spines absent. *Leaves*: blade elliptic to ovate, 10–23 by 4.5–14.5 cm, base rounded, rarely cordate or cuneate, slightly oblique, margins entire, apex rounded to acuminate; upper surface glabrous, dull dark green; lower surface with few simple hairs on veins, peltate scales absent, (yellow) green, two cup-like glands at the base; veins 5–8 pairs, red brown, sometimes 3-veined from base; petiole terete to half-terete, 1–7 cm long, red brown, hairy. *Inflorescences* terminal or axillary, narrow, up to 40 cm long, with long side branches, pale yellow, velutinous; bracteoles lanceolate, 2–9 by 0.5–3 mm, apex long acuminate, sessile, with several disc-like glands present. *Calyx* 2.5–3 by 2.5–3 mm, 5-lobed, sometimes appearing fewer, dark purple green, velutinous with sometimes a glabrous margin, outer surface with discoid glands; lobes up to 0.5 mm long, apex rounded to acute; fruiting calyx 5–6 mm diam., erect. *Corolla* 5-lobed, outer surface hairy, sparsely glandular, white to whitish pink or pale purple; tube 8–9 mm long; upper lip, 2-lobed, 2–4 by 1.5–3 mm, apex rounded; lower lip 3-lobed; mid-lobe oblong, 5–8 by 3–5 mm, apex rounded, white to pale purple, with two yellow marks; lateral lobes 3.5–7 by 2–4 mm long, apex round. *Stamens* inserted at apex of tube, glabrous, glands present; lower pair 10–12 mm long, anthers c. 2 mm long, brown; upper pair fertile, 9–10 mm long, anthers c. 1.5 mm long, brown. *Ovary* glabrous with a few hairs at apex; style 10–12 mm long, stigma c. 1.5 mm long. *Fruit* (dried) 9–11 by 5–6 mm, clavate, apex rounded, glabrous, sometimes with hairs at apex, often with a ring of scars around apex, purplish blue to purple (pink) when mature.

Distribution — Papua New Guinea (Morobe, Northern and Central provinces).

Habitat & Ecology — A tree in primary and secondary forest, often along rivers or at the sea-side, usually in flat lands, rarely on ridges, usually in alluvial soils, usually poorly drained; sometimes over ultrabasic rock; sometimes associated with *Anisoptera thurifera* (Blanco) Blume or *Dillenia nalagi* Hoogland. Altitude: 0–300(–600) m. Flowering and fruiting: throughout the year.

Vernacular names — Bauma, Pò'a (Orokaiva); Boa (Yekora).

14. **Gmelina sessilis** C.T.White & W.D.Francis

Gmelina sessilis C.T.White & W.D.Francis, [Rep. Forest Resources Territ. Papua & New Guinea (1925) 136, nom. inval.] Proc. Roy. Soc. Queensland 38 (1927) 257. — Type: *Lane-Poole 303* (holo BRI; iso BO, K), [Papua New Guinea,] Papua, Baroi.

Tree, 6–30 m high, dbh 13–75 cm; lightly buttressed; bark fissured, peeling in irregular flakes, grey brown to brown; slash (orange) brown to red brown; wood soft, creamy white. *Twigs* hairy, spines absent. *Leaves*: blade elliptic to orbicular, often ovate, 14–24 by 10–19 cm, base rounded to cuneate, margins entire, often slightly lobed, apex rounded to acute; upper surface glabrous with simple hairs covering the veins, glossy, (dark) green; lower surface covered with simple hairs, with glands clustered around the base, peltate scales absent, dull, pale green or glaucous; veins 5–7 pairs, yellowish, sometimes 3-veined from base, lower surface with strong tertiary venation; petiole half-terete, slightly channelled, 4–7 cm long, hairy. *Inflorescences* terminal, narrow, 13–21 cm long, velutinous; bracteoles rounded, 13–17 by 11–13 mm, sessile, apex acuminate

to rounded, with discoid glands. *Calyx* 4–6 by 3.5–5 mm, 5-lobed, sometimes appearing fewer, velutinous, green, outer surface with discoid glands; lobes 1–2 by 1–1.8 mm, apex acute; fruiting calyx c. 7 mm diam., erect to patent. *Corolla* 5-lobed, cream to light purple, with darker markings, outer surface velutinous, glabrous at base, inside glabrous, sparsely glandular; tube 6–11 mm long; upper lip 3–5 by 2–8 mm, apex rounded, erect; lower lip 3-lobed; mid-lobe spatulate to oblong, 4–8 by 3–4 mm, apex rounded, yellow patch at base; lateral lobes 4–5 by 2.5–3 mm, apex rounded, oblique. *Stamens* inserted at apex of tube, white; lower pair 5–14 mm long, anthers c. 1.5 mm long; upper pair fertile, 4–10 mm long, anthers c. 1.5 mm long. *Ovary* glabrous; style c. 12 mm long, stigma c. 2 mm long. *Fruit* (dried) c. 12 by 10 mm, cylindrical, apex truncate, glabrous, bright blue to glossy violet.

Distribution — Papua New Guinea (Gulf District and New Britain).

Habitat & Ecology — Growing in primary to secondary forest. Soil: alluvium or grey sandy loam. Altitude: 30–60 m. Flowering: March to April; fruiting: February to May.

15. Gmelina smithii Moldenke

Gmelina smithii Moldenke, Phytologia 6 (1958) 326. — Type: *L.S. Smith 1064* (holo LAE; iso K, L), Papua New Guinea, Central Highlands, Aiyura.

Tree, 10–45 m high, dbh 10–100 cm; bark fissured to smooth, pale blue grey or whitish brown; wood soft, pale yellow brown. *Twigs* hairy, ridge between petioles present, spines absent. *Leaves*: blade elliptic to obovate or ovate, 7–13.5 by 4–8 cm, base rounded to cuneate, margins entire, apex rounded to acute; upper surface glabrous, (pale olive-)green, glossy; lower surface glabrous, pale green to pale bronze, with some discoid glands clustered around the base, covered with whitish peltate scales; veins 6–11 pairs; petiole half-terete, channelled, 1–2.5 cm long, glabrous with few hairs at base. *Inflorescences* terminal, many-flowered, 7–19 cm long, velutinous; bracteoles ovate to linear, 5–7 by 2–5 mm, decreasing in size and particularly in width towards base, apex acute, persistent, blackish. *Calyx* 5-lobed, velutinous; flowering calyx 3.5–5 by 3.5–5 mm; lobes 1–2.5 by 1–1.2 mm, apex acute to rounded; fruiting calyx 9–10 mm diam., patent. *Corolla* 5-lobed, white to purple or red, outer surface hairy, sparsely glandular; tube 3–6 mm long; upper lip 2-lobed, 3–6 by 3–5 mm, apex rounded; lower lip 3-lobed; mid-lobe oblong, 4–6 by 3.5–5 mm, apex rounded, pale blue with yellow spots and lines, sometimes with a purple apex; lateral lobes 3–5 by 4–5 mm, apex rounded to acute. *Stamens* inserted at apex of tube; lower pair 8–10 mm long, anthers 1.5–2 mm long; upper pair fertile, 8–10 mm long, anthers 1.5–2 mm long. *Ovary* glabrous; style 7–14 mm long, stigma 1.5–2 mm long. *Fruit* (dried) 7–12 by 10–15 mm, globose, apex rounded, glabrous, red to pink when mature.

Distribution — Papua New Guinea (Morobe, E Highlands and Madang districts).

Habitat & Ecology — Growing in lower or mid-mountain rainforests, sometimes associated with Fagaceae forest. Altitude: 1525–1980 m. Flowering: May to October; fruiting: May to October.

Vernacular names — Kaboya (Aiyura); Wakhai (Fore); Yabeina (Anona).

16. *Gmelina uniflora* Stapf

Gmelina uniflora Stapf, Hooker's Icon. Pl. 24 (1895) t. 2391; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 217; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 65. — *Gmelina uniflora* Stapf var. *typica* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 66, nom. illig. — Type: *Motley 1204* (holo K), [Indonesia,] South Borneo, Banjermassing.

Gmelina uniflora Stapf var. *villosa* Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 66. — Syntypes: *Jaheri (Exp. Nieuwenhuis) 1109* (BO n.v.); *Jaheri (Exp. Nieuwenhuis) 1300* (BO, L, NY); *Jaheri (Exp. Nieuwenhuis) 1463* (BO, L); all [Indonesia,] Borneo, Soengei Bloe-oe.

Small tree or liana, 4–30 m high, dbh 8–30 cm; bark light to reddish brown, smooth; sapwood white to pale orange. *Twigs* hairy, spines absent. *Leaves*: blade broadly elliptic or obovate-elliptic, 10–20 by 6.5–12 cm, papery, base rounded to cuneate, margins entire, apex obtuse or shortly acuminate; upper surface glabrous, green to dark green; lower surface covered with whitish peltate scales, sometimes sparsely hairy, light green to grey green or silvery, sometimes with glands at base present; veins 4–6 pairs, sometimes 3-veined from base; petiole half terete, 1.5–4.5 cm long, glabrous. *Inflorescences* c. 2.5 cm long, usually consisting of a single or only a few flowers, axillary, velutinous, covered with peltate scales; bracteoles lanceolate, 12–14 by 3–4 mm, apex acuminate. *Calyx* 4- or 5-lobed, 14–20 by 7–10 mm, velutinous, dark brown to pale green, becoming pale yellow when in fruit, sometimes with glands, slightly accrescent; lobes 7–10 mm long, apex acuminate. *Corolla* 5-lobed, white to pale yellow, yellow guides in throat, velutinous; tube 10–32 mm long; upper lip 2-lobed, lobes 5–7 by 6–7 mm, apex rounded; lower lip 3-lobed, mid-lobe 5–13 by 8–12 mm, spatulate, apex rounded, glabrous; lateral lobes 4–10 by 4–8 mm, apex rounded. *Stamens* inserted at apex of tube, white; lower pair 10–18 mm long, anthers 2.5–3 mm long; upper pair fertile, 11–13 mm long, anthers 2–2.5 mm long. *Ovary* glabrous with apex covered with hairs; style 15–30 mm, long, stigma c. 3 mm long. *Fruit* 2.5–4 by 1.5–2.5 cm, clavoid, apex rounded, glabrous, covered with scales when young, smooth, (pale) yellow.

Distribution — Endemic to Borneo.

Habitat & Ecology — Growing in primary and secondary forest. Soil: (sandy) clay or loam, sometimes over sandstone, shale, limestone or ultramafic. Altitude: 0–1100 m. Flowering: January to September; fruiting: August to March.

Vernacular names — Sarawak: Akar ankaleh, Akar enkeliae (Iban); Susu-susu (Kedayan); War Imang Bayang (Kelabit). Brunei: Akar inklis (Iban); Paginggi (Brunei).

Uses — In Sarawak it is used for treating goitres by first pounding the leaf and rubbing the paste on the affected part. It is also used for soap by crushing the bark and adding water. The fruits are reported to be eaten in Brunei.

DUBIOUS TAXA

[*Gmelina inermis* Wight ex Wall., Numer. List (1828) 1816d, nom. nud.]. — *Gmelina asiatica* L. forma *inermis* (Wight ex Wall.) Moldenke, Phytologia 55 (1984) 42. — *Wallich Cat. 1816d* (holo not located), [Indonesia,] Madura.

Gmelina lobata Gaertn., Fruct. Sem. Pl. (1791) 268; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 69. — *Gmelina elliptica* Sm. forma *lobata* (Gaertn.)

Moldenke, Phytologia 4 (1953) 178. — Syntypes: Gaertner, Fruct. Sem. Pl. (1791) 56, f. 2; Rumph., Herb. Amboin. 3 (1743) t. 39 = **Gmelina asiatica** L. or **G. elliptica** Sm.

Gmelina palawensis H.J. Lam var. *dingatensis* Moldenke, Phytologia 3 (1951) 418. — Type: *Ahern 461Q* (holo BO; iso BO), Philippines, Mindanao, Suirago, Dingat.

Note — De Kok found it impossible to identify the collections on which these three names are based (see also De Kok, Kew Bull. 67 (2012) 326).

Gmelina sinuata Link, Enum. Hort. Berol. Alt. 2 (1822) 128. — Type: unknown.

EXCLUDED SPECIES

Gmelina indica Burm.f., Fl. Ind. (1768) 132; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 228. — *Gmelina javanica* Christm., Vollst. Pflanzensyst. 2 (1777) 134, nom. superfl. — Type: Burmann, Fl. Ind. (1768) 132, t. 39, f. 5 = **Flacourtia indica** (Burm.f.) Merr. (see Sleumer in Steenis, Fl. Males., Ser. I, 5 (1954) 76).

17. GOMPHOSTEMMA

(L.J. Walsingham)

Gomphostemma Wall. ex Benth. in Wall., Pl. Asiat. Rar. 2 (1830–1831) 12; Prain, Ann. Roy. Bot. Gard. Calcutta 3 (1891) 242; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1895) 223; H.Keng, Gard. Bull. Singapore 24 (1969) 79; in Steenis, Fl. Males., Ser. I, 8 (1978) 319; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 70; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 215. — Type: not designated.

Coarse perennial herbs. *Indumentum* of simple, stellate and branched hairs. *Stems* erect, woody and stout below, less so above, grooved and hoary pubescent, slightly scabrid, with stellate, branched and simple hairs. *Leaves* decussate, simple, petiolate, toothed. *Flowers* in few- to many-flowered whorls forming densely sessile or laxly branched cymes, rarely spiciform. *Calyx* more or less actinomorphic, ribbed or not, campanulate, divided into 5 lobes, these equal to subequal. *Corolla* tubular, 2-lipped, 4-lobed (1/3), white, cream, orange-yellow or purplish red, tube slender, erect or incurved, mostly strongly dilated in distal part; upper lip shallowly hooded, entire or emarginate, the lower lip spreading, broadly 3-lobed. *Stamens* 4, more or less included or only very shortly exserted under the upper lip, pubescent, all ascending, the lower pair longer; anthers weakly distinct, parallel or narrowly divergent, each anther 4-celled in bud, later 2-celled, cells transverse, parallel. *Disc* subequal or gibbous behind. *Style* gynobasic; stigma lobes subulate, subequal or unequal. *Fruit* a schizocarp of 4 nutlets, usually only 1 or 2 developing fully, the remainder abortive. *Nutlets* drupaceous, glabrous or pubescent, the pericarp usually fleshy and white, attachment scar basal.

Distribution — About 30 species in SE Asia, from E India and Burma through Indo-China; in *Malesia* 8 species, mostly in Sumatra and Peninsular Malaysia, and not extending east of the Philippines, Sulawesi and Bali.

Habitat & Ecology — In montane rainforest areas lower to medium altitudes, 150–1400 m, *Gomphostemma javanicum* also at higher altitudes (up to 2400 m).

Taxonomy — The genus was last revised in Malesia by Keng (1969, 1978), who recognised eight species. Prior to this, Prain (1891), tentatively introduced three divisions within the genus, essentially based on corolla and fruit characters:

- Sect. *Podosiphon* Prain: the corolla tube incurved, hirsute within; usually one or more of the nutlets aborted;
- Sect. *Stenostoma* Prain: the corolla comparatively narrow, the tube nearly straight; unusual for more than one nutlet to develop;
- Sect. *Eugomphostemma* Prain [*Gomphostemma*]: corolla tube incurved as in *Pogosiphon*, but glabrous within and very much longer and larger; all four nutlets usually develop.

Keng (1969) did not divide the genus into sections in his account, but did use the sections described by Prain as the basis for his key. I do not consider the use of these sections to be advantageous, so do not present them here.

KEY TO THE SPECIES

1a. Inflorescence spiciform, in the axils of the leaves; bracts caducous . . . . . **3. G. dolichobotrys**
b. Inflorescence of few- to many-flowered whorls forming densely sessile or laxly branched cymes; bracts persistent 2
2a. Prominent hairs on outer surface of calyx long and simple, giving a densely long hirsute and woolly appearance . . . . . **4. G. hirsutum**
b. Prominent hairs on outer surface of calyx not long and simple, not giving a densely long hirsute and woolly appearance 3
3a. Plants less than 45 cm high, usually collected complete, with narrow fusiform tubers on a root system. Cymes with 2–4 flowers . . . . . **6. G. mastersii**
b. Plants 45 cm or higher, usually collected incomplete without any root systems. Cymes with 4 or more flowers 4
4a. Calyx up to 7 mm long. Corolla orange-yellow, no more than 2 cm long . . . . . **7. G. microcalyx**
b. Calyx ≥ 7 mm long. Corolla white to white-yellow to yellow, ≥ 2 cm long. 5
5a. Calyx lobes ≥ 8 mm long, ending in a long subulate tip 6
b. Calyx lobes up to 8 mm long, apex acute to acuminate to caudate, not subulate . 7
6a. Calyx tube with ribs strongly apparent. Corolla narrowly widening from the calyx tube. Inflorescence in axils of the leaves. Leaf blades elliptic-obovate . . . . . **1. G. crinitum**
b. Calyx tube with ribs slightly apparent. Corolla broadly widening from the calyx tube. Inflorescence on bare stem below leaves. Leaf blades ovate to oblong-ovate to cordate . . . . . **2. G. curtisii**
7a. Inflorescence dense, sessile, unbranched cymes. Corolla with incurved tube and inflated throat, 4–5(–5.5) cm long . . . . . **5. G. javanicum**
b. Inflorescence lax or condensed, pedunculate, often branched cymes. Corolla with straight tube and narrow throat, 2–2.5 cm long . . . . . **8. G. parviflorum**

1. **Gomphostemma crinitum** Wall. ex Benth.

Gomphostemma crinitum Wall. ex Benth. in Wall., Pl. Asiat. Rar. 2 (1830–1831) 12; J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 724; Ridl., Fl. Malay Penins. 2 (1923) 652. — Lectotype (designated by Bongcheewin, Paton & Ingrouille): *Wallich Cat. 2159*.2 (lecto K (Herb. Benthamianum); isolecto K-W), Peninsular Malaysia, Penang.

Gomphostemma crinitum Wall. ex Benth. var *griffithii* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 724. — Lectotype (designated by Bongcheewin, Paton & Ingrouille): *Griffith* 4042 (lecto CAL; isolecto K 2 sheets, P), Peninsular Malaysia.

Gomphostemma parviflorum auct. non Wall. ex Benth: Benth., Labiat. Gen. Spec. (1835) 648; in A.DC., Prodr. 12 (1848) 551; Miq., Fl. Ned. Ind. 2 (1859) 987.

Plant 50–150 cm tall. *Stems* erect, flexuose, becoming stout, ash-grey tomentose, slightly scabrid. *Leaves* herbaceous; blade elliptic-obovate, 18–30 by 6–10 cm, base acuminate, margins shallowly dentate to crenate, apex acute, upper surface slightly hispid with short white hairs some branched or stellate, lower surface densely short stellate with yellowish glands, long stellate and glandular on midribs and veins, so appearing paler, but distinct reticulate venation still prominent; petiole 2–4 cm long, also with stellate yellow glandular hairs. *Inflorescences* lax, rarely condensed, cymes in axils of leaves, 4- or more flowered, often branched; peduncles up to 2 cm long; bracts linear-lanceolate, 1–2 cm long with stellate glandular hairs, brown, persistent; pedicels 3–7 mm long. *Calyx* 12–15 mm long, tube 4–5 mm long, with prominent ribs, outer surface pubescent with prominent white stellate hairs, with yellow sessile glands, lobes 8–10 mm, acuminate ending in long subulate tip, inner surface orange brown and pubescent with long white glandular simple hairs. *Corolla* yellow-white, 2–3.5 cm long, the tube straight and narrow for 1–1.5 cm then shortly widening, lobes 4–6 mm long, outer surface tomentose with white stellate hairs with yellow glands, inner surface with some short white hairs. *Stamens*: filaments 18–20 mm long with some glandular hairs; anthers 1–1.5 mm long. *Ovary* and style glabrous. *Nutlets* 5–6 mm long, glabrous. — **Fig. 16e.**

Distribution — Burma, Thailand, Vietnam; in *Malesia*: Peninsular Malaysia, Sumatra.

Habitat & Ecology — Lower montane forest. Altitude: 300–1500 m.

Note — *Gomphostemma crinitum* has a distinctive ash-grey appearance, and an elongated flexuose appearance to the stems. The very long subulate, almost filiform calyx lobe tips, are also characteristic, giving a distinct 'frilly' appearance to the inflorescence.

2. **Gomphostemma curtisii** Prain

Gomphostemma curtisii Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 59 (1890) 315. — Type: *Curtis KD 1310* (holo K; iso SING), Peninsular Malaysia, Perak, Waterloo.

Cyrtandromoea repens Ridl., J. Straits Branch Roy. Asiat. Soc. 57 (1910) 74; Fl. Malay Penins. 2 (1923) 543; B.L.Burtt, Bull. Bot. Surv. India 7 (1965) 87. — Type: *Ridley 14446* (holo K; iso S), [Peninsular Malaysia,] Perak, Temengo.

Plant c. 45–90 cm tall. *Stems*: lower stems woody, upper stems more herbaceous with sprawling, flexuose habit, some rooting at nodes. *Leaves*: blades ovate to oblong-ovate or cordate, 7–13 by 6–12 cm, base shortly attenuate, margins shallowly dentate, apex acute, upper and lower surfaces with even covering of stellate hairs, lower surface

more densely stellate on midrib and veins showing distinct reticulate venation; petioles 2.5–4.8 cm long, also with stellate hairs. *Inflorescences* lax, pedunculate, 4- or more flowered, branched cymes at nodes below leaves, on bare stems; peduncles 3–6 mm long; bracts oblong-ovate, 10–15 mm long, red-brown, with stellate hairs, persistent; pedicels 2–4 mm long. *Calyx* 1–2 cm long, tube c. 8 mm long, with 10 ribs slightly apparent, outer surface reddish brown, pubescent with prominent white stellate hairs; lobes 8–10 mm long, acuminate ending in long subulate tips, inner surface red-brown, glabrous. *Corolla* white-yellow, 2.3–3.8 cm long, the tube 1.3–2.5 cm long, narrow and distinctly incurving for 5.5–10 mm, then broadly widening; upper lobe longer than lower lobes, the 3 lobes of the lower lip subequal, 4–6 mm long, outer surface with short stellate and simple hairs, inner surface glabrous. *Stamens*: filaments c. 2.5 cm long, with some yellow glandular simple hairs; anthers c. 1.5 mm long with scattered yellow glandular hairs. *Style* with some simple hairs especially towards the subequal stigma lobes. *Nutlets* 5–6 mm long, with few simple hairs towards apex.

Distribution — Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo.

Habitat & Ecology — Lower montane forest. Altitude: 650–750 m.

Note — It is difficult to get a true picture of the height of this species as specimens normally consist of the soft weak top of the plant along with bits of the sprawling stem, the base not often included. It is common to find roots at nodes along the stem, leading to the conclusion that plants root where the stem touches the ground. *Gomphostemma curtisii* is distinctive because of its long subulate calyx lobes and branched cymes, occurring on the lower parts of the stem. The calyx tube appears less prominently ribbed than the other species. The ovate to oblong-ovate or cordate leaves are also noticeable, though those specimens from Sumatra show a more elongated elliptic to ovate leaf.

3. Gomphostemma dolichobotrys Merr.

Gomphostemma dolichobotrys Merr., Contr. Arnold Arbor. 8 (1934) 148. — Type: *W. & C. Bangham 728* (holo GH; iso NY), Sumatra, Atjeh, Takengon.

Gomphostemma racemosum H.Keng, Gard. Bull. Singapore 24 (1969) 80, f. 14. — Type: *Van Steenis 8684* (holo L; iso BO, K, L), N Sumatra, Atjeh, Gajoland.

Plant to 2 m tall. *Stems* stout with white stellate and occasional branched glandular hairs 0.5–3 mm long, giving yellowish brown appearance. *Leaves*: blade ovate-elliptic, 9–24 by 6–14 cm, base broadly acute, margins shallowly dentate, apex acute or shortly acuminate, upper surface with even covering of long and short simple glandular appressed hairs, lower surface densely covered with glandular stellate hairs 0.5–3 mm long, more so on the midrib and veins; petiole 1–7 cm long, indumentum as stems. *Inflorescences* with 6–8 flowers per verticillaster, forming a spiciform structure in the axils of the leaves, 5.5–7.5 cm long excluding the peduncle; bracts narrowly lanceolate, 6–9 mm long, caducous; pedicels 1.5–2 mm long. *Calyx* tubular, 7–12 mm long, calyx tube 4–5 mm long, with 10 ribs, outer surface pubescent with prominent white stellate hairs; lobes 1.5–2.5 mm long, acuminate, narrowing to short caudate tips, inner surface yellow brown with even covering of simple white hairs. *Corolla* white, 1.6–2 cm long, tubular, lobes subequal, outer surface puberulent with stellate, glandular white hairs.

Stamens with filaments c. 1.5 cm long, with some simple hairs. *Style* with stigma lobes equal. *Nutlets* c. 1 mm long, globose. — **Fig. 16a, b.**

Distribution — Known only from three collections from N Sumatra.

Habitat & Ecology — Lower montane riverine forest and scrub.

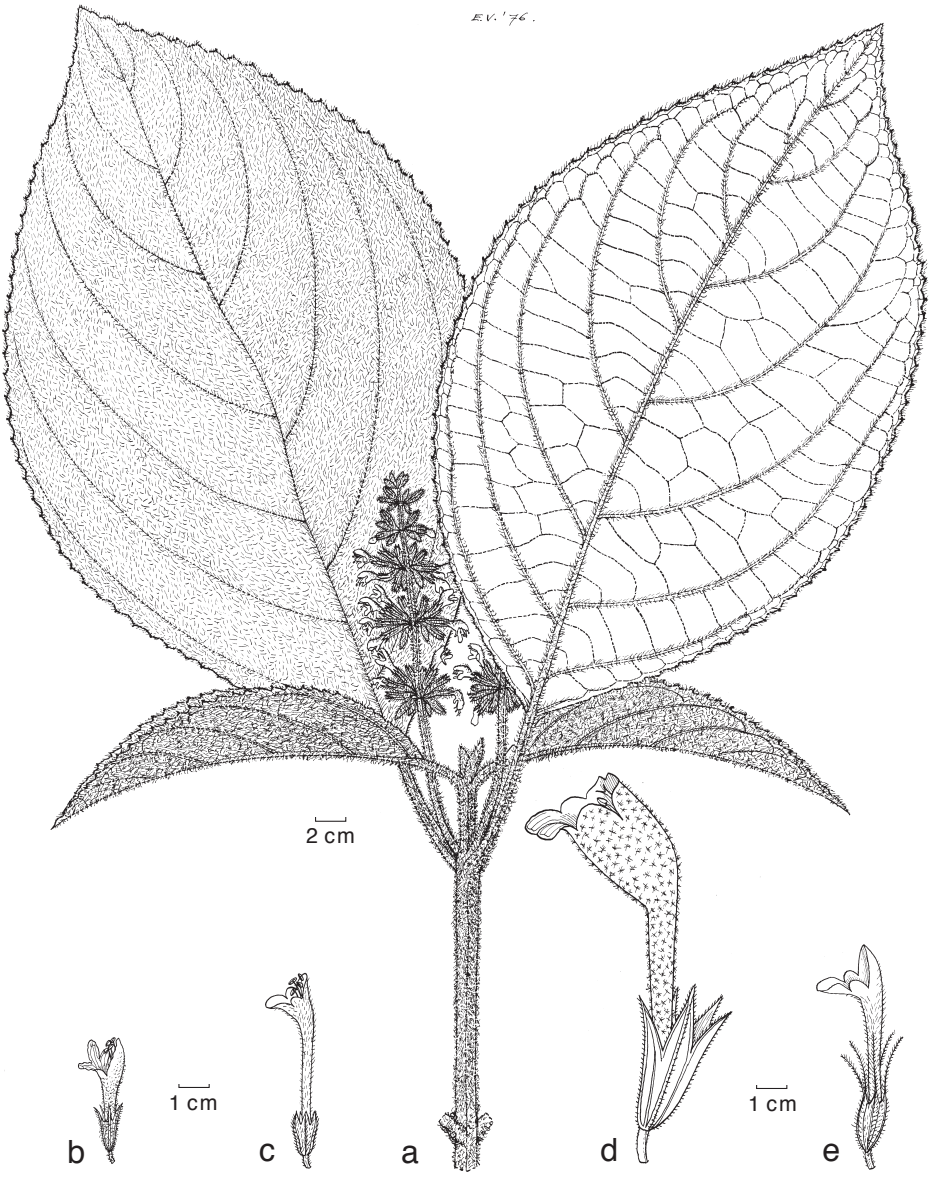

Fig. 16. a, b. *Gomphostemma dolichobotrys* Merr. a. Habit; b. flower. — c. *G. microcalyx* Prain. Flower. — d. *G. javanicum* (Blume) Benth. Flower. —e. *G. crinitum* Wall. ex Benth. Flower (a, b: *Van Steenis 8684*; c: *King's collector (Kunstler) 2155*; d: *Scortechini s.n.*; e: *Griffith s.n.*; a, b: L; c–e: after Prain 1890). Drawing by Ed Vijsma, 1976.

Note — This species is readily identified by the axillary spiciform inflorescence, unique within the genus, as well as the narrowly lanceolate, caducous bracts subtending the flowers. A rarely collected species from one specific area of Sumatra: Van Steenis reported it to be locally common in 1937, but only one other collection has appeared since, made in 1975.

4. **Gomphostemma hirsutum** Walsingham

Gomphostemma hirsutum Walsingham in Walsingham & Bramley, Kew Bull. 65 (2010) 479. — Type: *Rumutom 122* (holo K; iso KEP), Borneo, Sabah, Ranau Distr., Kawasan Taman.

Plant 70–100 cm tall. *Stems* stout with white stellate hairs 0.5–2.8 mm long. *Leaves*: blade narrowly elliptic, 15–26 by 3–6 cm, base attenuate, margins shallowly dentate, apex acute, upper surface with even covering of long simple hairs with occasional branched hairs, lower surface more densely covered with a mixture of short and long stellate hairs and some long simple hairs, giving greyish white appearance, and showing distinct midrib and fine veining; petiole 1.5–3.2 cm long, indumentum as stems. *Inflorescences* dense, very shortly pedunculate, with 4- or more flowered cymes in axils of leaves; bracts red-brown, narrowly ovate, 7–11 mm long, with very long simple hairs 0.5–2.5 mm long, some branched, persistent; pedicels 1–2 mm long. *Calyx* 15–17 mm long, tube 0.9–1 cm long with 10 ribs, outer surface with a densely hirsute and woolly appearance, with prominent long white simple hairs, mixed with a few stellate hairs, these stellate and branched; lobes 6–7 mm long, acuminate, narrowing towards ± long caudate tips, also with long white simple hairs, inner surface red-brown with even covering of long white simple hairs. *Corolla* creamy-white or white, 3–4.5 cm long, the tube narrow and distinctly incurving for 1.2–2 cm then broadly widening; upper lip longer than lower lip, the 3 lobes of lower lip subequal, 5–8 mm long, outer surface tomentose with white stellate hairs, inner surface ± glabrous. *Stamens* with filaments 2.5–3 cm long with some white glandular simple hairs; anthers c. 2.5 mm long, grey, with covering of short white hairs. *Style* with long and short-stellate and branched hairs especially towards stigma; stigma lobes equal. *Nutlets* 1.6–1.8 mm long, with tuft of mixed stellate, branched and simple white hairs towards apex.

Distribution — Apparently endemic to Sabah (Ranau & Lahad Datu Dist.).

Habitat & Ecology — Lower montane forest. Altitude: 650–750 m.

Note — This species is described from only five collections, and is apparently endemic to Sabah. *Gomphostemma hirsutum* can easily be recognised by its calyx indumentum of prominent long white simple hairs mixed with few stellate hairs. The narrowly elliptic leaves have an indumentum of longer white hairs, particularly on the lower surface, giving an overall greyish white appearance to dried material.

5. **Gomphostemma javanicum** (Blume) Benth.

Gomphostemma javanicum (Blume) Benth., Labiat. Gen. Spec. (1835) 650. — *Prasium javanicum* Blume, Bijdr. (1826) 840. — Lectotype (designated by Keng, Gard. Bull. Singapore 24 (1969) 87): *Blume s.n.* (lecto L, sheet no. 904.354-154), Java, Gunung Gede.

Gomphostemma oblongum Wall. ex Benth. in Wall., Pl. Asiat. Rar. 2 (1830) 12. — Type: *Wallich Cat. 2154* (holo K), Tavoy, Myanmar.

Gomphostemma philippinarum Benth. in A.DC., Prodr. 12 (1848) 551. — Type: *Cuming 840* (iso BM, E, DC, P), Philippines.

Gomphostemma oblongum Wall. ex Benth. var. *helferi* Hook.f., Fl. Brit. India 4 (1885) 697. — *Gomphostemma javanicum* (Blume) Benth. var. *helferi* (Hook.f.) Murata, S. E. Asian Stud. 14 (1976) 189. — Type: *Helfer 4043* (holo K), Myanmar, Tenasserim.

Gomphostemma scortechinii Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 59 (1890) 313. — Type: *Scortechini 1225* (holo CAL; iso CAL, K, SING), Peninsular Malaysia, Perak, Gunong Hijau (possibly), Thaiping Hills.

Gomphostemma rugosum Prain, Ann. Roy. Bot. Gard. Calcutta 3 (1891) 262. — *Gomphostemma javanicum* (Blume) Benth. var. *rugosum* (Prain) Murata, S.E. Asian Stud. 14 (1976) 190. — Lectotype (designated by Bongcheewin, Paton & Ingrouille): *Wallich Cat. 2156.1* (lecto CAL; isolecto K-W), Myanmar, Tenasserim.

Gomphostemma cinerea Elmer, Leafl. Philipp. Bot. 8 (1919) 3086. — Type: *Elmer 17836* (holo PNH†; iso BM, K, L, NY, P, U, US), Philippines, Luzon, Laguna Prov., Los Baños.

Gomphostemma oblongum Wall. ex Benth. var. *setosa* Ridl., Fl. Malay Penins. 2 (1923) 653. — Type: *Ridley s.n., 1921* (holo K), Peninsular Malaysia, Semangkok Pass, Selangor.

Gomphostemma lacteum Ridl., J. Bot. 62 (1924) 300. — Type: *Mohammed Nur & Burkill SFN11075* (holo K; iso SING), Peninsular Malaysia, Pahang, Pinetree Hill, near Fraser Hill.

Gomphostemma javanicum (Blume) Benth. var. *brevidens* Murata, Acta Phytotax. Geobot. 40 (1989) 101. — Type: *Murata et al. T-15988* (holo KYO; iso BKF, KYO), Thailand.

Plant 0.5–2 m tall. *Stems* stout, hoary pubescent, slightly scabrid. *Leaves*: blade elliptic-ovate to ovate, 15–24(–28) by 5.5–12 cm, margins shallowly dentate to crenate, apex acuminate, base long cuneate to acuminate, upper surface hispid with some branched hairs, lower surface densely stellate so appearing paler, but showing distinct reticulate venation; petiole 0.8–4 cm long, also with stellate yellow glandular hairs. *Inflorescences* dense, 4–15 flowers in sessile whorls, in axils of leaves; bracts ovate-oblong, red-brown, 6–10 mm long with stellate hairs, persistent; pedicels 3–8 mm long. *Calyx* 0.7–2 cm long, calyx tube 6–8 mm long, with 10 prominent ribs, outer surface white pubescent, with prominent white stellate hairs, with yellow sessile glands; lobes 0.3–8 mm long, acute to acuminate often narrowing to ± caudate tips, inner surface red brown and tomentose with white hairs. *Corolla* white to yellow, 4–5(–5.5) cm long, the tube distinctly incurving, 1.2–2 cm long, the throat broadly widening, upper lip 5–9 mm long; 3 lobes of lower lip 4–7 mm long, outer surface tomentose with white stellate hairs with yellow glands, inner surface with some short white hairs. *Stamens* with filaments c. 2.5 cm long with some yellow glandular hairs; anthers c. 2.5 mm long with long white scattered hairs and sessile yellow glands. *Style* with some simple hairs especially towards stigma; stigma lobes unequal. *Nutlets* 5–6 mm long, whitish, with some stellate hairs at apex. — **Fig. 16d; Plate 4g.**

Distribution — Burma, Vietnam, Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Java, Borneo, Philippines.

Habitat & Ecology — Lower montane forest. Altitude: 100–2400 m.

Notes — 1. The proliferation of sessile yellow to white gland dots on the lower leaf surface, and on the centre of the stellate hairs on the stems, and inflorescence, gives *G. javanicum* its overall yellow appearance.

2. This species has a broad distribution within which the inflorescence characters, particularly calyx lobe length, appear to vary, as does the leaf shape, size and indumentum. Close examination of this variation shows that it is continuous, and as previously

concluded by Keng (1969: 89) this is a polymorphic species. Attempts by other authors to recognise this variation formally have resulted in a large number of names across the distribution, especially in Thailand (e.g., Murata 1976).

3. *Gomphostemma javanicum* in Peninsular Malaysia grows as single stemmed plants that are widely scattered, however, the Bornean *G. javanicum* plants examined tend to be found in large patches and have many stems, often suckering (e.g., *Beaman 10666*, MSC).

4. Keng (1969: 87) describes *G. scortechinii* as having c. 20 flowers in dense, axillary verticillasters whilst *G. javanicum* has 10–15 flowers per verticillaster. There are very few specimens identified as *G. scortechinii* and this character is difficult to ascertain, proving it to be unreliable and variable. Keng's description of calyx lobe length and bract shape (i.e., subulate in *G. scortechinii* and ovate in *G. javanicum*) is also inadequate. Of those specimens seen, those determined *G. scortechinii* appear to have larger corollas and leaves than those determined *G. javanicum*, and the indumentum on the upper surface of the leaves has longer stellate and branched hairs than typical for *G. javanicum*. However, it seems likely that the specimens available fall into the polymorphic variation of *G. javanicum*, so *G. scortechinii* has here been placed in synonymy.

6. Gomphostemma mastersii Benth. ex Hook.f.

Gomphostemma mastersii Benth. ex Hook.f., Fl. Brit. India 4 (1885) 699. — Lectotype (designated by Bongcheewin, Paton & Ingrouille): *Hooker f. & T. Thompson 1814* (lecto K (Herb. Hookerianum); isolecto K (Herb. Hookerianum)), India, Khasia, Nunklow.

Gomphostemma furfuraceum Hallier f., Bull. Herb. Boissier 6 (1898) 351. — Type: *Jaheri s.n.* (holo G; iso BO), East Sumatra.

Gomphostemma parvum Merr., Pap. Michigan Acad. Sci. 19 (1934) 192. — Type: *Barlett 8176* (holo NY; iso US), Indonesia, Sumatra, East Coast, Asahan, along Aek Panialalangan, Pargambrian.

Plant 25–35 cm tall. *Stems* short, ascending, slender and flexuose, slightly scabrid, roots if present having narrow fusiform-swollen tubers. *Leaves*: blade elliptic-ovate or oblong-elliptic, 7–12 by 5–7 cm, base acuminate, margins widely and shallowly dentate, apex acuminate, upper surface sparsely stellate with some long simple hairs, lower surface more densely stellate, especially on distinct reticulate venation, so appearing paler; petiole 2–4.5 cm long, with stellate hairs. *Inflorescences* shortly pedunculate, with 2–4-flowered whorls in axils of lower leaves, these with short internodes; peduncles 3–6 mm long; bracts lanceolate-ovate, orange-brown, 8–10 mm long, with filiform points and stellate hairs, persistent; pedicels 2–4 mm long. *Calyx* 1.2–2.2 cm long, calyx tube 7–8 mm long, with 10 slight ribs apparent, orange to reddish brown outer surface covered with white glandular stellate hairs; lobes 7–12 mm long, acuminate ending in long subulate tips, inner surface orange to reddish brown, with long simple hairs. *Corolla* orange-yellow, 3.5–5.5 cm long, the tube 1.5–2.5 cm long, narrow and distinctly incurving for 0.5–1.2 mm, then broadly widening; upper lip longer than lower lip; the three lobes of lower lip subequal, 4–6 mm long, outer surface with short stellate, glandular hairs, inner surface glabrous. *Stamens* with filaments c. 3 cm long with few yellow glandular simple hairs; anthers c. 1.5 mm long, with scattered yellow glandular hairs. *Style* glabrous with subequal stigma lobes. *Nutlets* 5–6 mm long, ovoid, orange-brown, glabrous.

Distribution — Assam, Thailand; in *Malesia*: Sumatra.

Habitat & Ecology — Lowland forest.

Notes — 1. This species is easily recognised by its distinctive root tubers. Specimens collected without the root system can be distinguished by the inflorescence, the verticillasters of which are 2–4-flowered and axillary with short internodes between them.

2. Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 322) named *De Wilde & De Wilde-Duyfjes 12358*, *12844*, *13483* and *13615* as *G. curtisii*, but noted that they deviated from the norm by their orange flowers and narrow fusiform-swollen tuberous roots. This latter distinct characteristic is consistent with *G. mastersii* from Thailand: Thai specimens examined share these characteristics, particularly the fusiform root tubers. *Gomphostemma curtisii* tends to have a scrambling habit; specimens do not usually include the root system. It also has many more flowers in the inflorescence, these can often appear on the bare length of the lower part of its longer stem. In addition, the corollas of *G. mastersii* are orange-yellow, but those of *G. curtisii* are white-yellow; the calyx lobes of *G. mastersii* look more filiform and needle-like than those of *G. curtisii*, and the flowers of *G. mastersii* are generally bigger with the tube dilating more gradually than those of *G. curtisii*.

7. Gomphostemma microcalyx Prain

Gomphostemma microcalyx Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 59 (1890) 316; Ann. Roy. Bot. Gard. Calcutta 3 (1891) 251, pl. 84; J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1907) 723; Ridl., Fl. Malay Penins. 2 (1923) 652. — Lectotype (designated by Keng, Gard. Bull. Singapore 24 (1969) 82): *Dr King's Collector 10445* (lecto K; isolecto CAL), Malay Peninsula, Perak, Ulu Bubong.

Plant 60–150 cm tall. *Stems* stout. *Leaves*: blades narrowly ovate to elliptic, 12–20 by 5.5–9 cm, base attenuate, margins shallowly dentate, apex acute, upper surface with even covering of stellate hairs with some small sessile glands, lower surface more densely stellate so appearing paler, but showing distinct reticulate venation; petiole 4–8 cm long, with stellate hairs. *Inflorescences* dense, very shortly pedunculate, cymes 4- or more flowered, in axils of lower leaves and on the bare stem below the leaves; peduncles 1–1.5 mm long; bracts red-brown, narrowly ovate, 6–7 mm long, with stellate hairs, persistent; pedicels 1–2 mm long. *Calyx* 5–7 mm long, calyx tube 3–4 mm long with 10 ribs, outer surface pubescent with prominent white stellate hairs, lobes 2–3 mm long, acuminate, narrowing towards ± caudate tips, inner surface red-brown, mostly glabrous but with some short white simple hairs. *Corolla* orange-yellow, c. 2 cm long, the tube straight and very narrow for 0.8–1.5 cm then shortly widening, lobes 3–4 mm long, outer surface with long and short simple white hairs, some glandular, inner surface with short white hairs. *Stamens*: filaments c. 2 cm long with white glandular hairs; anthers c. 1 mm long, grey-green. *Style* and *ovary* glabrous, stigma lobes subequal. *Nutlets* c. 2.5 mm long, glabrous. — **Fig. 16c; Plate 4h.**

Distribution — Peninsular Malaysia, Sumatra, Borneo.

Habitat & Ecology — Lower montane forest. Altitude: 150–1400 m.

Note — This species is easily distinguished in flower by its orange-yellow corolla, distinct in colour and much narrower than the yellowish white corollas of the other

Bornean species. When sterile or fruiting, *G. microcalyx* could be confused with *G. javanicum*, however, its upper stems and generally longer petioles have a more flexuose, slightly sprawling appearance than that of the latter, which is more erect giving a stronger, sturdier appearance. In addition, the leaves of *G. microcalyx* are more delicate, displaying a finer network of veins than the leaves of *G. javanicum*, which are robust and somewhat bullate. The upper surface of the leaves of *G. microcalyx* have a covering of stellate hairs whilst those of *G. javanicum,* though variable, are mostly hispid with only occasional branched or stellate hairs. *Gomphostemma microcalyx* has a small inflorescence almost always on the stem below the leaves, consisting of smaller calyces appearing less prominently ridged than those of *G. javanicum*. The nutlets of *G. microcalyx* are glabrous whilst those of *G. javanicum* have some stellate hairs at the apex.

8. Gomphostemma parviflorum Wall. ex Benth.

Gomphostemma parviflorum Wall. ex Benth. in Wall., Pl. Asiat. Rar. 2 (1830–1831) 12; Miq., Fl. Ned. Ind. 2 (1859) 987; Hook.f., Fl. Brit. India 4 (1885) 697, Prain, Ann. Roy. Bot. Gard. Calcutta 3 (1891) 252, pl. 86; Dunn, Notes Roy. Bot. Gard. Edinburgh 6 (1915) 189; Backer & Bakh.f., Fl. Java 2 (1965) 619. — Lectotype (designated byBongcheewin, Paton & Ingrouille): *Wallich Cat. 2158* (lecto K), East Pakistan [Bangladesh], Sillet.

Gomphostemma dichotomum Zoll. & Moritzi, Syst. Verz. (1846) 54. — Type: *Zollinger 2028* (holo P; iso A, BM 2 sheets, G 2 sheets, P), Java.

Gomphostemma bartlettii Merr., Pap. Michigan Acad. Sci. 19 (1933, '1934') 191. — Type: *Bartlett 7935* (iso L, US), Sumatra, between Panapparan and Pagar Batoe, Habinsaran.

Plant to 3 m tall. *Stems* stout, erect, with white stellate, yellow glandular hairs, giving yellowish brown appearance. *Leaves*: blade elliptic-ovate, 15–20 by 6–10 cm, base attenuate, margins shallowly dentate, apex acute, upper surface hirsute with simple hairs and very few branched hairs, lower surface densely stellate so appearing paler, but showing distinct reticulate venation; petiole 2–5 cm long, also with stellate hairs and with yellow glands. *Inflorescences* lax or condensed, in 4- or more flowered pedunculate, often branched cymes, in axils of leaves; peduncles 5–15 mm long; bracts lanceolate to ovate, 10–15 mm long with stellate hairs, persistent; pedicels 3–6 mm long. *Calyx* 10–14 mm long, calyx tube 5–7 mm long, with 5 prominent ribs, outer surface pubescent, with prominent white stellate hairs with yellow sessile glands, lobes 6–8 mm long, narrowly acuminate, often narrowing to ± caudate tips, inner surface red-brown and densely hirsute with simple white-yellow glandular hairs. *Corolla* white to yellow, 2–2.5 cm long, the tube straight and narrow for 1.2–1.9 cm then shortly widening to narrow throat, lobes 3–4 mm long, outer surface tomentose with white stellate hairs, with yellow glands, inner surface with some short white hairs. *Stamens* with filaments c. 2.5 cm long with white glandular hairs; anthers c. 1.5 mm long with some white hairs. *Style* and *ovary* glabrous, stigma lobes unequal. *Nutlets* 6–8 mm long, smooth and glabrous.

Distribution — India, Burma; in *Malesia*: Sumatra, Java.

Habitat & Ecology — Lowland forest. Altitude: to 1500 m.

Note — Plant distinctly covered with yellow or darkish brown tomentosum.

DOUBTFUL TAXA

Gomphostemma hemsleyanum Prain ex Collett & Hemsl., J. Linn. Soc., Bot. 28 (1890) 116. — Lectotype: (designated byBongcheewin, Paton & Ingrouille): *Collett 887* (lecto CAL; isolecto K), Myanmar, Meiktila.

Note — This species is recorded from Burma and E Java. The specimen Keng refers to in both his 1969 (Gard. Bull. Singapore 24 (1969) 85) and 1978 (in Steenis, Fl. Males., Ser. I, 8 (1978) 321) accounts (pro *Backer 8241*, BO), from extreme E Java, remains the single Javanese record, which Keng claims shows the characteristic disjunct area of species between the drought areas of Burma and Java (see Steenis, Reinwardtia 5 (1961) 426, map 6). Keng appears certain that the general habit and inflorescence of this specimen, though differing in some ways from the type, in his opinion, provide no doubt about the identity, though this must be questionable. *Backer 8241* was not available for further study, and since there are no further collections of this distinct species, the existence of *G. hemsleyanum* in the Flora Malesiana area remains dubious.

18. HOSEA

(R.P.J. de Kok)

Hosea Ridl., J. Straits Branch Roy. Asiat. Soc. 50 (1908) 124; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 200. — Type: *Hosea lobbii* (C.B.Clarke) Ridl.

Hoseanthus Merr., J. Straits Branch Roy. Asiat. Soc. 76 (1917) 114, nom. illeg., nom. superfl. pro *Hosea* Ridl.; Burkill, Econ. Prod. Malay Pen. (1935) 1199. — Type: *Hoseanthus lobbii* (C.B.Clarke) Merr. (= *Hosea lobbii* (C.B.Clarke) Ridl.).

Lianas. *Branches* ± rounded; bark dark brown to grey-brown. *Leaves* simple, decussate; blade glabrous, margin entire; venation arcuate-reticulate. *Inflorescences* axillary compound cymes on long peduncles, comprising terminal thyrses; bracts orange, conspicuous. *Calyx* campanulate, accrescent, margin with (3 or) 4 broadly triangular small teeth. *Corolla* salver-shaped, pale orange, lobes 4, not distinctly 2-lipped. *Stamens* 4, divergent, exserted, anthers versatile. *Ovary* ± ovoid, 4-lobed; style gynobasic, stigma shortly bifid. *Fruit* a schizocarp with up to four mericarps, exocarp fleshy, usually only 1 or 2 developing fully, elongate, narrowed at both ends (fusiform), becoming purple, attachment scar small, basal.

Distribution — Monotypic, one species in Borneo.

Taxonomy — This monotypic genus was recognised when Ridley transferred *Clerodendrum lobbii* C.B.Clarke to *Hosea*, because the species was distinct from *Clerodendrum* in having a 4-lobed corolla and fusiform fruit.

1. Hosea lobbii (C.B.Clarke) Ridl.

Hosea lobbii (C.B.Clarke) Ridl., J. Straits Branch Roy. Asiat. Soc. 50 (1908) 125 ('*lobbiana*'); Masam., Enum. Phanerog. Born. (1942) 641. — *Clerodendrum lobbii* C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 590. — *Hoseanthus lobbii* (C.B.Clarke) Merr., J. Straits Branch Roy. Asiat. Soc. 76 (1917) 114, nom. illeg., gen. superfl. — Type: *Lobb s.n.* (holo K), Borneo, Sarawak ['Penang' – see below].

Clerodendrum discolor Becc., For. Borneo (1902) 203, nom. illeg. (non *Clerodendrum discolor* (Klotzsch) Vatke = *Rotheca myricoides* (Hochst.) Steane & Mabb. var. *discolor* (Klotzsch) Verdc.). — Syntypes: *Beccari PB 35* (FI), Borneo, Sarawak, Kuching; *Beccari PB 3584* (FI), Borneo, Sarawak, Sungei Mahou.

Liana, reaching up to c. 8 m. *Branchlets* glabrous. *Leaves* glabrous to minutely puberulent; blade broadly elliptic to ovate, 6–16 by 4–10.5 cm, 1.5–1.8 times as long as wide, thickly chartaceous, glabrous, apex abruptly acuminate, base ± obtuse, margin entire; secondary veins 6 or 7 pairs, raised abaxially; petiole 1.5–3 cm long. *Inflorescences* formed from axillary compound cymes on long peduncles 7–11 cm long; subtended by orange, ovate, membranaceous leaf-like bracts, 3–9 by 2–5.5 cm; pedicels puberulent. *Calyx* campanulate, 11–12 mm long, minutely puberulent with a few disc-shaped glands externally; lobes 4 (or 3 due to incomplete separation), ovate-triangular, 2–4 mm long; slightly accrescent, elongating to 14–16 mm. *Corolla* orange; tube 14–20 mm long, ± glabrous; lobes 4 (3 obovate and c. 12 mm long; 1 oblong and c. 20 mm long). *Stamens* extending c. 3 cm beyond corolla tube; filaments reddish. *Ovary* puberulent apically. *Fruit* elongate-fusiform, narrowed at both ends, somewhat curved, 1 or 2 mericarps developing per flower, 4–8 cm long, each with a single, elongate seed. — **Fig. 17.**

Distribution — Borneo (Brunei, Sarawak).

Habitat & Ecology — Peat swamp forest and secondary forest, usually along riverbanks. Altitude: 0–20 m.

Note — Many of Thomas Lobb's collecting localities are known to be incorrect (Steenis-Kruseman in Steenis, Fl. Males., Ser. I, 1 (1950) 325). The type was undoubtedly collected during Lobb's time in Sarawak, rather than from Penang (where Lobb was stationed only at intervals between 1845 and 1849, and where this plant is not known to occur) as stated on the sheet and in Clarke's description. The inclusion of *Clerodendrum discolor* in *Hosea lobbii* is discussed by Wearn & Mabberley (Syst. Bot. 36 (2011) 1060).

19. HYPTIS

(G.L.C. Bramley, updated from Keng 1978)

Hyptis Jacq., Collectanea 1 ('1786' 1787) 101, 103, nom. cons.; H.Keng, Gard. Bull. Singapore 24 (1969) 90; in Steenis, Fl. Males., Ser. I, 8 (1978) 368; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 267; Suddee, A.J.Paton & J.Parn., Kew Bull. 59 (2004) 348; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 258; Harley & J.F.B.Pastore, Phytotaxa 58 (2012) 1. — Type: *Hyptis capitata* Jacq.

Herbaceous or shrubby, often aromatic. *Leaves* simple to pinnatifid or subdigitate. *Inflorescences* forming hemispherical or spherical capitula of sessile to subsessile flowers; bracts inconspicuous to leaf-like, sometimes coloured; bracteoles subulate, ligulate or lanceolate to ovate, forming an involucre, usually not reflexing at maturity. *Calyx* actinomorphic to zygomorphic, rarely 2-lipped, 5-lobed (rarely appearing 10-lobed due to appendaged sinuses), often accrescent. *Corolla* 5-lobed, 2-lipped; upper lip 2-lobed, lobes erect or spreading or reflexed; lower lip 3-lobed, the midlobe abruptly deflexed, with thickened margins, sometimes saccate at the base. *Stamens* 4, declinate, exserted; filaments free, without basal appendages; anther-cells confluent. *Disc* entire,

Plate 1. a. *Anisomeles malabarica* (L.) R.Br. ex Simms. – b, c. *Callicarpa havilandii* (King & Gamble) H.J.Lam. b. Flowers, c. fruits. – d. *Callicarpa hispida* (Moldenke) Bramley. – e, f. *Callicarpa longifolia* Lam. e. Flowers, f. fruits. – g. *Callicarpa involucrata* Merr. – h. *Callicarpa pentandra* Roxb. – i. *Callicarpa woodii* Merr. Photos by Gemma Bramley.

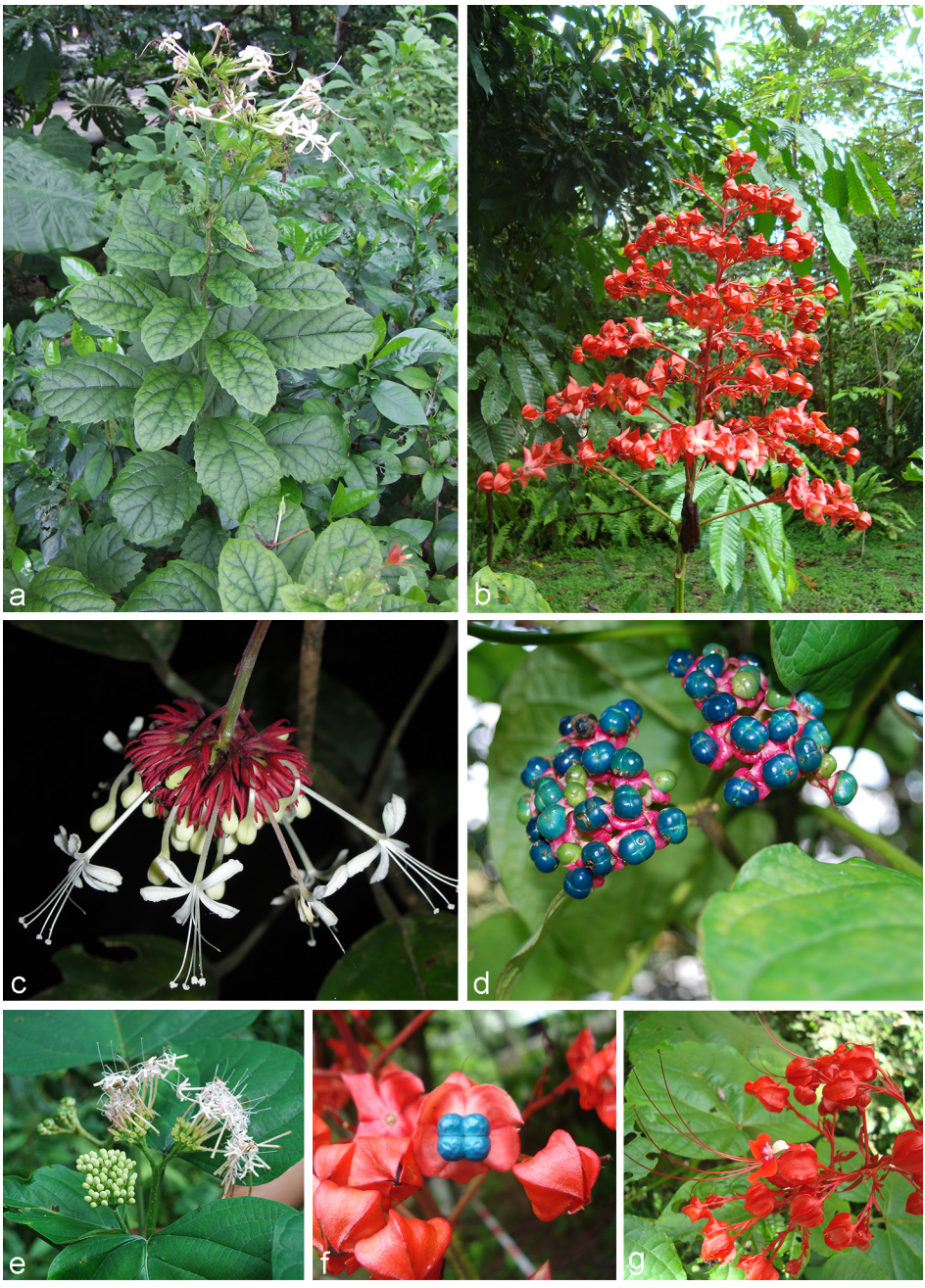

Plate 2. a. *Clerodendrum calamitosum* L. – b, f, g. *Clerodendrum japonicum* (Thunb.) Sweet var. *bethuneanum* (H.Low) Wearn & Mabb. b: Inflorescences; f. fruits; g. flowers. – c. *Clerodendrum deflexum* Wall. – d, e. *Clerodendrum colebrookianum* Walp. d. Fruits; e. flowers. Photos: a, b, f, g by James Wearn; c by Tim Utteridge; d, e by David Mabberley.

Fig. 17. *Hosea lobbii* (C.B.Clarke) Ridl. a. Habit; b. leaves with inflorescence; c. flower; d. fruit (a: *Purseglove P 4406*; b, c: *Sinclair & Kadim bin Tassim 10411*; d: *Atkins 517*; all L). Drawing by Esmée Winkel, 2012.

equal-sided to weakly 4-lobed. *Style* gynobasic, with stylopodium absent or present. *Fruit* a schizocarp, dividing into 4 nutlets. *Nutlets* narrowly ellipsoid or ovoid, smooth or rugose sometimes only one or two developed, mucilaginous or not, attachment scar basal.

Distribution — Species about 144, all New World, but several species widespread weeds in the Old World tropics; in *Malesia* the two species recorded have become naturalized as weeds.

Note — *Hyptis* has been subject to a number of taxonomic changes (Harley & Pastore 2012), and has been split into a number of new and resurrected genera. Keng (1978) recognised five species of *Hyptis* in Malesia. Two of these remain in *Hyptis*, the other three are now assigned to other genera. *Hyptis spicigera* is now recognised as *Cantinoa americana*; *Hyptis pectinata* and *Hyptis suaveolens* are now in *Mesosphaerum*.

KEY TO THE SPECIES

1a. Flowering heads 0.8–1.2 cm diam. in fruit; peduncles 1–1.2 cm long . . . . . **1. H. brevipes**

b. Flowering heads 1.5–2 cm diam. in fruit; peduncles 3–5(–8) cm long . . . . . **2. H. capitata**

1. Hyptis brevipes Poit.

Hyptis brevipes Poit., Ann. Mus. Natl. Hist. Nat. 7 (1806) 465; Miq., Fl. Ned. Ind. 2 (1858) 959; Hook.f., Fl. Brit. India 4 (1885) 630; Ridl., Fl. Malay Penins. 2 (1923) 645; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 416; Pl. Elmer. Born. (1929) 268; Backer & Bakh.f., Fl. Java 2 (1965) 634. — *Mesosphaerum brevipes* (Poit.) Kuntze, Revis. Gen. Pl. 2 (1891) 525. — Type: *Bonpland 1583* (holo P; iso P), Colombia, Rio Magdalena.

Hyptis acuta Benth., Linnaea 6 (1831) 82. — Type: *Scheide & Deppe s.n.* (holo B†), Mexico, Mesachica.

Thymus biserratus Blanco, Fl. Filip. (1837) 478. — *Pycnanthemum subulatum* Blanco, Fl. Filip., ed. 2 (1845) 333; Fl. Filip., ed. 3, 2 (1878) 251, t. 204; Merr., Sp. Blancoan. (1918) 338. — Neotype (designated by Suddee et al., Kew Bull. 59 (2004) 345): *Merrill Species Blancoanae 478* (neo K; isoneo L), Philippines, Luzon, Batangas prov.

Leucas globulifera Hassk., Cat. Hort. Bot. Bogor. (1844) 133; Miq., Fl. Ned. Ind. 2 (1859) 984. — Type: *Hasskarl s.n.* (holo L), Java.

Hyptis brevipes Poit. var. *serrata* Briq., Annuaire Conserv. Jard. Bot. Genève 2 (1898) 227. — Syntypes: *Cuming 1113* (G-DC, K, L, TCD), Philippines, Luzon; *Gaudichaud 175* (G-DEL), Philippines, Manille; *Delessert s.n.*, 1835 (G-DEL), Indes orientales, Pulo-Pinang; *Rusby & Squires 78* (G-DEL, M), Venezuela, Sacupana.

Mentha javanica auct. non Blume: Span., Linnaea 15 (1841) 332.

Erect herb, 0.5–1.5 m high, not aromatic. *Stems* 4-angled, shortly branched, glabrous or pilose. *Leaves*: blades very narrowly ovate or ovate-oblong, 4–8 by 1–2.5 cm, apex acute or acuminate, base attenuate, decurrent on petiole, margin irregularly serrate, sparsely hispid on venation on both surfaces; petiole 0.5–1 cm long, hispid. *Inflorescences* of axillary spherical capitula, 0.6–0.8 cm diam., in fruit 0.8–1.2 cm diam., peduncles 1–1.2 cm long, with antrorse hairs; bracts subtending heads very narrowly ovate to subulate, 4–8 mm long, sessile, persistent, often deflexed. *Calyx*

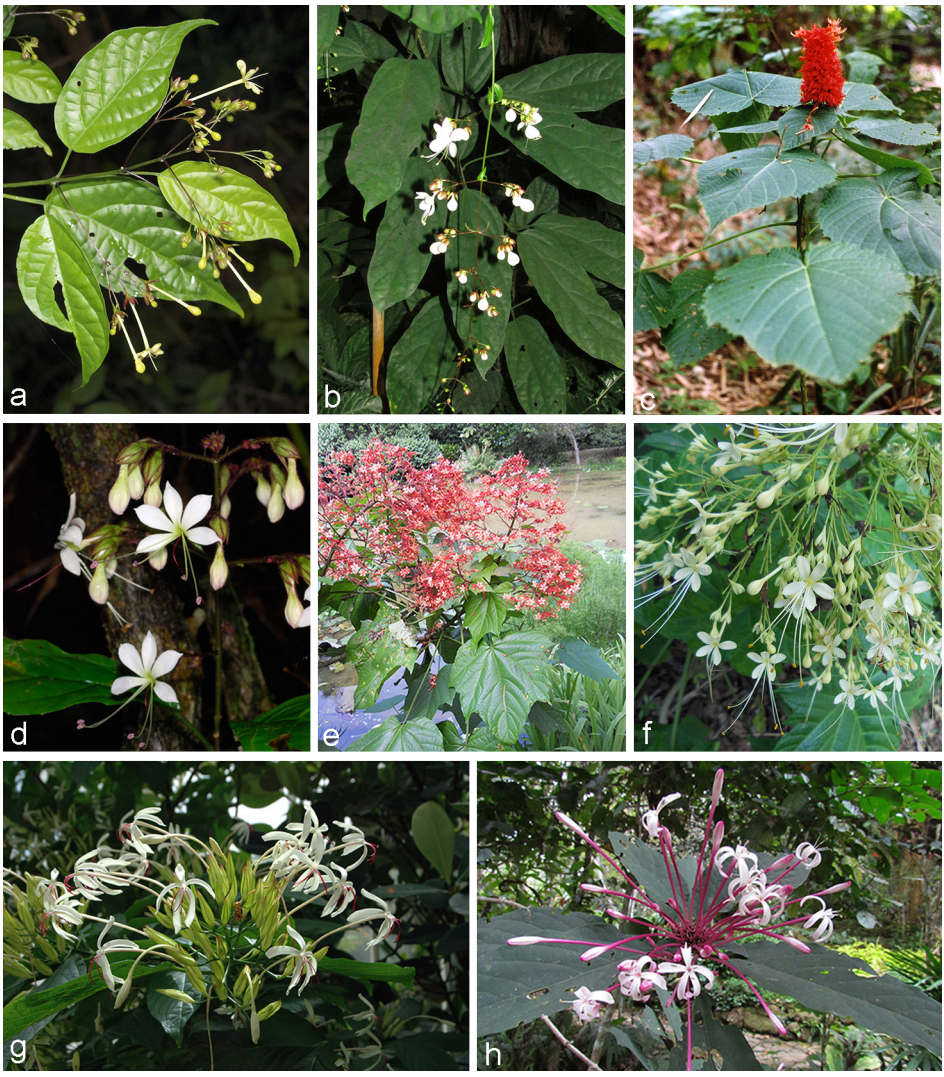

Plate 3. a. *Clerodendrum disparifolium* Blume. – b. *Clerodendrum nutans* Wall. ex Jack. – c. *Clerodendrum rumphianum* de Vriese & Teijsm. – d. *Clerodendrum kinabaluense* Stapf. – e, f. *Clerodendrum paniculatum* L. e. Pink flowers; f. white flowered cultivar. – g. *Clerodendrum minahassae* Teijsm. & Binn. – h. *Clerodendrum quadriloculare* (Blanco) Merr. Photos: a by Tim Utteridge; b, e, f, h by James Wearn; c by Roy Ellen; d, g by Eric Hunt (used with permission).

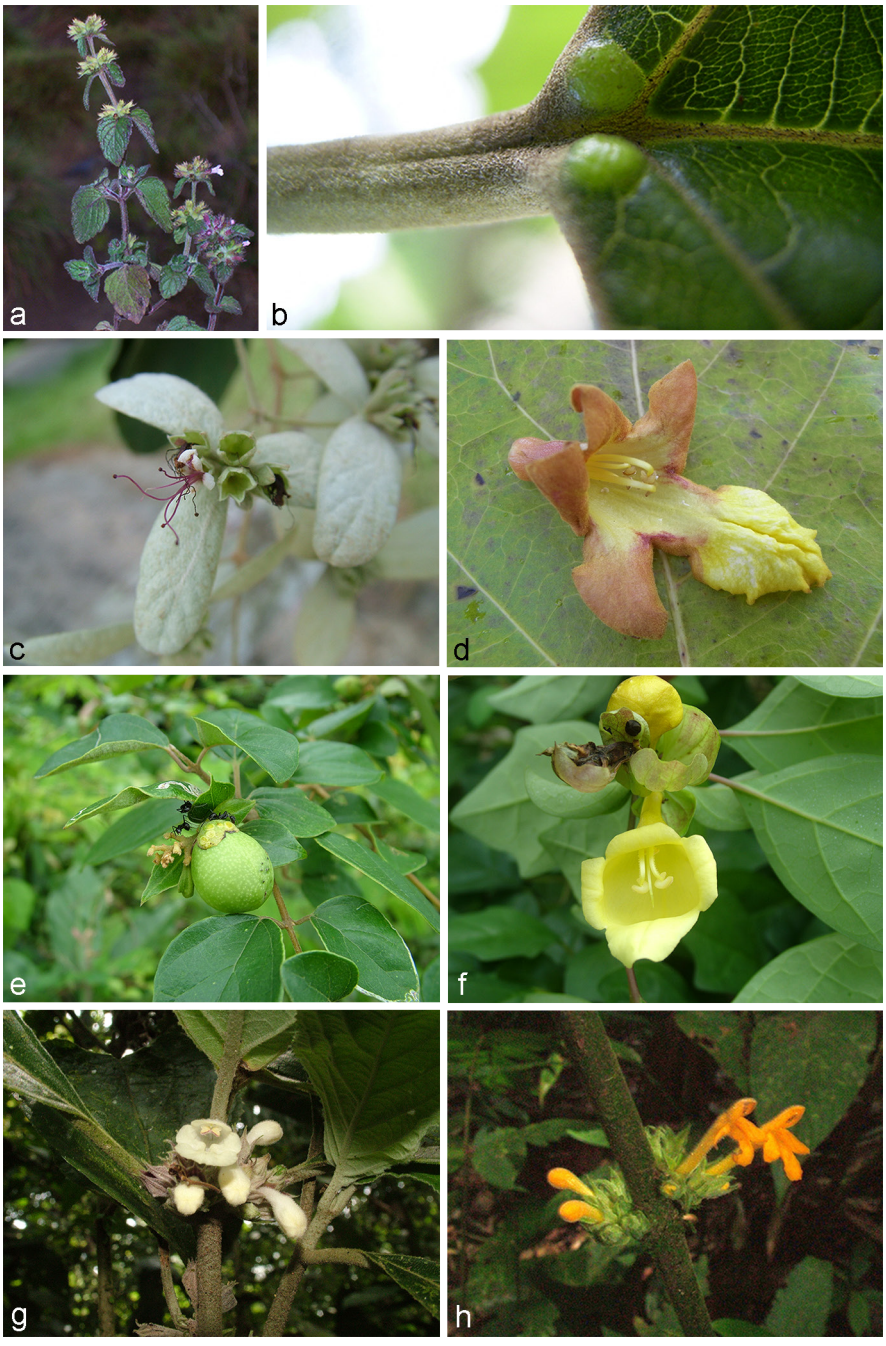

Plate 4. a. *Clinopodium umbrosum* (M.Bieb.) Kuntze. – b, d. *Gmelina* L. b: leaf glands; d: flower. – c. *Congea tomentosa* Roxb. – e. *Gmelina elliptica* Sm. – f. *Gmelina philippinensis* Cham. – g. *Gomphostemma javanicum* (Blume) Benth. – h. *Gomphostemma microcalyx* Prain. Photos: a by Bhanubong Bongcheewin; b, d by Rogier de Kok; c, e–h by Gemma Bramley.

funnel-shaped, 2.5–3.5 mm long, in fruit 3.5–4 mm long; lobes erect, subulate, 1–1.4 mm long, sparsely ciliate. *Corolla* white, 3–5 mm long; lips glandular, the lower lip yellowish. *Anthers* purple. *Disc* minute. *Nutlets* ovoid, 0.5–0.8 mm long, dark brown or black, minutely rugose, not mucilaginous when wet. — **Fig. 18a–c; Plate 5a.**

Distribution — Native of Mexico, naturalized in and now found throughout *Malesia* and other Old World tropics.

Habitat & Ecology — Waste places, often abundant in fallow rice-paddies, mainly under everwet climatic conditions, rather rare in seasonally dry areas, ascending to c. 1675 m (Kinabalu area). Flowering: throughout the year. Keng (1978) noted that this species has been found once at high altitude (c. 3100 m) on the summit of Mt Agung, Bali, in small, condensed but flowering specimens. This is explained by exozoic dispersal of seed by either game or monkeys, or by Balinese who annually pilgrimage this sacred summit.

Vernacular names — Peninsular Malaysia: Ati-ati putĕh, Gantanggau, Kanching baju, Sawi ĕnggang, Sawi hutan (Malay). Sumatra: Ane-ane (Malay). Java: Boborondongan, Bohorongan, Djukut pĕndjul, Gĕnggèjan, Kanĕju, Ki heuleud, Mala munding (Sundanese); Godong pusĕr (Javanese). Borneo: Kumpai huluman. Philippines: Albaka (Sulu); Lombar-kombaran, Lingalingalingahan, Pansi-pansi, Pompul-ponipidan (Tagalog); Lubulan (Subanum); Niog-nidgan (Bikol, Panay Bisaya); Pulipul (Ifugao). Sulawesi: Pupulut alus, Tutumbalen (Minahassa).

Uses — In Malaysia the leaves are sometimes eaten. A decoction of the leaves is considered a protective medicine after childbirth; also used to drive out worms in children by application to the abdomen (Burkill, Dict. Econ. Prod. Malay Penins. (1935) 1220).

2. **Hyptis capitata** Jacq.

Hyptis capitata Jacq., Collectanea 1 (1787) 102; Miq., Fl. Ned. Ind. 2 (1858) 958; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 416; Backer & Bakh.f., Fl. Java 2 (1965) 634. — *Clinopodium capitatum* (Jacq.) Sw., Prodr. Veg. Ind. Occ. (1788) 88. — *Mesosphaerum capitatum* (Jacq.) Kuntze, Revis. Gen. Pl. 2 (1891) 525. — Type: Plumier, Plantarum Americanum Fasciculus Primus 7 (1758) t. 163, f. 2.

Hyptis rhomboidea M.Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 11, 2 (1844) 188; H.Keng, Gard. Bull. Singapore 24 (1969) 92, f. 15; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 267. — Type: *Galeotti 679* (holo BR), Mexico, Vera-Cruz.

Pycnanthemum decurrens Blanco, Fl. Filip., ed. 2 (1845) 333; Fl. Filip., ed. 3, 2 (1878) 251, t. 294. — *Hyptis decurrens* (Blanco) Epling, Repert. Spec. Nov. Regni Veg. 34 (1933) 120. — Neotype (designated by Suddee et al., Kew Bull. 59 (2004) 346): *Merrill Species Blancoanae 472* (neo K; isoneo L), Philippines, Luzon, Rizal prov., Antipolo.

[*Hyptis celebica* Zipp. ex Koord., Meded. Lands Plantentuin 19 (1898) 561, nom. nud.]

Hyptis mariannarum Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3A (1897). — Type: *Gaudichaud 110* (holo G-DEL), Iles Mariannes [= Guam].

Thymus virginicus auct. non L.: Blanco, Fl. Filip. (1837) 478.

Hyptis lanceolata auct. non Poir.: Briq., Annuaire Conserv. Jard. Bot. Genève 2 (1898) 225; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 416.

Stout, erect annual herb, 0.5–2.5 m high, not aromatic. *Stems* and *branches* (often very short) densely or sparsely pubescent with antrorse hairs on the angles. *Leaves*: blade lanceolate or rhomboid-elliptic, 6–10(–14) by 1.5–4(–6) cm, apex acute to

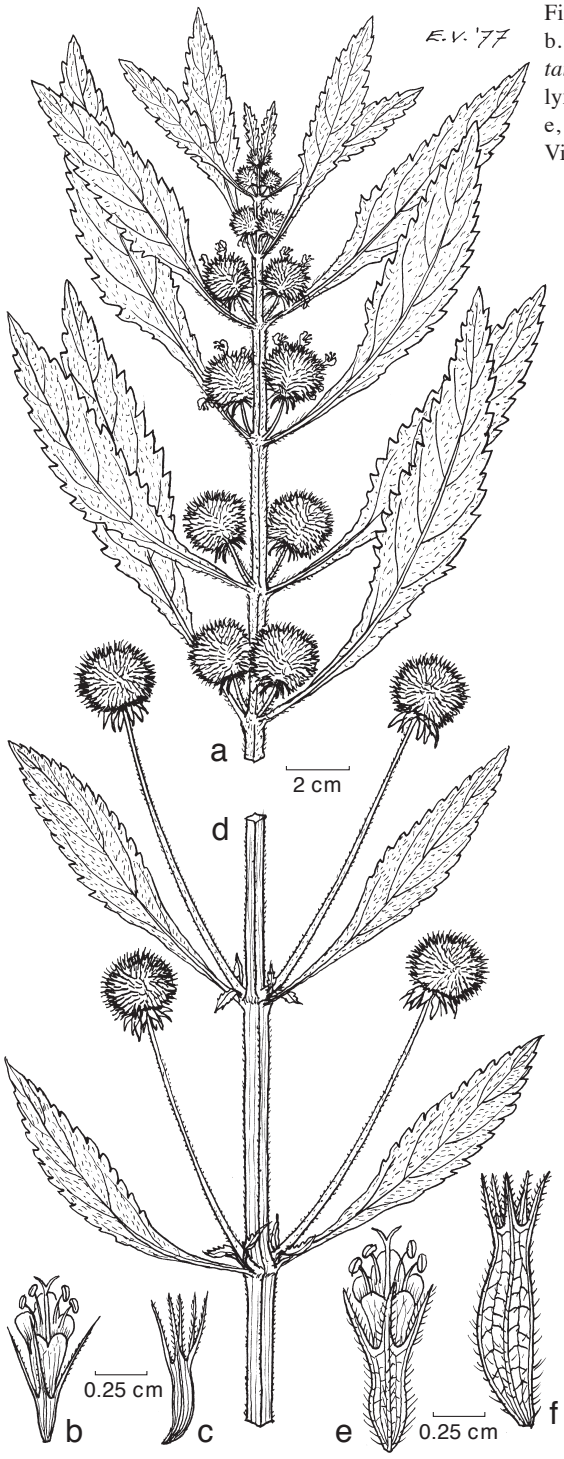

Fig. 18. a–c. *Hyptis brevipes* Poit. a. Habit; b. flower; c. fruiting calyx. — d–f. *H. capitata* Jacq. d. Habit; e. flower; f. fruiting calyx (a–c: *Schiffner 2471*; d: *Schiffner 2868*; e, f: *Schiffner 2484*; all L). Drawing by Ed Vijsma, 1977.

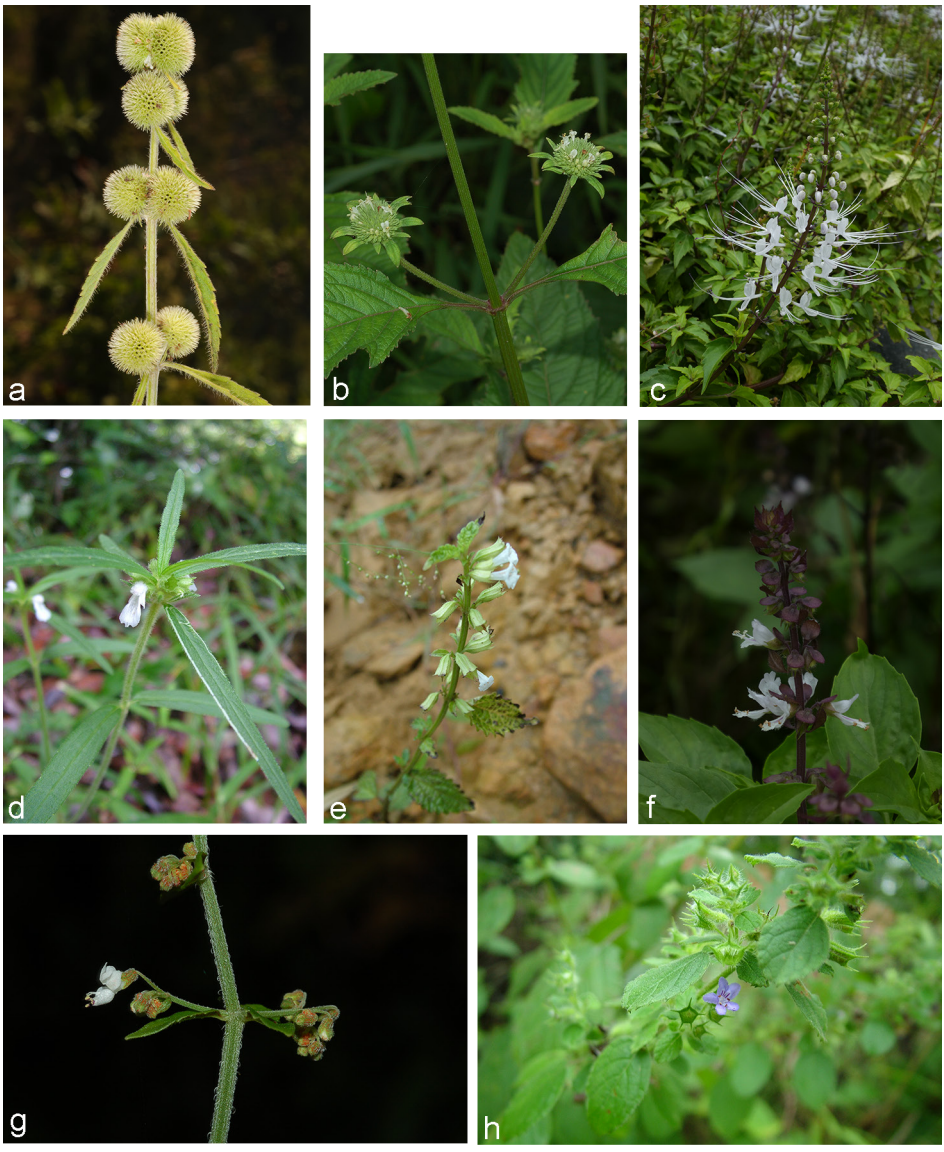

Plate 5. a. *Hyptis brevipes* Poit. – b. *Hyptis capitata* Jacq. – c. *Orthosiphon aristatus* (Blume) Miq. – d. *Leucas zeylanica* (L.) W.T.Aiton. – e. *Melissa axillaris* (Benth.) Bakh.f. – f. *Ocimum basilicum* L. – g. *Isodon lophanthoides* (Buch.-Ham. ex D.Don) H.Hara. – h. *Mesosphaerum suaveolens* (L.) Kuntze. Photos: a, b, g by Somran Suddee; c, f by Bhanubong Bongcheewin; d, e, h by Gemma Bramley.

Plate 6. a. *Platostoma cochinchinense* (Lour.) A.J.Paton. – b. *Rotheca serrata* (L.) Steane & Mabb. – c, e. *Premna serratifolia* L. c. Inflorescence; e. flowers. – d. *Premna trichostoma* Miq. – f. *Salvia misella* Kunth. Photos: a by Somran Suddee; b–d by Gemma Bramley; e, f by Tim Utteridge.

acuminate, base attenuate, decurrent on petiole, margin crenate-serrate to irregularly serrate, sparsely pubescent above and below, especially on the venation of lower surfaces; petiole 2–3 cm long. *Inflorescences* of single, axillary spherical capitula with numerous flowers, 0.8–1 cm diam. (1.5–2 cm in fruit); peduncle 3–5(–8) cm long, basal involucral bracts linear to very narrowly ovate, 3–10 mm long, hairy. *Calyx* 3–4 mm long, in fruit 6–8 mm long; lobes subulate, erect, as long as or slightly shorter than the tube. *Corolla* white, violet-dotted, 5–6 mm long; upper and lower lips with some hair and sessile glands. *Anthers* purple. *Nutlets* brown, ovoid, 1.2–2 mm long, smooth, not mucilaginous when wet. — **Fig. 18d–f; Plate 5b.**

Distribution — Native of tropical America, naturalized in all tropics; throughout *Malesia*.

Habitat & Ecology — Open, sunny to slightly shaded waste places, along water courses, on fallow paddies, also in teak-forest, in E Java under seasonal conditions and sometimes gregarious. Altitude: sea-level to 1300 m. Flowering: throughout the year.

Vernacular names — Sumatra: Morroguni, Wurakapiki. Borneo: Lubok bulu; Sarawak: Dan buku napsu, Oaga bini; Brunei: Tembuku-tembuku, Timan-timan. NE Philippines: Bababanga, Leng-lenga, Tetetei (Bontok); Botonesan, Kambali, Kombar-kombaran, Linga-lingahan, Turukan (Tagalog); Palapasagi (Panay Bisaya); Palopalot, Tuhulisan (Iloko); Pansi-pansi, Tarotabako (Bikol); Tabaku-labaku (Sulu). Sulawesi: Aring kaming, Kan-i-lamperan-sela, Kide, Pentengipus, Rumput kembang gros, R. (ne) membe, Tutumbalen, Tutumbalen sela (Minahassa). Lesser Sunda Islands: Abgoanam, Ilite bublong, Merara welana, Tatabak. New Guinea: Pupu.

Uses — In the Philippines a decoction of the leaves is used for cleansing wounds and against amenorrhoea (Quisumbing, Medic. Pl. Philip. (1951) 817).

Note — There has been confusion surrounding the names *H. capitata* and *H. rhomboidea*. Epling (1933: 120) first referred the Malesian specimens to *H. decurrens* (Blanco) Epling, but in his monograph of 1949 (Revista Mus. La Plata, Secc. Bot. 7 (1949)) he reduced this to *H. rhomboidea* M.Martens & Galeotti, a name that Keng (1969) also used. However, in Keng's later Flora Malesiana account (1978) he chose to use the name *H. capitata*, remarking that after a close study of many specimens from various parts of the world, he agreed with Bentham, Miquel, and Merrill in accepting the name *H. capitata*.

EXCLUDED

Based on Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 386):
Hyptis atrorubens Poit., Ann. Mus. Natl. Hist. Nat. 7 (1806) 466; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 417.

The record of the presence of this American species in Manila is based on a specimen collected by Meyen; "I [Keng] have not seen this specimen but Merrill (1923) suggested that it may be an erroneous identification".

20. ISODON

(G.L.C. Bramley)

Isodon (Schrad. ex Benth.) Spach, Hist. Nat. Vég. 9 (1840) 162; H.W.Li, J. Arnold Arbor. 69 (1988) 291; A.J.Paton & Ryding, Kew Bull. 53, 3 (1998) 723; Suddee, A.J.Paton & J.Parn., Kew Bull. 59 (2004) 337; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 256. — *Plectranthus* L'Hér. sect. *Isodon* Schrad. ex Benth., Labiat. Gen. Spec. (1832) 40; in A.DC., Prodr. 12 (1848) 55; Hook.f., Fl. Brit. India 4 (1885) 616. — Lectotype (designated by Codd, Taxon 17 (1968) 239): *Isodon rugosus* (Wall. ex Benth.) Codd.

Rabdosia (Blume) Hassk., Flora 25 (Beibl. 2) (1842) 25. — Type: *Rabdosia javanica* (Blume) Hassk. (= *Isodon coetsa* (Buch.-Ham. ex D.Don) Kudô).

Annual or perennial herbs or undershrubs. *Indumentum* of simple hairs. *Stems* sometimes woody at base, quadrangular or round-quadrangular, glabrous or pubescent and usually hollow inside. *Leaves*: blade membranaceous to chartaceous, usually serrate or sometimes serrate-crenate. *Inflorescences* terminal and axillary, usually branched, forming a small or large panicle; cymes pedunculate, lax to dense, few- to many-flowered; bracts with lower pairs similar to leaves, gradually reduced in size upwards, persistent; bracteoles present, short, persistent. *Calyx* campanulate, in fruit declinate, inconspicuously bilabiate with upper lip 3-lobed and lower lip 2-lobed; tube 10-nerved, usually twice or more as long as teeth, without spur at base. *Corolla* with upper lip subequally 4-lobed; lower lip orbicular; tube straight then usually gibbous on upper side near base. *Stamens* declinate, exserted or included, villous at base; lower pair inserted above the middle of corolla tube; upper pair inserted near the base of corolla tube. *Disc* with equal sides or with anterior side well-developed but not exceeding ovary. *Ovary* glabrous; style gynobasic, longer than stamens. *Fruit* a schizocarp of four nutlets. *Nutlets* oblong or ovoid, c. 1 mm long, smooth, producing mucilage when wet or not, attachment scar basal.

Distribution — About 100 species in tropical and subtropical Asia; two species in tropical Africa; in *Malesia* 3 species, one rarely collected in Peninsular Malaysia, one found in Java, Lesser Sunda Islands and Sulawesi, and the third more widespread (not Borneo or New Guinea).

Note — *Isodon* was not recognised by Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 386); since Keng's account, generic relationships in Lamiaceae tribe Ocimeae have been subject to numerous studies (e.g., Paton & Ryding 1998; Harley et al., Kew Bull. 58 (2003) 485), and a number of changes have been published (see also major changes to *Platostoma*). Two of the *Isodon* species recognised here were considered *Plectranthus* species by Keng; the third species is a new record for Flora Malesiana. *Isodon* belongs in subtribe Hanceolinae (Harley et al. 2004); the main character separating it from *Plectranthus* is the stamen morphology: in *Isodon*, the two pairs of stamens are inserted at different points in the corolla tube (upper pair usually attached at corolla midpoint, lower pair usually attached at corolla throat); in *Plectranthus*, both stamen pairs are adjacent at attachment to the corolla.

Plate 7. a. *Sphenodesme triflora* Wight. – b. *Sphenodesme* Jack, flower. – c–e. *Teijsmanniodendron pteropodum* (Miq.) Bakh. c. Leaf aestivation; d. fruit; e. leaves. – f. *Teijsmanniodendron glabrum* Merr. Photos: a, b: Gemma Bramley; c–f by Rogier de Kok.

Plate 8. a. *Vitex longisepala* King & Gamble. – b. *Vitex gamosepala* Griff. – c. *Vitex vestita* Wall. ex Walp., leaves. – d, e. *Vitex pinnata* L. d. Flower; e. fruit. Photos: a, c–e by Gemma Bramley; b by Tim Utteridge.

KEY TO THE SPECIES

1a. Stamens and style included or subincluded. Corolla violet-blue to pale blue . . . . . **1. I. coetsa**
b. Stamens and style much exserted. Corolla predominantly white to pinkish white, sometimes with some purple spotting 2
2a. Corolla tube not gibbous . . . . . **2. I. lophanthoides** var. **lophanthoides**
b. Corolla tube gibbous near base . . . . . **3. I. teysmannii**

1. Isodon coetsa (Buch.-Ham. ex D.Don) Kudô

Isodon coetsa (Buch.-Ham. ex D.Don) Kudô, Mem. Fac. Sci. Taihoku Imp. Univ. 2 (1929) 131; Suddee, A.J.Paton & J.Parn., Kew Bull. 59 (2004) 254. — *Plectranthus coetsa* Buch.-Ham. ex D.Don, Prodr. Fl. Nepal (1825) 117. — *Ocimum coetsa* (Buch.-Ham. ex D.Don) Spreng., Syst. Veg. 4 (1827) 223 ('*Ocymum*'). — *Rabdosia coetsa* (Buch.-Ham. ex D.Don) H.Hara, J. Jap. Bot. 47 (1972) 194. — Type: *Buchanan-Hamilton s.n.* (holo BM), Nepal, Narainhetty.

Elsholtzia javanica Blume, Bijdr. (1826) 525. — *Plectranthus javanicus* (Blume) Benth., Labiat. Gen. Spec. (1832) 45; Miq., Fl. Ned. Ind. 2 (1858) 946; Backer & Bakh.f., Fl. Java 2 (1965) 636; H.Keng, Gard. Bull. Singapore 24 (1969) 142; Steenis, Mountain Fl. Java (1972) pl. 25-2; H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 386. — *Rabdosia javanica* (Blume) Hassk., Flora 25 (Beibl.2) (1842) 25. — *Isodon javanicus* (Blume) H.W.Li, J. Arnold Arbor. 69 (1988) 330. — Lectotype (designated here): *Blume s.n.* (lecto L; isolecto K, L 2 sheets), Java, Buitenzorg.

Plectranthus intermedius Zoll. & Moritzi, Syst. Verz. (1846) 55. — Type: *Zollinger s.n.* (not located), Java, river Tjapoes.

Plectranthus rufescens Benth. in A.DC., Prodr. 12 (1848) 59; Miq., Fl. Ned. Ind. 2 (1858) 945. — Type: ?*Zollinger s.n.* (not located), Java.

Plectranthus diffusus Merr., Philipp. J. Sci., C 4, Suppl. (1906) 235; Philipp. J. Sci., C 5 (1910) 382; Enum. Philipp. Fl. Pl. 3 (1923) 418; Steenis, Bull. Jard. Bot. Buitenzorg Ser. 3, 13 (1934) 222. — Type: *Merrill 4554* (holo PNH†; iso K, NY), Philippines, Luzon, Lepanto dist., Mt Data.

[*Moschosma philippinense* Elmer, Leafl. Philipp. Bot. 10 (1939) 3809, nom. nud.]

Ocimum tenuiflorum auct. non L.: Blume, Catalogus (1823) 83.

Plectranthus menthoides auct. non Benth.: Zoll. & Moritzi, Syst. Verz. (1846) 55.

Herb or undershrub, 0.8–3 m high, often much branched, fetid when bruised but not aromatic. *Stems* and *branches* angled, slender, pubescent with retrorse hairs. *Leaves*: blade ovate to oblong-ovate or rhomboid, 2–5(–8) by 1–2.5(–5) cm, apex acuminate, base acute or rounded, margins serrate, the serrations with mucronate tips, with appressed hairs on both surfaces, these more dense on the venation below; petiole 0.5–1 cm long. *Inflorescences* of lax, lateral, stalked cymes, forming large compound terminal panicles, 20–30 (or more) cm long; bracts foliaceous, gradually reduced upwards, sessile within inflorescence, ovate. *Calyx* 1.5–2 mm long, in fruit 4.5–5 mm long, slightly gibbous then pinched in before widening at mouth, hairy especially around base, tube sparsely hairy, subequally 5-lobed, lobes deltoid, acute. *Corolla* violet-blue to pale blue, 5–10 mm long, upper lip pubescent with sessile glands on back, lower lip 2.5–6 mm long, pubescent, with sessile glands outside; tube straight, 2.5–4 mm long, slightly gibbous on upper side. *Stamens* free; filaments pubescent below, included in the lower lip of corolla. *Style* included. *Nutlets* ovoid or ellipsoid, c. 1 mm long, glabrous, smooth, brown to black. — **Fig. 19.**

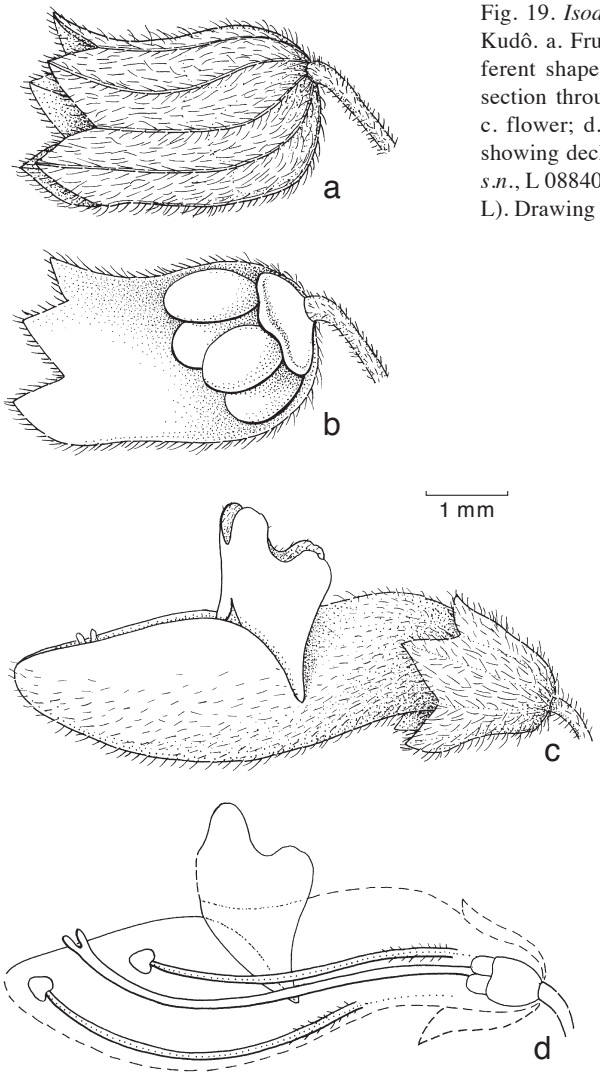

Fig. 19. *Isodon coetsa* (Buch.-Ham. ex D.Don) Kudô. a. Fruiting calyx, larger and slightly different shape than flowering one; b. schematic section through fruiting calyx showing nutlets; c. flower; d. schematic section through flower showing declinate stamens and style (a, b: *Went s.n.*, L 0884013; c, d: *van Ooststroom 13909*; all L). Drawing by Anita Walsmit Sachs, 2012.

Distribution — N Sumatra (Karo, Mt Kerintji), Java (from Mt Gedeh eastwards), the Philippines (N Luzon), Sulawesi, Lesser Sunda Islands (Bali, Lombok, Sumbawa, Flores, Timor).

Habitat & Ecology — Forest edges and secondary growths, clearings, grassland, also in *Casuarina* forest, along streams, and in glades. Altitude: (850–)1000–2400 m. Flowering: throughout the year.

Vernacular names — Rheumatiek plant (Dutch). Sumatra: Lating ajam (Malay). Java: Jangelan, Sangketan (Javanese); Surawung langit, Tjuru (Sundanese). Bali: Sangket sangket. Philippines: Bungbungtit (Igorot).

2. Isodon lophanthoides (Buch.-Ham. ex D.Don) H.Hara var. **lophanthoides**

Isodon lophanthoides (Buch.-Ham. ex D.Don) H. Hara var. *lophanthoides*: H.Hara, J. Jap. Bot. 60 (1985) 235; H.W.Li, J. Arnold Arbor. 69 (1988) 334; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 278; Suddee, A.J.Paton & J.Parn., Kew Bull. 59 (2004) 365. — *Hyssopus lophanthoides* Buch.-Ham. ex D.Don, Prodr. Fl. Nepal. (1825) 110. — *Rabdosia lophanthoides* (Buch.-Ham. ex D.Don) H.Hara, J. Jap. Bot. 47 (1972) 197. — *Plectranthus lophanthoides* (Buch.-Ham. ex D.Don) Grierson & D.G.Long, Notes Roy. Bot. Gard. Edinburgh 40 (1982) 177. — Neotype (designated by Suddee et al. 2004): *Robert Blinkworth* in *Wallich Cat. 2742B* (neo K-W; isoneo BM, K), Nepal.

Erect or ascending annual or short-lived perennial herb or undershrub up to 1 m tall. *Stems* quadrangular, branched or not, glabrescent to pubescent. *Leaves* well-spaced on the stem or basally clustered; blade broadly ovate or ovate, 1.5–4 by 0.8–3 cm, apex acute or obtuse, base broadly cuneate, cuneate, subtruncate or sometimes cordate, margins serrate or crenate, pubescent above, glabrescent to pubescent and dotted with minute sessile glands beneath, greenish, purplish or yellowish brown when dry, veins subprominent both sides; petioles up to 2 cm long in lower leaves, gradually reduced in length and becoming absent on upper leaves, glabrescent to pubescent. *Inflorescences* terminal and axillary, composed of several lax narrow racemose branches, forming a large panicle, with axis glabrous to pubescent; cymes with peduncle up to 15 mm long, lax or dense; bracts ovate, adaxially glabrous or glabrescent, abaxially glabrescent to pubescent, with sessile glands, persistent; bracteoles linear or linear-oblong, 0.5–2 mm long, pubescent, caducous or persistent; pedicels up to 8 mm long in flower and fruit, pubescent. *Calyx* campanulate, 1–2 mm long at anthesis, pubescent with hairs denser at tube base, tubular-campanulate, 3–4 mm long in fruit, inconspicuously 2-lipped; lobes subequal, triangular-ovate, usually obtuse at apex, not gibbous at anterior base. *Corolla* pinkish white, straight, 4–6 mm long; upper lip glabrous or pubescent, with sessile glands on back, lower lip 1–3 mm long, glabrous all over or slightly pubescent at base of lobe inside, with sessile glands outside; tube 2–5 mm long, not gibbous at base, slightly dilated at throat, glabrous or slightly pubescent, with or without sessile glands outside. *Stamens* long-exserted, villous at base; anterior pair inserted above the middle of corolla tube; posterior pair inserted near the base of corolla tube. *Style* long-exserted, longer than stamens. *Nutlets* brown, ovoid or oblong, 0.8–1 mm long, smooth. — **Plate 5g.**

Distribution — India, Nepal, Bhutan, S China, Burma, Laos, Thailand and Vietnam; in *Malesia*: Peninsular Malaysia (Cameron Highlands).

Habitat & Ecology — Amongst wayside vegetation, sometimes at high altitude. In *Malesia*, collected once at c. 75 m (250 ft), and once at 1800–1899 m.

Note — *Isodon lophanthoides* has been collected twice in Peninsular Malaysia, once from Gunung Brinchang in the Cameron Highlands, and once from Sungai Telom, an area to the south of the first locality. The disjunct distribution between the most southern areas in which *I. lophanthoides* occurs in Central Thailand and southern Vietnam (see Suddee et al. (2004) 368), is unusual, and further fieldwork may be likely to result in more records of this species being found in Peninsular Malaysia.

3. Isodon teysmannii (Miq.) H.W.Li

Isodon teysmannii (Miq.) H.W.Li, J. Arnold Arbor. 69 (1998) 332. — *Plectranthus teysmannii* Miq., Fl. Ned. Ind. 2 (1858) 944; Backer & Bakh.f., FI. Java 2 (1965) 636; H.Keng, Gard. Bull. Singapore 24 (1969) 144; in Steenis, Fl. Males., Ser. I, 8 (1978) 386. — Syntypes: *Teysmann s.n.* (U 2 sheets), Java.

Plectranthus benthamianus Miq., Fl. Ned. Ind. 2 (1858) 946. — Type: *Horsfield Lab. 21* (iso BM, K), Java.

Plectranthus zollingeri Briq., Annuaire Conserv. Jard. Bot. Genève 2 (1898) 234. — Type: *Zollinger 2215* (not located), Java.

Plectranthus punctatus auct. non L'Hér.: Blume, Catalogus (1823) 84.

Erect herb or undershrub, 0.5–1.5 m high. *Stems* and *branches* tetragonous, slender, pubescent. *Leaves*: blade ovate or elliptic-ovate, 2.5–5 by 1.5–3.5 cm, apex acute or acuminate, base truncate or rounded, rarely acute, margin serrate-dentate, puberulent above, densely glandular-pubescent beneath; petiole 0.2–1 cm long; upper leaves sessile or even amplexicaulous. *Inflorescences* of lax stalked cymes disposed in lateral thyrses, forming a large terminal panicle 10–15(–20) cm long, 4–5 cm wide. *Calyx* subcampanulate, 1.5–2 mm long, in fruit 3.5–4 mm long, with short hairs on the veins and sessile glands, subequally 5-lobed, lobes deltoid, blunt or rounded. *Corolla* white with small lilac dots on upper lip, 5–6 mm long, both upper and lower lips c. 1.5 mm long, tube straight, gibbous above. *Stamens* and *stigma* long exserted. *Nutlets* ovoid, 0.8–1 mm long.

Distribution — Java (from Priangan Mts Tilu and Papandajan eastwards), C and S Sulawesi, Lesser Sunda Islands (Bali, Lombok, Sumbawa, Flores).

Habitat & Ecology — Grasslands, thickets, forest edges, also in *Casuarina* forest, never in marshy places. Altitude: 1400–2700 m in the Lesser Sunda Islands and Celebes as low as c. 1000 m. Flowering: throughout the year.

Vernacular names — Java: Djonge (Sundanese); Slanghet (Javanese).

Note — Very similar to *I. lophanthoides*, a continental Asian species (two records from Peninsular Malaysia), currently separated only on a corolla tube that is gibbous near the base (*I. teysmannii*) or not (*I. lophanthoides*); a detailed study of specimens throughout this range would clarify the relationship between these two species.

21. LEONOTIS

(G.L.C. Bramley, updated from H.Keng 1978)

Leonotis (Pers.) R.Br., Prodr. (1810) 504; Miq., Fl. Ned. Ind. 2 (1859) 984; Hook.f., Fl. Brit. India 3 (1885) 8; Ridl., Fl. Malay Penins. 2 (1923) 655; Backer & Bakh.f., Fl. Java 2 (1965) 622; H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 334; Iwarsson & Y.B.Harv., Kew Bull. 58 (2003) 597; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 227. — *Phlomis* L. subg. *Leonotis* Pers., Syn. Pl. 2 (1806) 127. — Type: *Leonotis ocymifolia* (Burm.f.) Iwarsson.

Leonurus Mill., Gard. Dict., ed. 4, 2 (1754), *s.p.*, nom. illeg. (non *Leonurus* L.). — Type: not designated.

Hemisodon Raf., Fl. Tellur. 3 (1837) 88. — Type: *Hemisodon leonurus* (L.) Raf. (= *Leonotis leonurus* (L.) R.Br.).

Herbs or shrubs. *Leaves* simple. *Inflorescences* thyrsoid, flowers rather large, in densely crowded, axillary verticillasters; bracts slender to spinose. *Calyx* funnel-shaped,

8–10-nerved, 8–10-lobed; mouth slightly oblique, uppermost lobe longest. *Corolla* as long as or longer than the calyx, soon withering, 2-lipped; upper lip long, longer than lower lip, concave, villous with reddish, orange or cream hairs, lower lip 3-lobed. *Stamens* 4, ascending under upper lip of corolla; lower pair longer; anther-cells divaricate, confluent. *Disc* equal. *Style* gynobasic, subulate, with the upper stigmatic segment reduced to a tiny tooth. *Fruit* a schizocarp of four nutlets. *Nutlets* oblong or obovoid, glabrous, attachment scar basal.

Distribution — About ten species, in tropical and southern Africa; in *Malesia* one species, occurring as a weed, probably after having escaped from cultivation (also in other areas of the Tropics).

1. Leonotis nepetifolia (L.) R.Br.

Leonotis nepetifolia (L.) R.Br. in W.T.Aiton, Hort. Kew., ed. 2, 3 (1811) 409. — *Phlomis nepetifolia* L., Sp. Pl. (1753) 586. — Lectotype (designated by Iwarsson in Leistner, Fl. S. Africa 28 (1985) 37): 'Cardiaca Americana annua Nepetae folio, floribus brevibus phoeniceis villosis' in Hermann, Hort. Lugd.-Bat. Cat. (1687) 115, 117.

Annual herb, 1–2.5 m high. *Stems* and *branches* deeply furrowed, finely pubescent. *Leaves*: blades oblong-ovate to ovate, 4.5–6(–12) by 3–5(–9.5) cm, membranaceous, apex acute or abruptly acuminate, base rounded to truncate, abruptly narrowed into the petiole, margin coarsely crenate serrate, finely pubescent on both surfaces; petiole 2–7.5 cm long. *Inflorescences* of 2–8 distant, globose, dense verticillasters, 2.5–7 cm diam., composed of several, vertically deflexed, 2-seriate, many-flowered cincinni; bracts linear-subulate, 0.5–1.4 cm long, pubescent, strongly deflexed, hidden by the flowers. *Calyx* 1.2–1.5 cm long, in fruit 1.5–2 cm long, incurved, ribbed, short soft hairy below, and with long white hairs above; lobes 8 or 9, unequal, sharply pointed. *Corolla* with orange hairs, 2–2.5 cm long, the tube with 3 rings of hairs inside; upper lip arched, 1–1.2 cm long, outside densely set with hairs. *Nutlets* oblong-obovoid, 2.5–3 mm long, truncate above, dull black. — **Fig. 20d–f.**

Distribution — Native of tropical Africa, naturalized in many parts of the tropics, in *Malesia*: Malay Peninsula, Sumatra (incl. Bangka) and Java (common in W, more rare in C and E Java).

Habitat & Ecology — A weed, found along roadsides, in waste places, fallow fields near ponds and lakes, etc. Altitude: 5–1350 m. Pollinated by birds. Flowering: throughout the year.

Uses — Burkill (Dict. Econ. Prod. Malay. Penins. (1935) 1329) stated that in Malaysia the leaves are medicinal for wounds. Cultivated across the region.

CULTIVATED

Leonotis ocymifolia (Burm.f.) Iwarsson, Fl. S. Africa 28 (1985) 32. — *Leonotis leonitis* (L.) R.Br. in W.T.Aiton, Hort. Kew., ed. 2, 3 (1811) 410, nom. inval.; Backer & Bakh.f., Fl. Java 2 (1965) 622.

A native of tropical Africa, according to Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 334) formerly cultivated in C Java as a hedge plant near Sela, on the saddle Merbabu-Merapi at c. 1200 m altitude.

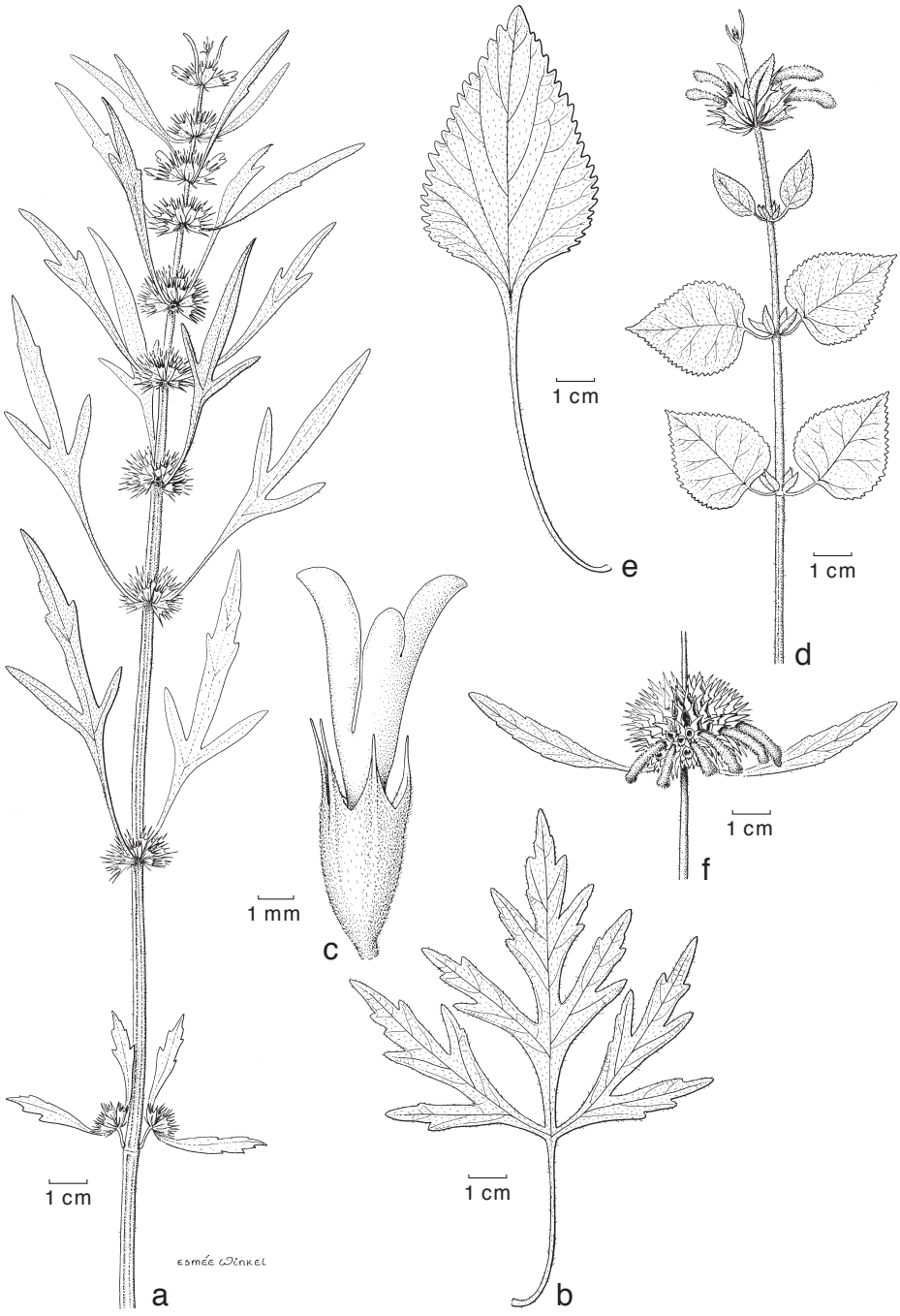

Fig. 20. a–c. *Leonurus japonicus* Houtt. a. Habit; b. leaf; c. flower. — d–f. *Leonotis nepetifolia* (L.) R.Br. d. Habit; e. leaf; f. inflorescence (a, c: *Danser 6614*; b: *Koopman s.n.* L 0767287; d, f: *Dihm 320*; e: *Van Ooststroom 13009*; all L). Drawing by Esmée Winkel, 2012.

22. LEONURUS

(G.L.C. Bramley, updated from Keng 1978)

Leonurus L., Sp. Pl. (1753) 584; H.Keng, Gard. Bull. Singapore 24 (1969) 97; in Steenis, Fl. Males., Ser. I, 8 (1978) 336; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 223. — Type: *Leonurus cardiaca* L.

Erect herbs. *Leaves* often lobed or palmate-pinnately dissected. *Inflorescences* axillary thyrsoid, verticillasters of numerous flowers; bracts subulate. *Calyx* usually weakly zygomorphic, 5-lobed, lobes subequal to unequal (3/2), spinose. *Corolla* 2-lipped, upper lip entire, erect, convex; lower lip 3-lobed, midlobe very large, deeply notched, tube naked or annulate within. *Stamens* 4, in 2 pairs, ascending under the upper lip, not exserted; lower pair slightly longer; anthers 2-celled, cells parallel, connivent. *Disc* uniform. *Style* gynobasic, equally 2-fid, branches obtuse or subulate. *Fruit* a schizocarp of four nutlets. *Nutlets* dry, smooth, triquetrous, truncate at apex, attachment scar basal.

Distribution — About 25 species, mainly in temperate Asia and Europe, one introduced and sometimes cultivated in the tropics and *Malesia*.

1. Leonurus japonicus Houtt.

Leonurus japonicus Houtt., Nat. Hist. 9 (1778) 366, t. 57, f. 1; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 163; Harley & A.J.Paton, Kew Bull. 56 (2001) 433. — Type: Houttuyn, Nat. Hist. 9 (1778) t. 57, f. 1.

Stachys artemisia Lour., Fl. Cochinch. (1790) 365. — *Leonurus artemisia* (Lour.) S.Y.Hu, J. Chin. Univ. Hong Kong 2 (1974) 381. — Type: *Loureiro s.n.* (holo P).

Leonurus sibiricus auct. non L.: Blume, Bijdr. (1826) 828; Hook.f., Fl. Brit. India 4 (1885) 678; Merr., Fl. Manila (1912) 412; Ridl., Fl. Malay Penins. 2 (1923) 651; Backer & Bakh.f., Fl. Java 2 (1965) 623; H.Keng, Gard. Bull. Singapore 24 (1969) 98, f. 16; in Steenis, Fl. Males., Ser. I, 8 (1978) 336.

Annual or perennial herb, 0.5–1.5 m high. *Stems* 4-angled, furrowed, softly pubescent or glabrescent. *Leaves* palmati-pinnately partite or dissected, with linear incised segments, upper ones linear, 4–5 cm long, lower and basal ones ovate or deltoid in outline, 5–7 by 3–4.5 cm, glabrous or glabrescent above, often glaucous and pubescent on the nerves beneath; petiole 2–5.5 cm long. *Bracts* subulate or spinescent, 4–10 mm long. *Calyx* 6–8 mm long, tube 4–6 mm long, glabrous or sparingly pubescent, with yellow sessile glands, lobes subulate 1.5–3 mm long. *Corolla* white, pink or reddish, 10–14 mm long; tube often obliquely annulate within; upper lip obovate, pubescent outside; midlobe of lower lip obcordate, pubescent. *Anthers* glandular. *Nutlets* oblong, triquetrous, brown, 2–3 mm long. — **Fig. 20a–c.**

Distribution — China to Australia, widely naturalized elsewhere; in *Malesi*a: NE Malay Peninsula (also Singapore), Sumatra (Asahan, Bangka), Java (throughout), Borneo (Sarawak), Philippines (Batan Is., Luzon, Mindanao), Sulawesi, Lesser Sunda Islands (Bali, Timor), Moluccas.

Habitat & Ecology — Waste places, river-banks, railway embankments, always in settled land, still local and as a whole fairly rare, sometimes cultivated as an ornamental or for medicinal purpose and escaped, under both everwet and seasonal climatic conditions. Altitude: 1–2000 m. Flowering: throughout the year (in Java).

Vernacular names — Lion's tail, Siberian motherwort (English). Malay Peninsula: Seranting, Tebungaga (Malay). Sumatra: Si saratang (Malay). Java: Dendereman, Padang derman (Sundanese); Gindjean (Javanese). Philippines: Kamariang-sungsong (Tagalog). Moluccas: Gofu hairan roriha (Ternate); Laranga kohari (Tidore).

Uses — In Java considered a substitute for opium, but its chemical properties are harmless (Heyne, Nutt. Pl. Ned.-Ind., ed. 3 (1950) 1327). An infusion in spirits is sometimes given after childbirth. In Malaysia employed as a poultice against head-aches. A decoction of the leaves is used in the Philippines as a diuretic. Hooper (Gard. Bull. Singapore 6 (1929) 82) stated it to be a general remedy in puerperal and menstrual diseases. Hartley (Lloydia 32 (1969) 266) listed it as anti-cancerogenous.

Note — The name *Leonurus sibiricus* L. has been incorrectly applied to Malesian material of *L. japonicus* (Harley & Paton 2001: 243). The former species occurs naturally in Siberia, Russia. The two species can be distinguished by their calyx, namely, *L. japonicus* has a smaller calyx than true *L. sibiricus*, with calyx lobes erect and almost equal in length in the former, but *L. sibiricus* has a more distinctly 2-lipped calyx with a deflexed lower calyx lip.

23. LEUCAS

(G.L.C. Bramley, updated from Keng 1978)

Leucas R.Br., Prodr. (1810) 504; H.Keng, Gard. Bull. Singapore 24 (1969) 100; in Steenis, Fl. Males., Ser. I, 8 (1978) 337; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 227. — Type: *Leucas decemdentata* (Willd.) Sm.

Annual or perennial herbs or subshrubs. *Leaves* simple. *Inflorescences* thyrsoid or rarely racemoid, flowers in dense axillary, distant verticillasters; sometimes forming terminal, capitate clusters; bracts leaf-like, bracteoles generally much narrower. *Calyx* zygomorphic, mouth oblique, or actinomorphic, mouth truncate; lobes 8–10, equal, or unequal with the upper lobe largest. *Corolla* white, tube slender and often not exserted, with a hairy ring inside or not; upper lip erect, concave, the margins fringed with dense velutinous hairs; lower lip 3-fid, spreading, centre lobe longer and with a slight division at the apex, longer or shorter than upper lip, not withering. *Stamens* 4, didynamous; upper pair shorter; all ascending under upper lip, cells divaricate, ultimately confluent. *Disc* entire or lobed, uniform or enlarged on anterior side. *Style* gynobasic, *stigma* unequally lobed. *Fruit* a schizocarp with four nutlets. *Nutlets* oblong-trigonous to obovoid, attachment scar basal.

Distribution — About 100 species, chiefly in warm and tropical parts of Africa and Asia; in *Malesia* 6 species.

KEY TO THE SPECIES

1a. Calyx lobes (7–)8 2
b. Calyx lobes (9–)10 3
2a. Calyx lobes unequal, upper lobe much broader and longer . . **4. L. lavandulifolia**
b. Calyx lobes ± equal in size, upper lobe occasionally slightly larger . . . . . **6. L. zeylanica**

3a. Calyx mouth truncate, not oblique 4
b. Calyx mouth oblique, the upper side longer than the lower side 5
4a. Hairs on stems retrorse (pointing down). — Throughout Malesia except Sumatra and Borneo . . . . . **2. L. decemdentata**
b. Hairs on stems antrorse (pointing up) and spreading. — Philippines (Luzon) . . . . . **3. L. lanata**
5a. Upper calyx lobe much broader than other lobes . . . . . **4. L. lavandulifolia**
b. Upper calyx lobe same length or longer but not broader than other lobes 6
6a. Calyx hairy in upper half outside and completely inside . . . . . **1. L. aspera**
b. Calyx completely hairy outside and in upper half inside . . . . **5. L. leucocephala**

1. Leucas aspera (Willd.) Link

Leucas aspera (Willd.) Link, Enum. Hort. Berol. Alt. 2 (1822) 113; Miq., Fl. Ned. Ind. 2 (1859) 982; Merr., Enum. Philipp.Fl. Pl. 3 (1923) 410; Quisumb., Medic. Pl. Philip. (1951) 828; Backer & Bakh.f., Fl. Java 2 (1965) 623; H.Keng, Gard. Bull. Singapore 24 (1969) 10. — *Phlomis aspera* Willd., Enum. Pl. 2 (1809) 621. — Type: *sine coll.* (B-W, n. 10951), habitat in Caramania.
[*Leucas minahassae* Koord. in Koorders-Schumacher, Syst. Verz. 3 (1914) 112, nom. nud.]

Annual herb, 30–60 cm high, often branched. *Stems* and *branches* hispid, with spreading hairs. *Leaves*: blade linear to very narrowly ovate, 3.5–6 by 0.4–1.2 cm, apex acute, base attenuate, margin shallowly crenate-serrate, appressed hairs on both surfaces, hairs thicker and longer on nerves; petiole up to 1 cm long or shorter, leaves appearing subsessile, hispid. *Inflorescences* of terminal verticillasters, these can be on axillary shoots, forming a globular head 1.5–2.5 cm diam.; flowers subsessile; bracteoles narrowly lanceolate, 6–10 mm long, ciliate along the margins. *Calyx* 7–9 mm long in flower, in fruit 10–12 mm long, cylindric; tube 10-nerved and 10-lobed, mouth strongly oblique, sometimes with a slight constriction about 1/3 way down tube, lobes erect, the upper one longest, c. 1.5 mm long, the others up to 1 mm long; outer surface hairy on the upper half, lower half glabrous, inner surface hairy. *Corolla* 10–11 mm long, with a hairy ring ± halfway down the tube; lower lip about twice as long as upper lip, sparsely pubescent below. *Nutlets* narrowly ovoid, 2–2.5 by c. 0.8 mm, ventral surface triquetrous, dorsal one rounded, finely granulate or nearly smooth, black.

Distribution — Mauritius to continental SE Asia (India, Burma, Thailand, Indo-China); in *Malesia*: Malay Peninsula (incl. Penang), Java (vicinity of Jakarta; Central-East Java; Madura I.; Kangean Is.), Philippines (Luzon, Mindoro, Mindanao), N Sulawesi (Minahassa), Lesser Sunda Islands (Sumbawa), and Papua New Guinea (Morobe Distr., one coll.).

Habitat & Ecology — Various habitats: mostly grassy plains, maize fields, open dry sandy soils, waste places, teak-forest, railway embankments, dunes; locally often common. Altitude: sea-level to c. 500 m. Flowering: throughout the year.

Vernacular names — Java: Lenglengan, Ngangegan (Javanese); Patji-patji (Malay). Philippines: Karukamoli sulasulasihan (Tagalog); Pansi-pansi (Tinggian, Tagalog, Bisaya); Paysi-paysi (Bisaya); Sipsipan (Pampangan).

Uses — In the Philippines it is said that the crushed plant is applied hot to wounds (Quisumbing, Medic. Pl. Philip. (1951) 820). De Tavera (The Medicinal Plants of the

Philippines (1892) 199) stated that bruised leaves are used against bites of snakes and poisonous insects.

2. Leucas decemdentata (Willd.) Sm.

Leucas decemdentata (Willd.) Sm. in Rees, Cycl. 20, 2 (1812) 6. — *Phlomis decemdentata* Willd., Sp. Pl. 3 (1800) 124. — Type: *sine coll.* (B-W, n. 10949), habitat in Societatis insulis.

Leucas flaccida R.Br., Prodr. (1810) 505; Miq., Fl. Ned. Ind. 2 (1859) 979; H.Keng, Gard. Bull. Singapore 24 (1969) 107. — *Phlomis flaccida* (R.Br.) Steud., Nomencl. Bot. 1 (1821) 613. — *Isodeca flaccida* (R.Br.) Raf., Fl. Tellur. 3 (1837) 88. — Type: *Banks & Solander s.n.* (holo BM), Australia, Queensland, Endeavour River.

Phlomis chinensis Blume, Bijdr. (1826) 829, nom. illeg. (non *P. chinensis* Retz.). — Type: not indicated.

Leucas parviflora Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 62. — Type: *Wallich Cat. 2061* (sheet in K-W, but no specimen attached).

Leucas mollissima Wall. ex Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 62; Merr. & Rolfe, Philipp. J. Sci., C 5 (1910) 381; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 411; M.R.Hend., J. Malayan Branch Roy. Asiat. Soc. 17 (1939) 66; H.Keng, Gard. Bull. Singapore 24 (1969) 106. — Type: *Wallich Cat. 2054.1* (holo K-W).

Phlomis moluccana Roxb., Fl. Ind. ed. 1832, 3 (1832) 11. — Type: not located.

Leucas javanica Benth., Labiat. Gen. Spec. (1834) 611; Merr., Fl. Manila (1912) 412; Backer & Bakh.f., Fl. Java 2 (1965) 622, incl. forma *javanica* Backer, et forma *littoralis* Backer, excl. forma *montana* Backer; H.Keng, Gard. Bull. Singapore 24 (1969) 105. — Type: *Blume s.n.* (holo L), Java, intra montem Burangrang et Tankawam Paku.

Leucas oxyodon Miq., Fl. Ned. Ind. 2 (1859) 981. — Type: *Horsfield s.n.* (iso BM, K), Java.

Leucas sericea Elmer, Leafl. Philipp. Bot. 1 (1908) 340. — Type: *Elmer 8409* (holo PNH†; iso L, NY), Philippines, Luzon, Prov. Benguet, Baguio, Mt Santo Tomas trail.

Leucas procumbens auct. non Desf.: Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 398; Herb. Timor. Descr. (1835) 70; Miq., Fl. Ned. Ind. 2 (1859) 979. — Although recorded by Miquel (1859) from Timor, no specimens have been seen bearing this name.

Leucas biflora auct. non (Vahl) Sm. (cited mistakenly as *L. biflora* R.Br.): Benth. in A.DC., Prodr. 12 (1848) 527; Miq., Fl. Ned. Ind. 2 (1859) 980. See Note 2.

Annual herb, 0.25–1.5 m high. *Stems* and *branches* slender, covered with retrorse (downward pointing) soft appressed or long villous hairs, hairs sometimes restricted to the edges of the quadrangular stem. *Leaves*: blade lanceolate to narrowly or broadly ovate, (0.5–)2–6(–8) by (0.5–)1–4(–5) cm, apex obtuse or acute, base rounded or cuneate to attenuate; margin crenate-serrate or coarsely serrate, with scattered to dense hairs on both surfaces, surface usually visible, occasionally obscured; petiole 0.2–1 cm long. *Inflorescences* with 2–8(–10) flowers in spaced axillary verticillasters; bracteoles linear, 1–4 mm long (up to 5–7 mm long in Java), setose. *Calyx* tubular to campanulate, more rarely narrowly tubular with a constriction about 1/3 way down the tube, 4–8(–10) mm long, in fruit 7–10 mm long, sparsely or densely hairy outside, 10-lobed, lobes equal to subequal, lanceolate or triangular at the base and abruptly narrowed apically, 0.5–2(–3) mm long; mouth truncate, not oblique. *Corolla* 8–15 mm long, tube usually within calyx, annulate within; lower lip slightly longer than the upper one. *Nutlets* obovoid, c. 1.5 by 0.5 mm, subtruncate above, smooth.

Distribution — Continental S and SE Asia (Burma, Thailand, Indo-China, S China), Formosa, Ryukyu Is.; throughout *Malesia* (except Sumatra and Borneo) to NE Australia.

Habitat & Ecology — In open waste places, thickets and grassland, forest edges, or on limestone hills and littoral rocks, at low and high altitude. Altitude: sea-level to 3000 m. Flowering: throughout the year.

Vernacular names — Java: Lenglengan, Paseg puti (Javanese); Patji-patji (Malay, Sundanese); Saja hetela (Sundanese). Philippines: Bagbagsangi, Pangpangau (Bontok); Banbansit (Iloko); Paling-harap (Tagalog). Lesser Sunda Islands: Bimig arial, Daaratuk, Kafi. New Guinea: Habi'inz, Maiinz (Kainantu, Tairora).

Notes — 1. Here *L. decemdentata* is recognised as a highly variable species, particularly in its indumentum, bracteole length and calyx size. Plants found in Polynesia, New Guinea, the Lesser Sunda Islands and to a certain extent, the Philippines, conform to the type of *L. decemdentata* (Society Islands), and the Australian type material of *L. flaccida* (now considered a synonym); the Indochinese material is also similar. However, the Javanese material appears to be a lot more variable – in the past this has been described under a number of different names, some at the specific level, others infraspecific. It is too difficult to separate the majority of the material examined into different taxa: the variation in the calyx size, bracteole length and corolla size appears to be continuous. Exceptions are some Javan specimens that are densely hairy, have larger bracteoles, a slightly oblique calyx and larger corollas: these are recognised as *L. leucocephala* (previously treated as a synonym of *L. javanica* by Keng (1969: 105). In addition, two specimens seen from the far north of the Philippines are tentatively recognised as *L. lanata*, a species present in India, Indo China, S China and Taiwan (see further notes under those species).

2. *Leucas biflora* (Vahl) Sm. is found from Sri Lanka to Indo-China, not in Malesia.

3. **Leucas lanata** Benth.

Leucas lanata Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 61. — Type: *Wallich Cat. 2055* (holo K-W), Kamaon.

Perennial herb, 0.25–0.5 m tall. *Stems* ascending, branched, lanate with spreading and upward pointing (antrorse) long interwoven hairs. *Leaves*: blades narrow-ovate to ovate, 2.5–5 by 1–3 cm, margin serrate or crenate, apex acute to obtuse, base broadly cuneate to rounded, tomentose to lanate; petiole 0.5–1 cm long. *Inflorescences* lax with 3–6 verticils widely separated, verticils 6–15-flowered, c. 1.5 cm diam.; bracteoles 2–4 mm long, up to 3/4 the calyx length. *Calyx* narrowly tubular to turbinate, straight, pubescent within, 6–7 mm long with 10 ± equal lobes; lobes lanceolate erect, 1–2 mm long; throat truncate. *Corolla* 7–8 mm long, ring of hairs within the tube near the middle, tube c. 4 mm long. *Nutlets* not seen.

Distribution — Pakistan to Indo-China, S China, Taiwan; in *Malesia*: northern Philippines (Luzon: Ilocos Norte).

Habitat & Ecology — Among rocks.

Note — Close to *L. decemdentata* but differing in having ascending and spreading interwoven stem hairs, and a dense more appressed indumentum. This species is more common outside the Flora area, but a few specimens seen from the far north of the Philippines match material from Taiwan and Indochina. Further investigation may result in this taxon falling under the broad circumscription of *L. decemdentata*.

4. Leucas lavandulifolia Sm.

Leucas lavandulifolia Sm. in Rees, Cycl. 20, 2 (1812) 2; Merr., Fl. Manila (1912) 412; Enum. Philipp. Fl. Pl. 3 (1923) 411; Ridl., Fl. Malay Penins. 2 (1923) 650; Quisumb., Medic. Pl. Philip. (1951) 820; Backer & Bakh.f., Fl. Java 2 (1965) 623; H.Keng, Gard. Bull. Singapore 24 (1969) 103. — *Leonurus indicus* L., Syst. Nat., ed. 10, 2 (1759) 1101 (non *Leucas indica* (L.) R.Br.). — *Hetrepta lavandulifolia* (Sm.) Raf., Fl. Tellur. 3 (1837) 88. — Type: *Burman s.n.* (LINN), India.

Leucas linifolia (Roth) Spreng., Syst. Veg. 2 (1825) 743; Miq., Fl. Ned. Ind. 2 (1859) 983. — *Phlomis linifolia* Roth, Nov. Pl. Sp. (1821) 260; Blume, Bijdr. (1826) 829. — Type: *Heyne s.n.* (B†), India.

Phlomis zeylanica auct. non L.: Blume, Catalogus (1823) 15; Blanco, Fl. Filip. (1837) 475 (‘*ceilanica*’); Fl. Filip., ed. 2 (1845) 331; Fl. Filip., ed. 3, 2 (1878) 248.

Erect, fetid, annual herb, 30–80 cm high, often much branched. *Stems* and *branches* pubescent, hairs antrorse (pointing upwards), subglaucous. *Leaves* herbaceous; blade linear-lanceolate, rarely lanceolate, 2.5–6 by 0.4–1 cm, subsessile, apex acuminate, base attenuate, entire, margin subentire or remotely and sparingly serrate. *Inflorescences* with flowers shortly pedicelled, in terminal and axillary, always leafy verticillasters, often congested towards apex and forming a cluster or clusters 1.5–2 cm diam.; bracteoles linear, 3–5 mm long, puberulous. *Calyx* obliquely turbinate, 6–7 mm long, in fruit 8–9 mm long, glabrous to hairy; mouth oblique, pubescent within with white hairs, slightly constricted; lobes 7–10, the uppermost one (posterior) large and broad, others minute and spinescent. *Corolla* c. 10 mm long; tube with ring of hairs within near the middle; lower lip much longer than upper lip, patent, the midlobe large, obovate. *Nutlets* oblong, c. 2.5 by 1 mm, rounded at apex, inner surface angular, outer rounded, dark brown, pale at base. — **Fig. 21.**

Distribution — South Africa, continental Asia (India to China); in *Malesia*: throughout, with the exception of the Lesser Sunda Islands; once collected in Bawean I. (near Java); very rare in Borneo mainland and New Guinea (in Misool I., and once in Morobe Distr.).

Habitat & Ecology — Open waste places, roadsides, grassland, fallow agricultural land, paddy dams, locally often numerous. Altitude: sea-level to 1500 m. Flowering and fruiting: throughout the year.

Vernacular names — Patji-patji (Malay). Sumatra: Lènggas, Patjĕ patjĕ, Patji-patji (Malay). Java: Lèngan (Javanese); Lènglèngan, Lingko-lingkoan, Nlènglèngan (Sundanese); Sarap nornor, Sĕbasĕ (Madurese). Philippines: Karukansóli, Salita, Solasolasilian (Tagalog); Kaskasúmba (Iloko); Laňga-laňga (Bikol); Pansipansi (Tagalog, Bisaya); Paysi-paysi (Bisaya). NE Sulawesi: Kĕkombaän (Manado). Lesser Sunda Islands: Bali: Patji patji. Moluccas: Daun heran, Daun sètan, Gofi hairan (Ternate); Hairani (Halmaheira); Langa-langa (Buginese); Laranga (Tidore).

Uses — Said to be in use for healing chronic leg sores, dermatosis, as an anthelmintic for round worms, and for appeasing affection of the nerves. In the Philippines (and also elsewhere) a poultice of fresh leaves is applied on wounds, especially on those with inflammation; in Java commonly applied on stinking wounds on animals in order to cleanse them from fly larvae, also for eye-sores and as a gargle. Heyne (Nutt. Pl. Ned.-Ind. (1927) 1326), mentioned further the use of the plant as a vegetable at Jakarta and fodder for cattle. There seems to be some application of the plant in veterinary surgery. A decoction of the roots is sometimes used for inflamed callosity.

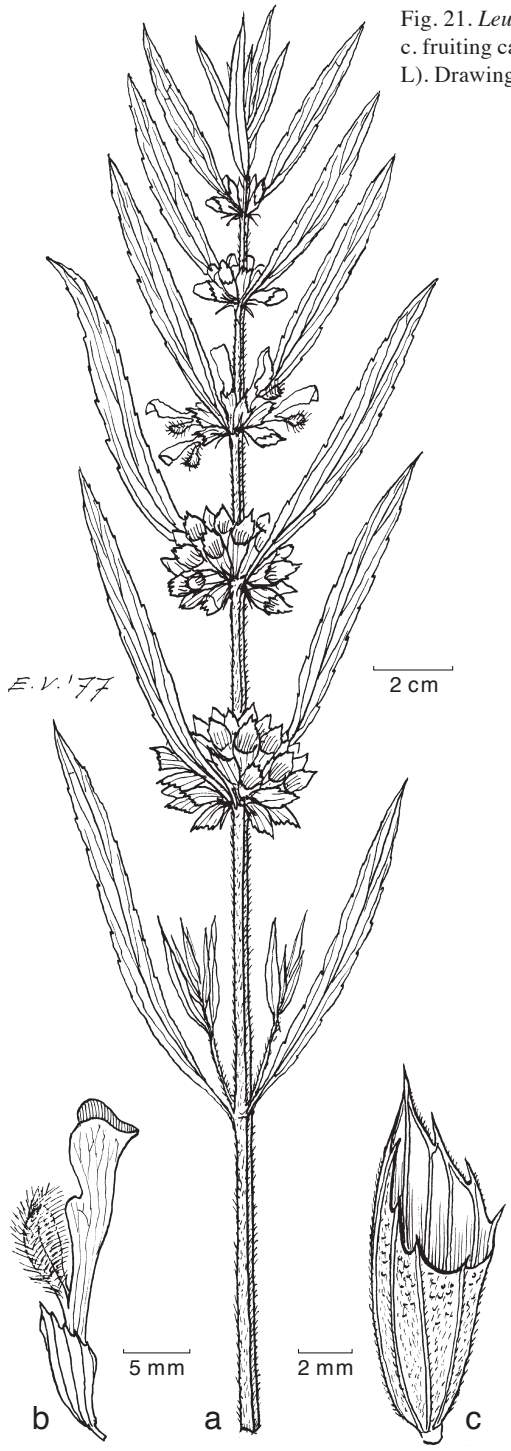

Fig. 21. *Leucas lavandulifolia* J.E.Sm. a. Habit; b. flower; c. fruiting calyx (a, c: *Koorders 23278*; b: *Boerlage 58*; all L). Drawing by Ed Vijsma, 1977.

5. Leucas leucocephala Miq.

Leucas leucocephala Miq., Fl. Ned. Ind. 2 (1859) 981. — Type: *Horsfield s.n.* (iso BM, K), Java.
Leucas javanica Benth. forma *montana* Backer in Backer & Bakh.f., Fl. Java 2 (1965) 622 (non *L. javanica* var. *montana* Zoll. & Moritzi). — Type: not indicated.
Leucas marrubioides auct. non Desf.: H.Keng, Gard. Bull. Singapore 24 (1969) 106; in Steenis, Fl. Males., Ser. I, 8 (1978) 340.

Herb, 30–80 cm high. *Stems* and *branches* densely pubescent, hairs long, spreading to retrorse (pointing downwards). *Leaves*: blade narrowly ovate, 3–4.5 by 1–2.5 cm, shortly petiolate, apex acute, base obtuse to rounded, entire, margin serrate. *Inflorescences* of terminal verticillasters, 3–6-flowered, 1.5–2 cm diam.; bracteoles linear, 9–13 mm long, densely ciliate. *Calyx* obliquely turbinate, 9–13 mm long in flower, not seen in fruit, outer surface densely pubescent, inner surface pubescent in the upper half, mouth oblique, the anterior side slightly longer than the posterior, 10-lobed, lobes 2–5 mm long, narrowly triangular at the base then abruptly becoming linear. *Corolla* 11–16 mm long; tube with ring of hairs within near the middle; lower lip slightly longer than upper lip, with some hairs on the lower surface. *Nutlets* not seen.

Distribution — Throughout S and SE Asia, throughout *Malesia*, not yet known from Sulawesi.

Habitat & Ecology — Altitude: c. 2300 m (only data recorded).

Note — *Leucas leucocephala* was treated as a synonym of *L. javanica* (recognised here *as L. decemdentata*) by Keng (1969), but after examining many specimens of the variable *L. decemdentata*, it is likely that a group of taxa from Java that can be recognised as distinct. The name *L. leucocephala* therefore represents specimens that are densely hairy with larger bracteoles, a slightly oblique calyx and larger corollas (e.g., Jang plateau: *Hoogerwerf 436* (L); *van Steenis 10926* (K, L)).

6. Leucas zeylanica (L.) W.T.Aiton

Leucas zeylanica (L.) W.T.Aiton, Hort. Kew., ed. 2, 3 (1811) 409; Miq., Fl. Ned. Ind. 2 (1859) 982; Hook.f., Fl. Brit. India 4 (1885) 689; Koord., Exkurs.-Fl. Java 3 (1912) 146; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 411; Ridl., Fl. Malay Penins. 2 (1923) 650; Backer & Bakh.f., Fl. Java 2 (1965) 623; H.Keng, Gard. Bull. Singapore 24 (1969) 101. — *Phlomis zeylanica* L., Sp. Pl. (1753) 586. — *Leucasia zeylanica* (L.) Raf., Fl. Tellur. 3 (1837) 88. — Type: *Herb. Hermann 1: 1, No. 227* (BM-000621228).
Spermacoce denticulata Walp., Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 19, Suppl. 1 (1843) 352. — Type: not located.
Leucas malayana Hance ex Walp., Ann. Bot. Syst. 3 (1852) 269; Miq., Fl. Ned. Ind. 2 (1859) 984. — Type: *Hance s.n.* (not located), Singapore.
Leucas bancana Miq., Fl. Ned. Ind., Suppl. 1 (1861) 572. — Type: *W.S. Kurz* (as J. Amand – on label – or J. Amann; Miquel 1861: xv) *s.n.* (holo U, U145164), [Indonesia, Sumatra,] Bangka (for collector information: http://www.nationaalherbarium.nl/FMCollectors/K/KurzWS.htm).

Annual herb, 20–60 cm high, often branched. *Stems* and *branches* hispid. *Leaves*: blade lanceolate, 3–7 by 0.5–3 cm, membranaceous, apex acute, base attenuate; margin very shallowly serrate, velutinous to hirsute on both surfaces; petiole 0.2–0.8 cm long, hispid. *Inflorescences* with subsessile flowers, in terminal verticillasters, usually 6–8 forming a globular head of 1.5–2 cm diam., occasionally also axillary verticil-

lasters occur below; bracteoles linear, 4–5 mm long, spinescent. *Calyx* turbinate, 5–6 mm long, in fruit 6–8 mm long, slightly curved, velutinous to hispid, 10-nerved and 8-lobed, upper lobe slightly longer than the rest, others lobes ± equal, c. 0.5 mm long, subulate to linear; mouth ± truncate, pubescent within. *Corolla* 8–9 mm long, tube with a ring of hairs near the middle; lower lip patent, more than twice as long as upper lip. *Anthers* red. *Nutlets* obovoid, c. 3 by 1 mm, apex truncate; ventral surface angular, dorsal rounded; smooth. — **Plate 5d.**

Distribution — Throughout S and SE Asia; in *Malesia*: throughout, not yet known from Sulawesi.

Habitat & Ecology — Sunny dry localities, often on sandy soil, paddy dams, waste places, roadsides. Altitude: up to 1000 m. Flowering: throughout the year.

Vernacular names — Malay Peninsula: Katumbit, Ketumbak luka-luka. Java: Lenglengan (Javanese); Patji patji (Sundanese). Philippines: Guma-guma (Sulu); Masibulan (Gaddang).

Uses — In spite of the disagreeable smell of the plant and the very bitter taste, it is sometimes used in Bali as a vegetable (in sajor; Heyne, Nutt. Pl. Ned.-Ind. (1927) 1327). Furthermore, the sap of the leaves is used for sores of eyes and nostrils. A poultice for scabies, itches, head-aches, vertigo and colic. Also used as a vermifuge with children.

DOUBTFUL

Leucas marrubioides Desf.

Leucas marrubioides Desf., Mém. Mus. Hist. Nat. 11 (1824) 6, t. 3, f. 1. — Type: *Desfontaines s.n.* (holo P), Ceylon [Sri Lanka].

Note — Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 340) cites *L. marrubioides* as occurring within the region, using it to represent what is considered here as *L. leucocephala*. The type of *L. marrubioides* (*Desfontaines s.n.*, at P) somewhat matches material in the region that has been included in *L. decemdentata*; the variation in indumentum and calyx size forming part of the continuum described under that species, but it does not share the densely hairy indumentum, oblique calyces and larger corollas of *L. leucocephala*.

Leucas martinicensis (Jacq.) R.Br.

Clinopodium martinicense Jacq., Enum. Syst. Pl. (1760) 25. — *Leucas martinicensis* (Jacq.) R.Br. in W.T.Aiton, Hort. Kew. 3 (1811) 409; Miq., Fl. Ned. Ind. 2 (1859) 983; Ridl., Fl. Malay Penins. 2 (1923) 650. — *Phlomis martinicensis* (Jacq.) Sw., Prodr. Veg. Ind. Occ. (1788) 88. — Type: *Jacquin s.n.* (holo W).

Note — Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 340) lists *L. martinicensis* as occurring in the flora area: I have not seen any specimens of this species from Malesia, but, given its weedy nature it may be present.

EXCLUDED
(following Keng, in Steenis, Fl. Males., Ser. I, 8 (1978) 341)

Leucas chinensis (Retz.) Sm. in Rees, Cycl. 20, 2 (1812) 8; Benth., Linnaea 6 (1831) 81; Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 398; Herb. Timor. Descr. (1835) 70.

This record is based on Chamisso's collection from Manila, which is *L. decemdentata*.

Leucas pubescens auct. non Benth.: Usteri, Beitr. Kenntn. Philipp. (1905) 124.

Merrill (Enum. Philipp. Fl. Pl. 3 (1923) 411) noted that he had seen no specimens of this species, which is definitely known only from India, and that the identification of Usteri's specimen is probably wrong.

24. MELISSA

(G.L.C. Bramley, updated from Keng 1978)

Melissa L., Sp. Pl. (1753) 592; H.Keng, Gard. Bull. Singapore 24 (1969) 108; in Steenis, Fl. Males., Ser. I, 8 (1978) 341; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 225; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 253. — Type: *Melissa officinalis* L.

Branched, perennial herbs. *Leaves* crenate. *Inflorescences* of axillary verticillasters with 2–16 flowers. *Calyx* tubular, always 13-nerved, sometimes not very clearly so due to the reticulation of transverse veins; 2-lipped; upper lip 3-lobed, lobes short, highly connate, often slightly upcurved; lower lip 2-lobed, lobes long, subulate. *Corolla* straight or ± recurved, long and slender; upper lip shorter than lower, lobe emarginate or notched, erect; lower lip 3-lobed, lateral lobes small, median lobe flat and spreading. *Stamens* 4, didymous, ascending, upper pair smaller and shorter than lower pair, ascending under upper corolla lip; anthers 2-celled, cells divaricate. *Disc* equal-sided. *Style* gynobasic, lobes subequal. *Fruit* a schizocarp with four nutlets. *Nutlets* obovoid, smooth and dark, often with a very prominent basal scar, fine hairy, mucilaginous.

Distribution — Four species, in Europe, N Africa, S to SE Asia, extending to S China; in *Malesia*: 1 species (Sumatra, Java).

Uses — Plants used as a source of essential oils (medicines, flavouring).

1. Melissa axillaris (Benth.) Bakh.f.

Melissa axillaris (Benth.) Bakh.f. in Backer & Bakh.f., Fl. Java 2 (1965) 629; H.Keng, Gard. Bull. Singapore 24 (1969) 108, f. 18. — *Geniosporum axillare* Benth. in Wall., Pl. Asiat. Rar. 2 (1830) 18. — Type: *Wallich Cat. 2752* (holo K-W), Nepal.

Melissa parviflora Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 65; Hook.f., Fl. Brit. India 4 (1885) 651; Miq., Fl. Ned. Ind. 2 (1859) 969. — Type: *Wallich Cat. 2125* (holo K-W), Nepal.

Melissa hirsuta Blume, Bijdr. (1826) 830, nom. illeg. (non Hornem. 1815). — Type: *Blume s.n.* (holo L), Java.

Calamintha gracilis (Benth.) Benth. var. *pilosior* Miq., Fl. Ned. Ind. 2 (1859) 968. — Type: *Korthals s.n.* (not located), Sumatra.

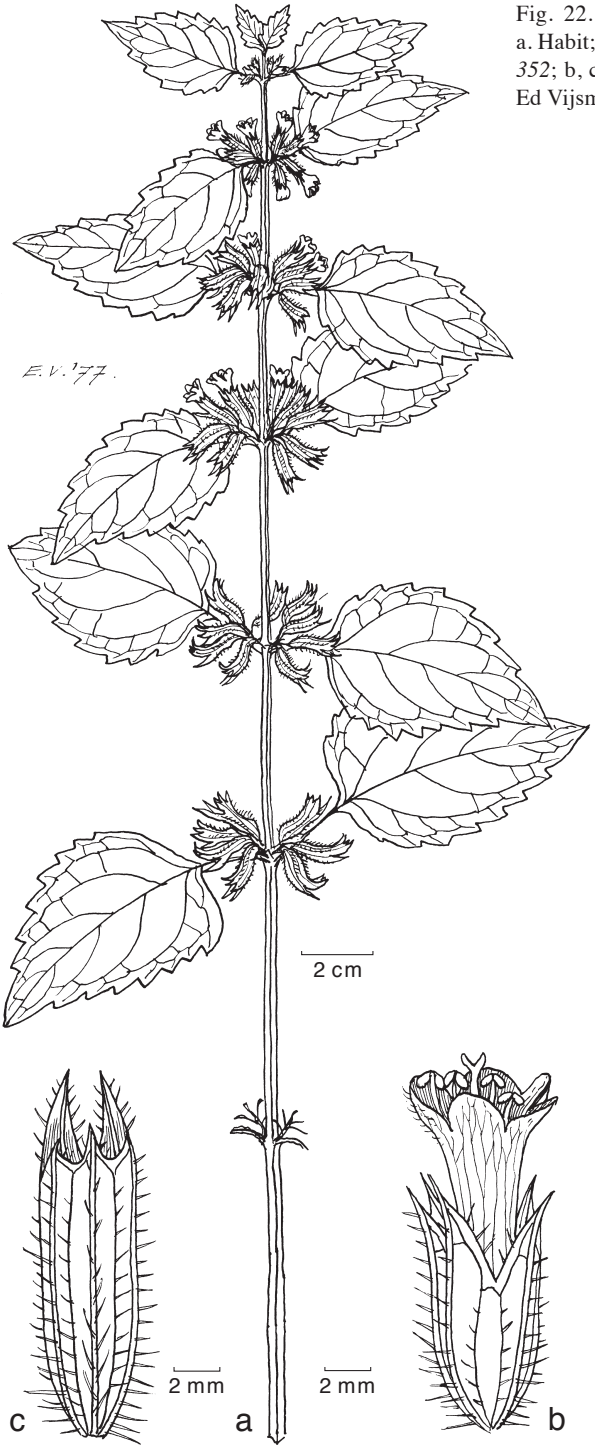

Fig. 22. *Melissa axillaris* (Benth.) Bakh.f. a. Habit; b. flower; c. fruiting calyx (a: *Coert 352*; b, c: *Backer 21063*; all L). Drawing by Ed Vijsma, 1977.

Erect herb, up to 1 m high, ± woody at the base. *Branches* pubescent when young. *Leaves*: blade thin or thick membranaceous, very variable in size and shape; small ones ovate or elliptic, 1.2–3 by 0.8–1.5 cm, apex acute, base rounded or cuneate; larger ones lanceolate-ovate, often unequilateral, 5–7 by 2–3 cm, apex acuminate, base acute; petiole 0.5–3 cm long. *Inflorescences* with usually 4–8 flowers in axillary verticillasters; pedicels 1–2 mm long, sericeous. *Calyx* 5–6 mm long, in fruit 6–8 mm long, pilose on the ribs outside; tube not inflated below. *Corolla* white, 9–10 mm long. *Stamens*: lower pair barely exserted. *Nutlets* c. 8 by 2 mm. — **Fig. 22; Plate 5e.**

Distribution — From India to SW China and Taiwan; in *Malesia*: N-Central Sumatra (Gajo Lands; Mt Kerintji) and W-Central Java (Mt Patuha eastwards to Mt Merbabu). Miquel (1859) and Merrill (Bibliogr. Enum. Born. Pl. (1921) 519) recorded it from Borneo, but no records have been seen from there.

Habitat & Ecology — Forest edges and along trails, open places along streams, but not on swampy soil. Altitude: 1500–2600 m. Flowering: February to May.

Vernacular names — Djawer kotok (Sundanese); Sangketan (Javanese).

CULTIVATED

Melissa officinalis L., Sp. Pl. (1753) 592; Backer & Bakh.f., Fl. Java 2 (1965) 629.

Widely cultivated outside its native distribution (S Europe to C Asia): Brink (Plant Resources of South-East Asia 13 (1999) 257) records that in Malesia it is occasionally cultivated in the mountains of Java and on several farms in Cavite province, the Philippines. He also states that it is in demand by international hotels in the Philippines.

Vernacular name — Lemon balm (English).

25. MENTHA

(G.L.C. Bramley, updated from Keng 1978)

Mentha L., Sp. Pl. (1753) 576; Backer & Bakh.f., Fl. Java 2 (1965) 631; H.Keng, Gard. Bull. Singapore 24 (1969) 111; in Steenis, Fl. Males., Ser. I, 8 (1978) 343; X.W.Li & Hedge, Fl. China 17 (1994) 236; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 237. — Type: *Mentha spicata* L.

Perennial, rarely annual herbs, with creeping rootstocks, often strongly aromatic with a mint smell. *Leaves* often gland-dotted. *Inflorescences* of few- to many-flowered axillary verticillasters or terminal spiciform thyrses in axils of reduced bracts; bracts often small. *Calyx* ± actinomorphic to slightly 2-lipped, 5-lobed, lobes subequal. *Corolla* lilac, pink or white, ± actinomorphic, funnel-shaped, short, 4-lobed, lobes subequal or upper lobe slightly broader than the other 3, emarginate. *Stamens* 4, slightly didynamous, exserted, divergent; filaments almost free, erect, glabrous; anthers 2-celled, cells parallel. *Disc* entire, uniform. *Style* gynobasic, shortly subequally 2-branched. *Fruit* a schizocarp of four nutlets. *Nutlets* ovoid, smooth or reticulate, not mucilaginous, attachment scar basal.

Distribution — About 20 species, and many hybrids, mainly in the northern temperate regions of the Old World; in *Malesia*: 1 species possibly native, some others cultivated.

1. Mentha canadensis L.

Mentha canadensis L., Sp. Pl. (1753) 577. — Lectotype (designated by Tucker et al., Taxon 29 (1980) 237): *Kalm* in *Herb. Linn. No. 730.18* (lecto LINN), Canada.

Mentha javanica Blume, Bijdr. (1826) 826; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 413; Ridl., Fl. Malay Penins. 2 (1923) 655. — *Mentha arvensis* L. var. *javanica* (Blume) Hook.f., Fl. Brit. India 4 (1885) 648; Backer & Bakh.f., Fl. Java 2 (1965) 631; H.Keng, Gard. Bull. Singapore 24 (1969) 111, f. 19. — Lectotype (designated here): *Blume s.n.* (lecto L, L0003721), Java.

Mentha arvensis L. var. *zollingeri* Briq., Bull. Herb. Boissier 2 (1894) 707. — Type: *Zollinger 1843* (B†), Java.

Aromatic, prostrate, stoloniferous herb, often rooting below. *Stems* 30–60 cm high, pubescent with appressed hairs. *Leaves*: blade lanceolate to broadly lanceolate, 2.5–4.5(–7) by 1–2.5(–3) cm, apex acute, base long-cuneate, margin entire at base, elsewhere serrate; sparingly hairy above, glabrous beneath; petiole 0.5–1 cm long. *Inflorescences* of axillary verticillasters; bracts linear or subulate, 2–4 mm long; pedicels 2–2.5 mm long. *Calyx* tubular-campanulate, 2–2.5 mm long, in fruit c. 3 mm long, with appressed short and long hairs, lobes lanceolate or subulate, ciliate, often shorter than the tube. *Corolla* violet or lilac, 4.5–5 mm long, puberulent outside. *Stamens* either short and included or long and exserted. *Nutlets* ellipsoid, c. 1 mm long, finely granular, often pointed above. — **Fig. 23a–d.**

Distribution — North America, across Asia; in *Malesia*: Malay Peninsula, Sumatra (also Batu Is.), Java, Philippines (Mindoro, Luzon, Samar), NE Sulawesi, Lesser Sunda Islands (E Timor) and Moluccas (Banda).

Habitat & Ecology — Mostly humid, open localities, borders of paddies, etc. Altitude: 150–1200 m. Flowering: throughout the year.

Vernacular names — Malay Peninsula: Pohok (derived from the Chinese Po-ho or Po-he). Sumatra: Iu-iu. Java: Bidjangut, Budangku, Budangs (Sundanese); Daun poko (Malay); Djanggot (Javanese); Kidjangur (Sundanese, Javanese). Philippines: Polihos (Samar-Leyte Bisaya); Polio (Tagalog) (both formed from the Spanish Poleo). Lesser Sunda Islands: Ortalam (East Timor).

Uses — Often cultivated. Leaves, whole plants and the oil extracted from *M. canadensis* (reported under the name *M. arvensis*) are all reported as having medicinal properties by La Dinh Moi (Plant Resources of South East Asia 12, 1 (1999) 344). They are used as a carminative, stomachic, antispasmodic, stimulant, sedative, sudorific, emmenagogue, astringent (externally) and refrigerant (externally) all over the world. They are administered internally to treat indigestion, flatulence, gastro-intestinal atony, colic and diarrhoea, or externally in the treatment of colds, influenza, fever, sinusitis, nose and throat complaints (all as nasal drops), headache, facial neuralgia and insect stings (e.g., as rubefacient). In Indonesia, pounded leaves are used externally against headache, and an infusion of the leaves as sudorific and expectorant to treat cough, as a carminative, and as antispasmodic in gastro-enteritis. Although the main use in the Philippines is reportedly as a culinary herb, an infusion of the leafy stems is also used as carminative, and pounded leaves are used to treat insect stings. Mint leaves in the form of tea or tablets are used in the Philippines as an analgesic, particularly in dental surgery.

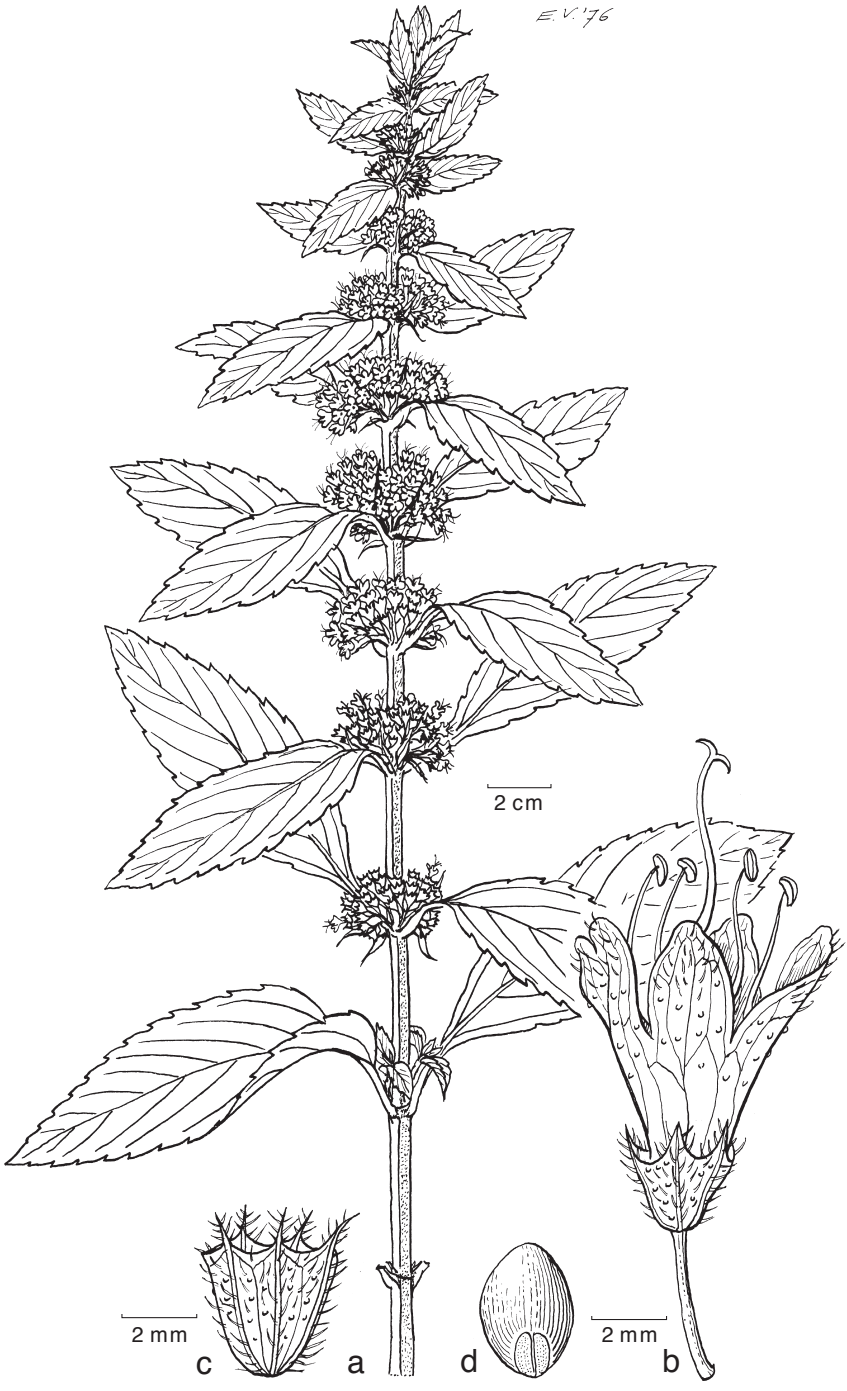

Fig. 23. a–d. *Mentha canadensis* L. a. Habit; b. flower; c. calyx; d. nutlet (a, b: *Van der Gaag 117*; c, d: *Backer 26437*; all L).

Note — After many studies citing the uncertain relationship between *M. arvensis* and *M. canadensis* (e.g., Tucker et al., Taxon 29 (1980) 237), *M. arvensis* is now accepted as a synonym of *M. canadensis*, and the accepted name of *M. arvensis* var. *javanica* is now *M. canadensis*. *Mentha canadensis* occurs in North America and across Asia.

CULTIVATED

Mentha × *cordifolia* Opiz ex Fresen., Syll. Pl. Nov. 2 (1828) 232 (provisional synonym of *Mentha* × *villosa* Huds., Fl. Angl., ed. 2 (1778) 250); Backer & Bakh.f., Fl. Java 2 (1965) 631; Cantoria, Philipp. J. Sci. 97 (1968) 281. — Type: not located.

Notes — A native of the northern temperate countries but cultivated in Java; it never flowers and is propagated vegetatively. Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 343) states that: Cantoria (1968) examined the Philippine material of so-called *M. arvensis* and *M. javanica* phytochemically and came to the conclusion that all this was the same species which he referred to *M.* × *cordifolia*. He stated that in the Philippine Menthas no flowers were ever found. Contrary to this, *PNH (Conklin & Buwaya) 79601* from the Mountain Prov. in Luzon, seen at L, has flowers.

Mentha × *piperita* L., Sp. Pl. (1753) 576; Miq., Fl. Ned. Ind. 2 (1859) 967; J.W.Purseglove, Trop. Crops, Dicot. 2 (1968) 636. — Lectotype (designated by Tucker et al., Taxon 29 (1980) 235): *Mentha spicis brevioribus & habitioribus, foliis Menthae fuscae, sapore fervido Piperis* in Ray, Syn. Meth. Stirp. Brit., ed. 3 (1724) 234, t. 10, f. 2, Habitat in Anglia.

Native of Europe; at one time cultivated in Java. Collected in East Timor by Van Steenis (Jan. 1954); commonly used by the Portuguese in chicken broth.

Mentha pulegium L., Sp. Pl. (1753) 577; Backer & Bakh.f., Fl. Java 2 (1965) 631. — Lectotype (designated by Tucker et al., Taxon 29 (1980) 237): *Herb. Linn. 730.19* (lecto LINN), Habitat in Angliae, Galliae, Helvetiae inundates.

A native of the northern temperate countries, in Java locally cultivated in gardens as a condiment.

26. MESOSPHAERUM

(G.L.C. Bramley)

Mesosphaerum P.Browne, Civ. Nat. Hist. Jamaica (1756) 257; Harley & J.F.B.Pastore, Phytotaxa 58 (2012) 29. — Type: *Mesosphaerum suaveolens* (L.) Kuntze

Herbs, subshrubs or shrubs, often aromatic. *Leaves* simple, sessile to long-petiolate. *Inflorescences* a diffuse leafy panicle of pedunculate, often cincinnate cymes or few-flowered, shortly pedunculate cymes in axils of bracts; bracts leaf-like; flowers shortly pedicellate; bracteoles small, not forming an involucre. *Calyx* subactinomorphic often with white hairs in throat. *Corolla* 5-lobed, 2-lipped, upper lip 2-lobed, lower lip 3-lobed, with median lobe saccate, lobes spreading, deflexed at anthesis with a

basal transverse ridge. *Stamens* 4, declinate, exserted; filaments free, without basal appendages; anther-cells confluent. *Disc* entire, equal-sided to weakly 4-lobed. *Style* gynobasic, with stylopodium absent. *Fruit* a schizocarp with four nutlets. *Nutlets* narrowly ellipsoid or ovoid, smooth or rugose sometimes only one or two developed, mucilaginous or not, attachment scar basal.

Distribution — About 25 species, primarily Andean, also in mountains of Central America and Mexico, two species extending to Brazil, two species widespread weeds of the tropics also present in *Malesia*.

Note — *Mesosphaerum* has been reinstated at the genus level following a reduction in size of *Hyptis* (Harley & Pastore 2012: 29).

KEY TO THE SPECIES

1a. Cymes 6–15-flowered, congested, comb-shaped, because calyces all pointing upwards. Calyx tubular, 3–4 mm long in fruit . . . . . **1. M. pectinatum**

b. Cymes 2–5-flowered, flowers not congested, the structure not comb-shaped, not all calyces upright. Calyx obliquely campanulate, 8–10 mm long in fruit . . . . . **2. M. suaveolens**

1. Mesosphaerum pectinatum (L.) Kuntze

Mesosphaerum pectinatum (L.) Kuntze, Revis. Gen. Pl. 2 (1891) 525. — *Nepeta pectinata* L., Syst. Nat., ed. 10 (1759) 1096. — *Hyptis pectinata* (L.) Poit., Ann. Mus. Natl. Hist. Nat. 7 (1806) 474; Miq., Fl. Ned. Ind. 2 (1858) 960; Backer & Bakh.f., Fl. Java 2 (1965) 634; H.Keng, Gard. Bull. Singapore 24 (1969) 96; in Steenis, Fl. Males., Ser. I, 8 (1978) 371. — Lectotype (designated by Howard, Fl. Lesser Antilles 6, 3 (1989) 248): *P. Browne* in *Linnaen Herbarium 726.31* (lecto LINN), Jamaica.

Erect, perennial herb, often shrubby, 0.5–2.5 m high, strongly aromatic. *Stems* and *branches* 4-angled, glabrous or pubescent with retrorse hairs, hairs longer on stem angles. *Leaves*: blade ovate to elliptic, 2–3 by 1–1.5 cm, apex acute to obtuse, base rounded to truncate, margin serrate or crenate, glabrous or glabrescent above, sparsely or densely hairy below; petiole 0.5–1 cm long. *Inflorescences* terminal, branched, the short flowering branches combining to form a large panicle, flowering branches with dense cymes, flowers congested, cymes 6–15-flowered, appearing congested, comb-shaped (pectinate) because calyces point upwards; bracteoles linear to setaceous. *Calyx* pointing upwards, tubular, 2–2.5 mm long, in fruit 3–4 mm long, hairy, with white hairs conspicuous in the throat between the lobes, lobes subulate, slightly longer than the calyx tube. *Corolla* violet or pale mauve fading to cream, 2.5–5 mm long, hairy. *Nutlets* black, oblong, c. 1 mm long, smooth.

Distribution — Native of the American tropics, introduced and naturalized in many other parts of the world; in *Malesia*: W Java (area between Bandung and Jakarta), Philippines (a single *Cuming* collection with no locality), New Guinea (Morobe Distr.).

Habitat & Ecology — Waste places, sunny localities, borders of watercourses, scattered but locally gregarious, from sea-level to c. 700 m. Flowering: April to December.

2. **Mesosphaerum suaveolens** (L.) Kuntze

Mesosphaerum suaveolens (L.) Kuntze, Revis. Gen. Pl. 2 (1891) 525. — *Ballota suaveolens* L., Syst. Nat., ed. 10 (1759) 1100. — *Hyptis suaveolens* (L.) Poit., Ann. Mus. Natl. Hist. Nat. 7 (1806) 472, t. 29, f. 2; Miq., Fl. Ned. Ind. 2 (1858) 959; Hook.f., Fl. Brit. India 4 (1885) 630; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 417; Ridl., Fl. Malay Penins. 2 (1923) 645; Backer & Bakh.f., Fl. Java 2 (1965) 634; H.Keng, Gard. Bull. Singapore 24 (1969) 96; in Steenis, Fl. Males., Ser. I, 8 (1978) 371. — *Hyptis ebracteata* R.Br in W.T.Aiton, Hort. Kew., ed. 2, 3 (1811) 391, nom. superfl. — Lectotype (designated by Epling, Revista Mus. La Plata, Secc. Bot. 7 (1949) 261): *Browne s.n.*, Linnaen Herbarium 737.6 (lecto LINN), Jamaica.

Bystropogon graveolens Blume, Bijdr. (1826) 824. — *Schaueria graveolens* (Blume) Hassk., Flora 25, Beibl. 2 (1842) 25. — Type: *Blume s.n.* (L).

Marrubium indicum auct. non Burm.f.: Thunb., Fl. Jav. (1825) 15, 21; Blanco, Fl. Filip. (1837) 477; Fl. Filip., ed. 2 (1845) 352; Fl. Filip., ed. 3, 2 (1878) 250.

Perennial herb, 0.5–2 m high, strongly aromatic. *Stems* 4-angled, often with sticky glandular hairs and simple hairs. *Leaves*: blade ovate to broadly obovate, 3–5 by 2–4 cm, apex acute, base rounded to truncate or cordate, often slightly oblique, margin serrate to irregularly serrate, sparsely to densely hairy on both surfaces; petiole 0.5–3 cm long, sparsely hairy. *Inflorescences* of lax, 2–5-flowered axillary secund cymes, flowers not congested, not comb-shaped; peduncles 0.5–1.5 cm long, pubescent; bracteoles linear, 1–3 mm long, hairy. *Calyx* obliquely campanulate, 4–5 mm long, in fruit 8–10 mm long, becoming more open at the mouth and drier in texture; lobes erect, linear-subulate, subequal, sinus between lobes with white hairs. *Corolla* blue or bluish violet, 7–8 mm long, lower lip with some hairs on lower part, sessile glands. *Anthers* purple. *Nutlets* brown or black, narrowly oblong, 3.5–5 mm long, slightly emarginate at apex, prominent longitudinal central ridge each side, rugose, producing white mucilage when wet. — **Plate 5h.**

Distribution — Native of tropical America, naturalized in the tropics and throughout *Malesia*, though rarer in forest-clad islands (e.g., Borneo).

Habitat & Ecology — Usually in dry open localities, along streams, roadsides, in dunes, fallow agriculture fields, ladang wastes, in all waste places, along the sea-shore, coconut plantations, tobacco and rubber estates, clearings, garden regrowths, raised coral limestone, teak- and Eucalypt savannahs, even on kerangas in Brunei, often gregarious and forming dense stands, under both everwet and seasonal conditions. Altitude: sea-level to 1300 m. Flowering: throughout the year.

Vernacular names — Bush tea-bush (English). Malay Peninsula: Lerkuing, Malbar hutan, Pohok kemangi, Pohok pohok hutan, Rukuruku, Selaseh hutan, Sepulut (Malay). Sumatra: Deringdereng, Selasie (Malay). Java: Babadotan, Djukut bau, Karang bau, Sumengit (Sundanese); Bandotan, Basinan, Berokan, Lampesan, Sangketan, Selangking, Susurawungan, Tobil (Javanese); Komandhin, Mang kamang, Srengenge (Madurese); Ruku ruku hutan, Selasi hutan (Malay). Philippines: Amotan, Kolongkogong (Bikol); Bangbangsit, Litalit (Iloko); Bauing (Sulu); Loko-loko (Bisaya); Pilodo (Panay Bisaya). Lesser Sunda Islands: Flores: Kasi kamba; Sumba: Khalawau; Timor: Jagalette, Kunfa mate, Kunu busuk, Kunu fui; Alor: Kawada. Ambon: Solasi bankit. New Guinea: Pultalul; Samsir (Wapi). The names derived from *Selasi* refer to the likeliness of the nuts with those of *Ocimum*, which swell to a gelatinous mass when soaked in water.

Uses — In Java it is considered a medicinal plant (Heyne, Nutt. Pl. Ned.-Ind. (1927) 1333). It is sometimes used as forage for cattle. It is also said to promote lactation in women. Medicinally, it is a stimulant, sudorific and useful against catarrh in Malaysia. Malay use it for poulticing skin complaints (Burkill, Dict. Econ. Prod. Malay Penins. (1935) 1220). In the Philippines the fetid-aromatic leaves are put under beds, chairs, etc. to drive out bedbugs (Quisumbing, Medic. Pl. Philip. (1951) 818). The crushed leaves are used as an antiseptic for wounds and skin-diseases (Santos & Valenzuela, J. Philip. Pharm. Ass. 1 (1928) 86). The leaves are further used for the preparation of anti-rheumatic and anti-suporific baths. Also the roots find application, e.g., as an appetizer, for affection of the uterus, etc. (Guerrero in Brown, Minor Prod. Philipp. For., Bull. Bur. Forest. Philipp. Islands 22, 3 (1921) 233). Hartley (Lloydia 32 (1969) 265) listed this species as a potential medicine against cancer.

EXCLUDED

Mesosphaerum radiatum Kuntze, Revis. Gen. Pl. 2 (1891) 525.

Recorded as from Java by Kuntze (1891: 525), possibly due to an erroneous identification. *Mesosphaerum radiatum* is a synonym of *Hyptis alata* (Raf.) Shinners, native to SE USA.

27. MICROTOENA

(G.L.C. Bramley, updated from Keng 1978)

Microtoena Prain, Hooker's Icon. Pl. 19 (1889) t. 1872; H.Keng, Gard. Bull. Singapore 24 (1969) 117; in Steenis, Fl. Males., Ser. I, 8 (1978) 346; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 221; Qiang Wang & D.Y.Hong, Bot. J. Linn. Soc. 165 (2011) 322. — Type: *Microtoena cymosa* Prain (= *M. patchoulii* (C.B.Clarke ex Hook.f.) C.Y.Wu & S.J.Hsuan). Genus name sometimes also wrongly spelled as '*Microtaena*'.

Erect, branching, perennial herbs. *Leaves* simple. *Inflorescences* lax, cymes dichotomous with one-sided branches, in open terminal panicles. *Calyx* campanulate, accrescent in fruit, subequally 5-lobed, the upper lobe largest; throat glabrous within. *Corolla* tube long-exserted, 2-lipped; upper lip strongly galeate (hooded), concave, entire; lower lip spreading, 3-fid, midlobe much narrower and longer than the lateral ones. *Stamens* 4, in 2 pairs, ascending under the upper lip, two upper ones slightly longer; anther-cells divaricate when young, at length confluent; filaments often hirsute. *Disc* equal-sided. *Style* gynobasic, bifid, upper branch very short. *Fruit* a schizocarp with four nutlets. *Nutlets* minute, ovoid, ventral surface subtriquetrous, smooth or granular, attachment scar basal.

Distribution — About 6 species in Indo-Himalaya, Indo-China, S China; in *Malesia*: 1 species in Sumatra, Java and Bali.

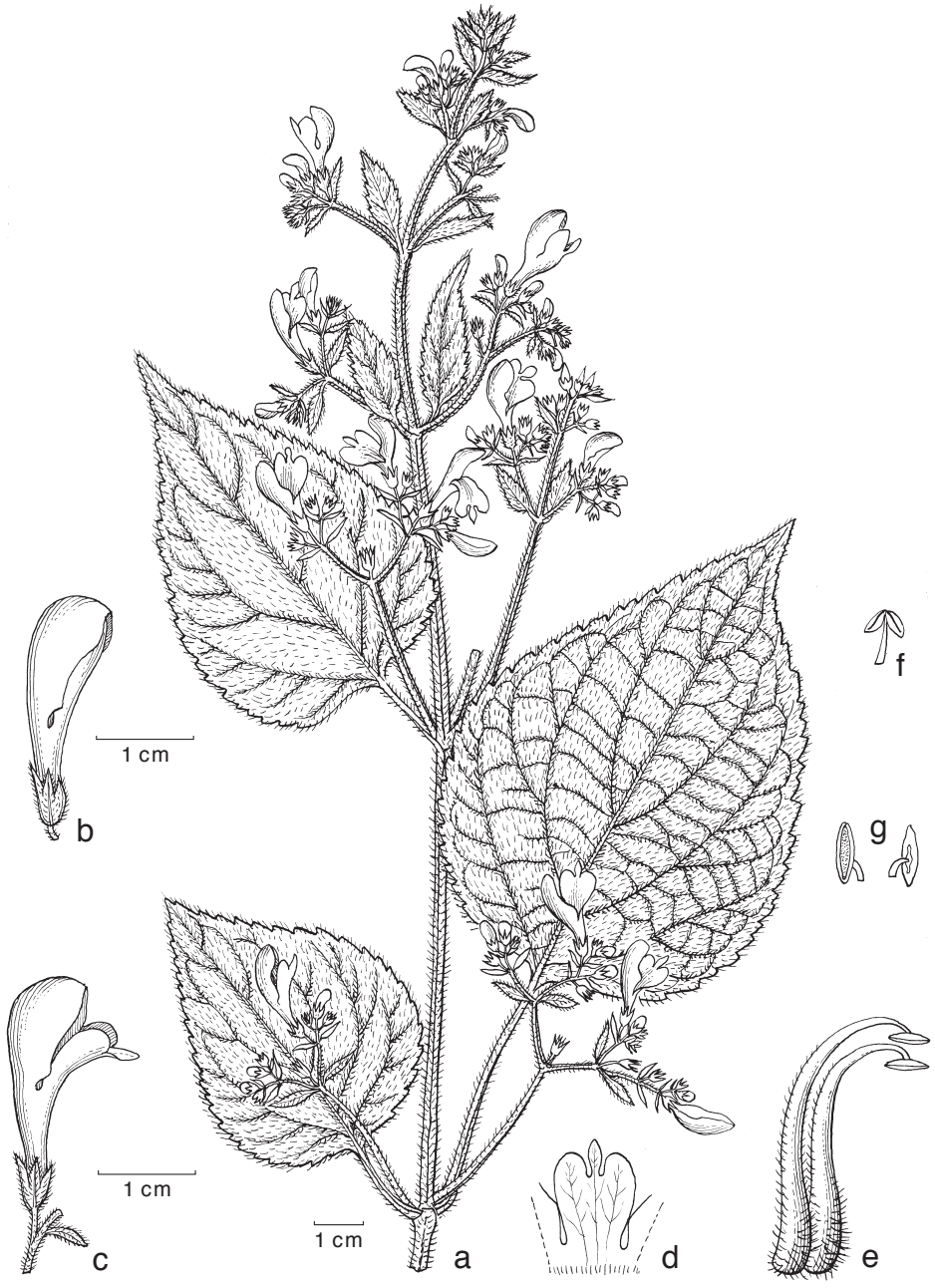

Fig. 24. *Microtoena insuavis* (Hance) Prain ex Briq. a. Habit; b. mature bud; c. open flower; d. anterior lip; e. two stamens; f. young anther; g. older stage with confluent cells (largely after Prain 1889).

1. Microtoena insuavis (Hance) Prain ex Briq.

Microtoena insuavis (Hance) Prain ex Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1896) 269; Backer & Bakh.f., Fl. Java 2 (1965) 625; H.Keng, Gard. Bull. Singapore 24 (1969) 117, f. 21. — *Gomphostemma insuave* Hance, J. Bot. 22 (1884) 231. — Type: *B.C.Henry 22237* (holo BM), China, Guangdong prov.

Microtoena siamica Stearn, J. Jap. Bot. 58 (1983) 11.— Type: *Kerr 6538* (holo BM), Thailand, Doi Chiengdao, Payap.

Herb, 0.5–1 m high. *Stems* and *branches* densely villose. *Leaves*: blade ovate to broadly ovate, 7–10 by 4.5–7.5 cm (sometimes much smaller), chartaceous, margins serrate or crenate-serrate, apex acute, base rounded or subcordate, often abruptly cuneate, upper surface hirsutulous, lower surface densely villose, also with sessile glands; petiole slender, 1–7 cm long. *Inflorescences* 10–35 cm long; bracts linear, 2–5 mm long, lower bracts leaf-like. *Calyx* turbinate, 1.5–2.5 mm long, dilated in fruit, hirsute and glandular; lobes triangular, subequal. *Corolla* yellow with upper lip purple or reddish, 9–16 mm long, pubescent. *Nutlets* ovoid, flattened, c. 1.5 by 1 mm, finely granular. — **Fig. 24.**

Distribution — China, Thailand, Vietnam; in *Malesia*: Sumatra, Java (rare in W Java: Preanger Mts; more common in E Java: Mts Ungaran, Lawu, N. Ardjuno, Jang), Lesser Sunda Islands (Bali).

Habitat & Ecology — Damp forests, along river-banks, waterfalls. Altitude: 1000–1700 m, but at Trawas waterfall below 1000 m. Flowering: May to October.

Taxonomy — A recent investigation into the *M. insuavis* complex (Wang & Hong, Bot. J. Linn. Soc. 165 (2011) 322) concluded that the taxonomy of the complex is controversial; the other two species recognised in the complex, *M. mollis* H.Lév. and *M. patchoulii* (C.B.Clarke ex Hook.f.) C.Y.Wu & S.J.Hsuan, do not occur in Malesia, but are found in China, India and Burma.

Note — Because of the strongly scented leaves, this plant is called the Chinese Patchouli by Prain (Bull. Misc. Inform. Kew. (1902) 11, as *Microtoena cymosa*).

28. MOSLA

(G.L.C. Bramley, updated from Keng 1978)

Mosla (Benth.) Buch.-Ham. ex Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 20 (1875) 456; Hook.f., Fl. Brit. India 4 (1885) 646; H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 346; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 245; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 230. — Type: *Mosla dianthera* (Buch.-Ham. ex Roxb.) Maxim.

Orthodon Benth., J. Linn. Soc., Bot. 9 (1865) 167, nom. illeg. (non R.Br., 1820, musci). — Type: *Orthodon japonicus* Benth. ex Oliv. (= *Mosla japonica* (Benth. ex Oliv.) Maxim.)

Annual herbs. *Leaves* strongly aromatic, usually glandular below. *Inflorescences* terminal or axillary, raceme-like, congested to interrupted, of 2-flowered verticillasters; bracts small, sometimes the lower leaf-like. *Calyx* campanulate, 10-nerved, often gibbous at base, subequally 5-lobed and 2-lipped; upper lip 3-lobed, lower lip 2-lobed, generally slightly longer. *Corolla* white to pinkish white, campanulate, weakly 2-lipped. *Stamens* 2, only upper pair fertile, shorter than and divergent under upper corolla lip, lower pair reduced to staminodes, sometimes absent; connective distinct, not elongate.

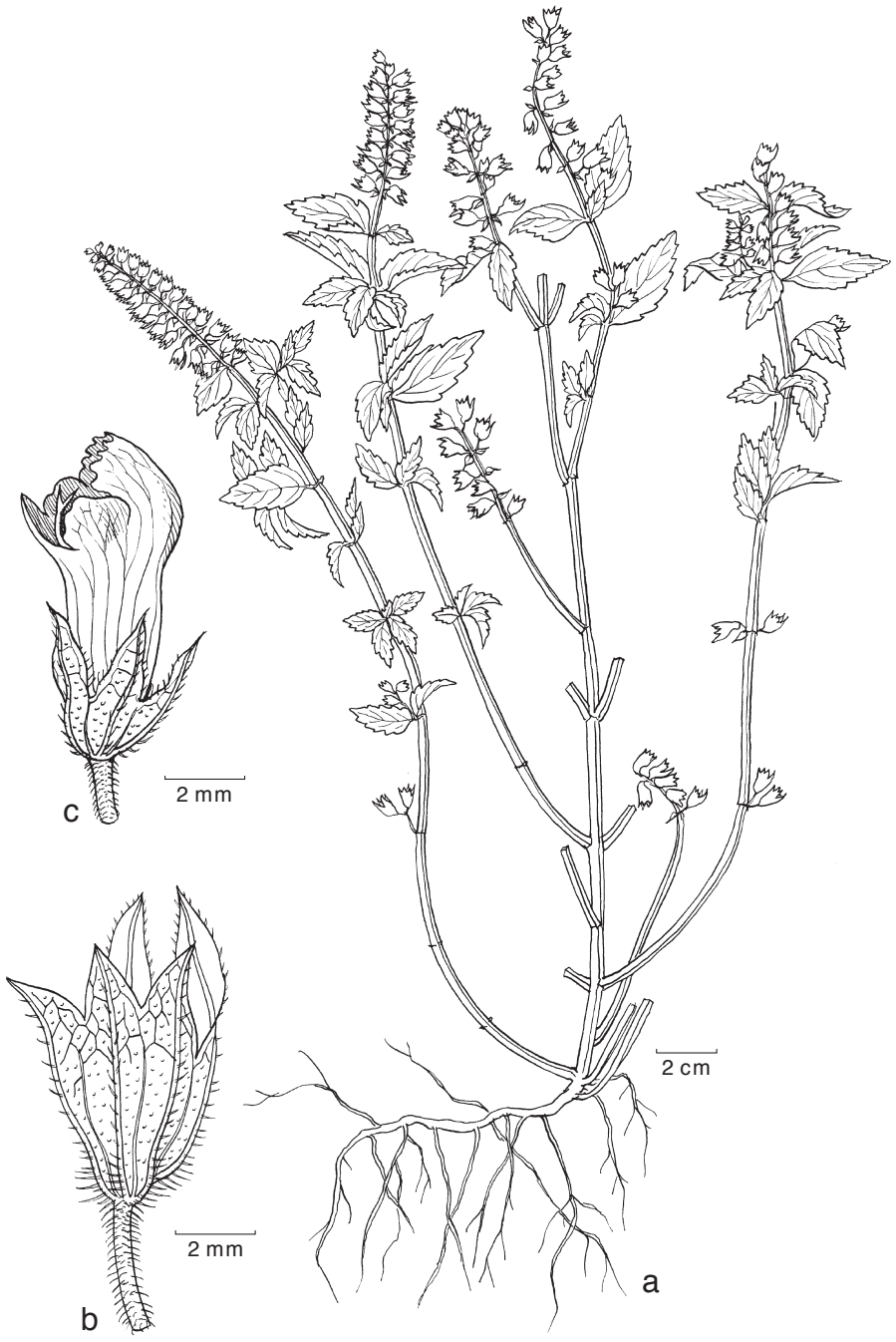

Fig. 25. *Mosla dianthera* (Buch.-Ham. ex Roxb.) Maxim. a. Habit; b. fruiting calyx; c. flower; fruiting calyx (a: *BS 37803*; b: *PNH 42669*; c. *Fl. Taiwan 17865*; *Lörzing 9979*; all L). Drawing by Ed Vijsma, 1976.

Style gynobasic, bifid, equalling corolla. *Fruit* a schizocarp with four nutlets. *Nutlets* ellipsoid, reticulate, attachment scar basal.

Distribution — About 22 species, India, through continental Asia to Japan and Taiwan; in *Malesia* a single species: Peninsular Malaysia (Cameron Highlands), N Sumatra and Philippines (Luzon).

1. Mosla dianthera (Buch.-Ham. ex Roxb.) Maxim.

Mosla dianthera (Buch.-Ham. ex Roxb.) Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 20 (1875) 457. — *Lycopus diantherus* Buch.-Ham. ex Roxb., Fl. Ind. 1 (1820) 145. — *Orthodon diantherus* (Buch.-Ham. ex Roxb.) Hand.-Mazz., Symb. Sin. 7 (1936) 933. — Lectotype (designated here): Roxburgh, Icon. Roxb. t. 1517 (lecto K).

Cunila nepalensis D.Don, Prodr. Fl. Nepal. (1825) 107. — *Melissa nepalensis* (D.Don) Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 66. — *Hedeoma napalensis* (D.Don) Benth., Labiat. Gen. Spec. (1834) 366. — Type: *Wallich Cat. 2124* (holo K-W), Nepal.

Mosla formosana Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 20 (1875) 459; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 414; H.Keng, Gard. Bull. Singapore 24 (1969) 122, f. 22g–i; H.W. Li, Acta Phytotax. Sin. 12, 2 (1974) 232. — *Orthodon formosanus* (Maxim.) Kudô, Mem. Fac. Sci. Taihoku Imp. Univ. 2, 2 (1929) 79. — Type: *Oldham 362* (iso? K), Formosa, Tamsuy.

Mosla lysimachiiflora Hayata, Icon. Pl. Formosan. 8 (1919) 104. — *Orthodon lysimachiiflorus* (Hayata) Masam., Trans. Nat. Hist. Soc. Formosa 22 (1932) 232. — Type: not located.

Erect herb, to 1 m high. *Stems* quadrangular, woody at base, pubescent. *Leaves* rhombic or ovate, 15–30 by 6–24 mm, membranaceous, apex acute, base truncate to cuneate, slightly decurrent along upper petiole, margins serrate, upper and lower surfaces pubescent to sparsely pubescent, lower surface also with yellow sessile glands; petioles 10–20 mm long. *Inflorescences* terminal or axillary, lax-flowered, 2-flowers per verticillaster, bracteoles minute; pedicels c. 1 mm long in flower, growing to 4 mm long in fruit. *Calyx* 1–2 mm long at anthesis, 5-lobed, lobes deltoid, 2-lipped; upper lip 3-lobed, lower lip 2-lobed, lobes slightly longer than upper, calyx becoming up to 5 mm long in fruit, outer surface pubescent especially on the veins, with red or yellow sessile glands, inner surface with a ring of hairs. *Corolla* pinkish, 3–3.5 mm long. *Fertile stamens* 2, slightly shorter than upper corolla lobe; staminodes usually absent. *Nutlets* c. 1 mm long, brown. — **Fig. 25.**

Distribution — India through Continental Asia to Japan, Taiwan; in *Malesia*: Peninsular Malaysia, N Sumatra, Philippines (N Luzon).

Habitat & Ecology — Montane forest, amongst wayside vegetation. Altitude: 1000–1880 m.

Vernacular name — Sumatra: Tappoea roedang.

Note — Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 331) recognised two species of *Mosla* in Malesia: *M. dianthera* and *M. formosana*, both species described by Maximovicz. Maximovicz separated them by length and breadth of the corolla relative to the calyx, and by the fruiting pedicel length. Based on the Malesian material I can see no significant difference in these characters, therefore, *M. formosana* is treated as a synonym here.

29. OCIMUM

(G.L.C. Bramley, updated from Keng 1978)

Ocimum L., Sp. Pl. (1753) 597; H.Keng, Gard. Bull. Singapore 24 (1969) 125; in Steenis, Fl. Males., Ser. I, 8 (1978) 376; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 296; A.J.Paton & E.Putievsky, Kew Bull. 51 (1996) 509; A.J.Paton, Harley & M.M.Harley in Y.Holm & R.Hiltunen, Ocimum. Medicinal and aromatic plants – industrial profiles (1999) 1; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 260; Suddee, A.J.Paton & J.Parn., Kew Bull. 60 (2005) 24. — Lectotype (designated by Britton & Millspaugh, Bahama Fl. 380 (1920) 26): *Ocimum basilicum* L.

Strongly scented aromatic herbs or undershrubs. *Stems* often much-branched. *Leaves* simple, opposite, petiolate. *Inflorescences* thyrsoid with cymes sessile, usually 3-flowered. *Calyx* infundibular to tubular, straight, curving upwards or bent downwards, strongly 2-lipped, 5-lobed (1/4), upper lobe largest, rounded, decurrent, lower lobes deltoid to subulate, lateral lobes deltoid to truncate, throat open or closed, glabrous or hairy; fruiting calyx reflexed against inflorescence axis. *Corolla* strongly 2-lipped, 5-lobed (4/1), white or pink, upper lip ascending, equally 4-lobed or central lobe longer than others, lower lip more or less horizontal, flat or concave. *Stamens* 4, declinate, upper pair attached near corolla base, rarely sterile, exserted, filaments usually hairy near base, often appendiculate; lower pair attached near corolla throat. *Style* gynobasic, stigma bifid, lobes equal, diverging. *Disc* equally 4-lobed. *Fruit* a schizocarp with four nutlets. *Nutlets* spherical to ellipsoid, usually mucilaginous when moistened, attachment scar basal.

Distribution — 65 species, throughout the tropics but mostly in Africa. Cultivated species common worldwide. Eight cultivated species in *Malesia*.

Habitat & Ecology — Usually found in drylands, grassland and open woodland.

Note — Species delimitation follows Suddee et al. (2005), who provide a revision of tribe Ocimeae in continental SE Asia.

KEY TO THE SPECIES

1a. Throat of fruiting calyx obstructed by upcurved median lobes of the lower lip, lower lip shorter than upper. Mostly shrubs or undershrubs . . . . . **4. O. gratissimum**
b. Throat of fruiting calyx open, not obstructed by median lobes of the lower lip, median lobes longer or as long as upper lobe. Mostly herbs 2
2a. Calyx tube with tiny glandular hairs inside. Nutlets unchanged when wet, not mucilaginous . . . . . **5. O. tenuiflorum**
b. Calyx tube hairy in the throat. Nutlets producing mucilage when wet 3
3a. Fruiting calyx 6–8 mm long. Corolla 7–8 mm long . . . . . **3. O. basilicum**
b. Fruiting calyx up to 5.5 mm long. Corolla 4–5.5 mm long 4
4a. Fruiting calyx 4–5.5 mm long. Stem internodes with long, spreading and sometimes retrorse hairs . . . . . **1. O. africanum**
b. Fruiting calyx 2–3.5 mm long. Stem internodes with short adpressed or retrorse hairs . . . . . **2. O. americanum**

1. **Ocimum africanum** Lour.

Ocimum africanum Lour., Fl. Cochinch. (1790) 370 ('*Ocymum*'). — Neotype (designated by Suddee et al., Kew Bull. 60 (2005) 28): *Talmy 76* (neo K; isoneo P), [Vietnam,] Cochinchine.

Ocimum pilosum Willd., Enum. Pl. (1809) 629. — *Ocimum americanum* L. var. *pilosum* (Willd.) A.J.Paton, Kew Bull. 47 (1992) 426. — Lectotype (designated by Paton, Kew Bull. 47 (1992) 426): *Willdenow herbarium 11064* (lecto B-W), unknown locality.

Ocimum × *citriodorum* Vis., Sem. Hort. Patav. (1840). — Type: cult. at Padua (Italy), s.c. (holo Padua, [photo K]).

Ocimum americanum auct. non. L: Backer & Bakh.f., Fl. Java 2 (1965) 640; H.Keng, Gard. Bull. Singapore 24 (1969) 125; in Steenis, Fl. Males., Ser. I, 8 (1978) 376; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 296.

Branched, erect herb, 10–50 cm tall. *Stems* and *branches* with long, spreading and sometimes retrorse hairs, spreading hairs much longer at nodes. *Leaves*: blade narrowly ovate to elliptic, 0.5–5 by 0.5–2.5 cm, apex acute, base cuneate to obtuse, margins entire or shallowly serrate, glabrous on both surfaces, or with some adpressed hairs on the venation below, or hairy on both surfaces, with yellow sessile glands on both surfaces; petiole to 2 cm long. *Inflorescences* lax, verticils up to 10 mm apart, axes with dense retrorse hairs; bracts ovate, to 5 mm long, acute to acuminate, margins hairy; pedicels recurved, 1–2.5 mm long, with spreading hairs. *Calyx* 1.5–2.5 mm long, in fruit 4–5.5 mm long, upper lobe rounded, decurrent at base, slightly accrescent, sometimes apex apiculate, hairs on margins and at base; lower lip with median lobes narrowly deltoid, cuspidate, longer than upper, margins hairy, lateral lobes broadly deltoid, slightly shorter or equal in length to upper lobe, margins hairy; throat open, hairy near mouth, glabrous at base. *Corolla* white or light purple, 4–5.5 mm long, tube straight, with or without yellow sessile glands, backs of lobes with hairs, upper lip with oblong median lobes and obovate-oblong lateral lobes, lower lip boat shaped. *Stamens* with upper pair with glabrous transverse process near base. *Nutlets* narrowly ellipsoid, 1–1.5 mm long, mucilaginous when wet.

Distribution — Tropical Africa, America and Asia, widely cultivated; in *Malesia*: Sumatra, Java, Borneo, Philippines, Sulawesi, Lesser Sunda Islands (Lombok), New Guinea.

Habitat & Ecology — Cultivated.

Uses — The uses Keng (1978) described for *O. americanum* may apply to *O. africanum* (see note).

Note — *Ocimum africanum* is of hybrid origin (*O. americanum* × *O. basilicum*). Suddee et al. (2005) note that it freely hybridises with *O. basilicum* and intermediates are not uncommon. Keng (1978) treated *O. africanum* as a synonym of *O. americanum*; the species delimitation here follows Suddee et al. (2005). From herbarium specimen data, *O. africanum* appears to be more common in Malesia than *O. americanum*.

2. **Ocimum americanum** L.

Ocimum americanum L., Cent. Pl. I. (1755) 15; Backer & Bakh.f., Fl. Java 2 (1965) 640; H.Keng, Gard. Bull. Singapore 24 (1969) 126. — Lectotype (designated by Morton, J. Linn. Soc., Bot. 58 (1962) 513): *Herb. Linn. No. 749.9* (LINN), America. Epitype (designated by Paton & Putievesky, Kew Bull. 51 (1996) 513): *Pushpangadan & Sobti 1* (holo? K), India, Kerala.

Ocimum canum Sims, Bot. Mag. 51 (1823) t. 2452; Miq., Fl. Ned. Ind. 2 (1858) 936; Hook.f., Fl. Brit. India 4 (1885) 607; Ridl., Fl. Malay Penins. 2 (1923) 644. — *Ocimum stamineum* Sims, Bot. Mag. 51 (1823) t. 2452. — Type: cultivated, seed from China, illustrated in Sims, Bot. Mag. 51 (1823) t. 2452. (See Suddee, Paton & Parnell, Kew Bull. 60 (2005) 28, two names based on same plate, name on top of page is *O. canum*, name in text is *O. stamineum*, one name superfluous, but choice not made.)

Ocimum brachiatum Blume, Bijdr. (1826) 833; Hassk., Cat. Hort. Bot. Bogor. (1844) 128; Pl. Jav. Rar. (1848) 477. — Type: *Blume s.n.*, Feb. 1839 (holo L; iso L), [Indonesia, Java,] Batavia [= Jakarta].

Branched, erect herb, 0.30–1 m high, strongly smelling of camphor. *Stems* and *branches* with short adpressed or retrorse hairs. *Leaves*: blade narrowly ovate to elliptic, 1–3.5(–4.5) by 0.5–1.2(–2) cm, apex acute, base cuneate, margins entire or shallowly serrate, glabrous on both surfaces, or with some adpressed hairs on the venation above, or hairy on both surfaces, with yellow sessile glands on both surfaces; petiole 1–2.5 cm long. *Inflorescences* lax, 7–15 cm long; bracts narrowly elliptic to ovate, 2–3(–5) mm long, apex acuminate, margins hairy; pedicels recurved, 1–2 mm long, with spreading hairs. *Calyx* 1.5–2 mm long, in fruit 2–3.5 mm long, upper lobe rounded, decurrent at base, apex apiculate, hairs on margins and at base; lower lip with median lobes narrowly deltoid, cuspidate, slightly longer than upper, margins hairy, lateral lobes broadly deltoid, slightly shorter or equal in length to upper lobe, margins hairy; throat open, hairy near mouth, glabrous at base. *Corolla* white or light purple, 4–5 mm long, tube straight, with or without yellow sessile glands, backs of lobes with hairs, upper lip with oblong median lobes and obovate-oblong lateral lobes, lower lip boat shaped. *Stamens* with upper pair with glabrous transverse process near base. *Nutlets* narrowly ellipsoid, 1–1.2 mm long, mucilaginous when wet.

Distribution — Madagascar, Tropical Africa, Arabia, Himalaya, India and continental SE Asia; in *Malesia*: Sumatra, Java, possibly cultivated in other areas in Malesia.

Habitat & Ecology — In Java cultivated in kitchen gardens, widely naturalized, along roadsides, also in teak forest, open waste places in settled areas. Altitude: up to 500 m. Flowering: throughout the year.

Uses — Following Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 377): eaten raw as a side-dish, also an important ingredient for curries and sayor. Nutlets taken with cool sweet drinks under the names of 'tj'ao' (Malay), 'tjingtjao' (Sundanese), 'dawet' (Javanese). Leaves are also used in flavouring dishes with a fishy or disagreeable smell. Hartley (Lloydia 32 (1969) 272) listed this species as a potential medicine against cancer. Burkill (Econ. Prod. Malay Pen. (1935) 1574) stated that pounded leaves are in Malaysia placed on the forehead against catarrh and that a decoction is used for coughs.

Note — Keng (1978) includes *O. africanum* as a synonym of *O. americanum*. Following Suddee et al. (2005) it is treated as a separate species here. The uses Keng (1978) described for *O. americanum* (listed here) may (also) apply to *O. africanum*, e.g., the use in Malaysia.

3. Ocimum basilicum L.

Ocimum basilicum L., Sp. Pl. (1753) 833; Miq., Fl. Ned. Ind. 2 (1858) 937, incl. varieties; Hook.f., Fl. Brit. India 4 (1885) 608; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 421; Ridl., Fl. Malay Penins. 2 (1923) 634; Backer & Bakh.f., Fl. Java 2 (1965) 639; J.W.Purseglove, Trop. Crops, Dicot. 2 (1968)

636; H.Keng, Gard. Bull. Singapore 24 (1969) 127. — Lectotype (designated by Paton, Kew Bull. 47 (1992) 426): *Linnean Herbarium 749.5* (lecto LINN), Western Asia.

Ocimum citriodorum Blanco, Fl. Filip., ed. 2 (1845) 591; Fl. Filip., ed. 3, 2 (1878) 256. — Type: lost.

Ocimum americanum auct. non L.: Blanco, Fl. Filip. (1837) 480; Fl. Filip., ed. 2 (1845) 335; Fl. Filip., ed. 3, 2 (1878) 254, t. 407.

Aromatic, lemon-scented, erect, branched herb, 0.3–1 m high. *Stems* and *branches* glabrous or sparsely hairy when young, often with short shoots in the leaf axils. *Leaves*: blade ovate or elliptic-ovate, 2.5–5.5 by 1.2–2.5 cm, membranaceous, apex acute, base cuneate, margin entire or coarsely and sparsely serrate, glabrous above and below, or glabrous above, below with hairs on the veins, or with some hairs above and below; petiole to 2 cm long. *Inflorescences* dense, 10–15 (or more) cm long, axes pubescent; bracts narrowly ovate to narrowly elliptic to elliptic, 6–10 by 2–5 mm; pedicels 1–2 mm long, recurved. *Calyx* 4–5 mm long, in fruit 6–8 mm long; upper lobe rounded, decurrent at base, apex apiculate, hairs on margins and at base; lower lip with median lobes narrowly deltoid, cuspidate, slightly longer than upper, margins hairy, lateral lobes broadly deltoid, shortly cuspidate, slightly shorter or equal in length to upper lobe, margins hairy; throat open, hairy near mouth, glabrous at base. *Corolla* white, pinkish, or violet, 7–8 mm long, tube straight, glabrous, with or without yellow sessile glands, backs of lobes with hairs, upper lip with oblong median lobes and broadly oblong lateral lobes, lower lip boat-shaped, glabrous. *Stamens* with upper pair with transverse process of tufted hairs near base. *Nutlets* dark brown, oblong or ellipsoid, c. 1.5 mm long, pitted, mucilaginous when wet. — **Plate 5f.**

Distribution — Throughout the Old World tropics; throughout *Malesia*.

Habitat & Ecology — Settled areas and open waste places, roadsides, teak forests, dry paddies. Altitude: up to c. 450 m, in New Guinea once found at 1150 m. Flowering: throughout the year. Galls on young stems caused by aphids or coccids.

Vernacular names — Basil, sweet basil (English). Malay Peninsula: Kemangi, Puar, Ruku, Sĕlasi antan, Sĕlasi hitam, Sĕlasi puteh (Malay). Sumatra: Hulasi, Kulasa koling, Leam, Rudang nalopok, Rudangna, Rudangna birong, Rudangna lopak, Selang bano, Sulasih, Theulateh (Malay). Java: Kemangi, Salasih, Solasi, Solasi bodas, Solasi hideung, Surawung, Telasi bodas (Sundanese); Kemangi, Lampas, Selasih, Selasih ireng, Telasih, Telasih ireng, Tulasih (Javanese); Salase (Madurese); Selase, Selasi, Selasi dulang, Selasi hitam, Selasi putih (Malay). Philippines: Albahdca (Tagalog, Ibanag); Balanoi (Tagalog); Bauing, Ruku ruku (Sulu); Bidai (Iloko); Bouak (Bisaya); Kalu-ui (Cebu Bisaya); Kamangi (Panay Bisaya); Samarig, Samilig (Bikol); Solasi (Tagalog, Pampang); Valanoi (Ivatan). Sulawesi: Amping, Badla, Kukuru, Kulasi, Lasi, Solasi, Sulasi, Tolasi, Tolasi djating. Lesser Sunda Islands: Slasih, Slasih tjeming, Sulaket, Sulasih; Bali: Afi; Timor: N'dakebuu; Roti: Woonene (Leti). Moluccas: Ambon: Sulasi kubus.

Uses — Following Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 377): widely used as a condiment. As of *O. americanum* the nutlets, which swell and become gelatinous in water, are added to cool sweet drinks. They are said to have stimulant, diuretic and demulcent properties. They are also used as an aphrodisiac, for gonorrhoea, diarrhoea, dysentery and constipation. They are especially prescribed in eye sores. Flowers are said to be a remedy for coughs of children. Leaves are used in a decoction as a carminative

and stimulant and as a remedy for coughs, in washing ulcers, and for hiccups. Roots are used for bowel complaints of children and as a febrifuge. Flowers of the purple-flowered variety are sometimes deposited on tomb-stones and in offerings. Oils of selasi are used in perfumes; in Java the variety with citrus-scent is valued (Heyne, Nutt. Pl. Ned.-Ind. (1927) 1336). There is also a form with a fennel scent.

4. Ocimum gratissimum L.

Ocimum gratissimum L., Sp. Pl. (1753) 832; Blume, Bijdr. (1826) 832 ('*Ocymum*'); Miq., Fl. Ned. Ind. 2 (1858) 938; Hook.f., Fl. Brit. India 4 (1885) 608; Ridl., Fl. Malay Penins. 2 (1923) 644; Backer & Bakh.f., Fl. Java 2 (1965) 639; H.Keng, Gard. Bull. Singapore 24 (1969) 128. — Neotype (designated by Paton, Kew Bull. 47 (1992) 411): *Linnean Herbarium 749.2* (neo LINN), cultivated in Uppsala, originally from India.

Ocimum viride Willd., Enum. Pl. (1809) 629. — Lectotype (designated by Morton, J. Linn. Soc., Bot. 58 (1962) 232): cultivated in Berlin Botanical Garden, unknown origin, *Willdenow Herbarium 100963* (lecto B-W, photo K).

Perennial herb, subshrub or shrub, 1–3 m high, woody at the base. *Stems* and *branches* glabrous or glabrescent when woody, with short spreading hairs when young. *Leaves*: blade narrowly elliptic to elliptic, 5–10 by 2.5–4.5 cm, membranaceous, apex acute, base cuneate, margin coarsely serrate, hairs along midvein above and on veins below, also with yellow sessile glands; petiole 1.5–4.5 cm long, slender, pubescent. *Inflorescences* lax or dense, 10–15 cm long, axes glabrous to softly pubescent; bracts caducous, sessile, broadly ovate, 2–5 by 2–4 mm, apiculate, hairy; pedicels 2–3 mm long, recurved. *Calyx* 2–3 mm long, in fruit 3–4 mm long; upper lobe rounded, accrescent, decurrent at base, apex pointed, hairs on margins and at base; lower lip much shorter than upper, with median lobes narrowly deltoid, curving upwards to almost press against upper lip, lateral lobes acute; tube with yellow sessile glands, some short spreading hairs; throat obstructed by upcurved median lobes of the lower lip, short hairs inside. *Corolla* greenish white, 3–4 mm long, tube straight, short hairs outside, with or without yellow sessile glands, backs of lobes with hairs, upper lip oblong, the four lobes equal, lower lip boat-shaped, glabrous. *Stamens* with upper pair with hairy transverse process near base. *Nutlets* dark brown, subglobose, c. 1.5 mm long, minutely tuberculate, mucilaginous when wet.

Distribution — Pantropical; in *Malesia*: Malay Peninsula, Sumatra (also Bangka), W Java and New Britain.

Habitat & Ecology — Open waste places along roadsides, etc. in settled areas. Altitude: up to c. 300 m. Flowering: throughout the year. Rather rare.

Vernacular names — Kemangi hutan, Ruku ruku rimba, Selasi besar, Selasi djambi, Selasi meka(h) (Malay). Sumatra: Selasi djambi, Selasi tjina (on Bangka).

Uses — Following Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 378): Cultivated as a hedge-plant, and found in native cemeteries. Leaves when bruised strongly smelling of cloves (forma *caryophyllatum*) or of thyme (forma *graveolens*). According to Heyne (Nutt. Pl. Ned.-Ind. (1927) 1337) hardly of economic importance. An infusion of the leaves is used as a kind of tea in S Sumatra. Also applied to ritual washing of corpses.

Note — Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 379) made the following comments about *O. viride*, now considered a synonym of *O. gratissimum*: native of tropi-

cal Africa, at one time introduced and cultivated in Java, with the intention of using it against mosquito attack, but without success. Also cultivated in the Malay Peninsula, where burned leaves are used as a repellent against mosquitos (Burkill (Econ. Prod. Malay Pen. (1935) 1574), though the statement that mosquitos will also be repelled by the living plants is incorrect.

5. Ocimum tenuiflorum L.

Ocimum tenuiflorum L., Sp. Pl. (1753) 597. — *Moschosma tenuiflora* (L.) Heynh., Nomencl. 1 (1840) 532. — Lectotype (designated by Cramer in Dassanayake & Fosberg, Revis. Handb. Fl. Ceylon 3 (1981) 119): Linnean Herbarium 749.13 (lecto LINN), cultivated in Uppsala.

Ocimum sanctum L., Mant. Pl. Altera (1767) 85; Miq., Fl. Ned. Ind. 2 (1858) 939; Hook.f., Fl. Brit. India 4 (1885) 609; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 422; Ridl., Fl. Malay Penins. 2 (1923) 643; Backer & Bakh.f., Fl. Java 2 (1965) 639; H.Keng, Gard. Bull. Singapore 24 (1969) 130. — Lectotype (designated by Cramer in Dassanayake & Fosberg, Revis. Handb. Fl. Ceylon 3 (1981) 116): Linnean Herbarium 749.7 (lecto LINN), cultivated in Uppsala.

Ocimum monachorum L., Mant. Pl. Altera (1767) 85; Blume, Bijdr. (1826) 831. — Type: unknown origin, cultivated in Uppsala (there is no specimen in LINN or S). Lectotype (designated by Suddee in Jarvis et al., Taxon 50 (2001) 515): Illustration of 'Ocimum caryophyllum monochorum Acinos columnea' in Bauhin & Cherler, Hist. Pl. 3 (1651) 260.

Ocimum flexuosum Blanco, Fl. Filip. (1837) 481; Fl. Filip., ed. 2 (1845) 335; Miq., Fl. Ned. Ind. 2 (1858) 939; Blanco, Fl. Filip., ed. 3, 2 (1878) 255. — Type: lost.

[*Ocimum nelsonii* Zipp. ex Span., Linnaea 15 (1841) 333, nom. nud.; Miq., Fl. Ind. Bat. 2 (1858) 939.]

Ocimum album auct. non L.: Blanco, Fl. Filip. (1837) 479.

Ocimum virgatum auct. non Thunb.: Blanco, Fl. Filip., ed. 2 (1845) 334; Fl. Filip., ed. 3, 2 (1878) 253.

Ocimum brachiatum auct. non Blume: Hassk., Pl. Jav. Rar. (1848) 471.

Erect, much branched herb, 30–60 cm, often woody at the base. *Stems* and *branches* with dense to even covering of spreading hairs. *Leaves*: blade narrowly elliptic to elliptic, 3–6 by 1–2.5 cm, membranaceous, apex obtuse or acute, base cuneate or attenuate, margin coarsely serrate, ± glabrous above, with adpressed hairs below, especially on the nerves, also with yellow sessile glands; petiole 0.5–1.5 cm long, spreading hairs. *Inflorescences* lax or dense, 8–10 cm long; bracts ovate, 2–3 by 3–4 mm, acuminate, margins ciliate, hairs also on surface; pedicels 2.5–4 mm long. *Calyx* 1–1.5 mm long, in fruit 3–4 mm long; upper lobe rounded, apex usually apiculate, hairs on margins and at base; lower lip with median lobes narrowly deltoid, cuspidate, curving upwards, longer than upper lip and lateral lobes, lateral lobes broadly deltoid, shortly cuspidate; tube with yellow sessile glands, spreading hairs; throat open, tiny glandular hairs inside. *Corolla* purplish red, 2–3 mm long, tube straight, glabrous outside, with or without yellow sessile glands, backs of lobes with hairs, upper lip oblong, the two median oblong-obovate lobes longer than the two oblong lateral lobes, lower lip obovate-oblong, glabrous. *Stamens* with upper pair with tuft of hairs at base. *Nutlets* dark brown, ellipsoid, c. 1 mm long, smooth, not mucilaginous when wet. — **Fig. 26.**

Distribution — Pantropical, possibly a native of tropical Asia, throughout *Malesia*.

Habitat & Ecology — A weed of waste places in settled areas, often in great quantity, in grass fields, along roadsides and sunny dry places, thickets and planted in garden land and on cemeteries. Altitude: up to 600 m. Flowering: throughout the year.

Fig. 26. *Ocimum tenuiflorum* L. a. Habit; b. flower; c. fruiting calyx (all *Bakhuizen van den Brink Sr. 8153*, L). Drawing by Ed Vijsma, 1977.

Vernacular names — Sacred basil, holy basil (English). Malay Peninsula: Oku, Ruku ruku, Ruruku, Salassay, Sulasi (Malay). Sumatra: Kimangi, Rudjang tampua, Rudjang taba, Ruku-ruku, Silasi putih; Sini sini (Nias Isl.). Java: Kilampes, Kimangi, Ruku-ruku, Ruku merah, Ruku putih, Silasih (Malay); Kering, Kimangih, Komangi, Koroko (Madurese); Kimange (Kangean Isl.); Kimangen, Kimangi, Kimangi abang, Kimangi putih, Kumangi, Lampes, Lampes abang, Lampes ireng, Lampes putih, Telasi putih (Javanese); Klampis, Lampes, Lampes beureum, Lampes bodas, Salasi wungu, Surawung (Sundanese). Borneo: Beng, Sulasi. Philippines: Albahdca (Spanish); Balanoi (Tagalog); Bidai (Iloko); Kamagni, Kolokoko, Kolon-kogon (Bisaya); Kamangkau (Bikol); Katigau, Lalui (Cebu Bisaya); Loko-loko (Tagalog, Pampangan); Luku-luku (Sulu); Magau (Magindanao); Malinau (Subanum). Sulawesi: Balakama, Busu-busu, Gangan bau balanda, Kimangen, Kokuru, Kokuru amping, Kokuru kulo, Kokuru kuro, Kokuru mahamu, Kokuru mea, Kokuru putih, Kokuru raindang, Kukuru, Kurasi, Kuri mabida, Kuri mahindeng, Lingid, Lingid budo, Lingid meha, Pikit, Pikit mopuha, Pikit mowuro, Pongpong, Pongpong kulo, Pongpong putih, Pongpong rangdang, Pongpong rundung, Tjamangi, Tjamangi balanda, Tjamani balanda, Ukadju tjamangi. Lesser Sunda Islands: Bali: Kintjarum, Salasi mihik, Salasi miik, Uku-uku; Lombok: Kimangi, Kumangi, Riruku; Sumba: Kindung. Moluccas: Lufe-lufe; Ternate: Busu-busu, Luluban; Ambon: Kayu ikan, Manasin. New Guinea: Wabkaran.

Uses — Following Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 378): according to Heyne (Nutt. Pl. Ned.-Ind. (1927) 1328) not used as a vegetable, sometimes as a condiment, and with some minor medicinal applications: cold with children, healing wounds, promoting lactation in women, a decoction of seeds said to be a demulcent. Seeds used for cleansing eyes. In Sumatra used with ceremonial offerings to spirits. In the Philippines it is said that a decoction of leaves is used for aromatic baths and as a remedy against gonorrhoea. In Malaysia, used against rheumatism. A sacred plant in Hindu religion (tulsi), no doubt derived from its manifold use.

30. ORTHOSIPHON

(G.L.C. Bramley, updated from Keng 1978)

Orthosiphon Benth., Edward's Bot. Reg. 15 (1830) t. 1300; Sleesen, Reinwardtia 5 (1959) 37; H.Keng, Gard. Bull. Singapore 24 (1969) 132; in Steenis, Fl. Males., Ser. I, 8 (1978) 379; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 261; Suddee, A.J.Paton & J.Parn., Kew Bull. 60 (2005) 6. — Type: *Ocimum triste* Roth (= *Orthosiphon thymiflorus* (Roth) Sleesen).

Clerodendranthus Kudô, Mem. Fac. Sci. Taihoku Imp. Univ. 2, 2 (1929) 117. — Type: *Clerodendranthus stamineus* (Benth.) Kudô (= *Orthosiphon aristatus* (Blume) Miq.).

Herbs or undershrubs. *Leaves* serrate or crenulate or subentire. *Inflorescences* thyrsoid with cymes sessile, cymes (1–)3-flowered. *Calyx* shortly tubular, straight or curving upwards, upper lip broad, rounded, strongly decurrent, curving upwards, lower lip with lateral and central lobes, lateral lobes deltoid usually with a prominent shoulder, central lobes subulate, throat open, glabrous; fruiting calyx reflexed against inflorescence axis. *Corolla* long exserted from calyx, tube 2-lipped; upper lip 3- or 4-lobed; lower lip entire, concave. *Stamens* 4, declinate, included or long-exserted, upper pair attached above mid-point of corolla tube, lower pair attached near mouth, usually inap-

pendiculate. *Disc* 4-lobed, lower lobe largest. *Style* gynobasic; stigma capitate-clavate, lobes equal, rounded, connivent. *Fruit* a schizocarp with four nutlets. *Nutlets* ovoid or globose, smooth, attachment scar basal.

Distribution — About 40 species in the tropics of the Old World; in *Malesia* 2 species.

Habitat & Ecology — In grassland, woodland or forest margins.

KEY TO THE SPECIES

1a. Stamens exserted more than 2 cm from the corolla tube, reaching far beyond the top of the lower lip. Corolla: tube slender, 10–12 mm long, lips c. 4.5 and c. 10 mm long, respectively. Style 5–6 cm long. . . . . **1. O. aristatus**

b. Stamens hardly longer than the corolla tube. Corolla: tube not particularly slender, 8–10 mm long, both lips 3–4 mm long. Style c. 1 cm long. . . **2. O. thymiflorus**

1. Orthosiphon aristatus (Blume) Miq.

Orthosiphon aristatus (Blume) Miq., F1. Ned. Ind. 2 (1858) 943; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 422; Backer, Onkruidfl. Jav. Suikerrietgr. (1931) 577; Sleesen, Reinwardtia 5 (1959) 38; Kochummen, Malayan Nat. J. 18 (1964) 73, pl. 9; Backer & Bakh.f., Fl. Java 2 (1965) 640; H.Keng, Gard. Bull. Singapore 24 (1969) 132. — *Ocimum aristatum* Blume, Bijdr. (1826) 833 (‘*Ocymum*’). — Lectotype (designated by Keng 1969): *Blume 1091* (lecto L; isolecto L, NY), Java, Batavia [= Jakarta].

Clerodendron spicatum Thunb., Fl. Jav. (1825) 22. — *Orthosiphon spicatus* (Thunb.) Backer, Bakh.f. & Steenis, Blumea 6 (1950) 359, nom. illeg. (non Benth. in A.DC., Prodr. 12 (1848) 53) — Type: *Thunberg s.n.* (holo S), Indonesia, Java.

Ocimum grandiflorum Blume, Bijdr. (1826) 835, nom. illeg. (non Lam., Encycl. 1 (1785) 387). — Type: *Blume s.n.* (lecto L; isolecto NY), Java.

Orthosiphon stamineus Benth. in Wall., Pl. Asiat. Rar. 2 (1830–1831) 15; Miq., Fl. Ned. Ind. 2 (1858) 943; Hook.f., Fl. Brit. India 4 (1885) 615; Ridl., Fl. Malay Penins. 2 (1923) 645. — *Clerodendranthus stamineus* (Benth.) Kudô, Mem. Fac. Sci. Taihoku Imp. Univ. 2, 2 (1929) 117. — Syntypes: *Wallich Cat. 2727A* (G-DC (microfiche), K (Herb. Benthamianum), K-W), Burma, Taong Dong Avae; *Wallich Cat. 2727B* (K (Herb. Benthamianum), K-W), Burma, Attran, Martabania (Martaban).

Orthosiphon tomentosus auct. non Benth.: Teijsm. & Binn., Cat. Hort. Bot. Bogor. (1866) 132.

Orthosiphon grandiflorum auct. non. Terrac.: Bold., Zakfl. Java (1916) 110.

Erect, ascending herb, 0.25–2 m high. *Stems* 4-angled, with short spreading or retrorse hairs in younger parts, glabrous when woody. *Leaves*: blade narrowly elliptic to elliptic to ovate, 3–9 by 0.7–4.5 cm, chartaceous or membranaceous, apex acuminate, base truncate to cuneate, shortly decurrent, margin coarsely serrate, glabrous on both surfaces or with short appressed hairs on both surfaces especially on venation, yellow sessile glands above and below; petiole 0.5–2(–4.5) cm long, puberulent. *Inflorescences* terminal up to 25 cm long; axes with retrorse hairs; bracts sessile, ovate, 1–3 mm long; pedicels 1–3 mm long in flower, extending in fruit. *Calyx* 2.5–5 mm long, in fruit 6–12 mm long, with short appressed hairs and yellow sessile glands, upper lip more or less same length as central lobes of lower lip, lateral lobes about half the length of central lobes. *Corolla* white, pale lilac or lilac, 10–20 mm long; tube slender, 10–12 mm

long, straight then slightly dilated towards throat, with short hairs, upper lip c. 4.5 mm long, shallowly 3-lobed, mid-lobe broadest, emarginate, recurved, lower lip c. 10 mm long, straight, concave. *Stamens* glabrous, filiform, coiled in bud, projecting up to 3.5 cm beyond the corolla-throat. *Style* 5–6 cm long, usually longer than stamens, stigma club-shaped, slightly cleft at apex. *Nutlets* broadly oblong, compressed, 1.5–2 mm long, reticulate, sometimes producing mucilage when wet. — **Fig. 27; Plate 5c.**

Distribution — Throughout continental SE Asia to tropical Australia, throughout *Malesia*; often cultivated.

Habitat & Ecology — In thickets and along forest borders in shaded not too dry localities, along roadsides and ditches, and in teak- and bamboo-forests, in rubber estates, among sago palms, on levees, in grassland, in regrowths and old garden land. Altitude: sea-level to 1000 m. Flowering: throughout the year. Flowers are occasionally cleistogamous; the corolla remains then concealed inside the calyx base, stamens are very short and the style is tortuous; yet the ovary and nutlets are normal.

Vernacular names — Kattesnor (Dutch). Sumatra: Giri giri march (in Jambi prov.), Sesungui, (Simalur Island) (Malay). Java: Kumis kuching (Malay – the common name); Kumis utjing, Singkir (Sundanese); Remudjung, Remu(k)h djung (Javanese); Se salasejan, Songot kotjeng (Madurese). Philippines: Kabling-gubat, Kabling parang (Tagalog). Moluccas, Halmahera: Lupu mangu-umi. Papua New Guinea: Mangkat kwabon (Kaliki village); Tjikupi-tjikupi (Kaisah village). Confusingly the name 'kumis kuching' (cat's whiskers) is also sometimes by error used for the Capparidaceous *Gynandropsis*.

Uses — From Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 380): often cultivated in gardens for ornamental and medicinal purposes. As van der Sleesen remarked (Reinwardtia 5 (1959) 38) it is very strange indeed that this plant, which is showy as an ornamental, was not collected or mentioned by botanists and explorers before 1777 from Malesia when Thunberg collected it in Java. And its medicinal use was not mentioned before 1885 from Java, and in SE Asia still later. As it is also not known to occur in genuinely native forest vegetation, it would even seem to be an introduced plant of which the Eurasians and Europeans detected the medicinal value in the latter half of the 19th century. Propagation is easy from cuttings. Its medicinal use is now universal throughout Malesia, leaves being used as a strong diuretic in infusions against various kinds of kidney complaints and illness, renal calculi, phosphaturic catarrh of the bladder, gout, etc. and also, together with *Phyllanthus urinaria* (Phyllanthaceae) and *Desmodiun gangeticum* (Fabaceae) against gall stones and podagra. Although the plant has repeatedly been under thorough phytochemical and pharmocological investigation (see references in Sleesen (1959) 41) a specific constituent responsible for its medicinal value has not been found.

Notes — 1. Following Keng (1978: 380) I do not accept Backer's (1931: 576) recognition of two forms in Java (*O. aristatus* and *O. grandiflorus*): apparently distinct by minor differences in hairiness and upper calyx lobe, these differences form part of the broad variation in indumentum in this species.

2. Both Keng (1978) and Suddee et al. (2005) comment on the use of *Orthosiphon spiralis* (Lour.) Merr., as the correct name for this taxon. However, the type of the basionym *Trichostema spirale* Lour. (Fl. Cochinch. (1790) 371), is yet to be found – apparently there is no specimen in either P or BM. Suddee and A.J.Paton (Taxon 53

Fig. 27. *Orthosiphon aristatus* (Blume) Miq. a. Habit; b. upper lip of corolla; c. style and stigma; d. fruiting calyx; e. nutlet (no origin indicated). Artist unknown.

(2004) 562) concluded that the name *Trichostema spirale* should be rejected, Loureiro's description being insufficient for identification as it could fit several Lamiaceae genera. The next earliest available name was *Clerodendrum spicatum* Thunb., but Bentham had already used *Orthosiphon spicatus*, so *Ocimum aristatum* Blume, another early available name, and *Orthosiphon aristatus* are now accepted as the correct name for this species.

2. Orthosiphon thymiflorus (Roth) Sleesen

Orthosiphon thymiflorus (Roth) Sleesen, Reinwardtia 5 (1959) 42; Backer & Bakh.f., FI. Java 2 (1965) 640; H.Keng, Gard. Bull. Singapore 24 (1969) 135. — *Ocimum thymiflorum* Roth, Nov. Pl. Sp. (1821) 269 ('*Ocymum*'). — *Plectranthus thymiflorus* (Roth) Spreng., Syst. Veg. 2 (1825) 690. — Type: *Heyne s.n.* (holo B†), South India.

Ocimum triste Roth, Nov. Pl. Sp. (1821) 270. — *Plectranthus tristis* (Roth) Spreng., Syst. Veg. 2 (1825) 690. — Type: *Heyne s.n.* (holo B†; iso L), South India.

Ocimum glabratus Benth. in Wall., Pl. Asiat. Rar. 2 (1830–1831) 14; Miq., Fl. Ned. Ind. 2 (1858) 942. — Syntypes: *Wallich Cat. 2724B* (syntypes K, K-W), India, Courtallum.

Ocimum viscosus Benth. in Wall., Pl. Asiat. Rar. 2 (1830–1831) 14. — *Ocimum tomentosus* Benth. var. *viscosus* (Benth.) Hook.f., Fl. Brit. India 4 (1885) 614. — Type: Herb. Wight. in *Wall. Cat. 2723A* (syn G-DC, K 3 sheets, K-W, L, P), India, Dindygul.

Ocimum petiolaris Miq., Fl. Ned. Ind. 2 (1858) 943. — Type: *Horsfield Lab. 23* (holo U; iso K 2 sheets), Indonesia, Java.

Erect or ascending herb, 30–50 cm high. *Stems* with short hairs in younger parts, hairs can be glandular, more woody parts glabrous. *Leaves*: blade ovate or broadly ovate, 3–4.5(–7) by 2.5–3(–4.5) cm, apex obtuse or subacute, base rounded or truncate (usually not decurrent), margin crenate, glabrous on both surfaces, or both surfaces with some short hairs especially on venation, yellow sessile glands above and below; petiole 1–2.5(–5) cm long, pubescent. *Inflorescences* terminal, 5–8(–12) cm long, axes with short hairs, sometimes glandular hairs; bracts ovate, acuminate, 2–5 mm long; pedicels 2–3 mm long, with short hairs. *Calyx* tubular, 4–5 mm long, in fruit 7–9 mm long, with short hairs and yellow sessile glands, upper lip more or less same length as lower central lobes, lateral lobes shorter, subulate, but more than half as long as central lobes. *Corolla* pale pink, 11–14 mm long, tube slightly incurved not particularly slender, with short hairs, upper lip 3–4 mm long, 3-lobed, mid-lobe broadest, emarginated, lower lip more or less equal in length to upper, slightly concave. *Stamens* included to slightly exserted, lower pair slightly longer. *Style* c. 1 cm long, more or less equal in length to lower stamens, stigma clavate with slight cleft at apex. *Nutlets* ellipsoid, 1–1.2 mm long, minutely reticulate, sometime producing mucilage when wet.

Distribution — Sri Lanka, Nepal, India to Indo-China; in *Malesia*: C and E Java, very rare.

Habitat & Ecology — Only from three localities on Java (Kediri, Nusa Barung and G. Sadeng near Puger), all, it seems, in dry calcareous localities under seasonal climatic conditions. Flowering: December.

IMPERFECTLY KNOWN SPECIES

Orthosiphon rotundifolius Doan ex Suddee & A.J.Paton, Kew Bull. 60 (2005) 14. — Type: *Pierre Lab. 7* (holo P; iso P six sheets), Vietnam, Ba Ria.

Two sheets collected by Horsfield in Java appear to be *O. rotundifolius*. However, as noted by Suddee et al. (2005), the lack of specimens from Peninsular Malaysia means that this is an odd disjunct distribution questioning the accuracy of the labelling of the Horsfield sheets.

31. OXERA

(R.P.J. de Kok)

Oxera Labill., Sert. Austro-Caledon. (1825) 23, t. 28; de Kok & Mabb., Kew Bull. 54 (1999) 257, 265; Barrabé et al., Bot. J. Linn. Soc. 179 (2015) 693. — *Oncoma* Spreng., Syst. Veg. ed. 16, 4 (1827) 11, 18, nom. superfl. — Type: *Oxera pulchella* Labill.

Maoutia Montrouz., Mém. Acad. Lyon 10 (1860) 241, nom. illeg. (non *Maoutia* Wedd.). — Type: *Maoutia neriifolia* Montrouz. (= *Oxera neriifolia* (Montrouz.) Beauvis.).

Faradaya F.Muell., Fragm. 5 (1865) 21; Seem., J. Bot. 3 (1865) 256; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 228; Moldenke, Phytologia 51 (1982) 348; Phytologia 52 (1982) 20; Munir, J. Adelaide Bot. Gard. 10 (1987) 165; de Kok & Mabb., Blumea 44 (1999) 321; Barrabé et al., Bot. J. Linn. Soc. 179 (2015) 693. — Type: *Faradaya splendida* F.Muell. (= *Oxera splendida* (F.Muell.) Gâteblé & Barrabé).

Clerodendrum L. sect. *Tetrathyranthus* A.Gray, Proc. Amer. Acad. Arts 6 (1862) 50; Benth. & Hook.f., Gen. Pl. 2 (1876) 1156 ('*Tetrathyranthi*'). — Lectotype (designated here): *Clerodendrum amicorum* Seem. (= *Oxera amicorum* (Seem.) Gâteblé & Barrabé).

Schizopremna Baill., Hist. Pl. 11 (1891) 119; Steenis, Acta Bot. Neerl. 4 (1955) 477. — Type: *Schizopremna timorensis* Baill. (= *Oxera amicorum* (Seem.) Gâteblé & Barrabé).

Lianas, shrubs or small trees, stems with raised lenticels. *Leaves* simple, decussate or ternate, spirally arranged or in whorls, petiolate, exstipulate, margin entire; venation reticulate, main veins abaxially prominent, adaxially not so; small glands 0.04–0.10 mm diam., sunken, round, scattered, many; big glands 0.2–2.2 mm diam., scattered or concentrated at base. *Inflorescences* a determinate thyrse in Malesia, axillary and/or terminal, sometimes cauliflorous; bracts linear to fusiform, 1.5–32 mm long, apex acute to acuminate, erect to reflex, flat, sessile to petiolate, green; flowers tetramerous, large, conspicuous, bisexual, hypogynous. *Calyx* 2–5-lobed, persistent, campanulate, united to adherent, but during flowering split into 2–5 lobes. *Corolla* hypocrateriform or campanulate, 4-lobed, actinomorphic in Malesia, fleshy to stiff, white or creamy to yellowish white in Malesia, deciduous. *Stamens* usually 2 but 4 in Malesia, antisepalous, epipetalous, filiform, exserted, usually all equal in length in Malesia, divergent; staminodes usually 2 but absent in Malesia, anthers extrorse, dorsifixed. *Disc* round. *Ovary* deeply lobed, 4-locular, with one ovule in each cell, seated on a disc; style filiform, terete, gynobasic, with two short stigmatic lobes. *Fruit* schizocarp, 4-celled, fusiform, elongate mericarps, 1–4 by abortion, exocarp fleshy, relatively thin; endocarp stony, smooth or with prominent to faint ridges; attachment scar basal.

Distribution — 24 species mainly endemic on New Caledonia, four species throughout the Southern Pacific, Northern Australia, New Guinea and the Moluccas; in *Malesia*: one species in Moluccas and New Guinea, the other only in Papua New Guinea.

Habitat & Ecology — Growing in primary to secondary coastal to montane forest at 0–1200 m.

Note — A combination of molecular and anatomical data gave convincing evidence to support the inclusion of *Faradaya* in *Oxera*: the two species of *Faradaya* found in Malesia are now transferred to *Oxera* (Barrabé et al. 2015).

KEY TO THE SPECIES

1a. Fruit (mericarps) bright red to orange with small white spots or streaks when mature. — Samoa and Tonga to Bismarck Archipelago . . . . . **1. O. amicorum**
b. Fruit (mericarps) white to creamy yellow when mature. — Australia, the island of New Guinea and the Moluccas . . . . . **2. O. splendida**

1. Oxera amicorum (Seem.) Gâteblé & Barrabé

Oxera amicorum (Seem.) Gâteblé & Barrabé, Bot. J. Linn. Soc. 179 (2015) 707. — *Clerodendrum amicorum* Seem., Bonplandia 10 (1862) 249 (‘*Clerodendron*’). — *Faradaya amicorum* (Seem.) Seem., J. Bot. 3 (1865) 258, de Kok & Mabb., Blumea 44 (1999) 325. — Lectotype (designated by Moldenke, Phytologia 51 (1982) 394): *Barclay 3373* (lecto BM; isolecto K), Tonga.

Schizopremna timorensis Baill., Hist. Pl. 11 (1891) 119. — Type: *Jacquinot s.n.* (holo P), [Indonesia,] Timor, Coupang.

Liana or small tree, 3–23 m high. *Stems* 5–30 cm diam., glabrous or somewhat scabrous, smooth, sometimes with a granular layer. *Leaves* decussate or ternate; blade elliptic to oblong to broadly obovate, 2.2–23 by 1.2–14 cm, leathery, shiny, glabrous to few patent hairs abaxially at base, apex round to acuminate, cuspidate or emarginate, base cuneate; venation sometimes triplinerved at base; big glands oval to round, crater-like, scattered or concentrated at base, few; petiole shallowly 6-channelled to half terete in cross-section, 5–35 by 0.5–2.8 mm, glabrous to scabrous, sometimes covered with glands. *Inflorescences* 1.6–25 cm long, axillary and/or terminal, sometimes cauline, determinate thyrse, pendulous to erect, borne on old and young wood, glabrous to villous; hairs non-transparent, simple. *Calyx* campanulate, 6–17 by 5.5–12 mm, 2–4-lobed, round in cross-section, glabrous to few hairs at base, cartilaginous to fleshy, (light) green to pure white; lobes 0.8–8.2 by 3–9 mm, apex round to acute, glabrous or with a few hairs at apex, all open and erect during flowering, completely reflexed during fruiting; glands round to oval, crater-like, brown, abundant adaxially; glandular hairs subsessile, few to abundant abaxially. *Corolla* hypocrateriform to almost bucket-shaped, 32–60 mm long, (creamy to yellow) white, erect to pendulous, fleshy, sometimes scented; tube 32–55 mm long, 1.4–7.5 mm wide at base, gradually broadening to 7–18 mm at mouth; lobes round to oblong or spatulate, all equal, 4.8–12 by 4.8–12 mm, apex round to emarginate, at first erect, after shedding of the pollen erect or reflexed; glandular hairs subsessile, around the mouth and on the lobes, multicellular, transparent. *Stamens*: filaments 13–35 mm long, inserted centrally or in upper third of the corolla, (cream-)white, exserted, at first erect, after shedding of pollen reflexed; hairs many, multicellular, transparent, patent, sometimes glandular; anthers 2.5–5 mm long, glabrous, straight to curled up when dehisced, yellow to (dark) brown; pollen

yellow. *Disc* 0.3–2 by 1.8–4 mm, glabrous, very light green. *Ovary* lobes light green, round to conical, 1–2 by c. 1 mm, glabrous or with crater-like glands; style 32–46 mm long, glabrous, (cream-)white; stigma linear to round, 0.5–0.8 mm long. *Fruit* (bright) red to orange with small white spots or streaks; mericarps 16–40 by 9–18 mm (dried), glabrous, smooth, 1–4 developing per fruit; endocarp 0.6–0.8 mm thick, smooth.

Distribution — Solomon Islands, Vanuatu, Fiji, Samoa, Tonga; in *Malesia*: Papua New Guinea, New Ireland and Bougainville.

Habitat & Ecology — Growing in primary to secondary coastal to montane forest in well-drained soil, sometimes over basalt. Altitude: sea-level to 1160 m. Flowering and fruiting: throughout the year.

Note — The flowers are visited by birds, most likely honeyeaters, or by bees. Fruits said to be eaten by pigeons. The flowers are described by collectors as scentless to sweet (nocturnal) scented.

2. **Oxera splendida** (F.Muell.) Gâteblé & Barrabé

Oxera splendida (F.Muell.) Gâteblé & Barrabé, Bot. J. Linn. Soc. 179 (2015) 707. — *Faradaya splendida* F.Muell., Fragm. 5 (1865) 21; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 234; de Kok & Mabb., Blumea 44 (1999) 332. — Lectotype (designated by Munir, J. Adelaide Bot. Gard. 10 (1987) 173): *Dallachy s.n.* (lecto K; isolecto MEL 3 sheets), Australia, Queensland, Rockingham Bay.

Faradaya papuana Scheff., Ann. Jard. Bot. Buitenzorg 1 (1876) 42; Munir, J. Adelaide Bot. Gard. 10 (1987) 166, 172. — Type: *Teysmann HB 6773* (syn BO, L), [Indonesia,] Nova Guinea, d'Andaj.

Faradaya albertisii F.Muell., Descr. Notes Papuan Pl. 8 (1886) 46; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 230; Munir, J. Adelaide Bot. Gard. 10 (1987) 165. — Lectotype (designated by Munir, J. Adelaide Bot. Gard. 10 (1987) 17): *D'Albertis s.n.* (lecto MEL; isolecto MEL 2 sheets), Papua New Guinea, Fly River.

Faradaya ternifolia F.Muell., Descr. Notes Papuan Pl. 8 (1886) 46; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 236. — Type: *Australian geographic society s.n.* (holo MEL; iso MEL), [Papua New Guinea,] Southern New Guinea.

?*Faradaya parviflora* Warb., Bot. Jahrb. Syst. 18 (1894) 208; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 231. — *Faradaya parviflora* Warb. var. *typica* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 232, nom. illig. — Syntypes: *Hellwig 164* (B†), Papua New Guinea, Finschhafen; *Hellwig 179* (B†), Papua New Guinea, Finschhafen.

Faradaya dimorpha Pulle, Nova Guinea 8 (1912) 686; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 233. — Type: *Von Römer 146* (holo L; iso BO), [Indonesia,] Irian Jaya.

Faradaya hahlii Rech., Repert. Spec. Nov. Regni Veg. 11 (1912) 185. — Type: *Rechinger 3927* (holo W), [Papua New Guinea,] New Britain, Kabakaul.

Faradaya magniloba Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 136; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 229. — Type: *Boden Kloss s.n.* (syn BM 2 sheets), [Indonesia,] Irian Jaya, Utakwa river to Mt Carstensz, camp I.

Faradaya matthewsii Merr., J. Straits Branch Roy. Asiat. Soc. 26 (1917) 115. — Type: *Villamil 253* (holo PNH†; iso BO, K 2 sheets), [Malaysia,] Sabah, Sandakan.

Faradaya nervosa H.J.Lam, Verbenaceae Malayan Archipel. (1919) 232; Bot. Jahrb. Syst. 59 (1924) 94. — Type: *Lauterbach 2822* (holo B†), [Papua New Guinea,] New Guinea, Bismarck-plain.

[*Faradaya parviflora* Warb. var. *angustifolia* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 232; Bot. Jahrb. Syst. 59 (1924) 94, nom. nud.]

[*Faradaya dimorpha* Pulle var. *opposita* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 233; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 72, nom. nud.]

[*Faradaya dimorpha* Pulle var. *ternata* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 233; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 72, nom. nud.]

Clerodendrum peekelii Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 10 (1927) 121. — *Faradaya peekelii* (Markgr.) Moldenke, Phytologia 52 (1982) 31. — Type: *Peekel 696* (syn BO n.v.), [Papua New Guinea,] New Britain, Vunapope.

Faradaya dimorpha Pulle var. *cauliflora* Moldenke, Phytologia 4 (1952) 53. — Type: *Brass 7427* (holo L), [Papua New Guinea,] Papua, Fly river, Oroville camp.

Faradaya parviflora Warb. var. *angustifolia* H.J.Lam ex Moldenke, Phytologia 31 (1975) 398, nom. in synon.

Faradaya excellens K.Schum. ex Moldenke, Phytologia 34 (1976) 274. — Type: *Lauterbach 528* (syn BM, K), [Papua New Guinea,] Neu-Guinea.

Clerodendrum fissicalyx Scheff. ex Moldenke, Phytologia Mem. II (1980) 385 ('*Clerodendron*'), nom. in synon.

Liana 6–25 m tall. *Stems* 2.5–15 cm diam., glabrous to scabrous, smooth, sometimes covered in gland secretion. *Leaves* decussate or ternate; blade ovate to elliptic, 9–29 by 5–16.5 cm, cartilaginous to subcoriaceous, sometimes shiny, apex acute to acuminate, base cordate to rounded, glabrous to scabrous at base and midvein; venation triplinerved at base; big glands round to oval, crater-like, brownish, at base, few; petiole half-terete in cross-section, 15–54 by 1.2–3 mm, glabrous to scabrous abaxial; glands round, raised, covered or partly covered. *Inflorescences* 6–35 cm long, axillary and/or terminal, determinate double thyrse with decussate bracts, erect, glabrous to covered with patent hairs; glands craterlike, few. *Calyx* campanulate, linear to bulbous, 8–23 by 4–8 mm, 1–4 lobes, split irregularly during flowering, erect during flowering, persistent, fleshy to membranaceous, greenish white to (pale) green, abaxially glabrous to covered with patent transparent hairs, erect when fruiting; lobes 7–18 by 4–11 mm, apex acute to acuminate or mucronate; glands round, crater-like, outside brown, few. *Corolla* narrowly infundibular, 22–76 mm long, tube 10–30 by 2–7 mm, abaxially glabrous or middle to apex with few multicellular transparent hairs, (weak to strong) sweet-scented, fragile or fleshy, white or greenish white; lobes spatulate to oblong, 5–54 by 8–33 mm wide at apex, 6–15 mm at base, erect, apex entire to lobed or emarginate. *Stamens*: filaments 16–75 by 0.3–1 mm, usually equal, in upper third of the tube, exserted to greatly exserted, white; hairs from base to middle part, absent to abundant, multicellular, transparent, patent; anthers 2.5–4 by 1–2 mm, glabrous, brownish; pollen orange yellowish to yellow. *Disc* 0.5–1.4 by 1.6–3.5 mm, glabrous, light green. *Ovary* lobes round, 1–2 by 1–2 mm, velutinous to glabrous, light green, sometimes with crater-like glands; style 45–80 mm long, glabrous, white; stigma triangular, 2-lobed, 0.2–1.5 mm long. *Fruit* ellipsoid to egg-shaped, falcate, white to pale or creamy yellow; mericarp 38–60 by 18–30 mm, sparingly scabrous; glands round; seed coat 1–3 mm thick, with c. 2 mm high irregular ridges.

Distribution — Solomon Islands and Australia (NE Queensland); in *Malesia*: Talaud Island, Moluccas, New Guinea. The report of a specimen growing in Sabah is most likely based on a cultivated specimen or a collection with the wrong locality data. — **Fig. 28a–e.**

Habitat & Ecology — Growing in primary to secondary forest, in swamp and flood forest to hill forest, in humus rich, loam or clay soils. Often common. Altitude: sea-level to 2000 m. Flowering: throughout the year but mainly from June to October; fruiting: throughout the year but mainly from September to January.

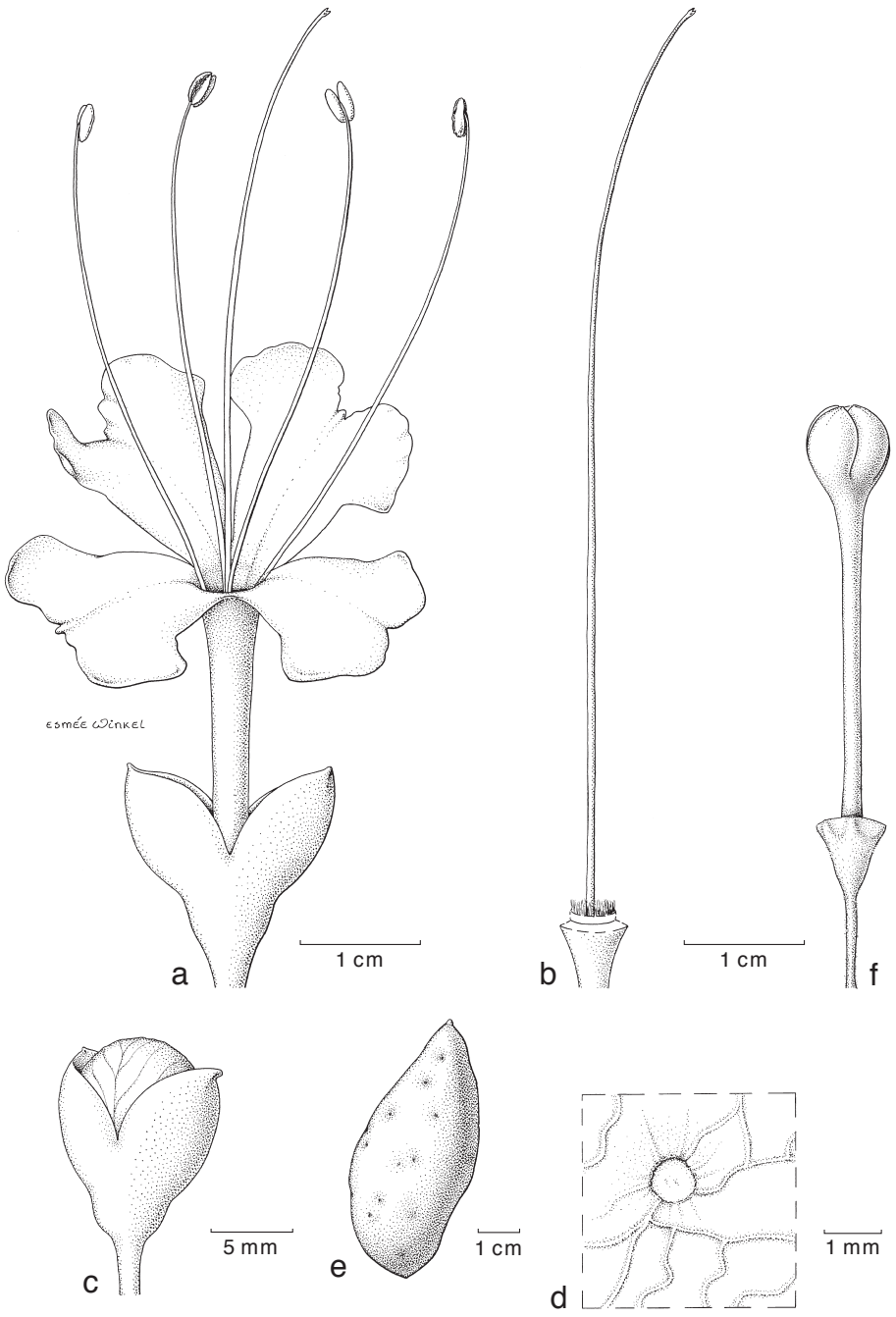

Fig. 28. a–e. *Oxera splendida* (F.Muell.) Gâteblé & Barrabé. a. Flower; b. flower with corolla (and stamens) removed; c. bud; d. leaf gland; e. fruit. — f. *Volkameria inermis* L. Bud (a, b: *Winters & Higgins 564*; c, d: *P. van Royen 3124*; e: *NGF (Gillison) 22481*; f: *KEP FRI (Whitmore) 12982*; all L). Drawing by Esmée Winkel, 2012.

Vernacular names — Indonesia, Talaud Island: Latára. Irian Jaya: Gieselompoes (Mooi); Rieraroh (Argoeni); Sijai (Bian). Papua New Guinea: North division: Pitutu (Orokaiva); W Highlands: Bemingkan (Hagen-Chimbu, Yoowi dialect); E Highlands: Nekamanoei (Okapa); E Sepik prov.: Tek ontrek (Miyanmin). Bougainville, Siwai: Kuteha.

Uses — Ornamental climber, which can be grown in tropical and subtropical regions, in open sunny places with plenty of water. In 1974, in Papua New Guinea, the toxicity of this species was part of a criminal investigation in Madang. It appeared that sap, or perhaps an infusion of the bark, had been given to the victim by his wife (Henty, Div. Bot., LAE 12 (1980) 134).

32. PARAPHLOMIS

(G.L.C. Bramley, updated from Keng 1978)

Paraphlomis Prain, Ann. Roy. Bot. Gard. Calcutta 9 (1901) 60; J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1907) 791; Ridl., Fl. Malay Penins. 2 (1923) 651; H.W.Li, Acta Phytotax. Sin. 10 (1965) 58; H.Keng, Gard. Bull. Singapore 24 (1969) 135; in Steenis, Fl. Males., Ser. I, 8 (1978) 348; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 221. — Type: *Paraphlomis rugosa* (Benth.) Prain (= *Paraphlomis javanica* (Blume) Prain).

Pogonanthera H.W.Li & X.H.Guo, Acta Phytotax. Sin. 31 (1993) 266, nom. illeg. (non Blume, Flora 14 (1831) 520; nor Spach, Hist. Nat. Vég. 9, 1840: 583). — Type: *Pogonanthera caulopteris* H.W.Li & X.H.Guo (= *Paraphlomis intermedia* C.Y.Wu & H.W.Li).

Herbs or shrubs. *Indumentum* of simple hairs. *Leaves* membranaceous, margins entire to crenate-serrate, long-petioled. *Inflorescences* thrysoid, rarely racemoid, flowers in dense, many-flowered verticillasters, often forming axillary, globose clusters; bracteoles numerous, filiform. *Calyx* tubular to obconical, more or less equally 5-lobed; tube erect or slightly incurved. *Corolla* white to yellow, strongly 2-lipped, upper lip erect, lower lip spreading, 3-lobed, tube outside pubescent, glabrous and annulate within. *Stamens* 4, ascending under the upper lip, the lower pair longer; anthers connivent, the 2 cells divaricate; filaments glabrous without basal appendages. *Disc* uniform, entire. *Style* gynobasic, bifid, lobes subequal or the upper one shorter. *Fruit* a schizocarp, four nutlets. *Nutlets* obovoid, triquetrous below, rounded above and on the dorsal surface, smooth, glabrous; pericarp thick, more or less coriaceous, attachment scar basal.

Distribution — About 20 species, from NE India to Taiwan, Vietnam and Indonesia; in *Malesia* 2 species (Peninsular Malaysia, Sumatra, Java, Borneo, Philippines), not yet known from the Lesser Sunda Islands, Moluccas, and New Guinea.

Habitat & Ecology — Mostly forests and hill slopes.

KEY TO THE SPECIES

1a. Verticillasters only sparingly hirsute. Corolla light yellow or white, with pink or dark purple centre, 1.8–2.5 cm long; limb densely short-hairy outside. Fruiting calyx almost glabrous, the lobes often broken off or reflexed . . . . . **1. P. javanica**

b. Verticillasters densely covered with long woolly hairs, golden yellow. Corolla pale yellow, 1.5–2 cm long; limb densely pilose outside. Fruiting calyx hirsute, the lobes persistent . . . . . **2. P. oblongifolia**

1. **Paraphlomis javanica** (Blume) Prain

Paraphlomis javanica (Blume) Prain, Ann. Roy. Bot. Gard. Calcutta 9 (1901) 59; Backer & Bakh.f., Fl. Java 2 (1965) 619; H.Keng, Gard. Bull. Singapore 24 (1969) 136, f. 26a–g. — *Leonurus javanicus* Blume, Catalogus (1823) 83; Bijdr. (1826) 828. — *Phlomis javanica* (Blume) Prain, Ann. Roy. Bot. Gard. Calcutta 3, 2 (1891) 231; Ann. Roy. Bot. Gard. Calcutta 9 (1901) 59. — Lectotype (designated by Keng 1969): *Blume 1462* (lecto L, barcode L0003739), Java, Gunung Salak.

Phlomis rugosa Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 63; Hook.f., Fl. Brit. India 4 (1885) 693. — *Paraphlomis rugosa* (Benth.) Prain, Ann. Roy. Bot. Gard. Calcutta 9 (1901) 60. — Type: *Wallich Cat. 2067* (K-W).

Gomphostemma petiolare Miq., Fl. Ned. Ind. 2 (1859) 987; Prain, Ann. Roy. Bot. Gard. Calcutta 9 (1901) 59; Koord., Exkurs.-Fl. Java 3 (1912) 143. — Type: *Blume s.n.* (L), Java.

Gomphostemma membranifolium Miq., Fl. Ned. Ind. 2 (1859) 988. — *Phlomis membranifolia* (Miq.) Ridl., J. Fed. Malay States Mus. 8 (1917) 77. — Type: *Horsfield s.n.* (K), Java, in Patjitan.

Gomphostemma luzonense Elmer, Leafl. Philipp. Bot. 1 (1908) 339. — Type: *Elmer 7433* (iso K, L, Z), Philippines, Luzon, Tayabas, Lucban.

Leonurus membranifolius (Miq.) Bold., Zakfl. Java (1916) 108; Merr., Brittonia 5 (1943) 29. — Type: unknown.

Gomphostemma sumatrense Ridl., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 85. — Type: *Ridley s.n.* (not located), Sumatra, Berastagi woods.

Paraphlomis brevidens Merr., Pap. Michigan Acad. Sci. 19 (1934) 193. — Type: *Yates 1553* (MICH, NY, US), Sumatra, East Coast, Karoland, Berastagi.

Undershrub, 0.5–1.8 m high. *Stems* obtusely 4-angled, deeply furrowed, minutely hirsute. *Leaves*: blade elliptic, oblong-ovate or oblong-lanceolate, 9–30 by 4.2–12 cm, thin membranaceous, apex acuminate or caudate, base cuneate or truncate or rounded; margin basally entire, elsewhere irregularly crenate-serrate, glabrous or with minute scattered hairs on the nerves on both surfaces; petiole 4–10 cm long, puberulent. *Inflorescences* with flowers in small distant verticillasters, axillary, sparingly hirsute; bracteoles linear to lanceolate, 5–7 mm long, short-hairy. *Calyx* turbinate, 0.8–1.2 cm long (in fruit about the same length, almost glabrous, with the lobes often broken off and/or reflexed), white or suffused with red at apex, tube slightly curved, hispid below; lobes 5, lanceolate, 2–4 mm long, triangular at base then narrowing to linear point, membranaceous. *Corolla* light yellow or white, with pink or dark purple centre, 1.8–2.5 cm long, densely short-hairy outside, tube annulate within; both lips pubescent outside, upper lip narrow, rounded at apex; lower lip 3-lobed, midlobe oblong, lateral lobes lanceolate. *Style* branches subequal. *Nutlets* whitish, greenish blue to brown or black, obovoid, 5–6 by 2–3.5 mm, acute and triquetrous below, rounded above.

Distribution — Continental SE Asia (E Himalayas, Thailand, Indo-China, S China), Taiwan; in *Malesia*: Malay Peninsula, N Sumatra, Java, Borneo (E Kalimantan and Sabah) and Philippines (Luzon, Leyte).

Habitat & Ecology — Open and humid places in rainforest, sometimes on limestone. Altitude: (lowland to) 600–1800 m.

Vernacular names — Sumatra: Soeri-soeri. Java: Galibung bulu (Sundanese), Tjitjabian utan. Philippines: Botiagon (Manobo).

Fig. 29. a, b. *Paraphlomis oblongifolia* (Blume) Prain ex Koord. a. Habit; b. flower. — c. *P. javanica* (Blume) Prain ex Backer & Bakh.f. Calyx (a, b: after Prain (1901); c. *Blume 1462*, L). Drawing by Ed Vijsma.

2. Paraphlomis oblongifolia (Blume) Prain

Paraphlomis oblongifolia (Blume) Prain, Ann. Roy. Bot. Gard. Calcutta 9 (1906) 60; Backer & Bakh.f., Fl. Java 2 (1965) 619; H.Keng, Gard. Bull. Singapore 24 (1969) 139, f. 26h, i. — *Leonurus oblongifolius* Blume, Bijdr. (1826) 828. — *Phlomis oblongifolia* (Blume) Kuntze, Revis. Gen. Pl. 2 (1891) 529. — Lectotype (designated by Keng 1969): *Blume s.n.* (lecto L, barcode L 0003741), Java, Mt Salak.

Gomphostemma macrophyllum Miq., Fl. Ned. Ind. 2 (1859) 988. — Syntypes: *Blume s.n.* (L), Java, Megamedoeng, Salak; *Forsten s.n.* (L barcode L 0003742), Sulawesi.

Undershrub, 1–2 m high. *Stems* and *branches* with appressed hairs densely covering surfaces. *Leaves* oblong-ovate, 15–20 by 6–8 cm, thin-membranaceous, apex acuminate, base cuneate, margins basally entire, elsewhere shallowly toothed, sparingly hispid on the nerves on both surfaces; petiole slender, 5–8 cm long. *Inflorescences* of distant axillary verticillasters, densely covered with long woolly golden hairs; bracts filiform, 7–10 mm long, densely hairy. *Calyx* obconic-campanulate, 1–1.2 cm long, (in fruit 1.2–1.4 cm long, remaining hirsute, lobes persistent), whitish with violet lobes; tube slightly curved, with appressed hairs on the tube, interspersed with erect or patent longer, thicker hairs; lobes linear lanceolate with thicker erect or patent hairs. *Corolla* pale yellow, 1.5–2 cm long, outside densely pilose, especially the upper lip; upper lip obovate, boat-shaped, apex truncate; lower lip with 3 subequal rounded lobes, the middle one broader, constricted below. *Style* with upper style branches much shorter than the lower. *Nutlets* dark blue to black, oblong, 7–8 by c. 3.5 mm, subtriquetrous, glabrous. — **Fig. 29.**

Distribution — Sumatra (North: Berastagi to Merapi; South: Mt Tanggamus and near Ulu Belu, Lampong), W Java, Sulawesi (one collection only).

Habitat & Ecology — Primary forest. Altitude: 700–1800 m.

Vernacular names — Bubukuan bulu (Sundanese); bubukuan is a common name for *Strobilanthes* Blume and other Acanthaceae, alluding to swollen nodes, bulu referring to hairs.

33. PERONEMA

(G.L.C. Bramley)

Peronema Jack, Malayan Misc. 2 (1822) 46; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 321; Burkill, Econ. Prod. Malay Pen. (1966) 1696; Kochummen in Ng, Tree Fl. Malaya 3 (1978) 306; Corner, Wayside Trees Mal. ed. 3, 3 (1988) 749; N.R.de Graaf et al. in Soerianegara & Lemmens, Pl. Resources SE Asia (PROSEA) 5, 1 (1993) 345; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 268. — Type: *Peronema canescens* Jack.

Large trees, non-aromatic, evergreen or deciduous. *Leaves* opposite, petiolate, pinnately compound, rachis often winged. *Leaflets* 4–19, alternate to subopposite, sessile to subsessile, elliptic to lanceolate, entire. *Inflorescences* cymose, forming a large, terminal panicle or in axils of upper leaves. *Calyx* actinomorphic, not accrescent, 5-lobed, lobes deltoid, reflexed in fruit. *Corolla* zygomorphic, limb 5-lobed, lower lobe largest, other 4 similar. *Stamens* 2 fertile (upper pair reduced to staminodes), included to slightly exserted, thecae parallel, separate at dehiscence; pollen tri-colpate, tectate-perforate, suprarugulose. *Disc* poorly developed to absent. *Ovary* unlobed. *Style* terminal with

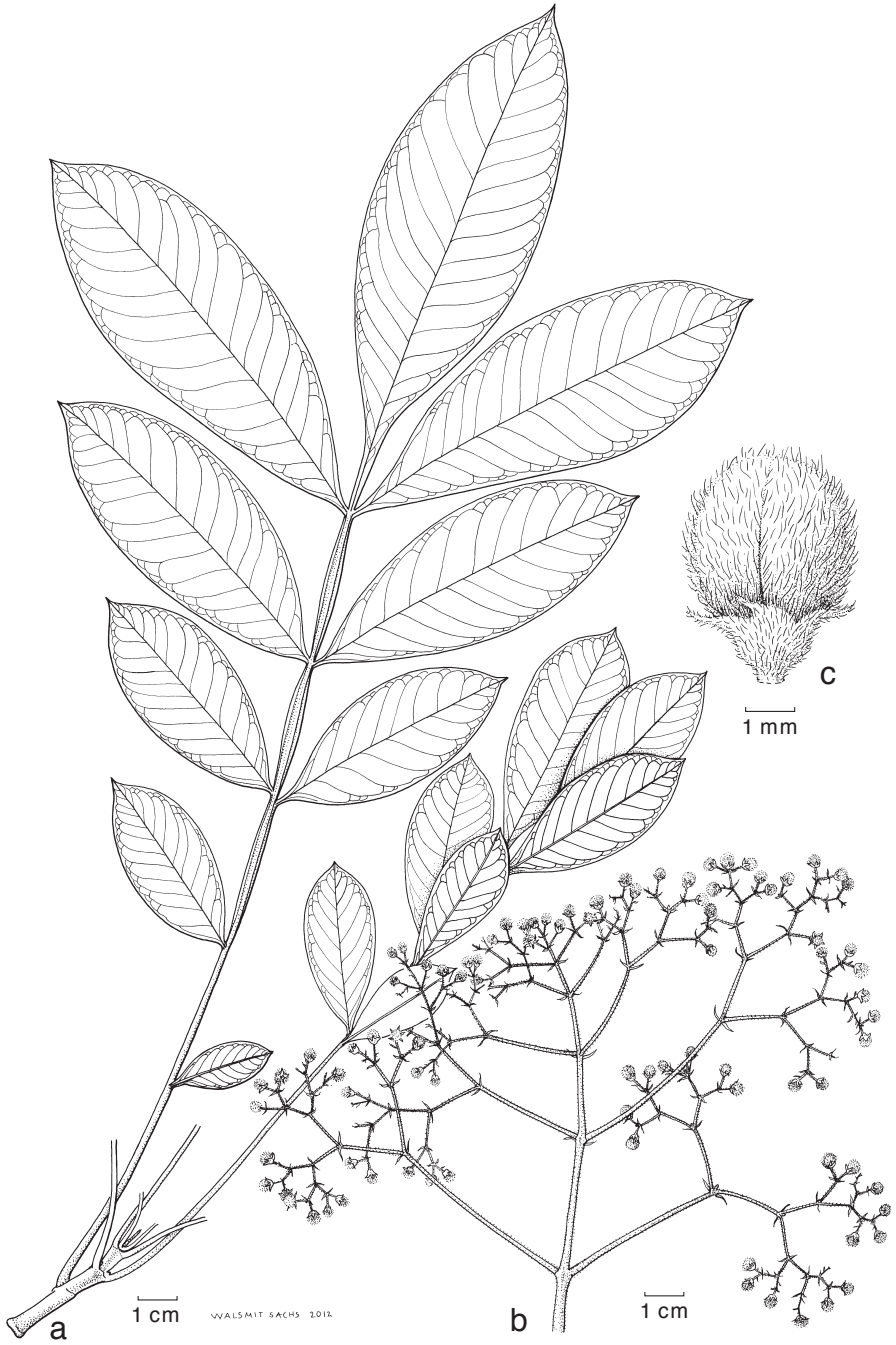

Fig. 30. *Peronema canescens* Jack. a. Habit; b. paniculate infructescence; c. fruit (a, b: *Koorders 29616*; c: *Shah & Shukor MS 2721*; all L). Drawing by Anita Walsmit Sachs, 2012.

stigma-lobes equal or unequal. *Fruit* dry, globose, villous, 4-seeded, remaining intact or splitting irregularly into two or four wedge-shaped mericarps, abscission scar as long as mericarp; endosperm absent; placenta central, winged; seeds pendulous.

Distribution — Monotypic. Peninsular Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo. Likely to have been introduced to Java in cultivation (Moldenke, Phytologia 45 (1980) 349).

1. **Peronema canescens** Jack

Peronema canescens Jack, Malayan Misc. 2 (1822) 46; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1909) 857; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 322; Desch, Malayan Forest Rec. 15 (1954) 625, pl. 124; Burkill, Econ. Prod. Malay Pen. (1966) 1696; Moldenke, Phytologia 45 (1980) 339; Corner, Wayside Trees Mal. ed. 3, 3 (1988) 749; N.R.de Graaf et al. in Soerianegara & Lemmens, Pl. Resources SE Asia (PROSEA) 5, 1 (1993) 345. — Lectotype (designated here): *Wallich Cat. 9075* (lecto K-W; isolecto K 2 sheets), origin unknown.

Peronema heterophyllum Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 570. — Type: *Teijsmann s.n.* (holo L), S Sumatra.

Tree, 10–35 m tall, 10–70(–120) cm diam., sometimes fluted or with buttresses; twigs quadrangular with a clear interpetiolar ridge. Outer *bark* shallowly fissured and scaly, grey brown; inner bark layered, brownish; sapwood yellow brown. *Leaves*: petiole 3–5(–18) cm long; blades (15–)25–30(–90) by 10–15 cm, purple when young; leaflets 4–19, alternate to subopposite, elliptic to lanceolate, 2.5–35 by 1–7.5 cm, increasing in size towards apex, sessile to subsessile, margins entire (serrate when young), base acute to cuneate, tapering, sometimes slightly asymmetric, apex acuminate, upper surface glabrous, lower surface grey tomentose, dull red-brown when young; veins 10–30 pairs, parallel, prominent below. *Inflorescences* 25–60 cm long, grey tomentose; bracts pubescent, c. 0.1 cm long. *Calyx* (light) green. *Corolla* glandular, white to greenish white with purple at margins, outer surface tomentose, lower lobe (lip) c. 2.5 mm long, twice as long as other 4 lobes, tube glabrate. *Ovary* pale green. *Fruit* 3–3.5 mm diam. — **Fig. 30.**

Distribution — As for genus.

Habitat & Ecology — Occasionally found in primary forest, more common in secondary forests and disturbed areas, often near streams. Soil: alluvial. Altitude: 30–900 m.

Vernacular name — Sungkai (Malay).

Uses — This species is used as a hedge plant and to stabilise roadsides and for (re)forestation purposes. The wood is described as light, moderately hard and elastic and is used for interior housing construction, carts or bridges (Burkill 1966, de Graaf et al. 1993).

34. PETRAEOVITEX

(L.J. Walsingham)

Petraeovitex Oliv., Hooker's Icon. Pl. 15 (1883) t. 1420; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 1068; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 323; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 97; Ridl., Fl. Malay Penins. 2 (1923) 637; Munir, Gard. Bull. Singapore 21 (1965) 215; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 268. — Type: *Petraeovitex riedelii* Oliv. (= *Petraeovitex multiflora* (Sm.) Merr.).

Woody climbers; *branches* quadrangular. *Leaves* decussate, ternate or biternate or rarely unifoliolate, petiolate; lateral nerves curving outwards towards the margin creating an intramarginal vein on each side. *Inflorescences* terminal or axillary paniculate cymes, flowers bisexual, pedicellate. *Calyx* campanulate, 5-lobed, markedly accrescent throughout flowering and fruiting, the lobes oblanceolate to oblong-spathulate, becoming membranaceous and distinctly reticulate and veined, appearing wing-like. *Corolla* tubular, 4- or 5-lobed. *Stamens* 4, fertile, epipetalous, subequal to didynamous, exserted or included, anthers oblong to elliptic. *Ovary* imperfectly 2-celled, 2 ovules in each cell. *Style* terminal. *Stigma* bilobed, lobes equal or unequal. *Fruit* indehiscent, dry, turbinate, apex conical, rounded or truncate, sometimes narrowed below apex giving urn-shape, surface usually longitudinally striate; enclosed in the calyx. *Seeds* 1 or 2 (other ovules aborting).

Distribution — Eight species: Burma, Thailand; in *Malesia*: Peninsular Malaysia, throughout Indonesia to New Guinea, the Bismarck Archipelago and Solomon Islands.

Habitat & Ecology — One species (*P. bambusetorum*) reported from bamboo forests in Perak, otherwise secondary forests or forest edges.

Taxonomy — Currently the genus *Petraeovitex* is unplaced in the Lamiaceae, after it and a number of other genera were transferred from the Verbenaceae (Harley et al. 2004). The genus was revised by Munir (1965). Based on Munir's account, and the material available to examine, eight species and four varieties of *Petraeovitex* are recognised in the Flora Malesiana area.

KEY TO THE SPECIES

1a. Flowers in short axillary cymes towards the end of growing non-specialized branches. Inflorescence with yellowish bracts 2
b. Flowers in cymes, borne on specialized flower-bearing branches or from axils where leaves have fallen. Inflorescence without bracts or with green or ash-coloured bracts 3
2a. Leaves densely pubescent . . . . . **5. P. scortechinii**
b. Leaves glabrous . . . . . **8. P. wolfei**
3a. Inflorescence with few or no bracts; flowers widely spread on peduncle or branchlets 4
b. Inflorescence with many bracts; flowers congested on peduncle and branchlets . 5
4a. Fruits non-striate. Younger inflorescences with few leafy bracts. Calyx without peltate scales . . . . . **1. P. bambusetorum**
b. Fruit striate. Younger inflorescences without bracts. Calyx with peltate scales . . . . . **3. P. membranacea**
5a. Stamens and style not or only slightly exserted. Fruit oblong, becoming truncate at apex, weakly depressed in centre of apex . . . . . **7. P. trifoliata**
b. Stamens and style conspicuously exserted. Fruit cuneate, either narrowing abruptly into an elongate conical apex, or apex remaining shorter, or weakly rounded to rounded at apex, not truncate, depressed in centre or not 6
6a. Corolla tube up to 12 mm long. Fruit narrowing abruptly into an elongate conical apex . . . . . **2. P. kinabaluensis**

b. Corolla tube 2–5 mm long. Fruit with apex weakly rounded, not narrowing abruptly 7

7a. Calyx lobes tomentose on outside only, glabrous within, deltate, equal in length to one third of the tube. Corolla sparsely puberulent outside. Stamens and style subequal or nearly so, anthers rounded . . . . . **4. P. multiflora**

b. Calyx lobes tomentose on both surfaces, long ovoid, almost equal in length to the tube. Corolla glabrous outside. Style exserted for nearly twice as long as the stamens, anthers elliptic-oblong . . . . . **6. P. sumatrana**

1. Petraeovitex bambusetorum King & Gamble

Petraeovitex bambusetorum King & Gamble, Bull. Misc. Inform. Kew (1908) 113; J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 1069; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 328; Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 98; Ridl., Fl. Malay Penins. 2 (1923) 637; Moldenke, Resume Geogr. Distr. & Syn. (1959) 180; Munir, Gard. Bull. Singapore 21 (1965) 232. — Lectotype (designated by Munir 1965): *King's collector (Kunstler) 8765* (lecto K; isolecto CAL), Peninsular Malaysia, Perak.

Petraeovitex bambusetorum King & Gamble forma *simplicifolia* Munir, Gard. Bull. Singapore 21 (1965) 233. — Type: *Haviland 1913* (holo K; iso CAL, L), Sarawak, Mt Po.

Stems woody when mature. *Leaves* trifoliolate or sometimes unifoliolate (appearing simple) in the younger parts; petioles up to 5.5 cm long; leaflets narrowly ovate to ovate-elliptic, terminal leaflet 10–14.5 by 4.7–9 cm with petiolules 12–20 mm long, lateral leaflets 8–12 by 4.2–6.5 cm with petiolules 9–12 mm long, apex acuminate, base rounded to cuneate, margin entire to shallowly dentate, glabrous. *Inflorescences* from woody nodes in the axils of fallen leaves on thicker woody parts of the stem, or axillary or terminal lax panicles, ultimate branchlets not strongly divaricate; flowers widely spread, not congested; bracts few, present in younger branches, leafy, greenish, deciduous so appearing absent in older branches; bracteoles linear, inconspicuous, up to 1 mm long, setulose; flowering pedicels c. 4 mm long, fruiting pedicels 5–6 mm long. *Calyx* (in bud) 4–7 mm long, lobes 2–5 mm long, with short glandular hairs, lacking peltate scales; young fruiting calyx 9–12 mm long, lobes 6–7 mm long, fruiting calyx 25–32 mm long, lobes 22–26 mm long. *Corolla* (in bud) 5–6 mm long. *Stamens* included with anthers elliptic-oblong. *Stigma* lobes unequal (Munir 1965). *Fruit* broader in the upper third, narrow towards base, 6–8 mm by c. 3 mm, non-striate, glabrous, apex conical.

Distribution — Peninsular Malaysia, Borneo (Sabah, Sarawak).

Habitat & Ecology — Bamboo forests, lowland forest, forest edges.

Notes — 1. The relationship between Peninsular Malaysian and Bornean specimens currently thought to be included in *P. bambusetorum* is unclear (e.g., Munir 1965). The inflorescences on most of the specimens examined from Peninsular Malaysia arise from woody nodes at the axils of fallen leaves in the older woody parts of the stem, giving a very different appearance to that of those specimens which have terminal or axillary panicles, a character seen on only one Peninsular Malaysian specimen, but which is common on Borneo. In addition, because the inflorescences are at different stages of development (Peninsular Malaysian specimens flowering; Bornean fruiting)

it is difficult to conclude whether they are conspecific or not. They are vegetatively similar, however, and until further material is available to examine, can continue to be recognised as one species.

2. *Petraeovitex bambusetorum* forma *simplicifolia* was recognised by Munir on the basis of Bornean material only, and distinguished by its uni- rather than trifoliolate leaves, and a fruit that is abruptly acuminate rather than flat conical. However, these characters are not reliable, because some fruits of the type appear somewhat malformed conical, others more flat conical. In addition, in Peninsular Malaysia, *KEP FRI (Kochummen) 29258*, a sterile collection that vegetatively matches the type of *P. bambusetorum*, has uni- as well as trifoliolate leaves; Kochummen notes on the label that young parts have 'simple' leaves. This was confirmed by recent observations of sterile plants in the field in the vicinity of the area where Kochummen collected his specimen.

2. Petraeovitex kinabaluensis Munir

Petraeovitex kinabaluensis Munir, Gard. Bull. Singapore 21 (1965) 234. — Type: *J. & M.S. Clemens 40561* (holo K; iso L), Borneo, Penibukan, Upper Kinabalu.

Young *stems* puberulent, older stems becoming woody and glabrous. *Leaves* trifoliolate, chartaceous or subcoriaceous; petioles puberulent, 5–7 cm long; leaflets elliptic to elliptic-ovate, terminal leaflet 10–15 by 3–6 cm, petiolules up to 3.5 cm long, puberulent, lateral leaflets 8.5–11.5 by 3–4.5 cm, petiolules 5–10 mm long, apex acuminate, base cuneate, nitid on both surfaces or dull on both surfaces, glabrous, nerve pairs 4–6. *Inflorescences* axillary, congested panicles, ultimate branchlets not strongly divaricate, bracts many, leafy, greenish, puberulent, gland dotted, subspathulate to elliptic ovate, 1–4 cm long; bracteoles linear, 2–8 mm long, puberulent; flowers congested; flowering pedicels 1–3 mm long, fruiting pedicels 4–5 mm long. *Calyx* 5–7 mm long, lobes 3–3.5 mm long, puberulous on inner and outer surface, fruiting calyx 23–28 mm long, lobes 15–20 mm long. *Corolla* 5-lobed (in bud) up to 10 mm long, tube extending up to 12 mm when open, lobes rounded to acuminate, pubescent, upper lip 2-lobed, the lower 3-lobed; lobes 4–5 by 2–3 mm. *Stamens* much exserted, 1.5–1.8 cm long, sparsely hairy at the base, anthers rounded. *Style* much exserted; stigma lobes equal. *Fruit* c. 10 by 3 mm, cuneate, broader in the middle, abruptly narrowing into an elongate conical apex, or apex remaining shorter, the upper third hairy, the remainder glabrous with sessile glands and longitudinally striate, sometimes a constriction between hairy and glabrous portions.

Distribution — Borneo, 2 varieties.

Habitat & Ecology — Lower and mid-montane forest. Secondary forest edges.

KEY TO THE VARIETIES

1a. Leaflets elliptic, nitid on both sides, cuneate at base, petiolules 2.5–3.5 cm long. Ovary not constricted between hairy and glabrous portions. Fruit with elongate conical apex . . . . . **a.** var. **kinabaluensis**

b. Leaflets elliptic-ovate, dull on both sides, generally rounded at base, sometimes subcordulate; petiolules up to 2.5 cm long. Ovary with slight constriction separating the hairy striate apex from the glabrous portions. Fruit with short conical apex . . . . . **b.** var. **agrestis**

a. var. **kinabaluensis**

Leaflets elliptic, base cuneate, nitid on both sides; terminal leaflet 10–15 cm long; petiolules 2.5–3.5 cm long. *Ovary* not constricted between hairy and glabrous portions. *Fruit* abruptly narrowing into an elongate conical apex, the upper third hairy, the remainder glabrous with sessile glands and longitudinally striate.

Distribution — Borneo (Sabah, Sarawak).

b. var. **agrestis** Munir

Petraeovitex kinabaluensis Munir var. *agrestis* Munir, Gard. Bull. Singapore 21 (1965) 235. — Type: *Gibot 18600* (holo SING), Sabah, Tawau.

Leaflets elliptic-ovate, base generally rounded, sometimes subcordulate, dull on both sides; terminal leaflet 10–11 cm long; petiolules up to 2.5 cm long. *Ovary* with slight constriction separating the hairy striate apex from the glabrous portions. *Fruit* with short conical apex, the upper third hairy, the remainder glabrous with sessile glands and longitudinally striate, a constriction present between hairy and glabrous portions.

Distribution — Borneo (Sabah, Kalimantan).

Note — Munir (1965) described this variety as differing from *P. kinabaluensis* var. *kinabaluensis* in having leaflets elliptic-ovate, dull on both sides, generally rounded at base, sometimes subcordulate; terminal leaflets up to 11 cm, petiolules up to 2.5 cm long: on the specimens available these characteristics are difficult to confirm and open to variation, though 'dull on both sides' has some justification. If the specimen is fruiting a more reliable characteristic is the ovary: it has a slight constriction separating the hairy striate apex from the glabrous portions, and the fruit of var. *agrestis* has a shorter conical apex than the elongated conical apex of var. *kinabaluensis*.

3. Petraeovitex membranacea Merr.

Petraeovitex membranacea Merr., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 30; Munir, Gard. Bull. Singapore 21 (1965) 230. — Type: *Ramos 1372* (holo PNH†; iso A, K), Sabah, Sandakan.

Stems woody when mature, glabrous. *Leaves* opposite, trifoliolate, membranaceous to subcoriaceous, petioles up to 6 cm long; leaflets ovate-oblong to ovate-elliptic, terminal leaflet 6–11 by 3–5.5 cm, petiolules 1–2 cm long, lateral leaflets 4.5–8 by 2.5–4.5 cm, petiolules 3–7 mm long, margins entire, apex acuminate, base rounded to asymmetric, glabrous, sessile glands above and below, 4- or 5- or 7-nerved on each side. *Inflorescences* axillary, sometimes where leaves have fallen; flowers widely spread, not congested; bracts absent, bracteoles linear, 2–4 mm long, setulose; flowering pedicels 1–10 mm long, fruiting pedicels up to 15 mm long; bracteoles setaceous, up to 1 mm

long. *Calyx* 5–6 mm long, lobes 1.5–2 mm long, with short hairs and peltate scales, fruiting calyx 21–28 mm long, lobes 14–16 mm long. *Corolla* (young) 4–4.5 mm long, lobes rounded, lobes with short hairs especially along the margins. *Stamens* included, anthers ellipsoid. *Stigma* lobes unequal. *Fruit* 8–9 by c. 3 mm, broader in the upper third, narrow towards base, apex conical, glabrous or with a few hairs at the apex, striate.

Distribution — Peninsular Malaysia, Borneo (Sabah, Sarawak); 2 varieties.

Notes — 1. Munir (1965) separates *P. membranacea* from the similar species *P. bambusetorum* only by its longitudinally striate, rather than non-striate fruit, and more membranaceous leaves. I also recognise (see key to the species) the presence of a few leafy bracts on young inflorescences of *P. bambusetorum* and the absence of bracts on those of *P. membranacea* as a useful characteristic for non-fruiting specimens.

2. In Munir's treatment (1965), *P. membranacea* was segregated into two varieties. *Petraeovitex membranacea* var. *membranacea* is a Borneo endemic, but var. *malesiana* apparently occurs in Sarawak and Peninsular Malaysia. Munir describes var. *malesiana* as differing by its thicker leaflets with up to seven (vs four) nerves; more lax and longer inflorescence, shorter flowering and fruiting pedicels, and ovary and fruit puberulent vs glabrous towards apex. Only a few specimens from the Flora Malesiana area, most identified by Munir as *P. membranacea* var. *malesiana*, are known: more material needs to be seen, to feel certain that any of these characters are distinct enough, but until then I will continue to recognise Munir's var. *malesiana*.

KEY TO THE VARIETIES

1a. Leaves membranaceous, 4- or 5-nerved on each side. Flowering pedicels 8–10 mm long, fruiting pedicels up to 15 mm long. Fruits glabrous at apex . . . . . **a.** var. **membranacea**

b. Leaves subcoriaceous, up to 7-nerved on each side. Flowering pedicels 1–2 mm long, fruiting pedicels up to 4 mm long. Fruits with short hairs around apex only . . . . . **b.** var. **malesiana**

a. var. **membranacea**

Leaves membranaceous, 4- or 5-nerved on each side. Flowering *pedicels* 8–10 mm long, fruiting pedicels up to 15 mm long. *Fruit* glabrous at apex.

Distribution — Borneo (Sabah).

b. var. **malesiana** Munir

Petraeovitex membranacea Merr. var. *malesiana* Munir, Gard. Bull. Singapore 21 (1965) 231. — Type: *Haviland & Hose 1913* (holo BM [1913B]; iso K [1913A], L [1913E]), Sarawak, Mt Singghi.

Leaves subcoriaceous, up to 7-nerved on each side. Flowering *pedicels* 1–2 mm long, fruiting pedicels up to 4 mm long. *Fruit* with short hairs around apex only.

Distribution — Peninsular Malaysia (Pahang, Selangor), Borneo (Sarawak).

4. Petraeovitex multiflora (Sm.) Merr.

Petraeovitex multiflora (Sm.) Merr., Interpr. Herb. Amboin. (1917) 453. — *Petrea multiflora* Sm. in Rees, Cycl. 27 (1814) 2. — Type: *C.Smith* (iso BM), [Moluccas,] Honimoa Island.

Petraeovitex riedelii Oliv., Hooker's Icon. Pl. 15 (1833) 16. — *Petraeovitex riedelii* F.Muell., Bot. Centralbl. 50 (1892) 195, nom. illeg. (non Oliv.). — Type: *Riedel s.n.* (K), [Moluccas,] Buru.

Petraeovitex multiflora (Sm.) Merr. var. *salomonensis* Bakh., J. Arnold Arbor. 16 (1935) 73. — *Petraeovitex sumatrana* H.J.Lam var. *salomonensis* (Bakh.) Moldenke, Resume Geogr. Distr. & Syn. (1959) 332. — Type: *Kajewski 1686* (BISH, BM, BO, NY), Bougainville Island, Kupei Gold Field.

Petraeovitex multiflora (Sm.) Merr. var. *pubescens* (Warb.) Munir, Gard. Bull. Singapore 21 (1965) 242. — Type: *Warburg 21148* (?holo BO; iso A), Moluccas, Kai Islands.

Stems woody when mature, glabrous, young stems puberulent. *Leaves* biternate, chartaceous, ovate-elliptic, primary petioles 6–10 cm long, secondary terminal petioles 3–4.8 cm long, terminal trifoliolate formation: terminal leaflet 6.5–11 by 4–6.2 cm, petiolule 1–1.5 cm long, lateral leaflets 5–10 by 3–5 cm, petiolules 2–7 mm long; lateral trifoliate formations: secondary lateral petiolule 2–3 cm long, terminal leaflet 7–10 by 4–5.5 cm, petiolule c. 1 cm long; lateral leaflets 5–7.5 by 3–4 cm, petiolules 2–4 mm long or sessile, apex acuminate to obtuse, base truncate, margins entire, often puberulent when young mostly on the nerves beneath, both surfaces glabrous when older. *Inflorescences* terminal and axillary, ultimate branchlets not strongly divaricate; flowers congested; bracts linear, 1–2 mm long, puberulous, greenish; flowering pedicels up to 1 mm long, fruiting pedicels 1–2 mm long; bracteoles almost half the length of the bracts. *Calyx* c. 1 mm long, lobes deltate, equal in length to one third of the tube, tomentose outside, glabrous inside, fruiting calyx sparsely puberulent, up to 1.5 cm long; lobes oblanceolate, up to 1.3 cm long. *Corolla* c. 2 mm long, lobes rounded at apex, sparsely puberulent outside, villous in the throat. *Stamens* exserted, anthers rounded. *Style* subequal in length to stamens, or nearly so; stigma lobes equal and reflexed. *Fruit* c. 1.5 mm long, broad and rounded at apex, cuneate towards base, puberulent, striate.

Distribution — Moluccas, New Guinea.

Habitat & Ecology — Lowland forest.

Vernacular name — New Guinea: Anadjula (Angoram).

5. Petraeovitex scortechinii King & Gamble

Petraeovitex scortechinii King & Gamble, Bull. Misc. Inform. Kew (1908) 113; Ridl., Fl. Malay Penins. 2 (1923) 637; Munir, Gard. Bull. Singapore 21 (1965) 228. — Type: *Scortechini 753* (lecto K), Perak.

Young *stems* and woodier older stems with a dense indumentum of short erect branched and simple hairs and yellow sessile glands, an interpetiolar ridge resembling a stipule scar present. *Leaves* opposite, trifoliolate, pale greenish yellow when young; petioles 2.6–7.5 cm long, pubescent as stems; terminal leaflet ovate, 4.7–7.5 by 2.9–4 cm, petiolules 0.5–1.7 cm long, pubescent; lateral leaflets ovate, 3.5–6 by 2.5–4.5 cm, petiolules 3–10 mm long; all leaflets with margins more or less entire, apex acute, base rounded to cuneate or unequally cordate, upper surface with branched hairs, these dense along the sunken midrib and larger veins, lower surfaces with branched hairs and yellow sessile glands, nerve pairs 3–5. *Inflorescences* short decussate cymes in axils of

young leaves on young lateral non-specialised branches, densely pubescent (as stems); flowers with peduncles 1.8–2.5 cm long; bracts same colour shape and size as young leaves, almost orbicular to elliptic, variable in size; flowering pedicels 2–3 mm long, fruiting pedicels to 3–4 mm long; bracteoles narrowly elliptic to linear, 2–5 mm long. *Calyx* (in bud): tube c. 4 mm long; lobes 5, oblong, c. 6 mm long, outer surface with branched hairs, fruiting calyx 26–36 mm long, lobes 19–26 mm long. *Corolla* (in bud) c. 12 mm long, divided into 4 lobes, one upper, two lateral and one lower, the lower larger, outer surface with branched hairs, inner surface with branched hairs on inside of lobes and scattered glandular hairs in tube. *Stamens* 4, exserted, filaments with some short glandular hairs, anthers elliptic. *Style* exserted; stigma bilobed, lobes subequal. *Fruit* 5–7 by c. 3 mm, broader towards apex, apex rounded, with short appressed upward pointing hairs around the base and longer, branched hairs above, longitudinally striate.

Distribution — Southern Thailand; in *Malesia*: Peninsular Malaysia.

6. Petraeovitex sumatrana H.J.Lam

Petraeovitex sumatrana H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 98. — Type: *Ajoeb (Exp. Jacobson) 183* (holo BO; iso L), Sumatra, Bengkulen, Rimbo Pengadang.

Petraeovitex elmeri Merr., Univ. Calif. Publ. Bot. 15 (1929) 267. — Type: *Elmer 21883* (holo CAS; iso BO, L, NY, SING, Z), Borneo, Sabah, Tawao.

Stems woody when mature, glabrous, young stems puberulent. *Leaves* biternate, chartaceous, ovate-elliptic, apex acuminate, base rounded or slightly cuneate, often puberulent on the lower surface, both surfaces glabrous when older; primary petiole up to 4 cm long, puberulent, secondary petioles 1.5–3 cm long; terminal trifoliolate formation: central leaflet up to 4.5 by 2.8 cm, petiolules 1.5–2 cm long, puberulent, lateral leaflets 2–3.8 by up to 2 cm, petiolule 2–5 mm; lateral trifolioate formations: secondary lateral petioles 5–15 mm long, terminal leaflet up to 4.3 by 2.3 cm, petiolule up to 1 cm long, lateral leaflets up to 2.8 by 2 cm, petiolules 0–5 mm long. *Inflorescences* axillary, sometimes where leaves have fallen, or terminal on specialised flower-bearing branches, ultimate branchlets not strongly divaricate; flowers congested; bracts linear, puberulous up to 1 mm long, greenish; flowering pedicels 1–1.5 mm long, fruiting pedicels 2–3 mm long; bracteoles linear, c. 0.5 mm long. *Calyx* c. 2 mm long, lobes 5, long ovoid, c. 1 mm long, almost equal in length to the tube, conspicuously tomentose on both surfaces; fruiting calyx glabrous, 4–10 mm long, lobes 14–19 mm long. *Corolla* 2–2.5 mm long, glabrous without, lobes subequal, c. 1 mm long, lobes often recurved to some degree. *Stamens* exserted, anthers elliptic-oblong. *Style* exserted for nearly twice as long as stamens; stigma lobes equal. *Fruit* 2.5–3 by c. 1 mm, cuneate, weakly rounded at apex, and depressed in the centre, apex glandular puberulent.

Distribution — Sumatra, Borneo, Moluccas (W Ceram).

Habitat & Ecology — Lowland and montane forest.

Vernacular name — Borneo: Akar (Penan).

Note — In flower the style and stigma appear well-exserted and conspicuous relative to the minute calyx and corolla, especially as the corolla lobes show some tendency to be recurved.

7. **Petraeovitex trifoliata** Merr.

Petraeovitex trifoliata Merr., Philipp. J. Sci., C 2 (1907) 425; Enum. Philipp. Fl. Pl. 3 (1923) 406. — Type: *Foxworthy 708* (holo PNH†; iso US), [Philippines,] Palawan.

Petraeovitex ternata Hallier f., Meded. Rijks-Herb. 37 (1918) 85. — Lectotype (designated here): *Hallier 4722* (lecto L), Philippines, Mindanao, Zamboanga Prov., San Ramon.

Petraeovitex ternata Hallier f. var. *glabrior* H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 97. — Type: *Jaheri 512* (holo L; iso NY), Borneo.

Stems woody when mature, glabrous to puberulent, young stems puberulent. *Leaves* trifoliolate, chartaceous, petioles 3–7.5 cm long; leaflets ovate to oblong-ovate, terminal leaflet 8–14 by 5–7.8 cm, petiolule 1–2 cm long; lateral leaflets up to 12 by 7.5 cm, petiolules 5–15 mm long, apex acuminate, base oblique truncate to subacuminate, margins more or less entire, hairy along the midrib of the lower surface, otherwise both surfaces glabrous. *Inflorescences* a terminal thyrse with lower branches axillary, also bearing terminal and lateral cymes; flowers congested on shortly subdivided branchlets, not strongly divaricate; flowering and fruiting pedicels up to 1 mm long; many axillary bracts and bracteoles, deciduous in the early stages of flowering, bracts green or ash-coloured, narrowly ovate to spathulate, bracteoles linear, puberulous. *Calyx* 8 mm long, lobes oblong to very narrowly ovate, c. 4 mm long, puberulent; fruiting calyx puberulent, lobes 1.5–2 cm long, tube 5–8 mm long. *Corolla* 8–10 mm long, funnel-shaped, puberulent on both sides, lobes c. 3 mm long, oblong-ovate, rounded. *Stamens* almost included to slightly exserted, anthers oblong often sparsely hairy in the lobes. *Stigma* lobes unequal, style almost included to slightly exserted, terminal in young stage, later excentric. *Fruit* 5–7 mm long, oblong, slightly narrowed towards base, rounded at apex when young, later truncate, weakly depressed in the centre, pubescent in the upper fifth, striate.

Distribution — Borneo, Philippines.

Habitat & Ecology — Secondary lowland forest.

8. **Petraeovitex wolfei** J.Sinclair

Petraeovitex wolfei J.Sinclair, Gard. Bull. Singapore 15 (1956) 18; Turrill, Curt. Bot. Mag. 173 (1960) t. 355; Munir, Gard. Bull. Singapore 21 (1965) 229; Gardenwise 25 (2005) 17. — Type: *SFN (Wolfe & Kadir) 21452* (holo SING; iso L, SING 2 sheets), Peninsular Malaysia, Kedah, Selamban, Jeniang Road, 103/4 milestone, Sungei Patani.

Young *stems* with indumentum of short erect hairs, older stems becoming woody and glabrous, a slight interpetiolar ridge resembling a stipule scar present. *Leaves* trifoliolate, rarely unifoliolate; petioles pubescent, 3–5 cm long; terminal leaflet elliptic to narrowly ovate or ovate, 5.5–9 by 4–6 cm, petiolules 0.6–1.4 cm long; lateral leaflets generally smaller, 3.5–8.5 by 2.7–4.5 cm, petiolules 0.4–1 cm long, all leaflets with base rounded to asymmetrically acute, margins more or less entire, apex acuminate to shortly acuminate, a mucronate tip especially conspicuous when leaflets younger and paler, upper surface glossy when dry, glabrous, lower surfaces glabrous, with sessile glands; nerve pairs 3–5. *Inflorescences* thyrsoid, pendulous and pubescent; bracts leaf-like, golden yellow, the cymes in the axils of young leaves and bracts; flowers evenly spaced; peduncles 1–3 mm long; bracts as young leaves, uni- to trifoliolate, yellow,

with simple erect hairs; flowering pedicels 3–4 mm long, fruiting pedicels 4–7 mm long; bracteoles as bracts but smaller, usually unifoliolate. *Calyx* (in bud) tube c. 6 mm long, lobes 5, oblong with acute apex, c. 10 mm long, outer and inner surfaces with short erect hairs; fruiting calyx 29–35 mm long, tube ribbed, lobes 20–25 mm long. *Corolla* (in bud) c. 17 mm long, divided into 2 upper, 2 lateral lobes of 2–2.5 mm long and 1 lower lobe of c. 4 mm long, outer surface with short erect simple hairs. *Stamens* 4 (in bud), included, didynamous, anthers oblong-elliptic. *Ovary* hairy in upper half, 4 lobes apparent at apex; *style* included, *stigma* lobes subequal. *Fruit* urn-shaped, c. 8 by 3 mm, apex above constriction, rounded, the upper third minutely puberulent, the remainder glabrous, also with sessile glands, longitudinally striate below constriction.

Distribution — Thailand; in *Malesia*: Peninsular Malaysia (Kedah, Kelantan, Terengganu, Pahang).

Habitat & Ecology — Lowland dipterocarp forest.

Uses — *Petraeovitex wolfei* (Wolfe's vine; Nong Nooch vine) is an ornamental increasing in popularity, e.g., Gardenwise 25 (2005) 17.

Note — *Petraeovitex wolfei* has become a popular cultivated climber due to its attractive bright yellow bracts and calyx. Recent fieldwork (2010) to the type locality to search for *P. wolfei* was not successful; the area has become agricultural land.

35. PLATOSTOMA

(G.L.C. Bramley, updated from Keng 1978)

Platostoma P.Beauv., Fl. Oware 2 (1818) 61; H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 382; A.J.Paton, Kew Bull. 52 (1997) 272; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 263; Suddee, A.J.Paton & J.Parn., Kew Bull. 60 (2005) 32. — Type: *Platostoma africanum* P.Beauv.

Mesona Blume, Bijdr. (1826) 838; Backer & Bakh.f., Fl. Java 2 (1965) 638; H.Keng, Gard. Bull. Singapore 24 (1969) 113; in Steenis, Fl. Males., Ser. I, 8 (1978) 373; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 294. — Type: *Mesona palustris* Blume (= *Platostoma palustre* (Blume) A.J.Paton).

Acrocephalus Benth., Edwards's Bot. Reg. 15 (1829) 13, t. 1282; Ridl., Fl. Malay Penins. 2 (1923) 644; Backer & Bakh.f., Fl. Java 2 (1965) 638; H.Keng, Gard. Bull. Singapore 24 (1969) 25; in Steenis, Fl. Males., Ser. I, 8 (1978) 365; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 295. — Type: *Acrocephalus scariosus* Benth. (= *Platostoma hispidum* (L.) A.J.Paton).

Geniosporum Wall. ex Benth., Edwards's Bot. Reg. 15 (1830) t. 1300. — Type: *Geniosporum strobiliferum* Wall. ex Benth. (= *Platostoma coloratum* (D.Don) A.J.Paton).

Nosema Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 73 (1904) 20; H.Keng, Gard. Bull. Singapore 24 (1969) 122; in Steenis, Fl. Males., Ser. I, 8 (1978) 375; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 294. — Type: *Nosema capitatum* Prain (= *Platostoma cochinchinense* (Lour.) A.J.Paton).

Hemsleia Kudô, Mem. Fac. Sci. Taihoku Imp. Univ. 2 (1929) 142. — Type: *Hemsleia calcarata* (Hemsl.) Kudô (= *Platostoma calcaratum* (Hemsl.) A.J.Paton).

Ceratanthus F.Muell. ex G.Taylor, J. Bot. 74 (1936) 3; H.Keng, Gard. Bull. Singapore 24 (1969) 46; in Steenis, Fl. Males., Ser. I, 8 (1978) 368; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 291. — Type: *Ceratanthus longicornis* (F.Muell.) G.Taylor (= *Platostoma longicorne* (F.Muell.) A.J.Paton).

Herbs or undershrubs. *Stems* erect or ascending. *Leaves* simple. *Inflorescences* thyrsoid with cymes sessile, cymes usually > 3-flowered; bracts often basally coloured, usually persistent. *Calyx* tubular, campanulate or urceolate, straight or curving upwards,

2-lipped, upper lip 1- or 3-lobed, lower lip 1–4-lobed; fruiting calyx declinate or suberect. *Corolla* tube 2-lipped, straight or curved, spurred at base or not; upper lip 3- or 4-lobed; lower lip entire, concave. *Stamens* 4, declinate or spreading, included or long-exserted, upper pair attached towards base of corolla tube, filaments appendiculate or not, lower pair attached near mouth, inappendiculate. *Disc* 4-lobed, lower lobe largest. *Style* gynobasic, stigma bifid, lobes linear, equal, diverging. *Fruit* a schizocarp of four nutlets. *Nutlets* usually weakly mucilaginous when wet, attachment scar basal.

Distribution — Forty five species in tropical Africa and Asia, also in Australia (Queensland); in *Malesia* 6 species of which a few widespread across the region, others endemic to specific areas.

Habitat & Ecology — Grassland, open woodland, often in wet areas.

Note — Since Keng (1978: 382) a number of changes to the circumscription of *Platostoma* have been accepted (Paton 1997). *Platostoma* in Malesia is enlarged (6 species), to include the genera *Mesona*, *Acrocephalus*, *Nosema* and *Ceratanthus*, all treated separately by Keng (1978).

KEY TO THE SPECIES

1a. Corolla with a conical spur at the base of the tube. — New Guinea and NE Australia . . . . . **5. P. longicorne**
b. Corolla without any spur at the base of the tube. — Malesia and other areas . . . 2
2a. Calyx upper lip 1-lobed, lower lip divided into 4 narrowly triangular lobes . . . . . **4. P. hispidum**
b. Calyx upper lip 1- or 3-lobed, lower lip 1-lobed 3
3a. Calyx upper lip with 3 distinct triangular lobes. Pedicels 5–6 mm long . . . . . **6. P. palustre**
b. Calyx upper lip 1-lobed or obscurely 3-lobed. Pedicels up to 5 mm long 4
4a. Calyx with some short hairs, in fruit funnel-shaped, lower lobe not closing calyx mouth . . . . . **1. P. africanum**
b. Calyx with long hairs, in fruit pitcher shaped, lower lobe curving upwards closing or obscuring calyx mouth 5
5a. Verticillasters interrupted. — Endemic to Philippines (Culion) . . . . **2. P. clausum**
b. Verticillasters uninterrupted. — N Sumatra . . . . . **3. P. cochinchinense**

1. Platostoma africanum P.Beauv.

Platostoma africanum P.Beauv., Fl. Oware 2 (1818) 61. — Type: P.Beauv., Fl. Oware 2 (1919) t. 95.

Branched, slender herb, 30 cm or more high. *Stems* and *branches* sparingly puberulent. *Leaves* rhomboid to ovate, sparingly puberulent on both surfaces, 1.2–3.5 by 0.5–1.5 cm, apex acute, base cuneate or attenuate, margin basally entire, elsewhere serrate; petiole 0.5–1 cm long. *Inflorescences* terminal, lax, verticillasters 6–10-flowered, 2 or more cm long; bracts narrowly elliptic, 4–5 mm long, glandular and hirsute; pedicels c. 2 mm long. *Calyx* 2–2.5 mm long, in fruit funnel-shaped, 3–4 mm long, sparingly puberulent; upper lip rounded, strongly deflexed backwards in fruit; lower

lip ovate, flat or slightly concave, not closing calyx mouth. *Corolla* white, pink or blue, 1.5–3 mm long. *Nutlets* ovoid, minute, brown to black, finely reticulate.

Distribution — Tropical Africa and S Asia (India: Deccan Peninsula); in *Malesia*: Lesser Sunda Islands (Sumba), once collected (*Iboet 397*, L).

2. Platostoma clausum (Merr.) A.J.Paton

Platostoma clausum (Merr.) A.J.Paton, Kew Bull. 52 (1997) 285. — *Mesona clausa* Merr., Philipp. J. Sci., C 7 (1912) 345; Enum. Philipp. Fl. Pl. 3 (1923) 420. — *Nosema clausum* (Merr.) H.Keng, Gard. Bull. Singapore 24 (1969) 123, f. 23a–e; in Steenis, Fl. Males., Ser. I, 8 (1978) 375. — Type: *Merrill 460* (holo PNH†; iso GH, K, NY), Philippines, Culion.

Erect, unbranched herb, 20–30 cm high. *Stems* densely villose with retrorse hairs. *Leaves* chartaceous, oblong or very narrowly elliptic, 4.5–6 by 1–2 cm, apex acute or obtuse, base acute, with short appressed hairs on both surfaces, especially on venation, margin serrate; petioles 0.5–1.5 cm long, velvety. *Inflorescences* 12–15 cm long, verticillasters interrupted, dense, c. 1.5 cm wide, 2–2.5 cm apart, upper ones closer together, axes densely villous; bracts subtending each whorl, ovate, 0.5–1.5 cm long, acuminate, densely villous, deflexed, the lowermost ones resembling the leaves. *Calyx* 2.5–3 mm long, with dense long hairs, the surface obscured, upper lip oblong, obtuse; lower lip rounded; fruiting calyx thick-coriaceous, pitcher-shaped, almost resembling *Nepenthes* sp. pitcher in shape, 7–8 mm long, slightly inflated in the middle, the mouth nearly closed by the lid-like lower lip; pedicels 3–5 mm long. *Corolla* (after Keng 1969, 1978) violet, trumpet-shaped, 3.5–4 mm long, inflated from middle upwards and abruptly narrowed into a small lower tube; upper lip shortly 3-lobed, central lobe much larger than the two lateral ones; lower lip entire, concave. *Stamens* exserted, the upper pair pubescent and appendaged at the base. *Nutlets* ellipsoid, c. 1 mm long, smooth. — **Fig. 31d.**

Distribution — Philippines (Culion Is., 2 collections).

Habitat & Ecology — Open, damp places at low altitude. Flowering: October to December.

Note — Only known from collections from Culion Island made in 1902. This species is similar to *P. cochinchinense*, distributed across continental SE Asia. If new collections were made, further detailed comparison may result in *P. clausum* being recognised as *P. cochinchinense*, the only major difference found to date being the form of the inflorescence.

3. Platostoma cochinchinense (Lour.) A.J.Paton

Platostoma cochinchinense (Lour.) A.J.Paton, Kew Bull. 52 (1997) 285. — *Dracocephalum cochinchinense* Lour., Fl. Cochinch. (1790) 371. — *Nosema cochinchinense* (Lour.) Merr., Trans. Amer. Philos. Soc., n.s., 24 (1935) 343. — Neotype (designated by Suddee et al., Kew Bull. 60 (2005) 32): *Squire 156* (neo K; isoneo A, BM, E, NY, P), Vietnam, Thua Thien Hue, Hue, South river.

Mesona prunelloides Hemsl., J. Linn. Soc., Bot. 26 (1890) 267. — *Nosema prunelloides* (Hemsl.) C.B.Clarke ex Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 73 (1904) 21. — Type: *Playfair 110* (holo K), China, Kwangtung, Pakhoi.

Nosema capitatum Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 73 (1904) 20. — *Mesona capitata* (Prain) Doan in Lecomte, Fl. Indo-Chine 4 (1936) 931. — Type: *Teysmann s.n.* (holo K), Thailand, Kachanaburi.

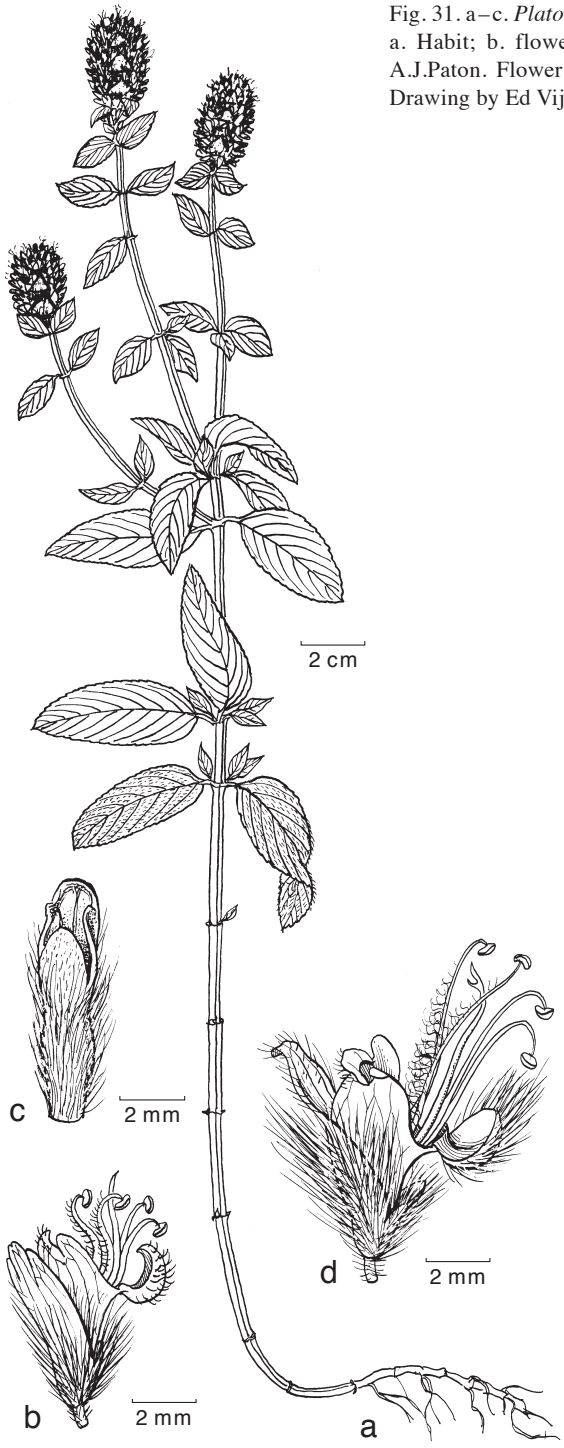

Fig. 31. a–c. *Platostoma cochinchinense* (Lour.) A.J.Paton. a. Habit; b. flower; c. calyx. — d. *P. clausum* (Merr.) A.J.Paton. Flower (a–c: *Horner 8*; d: *BS 41313*; all L). Drawing by Ed Vijsma, 1976.

Erect herb, 30–50 cm high, sparingly branched. *Stems* obscurely angled, with retrorse or antrorse hairs, sometimes villous. *Leaves* narrowly ovate, 4–6 by 1–1.5 cm, chartaceous, apex acute, base cuneate, margin serrate, sparsely hairy to villous on both surfaces; petiole 0.5–1(–2) cm long. *Inflorescences* terminal, occasionally axillary, 6–8 cm long; verticillasters almost continuous; bracts subtending the lowermost whorls similar to the normal leaves but smaller, distinct from upper, smaller, very narrowly ovate lobes, up to 30 by 15 mm, densely villous; pedicels 0.5–2 mm long. *Calyx* campanulate 2.5–3 mm long, 5–6 mm long in fruit, densely hairy, upper lip oblong, 1-lobed to shallowly 3-lobed, if 3-lobed median lobe broadest, lower lip 1-lobed, much shorter than the upper one, obscured by densely villous indumentum in flower, curving upwards almost closing throat; in fruit, pitcher shaped. *Corolla* purple, mauve, blue or white, 3–4 mm long; upper lip shortly 3-lobed, the lobes more or less equal in length, lower lip 1-lobed, concave, both villous outside. *Stamens* long-exserted, lower pair inserted near base of lower corolla lobe, filaments sparsely hairy, upper pair inserted near base of corolla tube, filaments hairy and with an appendage at the base. *Nutlets* c. 1 mm long, producing some mucilage when wet. — **Fig. 31a–c; Plate 6a.**

Distribution — Continental SE Asia (Thailand, Indo-China to S China: Kwantung, Hainan); in *Malesia*: N Sumatra (Batak-Toba Lands and Padang Lawas).

Habitat & Ecology — Open places, rocky habitats, grassy savannahs, open mossy ground. Altitude: 100–1000 m. Flowering: throughout the year.

4. **Platostoma hispidum** (L.) A.J.Paton

Platostoma hispidum (L.) A.J.Paton, Kew Bull. 52 (1997) 273. — *Gomphrena hispida* L., Sp. Pl. ed. 2 (1762) 326. — *Acrocephalus hispidus* (L.) Nicolson & Sivad., Taxon 29 (1980) 324. — Lectotype (designated by Nicolson & Sivadasan 1980): Rheede, Hort. Malab. 9 (1689) 141, t. 72.

Prunella indica Burm.f., Fl. Ind. (1768) 130. — *Acrocephalus indicus* (Burm.f.) Kuntze, Revis. Gen. Pl. 2 (1891) 511; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 421; Backer & Bakh.f., Fl. Java 2 (1965) 638; H.Keng, Gard. Bull. Singapore 24 (1969) 26; in Steenis, Fl. Males., Ser. I, 8 (1978) 365; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 295. — Type: *Anonymous s.n.* (holo G), India.

Ocimum capitatum Roth, Nov. Pl. Sp. (1821) 276 (‘*Ocymum*’). — *Lumnitzera capitata* (Roth) Spreng., Syst. Veg. 2 (1825) 687. — *Acrocephalus capitatus* (Roth) Benth., Edwards’s Bot. Reg. 15 (1830) t. 1300; Miq., Fl. Ned. Ind. 2 (1858) 941; Ridl., Fl. Malay Penins. 2 (1923) 644. — Type: *Heyne s.n.* (holo B†; iso L), India Orientalis.

Ocimum acrocephalum Blume, Bijdr. (1826) 834 (‘*Ocymum*’). — Lectotype (designated by Keng 1969: 27): *Blume 974* (lecto L; isolecto L 2 sheets), Java.

Acrocephalus spicatus C.B.Rob., Philipp. J. Sci., C 6 (1911) 356. — *Acrocephalus indicus* (Burm.f.) Kuntze var. *spicatus* (C.B.Rob.) H.Keng, Gard. Bull. Singapore 24 (1969) 27. — Type: *Williams 2954* (iso A, K, NY), Philippines, Santa Cruz, Davao, SE Mindanao.

Erect annual herb, up to 1 m high. *Stems* quadrangular, with some hairs to glabrescent in younger parts, glabrous when more woody, often branched from the base, often with young shoots in the leaf axils. *Leaves* elliptic to very narrowly elliptic, 2–5.5 by 0.5–1 cm, apex acute, base attenuate, margin coarsely serrate, glabrous to hispid on both surfaces, when hairs present these more apparent on venation, also with yellow sessile glands; petioles 0.2–1 cm long. *Inflorescences* in terminal heads or cylindric spikes, rarely axillary, 5–15 mm wide, up to 3(–4) cm long, subtended at the base with 2 or several leafy bracts, congested terminal heads or spikes including bracts subtending 4–6

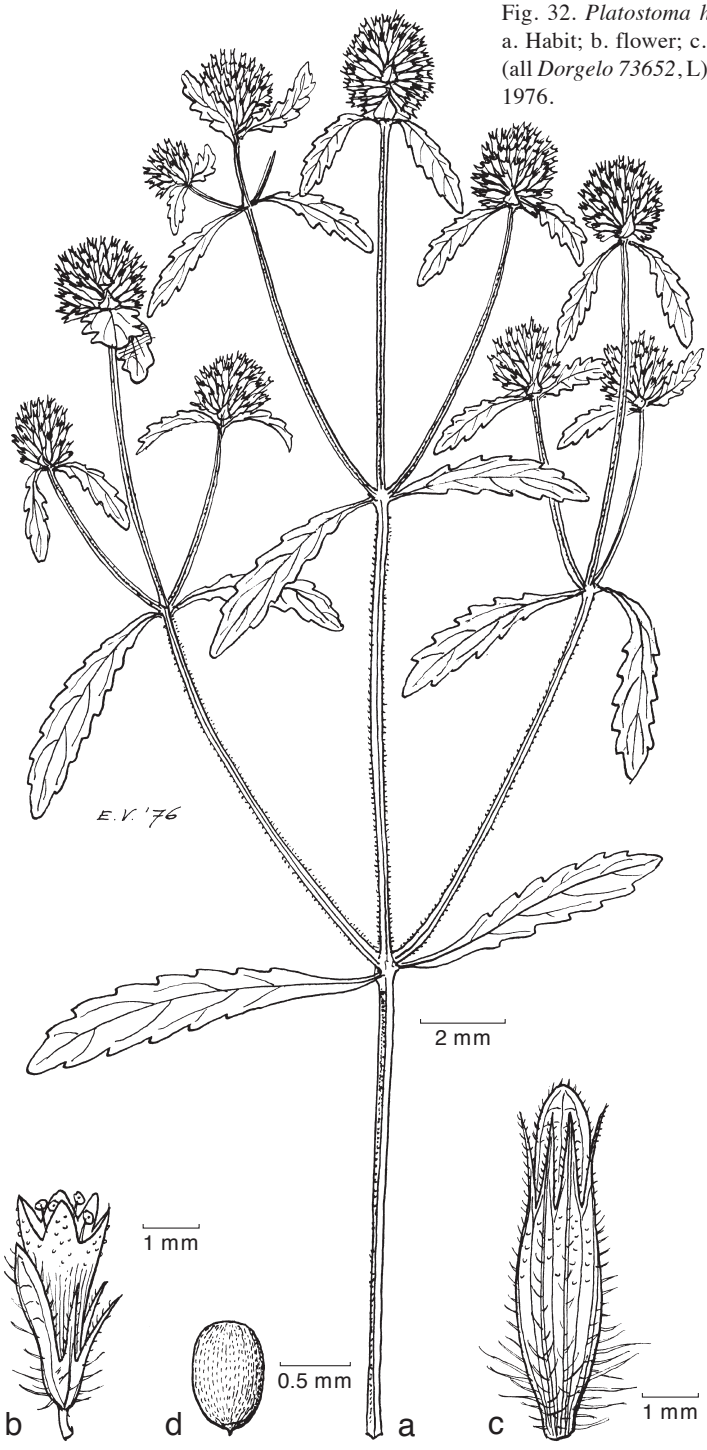

Fig. 32. *Platostoma hispidum* (L.) A.J.Paton. a. Habit; b. flower; c. fruiting calyx; d. nutlet (all *Dorgelo 73652*, L). Drawing by Ed Vijsma, 1976.

flowers; bracts broadly ovate, 2–3 mm wide, subsessile, apex shortly acuminate, villous at base below, shorter hairs elsewhere, also with yellow sessile glands. *Calyx* tubular, 2–2.5 mm long, in fruit 4–5 mm long, hairy, often more densely so at base, upper lip entire, oblong or obovate-oblong, lower lip 4-lobed, lobes very narrowly triangular, ciliate, equal in length, shorter than upper lobe. *Corolla* white or pale purple, tubular, 2–3 mm long, tube short, upper lip shortly 4-lobed, lobes equal to subequal, lower lip entire, slightly longer than the upper lip. *Stamens* included, lower pair attached near base of lower corolla lobe, upper pair attached near midpoint of corolla tube, filaments with some hair, inappendiculate. *Nutlets* minute, oblong-ellipsoid, 0.5–1 mm long, not producing mucilage when wet. — **Fig. 32.**

Distribution — Continental SE Asia (India, Assam, Thailand, Indo-China to S China) and throughout *Malesia*.

Habitat & Ecology — In open vegetation and in grassland, also in fallow fields and paddies. Rather rare, but locally common; sometimes in both everwet and strongly seasonal climates. Altitude: largely below 800 m, ascending in N Sumatra (Toba) to 1250 m. Flowering: throughout the year.

5. **Platostoma longicorne** (F.Muell.) A.J.Paton

Platostoma longicorne (F.Muell.) A.J.Paton, Kew Bull. 52 (1997) 280. — *Plectranthus longicornis* F.Muell., Fragm. 5 (1865) 51; Benth., Fl. Austral. 5 (1870) 76; Steenis, Bull. Jard. Bot. Buitenzorg Ser. 3, 13 (1934) 222. — *Ceratanthus longicornis* (F.Muell.) G.Taylor, J. Bot. 74 (1936) 39; H.Keng, Gard. Bull. Singapore 24 (1969) 46, f. 8; in Steenis, Fl. Males., Ser. I, 8 (1978) 368. — Type: *Dallachy s.n.* (iso K), Australia, Rockingham's Bay.

Perennial herb, 25–45 cm high. *Stems* unbranched, rarely branched from the base, tomentose or pubescent, thickened, (sometimes nodiferous) and scaly in underground portion. *Leaves* usually 2 or 3 pairs at base or towards the base of the stem, spatulate to oblanceolate, obovate or oblong, 2.5–3.5(–5) by 1–1.5 cm, apex obtuse or rounded, base attenuate, margin sinuate or coarsely serrate or subentire, short appressed hairs and yellow sessile glands on both surfaces; petiole 2–5 mm long. *Inflorescences* terminal, unbranched, 10–15 cm long, verticillasters (4–)6–8-flowered; bracts narrowly ovate, cordate, sessile, apex acuminate, hairy, with dense yellow sessile glands; pedicels 2–3 mm long. *Calyx* widely opened, 1.5–2.5 mm long, in fruit 2.5–3 mm long and broad, somewhat inflated, upper lip a broad, truncate and emarginate lobe with 2 smaller lateral lobes at its base, lower lip obtuse and emarginate, hairy, with dense yellow sessile glands. *Corolla* blue, violet or deep purple, tubular, curved, with a narrow conical recurved spur at the base, extending beyond the calyx, with short hairs; upper lip erect, broad, shortly 4-lobed, the two median lobes slightly longer than the two lateral lobes; lower lip oblong, concave. *Stamens* ± included, the lower pair inserted near lower corolla lobe, just visible in the corolla mouth, upper pair near the base of the corolla tube. *Nutlets* globular, flattened, c. 1 mm wide, glandular. — **Fig. 33.**

Distribution — NE Queensland; in *Malesia*: SE New Guinea (Oriomo, Middle Fly and Wassi Kussa R. areas).

Habitat & Ecology — Locally common in seasonally dry lowland grasslands and savannahs.

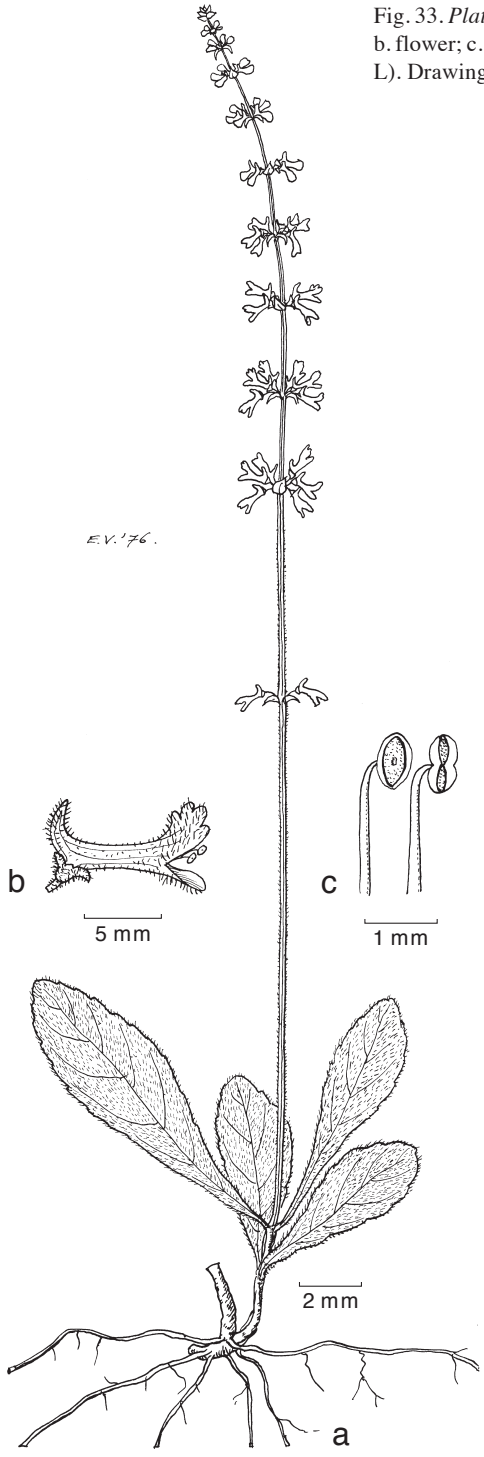

Fig. 33. *Platostoma longicorne* (F.Muell.) A.J.Paton. a. Habit; b. flower; c. stamens, thecae finally confluent (all *Brass 8403*, L). Drawing by Ed Vijsma, 1976.

6. **Platostoma palustre** (Blume) A.J.Paton

Platostoma palustre (Blume) A.J.Paton, Kew Bull. 52 (1997) 281. — *Mesona palustris* Blume, Bijdr. (1826) 839; Miq., Fl. Ned. Ind. 2 (1858) 940; Backer & Bakh.f., Fl. Java 2 (1965) 638; H.Keng, Gard. Bull. Singapore 24 (1969) 114, f. 20a–f; in Steenis, Fl. Males., Ser. I, 8 (1978) 373. — Lectotype (designated by Suddee et al., Kew Bull. 60 (2005) 57): *Blume s.n.* (lecto L; isolecto L), Java, Buitenzorg.

Geniosporum parviflorum Benth. in Wall., Pl. Asiat. Rar. 2 (1830) 18. — *Mesona parviflora* (Benth.) Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1897) 365 ('*parviflorum*'); X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 294. — Syntypes: *de Silva 60* in *Wallich Cat. 2750* (syntypes BM, K, K-W), India Orientalis, Sillet.

Mesona wallichiana Benth. in A.DC., Prodr. 12 (1848) 46; Hook.f., Fl. Brit. India 4 (1885) 611. — Lectotype (designated by Suddee et al., Kew Bull. 60 (2005) 57): *de Silva 60* in *Wall. Cat. 2750* (lecto K-W; isolecto BM, K), India Orientalis, Silhet (the authors note that this specimen is also the type of *Geniosporum parviflorum*).

Mesona philippinensis Merr., Philipp. J. Sci., C 7 (1912) 101; H.Keng, Gard. Bull. Singapore 24 (1969) 116, f. 20g. — Type: *Merrill 4500* (iso BM, K), Philippines, Luzon, Distr. of Lepanto, Mt Data.

Erect, aromatic herb, 30–50 cm high. *Stems* slender, unbranched or sparsely branched at apex, with retrorse hairs, sometimes densely villose, hairs often longer at nodes. *Leaves* narrowly elliptic to elliptic to narrowly ovate, 2–8 by 1.2–3.5 cm, membranaceous or chartaceous, apex acute or obtuse, base narrowly acute or rounded, margins crenate to serrate, above glabrescent to hispid, below hispid especially on venation; petioles 0.2–2 cm long, hispid or villose. *Inflorescences* terminal, 5–20 cm long, cymes unbranched or branched obscure, close or distant, usually 12–20- or more-flowered, axes villose or hirsute; bracts narrowly ovate to narrowly elliptic, pinkish white, sessile, up to 20 by 5 mm, apex acuminate, with appressed hairs to villous below, caducous; pedicels 5–6 mm long. *Calyx* 2–2.5(–3) mm long, covered with white hairs, especially conspicuous at the base in flower, in fruit 4–5 mm long; upper lip with three triangular lobes, the centre lobe larger than the lateral lobes, ciliate, lower lip oblong, shorter than upper lobes, rounded, curved upwards. *Corolla* pink or lilac, c. 4 mm long, upper lip 3-lobed, median lobe larger than lateral lobes, lower lip concave, hairy outside. *Stamens* exserted, lower pair inserted at base of lower corolla lobe, upper pair inserted near base of corolla tube, filaments hairy with an appendage at base. *Nutlets* ellipsoid, 1–1.5 mm long, producing a little mucilage when wet. — **Fig. 34.**

Distribution — India and Burma to Indo-China; in *Malesia*: Central Sumatra (Mt Singalang), throughout Java, Philippines (northern half of Luzon), Sulawesi, Lesser Sunda Islands (Bali, Lombok, Sumbawa) and New Guinea.

Habitat & Ecology — Roadsides, along ditches, open grassy slopes, swampy areas, forest borders, dry rice-fields, standing both everwet and seasonal conditions, locally sometimes rather common. Altitude: 75–2300 m. Flowering: March to November.

36. PLECTRANTHUS

(G.L.C. Bramley, updated from Keng 1978)

Plectranthus L'Hér., Stirp. Nov. (1788) 84; Backer & Bakh.f., Fl. Java 2 (1965) 635; H.Keng, Gard. Bull. Singapore 24 (1969) 141; in Steenis, Fl. Males., Ser. I, 8 (1978) 382; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 264; Suddee, A.J. Paton & J.Parn., Kew Bull. 59 (2005) 387; all excl. syn. *Rabdosia* & *Isodon*. — Lectotype (type cons., designated by Nakai, Bot. Mag. (Tokyo) 48

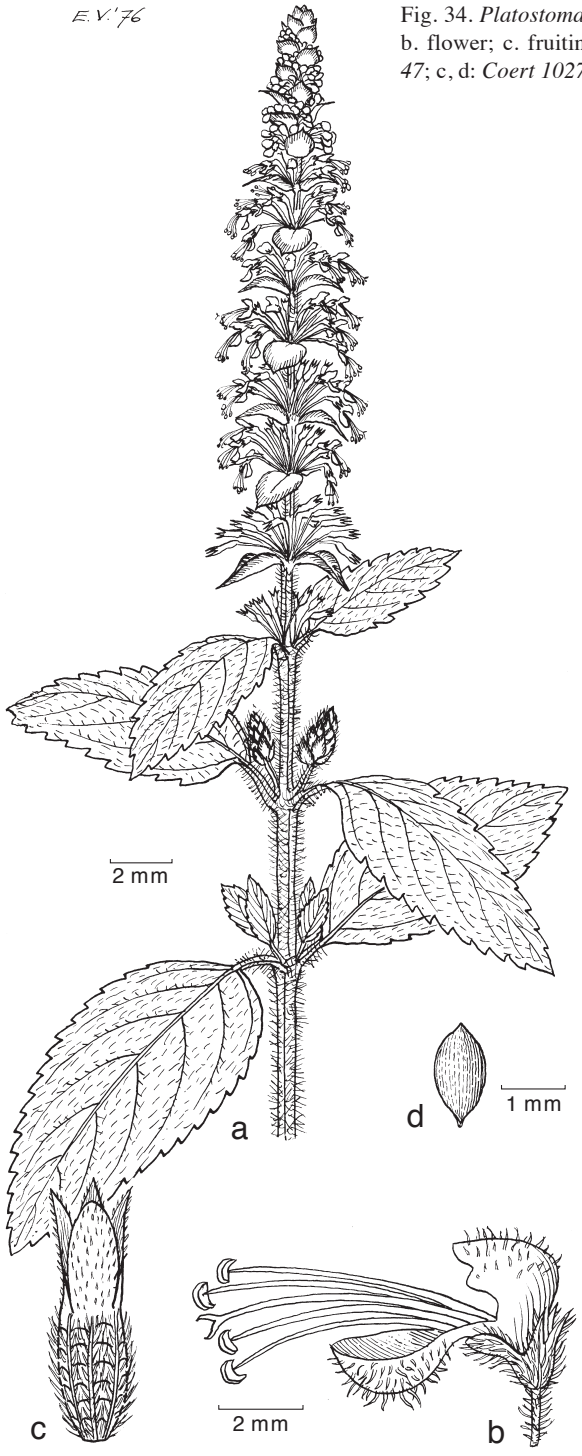

Fig. 34. *Platostoma palustre* (Blume) A.J.Paton. a. Habit; b. flower; c. fruiting calyx; d. nutlet (a, b: *B.J. Karsten 47*; c, d: *Coert 1027*; all L). Drawing by Ed Vijsma, 1976.

(1934) 785, see also discussion by Bullock & Killick, Taxon 6 (1957) 239 and Rickett & Stafleu, Taxon 9 (1960) 85): *Plectranthus fruticosus* L'Hér.

Germanea Lam., Encycl. 2 (1788) 690. — Lectotype (designated by Suddee et al. 2005): *Germanea urticifolia* Lam. (= *Plectranthus fruticosus* L'Hér.).

Coleus Lour., Fl. Cochinch. (1790) 372; Backer & Bakh.f., Fl. Java 2 (1965) 636; H.Keng, Gard. Bull. Singapore 24 (1969) 48; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 292. — Type: *Coleus amboinicus* Lour. (= *Plectranthus amboinicus* (Lour.) Spreng.).

Solenostemon Thonn. in Schumach., Beskr. Guin. Pl. (1827) 271. — Type: *Solenostemon monostachyus* (P.Beauv.) Briq. (= *Plectranthus monostachyus* (P.Beauv.) B.J.Pollard).

Herbs or undershrubs. *Leaves* simple, opposite, rarely ternate. *Inflorescences* thyrsoid, condensed or lax, cymes sessile or pedunculate, 1–many-flowered. *Calyx* tubular or funnel-shaped, often ventrally gibbous, straight or curved, 2-lipped or actinomorphic, 5-lobed, upper lobe broader than the four lower lobes (two central, two lateral), lower lobes equal or unequal. *Corolla* strongly 2-lipped, 5-lobed (4/1), upper lip 4-lobed, ascending, reflexed or truncate, lower lip horizontal to deflexed, cucullate or concave; corolla tube straight to curved or sigmoid. *Stamens* 4, vey rarely 2, declinate, lower and upper pairs attached around the base of lower lobe, upper pair inappendiculate. *Disc* 4-lobed with lower lobe larger. *Style* gynobasic, bifid, rarely emarginate. *Fruit* a schizocarp with four nutlets. *Nutlets* orbicular or occasionally oblong or ovoid, smooth, granulate or punctuate, mucilaginous or not, attachment scar small, basal.

Distribution — About 300 species in the Old World tropics, many in Africa; 10 species throughout *Malesia*.

Taxonomy — The generic concept followed here is in accordance with Harley et al. (2004) and Suddee et al. (2005). Their treatment of *Plectranthus* is based on a synthetic approach, using similarity of several characters; as a result, a number of traditionally recognised genera that would otherwise be recognised on the basis of single characters, are included in *Plectranthus*. Harley et al. (2004) notes that this enlarged *Plectranthus* may prove paraphyletic; molecular work is on-going.

KEY TO THE SPECIES

1a. Lateral and central lower calyx lobes (nearly) similar in shape and length; lateral and central lobes with narrow, acute or acuminate apices; central lobes not connate 2

b. Lateral and central lower calyx lobes dissimilar in shape and length; lateral lobes shorter than the central ones, with acute, rounded or truncate tip; central lobe connate to varying degrees 7

2a. Flowering calyx (and entire inflorescence) densely covered with long greyish arachnoid pubescence, the lower lobes all claw-like curved. . . . . **7. P. petraeus**

b. Flowering calyx glabrescent to hairy, the hairs never long greyish and arachnoid, the lower lobes erect or reflexed, sometimes incurved 3

3a. Corolla tube sigmoid or constricted near the median portion. Leaf blades (sub)-orbicular, reniform or broadly ovate 4

b. Corolla tube straight or decurved near the base, neither strongly declinate nor constricted near the median portion, sometimes gibbous. Leaf blades elliptic, narrowly ovate to ovate or broadly ovate (rarely spatulate-obovate or suborbicular) 5

4a. Corolla 8–12 mm long. Flowers 10–20 (or more) in cymes . . . **1. P. amboinicus**
b. Corolla 5–6 mm long. Flowers 6–8 in cymes . . . . . **2. P. apoensis**
5a. Calyx 4–4.5 mm long in flower. Corolla 9–12 mm long . . . . . **10. P. steenisii**
b. Calyx 1.2–3 mm long in flower. Corolla 3.5–6 mm long 6
6a. Lateral lower calyx lobes becoming broader and blunt in fruiting stage. Flowers numerous (usually over 20) in a verticillaster . . . . . **3. P. congestus**
b. Lateral lower calyx lobes subulate, sharply pointed. Flowers less than 12 in a verticillaster . . . . . **6. P. parviflorus**
7a. Lateral lower calyx lobes usually much shorter (1/2 or less) than the central ones, with rounded or truncate apices (rarely mucronate in some *P. scutellarioides*) . . 8
b. Lateral lower calyx lobes slightly shorter (2/3 to 3/4) than the central ones, with rounded, acute or acuminate apices 9
8a. Central lower calyx lobes highly connate, with an almost truncate apex with the notches marking the lobe tips, wide apart. Roots with sessile tubers . . . . . **8. P. rotundifolius**
b. Central lower calyx lobes deeply bifid at apex, but lobes close, almost parallel. No tubers on roots . . . . . **9. P. scutellarioides**
9a. Lateral lower calyx lobes about 2/3 as long as the central ones, in fruiting stage about 1/2 as long as the latter. — Sumatra, Java, Borneo, Philippines, Lesser Sunda Islands . . . . . **4. P. galeatus**
b. Lateral lower calyx lobes about 3/4 as long as the central ones, in fruiting stage almost as long as the latter. — Peninsular Malaysia (Perak, Kedah) only . . . . . **5. P. kunstleri**

1. Plectranthus amboinicus (Lour.) Spreng.

Plectranthus amboinicus (Lour.) Spreng., Syst. Veg. 2 (1825) 690. — *Coleus amboinicus* Lour., Fl. Cochinch. (1790) 372; Miq., Fl. Ned. Ind. 2 (1858) 948; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 418; Backer & Bakh.f., Fl. Java 2 (1965) 637; J.W.Purseglove, Trop. Crops, Dicot. 2 (1968) 634; H.Keng, Gard. Bull. Singapore 24 (1969) 50. — *Majana amboinica* (Lour.) Kuntze, Revis. Gen. Pl. 2 (1891) 524. — Lectotype (designated by Cramer, Kew Bull. 33 (1978) 551): Rumph., Herb. Amboin. 5 (1750) t. 102, f. 2. Epitype (designated by Launert, Mitt. Bot. Staatssamml. München 7 (1968) 298): *Kerr s.n.* (epi BM), Thailand, Mae Hong Son, Pai Distr.

Coleus suganda Blanco, Fl. Filip. (1837) 438; Fl. Filip., ed. 2 (1845) 337; Fl. Filip., ed. 3, 2 (1878) 259; Miq., Fl. Ned. Ind. 2 (1858) 948. — Neotype (designated by Suddee et al., Kew Bull. 59 (2005) 392): *Merrill Species Blancoanae 129* (neo K), Philippines, Luzon, Cavite prov., Maragondong.

Coleus carnosus Hassk., Flora 25 (2 Beibl.) (1842) 25; Cat. Hort. Bot. Bogor. (1844) 130; Miq., Fl. Ned. Ind. 2 (1858) 953; Ridl., Fl. Malay Penins. 2 (1923) 646. — *Coleus suborbicularis* Zoll. & Moritzi, Syst. Verz. (1846) 54, nom. superfl. — Type: *Zollinger 1950* (holo G-DC; iso A 2 sheets, P), Indonesia.

Coleus aromaticus auct. non. Roxb.: Benth. in Wall., Pl. Asiat. Rar. 2 (1830) 16.

Plectranthus aromaticus auct. non. Roxb.: Roxb., Fl. Ind. ed. Carey, 3 (1832) 22.

A more or less succulent herb, non-tuberous, 0.3–1 m high, strongly aromatic. *Stems* and *branches* round or round-quadrangular, hollow when old, hairy when young, glabrescent when old. *Leaves*: blade thick, fleshy, broadly ovate, suborbicular or reniform, 5–7 by 4–6 cm, apex obtuse or rounded, base rounded or truncate, often long-attenuate, margin coarsely crenate to dentate-crenate except in the basal part, sparsely pubescent

above and hirsute on the nerves beneath; petiole 2–4.5 cm long, pubescent. *Inflorescences* terminal, up to 30 cm long; flowers in dense, 10–20 (or more)-flowered cymes; bracts broadly ovate, 3–4 cm long, acuminate, sessile. *Calyx* campanulate, 2–4 mm long, hirsute and glandular, upper lobe broadly ovate-oblong, twice as long as lower lip, apex acute, margins ciliate, lateral and central lower lobes equal, acuminate; tube gibbous at base on lower side, otherwise straight. *Corolla* blue to purple, 8–12 mm long, upper lip densely hairy on back, median lobes rounded at apex, larger than lateral lobes, lower lip ovate-oblong, 5–6 mm long, with some hairs outside; tube 4–5 mm long, sigmoid below the middle, densely hairy with sessile glands. *Stamens* exserted from lower lip. *Nutlets* pale-brown, globose or ovoid, c. 1 mm long, smooth to minutely tuberculate, mucilaginous when wet.

Distribution — Possibly native in India, cultivated and introduced in the tropics, including throughout *Malesia*.

Habitat & Ecology — Cultivated, sometimes naturalized and found along roadsides, in old garden lands, riverbanks, cliffs along roads in settled areas. Altitude: up to c. 1500 m. Flowering: throughout the year.

Vernacular names — Sumatra: Daun djintin, Tirbangun (Karo); Tramun (Gajo). Java: Adjeran, Atjeran, Daun djinten (Sundanese); Bangun bangun, Daun djinten, Daun hati hati, Sukan, Terbangun (Malay); Daun kambing, Madja nering (Madurese); Daun kutjing, Iwak ira, Surawung (Javanese). Philippines: Clavo, Limon, Oregano, Torongil de limon (Spanish); Bildu (Sulu); Latai, Suganda (Subanum); Suganda (Tagalog). Lesser Sunda Islands: Bali: Iwak; W Flores: Golong dj. Potjo; Timor: Kuwu etu.

Uses — From Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 387): cultivated for its fragrant, aromatic leaves and assumed medicinal properties. In Malaysia used as a flavouring for drinks; also used for coughs of children and pains near stomach or heart. According to Burkill (Dict. Econ. Prod. Malay Penins. (1935) 635) leaves are mixed with rice flour for offerings when a house is built. Heyne wrote (Nutt. Pl. Ned.-Ind. (1927) 1334) that leaves are rubbed on hair and clothes during bathing. Ochse & Bakhuizen (Ind. Groent. (1931) 350) reported that in Java fresh leaves are added to certain dishes of fish or goat's meat to remove the strong smell. In the Philippines macerated leaves are used for burns and also for bites of centipedes and scorpions; furthermore for dyspepsia, asthma, and as a medicine after childbirth.

2. **Plectranthus apoensis** (Elmer) H.Keng

Plectranthus apoensis (Elmer) H.Keng, Gard. Bull. Singapore 24 (1969) 147. — *Coleus apoensis* Elmer, Leafl. Philipp. Bot. 7 (1915) 2694; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 418. — Type: *Elmer 11301* (iso GH, K), Philippines, Mindanao, Davao distr., Todaya, Mt Apo.

Herb, 1–2 m high. *Stems* and *branches* erect and slender, obscurely angular, puberulent. *Leaves*: blades more or less succulent, suborbicular or reniform, 4–7.5 by 5–6.5 cm, apex rounded, base truncate, margin irregularly crenate or bidentate, sparsely but evenly hairy above, below with more hair on the venation; petiole 1.5–3 cm long, slender, hairy. *Inflorescences* lax, terminal, paniculate, 20–25 cm long, 10–12 cm wide, flowers 6–8 in each verticillaster; pedicels divaricate, c. 2 mm long. *Calyx* campanulate, 1.5–2 mm long, upper lobe broad, 3-veined, hairy with dense red sessile glands,

lateral and central lower lobes sharply pointed, ± equal, free. *Corolla* light blue, 5–6 mm long; upper and lower lobes ± equal in length, or the lower slightly shorter; tube slender, constricted at about the middle, slightly gibbous near the base. *Stamens* 4, not exserted. *Style* shortly bifid. *Nutlets* not seen.

Distribution — Philippines (Mindanao: Mt Apo, one collection).

Habitat & Ecology — Associated with grasses in thickets on fertile soil, along an open ridge. Altitude: c. 1000 m. Flowering: September.

Vernacular name — Calalapo-bulan (Bagobo).

3. **Plectranthus congestus** R.Br.

Plectranthus congestus R.Br., Prodr. (1810) 506; Fl. Austral. 5 (1870) 79; H.Keng, Gard. Bull. Singapore 24 (1969) 147. — Type: *Banks & Solander s.n.* (holo BM), Australia, Queensland, Endeavour R.

Annual or perennial herb, 1–1.5 m high. *Stems* and *branches* hoary tomentose. *Leaves*: blade ovate or elliptic, 2–6 by 1.5–4 cm, apex obtuse, base cuneate, margin undulate-crenate, tomentose on both surfaces; petiole 0.5–1 cm long. *Inflorescences* terminal, paniculate, 15 cm or more long, 5–8 cm diam., flowers numerous (c. 20–30) in congested cymes; pedicels subsessile, 1–2 mm long. *Calyx* c. 2 mm long, in fruit 2.5–3 mm, villous, with sessile glands, upper lobe broadly ovate, obtuse, not decurrent, central and lateral lower lobes subulate, acute, incurved, ± equal, free, lateral lobes becoming broader and blunt in fruiting stage. *Corolla* pale blue to lilac, with orange sessile glands on outside surface of the lips, c. 6 mm long, tube sigmoid, slightly gibbous on the base of the upper side below the middle, upper lip with the two central lobes rounded, erect, lower lip horizontal, longer than upper lip. *Stamens* included in lower lip. *Nutlets* rounded, flattened, subtriquetrous, c. 0.8 mm wide, glandular-dotted.

Distribution — Queensland and NW Australia; in *Malesia*: Lesser Sunda Islands (Timor) and Papua New Guinea.

Habitat & Ecology — Open places and thickets, savannahs, coastal coral limestone and sea-cliffs. Altitude: sea-level to 1500 m. Flowering: March to August.

4. **Plectranthus galeatus** Vahl

Plectranthus galeatus Vahl, Symb. Bot. 1 (1790) 43; Blume, Bijdr. (1826) 836. — *Germanea galeata* (Vahl) Poir. in Lam., Encycl. 2 (1788) 763. — *Coleus galeatus* (Vahl) Benth., Labiat. Gen. Spec. (1832) 56; Miq., Fl. Ned. Ind. 2 (1858) 955; Backer & Bakh.f., Fl. Java 2 (1965) 637; H.Keng, Gard. Bull. Singapore 24 (1969) 60. — Type: *Hb. Vahlii s.n.* (holo C), Java.

Plectranthus macrophyllus Blume, Bijdr. (1826) 835. — *Coleus macrophyllus* (Blume) Benth., Labiat. Gen. Spec. (1832) 55; Hassk., Cat. Hort. Bot. Bogor. (1844) 129, incl. var. *concolor* Hassk.; Miq., Fl. Ned. Ind. 2 (1858) 951. — Type: *Blume s.n.* (L), Java.

Plectranthus bicolor Blume, Bijdr. (1826) 837. — *Coleus bicolor* (Blume) Benth., Labiat. Gen. Spec. (1832) 55; Hassk., Cat. Hort. Bot. Bogor. (1844) 129; Miq., Fl. Ned. Ind. 2 (1858) 954. — Type: *Blume s.n.* (L), Java.

Coleus spectabilis Miq., Fl. Ned. Ind. 2 (1858) 951. — Type: *Horsfield s.n.* (BM, K, U), Java.

Coleus remotiflorus Miq., Fl. Ned. Ind. 2 (1858) 954. — Type: *Horsfield Lab. 112* (BM, K, U), Java.

Coleus puberulus Miq., Fl. Ned. Ind. 2 (1858) 955. — Type: *Teijsmann s.n.* (?), Sumatra, Singalang.

Coleus macropus Miq., Fl. Ned. Ind. 2 (1858) 956. — Type: *Horsfield s.n.* (?), Java.

Coleus sparsiflorus Elmer, Leafl. Philipp. Bot. 7 (1915) 2699; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 420; H.Keng, Gard. Bull. Singapore 24 (1969) 60. — *Plectranthus sparsiflorus* (Elmer) H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 391. — *Coleus scutellarioides* auct. non (L.) Benth.: Elmer, Leafl. Philipp. Bot. 7 (1915) 2697. — Type: *Elmer 11646* (holo PNH†; iso BM, K, L, MO, Z), Philippines, Mindanao, Davao distr., Todaya (Mt Apo).

Coleus galeatus (Vahl) Benth. var. *borneensis* H.Keng, Gard. Bull. Singapore 24 (1969) 62. — Type: *Clemens & Clemens 34199* (holo L; iso BO), Malaysia, Sabah, Penataran Basin.

Erect or ascending, sparsely branched, slender herb, up to 1.5 m high. *Stems* and *branches* rusty pubescent when young, often with purple markings and red sessile glands. *Leaves*: blades varying from oblong to broadly ovate, mostly ovate, 6–12(–18) by 3–8(–13) cm, apex acute or acuminate, base rounded or shortly cuneate, margins irregularly crenate, glabrous above, pubescent on the nerves below; petiole 3–10 cm long, very slender, puberulous. *Inflorescences* terminal or axillary thyrses, 5–15 by 4–5.5 cm, flowers 5–8 (rarely up to 15) in short, stalked cymes; bracts broadly ovate, 3–12 mm long, caducous. *Calyx* subcampanulate, with short erect hairs, red sessile glands, 3–5 mm long, in fruit 7–11 mm long, upper lobe narrowly ovate to ovate, subacute, often strongly reflexed in fruiting stage, lower lip with lateral lobes deltoid, acute at apex, about 2/3 as long as central lobes when flowering, half as long when fruiting, central lobes lanceolate-subulate, connate, longer than the rest. *Corolla* purplish blue or white with purple lower lip, 1.5–2 cm long, with short hairs; tube sigmoid, very slender below, slightly gibbous at the base, abruptly decurved above; upper lip short and erect, lower lip longer. *Stamens* partly exserted from lower lip. *Nutlets* broadly ovoid, c. 1 mm long.

Distribution — Sumatra (rare), Java (becoming rare in E Java), Borneo, Philippines, Lesser Sunda Islands (Bali).

Habitat & Ecology — Fago-Lauraceous rainforests, in Borneo also in Dipterocarp forest; also in mossy elfin forest. Altitude: (450–)1000–2400 m. Flowering: throughout the year.

Vernacular names — Java: Dhinkamandhinan (Madurese); Djawer gedeh, Djawer gunung, Djawer koneng, Djawer kotok (Sundanese); Miara, Selasih hutan (Malay).

Note — *Plectranthus sparsiflorus* is newly treated as a synonym here.

5. Plectranthus kunstleri Prain

Plectranthus kunstleri Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66 (1897) 521; 74 (1907) 706; Ridl., Fl. Malay Penins. 2 (1923) 646; H.Keng, Gard. Bull. Singapore 24 (1969) 151. — Type: *King's collector 8240* (holo CAL?; iso BM, K), Malay Peninsula, Perak.

Erect herb, 0.5–1 m high. *Stems* and *branches* finely puberulous. *Leaves*: blade thin-membranaceous, ovate to broadly ovate, 6–12 by 4–6 cm, apex acute, base truncate or cuneate, margin basally entire, elsewhere remotely crenate, very sparsely pubescent on the main and secondary veins on both surfaces; petiole 1–4.5 cm long. *Inflorescences* terminal, paniculate, 10–15 cm long, the lower branches 5–6 cm long; bracts ovate, 2–3 mm long, acute, caducous; pedicels 3–4 mm long, glandular-puberulent. *Calyx* obliquely campanulate, 2–2.5 mm long, in fruit 6–7 mm long, shortly hirsute and sparingly gland-dotted, unequally 5-lobed; upper lobe broadly ovate, subrounded, lower lip with the two lateral lobes slightly shorter (about 3/4) than the central lobes

(later almost equal in fruit), rounded, the two central lobes subulate, connate beneath. *Corolla* pinkish purple, 7–8(–10) mm long, puberulent, tube sigmoid, decurved, only slightly gibbous near the base, upper lip short, erect, lower lip concave. *Stamens* held in lower lip. *Nutlets* oblong ovoid, black, c. 1 mm long.

Distribution — Malay Peninsula (Perak: Kula Dipang, 2 coll.; Kedah: Pulau Langkawi).

Habitat & Ecology — On limestone rocks, in shade. Altitude: 50–200 m.

6. Plectranthus parviflorus Willd.

Plectranthus parviflorus Willd., Hort. Berol. 1 (1806) t. 65; Benth., Fl. Austral. 5 (1870) 78; Hillebr., Fl. Hawaiian Isl. (1888) 344; H.Keng, Gard. Bull. Singapore 24 (1969) 150; S.T.Blake, Contr. Queensland Herb. 9 (1971) 35, f. 2L, 4A, 18, 35 (map). — Type: *Hb. Willdenow 11078* (B, photo BRI), plant cultivated in Berlin Botanic Garden, unknown origin.

Plectranthus australis R.Br., Prodr. (1810) 506. — Lectotype (designated by Blake, Contr. Queensland Herb. 9 (1971) 35): *Brown s.n.* (lecto BM), [Australia,] Port Jackson.

Plectranthus klossii S.Moore, Trans. Linn. Soc. London, Bot. 9 (1916) 137, incl. var. *major*; H.Keng, Gard. Bull. Singapore 24 (1969) 150; S.T.Blake, Contr. Queensland Herb. 9 (1971) 32, f. 2B, C, 3I, 16, 17A–C, map 36. — Syntypes: *Kloss s.n.* (BM), New Guinea, Papua, Otakwa river, Carstensz Peaks; *Kloss s.n.* (BM, K), New Guinea, Papua, Otakwa river, Carstensz Peaks.

Erect herb or semi-shrub, 0.1–1 m high. *Stems* and *branches* rather fleshy, glabrescent to densely villous. *Leaves*: blade narrowly ovate to ovate to suborbicular, 1–2.5(–9) by 0.5–1(–5) cm, apex broadly acute or rounded, base rounded or subcordate, often slightly oblique, margin crenate or remotely crenulate, soft rugose or villous on both surfaces, also with red sessile glands; petiole 0.5–1(–3.5) cm long, with spreading hairs. *Inflorescences* lax, terminal or in upper axils, 5–30(–35) cm long, simple or branched at the base, flowers 6–12 in dense verticillasters; bracts cordate, caducous. *Calyx* 1.2–2.5 mm long, in fruit 2.5–5 mm long, hairy, upper lobe very broad, decurrent in fruit, lower lobes subulate, sharply pointed, subequal, ± straight, free. *Corolla* white or light blue with dark markings on the throat, 3.5–5.5 mm long, tube slightly decurved near the base, upper lip erect, two central lobes rounded, lower lip longer. *Stamens* held in lower lip. *Nutlets* minute, ovoid, c. 0.8 mm long.

Distribution — Lesser Sunda Islands to Australia and the Pacific; in *E Malesia*: Lesser Sunda Islands (Sumbawa, Wetar, Flores, Timor) and New Guinea.

Habitat & Ecology — Rocky, steep slopes, dry forest, savannah grassland, limestone cliffs, old garden lands. Altitude: (60–)400–2600 m. Flowering: October to May.

Vernacular names — Lesser Sunda Islands: Timor: Ahi liga inen (Bobonero); Kunum (Dawan). New Guinea: Mun (Dani).

Notes — 1. Blake (1971: 35) devoted a critical, lengthy synonymy and discussion to this species, which he amply described from Australian specimens. He said that *P. parviflorus* is distinguished in the field by its tuberous base, the (small) tuber formed at ground level being already developed in seedlings before the second pair of leaves is developed; after flowering plants die down almost to the tuber, new shoots being later produced from it and the basal part of the stem.

2. There is a great deal of variation in leaf size, which may be correlated with altitude. For example, *Willis 175* (K), collected from the Mt Jaya area at c. 2600 m, has leaves c. 1 by 0.5 cm, smaller than is typical.

7. **Plectranthus petraeus** Backer ex Adelb.

Plectranthus petraeus Backer ex Adelb., Reinwardtia 3 (1954) 152, f. 3; Backer & Bakh.f., Fl. Java 2 (1965) 636; H.Keng, Gard. Bull. Singapore 24 (1969) 145; S.T.Blake, Contr. Queensland Herb. 9 (1971) 54, f. 2N, 4H, pl. 27, map 36. — Type: *Backer 36387* (holo L), Java, Idjen plateau.

Undershrub, 1–1.5 m high, very fragrant. *Stems* and *branches* with even to dense spreading hairs. *Leaves*: blade elliptic or ovate, 4–10 by 3–6 cm, apex acute or obtuse, base cuneate or shallowly cordate, margin crenate-serrate, above and below densely hairy to villous; petiole 1–3 cm long. *Inflorescences* terminal, paniculate, 15–20 cm long, narrow, axes villous, surface almost obscured; bracts ovate, sessile, c. 2.5 mm long and wide, surface obscured by dense hairs; pedicels 2–3 mm long. *Calyx* campanulate, curved, 3–3.5 mm long, in fruit c. 4 mm long, 5-lobed, upper lobe broader than lower four lobes, these subequal, subulate, claw-like, curved upwards, free, densely covered with long greyish arachnoid pubescence. *Corolla* white with violet-tinged upper lip, 5–6 mm long, tube shorter than the calyx, upper and lower lips hairy, also with sessile glands. *Stamens* held in lower lip of corolla. *Nutlets* rounded, flattened, c. 1 mm wide.

Distribution — E Java (Mt Idjen).

Habitat & Ecology — Between grass, herbs and seedling trees on old lavastreams (redjengans), in exposed places, locally common. Altitude: 1100–1450 m. Flowering: April to July, November.

8. **Plectranthus rotundifolius** (Poir.) Spreng.

Plectranthus rotundifolius (Poir.) Spreng., Syst. Veg. 2 (1825) 690. — *Germanea rotundifolia* Poir. in Lam., Encycl. 2 (1788) 763. — *Coleus rotundifolius* (Poir.) A.Chev. & Perrot, Vég. Utiles Afrique Trop. Franç. 1 (1905) 101. — *Solenostemon rotundifolius* (Poir.) J.K.Morton, J. Linn. Soc., Bot. 58 (1962) 272. — Type: *Commerson s.n.* (holo P; iso FI), Mauritius.

Plectranthus tuberosus Blume, Bijdr. (1826) 838. — *Coleus tuberosus* (Blume) Benth., Labiat. Gen. Spec. (1832) 59; Miq., Fl. Ned. Ind. 2 (1858) 953; Hook.f., Fl. Brit. India 4 (1885) 625; Ridl., Fl. Malay Penins. 2 (1923) 646; K.Heyne, Nutt. Pl. Ned.-Ind. (1927) 1335; Burkill, Dict. Econ. Prod. Malay Penins. (1935) 636. — Type: *Blume s.n.* (holo L; iso NY, P), Java.

Coleus parviflorus Benth. in A.DC., Prodr. 12 (1848) 72; Backer & Bakh.f., Fl. Java 2 (1965) 637; J.W.Purseglove, Trop. Crops, Dicot. 2 (1968) 634. — Type: *Wight 2512* (holo K; iso E, K), South India, Quilon and Panpanassum.

Erect or ascending herb, 0.4–1 m high; lower half of stem creeping, rooting from the nodes, and some of the roots swollen into sessile, oblong, 2–4 cm long, brownish black, aromatic tubers similar to small potatoes. *Stems* rounded-quadrangular, densely pubescent on the angles. *Leaves*: blade fleshy, faintly aromatic when bruised, ovate to broadly ovate or suborbicular, 2–5(–6) by 1.5–3.5(–4) cm, apex acute, base cuneate to attenuate, margin crenate, glabrous to sparsely hairy above and below, with sessile glands below; petiole 1–3(–5) cm long. *Inflorescences* terminal, simple, 5–15 cm long, flowers 2–10 in a verticillaster; pedicels 1–2 mm long, puberulent; bracts sessile, ovate, up to 5 mm long, caducous. *Calyx* campanulate, 2–3 mm long, 3.5–5 mm long in fruit, tube pubescent, also with sessile glands, upper lobe oblong, acute, finely ciliate, twice as long as lateral lobes of lower lip; lateral lobes with rounded apex, central lobes of lower lip highly connate, united for more than half of their length, with an almost truncate apex with the notches marking the lobe tips, wide apart, subequal to upper lip. *Corolla*

whitish purple, 7–10(–12) mm long, tube 4–5 mm long, sigmoid at middle, slightly dilated at base, widely expanded at throat, upper lip pubescent with sessile glands on back, 2 central lobes rounded, lower lip pubescent and with sessile glands outside. *Stamens* held in lower lip. *Nutlets* brown, ovoid or globose, c. 1 mm long, smooth, not mucilaginous when wet.

Distribution — Tropical Africa, India, Sri Lanka, throughout continental Asia; in *Malesia*: Malay Peninsula, Sumatra, Java, Philippines, Moluccas. Widely cultivated in the tropics.

Habitat & Ecology — Cultivated only, usually in lowland areas, rarely up to c. 1000 m. Flowering: February to August.

Vernacular names — Sumatra: Hombili, Kimbili, Kimili (Malay); Tramun (Gajo). Java: Daun sabrang, Gombili, Kintang djawa, Ubi kimbili (Malay); Gimbili, Kintang djawa, Kintang djembiit, Kintang eeler, Kintang eereng, Kintang kintul, Kintang klitji, Kumbili djawa (Javanese); Huwi kintang, Kentang, Kentang bogor, Kentang djawa, Kentang saba, Kumili djawa (Sundanese); Kambili, Kambili gangan, Kambili larbhat, Larbha(k), Ibisola (Madurese). Moluccas: Kombili (Malay); Ceram: Isahu, Isiahu, Katilen; Buru: Safut; Kei Islands: Tiia.

Uses — The white, starchy, slightly aromatic tubers become darkened with age. They are eaten cooked or steamed, sometimes even raw. Adult tubers are also used as a substitute for potatoes, for the preparation of minced meatballs. Burkill (1935: 636) says they should be consumed in small quantities, as they are somewhat indigestible. Heyne (1927: 1335) says cultivation in Java is mostly in loose soil on fallow rice-fields, in W Java (Banten, Djakarta) and E Java (Bagelen, Kedum Jogja); harvested after 3–4 months. Hartley (Lloydia 32 (1969) 265) listed it as a potential anti-cancerogene.

Note — No fruiting specimens have been found from Java.

9. **Plectranthus scutellarioides** (L.) R.Br.

Plectranthus scutellarioides (L.) R.Br., Prodr. (1810) 506; Blume, Bijdr. (1826) 837. — *Ocimum scutellarioides* L., Sp. Pl. ed. 2, 2 (1763) 834 ('*Ocymum*'). — *Coleus scutellarioides* (L.) Benth. in Wall., Pl. Asiat. Rar. 2 (1830) 16; Miq., Fl. Ned. Ind. 2 (1858) 949; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 420 (as excl. sp.); Backer & Bakh.f., Fl. Java 2 (1965) 637; H.Keng, Gard. Bull. Singapore 24 (1969) 51, f. 9, incl. var. *crispipilus* (Merr.) H.Keng, var. *grandifolius* (Benth.) H.Keng, var. *integrifolius* (Elmer) H.Keng and var. *gibbsiae* (S.Moore) H.Keng. — *Majana scutellarioides* (L.) Kuntze, Revis. Gen. Pl. 2 (1891) 524. — *Solenostemon scutellarioides* (L.) Codd, Bothalia 11 (1975) 439. — Lectotype (designated by Merrill, Interpr. Herb. Amboin. (1917) 460): *Majana* (*alba* et *rubra*) in Rumphius, Herb. Amboin. 5 (1747) 291, t. 101.

Polypodium ovatum Burm.f., Fl. Ind. (1768) 223. — Type: unknown collector (holo G), Java.

Plectranthus aromaticus Roxb., Hort. Bengal. (1814) 45. — Type: Rumphius, Herb. Amboin. 5 (1747) t. 101 (same type as the lectotype of *Ocimum scutellarioides* L.).

Plectranthus ingratus Blume, Bijdr. (1826) 836. — *Coleus ingratus* (Blume) Benth., Labiat. Gen. Spec. (1832) 53. — *Coleus scutellarioides* (L.) Benth. var. *ingratus* (Blume) Miq., Fl. Ned. Ind. 2 (1858) 950. — Lectotype (designated by Keng 1969): *Blume 992* (lecto L), Indonesia, Java, G. Parang.

Plectranthus laciniatus Blume, Bijdr. (1826) 838. — *Coleus laciniatus* (Blume) Benth., Labiat. Gen. Spec. (1832) 56. — *Coleus scutellarioides* (L.) Benth. var. *laciniatus* (Blume) Miq., Fl. Ned. Ind. 2 (1858) 950. — Lectotype (designated by Keng 1969): *Blume s.n.* (lecto L), Indonesia, Java.

Coleus atropurpureus Benth. in Wall., Pl. Asiat. Rar. 2 (1830) 16; Miq., Fl. Ned. Ind. 2 (1858) 951; Ridl., Fl. Malay Penins. 2 (1923) 646; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 418. — *Majana scutellarioides* (L.) Kuntze var. *atropurpureus* (Benth.) Kuntze, Revis. Gen. Pl. 2 (1891) 524. — Syntypes: *Wall. Cat. 2733A* (K, K-W), Singapore.

Coleus acuminatus Benth., Linnaea 6 (1831) 81; Miq., Fl. Ned. Ind. 2 (1858) 950; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 418. — Neotype (designated by Suddee et al., Kew Bull. 59 (2004) 410): *Cuming 1683* (neo K; isoneo BM, K, P, TCD), Philippines, Island of Samar.

Coleus grandifolius Benth., Labiat. Gen. Spec. (1832) 54; Miq., Fl. Ned. Ind. 2 (1858) 952. — Syntypes: *Guichenot s.n.* (syntypes P; isosyntypes G-DC, K, L), Timor.

Coleus secundiflorus Benth., Labiat. Gen. Spec. (1832) 55; Miq., Fl. Ned. Ind. 2 (1858) 952. — Type: *Guichenot s.n.* (holo P), Timor.

Coleus multiflorus Benth., Labiat. Gen. Spec. (1832) 55; Miq., Fl. Ned. Ind. 2 (1858) 951; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 419. — Type: *Perrottet s.n.* (holo P), Philippines, Manila.

Coleus blumei Benth., Labiat. Gen. Spec. (1832) 56; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 419; Ridl., Fl. Malay Penins. 2 (1923) 646; Burkill, Dict. Econ. Prod. Malay Penins. (1935) 635; Quisumb., Medic. Pl. Philip. (1951) 815. — *Solenostemon blumei* (Benth.) M.Gómez, Bol. Secr. Agric. Comerc. Trab., Cuba 22 (1914) 127. — *Plectranthus blumei* (Benth.) Launert, Mitt. Bot. Staatssamml. München 7 (1968) 301.— Lectotype (designated by Suddee et al., Kew Bull. 59 (2004) 410): *Blume s.n.* (lecto L), Indonesia, Java.

Coleus pumilus Blanco, Fl. Filip. (1837) 482; Fl. Filip., ed. 2 (1845) 336; Fl. Filip., ed. 3, 2 (1878) 257; Miq., Fl. Ned. Ind. 2 (1858) 956; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 420; Stapf, Bot. Mag. 150 (1924) t. 9034. — Neotype (designated by Suddee et al., Kew Bull. 59 (2004) 410): *Merrill Species Blancoanae 190* (neo K), Philippines, Barrio of Pineda, Pasig, Rizal Province, Luzon.

Coleus grandifolius Blanco, Fl. Filip. (1837) 482, nom. illeg. (non Benth. 1832). — Neotype (designated here): *Merrill Sp. Blancoanae 786* (neo US), Manila, Luzon.

Coleus verschaffeltii Lem., Ill. Hort. 8 (1861) t. 293. — Lectotype (designated by Suddee et al., Kew Bull. 59 (2004) 410): Lem., Ill. Hort. 8 (1861) t. 293.

Plectranthus monadelphus Llanos ex Fern.-Vill. & Náves in Blanco, Fl. Filip., ed. 3, 4 (1880) 105, nom. illeg. (non Roxb. 1832). — Type: lost.

Coleus igolotorum Briq., Annuaire Conserv. Jard. Bot. Genève 2 (1898) 236; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 419. — Type: *Callery 48* (holo G-DEL; iso P), Philippines, Île de Luzon, dans le pays des Igolotes.

Coleus gaudichaudii Briq., Annuaire Conserv. Jard. Bot. Genève 2 (1898) 237. — Type: *Gaudichaud s.n.* (holo G-DEL), Philippines, Île de Luzon pres de Manille.

Coleus formosanus Hayata, J. Coll. Sci. Imp. Univ. Tokyo 22 (1906) 320. — Type: *Miyake s.n.* (holo TI), [Japan,] Kotosho.

Coleus macranthus Merr., Philipp. J. Sci. 1, Suppl. (1906) 234; Enum. Philipp. Fl. Pl. 3 (1923) 419; H.Keng, Gard. Bull. Singapore 24 (1969) 59. — *Plectranthus merrillii* H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 391 (non *Plectranthus macranthus* Hook.f.). — Syntypes: *Merrill 4483* (K); *Merrill 4502* (K (same sheet as *4505*)), Philippines, Luzon, Lepanto dist., Mt Data; *Merrill 4505* (syntype K (same sheet as *4502*)).

Coleus macranthus Merr. var. *crispipilus* Merr., Philipp. J. Sci. 1, Suppl. (1906) 234. — *Coleus crispipilus* (Merr.) Merr., Philipp. J. Sci., C 5 (1910) 382; Enum. Philipp. Fl. Pl. 3 (1923) 419. — Type: *Merrill 4780* (holo PNH†; iso BM, K, NY), Philippines, Suyoc to Panai, Province of Benguet, Luzon.

Coleus pubescens Merr., Philipp. J. Sci., C 3 (1908) 432; Enum. Philipp. Fl. Pl. 3 (1923) 420. — Type: *BS (Zenix) 3892* (holo PNH†; iso BM), Philippines, Babuyan Island.

Coleus zschokkei Merr., Philipp. J. Sci., C 5 (1910) 382; Enum. Philipp. Fl. Pl. 3 (1923) 420. — Type: *Merrill 6529* (holo PNH†; iso K, NY, P), Philippines, Luzon, Prov. of Benguet, Mt Pulog.

Coleus rehneltianus A.Berger, Bot. Jahrb. Syst. 54, Beibl. 120 (1915) 71; Backer & Bakh.f., Fl. Java 2 (1965) 637. — Type: not located, but according to Suddee et al. (Kew Bull. 59 (2004) 410) the types of Alwin Berger are probably in NY.

Coleus integrifolius Elmer, Leafl. Philipp. Bot. 7 (1915) 2696; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 419. — Type: *Elmer 13627* (holo PNH†; iso A, BM, K, L, NY, P), Philippines, Mindanao, Prov. of Agusan, Cabadbaran (Mt Urdaneta).

Coleus gibbsiae S.Moore in Gibbs, Fl. Arfak Mts. (1917) 178. — Type: *Gibbs 5909* (holo BM; iso K, L), Indonesia, New Guinea, Arfak Mts, 2100 m.

Erect or ascending branched herb, occasionally creeping, 0.2–1.5 m high, aromatic, without tubers. *Stems* and *branches* finely pubescent with retrorse hairs, or glabrous, rarely villous. *Leaves* very variable in size, shape and colour, generally ovate in outline, blade (1–)4–7(–15) by (1–)3–5(–10) cm, apex acute or acuminate, base rounded or cuneate, margin crenate, serrate, remotely crenate or sometimes laciniate, upper surface glabrous or with short hairs, lower surface pubescent on the main and secondary veins, both surfaces with red sessile glands; petiole 1–5(–8) cm long. *Inflorescences* terminal, simple, up to 40 cm long, flowers in few- to many-flowered verticillasters or in irregularly branched cymes, peduncles of the lateral cymes short or elongated; pedicels 1–2 mm long in flower, extending in fruit; bracts narrowly ovate to ovate, 2–8 mm long, apex acute, pubescent, caducous. *Calyx* campanulate, 2–3 mm long, in fruit 4–8 mm long, hirsute, especially at the base of the tube and on lateral lobes, sparingly to densely covered with red or yellow sessile glands, unequally 5-lobed; upper lobe broadly ovate, subacute, two lateral lobes of lower lip short, oblong-obtuse, truncate or rounded, rarely mucronate with a tiny apiculate apex, about half as long as central lobes of lower lip, these oblong to subulate, connate for 2/3 of their length, appearing bifid and acuminate at apex, almost parallel, longer than upper lobe. *Corolla* blue or violet, with whitish tube, 8–13 mm long (15–20 mm long in some Papuan specimens); tube 4–5 mm long, sigmoid below the middle, widely expanded at throat, with scattered hairs and sessile glands outside; upper lip with lobes pubescent, the two central lobes rounded, lower lip 4–5 mm long. *Stamens* included in lower lip. *Nutlets* broadly ovate or orbicular, brown to black, shining, 1–1.2 mm long, minutely tuberculate, mucilaginous when wet.

Distribution — Continental SE Asia (India, Burma, Thailand, Indo-China, S China), Taiwan, to Australia, Melanesia (Solomons) and Polynesia; in *Malesia*, throughout; frequently cultivated for ornamental purpose.

Habitat & Ecology — Varied habitats from the lowland to the mountains, in rainforest, along shaded stream-banks and other watercourses, on rice-field dykes, in thickets, in Malaysia also on limestone hills, in secondary forest, mossy forest, etc. Altitude: up to 2900 m. Flowering: throughout the year.

Vernacular names — Sumatra: Aram gara, Ati ati, Daun ati ati, Hatisolo, Poko ati ati, Singgelam, Tinggelan (Malay); Bangun bangun na gerger, bangun bangun na rata, Bunga pitadan(g), Pitadan(g), Si gresing, (Batak); Saribotong uding (Simalur island). Java: Arak, Daun dhilem, Daun dhilep, Dhin kamadhinan (Madurese); Daun bunga, Daun pinang, Daun pupur, Daun wangi, Dilam, Majana, Majana mas, Majana merah, Miara mas, Mijana, Nilam, Nilam bunga, Nilam pinang (Malay); Djawer beureum, Djawer kotok, Si gresing (Sundanese); Her, Kentangan (Javanese). Borneo: Sabah: Ati ati (Kedayan); sa-mayuk. Philippines: Aga dinokud, Kodalita (Ifugao); Badiara, Maliana, Mayana (Tagalog, Bisaya, Pampangan); Dapomaya, Lampunaga, Lapunaya, Tapomaya (Bisaya); Malamayana (Tagalog); Maryana, Maryapa (Pampagan); Cebu: Myana; Sahemaya, Saymayu (Sulu); Salumaya (Subanum). Lesser Sunda Islands: Arak, Delem,

Dilem, Miana, Miana ireng, Miana muk, Miana nila, Miana tjemeng; Bali: Kunu wangi; Timor: Kunu roto. Moluccas: Ate ate, Ate ate mahamu, Ate ate mopura, Atei, Ati ati, Atoi mapuha, Daun dilam, Mayana, Mayana hitam, Pantji-pantji, Pupuru, Rangon tati, Salbu kero, Salebung, Salebung kero, Saru-saru, Serewung, Serewung mea, Serewung raindang, Serewung rangdang, Serewung rundang; ton kau. New Guinea: Amaneh, Apiuna, Budimu (pap), Doraim, Kompiai, Kukubari, Maiferai, Nogoipa; Asaro, Kefamo, Moipaherra, Ngondum, Nump (Hagen, Yoowi dial.); Bungu (Onjob); Edomani, Ijamun, Kapugund, Kepilam, Tagau (Enga); Ekinarb, Kiena-ero, Uwoije (Kapauko); Ib'kombi, Kabwe, Karap, kombil (Mendi lang.); Kondu (Hagen); Kumberumi (Kaugel); Mun, Waokum (Dani); Nongu nongu (Tifal); Oiabua (Minufia); Porbagu (Kutubu).

Uses — Rahayu (Plant Resources of South-East Asia 12 (1999) 408) summarises the medicinal and ornamental uses: "the roots of *Plectranthus scutellarioides* are used internally in the Moluccas to treat diarrhoea and colic, and the leaves as anthelmintic and to treat urinary complaints, whereas sap is squeezed into the eye in the case of eye injury, and rubbed on swellings. Elsewhere in Indonesia the sap or a decoction is used as an abortivum and emmenagogue, and to treat haemorrhoids, inflamed eyes and boils. In Malaysia, a decoction of the leaves is used to stimulate digestion, as a sedative, to treat dyspepsia and congestion of the liver, and externally against swellings, smallpox and ophthalmia. Fresh leaves are applied in the Philippines externally or in cataplasm to bruises and contusions, and to treat headache. In Papua New Guinea, young leaves are baked and squeezed whilst hot onto fresh cuts and sores. *Plectranthus scutellarioides* is commonly cultivated for its ornamental purplish foliage".

Notes — 1. Extremely variable in leaf shape and size, inflorescence size, and corolla colour and size. Numerous attempts to categorise this variation using infraspecific ranks have been made, but I have not found it possible to find characters that clearly distinguish varieties or subspecies. Further detailed study, including molecular work, may establish workable groups within this species.

2. *Plectranthus merrillii* is included as a new synonym here. Merrill (1906) and Keng (1969) distinguished it on the basis of its rusty indumentum, larger corolla and stalked cymes, but there are other plants, especially from New Guinea, that show similar characters. I have found that it is not possible to distinguish fruiting specimens of *P. scutellarioides* and *P. merrillii*.

3. Plants from higher altitudes have a tendency to have a creeping habit, for example, those plants described as *Coleus pumilus*, from the Philippines.

10. Plectranthus steenisii H.Keng

Plectranthus steenisii H.Keng, Gard. Bull. Singapore 24 (1969) 145, f. 27. — Type: *Van Steenis 7111* (holo L), Java, res. Pasoeroean, G. Ardjoeno, road between Sawahan Bakal and Sawaham Ardjoeno.

Erect, aromatic herb. *Stems* and *branches* densely villose. *Leaves*: blade ovate or spatulate-obovate, 5–9 by 4–6.5 cm, apex acute or rounded, base acute or acuminate, margin crenate-dentate, hirsute on both surfaces, especially densely on the venation below; petiole 1–3 cm long. *Inflorescences* terminal, paniculate, 25–30 cm long, flowers 20–30 in a verticillaster; pedicels 2–4 mm long. *Calyx* campanulate, 4–4.5 mm

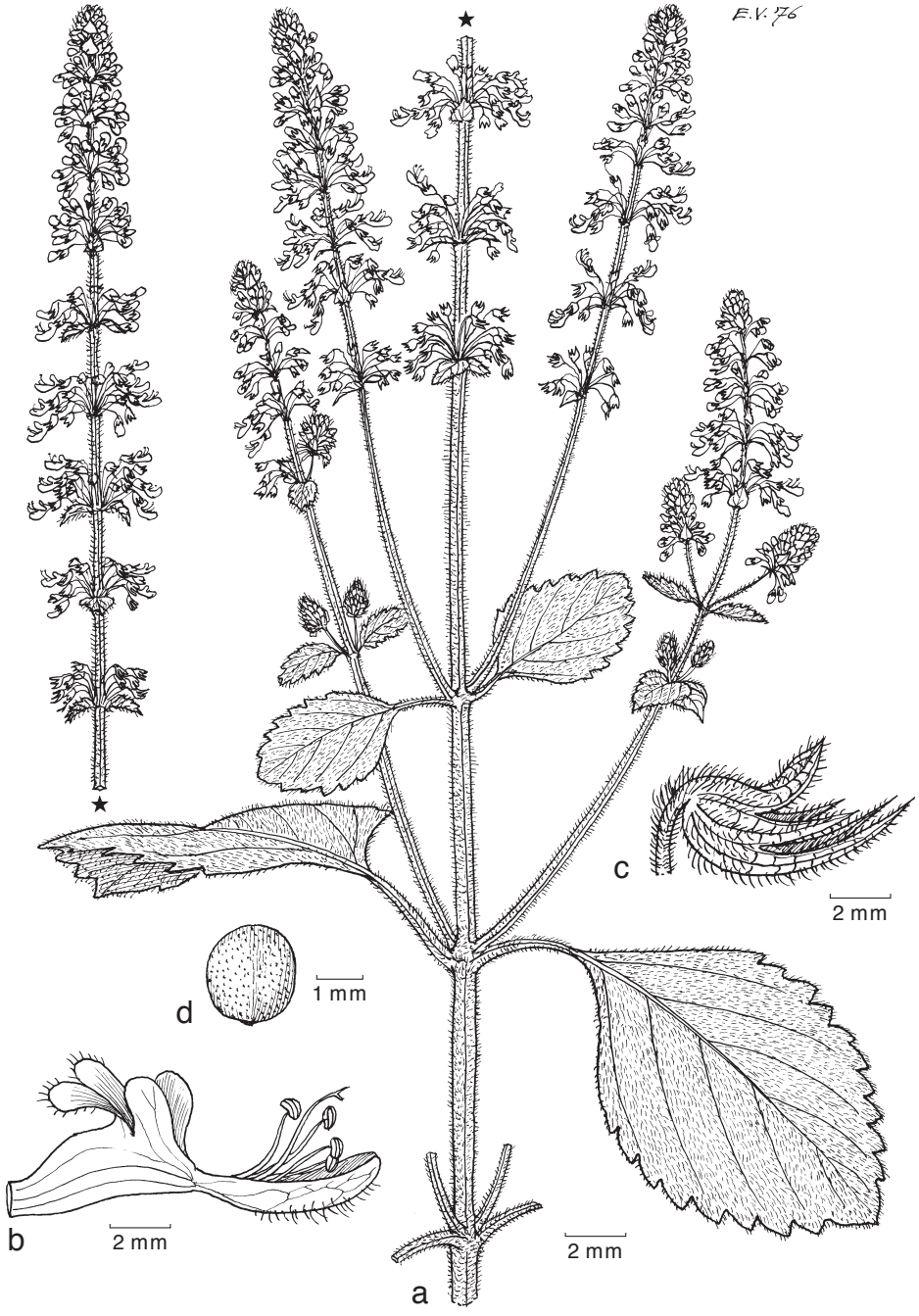

Fig. 35. *Plectranthus steenisii* Keng. a. Habit; b. corolla; c. fruiting calyx; d. nutlet (all *Van Steenis 7111*, L). Drawing by Ed Vijsma, 1976.

long, in fruit 5.5–6 mm long, hairy, upper lobe recurved, lateral and central lobes of lower lip subequal, all lobes lanceolate, free. *Corolla* blue, 9–12 mm long, tube erect, prominently gibbous in the medium portion above the upper and lower lips. *Stamens* included in lower lip. *Nutlets* subrotundate, flattened, c. 1.2 mm long and wide. — **Fig. 35.**

Distribution — E Java (Mts Ardjuno, Tengger, Idjen, 3 collections).

Habitat & Ecology — Stony slopes in Casuarina forest. Altitude: 2000–2650 m; on Mt Idjen above Bajeman said to have been collected by Backer between 50–600 m, which Keng cites as a likely error (Keng (1978) 386). Flowering: April, June, October. Locally on Mt Ardjuno gregarious in one place.

Note — Keng (1978) separates *P. steenisii* from other Malesian species of *Plectranthus* by the very long corolla (10–12 mm long) and the gibbous corolla tube. The corolla on the specimen at K is 9 rather than 10 mm long, but it is markedly gibbous, appearing rather squat. Corolla length is highly variable in other species such as *P. scutellarioides*, and 9–12 mm does not seem a size range particularly distinct from the other Malesian species. Further investigation, preferably with more recently collected material, needs to be carried out to fully determine the status of this species.

CULTIVATED

Plectranthus caninus Roth, Nov. Pl. Sp. (1821) 279. — Type: *Heyne s.n.* in *Wallich Cat. 2729C* (holo B†; iso K-W), India.

Native of India, cultivated and probably run wild in the highlands of New Guinea (*Borgmann 342*, Toromambuna Mission Station; *NGF 42901*, Kainantu Subdistr., Aiyura H.A.E.S, in nursery plots). Fleshy leaved, mostly herbaceous plants with pubescent to villose stem, strictly 6-flowered verticils, and bracts forming conspicuous terminal coma, flowers up to 14 mm long.

Plectranthus neochilus Schltr., J. Bot. (1896) 394. — Type: *E.E. Galpin 968* (holo K; iso BOL, GRA, NH, SAM), South Africa, Transvaal, Baberton.

Native of southern tropical Africa, but widely grown in horticulture (possibly naturalized in Australia). One specimen seen from New Guinea, but likely to occur elsewhere in the region if its use in horticulture increases. Fleshy leaved, mostly herbaceous plants with strictly 6-flowered verticils, bracts forming conspicuous terminal coma, large flowers up to 20 mm long.

DOUBTFUL & EXCLUDED

(based on Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 392)

Coleus grandifolius auct. non Benth. (1832): Koord., Minahassa (1898) 561.

Recorded as wild and cultivated at Manado, Celebes [Sulawesi]. Probably refers to *Plectranthus scutellarioides* (L.) R.Br.

Coleus macrostachys Benth., Labiat. Gen. Spec. (1832) 57; Miq., Fl. Ned. Ind. 2 (1858) 952; Koord., Exkurs.-Fl. Java 3 (1912) 156. — Type: *Commerson s.n.* (holo P; iso P), Java.

Based on Commerson's collection, but also listed are two *Zollinger* numbers (*928* and *1970*), all from Java. Exact identity unknown.

Coleus savannicola K.Schum. in K.Schum. & Lauterb., Fl. Schutzgeb. Südsee (1900) 529; Mansf., Bot. Jahrb. Syst. 62 (1929) 380. — *Lauterbach 2777* (type not seen), [Papua New Guinea,] Kaiser Wilhelms Land, Bismarck Mts.

According to Mansfeld (1929) probably merely a form of *Plectranthus scutellarioides* (L.) R.Br.

Plectranthus australis auct. non R.Br. (1810): Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 397; Herb. Timor. Descr. (1835) 69.

Based on Gaudichaud's collection from Timor. Probably refers to *P. parviflorus* Willd.

Plectranthus leschenaultii Benth., Labiat. Gen. Spec. (1832) 34; Miq., Fl. Ned. Ind. 2 (1858) 947. — Type: *Leschenault 595* (holo P), Java.

Based on Leschenault's collection from Java. Exact identity unknown.

37. POGOSTEMON

(B. Bongcheewin & G.L.C. Bramley)

Pogostemon Desf., Mém. Mus. Hist. Nat. 2 (1815) 154, t. 6; Hassk., Flora 25, Beibl. 2 (1842) 25 ('*Pogonostemon*'); Cat. Hort. Bot. Bogor. (1844) 130; Miq., Fl. Ned. Ind. 2 (1859) 961; H.Keng, Gard. Bull. Singapore 24 (1969) 151; in Steenis, Fl. Males., Ser. I, 8 (1978) 351; Press, Bull. Nat. Hist. Mus. London, Bot. 10 (1982) 1; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 258; Bhatti & Ingr., Bull. Nat. Hist. Mus. London, Bot. 27 (1997) 77; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 214. — Type: *Pogostemon plectranthoides* Desf. (= *Pogostemon benghalensis* (Burm.f.) Kuntze).

Dysophylla Blume, Bijdr. (1826) 826; Ridl., Fl. Malay Penins. 2 (1923) 647; El Gazzar & L.Watson ex Airy Shaw, Taxon 16 (1967) 190; H.Keng, Gard. Bull. Singapore 24 (1969) 67; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 262. — Type: *Dysophylla auricularia* (L.) Blume (= *Pogostemon auricularius* (L.) Hassk.).

Annual or perennial herbs or shrubs, usually pubescent, hairs simple or branched, sometimes strongly scented like patchouli or otherwise. *Leaves* opposite or whorled, sessile or petiolate. *Inflorescences* thrysoid, appearing spike-like, paniculate or solitary, flowers small to minute; bracts small or minute, densely hairy. *Calyx* tubular, 5-lobed (3/2), lobes subequal or lower longer; throat naked within. *Corolla* weakly 2-lipped, 4-lobed (3/1). *Stamens* 4, exserted, equal or upper pair slightly longer, divergent; filaments bearded with moniliform hairs, often at least twice the length of the corolla tube; anthers 2-celled, these confluent. *Disc* equal, subentire. *Style* gynobasic,

bifid at the top, lobes subequal. *Fruit* a schizocarp with 1–4 nutlets. *Nutlets* ovoid or ellipsoid, smooth or granulate, attachment scar basal.

Distribution — About 80 species throughout SE Asia to China and Japan; in *Malesia*: nine species throughout, one species extending to Australia.

Taxonomy — Since Keng's (1978) account of *Pogostemon*, Press (1982) and Bhatti & Ingrouille (1997) have published taxonomic studies on the genus and its relatives. Following Keng, both studies include *Dysophylla* in *Pogostemon*. Press (1982) supports Keng's proposed sections (sect. *Euasteralis* (Raf.) H.Keng; sect. *Pogostemon*) but suggests minor modifications: Sect. *Pogostemon* includes opposite-leaved species of *Dysophylla* and *Pogostemon* s.str.; species within it have all leaves in opposite pairs, leaves are usually petiolate and corollas have an upper lip equalling or longer than the lower; plants are from stony, dry grounds or forest margins. Section *Euasteralis* includes the verticillate-leaved *Dysophylla* species: at least some of the leaves are in whorls of three or more, leaves are usually sessile, the corollas have an upper lip equalling or shorter than the lower; plants are of wet habitats. Bhatti & Ingrouille (1997) propose a new classification with three subgenera, two of which are divided into two sections each. However, they cast doubt on the validity of some of their sections. For example, they remark that their Sect. *Dysophylla* is a poorly delimited group, that in the future it will be subdivided into several smaller taxa, and that data to enable stable groups to be erected are not yet available. In light of this, following Keng (1978) and Press (1982), the Malesian *Pogostemon* species are presented here in two sections: sect. *Pogostemon* and sect. *Euasteralis*.

KEY TO THE SECTIONS

1a. Leaves in whorls of 4 (or 5) (rarely > 5) . . . . . Sect. **Euasteralis**
b. Leaves opposite, never whorled . . . . . Sect. **Pogostemon**

Pogostemon Desf. section **Pogostemon**

Pogostemon Desf. section *Pogostemon*: H.Keng. in Steenis, Fl. Males., Ser. I, 8 (1978) 353. — Type: as the species.

Leaves opposite.

KEY TO THE SPECIES

1a. Spike-like inflorescences arranged into a panicle 2
b. Spike-like inflorescences, usually simple, terminal, solitary, rarely branched once or twice near the base. 4
2a. Verticillasters with clear spaces between them, internodes always visible, axes short appressed-hairy. Calyx 3–3.5 mm (in fruit 3.5–4 mm) long . . . . **3. P. heyneanus**
b. Verticillasters almost continuous, spaces not obvious between them, axes densely patent-canescent, pubescent or hirsute. Calyx 4–5 mm (in fruit 5–6 mm) long . 3
3a. Leaf blades short appressed-hairy to glabrous. Verticillasters pubescent; bracts very narrowly ovate. Calyx pubescent . . . . . **2. P. cablin**

b. Leaf blades with bristles, c. 1 mm long. Verticillasters villous to woolly; bracts obovate. Calyx with scattered bristles . . . . . **8. P. villosus**
4a. Verticillasters with clear spaces between them so internodes visible; axes glabrous to hairy 5
b. Verticillasters nearly continuous, spaces not usually visible between them; axes densely tomentose or hairy 7
5a. Calyx 4–4.5 mm long (in fruit 5–5.5 mm long); lower two calyx lobes slightly separate from upper three . . . . . **4. P. menthoides**
b. Calyx 4.5–7 mm long (in fruit 7–8 mm long); calyx lobes evenly spaced 6
6a. Calyx with eglandular hairs, glandular hairs absent. Leaf blades narrowly ovate to ovate, base cuneate to rounded, margins crenate to serrate to biserrate . . . . . **5. P. philippinensis**
b. Calyx with glandular hairs and longer eglandular hairs. Leaf blades ovate to broadly ovate, base rounded or cordate, margins coarsely and irregularly crenate . . . . . **6. P. reticulatus**
7a. Flowers very small: calyx 1.2–1.5 mm long; corolla 2–2.5 mm long. Verticillasters many-flowered . . . . . **1. P. auricularius**
b. Flowers relatively large: calyx 4.5–5 mm long; corolla 7–8 mm long. Verticillasters 12–20-flowered . . . . . **7. P. velatus**

1. Pogostemon auricularius (L.) Hassk.

Pogostemon auricularius (L.) Hassk., Tijdschr. Natuurl. Gesch. Physiol. 10 (1843) 127; Miq., Fl. Ned. Ind. 2 (1859) 964; El Gazzar & L.Watson, Taxon 16 (1967) 188; Backer & Bakh.f., Fl. Java 3 (1968) 657; H.Keng, Gard. Bull. Singapore 24 (1969) 180. — *Mentha auricularia* L., Mant. Pl. Altera (1767) 81. — *Dysophylla auricularia* (L.) Blume, Bijdr. (1826) 826; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 415; Ridl., Fl. Malay Penins. 2 (1923) 648; Backer & Bakh.f., Fl. Java 2 (1965) 633; H.Keng, Gard. Bull. Singapore 24 (1969) 67. — Lectotype (designated by Tucker et al., Taxon 29 (1980) 238): *Herb. Hermann 4:42, no.411* (lecto BM).

Mentha foetida Burm.f., Fl. Ind. (1768) 126. — Type: Rumph. in Herb. Amboin. 6 (1750) t. 16 (as '*Majana foetida*') (holo illustration).

Dysophylla auricularia (L.) Blume var. *gigantea* Doan in Lecomte, Fl. Indo-Chine 4 (1936) 965. — *Pogostemon auricularius* (L.) Hassk. var. *giganteus* (Doan) P.H.Hô ex A.L.Budantzev, Komarovia 1 (1999) 22. — Type: *Evrard 2461* (holo P), Vietnam, Phanrang, Cana.

Pogostemon barbatus Bhatti & Ingr., Bull. Nat. Hist. Mus. London, Bot. 27 (1997) 109. — Type: *Hu 12319* (holo K), Hong Kong, Fau Tan Valley.

Erect annual herb; *stems* simple or laxly branched, 30–80 cm high, pubescent with spreading hairs. *Leaves* opposite; blade narrowly ovate to ovate, 4–6 by 2–3 cm, membranaceous, apex acute or rarely obtuse, base cuneate or rounded, margins irregularly serrate, pubescent on venation below, also with yellow sessile glands; petiole 2–8 mm long, hairy. *Inflorescences* 4–15 cm long, verticillasters formed of numerous flowered cymules, congested, internodes usually not visible, axes with dense hairs; bracts narrowly elliptic, c. 2 mm long, long ciliate. *Calyx* campanulate, with yellow sessile glands, 1.2–1.5 mm long, 5-lobed; lobes subequal, triangular, ciliate, calyx in fruit urn-shaped, lobes often incurved over the nutlets. *Corolla* lavender blue, pale pink, or white, 2–2.5 mm long, tube slender, lobes obtuse, pubescent. *Nutlets* ellipsoid, c. 0.6 by 0.4 mm, finely reticulate, brown.

Distribution — Throughout SE Asia to S China; in *Malesia*: throughout, though not yet recorded from the Lesser Sunda Islands, and not from Australia.

Habitat & Ecology — Sunny, constantly or periodically humid localities, borders of ditches, dams of paddies, grassy wastes, thickets, locally often common. Altitude: from the lowland ascending to 2000 m. Flowering: throughout the year.

Vernacular names — Malay Peninsula: Ekor kuching, Poko awi tana (Malay). Sumatra: Ajiri kutjing (Djambi region); Angur angur (Piso piso, Karo region); Daun silipan (Langkat); Kekutjing, Kutjing kutjing (Malay); Si-marihoer-ihoer-ni-asu (Batak). Java: Buntut sero, Buntut utjing (Sundanese); Buntut serot, Djangnan ramhit, Delangking, Husu, Majana utan (Malay); Ketumpang, S(e)tangking (Javanese). Borneo: Kambing kambing. Philippines: Buntut pusa (Tagalog). Moluccas: Maja busuk, Maja hutan.

Uses — Pounded leaves, whether or not powdered with lime, are applied as a poultice on the abdomen (Ridley 1923). Poulticing is also recorded for other troubles, e.g., diarrhoea, colic, worms and a sore throat. Burkill & Haniff (Gard. Bull. Singapore 6 (1930) 238) said that the plant is in Malaya in common use for simple disturbances of the stomach of children. Hartley (Lloydia 32 (1969) 265) listed it as potential anticancerogene.

2. **Pogostemon cablin** (Blanco) Benth.

Pogostemon cablin (Blanco) Benth. in A.DC., Prodr. 12 (1848) 156; Miq., Fl. Ned. Ind. 2 (1859) 964; Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1907) 708; Kew Bull. (1908) 78; Merr., Philipp. J. Sci., C 7 (1912) 345; Fl. Manila (1912) 411; Enum. Philipp. Fl. Pl. 3 (1923) 414; Ridl., Fl. Malay Penins. 2 (1923) 647; Backer & Bakh.f., Fl. Java 2 (1965) 633; H.Keng, Gard. Bull. Singapore 24 (1969) 154; Bhatti & Ingr., Bull. Nat. Hist. Mus. London, Bot. 27 (1997) 92. — *Mentha cablin* Blanco, Fl. Filip. (1837) 473. — Neotype (designated here): *Merrill Species Blancoanae 112* (neo US; isoneo BM, K, L), Philippines, Luzon, Rizal, Antipolo.

Pogostemon mollis Hassk., Tijdschr. Natuurl. Gesch. Physiol. 10 (1843) 126 ('*Pogonostemon*'), nom. illeg. (non Benth. 1833); Cat. Hort. Bot. Bogor. (1844) 310. — Type: not located.

Pogostemon tomentosus Hassk., Cat. Hort. Bot. Bogor. (1844) 131 ('*Pogonostemon*'); Benth. in A.DC., Prodr. 12 (1848) 153; Miq., Fl. Ned. Ind. 2 (1859) 962; H.Keng, Gard. Bull. Singapore 24 (1969) 153. — Type: not located.

Pogostemon patchouly Pellet.-Saut., Mém. Soc. Roy. Sci. Orléans 5 (1845) 277, t. 7; Miq., Fl. Ned. Ind. 2 (1859) 962; Hook.f., Fl. Brit. India 4 (1885) 634, incl. var. *suavis* Hook.f. — *Pogostemon heyneanus* Benth. var. *patchouli* (Pellet.) Kuntze, Revis. Gen. Pl. 2 (1891) 529. — Type: not located.

Pogostemon comosus Miq., Fl. Ned. Ind. 2 (1859) 963; Koord., Exkurs.-Fl. Java 3 (1912) 152. — Type: *Horsfield s.n.* (K), Java, Banjoemas.

Pogostemon nepetoides Stapf, Bull. Misc. Inform. Kew (1908) 116. — Type: *Micholitz s.n.* (K), Philippines.

Pogostemon nepetoides Stapf var. *glandulosus* Merr., Philipp. J. Sci., C 7 (1912) 347. — Type: *BS (Ramos) 13406* (iso L), Philippines, Luzon, Rizal prov., Bosoboso (San Isidro).

Pogostemon battakianus Ridl., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 85. — Type: *Ridley s.n.* (K), Sumatra, Berastagi, lane by Battak village.

Pogostemon javanicus Backer ex Adelb., Reinwardtia 3 (1954) 150; Backer & Bakh.f., Fl. Java 2 (1965) 632, 657. — Type: *Zollinger s.n.* (L), Java, Besuki, Banjuwangi.

Pogostemon hortensis Backer ex Adelb., Reinwardtia 3 (1954) 152; Backer & Bakh.f., Fl. Java 2 (1965) 633. — Type: *Buysman 128* (holo U), Java Timur.

Mentha auricularia auct. non L.: Blanco, Fl. Filip., ed. 2 (1845) 329; Fl. Filip., ed. 3, 2 (1878) 245.

Erect, aromatic, branched herb, to 1 m high; stem and branches pubescent. *Leaves* opposite; blade narrowly ovate or ovate, 5–10(–14) by 3.5–6.5(–10) cm, membranaceous; apex acute, base cuneate-rounded to truncate, sometimes oblique, margins dentate or crenate or partly biserrate, with short appressed hairs on venation and lamina surface; petiole 1–3.5(–6.5) cm long, pubescent. *Inflorescences* 3 or many forming a terminal panicle, l5–30(–40) cm long; verticillasters slightly apart below, closer together above, internodes not obvious, grey-pubescent, with dense cincinni of seriately imbricating; bracts very narrowly ovate, ciliate, sometimes ± secund. *Calyx* tubular, 4–5 mm long, in fruit 5–6 mm long, 5-lobed; lobes subequal, tube narrowed at both ends, pubescent. *Corolla* white, lavender blue, or violet, 6–7 mm long. *Nutlets* ellipsoid, 0.6–1 by 0.5–0.6 mm, subtriquetrous, smooth, black.

Distribution — Sri Lanka and continental SE Asia; in *Malesia*: Peninsular Malaysia, N Sumatra, Java, Philippines (Luzon, Leyte), Sulawesi, Lesser Sunda Islands (Bali, Sumba, Sumbawa, Alor, Flores, Timor) and Papua New Guinea (Morobe Distr.: one collection, *NGF 27934*). Also cultivated and occasionally escaped from cultivation, which makes it difficult to decide in which areas it is really native in Malesia. Merrill (1923: 414) remarks that in Luzon it is occasionally planted in gardens, occurring also on steep talus slopes in areas remote from settlement, as though indigenous. In Java it is never found in the flowering state (Keng 1978: 354).

Habitat & Ecology — Garden lands and clearings and in settled areas. Altitude: up to 1900 m (Sumatra). Flowering: May to February.

Vernacular names — Malay Peninsula: Nilam, Patchouly (Malay). Philippines: Kabiling (Pampangan); Kablin, Kabling, Karlin (Tagalog, Pampangan, Iloko); Kadh'ten (Bisaya); Kadling (Tagalog, Bisaya); Kadlum (Bikol, Sulu, Samar-Leyte Bisaya); Sarok (Igorot). Lesser Sunda Islands: Sumba: Remi kawini, Roo nggolé; Alor: Pisak; Timor: Ugapa.

Uses — The leaves are widely extracted for the well-known patchouli oil of commerce, not to be confused with that extracted from *Microtoena insuavis* (Hance) Prain ex Briq. (Khasya patchouli) and from *Pogostemon heyneanus* (Indian patchouli). Patchouli oil is used in perfumes and cosmetics. According to Quisumbing (Medic. Pl. Philip. (1978) 830) the crushed leaves are often used for hair-washing in the Philippines. Furthermore, the leaves are employed as an insecticide against cockroaches, moths, etc., and as a repellent for leeches. They are also added to baths for their presumed antirheumatic quality. An infusion of fresh leaves is taken internally to allay painful menstruation.

3. **Pogostemon heyneanus** Benth.

Pogostemon heyneanus Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 31; Miq., Fl. Ned. Ind. 2 (1859) 961; Prain, Kew Bull. (1908) 78, with ample discussion of synonymy; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 414; Ridl., Fl. Malay Penins. 2 (1923) 647; Backer & Bakh.f., Fl. Java 2 (1965) 633; H.Keng, Gard. Bull. Singapore 24 (1969) 152. — Type: *Heyne s.n.* (K), India.

Pogostemon suavis Ten., Giorn. Bot. Ital. 2 (1847) 56. — *Pogostemon patchouly* Pellet.-Saut. var. *suavis* (Ten.) Hook.f., Fl. Brit. India 4 (1885) 634. — Type: ?NAP, not located.

Erect branching herb, sometimes rooting at nodes, 0.5–1.5 m high; stem and branches slender, pubescent to sparingly pubescent. *Leaves* opposite; blade elliptic to ovate to

broadly ovate, 5–11 by 3.5–6 cm, membranaceous, apex acute, base broadly cuneate, often slightly oblique, margin crenate or bi-crenate; with scattered hairs on lamina, more dense on venation or sometimes almost glabrous on both surfaces; petiole 1–3 cm long, pubescent. *Inflorescences* paniculate, 6–15 cm long, terminal; verticillasters globular, 0.5–1.5 cm apart at the base, closer together upwards but internodes always visible, with short, appressed hairs; bracts narrowly lanceolate, 3–3.5 mm long, acute, pubescent with appressed hairs. *Calyx* narrowly tubular, 3–3.5 mm long, in fruit 3.5–4 mm long, outside with appressed hairs and yellow sessile glands; lobes equal, narrowly triangular, < 1 mm long. *Corolla* white, or the upper lip pale violet, 4.5–5 mm long, glabrous. *Nutlets* obliquely ovoid, 0.5–0.6 mm long, black, smooth.

Distribution — Sri Lanka and continental SE Asia; in *Malesia*: Peninsular Malaysia, Sumatra, W Java, Borneo (Sarawak; Kalimantan), Philippines (Palawan, Panay, Mindanao). Possibly not native in Malesia. Also cultivated.

Habitat & Ecology — Thickets, old clearings, coconut groves, stream banks in forest, can be on limestone. Altitude: from the lowland up to 1800 m. Flowering: throughout the year.

Vernacular names — Malay Peninsula: Indian patchouli (English), Boon kalif, Bunga dilam, Nilam bukit, Pakochilam, Poko nyao, Ruku, Rumput kuku (Malay). Sumatra: Dukut nilam habuda, patchouli. Java: Dilĕm (Malay, Madurese); Dilĕm kĕmhang (Javanese); Dilĕp (Sundanese). Philippines: Kadlum (Panay bisaya); Lagumtum, Malbaka (Subanum).

Uses — According to Burkill & Haniff (Gard. Bull. Singapore 6 (1930) 238) a decoction of the leaves is used in Malaya against coughs and asthma. A decoction of the roots is sometimes administered for dropsy. Heyne (Nutt. Pl. Ned.-Ind. (1927) 1332) says that flowering plants contain a volatile oil smelling like patchouli, but apparently it has never been grown for the oil. In Mindanao, leaves are applied to wounds (*PNH (Frake) 38323*, L). Hartley (Lloydia 32 (1969) 275) listed this species as a possible anti-cancer medicine.

Note — Rather similar to *Pogostemon parviflorus* Benth., a name applied to taxa from India to Myanmar. The two species appear to differ only in the degree of laxity within the inflorescence. Future study may result in the two taxa being recognised as conspecific.

4. **Pogostemon menthoides** Blume

Pogostemon menthoides Blume, Bijdr. (1826) 825; Miq., Fl. Ned. Ind. 2 (1859) 963; Backer & Bakh.f., Fl. Java 2 (1965) 632; H.Keng, Gard. Bull. Singapore 24 (1969) 156; Steenis, Mountain Fl. Java (1972) pl. 25-10; H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 351; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 261. — Lectotype (designated by Keng 1969): *Korthals 445 in Herb. Blume* (lecto L; isolecto L 2 sheets), Indonesia, Java, Mt Gede.

Pogostemon fraternus Miq., Fl. Ned. Ind. 2 (1859) 963. — Type: *Horsfield 1141* (holo K), Indonesia, Java, Mt Praoe.

Pogostemon macgregorii W.W.Sm., Rec. Bot. Surv. India 6 (1914) 39. — Type: *MacGregor 844* (holo CAL), Burma, Southern Shan States.

Pogostemon plectranthoides auct. non Desf.; Koord., Exkurs.-Fl. Java 3 (1912) 153.

Erect branched herb, 0.5–1 m high; stems pubescent. *Leaves* opposite; blade very narrowly ovate to ovate, 1–5(–8) by 0.7–3(–5) cm, membranaceous, apex acute, base acute or rounded, often slightly oblique, margins serrate or biserrate, with appressed hairs covering both surfaces; petiole 0.5–1 cm long, pubescent. *Inflorescences* terminal, solitary, 3–15 cm long; verticillasters 3–12-flowered, spaced evenly, internodes visible, axes hairy; bracts linear, ciliate, up to 5 mm long. *Calyx* narrowly tubular, 4–4.5 mm long, in fruit 5–5.5 mm long, the base swelling and mouth constricting a little, 5-lobed; lobes very narrowly triangular, the lower two slightly separate from the upper three, outer surface with an even covering of shorter glandular hairs and scattered spreading hairs, lobes ciliate also with hairs on the inner surface. *Corolla* white and violet, or reddish, 6–7 mm long, with hairs on lobes. *Nutlets* subglobose, c. 0.6 by 0.5 mm, obscurely 3-angular, black, finely reticulate.

Distribution — Asia (Assam, Burma, Thailand, Indo-China); in *Malesia*: Java (from Mt Gedeh eastwards), Borneo (Mt Kinabalu), Philippines (Luzon) and Lesser Sunda Islands (Bali).

Habitat & Ecology — In deep shade of rainforest, often along trails, also in elfin forest and in Casuarina forest. Altitude: 1000–2200 m. Flowering: throughout the year.

Vernacular names — Java: Dilĕm, Tjuwing areuj (Sundanese).

Uses — In Java, the fragrant leaves are sometimes laid between clothes as a repellent to insects.

Note — Keng (1978) notes: "the record of *P. plectranthoides* Desf., a species of India, is evidently based on a misinterpretation or on an early collection of cultivated specimens in the Bogor Botanic Gardens".

5. **Pogostemon philippinensis** S.Moore

Pogostemon philippinensis S.Moore, J. Bot. 43 (1905) 146; Merr., Philipp. J. Sci., C 5 (1910) 381; Enum. Philipp. Fl. Pl. 3 (1923) 415; H.Keng, Gard. Bull. Singapore 24 (1969) 156. — Lectotype (designated by Keng 1969): *Vidal 3421* (lecto K; isolecto A), Philippines, Panay, Ilo-Ilo.

Pogostemon membranaceus Merr., Philipp. J. Sci., C 7 (1912) 347; Enum. Philipp. Fl. Pl. 3 (1923) 414. — Type: *BS (Ramos) 16419* (iso K, L), Philippines, Luzon, Laguna prov., Capuan.

Pogostemon elatispicatus Bhatti & Ingr., Bull. Nat. Hist. Mus. London, Bot. 27 (1997) 102. — Type: *PNH (Edaño) 18046* (holo BM; iso L 2 sheets), Philippines, Luzon, Ilocus Norte prov., Mt Darna.

Erect herb, 50–75 cm high, branched; stem and branches pubescent to pilose. *Leaves* opposite; blade narrowly ovate to ovate, 3–9 by 2.5–5 cm, membranaceous, apex acuminate, base cuneate to rounded, margins crenate to serrate or biserrate; glabrescent above, below with simple erect to spreading hairs on venation and surface, also with yellow sessile glands; petiole 1–3 cm long, pubescent. *Inflorescences* terminal, solitary, 4–12 cm long, verticillasters 10–many-flowered, usually close together but internodes visible; bracts linear-lanceolate, pubescent. *Calyx* tubular, 5–6 mm long, in fruit 6–7 mm long, 5-lobed; lobes narrowly triangular, 0.5–1 mm long, evenly spaced, appressed hairs evenly covering outer surface, more hairs on the lobes, also with yellow sessile glands. *Corolla* lavender-blue, 7–10 mm long. *Nutlets* ovoid, 0.6–0.7 mm long, obscurely triquetrous, smooth. — **Fig. 36.**

Distribution — Philippines (Luzon, Mindoro, Panay).

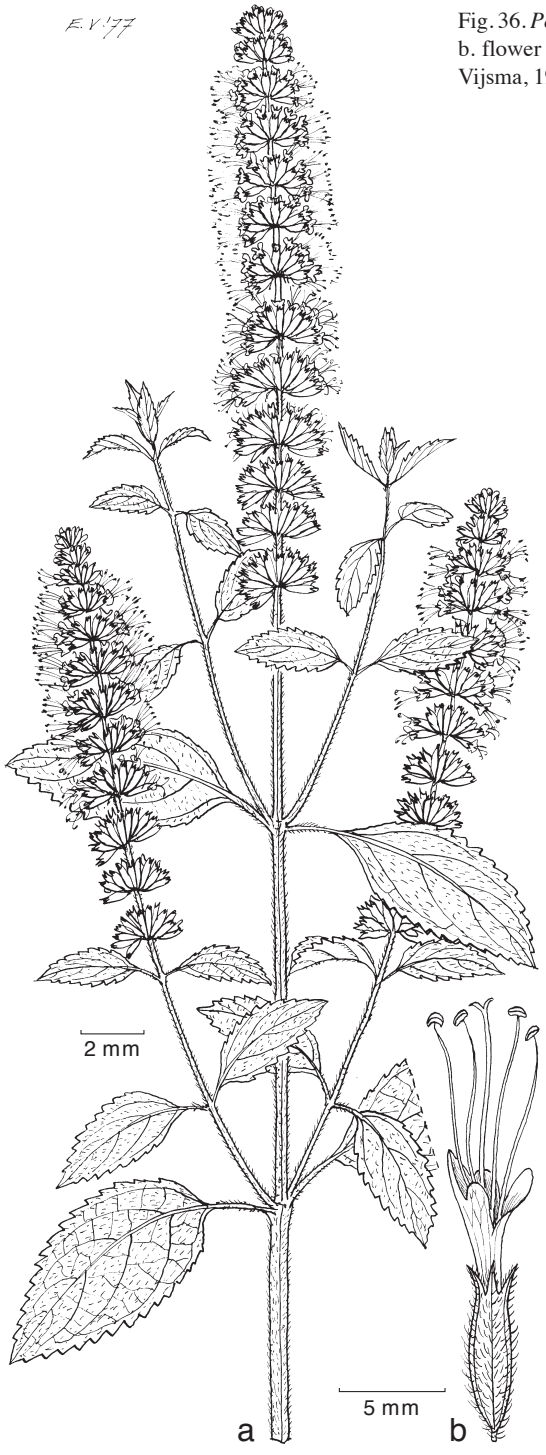

Fig. 36. *Pogostemon philippinensis* S.Moore. a. Habit; b. flower (all *Vanoverbergh 208*, L). Drawing by Ed Vijsma, 1977.

Habitat & Ecology — Damp ravines, alluvial forest, thickets, also in mossy forest. Altitude: ascending to 2400 m. Flowering: August to March.

Vernacular names — Philippines: Kadlum purii (Mangyan); Legleg, Ngiňgiyau (Bontok); Paňga-ti-núang (Iloko).

Note — See notes under *P. reticulatus*, a similar species. The specimen *BS (Ramos) 7267* (K) is determined as *P.* sp. aff. *philippinensis*, because its calyx has long, simple hairs and shorter glandular hairs, making it intermediate between *P. reticulatus* and *P. philippinensis*.

6. Pogostemon reticulatus Merr.

Pogostemon reticulatus Merr., Philipp. J. Sci., C 7 (1912) 348; Enum. Philipp. Fl. Pl. 3 (1923) 415; H.Keng, Gard. Bull. Singapore 24 (1969) 155. — Type: *FB (Ahern's collector) 3395* (iso BM, K 4 sheets), Philippines, Luzon, Rizal prov., Montalban.

Erect, branched herb, 50–75 cm high; stem and branches puberulent, scattered, with long white hairs and shorter glandular hairs. *Leaves* opposite; blade ovate to broadly ovate, 5–10.5 by 3.5–8 cm, membranaceous, apex obtuse or shortly acuminate, base rounded or cordate, margin coarsely and irregularly crenate, appressed long hairs above, below with longer spreading hairs on the venation, lamina surface with shorter erect sometimes glandular hairs and yellow sessile glands; petiole 3–8 cm long. *Inflorescences* terminal, solitary, 6–15 cm long including the peduncle, axes with short glandular hairs; verticillasters 3–8-flowered, internodes 1–2 cm long, congested at apex, more distant and visible below; bracts linear to filiform, c. 2 mm long, ciliate with long spreading hairs, also with short glandular hairs. *Calyx* narrowly tubular, 4.5–6 mm long, 5-lobed; lobes ± equal, evenly spaced, oblong, short glandular hairs all over calyx surface, longer simple hairs at the lobe tips and along the lobe edges. *Corolla* 6–7 mm long, lilac. *Nutlets* 0.5–0.75 by c. 0.5 mm, obscurely triquetrous.

Distribution — Philippines (Luzon), Sulawesi (Kabaena Island).

Habitat & Ecology — Thickets and forests at low and medium altitude.

Vernacular name — Philippines: Kadling (Tagalog).

Note — Closely similar to *P. philippinensis*. The most obvious difference between the two species is the calyx indumentum (glandular hairs present in *P. reticulatus*), and the generally narrower leaves, with more uniform margins, in *P. philippinensis*. Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 355) notes that *Loher 4207* (K) deviates from the typical form by conspicuously peduncled verticillasters; they are normally subsessile – I have also noticed this in *Iwatsuki et al. P-910* (K). *McDonald & Ismail 4114* (BO, HUH, K) from Kabaena Island, Sulawesi, determined as *P.* sp. aff. *reticulatus*, shares inflorescence characters with *P. reticulatus*, but the leaves are smaller and less hairy. Given that *P. reticulatus* is not yet known from any Philippine island other than Luzon, its possible presence on Kabaena Island, which lies off the South East arm of Sulawesi, would represent a disjunct distribution.

7. **Pogostemon velatus** Benth.

Pogostemon velatus Benth. in A.DC., Prodr. 12 (1848) 155; Miq., Fl. Ned. Ind. 2 (1859) 964; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 415; H.Keng, Gard. Bull. Singapore 24 (1969) 159; in Steenis, Fl. Males., Ser. I, 8 (1978) 355. — Type: *Cuming 1097* (iso K 2 sheets, L), Philippines, Albay.
Pogostemon williamsii Elmer, Leafl. Philipp. Bot. 9 (1934) 3197. — Type: *Elmer 22225* (iso BM, BO, GH, K), Philippines, Luzon, Pampanga prov., Zambales mountains, Mt Pinatubo.

Perennial branching, aromatic herb or undershrub, c. 1 m high; stem and branches stout, tomentose. *Leaves* opposite; blade narrowly ovate to broadly ovate, 3–8(–11) by 1.5–4(–5) cm, thick, apex acute or acuminate, base rounded or cordate, margin crenate to biserrate, densely hairy on both surfaces, the lower surface ± obscured or scarcely visible; petiole 0.5–3 cm long. *Inflorescences* terminal and solitary, 5–12(–15) cm long, verticillasters 12–20-flowered, usually congested, internodes usually not visible; bracts variable, ± linear to very narrowly ovate to leaf-like in some less congested inflorescences (*Cuming 1097*), ciliate, sometimes also with shorter glandular hairs. *Calyx* tubular, 4.5–5 mm long, in fruit 6–6.5 mm long and mouth enlarged, 5-lobed; lobes narrowly triangular, outer surface with appressed hairs, more hairs present on the lobes. *Corolla* violet, 7–8 mm long, outer surface with some hairs. *Nutlets* subspherical, c. 0.6 by 0.5 mm, black, smooth.

Distribution — Philippines (Luzon).

Habitat & Ecology — Primary forest, ravines and thickets. Altitude: 1200–2400 m. Flowering: throughout the year.

Vernacular names — Dila (Iloko); Opop (Igorot); Sipan-ti-bayungan (Bontok).

Note — Keng (1978) notes that the type of *P. williamsii* (*Elmer 22225*) has narrower inflorescences and leaves than typical.

8. **Pogostemon villosus** (Roxb.) Benth.

Pogostemon villosus (Roxb.) Benth., Labiat. Gen. Spec. (1833) 153. — *Elsholtzia villosa* Roxb., Fl. Ind. ed. Carey 3 (1832) 4. — Type: *Wallich s.n.*, 1831 (K).

Undershrub, 0.5–0.8 m high; stem and branches sparsely puberulent. *Leaves* opposite; blade thin-membranaceous, ovate to deltoid, (4–)7–11 by (3–)6–8.5 cm, with long bristles (c. 1 mm long), scattered all over both surfaces; apex acute or broadly caudate, base cuneate or truncate and shortly decurrent, margin basally entire, elsewhere shallowly and irregularly incised, serrate-crenate on the incisions; petiole (1–)6.5 cm long, puberulent. *Inflorescences* paniculate, few-branched, with verticillasters densely congested, internodes not obvious, 3–6 cm long, c. 1.5 cm diam., villous to woolly; peduncle 0.5–3 cm long, woolly; bracts obovate, acute, equalling or slightly longer than the calyx, villous. *Calyx* tubular-campanulate, 4.5–5 mm long, outside with scattered bristles; 5-lobed, lobes broadly lanceolate, margin ciliate. *Corolla* 5–6 mm long, lilac, tube very slender. *Nutlets* not seen.

Distribution — India, Bangladesh (Assam, Silhet); in *Malesia*: Central W Sumatra (Mt Kerintji), 2 collections (*Bünnemeijer 8811*, *9612*).

Habitat & Ecology — Mountain forest. Altitude: 1500–1900 m. Flowering: March to April.

Note — The two Sumatran collections appear to be conspecific with the Indian type material of *P. villosus*; however, it seems strange that this species is not recorded from the Thai-Malay Peninsula. The two Sumatran specimens may have been introduced as cultivated plants, or, further study may result in this species being considered synonymous with *P. cablin* or *P. hispidus*, to which it seems similar (Prain, Kew Bull. (1908) 254; Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 354).

Pogostemon Desf. section **Euasteralis** (Raf.) H.Keng

Pogostemon Desf. sect. *Euasteralis* (Raf.) H.Keng. in Steenis, Fl. Males., Ser. I, 8 (1978) 352. — *Euasteralis* Raf., Fl. Tellur. 2 (1837) 95. — Type: *Euasteralis pumila* Raf. (= *Pogostemon stellatus* (Lour.) Kuntze).

Leaves in whorls of 4 or more.

9. Pogostemon verticillatus (Benth.) Miq.

Pogostemon verticillatus (Benth.) Miq., Fl. Ned. Ind. 2 (1859) 965. — *Dysophylla verticillata* Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 30. — *Mentha verticillata* (Benth.) Roxb., Fl. Ind. ed. Carey, 3 (1832) 5, nom. illeg. (non L.). — Type: *Wallich Cat. 1544* (K-W), Sillet.

Dysophylla quadrifolia Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 30; S.Vidal, Phan. Cuming. Philipp. (1885) 136; Hook.f., Fl. Brit. India 4 (1885) 639; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 415. — *Mentha quadrifolia* Roxb. [Hort. Bengal. (1814) 44, nomen], Fl. Ind. ed. Carey, 3 (1832) 4, nom. illeg. (non D.Don, nor Benth.). — ?*Pogostemon quadrifolius* (Benth.) F.Muell., Fragm. 5 (1866) 200. — *Dysophylla stellata* (Lour.) Benth. ex Wall. var. *roxburgiana* H.Keng, Gard. Bull. Singapore 24 (1969) 72. — ?*Pogostemon stellatus* (Lour.) Kuntze var. *roxburgianus* (H.Keng) H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 352. — Type: *Wallich Cat. 1539* (K-W).

Annual (or sometimes perennial) herb, erect or ascending; stem laxly or profusely branched, 10–100 cm high, glabrous to pubescent. *Leaves* in whorls of 4 (or 5) (–10 in continental Asia), sessile or subsessile; blade linear, 3–8 cm by 2–7 mm, glabrous, apex acute to acuminate, base truncate, margins entire or obscurely serrate. *Inflorescences* villous, cylindric, terminal, 3–6 cm long; verticillasters close-set throughout, often indistinguishable from each other, hairs clustered around pedicels; bracts very narrowly ovate, with appressed hairs. *Calyx* campanulate, 1–1.5 mm long in flower, up to 2 mm long in fruit, 5-lobed; lobes subequal, triangular, spreading, outer surface with appressed and erect hairs, also with red or yellow sessile glands. *Corolla* pink to purple, tubular, c. 2 mm long, lobes pubescent. *Nutlets* ellipsoid, pale brown, c. 0.5 mm long.

Distribution — From India through SE Asia and China to Japan, and through Malesia to tropical Australia; in *Malesia*: on several islands rare, not recorded from Java and the Lesser Sunda Islands.

Habitat & Ecology — Grasslands and garden lands, swamps, bogs, lake beds, open wet places, e.g., rice-fields. Altitude: low, but in Sulawesi and New Guinea ascending to 2500 m. Flowering: May to January.

Vernacular names — New Guinea: Tsambi kumu (Medlpa, Kaugel dial.); Wamena (Dani); Weypa (Melpa).

Notes — 1. We recognise *P. verticillatus* as a distinct species, contrary to Keng (1978), who considered it a synonym of *P. stellatus* (the latter name now listed under 'imperfectly known species'). The type specimen of *P. verticillatus*, with its larger leaves, tends to reflect the variation found within Malesia more aptly than the type specimen of *P. stellatus* (see further notes under that name).

2. In his precursor to his Flora Malesiana treatment, Keng (Gard. Bull. Singapore 24 (1969) 71) described the name *Dysophylla stellata* (Lour.) Benth. var. *roxburghiana* as a new name for *Dysophylla quadrifolia*, a species that he considered was based on an illegitimate name (*Mentha quadrifolia*); he also stated that he did not think *D. quadrifolia* was a distinct species from *D. stellata*, rather contradicting his recognition of a new variety of *D. stellata*! Keng separated his var. *roxburghiana* from the typical variety on the basis of its tomentose or pubescent, rather than glabrous to sparsely hairy stem, as well as slightly wider leaves that are consistently in whorls of four. We consider these characters to be part of the variation in indumentum and leaf morphology found within *P. verticillatus*. We are listing *P. stellatus* var. *roxhburghiana* as a possible synonym, reflecting Keng's thoughts. However, further study of this taxon across its entire range is necessary before a decision can be made with confidence.

IMPERFECTLY KNOWN TAXA

Pogostemon ciliatus Bhatti & Ingr.

Pogostemon ciliatus Bhatti & Ingr., Bull. Nat. Hist. Mus. London, Bot. 27 (1997) 111. — Type: *Van Royen 3967* (holo K), New Guinea, Kebar valley, c. 100 km west of Manokwari.

Note — Described by Bhatti & Ingrouille (1997), based on one specimen from New Guinea, distinguished from other species by its hairy stigma lobes and ciliate upper and lower lip of the corolla, and a nutlet surface that has zigzag channels rather than being spinulose. The type is very similar to *P. verticillatus* in all characters other than the hairy stigma lobes – we do not think that the corolla indumentum is noticeably different. Probably a synonym of *P. verticillatus*; originally cited by Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 352) as an example of *P. stellatus* var. *roxburghianus*, distinguished from the typical variety by its hairy leaves and slightly longer corolla.

Pogostemon cristatus Hassk.

Pogostemon cristatus Hassk., Tijdschr. Natuurl. Gesch. Physiol. 10 (1843) 121 ('*Pogonostemon*'); Cat. Hort. Bot. Bogor (1844) 130; Miq., Fl. Ned. Ind. 2 (1859) 962; Backer & Bakh.f., Fl. Java 2 (1965) 633. — Type: not located.

Following Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 356): "according to Backer & Bakhuizen van den Brink Jr, this species is closely allied to *Pogostemon heyneanus* Benth. in Wall., from which it may be distinguished by the larger dimensions of the flower". We have seen images of several specimens labelled *P. cristatus* in BO, but most are fragmented, and we cannot confidently reduce this name to a synonym of *P. heyneanus* without further study of more material.

Pogostemon lythroides (Diels) Press

Pogostemon lythroides (Diels) Press, Bull. Nat. Hist. Mus. London, Bot. 10 (1982) 74. — *Dysophylla lythroides* Diels, Notizbl. Bot. Gart. Berlin-Dahlem 9 (1926) 1031. — Type: not located, China.

Note — Described by Diels based on material from China. We have not seen any of the material cited in the protologue. Bhatti & Ingrouille (Bull. Nat. Hist. Mus. London, Bot. 27 (1997) 111) extended the distribution to India, Sri Lanka, Malaysia, Sulawesi and Papua New Guinea, but I have not succeeded in locating the material they cite and am uncertain of the status of this species.

Pogostemon stellatus (Lour.) Kuntze

Pogostemon stellatus (Lour.) Kuntze, Revis. Gen. Pl. 2 (1891) 529 ('*stellatum*'). — *Mentha stellata* Lour., Fl. Cochinch. (1790) 361. — *Dysophylla stellata* (Lour.) Benth. ex Wall., Numer. List (1829) 1542. — Type: *Loureiro s.n.* (holo BM).

Note — Listed as an accepted species in the region by Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 352), with *P. verticillatus* as a synonym. After examining the type material of both species, as well as Malesian specimens given either name, we conclude that the status of *P. stellatus* is uncertain in the region. The type collection (Indo-Chinese) has many small leaves in each whorl, but the Malesian specimens tend to have four or five leaves per whorl that are about double in size to those of the *P. stellatus* type. Further study of these two taxa in the field is necessary to clarify their status: from field observations we note that leaf morphology can vary significantly if a habitat is subject to submergence, or partial submergence under water; if a plant is frequently submerged in water, the leaves can become much smaller and more numerous in each whorl.

EXCLUDED

Pogostemon gracilis Hassk., Tijdschr. Natuurl. Gesch. Physiol. 10 (1843) 126 ('*Pogonostemon*'); Cat. Hort. Bot. Bogor (1844) 130; Miq., Fl. Ned. Ind. 2 (1859) 962. — Type: unknown (see note).

Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 356) notes: "this is probably a plant cultivated in the Bogor Botanic Gardens. I have seen no material and it is not possible to evaluate it from the brief description. In Hasskarl's herbarium at L there is a sheet from India labelled *Dysophylla gracilis* Dalzell in his handwriting. His name might therefore represent a new combination, but this is not likely as it does not explain why he gave a new diagnosis without reference to Dalzell".

38. PREMNA

(R.P.J. de Kok)

Premna L., Mant. Pl. Altera (1771) 154; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 100; Munir, J. Adelaide Bot. Gard. 7 (1984) 1; Mabb. in Mabb. & de Kok, Fl. Nouv.-Calédonie 25 (2004) 47; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 194; Bramley et al., Tree Fl. Sabah & Sarawak 7 (2011) 42; de Kok, Kew Bull. 68 (2013) 55. — Type: *Premna serratifolia* L.

Gumira Rumph. ex Hassk., Flora 25, 2, Beibl. (1842) 26. — Type: *Gumira domestica* Hassk. (= *Premna parasitica* Blume).

Pygmaeopremna Merr., Philipp. J. Sci., C 5 (1910) 225; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 160; Munir, J. Adelaide Bot. Gard. 7 (1984) 3. — Type: *Pygmaeopremna humilis* Merr. (= *Premna herbacea* Roxb.).

Surfacea Moldenke, Phytologia 46 (1980) 59. — Type: *Surfacea racemosa* (Wall. ex Schauer) Moldenke (= *Premna racemosa* Wall. ex Schauer).

Trees, shrubs, lianas, or rarely herb-like with twigs visible above ground and a short woody stem below ground, no exudate. *Twigs* often with a ridge between petioles, glabrous to velutinous, base of young twigs sometimes surrounded by bracts. *Leaves* simple, opposite to alternate or in whorls of 3 or 4, often aromatic when crushed; hairs simple to stellate or dendroid. *Inflorescences* terminal, flowers in lax to (very) dense corymbose cymes, rarely a spike. *Calyx* tubular or cupuliform, 2-lipped or sometimes actinomorphic, either 0–5-lobed; lobes isomorphic to heteromorphic, slightly accrescent or not, inside with a ring of long hairs inserted at the place of stamen attachment. *Corolla* narrowly funnel-shaped, 2-lipped (occasionally only weakly zygomorphic), 4- (or 5-)lobed, upper lip usually entire, rarely 2-lobed, lower lip 3-lobed, with median lobe largest, inner surface of corolla with dense white hairs. *Stamens* 4, equal to slightly didynamous, slightly exserted from the tube. *Ovary* (2–)4-locular, unlobed, with 1 or 2 ovules per locule, sometimes only one ovule developing, the other three suppressed (*P. trichostoma* group), style terminal, stigma 2-lobed. *Fruit* drupaceous, globose or clavoid, unlobed, remaining undivided; 4-seeded or 1-seeded by abortion, endocarp smooth to warty or with ridges; seeds exalbuminous to albuminous.

Distribution — 50 species in tropical and subtropical Asia and Africa, northern Australia and the Pacific Islands; in *Malesia* 14 species.

Habitat & Ecology — Occurring in evergreen, deciduous or secondary forests, in open vegetation, often along streams and on beaches. Altitude: sea-level to 2600 m.

Uses — The wood of the bigger species is sometimes used in house building or in the making of furniture or tools, as the wood is durable and resembles teak (Burkill, Dict. Econ. Prod. Malay Penins. (1935)).

Note — A number of species (*P. trichostoma* group, see de Kok (2013) 1) have at the base of the young twigs a series of small (usually < 1.5 cm long) decussate triangular scales. On older branches, these scales usually have fallen off, leaving a series of closely packed bract scars. Fruit-type is one of the traditionally undervalued taxonomic characters in this group. Two fruit types can be recognised (although the differences in shape are often more, or only, apparent when the fruit is dried): the first is a typical globose drupe-like fruit consisting of four somewhat fleshy mericarps, each with one seed. This fruit type is similar to those in *Clerodendrum* and *Vitex*. The second type (*P. trichostoma* group) is a clavoid (shape often only apparent when dry; can appear globose when fresh), single seeded drupe-like fruit (only one seed matures fully) consisting of one somewhat fleshy mericarp, reminiscent of the reduction in mericarp number in *Teijsmanniodendron* and some species of *Vitex*; endocarp, encompassing the 1–4 seeds within the drupe-like fruits, smooth or with a clear set of longitudinal ridges or warts.

KEY TO THE SPECIES

1a. Small shrub, sometimes mistaken for a herb, 0.05–0.3(–1) m tall. Leaves sessile to subsessile (petiole 0–0.4 cm long) . . . . . **3. P. herbacea**
b. Shrub, liana or tree more than 1 m high. Leaves distinctly petiolate (petiole ≥ 0.3 cm long) 2
2a. Calyx, inflorescence and usually leaves covered with stellate or dendroid hairs . . . . . **13. P. tomentosa**
b. Calyx, inflorescence and leaves glabrous or with simple hairs 3
3a. Inflorescences in compact cymes along spike-like axes. Petiole 0.3–0.5 cm long . . . . . **4. P. interrupta**
b. Inflorescences in corymbose cymes. Petiole 0.3–9 cm long 4
4a. Petiole whole or partly winged or leaves decurrent on petiole. — Endemic to Java, Bali and/or Sumatra 5
b. Petiole not winged, leaf base rounded to cordate or emarginate to cuneate 6
5a. Leaf decurrent along the whole petiole; leaves sparsely to densely hairy, venation pinnate, sometimes palmate at base. — Endemic to Sumatra . . **2. P. decurrens**
b. Petiole partly winged; leaves glabrous to sparsely hairy (only velutinous on Bali), venation palmate at base. — Endemic to Java and Bali (introduced to S Sumatra) . . . . . **8. P. parasitica**
6a. Mature leaves with hairs (usually) not only on the main veins, but also on both surfaces of the rest of the blade or at least at leaf base, often densely hairy . . . 7
b. Mature leaves glabrous or with only a few hairs on the main veins. 8
7a. Calyx 4-lobed. Fruits clavoid, with one seed developing fully . **5. P. oblongata**
b. Calyx 0–5-lobed. Fruits subglobose, with (1–)4 seeds developing fully. . . . . **6. P. odorata**
8a. Calyx 4-lobed. Young twigs with a series of bracts at base. Fruits globose or clavoid when dry, with only 1 seed developing fully 9
b. Calyx 0–5-lobed. Young twigs without a series of bracts at base. Fruits globose (when dry) with 4 seeds developing fully 12
9a. Leaf base markedly cordate, sometimes rounded, often palmately veined. — Philippines, New Guinea . . . . . **10. P. regularis**
b. Leaf base rounded to cuneate, rarely cordate, never palmately veined. — Throughout Malesia 10
10a. Fruit surface warty when dry. — Endemic to Borneo (Sabah, Sarawak) . . . . . **1. P. clavata**
b. Fruit smooth when dry. — Throughout Malesia 11
11a. Leaves membranaceous, with sunken glands below; a conspicuous false intramarginal vein present. — Endemic to Borneo (W Sarawak, W Kalimantan). . . . . **7. P. pallescens**
b. Leaves membranaceous to chartaceous with sessile glands below, intramarginal vein absent. — Throughout Malesia . . . . . **14. P. trichostoma**
12a. Leaves base rounded to cordate. Dry fruit warty. — Endemic to Peninsular Malaysia . . . . . **12. P. sterculiifolia**
b. Leaves base cuneate to (slightly) cordate. Dry fruit smooth to slightly warty. — Throughout Malesia 13

13a. Liana (or tree on Christmas Island). Leaf membranaceous. Inflorescences always velutinous. Central lobe of lower lip of the corolla with rounded to emarginate apex. Stamens 4–7 mm long, exserted from the corolla tube. — Sumatra to the Lesser Sunda Islands . . . . . **9. P. pubescens**

b. Shrub or small tree, sometimes scandent or creeping. Leaves chartaceous to membranaceous. Inflorescences glabrous to velutinous. Central lobe of lower lip of the corolla with rounded apex. Stamens 1–5 mm long, just exserted from the corolla tube. — Throughout Malesia . . . . . **11. P. serratifolia**

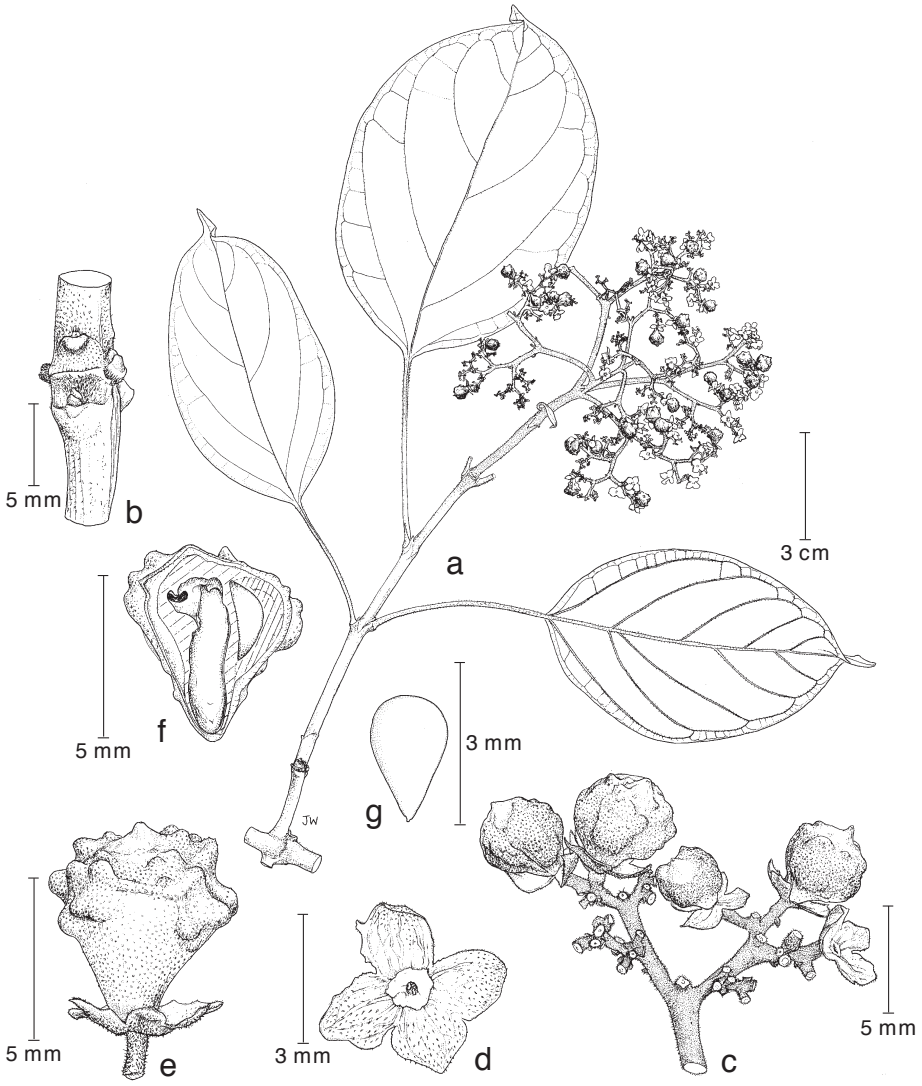

Fig. 37. *Premna clavata* de Kok. a. Habit; b. detail of base of young shoots; c. detail of inflorescences; d. calyx; e. fruit side view; f. fruit longitudinal section, side view; g. seed (a–d, g: *SAN (George et al.) 120965*; e, f: *SAN (Jimping) 119518*; all K). Drawn by Juliet Beentje.

1. **Premna clavata** de Kok

Premna clavata de Kok, Kew Bull. 68 (2013) 59. — Type: *George et al. 120965* (holo K; iso L, SAN), Borneo, Sabah, Kinabatangan, Sungai Tenegang Besar.

Liana, 5–7 m long. *Twigs* with a ridge between petioles, velutinous when young, base of young twigs surrounded by small bracts. *Leaves* (sub)opposite; blade elliptic to ovate, 9–12 by 4.5–9.5 cm, apex acuminate, base cuneate to slightly cordate, margins entire, often undulate, few hairs on both surfaces; main side veins 3–6, often tri-veined from the base; petioles 3.5–8.5 cm long, terete, covered with hairs. *Inflorescences* 8–14 cm long, corymbose cymes, velutinous; bracteoles linear, < 1 mm long. *Calyx* 4-lobed, lobes equal; flowering calyx unknown; fruiting calyx 4–6 mm diam., patent. *Corolla* greenish yellow, otherwise unknown. *Fruit* globose to clavoid, 4–6 by 4–6 mm, glabrous, endocarp warty when dry, black when mature. *Seeds* four with only one fully developing. — **Fig. 37.**

Distribution — Borneo: Endemic to Sabah and Sarawak.

Habitat & Ecology — Growing in secondary vegetation, often along rivers or on hills. Flowering: June; fruiting: June to July.

2. **Premna decurrens** H.J.Lam

Premna decurrens H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 36; de Kok, Kew Bull. 68 (2013) 60. — Type: *Lörzing 5854* (holo BO; iso BO, K, L, NY), Indonesia, Sumatra, Sibolangit, ten oosten van [east of] Bandarbaroe.

Liana to tree, 8–15 m long, dbh up to 70 cm; bark flaky, brown. *Twigs* without a ridge between petioles, densely hairy when young, becoming more glabrous as they mature, base of young twigs surrounded by bracts. *Leaves* opposite to alternate; blade elliptic to obovate, 9–30 by 5.5–20 cm, apex emarginate to acute, base cuneate, margins entire, membranaceous, sparsely to densely hairy on both surfaces; hairs simple, erect; glands black to yellow, sessile, venation pinnate, sometimes palmate at base, main side veins 3–7; petioles 1–3 cm long, channelled, leaf decurrent along the length of the petiole, covered with hairs. *Inflorescences* 22–30 cm long, corymbose cymes, velutinous; bracteoles linear, < 1.5 mm long. *Calyx* 4-lobed, clearly 2-lipped, sparsely hairy; flowering calyx 2–2.2 mm long; lobes almost isomorphic, 0.2–0.4 mm long, apex rounded; fruiting calyx unknown. *Corolla* tube 1.5–2 mm long; lobes equal, glabrous apart from some hairs at apex of lobes, inside long hairs at mouth, (creamy-) white; central lobe of lower lip oblong, 1.2–1.5 by 1–1.2 mm, apex rounded, reflexed when mature; other lobes 1–1.2 by 1–1.2 mm, apex rounded, reflexed when mature. *Stamens* 3–6 mm long, greatly exceeding tube, not didynamous; anthers rounded, c. 0.4 mm long. *Ovary* globose, c. 1 mm diam., glabrous, glands absent. *Style* 3–4 mm long, lobes c. 1 mm long. *Fruit* unknown.

Distribution — Endemic to N Sumatra.

Habitat & Ecology — Sporadically growing in open (including secondary) forest or along rivers. Altitude: 600–1250 m. Flowering: February to July.

3. **Premna herbacea** Roxb.

Premna herbacea Roxb., Hort. Bengal. (1814) 46; Fl. Ind. ed. 1832, 3 (1832) 80; Munir, J. Adelaide Bot. Gard. 7 (1984) 7; de Kok, Kew Bull. 68 (2013) 61. — *Gumira herbacea* (Roxb.) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — *Tatea herbacea* (Roxb.) Junell, Symb. Bot. Upsal. 1 (1934) 85. — *Pygmaeopremna herbacea* (Roxb.) Moldenke, Phytologia 2 (1941) 54. — Lectotype (designated by Rajendran & Daniel, Indian Verbenac. (Taxonom. Revis.) (2002) 245): Roxb., Icon., t. 1461 (lecto CAL; isolecto K).

Pygmaeopremna humilis Merr., Philipp. J. Sci., C 5 (1910) 225; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 161; Munir, J. Adelaide Bot. Gard. 7 (1984) 8. — *Tatea humilis* (Merr.) Junell, Symb. Bot. Upsal. 1 (1934) 85. — Syntypes: *Ramos 7841* (K), Philippines, Luzon, Province of Cagayan; *Ramos 8124* (BM, K, US), Philippines, Luzon, Province of Isabella, Ilagan.

Premna sessilifolia H.J.Lam, Verbenaceae Malayan Archipel. (1919) 133; Munir, J. Adelaide Bot. Gard. 7 (1984) 8. — *Pygmaeopremna sessilifolia* (H.J.Lam) Moldenke, Known Geogr. Distrib. Verb. Avicenn. ed 2. (1942) 78. — Type: *Schlechter 18303* (holo L; iso P), New Guinea [Papua New Guinea], near Kenegia River.

Premna angustifolia H.J.Lam, Verbenaceae Malayan Archipel. (1919) 118. — *Pygmaeopremna angustifolia* (H.J.Lam) Moldenke, Phytologia 6 (1959) 448. — Type: *Ledermann 13017* (holo L), New Guinea [Papua New Guinea], Etappenberg.

Small shrub, sometimes mistaken for a herb, 0.05–0.3(–1) m tall, woody stem mostly underground with creeping rhizome, above ground with one to few branching perennial herbaceous looking stems, base of young twigs without bracts. *Leaves* opposite; blade very narrowly ovate to elliptic, often obovate, (1.5–)3–12(–14) by (2–)3–7(–10) cm, apex acute to pseudoground, membranaceous to subchartaceous, glabrous with few hairs along margin and on veins, beneath often with minute glands, bright to pale green to light yellowish green above, green to whitish below; main side veins 5 or 6; petioles 0–4 mm long, puberlous. *Inflorescences* 1–7 cm long, corymbose cymes, densely glandular and puberlous; bracteoles linear, < 1 mm long. *Calyx* lobes 5, subequal, 0.5–1 mm long, apex obtuse; flowering calyx 1.5–2.5 mm long, pale green; fruiting calyx 3–5 mm diam., erect. *Corolla* tube 1.5–2 mm long, 2-lipped, glabrous to sparsely hairy on lobes, red to purplish or (greenish) white or greenish yellow; central lobe of lower lip orbicular, reflexed, 1.5–2.5 by 1.5–2 mm, white with a yellow base; side lobes of lower lip 1–1.5 by 1–1.8 mm, apex acute to rounded; upper lip 1.5–2(–2.5) mm diam., apex

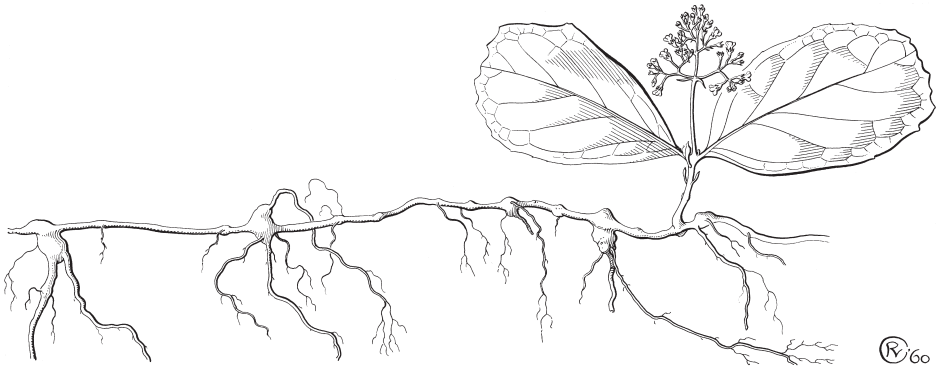

Fig. 38. *Premna herbacea* Roxb. Shrublet (origin unknown). Drawing by Ruth van Crevel, 1960.

rounded. *Stamens* 0.8–1.3 mm long, ± didynamous, slightly exserted; anthers c. 0.5 mm long. *Ovary* globose, c. 1 mm diam., glabrous, glandular at apex. *Style* 0.7–1.2 mm long. *Fruit* globose, 5–8 by 4–8 mm, glabrous, glossy, red to black when mature, endocarp with clear ridges. *Seeds* four, all developing into maturity. — **Fig. 38.**

Distribution — India to Hainan in China to Australia (Northern territories and Kimberley regions); in *Malesia*: Philippines, Papua New Guinea.

Habitat & Ecology — Growing in dry deciduous, pine or secondary forest to dry or periodically inundated (sometimes *Themeda* or *Imperata* dominated, sometimes with *Melaleuca* spp.) grasslands, that are periodically (sometimes yearly) burned. Soil: poor sand to (sandy) loam. Altitude: 25–1000 m. Flowering: April to November; fruiting: March to October.

4. **Premna interrupta** Wall. ex Schauer

Premna interrupta Wall. ex Schauer in A.DC., Prodr. 11 (1847) 633; de Kok, Kew Bull. 68 (2013) 62. — *Gumira interrupta* (Wall. ex Schauer) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — *Surfacea interrupta* (Wall. ex Schauer) Moldenke, Phytologia 46 (1980) 60. — Type: *Wallich Cat. 1778* (holo G-DC; iso BM, K, K-W, SING), Nepal.

Premna derryana King & Gamble, Bull. Misc. Inform. Kew (1908) 107; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 110. — Type: *Derry (Curtis) 3701* (holo CAL; iso K, SING), Peninsular Malaysia, Perak, Larut Hill.

Tree or shrub, with drooping branches or a climber, 2–4 m tall, dbh c. 3 cm; bark light brown. *Twigs* with a ridge between petioles, glabrous to few hairs, base of young twigs surrounded by small bracts. *Leaves* opposite; blade elliptic to ovate, 14–20 by 6.5–9.5 cm, apex acuminate, base cuneate, margins entire, membranaceous, glabrous; main side veins 4–7, often tri-veined from the base; petioles 0.3–0.5 cm long, channelled, glabrous, purplish. *Inflorescences* 14–20 cm long, compact cymes along 1–4 spike-like axes, velutinous at least when young; bracteoles linear, < 1 mm long. *Calyx* 4-lobed; flowering calyx 2–3 mm long, pale green; lobes often obscure, clearly 2-lipped, 0–1 mm long, apex acute to round; fruiting calyx similar to flowering calyx. *Corolla* tube 1.5–2 mm long, 2-lipped, externally glabrous, pale green to white turning pink, scented; central lobe of lower lip oblong, 2.2–3 by 1–2 mm, apex rounded, reflexed, white with yellow spot at base; side lobes of lower lip 1–1.2 by 1.2–2 mm, apex rounded to acute; upper lip oblong 1.5–2 by 1.5–2 mm diam., apex emarginate, erect. *Stamens* 7–10 mm long, excluded the corolla tube, strongly didynamous, green; anthers c. 0.5 mm long, purple. *Ovary* globose, c. 1 mm diam., glabrous, glands absent. *Style* 4–5 mm long, stigma c. 0.5 mm long, apex acute. *Fruit* clavoid, 2–2.5 by 1.5–2 mm, glabrous, endocarp smooth. *Seeds* four with only one developing into maturity.

Distribution — Nepal and N India east to S China and Vietnam; in *Malesia*: Peninsular Malaysia (Perak: Larut Hill and Maxwell's Hill).

Habitat & Ecology — Growing in primary lower montane forest, sometimes on limestone. Altitude: 1100–1450 m in Peninsular Malaysia. Flowering and fruiting: September to March.

5. **Premna oblongata** Miq.

Premna oblongata Miq., Fl. Ned. Ind. 2 (1859) 893; de Kok, Kew Bull. 68 (2013) 64. — *Gumira oblongata* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Neotype (designated by De Kok 2013): *Koorders 38261β* (neo K; isoneo L), Indonesia, Java, Pasoeroean.

Premna rotundifolia Koord. & Valeton, Meded. Lands Plantentuin 42 (1900) 182. — Type: *Koorders 14360β* (holo BO; iso BO, K, L), Indonesia, Java, Res. Besoeki, Idjen plateau.

Premna membranacea Merr., Gov. Lab. Bur. Bull. 35 (1905) 65; Philipp. J. Sci. 1, Suppl. (1906) 230. — Syntypes: *FB (Ahern's collector) 1165* (NY, US), Philippines, Luzon, Rizal Prov.; *FB (Ahern's collector) 3102* (K, NY), Philippines, Luzon, Rizal Prov.

Premna oswaldii Moldenke, Phytologia 5 (1954) 16 ('*oswaldi*'). — Type: *Koorders 25810β* (holo BO; iso BO, L), Indonesia, Java, Preanger, Tjiandjoer Afd., Djampang-wetan Dist., Takoka.

Premna sterculiifolia King & Gamble var. *bakhuizenii* Moldenke, Phytologia 5 (1954) 20 ('*bakhuizeni*'). — Type: *Bakhuizen van den Brink 6373* (holo BO; iso BO, K, L), Indonesia, Java, Batavia, Pasir Tjarèwèd.

Climber, shrub or small tree (often with gnarled trunk), 1.5–18 m high, dbh up to 30 cm. *Twigs* usually with ridge between petioles, velutinous when young, base of young twigs surrounded by bracts. *Leaves* alternate to (pseudo-)opposite; blade rounded to obovate or obovate, 5–28 by (3–)6–18 cm, apex round to acuminate, base rounded to cordate, margins entire, undulate; main side veins 5–7, often tri-veined from the base, velutinous on both surfaces or at least at leaf base; glands few; petioles 1–7 cm long, covered with curly to straight hairs. *Inflorescences* 5–15 cm long, corymbose cymes, velutinous; bracteoles linear, < 1 mm long. *Calyx* 4-lobed; flowering calyx 1.5–2 mm long, pale green; lobes (sub)equal 0.3–0.5 mm long, apex round to acute; fruiting calyx similar to flowering one. *Corolla* tube 2–2.5 by 1–1.5 mm, weakly 2-lipped, lobes equal, glabrous outside apart from some hairs on lobes, inside long hairs at mouth, white to whitish green or yellow; lobes 1–2 by 1–1.2 mm, apex rounded to acute, reflexed when mature. *Stamens* 2–3.5 mm long, greatly exceeding tube, sometimes didynamous, anthers 0.3–0.5 mm long. *Ovary* globose, 0.5–1 mm diam., glabrous, glands absent or few at apex. *Style* 2–4.5 mm long, stigma 0.5–1 mm long, apex acuminate. *Fruit* clavoid when dry, 2.5–4 mm long, glabrous, glands absent, dark or yellow green, endocarp smooth. *Seeds* four with only one fully developing into maturity.

Distribution — Sumatra, Java, Borneo, Philippines, Sulawesi.

Habitat & Ecology — Common in primary to secondary vegetation, sometimes epiphytic, sometimes growing on bare and hardly eroded lava blocks. Soil: yellow clay, sometimes over ultrabasic rock or basalt. Altitude: 240–1600 m. Flowering: February to August; fruiting: April to August.

Vernacular names — Java: Kangean Island: Djabaoe larbat. Borneo: Sabah: Puluran (Dusun). Philippines: Alamag (Tagalog).

6. **Premna odorata** Blanco

Premna odorata Blanco, Fl. Filip. (1837) 488; Merr., Sp. Blancoan. (1918) 331; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 153; de Kok, Kew Bull. 68 (2013) 64. — *Gumira odorata* (Blanco) Kuntze, Revis. Gen. Pl. 2 (1891) 508; Munir, J. Adelaide Bot. Gard. 7 (1984) 35. — *Premna pubescens* Blume var. *odorata* (Blanco) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 153. — Neotype (designated by Munir (1984) 35): *PNH (Tadena) 9602* (neo BRI; isoneo BM), Philippines, Laguna Province, Mt Makiling.

Premna vestita Schauer in A.DC., Prodr. 11 (1847) 631; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 153. — *Gumira vestita* (Schauer) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Type: *Cuming 599* (holo B; iso BM, K), in Insulis Philippinis.

Premna leucostoma Miq., Fl. Ned. Ind. 2 (1859) 899. — *Gumira leucostoma* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Syntypes: *Horsfield s.n.* (K), Indonesia, Java, Patjitan, Kelak; *Horsfield 929* (K), Indonesia, Java, Kelak.

Premna rufidula Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 569. — Type: *Teijsmann 339* (holo U; iso BO), Indonesia, Zuid Sumatra, Lampong Province, prope Tega-nennin.

Premna flavescens Buch.-Ham. ex C.B.Clarke var. *rubens* C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 578. — *Premna rubens* (C.B.Clarke) Ridl., Fl. Malay Penins. 2 (1923) 618. — Syntypes: *Griffith s.n.* (K), Malaysia Malacca; *Griffith KD 6020* (K, Hb. Hook.f.), Malaysia, Malacca.

Premna subscandens Merr., Philipp. J. Sci. 1, Suppl. (1906) 230; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 153. — Syntypes: *Ahern's collector 443* (BM, K, NY, US), Philippines, Luzon, Rizal Province, Antipolo; *Ahern's Collector 449* (BM, K, NY), Philippines, Luzon, Rizal Province, Antipolo; *Clark 1095* (K, NY), [Philippines,] Ticao; *Merrill 1874* (K, NY), Philippines, Luzon, Rizal Province, Bosoboso.

Premna depauperata Merr., Philipp. J. Sci. 1, Suppl. (1906) 231. — Type: *Merrill 603* (holo PNH; iso K, L, NY, US), Philippines, Culion.

Premna ruttenii H.J.Lam, Verbenaceae Malayan Archipel. (1919) 114. — Type: *Rutten 621* (holo U) [Malaysia, Sabah,] East Borneo, Bulongan, near Sadjan river.

Premna peekelii H.J.Lam, Verbenaceae Malayan Archipel. (1919) 115. — Type: *Peekel 794* (holo B†), Papua New Guinea, New Britain, Neu Pommern, Vunapope.

Premna curranii H.J.Lam, Verbenaceae Malayan Archipel. (1919) 116. — Type: *FB (Curran) 19022* (holo L), Philippines, Manila.

Premna oblongata Miq. var. *puberula* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 127; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 38. — Type: *Elmer 9388* (holo L; iso K), Philippines, Luzon, Lucban, Tayabas.

Premna inaequilateralis E.Beer & H.J.Lam, Blumea 2 (1936) 226. — Type: *Brass 5536* (holo BRI; iso L, NY), Papua New Guinea, Papua, Central Division, Mafulu, near Kenegia River.

Premna depauperata Merr. var. *oswaldiana* Moldenke, Phytologia 5 (1954) 14. — Type: *Riedel s.n.* (holo BO, sheet no. 22126; iso K), Indonesia, Celebes, Gorontalo.

Premna depauperata Merr. var. *serrulata* Moldenke, Phytologia 5 (1954) 14. — Type: *BS (Lopez) 41360* (holo PNH†; iso BO, NY), Philippines, Culion.

Premna subscandens Merr. var. *minutiflora* Moldenke, Phytologia 5 (1954) 20. — Type: *FB (Ahern's Collector) 443* (holo NY; iso BM, K, US), Philippines, Luzon, Rizal, Antipolo.

Small tree, shrub or liana, 1–10(–25) m tall, dbh 15–30 cm; bark smooth to flaky fissured, cream-grey to brownish ochre; sapwood cream to ochre. *Twigs* velutinous when young, with or without ridge between petioles, densely brownish pubescent, base of young twigs without bracts. *Leaves* opposite; blade ovate or obovate, rotundate to lanceolate, 2.5–16(–20) by (2–)4–10(–13.5) cm, apex emarginate to acuminate, base emarginate to cordate, margins entire to serrate, membranaceous or subchartaceous, pubescent, crushed leaves with disagreeable smell, yellowish green above, whitish below; hairs single, erect, covering both surfaces or rarely only on veins with few hairs on blade; glands present; venation often tri-veined from base, main side veins 3–7; petioles 0.3–7 cm long, velutinous to sparsely hairy. *Inflorescences* 4–15 cm long, corymbose cyme, puberlous; bracteoles linear, < 1 mm long. *Calyx* usually 2-lipped, 0–5-lobed; flowering calyx 1.5–3 mm long, densely pubescent, slightly accrescent; lobes 0.5–1 mm long when present, subequal apex rounded to subacute; fruiting 3–6 mm diam., variously lobed, patent. *Corolla* tube 1–3 by 1–2 mm, (weakly) 2-lipped, externally

glabrous to sparsely hairy on lobes, yellow orange to pinkish white or greenish white, corolla (yellowish or pale) green or white, aromatic; central lobe of lower lip ovate-orbicular or oblong to spatulate, 1.5–2 by 0.8–2 mm, apex rounded to obtuse, glabrous, whitish green; other lobes 1–1.5 by 0.8–1.5 mm, apex rounded, glabrous. *Stamens* 1–3 mm long, exserted, ± didynamous; anthers 0.2–0.5 mm long. *Ovary* globose, c. 1 mm diam., glabrous sometimes with a few hairs at apex, sometimes covered with glands. *Style* 2–7 mm long, exserted, stigma 0.1–0.5 mm long, apex acute. *Fruit* subglobose, 3–5 diam., glabrous, sometimes with a few hairs at apex, sometimes covered with glands, black to purple when mature, endocarp smooth. *Seeds* (1–)4 and equally developed when mature.

Distribution — Sri Lanka and East coast of India to S China to Australia's Northern Territory and Queensland; in *Malesia*: Peninsular Malaysia, rarely collected in Sumatra, Borneo, Java, Philippines, Lesser Sunda Islands, Maluku and New Guinea.

Habitat & Ecology — Usually common in primary and secondary vegetations. Soil: clay, sometimes over limestone or ultrabasic rock. Altitude: 25–1800 m. Flowering: throughout the year; fruiting: March to November.

Vernacular names — Sumatra: Waits-kedi (Lampong area). Java: Sengkĕl (Sundanese). Philippines: Alagao, Alagaw-bagin, Alagbaguin (Tagalog); Karimog (Maranao); Uradgao (Viscaya). Lesser Sunda Islands: Timor: Kleob katoe. Moluccas: Halmahera: Somoko (Tobaro). Papua New Guinea, New Britain: Kua.

Uses — In Peninsular Malaysia, the roots and leaves are used for medicinal purposes (Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1807).

7. **Premna pallescens** Ridl.

Premna pallescens Ridl., Bull. Misc. Inform. Kew (1929) 261; de Kok, Kew Bull. 68 (2013) 67. — Type: *Haviland 3052* (holo SING; iso K), Malaysia, Sarawak, Kuching.

Tree or climber, 6–18 m tall, dbh 15–20 cm; bark reddish brown to silver-beige, inner bark orange. *Twigs* without a ridge between the petioles, sparsely hairy to glabrous, base of young twigs surrounded by small bracts. *Leaves* opposite to alternate; blade elliptic to obovate, 7–22 by 2.5–7.5 cm, membranaceous, apex acuminate to long acuminate, base cuneate to round, margins entire, glabrous when mature, with hairs on veins or when young, pale whitish green beneath, lime-green above; glands sunken into leaves below, many; venation pinnate: main side veins 5–8, conspicuous false intramarginal vein present; petioles 0.5–4.5 cm long, channelled, sparsely with short hairs to glabrous. *Inflorescences* 3.5–10 cm long, corymbose cymes, sparsely hairy, dull green; bracteoles linear, < 3 mm long. *Calyx* 4-lobed, 2-lipped, with prominent reticulate venation when dried; flowering calyx 2–2.2 mm long, outer surface glabrous; glands sessile, yellow-white; lobes isomorphic, 0.8–1 mm long, apex rounded; fruiting calyx similar to flowering calyx. *Corolla* tube 1–1.8 mm long, lobes equal, glabrous apart from some hairs at apex, inside long hairs at mouth; central lobe of lower lip spatulate, 0.8–1 by 1–0.8 mm, apex rounded, reflexed when mature; other lobes 0.5–1 by 0.5–0.8 mm, apex rounded, reflexed when mature. *Stamens* 1.5–2 mm long, just exceeding tube, not didynamous, inserted on top of tube; anthers rounded, c. 0.2 mm long. *Ovary* globose, c. 1 mm diam., glabrous. *Style* 1.5–3.5 mm long, lobes c. 0.2 mm

long. *Fruit* 3–4.5 by 1.5–2 mm, with glands, endocarp smooth when dry. *Seeds* four with only one developing into maturity.

Distribution — Endemic to Borneo (W Sarawak, W Kalimantan).

Habitat & Ecology — Growing in primary to disturbed hill dipterocarp forest, along streams. Soil: basalt derived soils. Altitude: 250–500 m. Flowering and fruiting: October to March.

Vernacular name — W Kalimantan: Akah kasubu.

8. **Premna parasitica** Blume

Premna parasitica Blume, Bijdr. 14 (1826) 816; de Kok, Kew Bull. 68 (2013) 68. — *Gumira parasitica* (Blume) Hassk., Cat. Hort. Bot. Bogor. (1844) 135. — Type: *Blume s.n.* (holo BO; iso BO, K, L, NY) Indonesia, Java.

Premna parasitica Blume var. *hatusimae* Moldenke, Phytologia 5 (1954) 18. — Type: *De Voogd 2031* (holo BO; iso L), Indonesia, Bali, Batou.

Tree or climbing shrub, 5–11(–26) m tall. *Twigs* without a ridge between petioles, densely hairy when young, becoming more glabrous as they mature, base of young twigs surrounded by bracts. *Leaves* opposite to alternate, grouped together at the end of the twigs; blade elliptic to rounded, 15–24 by 8–18 cm, apex rounded to acute, base cuneate to cordate, margins entire, glabrous to sparsely hairy or velutinous on Bali, pale yellowish green; glands black to yellow, sessile, many; venation palmate at base, pinnate higher up, main side veins 4–6; petioles 0.5–3.5 cm long, partly winged, glabrous to covered with curly hairs, becoming more glabrous as they mature, remaining velutinous on Bali. *Inflorescences* 5–25 cm long, corymbose cymes, velutinous to sparsely hairy; bracteoles linear, < 1.5 mm long. *Calyx* 4-lobed; flowering calyx 2–2.2 mm long, outer surface glabrous; lobes almost isomorphic, 2-lipped, 0.8–1 mm long, apex rounded, back lobes slightly larger and more fused; glands yellow-white, sessile, fruiting calyx similar as flowering calyx. *Corolla* tube 2.5–3.5 mm long, lobes almost isomorphic, glabrous apart from some hairs at the apex, greenish white, scentless; central lobe of lower lip oblong, 1.5–2.5 by 1–1.5 mm, apex rounded, reflexed when mature, green; other lobes 1.5–2 by 1–1.5 mm, apex rounded, reflexed when mature. *Stamens* 2.5–3 mm long, greatly exceeding tube, not didynamous, white; anthers rounded, 0.2–0.5 mm long. *Ovary* globose, c. 1 mm diam., glabrous. *Style* 4–5 mm long, lobes 0.5–1 mm long. *Fruit* clavoid when dry, 3–4 by 1.5–1.8 mm, with glands, green violet, endocarp smooth when dry. *Seeds* four with only one developing into maturity.

Distribution — Java and Bali, introduced at least once to S Sumatra in the 19th century.

Habitat & Ecology — Found in small numbers growing along forest edges, sometimes on old lava flows. Altitude: 300–1700 m. Flowering: October to February; fruiting: December to January. Fruits of this species are sometimes infected by an unknown entity which causes 3–4 cm long round or cigar-shaped galls which resemble the fruits of *Cyrtandra* J.R.Forst. & G.Forst. (Gesneriaceae).

Vernacular namse — Java: Areuj ki djati, Areuj ki hoedyam (Sundanese); Djati moelje (Javanese); Moempol (Mandurese).

Uses — In E Java the leaves are used by woman after childbirth.

Note — The Bali population is morphologically distinct (see De Kok (2013) 69) and has only been collected twice and not since 1958. It is reported to occur in small populations from areas which are now for the most part deforested.

9. Premna pubescens Blume

Premna pubescens Blume, Bijdr. 14 (1826) 816; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 152; de Kok, Kew Bull. 68 (2013) 69. — *Gumira pubescens* (Blume) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Type: *Blume s.n.* (holo L), Indonesia, Java, ad pedem monjusstis Tjerimai.

Premna lucidula Miq., Fl. Ned. Ind. 2 (1859) 898. — *Gumira lucidula* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Lectotype (designated by Rajendran & Daniel, Bull. Bot. Surv. India 32 (1992) 191): *Horsfield s.n.* (lecto BM; isolecto BM), Indonesia, Java, in Patjitan.

Premna nervosa Koord. & Valeton, Meded. Lands Plantentuin 42 (1900) 186. — Type: *Koorders 22039ß* (holo BO; iso BO, K, L), Indonesia, Java, Noesa Kambangan.

Premna pubescens Blume var. *subglabra* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 153, nom. illeg. (autonym). — Syntypes: *Boerlage 462* (L), Indonesia, Java, Tjiomas, Gunung Wangon; *Colfs 144* (L), Indonesia, Sumbawa, Kailou Kesi; *Forbes 2621* (BM, K, L), Indonesia, Sumatra, Palembang, Moesi River, Lampar; *van Hall 96* (L), Indonesia, Java; *Zippelius 55* (L), Indonesia, Timor; *Zollinger 645* (BM, L, P), Indonesia, Java

Premna subscandens Merr. var. *glabrescens* Moldenke, Phytologia 8 (1962) 163. — Type: unknown.

Liana or tree, up to 8(–20) m tall on Christmas Island. *Twigs* with a ridge between petioles, sparsely hairy when young, becoming more glabrous as they mature, base of young twigs without bracts. *Leaves* opposite; blade ovate to obovate, 4–16 by 2–10 cm, apex emarginate to acuminate, base cordate to cuneate, sometimes oblique, margins entire to rarely serrate, membranaceous, glabrous with few hairs on main veins; glands yellow, sessile; main side veins 3–5, often tri-veined from the base; petioles 1–2.5 cm long, channelled, glabrous to covered with hairs. *Inflorescences* 2–10 cm long, corymbose cymes, velutinous; bracteoles linear, < 1 mm long. *Calyx* 5-lobed, obscurely 2-lipped, outer surface with a few hairs to velutinous, yellow sessile glands; flowering calyx 1.8–3 mm long; lobes 0.5–1 mm long, apex acute to rounded; fruiting calyx 3–4 mm diam., variously lobed. *Corolla* tube 2–5 by 2–2.5 mm, clearly 2-lipped, externally glabrous to sparsely hairy on lobes, inner surface densely covered with white hairs, white; glands yellow, sessile; central lobe of lower lip oblong, 2.2–3 by 1–2 mm, apex rounded to emarginate; side lobes of lower lip 1–2 by 1.2–2 mm, apex rounded; upper lip oblong 1–2 by 1–1.5 mm, apex rounded. *Stamens* 4–7 mm long, greatly exceeding the tube, ± didynamous, long hairs at base; anthers c. 0.5 mm long. *Ovary* globose, 0.5–1.3 mm diam., glabrous with few hairs at apex, glands absent to few present. *Style* 3.5–7 mm long, exceeding corolla tube, stigma c. 0.5 mm long, apex acute. *Fruit* globose when dry, 4–5 mm diam., glabrous, black, endocarp smooth to warty when dry. *Seeds* four, equally developed when mature.

Distribution — Sumatra, Java, Philippines, Lesser Sunda Islands; Australia: Christmas Island (Indian Ocean).

Habitat & Ecology — In Indonesia a rare species, sometimes growing in *Tectona* forest. Altitude: 25–750 m. On Christmas Island, commonly growing on (exposed) ter-

raced cliffs, in thin soils over limestone. Flowering: July to February; fruiting: October to February.

Vernacular names — Java: Sengkĕl (Sundanese). Lesser Sunda Islands: Timor: Nour nuif (SW Timor).

10. *Premna regularis* H.J.Lam

Premna regularis H.J.Lam, Verbenaceae Malayan Archipel. (1919) 131; de Kok, Kew Bull. 68 (2013) 70. — Lectotype (designated by De Kok (2013) 70): *Schlechter 18468* (lecto L; isolecto BM, K, NY, SING, US), Papua New Guinea, Kaiser-Wilhelmsland, Bismarck Mountains.

Premna serratifolia Blanco, Fl. Filip., ed. 2 (1845) 342, nom. illeg. (non L.); Merr., Sp. Blancoan. (1918) 332; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 153. — Type: lost.

Premna subrotundifolia Elmer ex H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 36. — Type: *Elmer 16711* (holo BO; iso BM, K, L, NY), Philippines, Luzon, Irosin, Mt Bulusan.

Premna membranacea Merr. var. *cordata* Merr., Enum. Philipp. Fl. Pl. 3 (1923) 391. — Type: *BS (Ramos & Pascasio) 34861* (holo PNH†; iso K, US), Philippines, Siargao.

Premna novoguineënsis Moldenke, Phytologia 5 (1954) 87. — Type: *Docters van Leeuwen 10575* (holo BO; iso L), Indonesia, Dutch New Guinea [= Papua], Nassau Mountains.

Tree to liana (sometimes epiphytic), up to 5 m high, dbh c. 3 cm. *Twigs* without a ridge between petioles, densely hairy when young, becoming more glabrous as they mature, base of young twigs surrounded by bracts. *Leaves* opposite to alternate; blade elliptic to rounded, 6.5–20 by 5–14 cm, apex rounded to acuminate, base markedly cordate, sometimes rounded, margins entire, membranaceous, glabrous when mature, with hairs on veins or when young; glands black to yellow, sessile, many; main side veins 4–6, venation often palmate, sometimes pinnate; petioles 3–6 cm long, channelled above, covered with curly hairs, becoming more glabrous as they mature. *Inflorescences* 5–15 cm long, corymbose cymes, white to shiny green or violet, velutinous to sparsely hairy; bracteoles linear, < 1.5 mm long. *Calyx* 4-lobed, 2-lipped, lobes almost isomorphic, outer surface with few hairs, yellow-white, sessile glands; flowering calyx 1–1.7 mm long; lobes 0.2–0.5 mm long, apex rounded; fruiting calyx 1–1.5 mm long, erect to patent. *Corolla* tube 2.8–3.2 mm long, lobes almost equal, reflexed when mature, glabrous, white to green, fragrant; central lobe of lower lip spatulate to oblong, 1–1.5 by 1.2–1.5 mm, apex rounded to acute; side lobes of lower lip oblong, 1–2 by 1–1.2 mm, apex acute; upper lobe 1–1.5 by 1.2–1.5 mm, apex rounded. *Stamens* 4–5 mm long, exceeding tube, not didynamous, white; anthers rounded, 0.3–0.5 mm long. *Ovary* globose, 0.5–1 mm diam., glabrous, with a few glands present. *Style* 4–10 mm long, white, lobes 0.5–0.8 mm long. *Fruit* clavoid when dry, 3–5 mm long, smooth, many small glands present, (dark) purple when mature, endocarp smooth. *Seeds* four with only one fully developing into maturity.

Distribution — Philippines, New Guinea.

Habitat & Ecology — Growing as an epiphytic climber or small tree along streams or rainforest margins. Soil: (fine brown) clay. Altitude: 100–760(–1394) m. Flowering: April to October; fruiting: May to November.

Vernacular name — Philippines: Malaapi (Tagalog).

11. Premna serratifolia L.

Premna serratifolia L., Mant. Pl. Altera (1771) 253; Munir, J. Adelaide Bot. Gard. 7 (1984) 13; de Kok, Kew Bull. 68 (2013) 71. — *Gumira serratifolia* (L.) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — *Premna obtusifolia* R.Br. var. *serratifolia* (L.) Moldenke, Phytologia 28 (1974) 403. — *Premna obtusifolia* R.Br. forma *serratifolia* (L.) Moldenke, Phytologia 36 (1977) 438. — Lectotype (designated by Munir (1984) 13): *Koenig s.n.* in *Herb. Linn. 782.4* (lecto LINN), India.

[*Gumira silvestris* Rumph., Herb. Amboin. 3 (1743) 209, t. 134, nom. invalid. (pre-linnean); see: Merr., Interpr. Herb. Amboin. (1917) 450, for interpretation]. — *Gumira domestica* Hassk., Flora 25, 2, Beibl. (1842) 26. — *Gumira integrifolia* Hassk., Cat. Hort. Bot. Bogor. (1844) 135, nom. superfl. — Type: Rumphius, Herb. Amboin. 3 (1743) 209, t 134.

Cornutia corymbosa Burm.f., Fl. Ind. (1768) 132, t. 411, f. 1, nom. illeg. (non Lam.). — *Premna integrifolia* L., Mant. Pl. Altera (1771) 252, nom. superfl. — *Premna corymbosa* (Burm.f.) Schauer in A.DC., Prodr. 11 (1847) 632, nom. illeg. (non Rottler & Willd., Neue Schriften Ges. Naturf. Freunde Berlin 4 (1803) 187). — *Gumira integrifolia* Kuntze, Revis. Gen. Pl. 2 (1891) 507, nom. superfl. — Lectotype (designated by Verdcourt, Fl. Trop. E. Africa, Verben. (1992) 73): *Hermann 2:1* (lecto BM-HERM), Ceylon [= Sri Lanka].

Premna obtusifolia R.Br., Prodr. Fl. Nov. Holland. (1810) 512. — *Premna integrifolia* L. var. *obtusifolia* (R.Br.) C.Pei, Mem. Sci. Soc. China 1 (1932) 75. — *Premna corymbosa* (Burm.f.) Schauer var. *obtusifolia* (R.Br.) H.R.Fletcher, Notes Roy. Bot. Gard. Edinburgh 19 (1936) 178. — Type: *Brown s.n.* (= *Bennett 2324*) (holo BM), Australia, Prince of Wales Island.

Premna foetida Reinw. ex Blume, Bijdr. 14 (1826) 816. — *Gumira foetida* (Reinw. ex Blume) Hassk., Cat. Hort. Bot. Bogor. (1844); H.J.Lam, Verbenaceae Malayan Archipel. (1919) 153. — Syntype: *Reinwardt s.n.* (syn L), Indonesia, Java.

[*Premna doncaria* Buch.-Ham. ex Wall., Numer. List (1828) 2647, nom. inval., nom. in synon.; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 36, erroneously as Wall. Cat. n. 2147.]

Premna timoriana Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 402. — Type: *Baudin s.n.* (holo not located; iso K, NY), Timor.

Premna nauseosa Blanco, Fl. Filip. (1837) 489; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 159; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 44. — *Gumira nauseosa* (Blanco) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — *Premna integrifolia* Blanco, Fl. Filip., ed. 2 (1845) 342, nom. superfl. — Type: lost.

Premna syringifolia Zipp. ex Span., Linnaea 15 (1841) 330; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 37. — Syntypes: *Zippelius s.n.* (syn L 2 sheets), Indonesia, Timor.

Premna tiliifolia Zipp. ex Span., Linnaea 15 (1841) 330; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 37. — Type: *Zippelius s.n.* (holo L), Indonesia, Timor.

Premna divaricata Wall. ex Schauer in A.DC., Prodr. 11 (1847) 631; Rajendran & Daniel, Indian Verbenac. (Taxonom. Revis.) (2002) 235. — *Gumira divaricata* (Wall. ex Schauer) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — Type: *Wallich Cat. 1781* (holo G; iso K-W), Malaysia, Caput Rochado freti Malayani.

Premna abbreviata Miq., Fl. Ned. Ind. 2 (1859) 892. — *Gumira abbreviata* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — Syntypes: *Blume 1101* (syn L 2 sheets), Indonesia, Java.

Premna ceramensis Miq., Fl. Ned. Ind. 2 (1859) 893. — *Gumira ceramensis* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — Type: *Forsten s.n.* (holo L), Indonesia, Klein-Ceram, Piroe.

Premna laevigata Miq., Fl. Ned. Ind. 2 (1859) 895. — *Gumira laevigata* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — Type: *Diepenhorst HB 2147* (holo U), Indonesia, Sumatra, Priaman.

Premna opulifolia Miq., Fl. Ned. Ind. 2 (1859) 898; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 141. — *Gumira opulifolia* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Type: *Horsfield s.n.* (holo L; iso K), Indonesia, Java, Soerakarta.

Premna cyclophylla Miq., Fl. Ned. Ind. 2 (1859) 899; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 140. — *Gumira cyclophylla* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — Type: *Horsfield s.n.* (holo L; iso BM, K 2 sheets), Indonesia, Java, Patjitan, Kelak.

Premna populifolia Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 570. — Type: *Diepenhorst HB 2124* (holo L; iso BO 2 sheets, L), Indonesia, Sumatra, Priaman.

Premna subcordata Turcz., Bull. Soc. Imp. Naturalistes Moscou 36, part II (1863) 216. — Syntypes: *Zollinger 2742* (BM, K 2 sheets), Indonesia, Java; *Gardneriana 673* (KW), [Sri Lanka,] Zeylanica.

Premna integrifolia L. var. *angustior* C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 574. — *Premna angustior* (C.B.Clarke) Ridl., Fl. Malay Penins. 2 (1923) 619. — *Premna corymbosa* (Burm.f.) Schauer var. *angustior* (C.B.Clarke) H.R.Fletcher, Notes Roy. Bot. Gard. Edinburgh 19 (1936) 178. — *Premna obtusifolia* R.Br. var. *angustior* (C.B.Clarke) Moldenke, Phytologia 5 (1954) 87. — Syntypes: *Griffith 6030* (syn K 2 sheets), Malaysia, Malacca.

Premna punctulata C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 575. — *Gumira punctulata* (C.B.Clarke) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Type: *Maingay 1766* (= *Maingay KD 1200*) (holo K; iso NY), Malaysia, Malacca.

Premna nitida K.Schum. in K.Schum. & Hollrung, Fl. Kais. Wilh. Lands (1889) 120. — *Gumira nitida* (K.Schum.) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Type: *Hollrung 679* (holo B; iso K), Papua New Guinea, Augusta Station.

Premna congesta Merr., Philipp. J. Sci. 1, Suppl. (1906) 232. — Type: *Ahern's Collector 3281* (holo PNH†; iso K, NY, US), Philippines, Luzon, Rizal Province, Bosoboso.

Premna subglabra Merr., Philipp. J. Sci. 1, Suppl. (1906) 234. — Syntypes: *Merrill 2165* (PNH, US), Mindoro, Pinamalayan; *Merrill 2243* (K, NY), Philippines, Mindoro Island, Polo; *Whitford 670* (not located), Philippines, Luzon, Tayabas Province, Atimonan; *Whitford 671* (K), Philippines, Luzon, Tayabas Province, Atimonan.

Premna wrayi King & Gamble, Bull. Misc. Inform. Kew (1908) 108. — Type: *Wray 200* (holo K), Malaysia, Malay Peninsula, Perak, Tapa.

Premna kunstleri King & Gamble, Bull. Misc. Inform. Kew (1908) 109. — Syntypes: *Goodenough 1350* (not located), Malaysia, Malacca, Sungei Udang; *King's Collector 938* (K), Malaysia, Malay Peninsula at Waterfall; *King's Collector 4723* (K), Malaysia, Perak, Larut; *King's Collector 5949* (K, TEX), Malaysia, Perak, Larut.

Premna benguetensis C.B.Rob., Philipp. J. Sci., C 3 (1908) 215. — Syntypes: *Williams 1086* (K, NY, PNH†, US), Philippines, Benguet Province, Baguio; *Williams 1207* (K, NY, PNH†), Philippines, Benguet Province, Baguio.

Premna membranifolia Merr., Philipp. J. Sci., C 8 (1913) 388. — Type: *Wenzel 114* (holo PNH; iso BM, US), Philippines, Leyte, Jaro.

Premna papuana Wernham in Ridl., Trans. Linn. Soc. London, Bot. 9 (1916) 136. — Type: *Boden-Kloss s.n.* (holo BM), Indonesia, Dutch New Guinea, camp VIa.

Premna leytensis Merr., Philipp. J. Sci., C 12 (1917) 302. — Type: *Wenzel 1364* (holo PNH; iso BM), Philippines, Leyte, Tigbao, near Tacloban.

Premna borneensis H.J.Lam, Verbenaceae Malayan Archipel. (1919) 117. — Type: *Haviland & Hose 3394* (holo L; iso BO), Malaysia, East Sarawak.

Premna integrifolia L. subsp. *truncatolabium* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 142. — Lectotype (designated by De Kok (2013) 73): *Lederman 6512* (lecto K), Papua New Guinea, Kaiser Wilhelmsland, Sepik.

Premna integrifolia L. subsp. *dentatolabium* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 144. — Lectotype (designated by De Kok (2013) 73): *Elmer 11115* (lecto K; isolecto BM, L), Philippines, Davao district, Todaya (Mt Apo).

Premna macrophylla H.J.Lam, Verbenaceae Malayan Archipel. (1919) 148, nom. illeg. (non *Premna macrophylla* Wall.). — *Premna lamii* Moldenke, Known Geogr. Distrib. Verb. Avicenn. ed. 2. (1942) 79. — *Premna capitata* A.Meeuse, Blumea 5 (1942) 71, nom. superfl. — Syntypes: *Horto Bot. Bogor* (L sheet no. 908.266-834), Indonesia, Java; *van Hasselt s.n.* (L sheet no. 908.267-763) (= *Premna trichostoma*), Indonesia, Java, Buitenzorg; *Korthals 963* (L sheet no. 908.266-715), Indonesia, Sumatra, prope Padang; *Korthals 968* (L sheet no. 908.267-743), Indonesia, Kalimantan, Dussun.

Premna parviflora H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 41, nom. illegit. (non *P. parvifolia* Roth). — Type: *Rachmat 167* (holo L not seen; iso L L 00375156), Indonesia, Celebes.

Premna glandulosa Merr., Philipp. J. Sci. 21 (1922) 532, nom. illeg. (non *P. glandulosa* Hand.-Mazz.). — *Premna glandulifera* Merr., Univ. Calif. Publ. Bot. 15 (1929) 262. — Type: *Castillo 652* (holo not located; iso K, P, US), Malaysia, Sabah, British North Borneo, Sandakan, Suanlamba watershed.

Premna integrifolia L. var. *minor* Ridl., Fl. Malay Penins. 2 (1923) 619. — *Premna obtusifolia* R.Br. var. *minor* (Ridl.) Moldenke, Phytologia 5 (1954) 88. — *Premna corymbosa* (Burm.f.) Schauer var. *minor* (Ridl.) H.R.Fletcher, Notes Roy. Bot. Gard. Edinburgh 19 (1936) 178. — Type: collector unknown (holo not located), Malaysia, Pahang, Pekan.

Premna sumatrana Ridl., Bull. Misc. Inform. Kew (1926) 77. — Type: *Boden-Kloss 14453* (holo K; iso BO, SING), Indonesia, Sumatra, Siberut Island.

Premna atra Merr., Phytologia 2 (1941) 5. — Type: *BS (Ramos) 41873* (holo A; iso BM, K, L, P, SING, US), Philippines, Luzon, Rizal Province, Mt Irig.

Premna dentatifolia Moldenke, Phytologia 5 (1954) 85. — Type: *Docters van Leeuwen-Reijnvaan s.n.* (holo BO sheet no. 22505), Indonesia, Java, Bangkong.

Premna obtusifolia R.Br. var. *pubescens* Moldenke, Phytologia 5 (1954) 88. — Type: *Hort. Bot. Bogor XV.F.2* (holo TEX), Indonesia, Java.

Premna brongersmai H.J.Lam, Blumea 7 (1954) 553. — Syntypes: *Brongersma 41* (syn BO, L 2 sheets), Indonesia, New Guinea, Vogelkop, Ajamaru, Semu.

Premna woodii Moldenke, Phytologia 8 (1962) 163. — Type: *Wood 2631* (holo UC), Malaysia, Sabah, Tenganiph.

Shrub or small tree, sometimes scandent or creeping, 1–10 m tall, dbh 3–40(–80) cm; bark green to (dark or reddish) brown or grey, smooth to scaly or fissured; sapwood cream coloured; hardwood brown. *Twigs* sometimes with conspicuous ridges between petioles, hairy when young, glabrescent, patches often remaining on interpetiolar ridges, bracts absent at base of new shoots. *Leaves* opposite to subopposite; blade ovate or obovate (2–)4–21 by (1–)3–16 cm, apex obtuse to acuminate, base cuneate to slightly cordate, margins entire or rarely serrate, chartaceous to membranaceous, glabrous sometimes with hairs on veins and/or in axil of the main vein with the side veins, dull to glossy, crushed leaves with foetid smell; glands yellow or brown, sessile; main side veins 4–9 pairs, often tri-veined from base; petioles 0.5–7 mm long, channelled, glabrous to the channel filled with hairs, glabrescent. *Inflorescences* 2–20 cm long, corymbose cymes, glabrous to velutinous; bracteoles linear, < 5 mm long. *Calyx* 0–5-lobed, clearly to obscurely 2-lipped, outer surface glabrous or sparsely pubescent, not to slightly accrescent, shortly pedicellate, green to yellow-white; lobe apex rounded to acute; glands yellow, sessile; flowering calyx 1–2 mm diam., variously lobed; fruiting calyx 2–4 mm long, variously lobed. *Corolla* tube 1.2–5 by 1–2 mm, slightly 2-lipped to lobes iso-morphous, glabrous to sparsely hairy on lobes, (greenish) white to reddish, scent absent or slightly lemon-like; glands yellow, sessile; central lobe of lower lip orbicular to oblong or spatulate, 0.8–3.5 by 0.5–2 mm, apex rounded, sometimes reflexed; other lobes 0.8–1.7 by 0.5–1.5 mm, apex rounded, erect to reflexed. *Stamens* 1–5 mm long, just exserted from the tube, ± didynamous, white; anthers 0.2–0.6 mm long, brown to yellowish green. *Ovary* globose, 0.5–1.3 mm diam., glabrous, sometimes with a dense patch glands at apex. *Style* 2–7 mm long, exserted, white. *Stigma* 0.5–1 mm long, apex acute. *Fruit* globose, 3–8 by 3–5 mm, glabrous, outer surface sometimes warty, glossy, green turning sometimes white, then black, purple or dark red when mature, endocarp smooth. *Seeds* four, equally developed when mature. — **Plate 6c, e.**

Distribution — Widely distributed along the coasts and the islands of tropical and subtropical Asia, Africa, Australia and the Pacific; throughout *Malesia*.

Habitat & Ecology — Growing in open vegetation (including *Melaleuca* savannahs), kerangas or swamp forests, common along the coasts (including *Barringtonia*, *Sago* or mangrove vegetation), rivers, or in urban environments. Soil: sand or (clay) loam or clay, sometimes over ultrabasic-, limestone- or volcanic-substrate. Altitude: 0–350(–700) m. This species is reported to be dioecious in Madang, Papua New Guinea (Mabberley, Sci. New Guinea 19 (1992) 37). Flowering and fruiting: throughout the year.

Vernacular names — Peninsular Malaysia: Akar buas buas, Akar juting; Malbau, Pako buas buas (Malay). Sumatra: Amboeng-amboeng laoet, Tandong-rimoe, Tandong-tandong (Malay); Baroewas (Batak); Baroewĕh, Baroh (Atjeh area); Si Baroewĕh (Minangkabou). Java: Ki pahang, Ki seungit, Woeng (Sundanese); Ketumbang embe, Kitai, Lamutah; Singkil, Sinkil alas (Javanese). Borneo: Sabah: Adua, Lambuas (Bajau); Baloh, Salung-anak (East Coast Bajau); Bangkung Kayu (Malay); Buas-buas, Sarunai (Brunei); Sarawak: Akar engkleh (Iban); Akar tulang (Kanyah); Singkel (Malay); C Kalimantan: Laban poetih. Philippines: Alacas, Alagao(-dagat) (Tagalog); Adgaw (Tagbanua). Sulawesi: Indjaro (Makassar region); Inrĕlo (Buginese). Lesser Sunda Islands: Bali: Babon. Moluccas: Daoen kambling, Sajor kambing (Malay); Ambon: Gumira, Gumira dara, Gumira laut (Ternate); Aru: Alar; Ceram: Ai'Suto; Bacan Island: Gomirang; Halmahera: Somoko (Tobaro). New Guinea: West Papua: Buwempe (Hatam); Dojik (Andjai); Oppraka (Momi village); Pue, Sorrĕmĕs; Papua New Guinea: Aroaro (Onjob and Minufia); Arorara (Wanigela); Aru-aru (Mekeo); Cuski (Ossima Village); E'yin, Kiare (Manus Island); Galo (Kulumo); Kal (Mbuke Island); Kala (Amele); La kepei (North Nakanai); Mumwas (Miyanmin); Onjob (Koreaf); Qalo (Luluai Village); Bougainville: Sibo (Bougainville Island).

Uses — Often grown in gardens and as a street tree. The young boiled leaves are eaten as a vegetable in Peninsular Malaysia and Indonesia. In various parts of Indonesia an infusion of the leaves and roots is used to treat fevers and shortness of breath, and women eat the leaves in order to stimulate breast milk production. As the plant is easy to propagate from cuttings it is used for hedges. The wood, especially the hard wood of the roots, is used for making tool handles and paddles (Heyne, Nutt. Pl. Ned.-Ind. (1927) 1314). Sarawak, Kenyah people: a solution of boiled roots is used as a cure for stomach-ache and diarrhoea. Philippines: E Mindoro, used for sore throats and coughs. Indonesia, Aru islands: used against snakebite. Halmahera: crushed leaves are applied to bee stings. Obi Island: boiled leaves are stroked over a baby's skin in order to make it more beautiful. Papua New Guinea and Indonesian New Guinea: the leaves are used as an insect repellent and the fruits are eaten.

12. **Premna sterculiifolia** King & Gamble

Premna sterculiifolia King & Gamble, Bull. Misc. Inform. Kew (1908) 108; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 113; de Kok, Kew Bull. 68 (2013) 76. — *Premna sterculiifolia* King & Gamble var. *typica* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 114, p.p., nom. inval. — Lectotype (designated by De Kok (2013) 76): *Wray 1828* (lecto K), Malaysia, Perak, at Waterfall.

Premna littoralis King & Gamble, Bull. Misc. Inform. Kew (1908) 107; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 135. — Type: *Wray 2719* (holo CAL; iso K), Malaysia, Perak, sea-coast at Matang.

Premna sterculiifolia King & Gamble var. *cordata* King & Gamble, Bull. Misc. Inform. Kew (1908) 109; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 114. — Type: *Scortechini 273* (holo CAL; iso K), Malaysia, Perak.

Liana to small tree, 5–7 m tall, dbh c. 15 cm. *Twigs* sometimes with an interpetiolar ridge, velutinous when young, becoming more glabrous as they mature, bracts lacking at base of young twigs. *Leaves* opposite to subopposite; blade elliptic to ovate, 11–15 by 9–13 cm, apex rounded to acuminate, base rounded to cordate, margins entire to dentate, membranaceous to coriaceous; glabrous when mature, with hairs on veins or when young; glands black to yellow, sessile, many; main side veins 5 or 6, tri-veined from base; petioles 4–7 cm long, channelled, glabrous to covered with curly hairs, becoming more glabrous as they mature. *Inflorescences* 5–15 cm long, corymbose cymes, velutinous to sparsely hairy; bracteoles linear, < 1.5 mm long. *Calyx* 0–5-lobed, clearly 2-lipped, sessile, outer surface glabrous, glands many, yellowish green/white; flowering calyx 1–2 mm long, erect; fruiting 3–4 mm diam., erect to patent. *Corolla* tube 3–4 mm long, lobes almost equal, glabrous apart from some hairs at the apex of lobes, pale green to cream or white, fragrant; central lobe of lower lip oblong, 1–1.5 by 1–1.2 mm, apex rounded, reflexed when mature; other lobes 0.8–1.5 by 0.8–1 mm, apex rounded, reflexed when mature. *Stamens* 2–4 mm long, scarcely to greatly exceeding tube, white; anthers rounded, 0.2–0.3 mm long, orange. *Ovary* globose, c. 1 mm diam., glabrous, glands present. Style 4–5 mm long, lobes c. 0.5 mm long. *Fruit* globose when dry, 4–4.5 mm, glands present, warty when dried, black when mature, endocarp warty. *Seeds* four, equally developed when mature.

Distribution — Peninsular Malaysia (Perak).

Habitat & Ecology — Growing from beaches to dense jungles. Altitude: 0–1400 m. Flowering: April; fruiting: March.

Note — This species was collected six times between 1882 and 1886. It is known only from the Malaysian state of Perak. Given its limited distribution and the relatively few collections known, all more than 100 years old, and the deforestation in the region, it is likely that this species is extinct.

13. **Premna tomentosa** Willd.

Premna tomentosa Willd., Sp. Pl. ed. 4, 3 (1800) 314; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 156; de Kok, Kew Bull. 68 (2013) 77. — Type: *Klein 1795* (holo B-Willd), [India,] Madras.

Premna adenosticta Schauer in A.DC., Prodr. 11 (1847) 630; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 126. — *Gumira adenosticta* (Schauer) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — Type: *Cuming 1230* (holo B; iso K 2 sheets, L 3 sheets, P 2 sheets), Philippines, Luzon, Albay Province.

Premna pyramidata Wall ex Schauer in A.DC., Prodr. 11 (1847) 633; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 156. — *Gumira pyramidata* (Wall. ex Schauer) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Syntypes: *Wallich Cat. 1779.1* (BM, G-DC, K-W), Myanmar, Kyaikkami, Amherst; *Wallich Cat. 1779.2* (G-DC, K-W), Myanmar, Tavoy.

Premna cumingiana Schauer in A.DC., Prodr. 11 (1847) 634; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 157. — *Gumira cumingiana* (Schauer) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — Syntypes: *Cuming 778* (K 2 sheets, L 2 sheets, P 2 sheets), Philippines, Luzon, Tayabas; *Cuming 1280* (BM, K 2 sheets, L 2 sheets, P 2 sheets), Philippines, Albay.

Premna flavida Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 570; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 147. — Type: *Diepenhorst 2107* (BO 2 sheets, U), Indonesia, Sumatra, Priaman; *Diepenhorst 2907* (BO), Indonesia, Sumatra, Priaman Province; *Diepenhorst 2325* (BO, U), Indonesia, Sumatra, Priaman Province.

Premna stellata Merr., Philipp. J. Sci., C 11 (1916) 203; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 154. — Type: *BS (Ramos) 24262* (holo PNH†; iso K, US), Philippines, Samar, Catubig River.

Premna cumingiana Schauer forma *glabrescens* Moldenke, Phytologia 5 (1954) 14. — Type: *Miranda s.n.* (holo BO sheet no. 22106), Philippines.

Premna cumingiana Schauer forma *dentata* Moldenke, Phytologia 5 (1954) 14. — Type: *Merrill Species Blancoanae 681* (holo BO sheet no. 22105; iso K, L, NY, P, US), Philippines, Luzon, Bulacan Province, Angat.

Premna cumingiana Schauer forma *cordata* Moldenke, Phytologia 8 (1962) 162. — Type: *Clemens 15630* (holo PNH†; iso NY), Philippines, Mindanao, Davao Province, Mt Apo.

Premna odorata Blanco forma *crenulata* Koord. & Valeton ex Moldenke, Phytologia 21 (1971) 418. — Type: *Koorders 9725β* (holo BO; iso BO, L), Indonesia, Java, Gadoenjan.

Premna tomentosa auct. non Willd.: Blanco, Fl. Filip., ed. 2 (1845) 342.

Tree, 5–18 m high, dbh 10–25(–50) cm; bark pale brown to white with large thin papery scales; sapwood pale orange to cream. *Twigs* brown and covered with stellate hairs when young, with a ridge between petioles; bracts lacking at base of young twigs. *Leaves* opposite; blade ovate to obovate, (4.5–)9–34 by 5–24 cm, apex acute to acuminate, base cuneate to cordate, margin entire, rarely serrate, membranaceous; hairs stellate or dendroid; main side veins 4–8, often tri-veined from the base, (light) green above, (light green) brownish below; glands whitish, on both upper and lower surface; petioles 1.5–8.5 cm long, subterete, velutinous to sparsely hairy, green to brown. *Inflorescences* 8–40 cm long, corymbose cymes, covered with stellate hairs and long simple to shortly branched hairs especially at nodes; bracteoles linear, < 1 mm long. *Calyx* 5-lobed, weakly 2-lipped, covered with stellate hairs; flowering calyx 2.5–3 by 1.8–2 mm; lobes 0.5–1 mm long, equal, green, apex acute; fruiting calyx 3–4 mm diam., patent. *Corolla* tube 2–4 mm long, 2-lipped, externally covered with stellate hairs to glabrous, light yellow to (greenish) white or light blue, scented; central lobe of lower lip spatulate to oblong, 1.5–2 by 1–2 mm, apex acute; side lobe of lower lip oblong, 1–1.8 by 0.1–1.8 mm, apex rounded; upper lobe spatulate, 1.8–2 by 1.8–2 mm, apex rounded. *Stamens* 1–2.5 mm long, just exceeding the tube when mature, not didynamous; anthers c. 0.2 mm long. *Ovary* globose, c. 1 mm diam., glabrous with few stellate hairs at apex, glands absent. Style 3.5–4.5 mm long, just exserted. Stigma 0.1–0.5 mm long, apex rounded to acute, yellow. *Fruit* globose when dry, 3–6.5 by 3–5.5 mm, stellate hairs at apex when young, later glabrous, sometimes with a black patch at the apex; glands absent or scattered and sometimes concentrated at apex, purple-black when mature, endocarp smooth. *Seeds* four, equally developed when mature.

Distribution — India, Sri Lanka to S China; in *Malesia*: Peninsular Malaysia, Sumatra, Java, Philippines; Australia (N Cape York Peninsula), Solomon Islands (Guadalcanal).

Habitat & Ecology — Growing in primary to secondary forest (for instance the *Schima*-bamboo forest of northern Peninsular Malaysia), beaches or open types of vegetations. Soil: sandy or clay loam, sometimes on granite shale, sandstone or (coral) limestone. Altitude: 0–400 m. Flowering: February to November; fruiting: May to

September (rarely February). Flowers reported to be visited by insects, fruits reported to be eaten by birds.

Vernacular names — Peninsular Malaysia: Ara dumut, Kapiat. Sumatra: Djati lauang (Medan region); Kajoe-koemit, Leban tjapo, Pisang-pisang or (Malay); Lajas-lajas (Karo-Batak); Nandabah (Alas region). Java: Bolang, Gadoengan (Javanese); Bungbulang, Bunglang (Sundanese). Philippines, Samar: Manaba.

Uses — Used medicinally in Peninsular Malaysia; the wood is used for making paddles and house posts. In S Sumatra, the bark mixed with that of a *Vitex*, is pressed and the sap is used against diarrhoea. The ground leaves are used to clean wounds and in the preservation of dried fish and meat (Heyne, Nutt. Pl. Ned.-Ind. (1927)).

14. **Premna trichostoma** Miq.

Premna trichostoma Miq., Fl. Ned. Ind. 2 (1859) 892; de Kok, Kew Bull. 68 (2013) 79; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 128. — *Gumira trichostoma* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Type: *Horsfield s.n.* (holo L; iso BM, K), Indonesia, Java, Banjoemas.

Premna oblongifolia Merr., Publ. Bur. Sci. Gov. Lab. 29 (1905) 48; Philipp. J. Sci. 1, Suppl. (1906) 230; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 129. — *Premna oblongifolia* Merr. var. *typica* H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 40, nom. inval. — Syntypes: *Elmer 5990* (BO, K, NY, P, US), Philippines, Luzon, Benguet Province, Baguio; *Whitford 816* (not located), Philippines, Tayabas (Infanta) Province.

Wendlandia papuana Lauterb. in K.Schum. & Lauterb., Nachtr. Fl. Schutzgeb. Südsee (1905) 390; Cowan, Notes Roy. Bot. Gard. Edinburgh 16 (1932) 306. — *Premna cowanii* Hatus. ex Moldenke, Phytologia 5 (1954) 11 (non *P. papuana* Wernham). — Type: *Schlechter 14395* (holo BO; iso K), Papua New Guinea, Kaiser Wilhelmsland, Torricelli-Gebirge.

Premna perakensis King & Gamble, Bull. Misc. Inform. Kew (1908) 107; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 122. — Syntypes: *King's Collector 7247* (CAL, K), Malaysia, Perak; *King's Collector 10738* (CAL, K), Malaysia, Perak; *Scortechini 516* (CAL, K), Malaysia, Perak.

Premna ridleyi King & Gamble, Bull. Misc. Inform. Kew (1908) 109; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 130. — Syntypes: *Scortechini 455* (CAL, K), Malaysia, Perak; *Ridley 6826* (CAL, K), Singapore, Garden Jungle.

Premna areolata Merr., Philipp. J. Sci., C 10 (1915) 73. — Type: *BS (Reillo) 16179* (holo PNH†; iso BM, K, L, US), Philippines, Basilan.

Premna williamsii Merr., Philipp. J. Sci., C 10 (1915) 74. — Type: *Williams 2330* (holo PNH†; iso NY 2 sheets, US), Philippines, Mindanao, Zamboanga District, Sax River.

Premna oblongata Miq. var. *subglabra* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 127; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 38. — *Premna oblongata* Miq. var. *subglabra* forma *typica* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 127, nom. inval. — *Premna oblongifolia* Merr. var. *subglabra* (H.J.Lam) Moldenke, Phytologia 5 (1954) 16. — Syntypes: *Herb. Boerlage 461* (L sheet no. 908.266-741), Indonesia, Java; *Herb. Boerlage 461B* (L sheet no. 908.266-742), Indonesia, Java, Tjiomas; *Anonymous s.n.* (L sheet no. 908.266-932), Indonesia, Java, Mt Salak; *Korthals s.n.* (L sheet no. 908.266-705), Indonesia, Borneo, Gunung Pamattan.

Premna oblongata Miq. var. *subglabra* forma *longituba* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 128. — Type: *Van Hasselt 241* (holo L), Indonesia, Java, Mt Salak.

Premna ledermanni H.J.Lam, Verbenaceae Malayan Archipel. (1919) 159. — Type: *Ledermann 8661* (holo L; iso K), Papua New Guinea, Deutsch-Neuguinea, Sepikgebiet, April river.

Premna oblongifolia Merr. var. *major* H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 40. — Syntypes: *Backer 736* (BO 2 sheets), Indonesia, Java, Tjisalak, 24 Dec. 1911; *Backer 17188* (BO, K, L 2 sheets, P), Indonesia, Java, Tjitjurug; *Backer 18509* (BO), Indonesia, Java, Madjenang; *Lörzing 680* (BO), Indonesia, Java, Tandjongsari, Tjandirátá; *Lörzing 722* (BO),

Indonesia, Java, Tjandirátá; *Lörzing 4363* (BO, L), Indonesia, Sumatra, Bandarbaru; *Teijsmann s.n.* (BO 2 sheets), Indonesia, Borneo, Sungei Landak; *Teijsmann s.n.* (not located), Indonesia, Java, Temanggung.

Premna oblongifolia Merr. var. *clemensorum* Moldenke, Phytologia 5 (1954) 16. — Type: *J. & M.S. Clemens 29858* (holo BO; iso BM, L), Malaysia, British North Borneo [Sabah], Mt Kinabalu, Tenompok.

Premna moluccana Moldenke, Phytologia 5 (1954) 86. — Type: *Kostermans et al. 883* (holo BO), Indonesia, Moluccas [Maluku], Morotai, Halitambiki.

Premna oblongifolia Merr. var. *angustata* Moldenke, Phytologia 43 (1979) 252. — Type: *SAN (Sinanggul) 57292* (holo SAN; iso K, L), Malaysia, Sabah, Lahad Datu, Bukit Silam.

Premna parasitica auct. non Blume: C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 574.

Liana, small tree or shrub, 1–20 m tall or when climbing up to 40 m long, sometimes rooting at the nodes, dbh 0.5–15 cm; outer bark smooth to scaly, blackish or dark green; sapwood white. *Twigs* without ridges between petioles, densely hairy when young, becoming more glabrous as they mature, a series of bracts at the base of each new shoot. *Leaves* opposite to subopposite (reported to be deciduous in Thailand); blade ovate to obovate, 3.5–18 by 2–9.5 cm, apex rounded to acuminate, base cuneate to slightly cordate, margins entire, membranaceous to chartaceous, pale to dark green, glabrous when mature, with sometimes hairs on veins or when young; glands black to yellow, sessile, many; side veins 3–9, often tri-veined from base; hairs erect, few; glands many; petioles 0.5–3.5 cm long, channelled, glabrous to covered with curly hairs, becoming more glabrous as they mature. *Inflorescences* 3–15 cm long, corymbose cymes, velutinous to sparsely hairy, whitish green; bracteoles linear, < 5 mm long. *Calyx* 4-lobed, weakly 2-lipped, outer surface glabrous or with few appressed hairs, (whitish) green; glands many, sessile; flowering calyx 1–1.8 by 1–1.2 mm long; glands sessile, yellow-white; lobes almost isomorphic, 0.1–0.5 mm long, apex round to acute; fruiting calyx similar as flowering calyx. *Corolla* tube 2–3 mm long, glabrous apart from some hairs at the apex of lobes, lobes equal, (greenish) white to pale green or grey, fragrant; central lobe of lower lip oblong to spatulate, 1–2 by 1–1.5 mm, apex rounded, reflexed when mature; other lobes 1–2 by 1–1.5 mm, apex rounded, reflexed when mature. *Stamens* 2–5 mm long, exceeding tube, not didynamous, white; anthers rounded, 0.2–0.5 mm long, white to bluish grey. *Ovary* globose, 0.25–0.5 mm diam., glabrous. *Style* 4–5 mm long, white, lobes 0.5–1 mm long. *Fruit* clavoid when dry, 3–5 by 1–2 mm, glabrous with glands, white or green turning purple and then black or blue when mature, endocarp smooth. *Seeds* four with only one developing into maturity. — **Plate 6d.**

Distribution — S Myanmar to Vietnam; throughout *Malesia*.

Habitat & Ecology — Growing in kerangas, swamp-, mossy- and primary-forest, often along rivers or in open areas, sometimes epiphytic, sometimes cultivated; soil: clay, sometimes over limestone or ultrabasic. Altitude: sea-level to 2600 m. Flowering: throughout the year; fruiting: March to October.

Vernacular names — Borneo, Sarawak: Akar kinjulabang (Iban Simanggang); Kapapar (Iban). Java: Deng, Godeng Tjéléngan, Tjéléngan (Javanese); Kendal rambat (Sundanese). Philippines: Atingol an iitang (Ifugao).

Uses — In the Philippines *P. trichostoma* is planted as a measure to stop stem borers and other pest infecting crops.

DOUBTFUL AND DUBIOUS NAMES

Premna cordata Blanco, Fl. Filip. (1837) 489, nom. illeg. (non *P. cordata* R.Br.). — Type: lost.

Premna cardiophylla Schauer in A.DC., Prodr. 11 (1847) 638. — *Gumira cardiophylla* (Schauer) Kuntze, Revis. Gen. Pl. 2 (1891) 507. — Type: unknown.

Premna goeringii Turcz., Bull. Soc. Imp. Naturalistes Moscou 36, part II (1863) 216 ('*görinii*'); H.J.Lam, Verbenaceae Malayan Archipel. (1919) 154. — Type: *Göring 425* (holo KW), Java au Forte Japonia.

39. PSEUDOCARYOPTERIS

(G.L.C. Bramley)

Pseudocaryopteris (Briq.) P.D.Cantino, Syst. Bot. 23 (1998 '1999') 380; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 202. — *Caryopteris* Bunge sect. *Pseudocaryopteris* Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1895) 178. — Type: *Pseudocaryopteris paniculata* (C.B.Clarke) P.D.Cantino.

Shrubs; *stems* and *branches* often scrambling or spreading. *Leaves* simple, opposite. *Inflorescences* of axillary dichasial cymes or axillary or terminal thyrse. *Calyx* actinomorphic or rarely slightly zygomorphic, tube campanulate, 5- or 6-lobed. *Corolla* white to deep red, purple or blue, zygomorphic, usually asymmetrical in bud (expanding on lower side), tube cylindric, 5-lobed, upper and lateral lobes similar, lower lobe larger. *Stamens* 4, in 2 pairs, didynamous or ± equal, exserted, arched, filaments pubescent at base; anthers 2-celled, divergent to divaricate, often confluent at dehiscence, pollen tri-colpate with supratectal verrrucae. *Disc* poorly developed. *Ovary* very shallowly 4-lobed, 4-ovuled; style subterminal; stigma 2-fid at the end, arms equal. *Fruit* dry or slightly fleshy schizocarp, sometimes requiring pressure to split into nutlets. *Nutlets* boat-shaped, smooth or slightly ridged, glabrous or pubescent, attachment scar as long as nutlet; endosperm absent.

Distribution — Three species, India, Pakistan, Nepal, Bhutan, S China, Thailand, Myanmar; one species in *Malesia*: W Sumatra.

Habitat & Ecology — Forest edges and thickets. Altitude: 1000–2000 m.

Note — Only known from one collection in the region, this originally identified as *Callicarpa vansteenisii* Moldenke.

1. Pseudocaryopteris paniculata (C.B.Clarke) P.D.Cantino

Pseudocaryopteris paniculata (C.B.Clarke) P.D.Cantino, Syst. Bot. 23 (1998 '1999') 380. — *Caryopteris paniculata* C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 597. — Lectotype (designated by Rajendran & Daniel, Indian Verbenac. (Taxonom. Revis.) (2002) 70): *Griffith Herbarium of the late East India Company no. 6044* (lecto K; isolecto P), India, East Bengal.

Callicarpa vansteenisii Moldenke, Phytologia 4 (1953) 286. — Type: *Van Steenis 6373* (holo BO; iso K, L), Sumatra, Aceh, Boer ni Poepandji.

Shrub, 1–3 m. *Stems* subterete, sparsely pubescent. *Leaves*: blade narrowly elliptic to narrowly ovate, 10–13 by 3–5.5 cm, apex acuminate, base cuneate to obtuse, margin serrate, upper surface sparsely pubescent, lower surface with scattered hairs on the laminas, hairs more dense on venation, surface covered with yellow sessile glands; petioles 1–1.5 cm long. *Inflorescences* axillary, thyrse with up to 6 cymes (more outside

Fig. 39. *Pseudocaryopteris paniculata* (C.B.Clarke) P.D.Cantino. a. Habit; b. inflorescence with 2-lipped corollas; c. young fruit (all *Hennipman 3295*, L). Drawing by Anita Walsmit Sachs, 2012.

Malesia); bracts and bracteoles linear, 1–2 mm long. *Calyx* cupular, tube 1–2 mm long, with 5 ± equal narrowly triangular lobes, 1–2 mm long, outer surface pubescent, inner surface glabrous. *Corolla* white (Sumatra) to violet (Thailand) to deep red, 4–5 mm long, the tube straight, c. 3 mm long; lower lobe larger than the four upper and lateral lobes. *Fruit* globose, orange to red when mature, c. 3 by 4 mm. — **Fig. 39.**

Distribution — Pakistan to S China; in *Malesia* known only from Sumatra (Aceh, Boer ni Poepandji).

Habitat & Ecology — In Malesia collected once from forest edge. Altitude: c. 1900 m.

Note — Originally described by Moldenke as *Callicarpa vansteenisii*. Not known from elsewhere in the region other than Aceh.

40. ROTHECA

(J.A. Wearn & D.J. Mabberley)

Rotheca Raf., Fl. Tellur. 4 (1838) 69; Steane & Mabb., Novon 8 (1998) 204; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 198. — Type: *Volkameria serrata* L. (= *Rotheca serrata* (L.) Steane & Mabb.).

Clerodendrum L. sect. *Cyclonema* (Hochst.) B.Thomas, Bot. Jahrb. Syst. 68 (1936) 22. — Type: *Clerodendrum myricoides* (Hochst.) Vatke (= *Rotheca myricoides* (Hochst.) Steane & Mabb.).

Clerodendrum L. sect. *Konocalyx* Verdc. in Polhill, Fl. Trop. E. Africa, Verben. (1992) 86. — Type: *Clerodendrum incisum* Klotzsch (= *Rotheca incisa* (Klotzsch) Steane & Mabb.).

Shrubs, subshrubs or herbs, sometimes geoxylic, more rarely scandent or decumbent, or even small trees. *Leaves* simple, decussate or verticillate; sessile to shortly petiolate; blade often distinctly crenate to coarsely serrate, distinctly acrid when crushed. *Inflorescences* terminal thyrses or axillary cymes, usually lax, occasionally reduced to solitary axillary flowers; flowers non-resupinate. *Calyx* campanulate to subspherical, frequently red or purple, not accrescent, (4 or) 5 (or 6)-lobed up to half its length, lobes acute to rounded. *Corolla* usually blue to whitish, hypocrateriform, asymmetrical in bud (expanding abruptly on lower side), subactinomorphic to unilabiate (all lobes on lower lip due to cleft between upper lobes); tube curved or straight, often saccate on lower side; lobes 5, lower often much larger and coloured differently from the others. *Stamens* 4, parallel, long-exserted, usually arched, anthers usually basifixed, thecae parallel, not confluent. *Ovary* glabrous to (glandular) hairy; placentas not furcated. *Style* terminal; stigma-lobes frequently unequal. *Fruit* a 4-lobed drupe, each lobe containing a 1-seeded pyrene.

Distribution — About 35 species widespread throughout the tropical Old World eastwards to Maluku, but only a few species in Asia. A single species is found native in *Malesia*.

Taxonomy — See Steane & Mabberley (1998).

1. **Rotheca serrata** (L.) Steane & Mabb.

Rotheca serrata (L.) Steane & Mabb., Novon 8 (1998) 206. — *Volkameria serrata* L., Mant. Pl. Altera (1767) 90. — *Clerodendrum serratum* (L.) Moon, Cat. Pl. Ceylon (1824) 46; Ridl., Trans. Linn. Soc. London, Bot. 3 (1893) 335; Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 72 (1909) 834; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 268; Ridl., Fl. Malay Penins. 2 (1923) 626; Burkill, Econ.

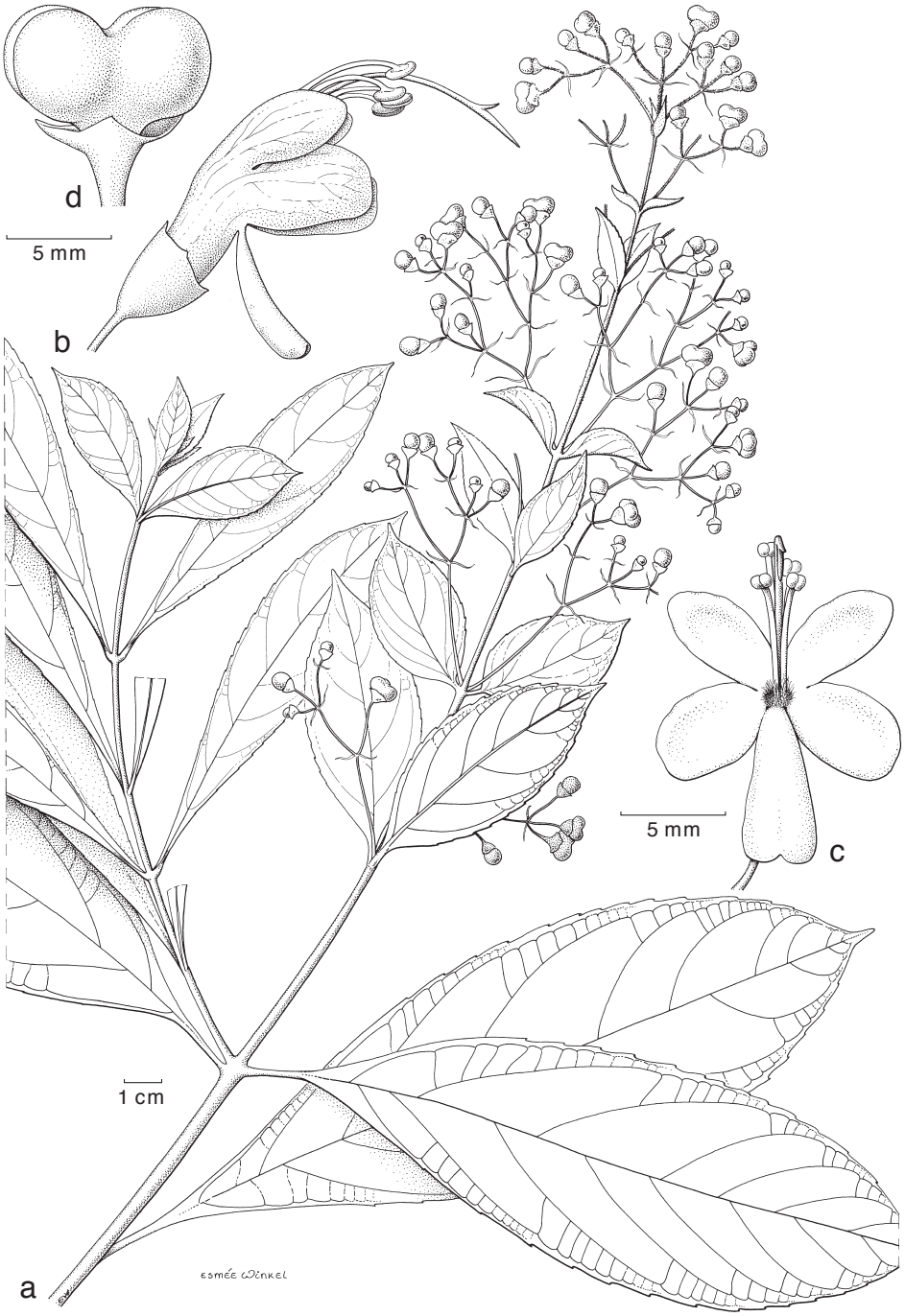

Fig. 40. *Rotheca serrata* (L.) Steane & Mabb. a. Habit; b. flower, lateral view; c. flower, top view; d. fruit (a, d: *Leeuwenberg 13249*; b, c: *Metzner 154*; all L). Drawing by Esmée Winkel, 2012.

Prod. Malay Pen. (1935) 586; Backer & Bakh.f., Fl. Java 2 (1965) 608; Burkill, Econ. Prod. Malay Pen. (1966) 593; Moldenke & A.Moldenke, Revis. Handb. Fl. Ceylon 4 (1983) 417 (see for full synonymy); Corner, Wayside Trees Mal., 3rd ed. (1988) 740, f. 257, 746; Valk. & Bunyapraphatsara, PROSEA 12, 2 (2001) 177. — Lectotype (designated by Moldenke & A. Moldenke 1983): *Anon.* in *Herb. Linn. 809/5* (lecto LINN), India.

Clerodendrum divaricatum Jack, Malayan Misc. 1, 5 (1820) 48. — Type: *Jack s.n.* (holo †), Sumatra, 'Laye'.

Clerodendrum serratum (L.) Moon var. *wallichii* C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 592; Ridl., Fl. Malay Penins. 2 (1923) 626. — Lectotype (designated here by Mabberley): *De Silva* in *EIC 1810/1* (lecto K-W), Bangladesh, Sylhet.

Clerodendrum vanprukii Craib, Bull. Misc. Inform. Kew (1911) 444; Leerat. & Chantar., Thai Forest Bull., Bot. 31 (2003) 46. — Lectotype (designated by Leeratiwong & Chantaranothai (2003) 46): *Vanpruk 207* (lecto K; isolecto K), Thailand, Phrae, Huai Kamin.

Bushy shrub, 1–4.5 m tall. *Stems* quadrangular, usually purplish, subglabrous to densely tomentose, especially when young. *Leaves* decussate and sometimes also ternate; blade elliptic or elliptic-ovate to oblong or rarely obovate, 7–22 by 3–8 cm, apex acute to shortly acuminate, base acute to subcuneate, margin serrate especially in distal half, subglabrous to densely pubescent; petioles 3–12 mm long. *Inflorescences* a thyrse to 25 cm long, terminal, with lowest branches to 7 cm long, axes usually blue-purplish, glabrous to tomentose, conspicuously bracteate (bracts leafy, to 4 by 2 cm, serrate to entire) and bracteolate (bracteoles elliptic to linear or lanceolate, to 15 mm long); peduncles 1.5–7.5 cm long, often bluish when young; pedicels 1–4 mm long. *Calyx* c. 4 mm long, campanulate, bluish when young, usually puberulent, margin dentate to subtruncate, not accrescent. *Corolla* 2-lipped, bluish to violet or purple, rarely pink- or cream-white; tube 5–9 mm long; upper lobes c. 9 mm long, erect, ± hooded, usually dark blue, lateral lobes usually pale blue, lower lobe c. 1.5 cm long, concave. *Stamens* 4 or 5, filaments 2–2.5 cm long, blue, curved, anthers white. *Fruit* subglobose or subobovoid, becoming dark purple-black, 2–4-lobed. — **Fig. 40; Plate 6b.**

Distribution — India, Sri Lanka, Nepal, Pakistan, Thailand, Laos, Vietnam; in *Malesia*: N and C Peninsular Malaysia (?native, see Mabberley ms.), Singapore (cult. only), Sumatra, Java, Borneo. Cultivated widely and often escaped from cultivation.

Habitat & Ecology — Common plant of forest edges, open country and in villages.

Uses — See Burkill (1935) and Corner (1988) for economic uses.

41. SALVIA

(G.L.C. Bramley, updated from Keng 1978)

Salvia L., Sp. Pl. (1753) 23; H.Keng, Gard. Bull. Singapore 24 (1969) 160; in Steenis, Fl. Males., Ser. I, 8 (1978) 356; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 195; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 235. — Type: *Salvia officinalis* L.

Herbs, undershrubs or shrubs. *Leaves* opposite, cauline or almost all radical, simple, 3-foliolate, pinnate or 1- or 2-pinnatifid. *Inflorescences* thyrsoid, terminal and/or axillary, often paniculate, spiciform, composed of distant to congested verticillasters with small to larger and showy flowers; bracts small or large, sometimes brilliantly coloured in cultivated forms. *Calyx* campanulate or tubular, 9–11-nerved, 2-lipped; upper lip entire or 3-fid; lower lip notched or 2-lobed. *Corolla* 2-lipped, tube naked or

annulate within, upper lip erect, lower lip 3-lobed, central lobe usually wider than the lateral ones, entire or emarginate. *Fertile stamens* 2, the lower pair, ascending under upper corolla lip, filaments short, articulating with a slender connective, and sometimes produced beyond the joint, connective linear, transverse, with an upper ascending arm, often longer than filament, which bears a linear fertile anther-cell, and a lower straight or deflexed branch bearing a reduced anther-cell or empty. *Disc* usually slightly swollen in front. *Style* gynobasic, shortly 2-fid, lobes usually subulate, equal or the lower larger, sometimes flattened. *Fruit* a schizocarp. *Nutlets* ovoid, often triquetrous, smooth, attachment scar basal.

Distribution — At least 900 species, almost cosmopolitan with main centres of diversity in SW Asia and C and S America. Open to forest and montane habitats. Probably only one species is native to *Malesia*; several other species are more or less naturalized; still others are cultivated in the gardens as ornamental. Only the native and truly naturalized species are included in the following key. The key in Backer & Bakhuizen van den Brink Jr. (Fl. Java 2 (1965) 625) covers the many cultivated species enumerated here.

KEY TO THE SPECIES

1a. Leaves mostly radical and pinnate (3 or 5 (or 7) leaflets). Rhizomatous herb, usually less than 20 cm high . . . . . **5. S. scapiformis**
b. Leaves cauline, entire, crenate or serrate, but not pinnate. Erect or procumbent herbs, usually more than 30 cm high 2
2a. Calyx up to 5 mm long in the fruiting stage. Corolla up to 6 mm long 3
b. Calyx 8 mm long or more in the fruiting stage. Corolla more than (6–)7 mm long 4
3a. Bracts narrowly ovate, long acuminate, 2–5 mm long. Calyx with glandular hairs, sessile glands usually absent. Flowers 2–4 per verticillaster. Habit usually creeping . . . . . **3. S. misella**
b. Bracts linear-spatulate, to 1.5 mm long. Calyx with simple hairs (very rarely glandular), red sessile glands present. Flowers 3–10 per verticillaster. Habit usually erect . . . . . **4. S. plebeia**
4a. Verticillasters distant, internodes 10–20 mm long. Corolla red, rarely white, more than 10 mm longer than the calyx . . . . . **1. S. coccinea**
b. Verticillasters approximate (congested), internodes 2–5 mm long. Corolla (purplish) blue, 2–3 mm longer than the calyx . . . . . **2. S. hispanica**

1. Salvia coccinea Buc'hoz ex Etl.

Salvia coccinea Buc'hoz ex Etl., Salv. (1777) 23; Ridl., Fl. Malay Penins. 2 (1923) 655. — Type: unknown.

Salvia pseudococcinea Jacq., Collectanea 2 (1789) 302. — *Salvia coccinea* Buc'hoz ex Etl. var. *pseudococcinea* (Jacq.) A.Gray, Syn. Fl. N. Amer. 2, 1 (1878) 368; Backer & Bakh.f., Fl. Java 2 (1965) 628; H.Keng, Gard. Bull. Singapore 24 (1969) 162, f. 29a–c. — Type: not located.

Salvia ciliata Benth., Labiat. Gen. Spec. (1833) 286, nom. illeg., non *Salvia ciliata* Poir. — Type: *Schiede & Deppe s.n.* (holo CGE; iso K), Mexico.

Salvia coccinea Juss. ex Murray var. *lactea* Adelb. in Backer, Bekn. Fl. Java 14, fam. 201 (1954) 29; Backer & Bakh.f., Fl. Java 2 (1965) 628, nom. inval. (non Buc'hoz ex Etl.).

Slender herb, 0.5–1 m high. *Stems* several, ascending, often branched, with short downward pointing hairs appressed to the surface on all stem faces, also with much longer patent hairs on stem edges. *Leaves* cauline, simple; blade narrowly ovate to ovate or deltoid-ovate, 1.7–5 by 1.5–3.5 cm, apex acute, base truncate or cordate, margin crenate or serrate, appressed short hairs above and below, hairs occasionally more dense below; petiole 0.5–2 cm long, with appressed hairs. *Inflorescences* terminal, with 6–10 flowers in a verticillaster, verticillasters distant, internodes 1–2 cm long; bracts narrowly ovate, 6–8 mm long, acuminate, ciliate with long hairs, caducous; pedicels 2–4 mm long, puberulous. *Calyx* tubular-campanulate, 7–8 mm long, in fruit 9–10 mm long, with short hairs outside and inside, striate due to venation; upper lip entire, obtuse; lower lip 2-lobed, lobes triangular, acute. *Corolla* red, rarely white, 20–25 mm long; tube straight, much exserted, widened upwards; upper lip short, erect; lower lip spreading or recurved, 3-fid. *Nutlets* narrowly ovoid, c. 3 by 1.2 mm, smooth, brown, swelling when soaked in water.

Distribution — Native of tropical America, cultivated in the tropics and occasionally escaping from cultivation; in *Malesia* found naturalized in Malay Peninsula (also Penang), Sumatra (Sibolangit), Java, Philippines (Luzon), N Sulawesi and New Guinea; also in New Caledonia and other Pacific islands.

Habitat & Ecology — Weed on fallow lands, along roadsides, abandoned garden land. Altitude: 600–1100 m. Flowering: throughout the year.

Vernacular names — Java: Lotongoan (Sundanese). Worldwide: Tropical sage (English).

Note — The calyx is tinged red in the red-flowered form, but green in the white-flowered form ('lactea' found in Java only, not validly published by Adelbert, but recognised as a cultivar, see Clebsch, The New Book of Salvias (2008) 84).

2. Salvia hispanica L.

Salvia hispanica L., Sp. Pl. (1753) 25; Backer & Bakh.f., Fl. Java 2 (1965) 627. — *Kiosmina hispanica* (L.) Raf., Fl. Tellur. 3 (1836) 92. — Lectotype (designated by Wood & Harley, Kew Bull. 44 (1989) 225): Tabernaemontanus, New Vollk. Kräuterb. (1664) 764, t. 374.

Erect or ascending herb, 0.5–1 m or more high. *Stems* and *branches* with appressed downward pointing hairs. *Leaves* cauline, simple; blade narrowly ovate to ovate, 3–8.5 by 1–4.5 cm, apex acute or acuminate, base obtuse and abruptly attenuate, margin serrate or serrulate; pubescent on both surfaces; petiole 1–3 cm long. *Inflorescences* terminal, 3–10(–18) cm long, with 6–10 flowers per verticillasters, these congested, internodes 2–5 mm long; bracts ovate, 6–8 mm long, caudate, with dense appressed hairs on surface, ciliate with longer hairs. *Calyx* tubular, slightly inflated below, 6–7 mm long, in fruit 8–9 mm long; densely appressed hairs outside and inside; upper lip strongly keeled, sharply acuminate; lower lip 2-lobed, lobes acuminate. *Corolla* (purplish) blue, (6–)8–9 mm long, the lips shortly exposed; upper lip rounded, sericeous outside; lower lip 3-lobed. *Stamens* barely exserted. *Nutlets* ellipsoid, c. 1.5 by 1 mm long, brown, smooth.

Distribution — Native in tropical America; cultivated and naturalized in *Malesia*: W Java.

Habitat & Ecology — Open localities, roadsides, fallow or weed overgrown agricultural fields; sometimes cultivated for the seeds. Altitude: 900–1700 m. Flowering: throughout the year.

Vernacular names — Java: Salasi huma, Tjoing, Tjuing (Sundanese).

Uses — Heyne (Nutt. Pl. Ned.-Ind. (1927) 1327) reported that seeds are sometimes used as a surrogate for those of selasi (*Ocimum*).

3. Salvia misella Kunth

Salvia misella Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 2 (1818) 290; Backer & Bakh.f., Fl. Java 2 (1965) 627. — Type: *Humboldt & Bonpland s.n.* (P-Bonpl.), Mexico, Guerrero.

Salvia riparia Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 2 (1818) 300. — Type: *Bonpland 3530* (iso P), Crescit regione temperate in ripa fluminis Chulucanas inter pagum Guanacabamba Peruvianorum et paramo de Guamani.

Salvia obscura Benth., Labiat. Gen. Spec. (1833) 245. — Type: *Anonymous 245* (holo K), Jamaica.

Salvia privoides Benth., Bot. Voy. Sulphur (1846) 150. — Type: *Sinclair s.n.* (holo K; iso K), Honduras, Gulf of Fonseca.

Slender herb, creeping, decumbent, sometimes erect, to 75 cm long. *Stems* hirsute sometimes also with glandular hairs, becoming less hairy on older stems. *Leaves* cauline; blade narrowly ovate to ovate, 1.5–4(–7) by 0.8–2.5(–4) cm, apex acute, base cuneate, narrowed into the petiole, margin serrate, lamina generally with hairs on both surfaces; petiole 2–10 mm long. *Inflorescences* terminal, spike-like, 5–30 cm long, slender, with 2–4 flowers in a verticillaster; bracts narrowly ovate, 2–5 by 1.5–3.5 mm, long acuminate. *Calyx* campanulate, 2.5–3 mm long, in fruit 4–5 mm long, covered with both longer simple and shorter capitate glandular hairs, sessile glands usually absent, deeply 2-lipped; upper lip rounded shortly caudate, lower lip 2-lobed, the lobe tips mucronate, c. 0.75 mm long. *Corolla* pale to bright blue, occasionally lilac, 5–6 mm long. *Nutlets* ellipsoid, 1.5–2 mm long. — **Plate 6f.**

Distribution — Native of tropical America; locally naturalized in *Malesia*: Java (incl. Kangean Island) and Lesser Sunda Islands (Sumbawa, Flores, Timor), Papua New Guinea; also in Australia (Queensland), the Solomon Is. (Guadalcanal) and New Caledonia.

Habitat & Ecology — A weed of open waste places. Altitude: up to 1000 m. Flowering: February to October.

Notes — 1. Similar to *S. plebeia* but glandular hairs more common and dense; a general absence of red sessile glands; inflorescence longer with generally 2–4 flowers per verticillaster, and verticils enclosed in ovate bracts that have long acuminate tips. *Salvia misella* is the more common plant in Malesia, often with a creeping rather than erect habit.

2. *Salvia riparia* is considered a synonym of *S. misella* here, following Flora Mesoamericana (Klitgaard in Davidse et al., Fl. Mesoamer. 4, 2 (2012) 85; http://www.tropicos.org/docs/meso/lamiaceae.pdf) and the World Checklist of Lamiaceae (http://apps.kew.org/wcsp/home.do), contrary to Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 359), who recognised it at the species level.

4. Salvia plebeia R.Br.

Salvia plebeia R.Br., Prodr. Fl. Nov. Holland (1810) 501; Miq., Fl. Ned. Ind. 2 (1859) 970 ('*plebeja*'); Merr., Enum. Philipp. Fl. Pl. 3 (1923) 413; Ridl., Fl. Malay Penins. 2 (1923) 655; H.Keng, Gard. Bull. Singapore 24 (1969) 162, f. 29d–f. — Type: *Brown 2393* (K), Australia, Paterson's river, bet. Mt Anne and Mt Elizabeth.

Salvia brachiata Roxb., Fl. Ind. 1 (1820) 146. — Type: *Wall. Cat. 2149*?

Salvia minutiflora Bunge, Enum. Pl. China Bor. (1833) 50 — Type: *Bunge s.n.* (?LE), Hab. ad vias et in collibus prope Pekinum.

Salvia violacea auct. non Ruiz & Pav.: Blanco, Fl. Filip., ed. 2 (1845) 14; Fl. Filip., ed. 3, 1 (1877) 27.

Erect herb, 40–60 cm high or more. *Stems* 4-angled, grooved, tomentose or glabrescent. *Leaves* cauline, simple, sparsely hirsute or nearly glabrous, very narrowly elliptic or narrowly ovate, 2–4 by 0.8–1.5 cm, apex subacute or obtuse, base cuneate to decurrent into petiole, margin crenate; petiole 2–4 cm long, hirsute. *Inflorescences* terminal and in upper leaf-axils, often forming large panicles, flowers 3–10 in a verticillaster; bracts small, linear-spatulate, to 1.5 mm long; pedicels 1–2 mm long, hairy. *Calyx* campanulate, c. 2 mm long, in fruit 3.5–4 mm long, outer surface with short erect (usually simple) hairs and red sessile glands, 2-lipped; upper lip obtuse, often shortly 3-fid at the tip; lower 2-lobed, shortly mucronate. *Corolla* violet, purplish or blue, 2.5–3 mm long, shortly exserted. *Nutlets* ovoid, c. 1 by 0.7 mm, brown, rugose.

Distribution — Continental SE Asia (from the Deccan to Korea and Japan) to Australia; in *Malesia*: N Sumatra (Aceh: Toba plateau) and the Philippines (N Luzon: Cagayan Prov.), very rare.

Habitat & Ecology — A weed of fallow land, in Sumatra at 1000–1350 m, in Luzon at low altitude in and about towns. Flowering: August to October.

Vernacular name — Sumatra: Ruku ruku begal (Karo).

Note — See note 1 under *S. misella*.

5. Salvia scapiformis Hance

Salvia scapiformis Hance, J. Bot. 23 (1885) 368; Merr., Philipp. J. Sci., C 5 (1910) 228; Enum. Philipp. Fl. Pl. 3 (1923) 413 ('*scaphiformis*'); H.Keng, Gard. Bull. Singapore 24 (1969) 161, f. 29g, i; J.T.Wu & T.C.Huang, Taiwania 20 (1975) 77. — Type: *C. Ford 22314* (BM), intralae Formosae [Taiwan], prope Tam sui.

[*Salvia nana* Doan in Lecomte, Fl. Indo-Chine 4 (1936) 993, nom. inval., nom. nud.]

Dwarf rhizomatous herb, 10–20 cm high. *Leaves* variable, mostly radical (in Malesia), pinnate, rarely bipinnate, 3–8 cm long; leaflets often 5-, sometimes 7-, rarely 3-foliolate, terminal leaflets largest, narrowly ovate to ovate, rarely ± linear, 1–4 by (0.2–)0.8–3 cm, apex acute, base rounded or cordate, margins regularly or irregularly crenate-serrate, with scattered hairs on both surfaces; petiole slender, with shorter erect hairs and longer spreading hairs, 4–10 cm long. *Inflorescences* with 4–7 flowers in a verticillaster, verticillasters 1–1.5 cm apart, inflorescence axes with simple and/or glandular hairs. *Calyx* tubular-campanulate, 4–5.5 mm long, in fruit 7–9 mm long, outside sparsely hairy, more hairs on veins, hairs simple or glandular, inside with short appressed hairs; tube 2-lipped, upper lip broad deltoid, entire; lower lip 2-lobed, lobes acuminate. *Corolla* purple, 8–9 mm long, exserted; tube annulate within. *Stamens* ex-

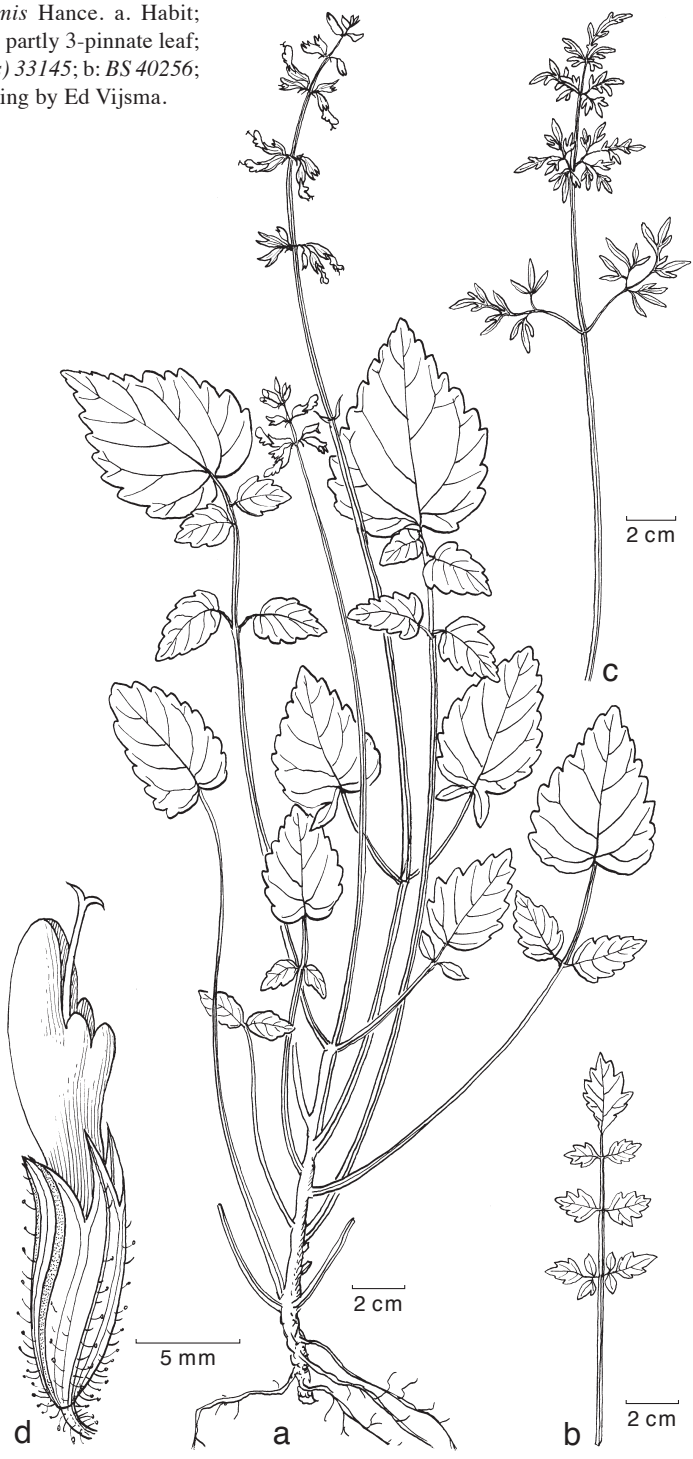

Fig. 41. *Salvia scapiformis* Hance. a. Habit; b. partly 2-pinnate leaf; c. partly 3-pinnate leaf; d. flower (a, d: *FB (Ramos) 33145*; b: *BS 40256*; c: *BS 40233*; all L). Drawing by Ed Vijsma.

posed, lower connective-branches reduced. *Nutlets* ellipsoid to flattened-subtriquetrous, 2–2.5 by c. 1 mm. — **Fig. 41.**

Distribution — China, Taiwan, Ryukyu Is.; in *Malesia*: Philippines (N Luzon).

Habitat & Ecology — On cliffs, mossy banks, boulders and in ravines along small streams. Altitude: 400–1500 m. Flowering: March to September.

Note — The Philippine specimens examined have pinnate leaves; in China and Taiwan the typical form of *S. scapiformis* has simple leaves, although there are a few examples of plants with pinnate leaves from Taiwan. One of the Philippine specimens (*BS (Ramos & Edano) 40233*) has bipinnate leaves with very narrow leaflets. This specimen was annotated by Merrill as *S. philippinensis* sp. nov., but he never published his suggested new name.

CULTIVATED

A number of *Salvia* species are recorded to be, or have been cultivated. Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 360) reported that in Peninsular Malaysia, the cultivated species do not set viable nutlets in the lowland except for *S. coccinea*. The names below are based on Keng's original list; because of the increase in popularity of *Salvia* in horticulture, it is likely that there will be more species and/or cultivars in cultivation in Malesia now.

Salvia azurea Michx. ex Vahl, Enum. Pl. 1 (1804) 253. — Listed as *Salvia azurea* Lam. ssp. *pitcheri* (Torr. ex Bth.) Epling in Feddes Repert. Beih. 1 10 (1938) 194; Backer & Bakh.f., Fl. Java 2 (1965) 626

Corolla sky blue, rarely white.

Distribution — Native in the southern part of North America. Cultivated in Java as an ornamental.

Salvia confertiflora Pohl, Pl. Bras. Icon. Descr. 2 (1833) 134, t. 190; Backer & Bakh.f., Fl. Java 2 (1965) 628

Corolla red.

Distribution — Native of Brazil. Cultivated in Java, occasionally naturalized.

Salvia farinacea Benth., Labiat. Gen. Spec. (1833) 274; Backer & Bakh.f., Fl. Java 2 (1965) 626

Corolla bluish violet or white.

Distribution — Native in the southern part of North America. Cultivated in Java and Luzon as an ornamental.

Salvia fulgens Cav., Icon. 1 (1791) 15, t. 23; Miq., Fl. Ned. Ind. 2 (1859) 970; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1979

Corolla bluish.

Distribution — Native to Mexico. Cultivated in Java and Peninsular Malaysia.

Salvia × ianthina Otto & A.Dietr., Allg. Gartenzeitung 15 (1847) 362; Backer & Bakh.f., Fl. Java 2 (1965) 628. [= The accepted name for this species is now **Salvia hypoleuca** Benth.]

Corolla blue.

Distribution — Native of Mexico or Peru. In Java locally running wild, but not truly naturalized.

Salvia occidentalis Sw., Prodr. Veg. Ind. Occ. (1788) 14

Distribution — Native of tropical America.

Note — I have not seen specimens of this species, but it is recorded by Sosef & Van der Maesen (PROSEA 11 (1997) 294) as having been introduced to Indonesia to test as a cover crop. It has now apparently naturalized in Java, where once established it presents the formation of an *Imperata* grass cover.

Salvia officinalis L., Sp. Pl. (1753) 23; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 413 (as excl. sp.); Backer & Bakh.f., Fl. Java 2 (1965) 626

Corolla violet, rarely white.

Distribution — Native of southern Europe. Dasuki (PROSEA 13 (1999) 197) reports that small-scale cultivation of *S. officinalis* in SE Asia is taking place, mainly to satisfy the demand of a foreign clientele (international hotels, fast-food chains).

Salvia purpurea Cav., Icon. 2 (1793) 52, t. 166; Burkill, Dict. Econ. Prod. Malay Penins. (1935) 1979

Corolla purple.

Distribution — Native to Mexico and C America. Cultivated in Peninsular Malaysia.

Salvia splendens Sellow ex Schult. in Roem. & Schult., Mant. Pl. Altera (1822) 185; Backer & Bakh.f, Fl. Java 2 (1965) 628

Corolla bright crimson.

Distribution — Native of Brazil. Cultivated in many parts of Malesia as an ornamental, in Java also locally naturalized. Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 360) reports: “there seems to be recorded an older name *S. splendens* Buchoz, Hist. Règne Vég. II Dec. 3, t. 2 (1773) (n.v.). It is not certain that this is a valid name and that it is the same species”.

Salvia tiliifolia Vahl, Symb. Bot. 3 (1794) 7; Backer & Bakh.f., Fl. Java 2 (1965) 627

Corolla blue.

Distribution — Indigenous to E Mexico and the West Indies. In E Java locally naturalized as a weed below Nongkodjadjar, 1000–1100 m.

Salvia uliginosa Benth., Labiat. Gen. Spec. (1833) 251; Backer & Bakh.f., Fl. Java 2 (1965) 626

Corolla sky-blue, rarely white.

Distribution — Indigenous in south-eastern part of N America. Cultivated, in Java as an ornamental.

Salvia viridis L. var. **horminum** (L.) Batt. & Trab., Fl. Alger (1890) 685; Backer & Bakh.f., Fl. Java 2 (1965) 628

Corolla pink, violet or white.

Distribution — Native of the Mediterranean region and SW Asia. Cultivated in Java.

42. SCUTELLARIA

(G.L.C. Bramley, updated from Keng 1978)

Scutellaria L., Sp. Pl. (1753) 598; H.Keng, Gard. Bull. Singapore 24 (1969) 164; in Steenis, Fl. Males., Ser. I, 8 (1978) 323; A.J.Paton, Kew Bull. 45 (1990) 399; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 75; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 211. — Type: *Scutellaria galericulata* L.

Herbs or shrubs, sometimes woody below. *Leaves* opposite, petiolate, rarely sessile, entire, toothed or rarely pinnatifid. *Inflorescences* terminal or axillary, racemes with flowers decussately or helically arranged, often secund or solitary in axils of leaves; bracts minute or conspicuous. *Calyx* short, campanulate, 2-lipped, accrescent, lips entire, upper lip with a large caducous shield- or pouch-like appendage ('scutellum') above it; in fruit, at first the lips closed together, then the upper lip detaching with the appendage to release nutlets. *Corolla* tube zygomorphic, white, pink, blue, yellow or red, straight or curved, usually sharply recurved from the base and erect upwards, not annulate within, 2-lipped; upper lip often boat-shaped, entire or notched; lower lip broad, 3-lobed. *Stamens* 4; lower pair longer, ascending under upper corolla lip, anthers often dimidiate or 1-celled; upper pair shorter, anthers 2-celled. *Disc* tubular, elongate. *Ovary* oblique, on a short gynophore; style gynobasic, stigma 2-fid. *Fruit* a schizocarp; nutlets very minute, smooth, granular or hispid, attachment scar small, ventral. *Seeds* more or less transverse, with curved embryo.

Distribution — About 360 species, subcosmopolitan, absent in S Africa, the Pacific islands (except the Bonins near Japan), and New Zealand, poorly represented in lowland tropics; in *Malesia* 3 species.

Habitat & Ecology — In the Malesian tropics both at low and high altitude.

Taxonomy — The three species present in Malesia all have wide distributions and are morphologically variable. Numerous attempts have been made to make sense of this variation through infraspecific ranks (as followed by Keng 1978). Here, I have more or less followed Keng's account, with the exception of some changes to the identification key, but I do not think it is completely satisfactory. Further work, especially study of these plants in the field, needs to be done to clarify the limits both between and within these species.

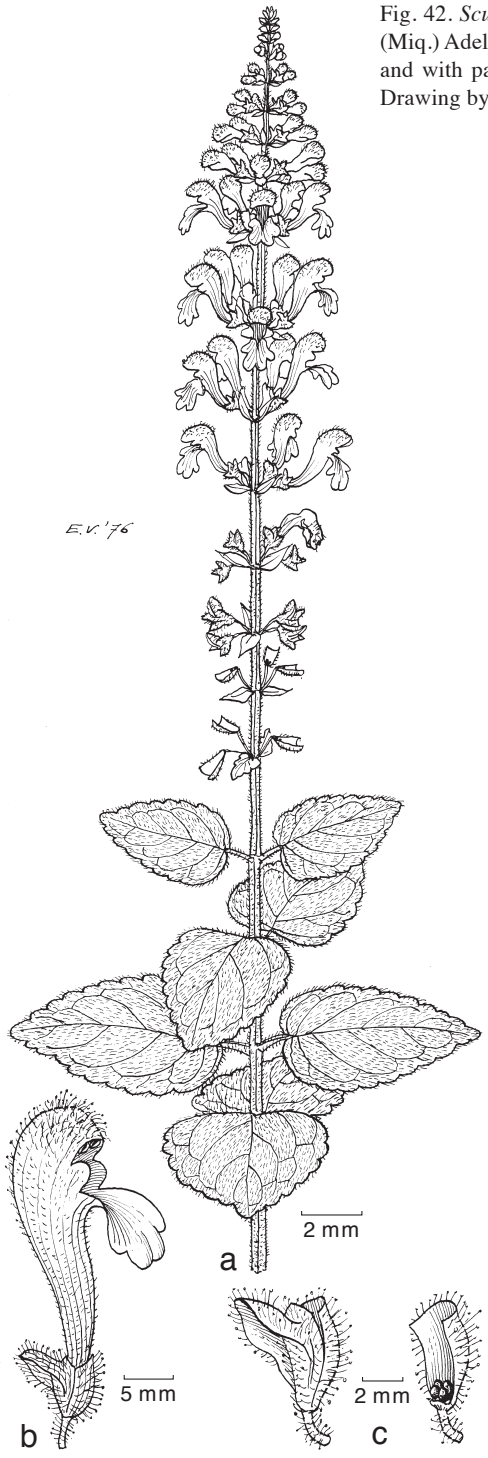

Fig. 42. *Scutellaria discolor* Wall. ex Benth. var. *cyrtopoda* (Miq.) Adelb. a. Habit; b. flower; c. intact calyx in fruit (left) and with part of calyx removed (right) (all *Coert 252*; L). Drawing by Ed Vijsma, 1976.

KEY TO THE SPECIES

1a. Flowers solitary to 3 (rarely 4) in a verticillaster, radially spreading. Petiole length variable on same plant, up to 8 (or more) cm long . . . . . **1. S. discolor**
b. Flowers generally 2 in a verticillaster, secund or opposite. Petiole length not particularly variable on same plant, up to 3 cm long 2
2a. Flowering calyx 1–1.5 mm long. Pedicels nearly perpendicular to the rachis. Leaf blades broadly ovate, rounded or reniform, the base usually cordate. . **2. S. indica**
b. Flowering calyx 3–4 mm long. Pedicels always obliquely erect (at angles of 60° to 75°) to the rachis. Leaf blades very narrowly ovate to ovate, base acute to rounded . . . . . **3. S. javanica**

1. Scutellaria discolor Colebr.

Scutellaria discolor Colebr. in Wall., Pl. Asiat. Rar. 1 (1830) 66; Miq., Fl. Ned. Ind. 2 (1859) 972; Ridl., Fl. Malay Penins. 2 (1923) 649; Backer & Bakh.f., Fl. Java 2 (1965) 620; Steenis, Mountain Fl. Java (1972) pl. 24-7. — Type: *Wall. Cat. 2134* (K 4 sheets, K-W), Silhet.
Scutellaria heteropoda Miq., Fl. Ned. Ind. 2 (1859) 972, incl. var. *grandis* Miq. — Syntypes: *Horsfield s.n.* (BM, K, L), Java; *Zippel s.n.* (not located), Moluccas.
Scutellaria zollingeriana Briq., Annuaire Conserv. Jard. Bot. Genève 2 (1898) 104. — Type: *Zollinger 2695* (G-DEL), Java.
Scutellaria indica auct. non L.: Blume, Bijdr. (1826) 839.
Scutellaria colebrookiana auct. non Wall.: Zoll. & Moritzi, Syst. Verz. (1846) 54.

Small herb, usually 20–50(–100) cm high. *Stems* hirsute, rarely branched. *Leaves* often towards base of stem to radical; blade broadly elliptic to rounded, rarely ovate, 2.5–6(–11) by 2–5(–10) cm, sometimes smaller, membranaceous, apex obtuse or rounded, base often rounded to cordate, margin coarsely crenate, glabrescent or sparsely pubescent on both surfaces; petiole length variable, from (0.5–)1–8 (occasionally longer) cm, hirsute. *Inflorescences* terminal, raceme-like, 10–15 cm long; flowers solitary or 2 or 3 (sometimes 4) flowers subverticillately arranged in verticillasters, radially spreading (not confined to one plane); bracts linear, 1–3 mm long; pedicels 2–5 mm long, pubescent. *Calyx* cup-shaped, 2–2.5 mm long, in fruit 4–5 mm long, hirsute. *Corolla* trumpet-shaped, blue, pale-blue or purple-violet, 10–12 mm long. *Nutlets* ellipsoid, c. 1.2 by 0.7 mm, black, echinate. — **Fig. 42.**

Distribution — Continental SE Asia (from the Deccan to Assam, Nepal, Burma, Thailand, Indo-China and SW China: Yunnan); widespread in *Malesia*: Malay Peninsula, Java (incl. Bawean Is. & Kangean Is.), Lesser Sunda Islands (Lombok, Flores, Sumba, Sumbawa, Alor, Wetar, Timor), Moluccas (Ceram, Ambon) and New Guinea. It is peculiar that this species is not found in several large islands (Sulawesi, Philippines). The single record of Sumatra by Korthals specimens named by Miquel *S. heteropoda* var. *grandis* (Keng, Gard. Bull. Singapore 24 (1969) 166) is almost certainly mislocalized and came from Java, where other similar specimens of Korthals had their provenance (Keng 1978). Two varieties in Malesia.

Habitat & Ecology — Grassland along streams, shady and moist places in rainforest, trails in forest, moist rocks in ravines, in Sumbawa in lowland Dipterocarp forest, in the Vogelkop in oak forest, in Timor on limestone in *Podocarpus* forest. Altitude: from

the lowland up to 2400 m, at low altitude on several small islands but also on the larger islands. Flowering: throughout the year.

Vernacular names — General: Nilam bukit, Toma (Malay). Java: Amperu lemah, Djarongan, Lampesan (Javanese); Beungbeureuman tangkal, Daun kukuran, Djawer kotok (leuweung), Kipahit, Tjawir kotok hutan (Sundanese). Moluccas: Ambon: Daun kukur; Ceram: Huta alosu; Ternate: Majana kusu.

Uses — According to Heyne (Nutt. Pl. Ned.-Ind. (1927) 1326) used against pains in the loins.

Note — A wide-ranging, rather variable species. Keng (1978) notes that the early described Indian specimens were rather tiny herbs, usually less than 30 cm high, with rounded or reniform leaves 1.5–2 cm long and few-flowered terminal inflorescences. Malesian specimens are generally taller with elliptic to rounded, larger leaves 4.5–6 by 3.5–5 cm and many-flowered terminal and upper-axillary inflorescences.

KEY TO THE VARIETIES

1a. Stem hirsute. Leaves membranaceous; petioles 1–8 cm long. Bracts linear, 1–3 mm long . . . . . **a.** var. **discolor**

b. Stem densely glandular-hairy. Leaves chartaceous; petiole 0.5–1.5 cm long. Bracts prominent, lower ones very narrowly ovate, 3–5 mm long, decreasing in size upwards . . . . . **b.** var. **cyrtopoda**

a. var. **discolor**

Scutellaria discolor Colebr. var. *discolor*: H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 324. — Type: as the species.

Stems hirsute. *Leaves* broadly elliptic to rounded, rarely ovate, 2.5–6(–11) by 2–5 (–10) cm, membranaceous, glabrescent or sparsely pubescent on both surfaces; petioles 1–8 cm long. *Bracts* linear, 1–3 mm long.

Distribution — As the species.

b. var. **cyrtopoda** (Miq.) Adelb.

Scutellaria discolor Colebr. var. *cyrtopoda* (Miq.) Adelb., Fl. Java 201 (1954) 14; Backer & Bakh.f., Fl. Java 2 (1965) 620; H.Keng, Gard. Bull. Singapore 24 (1969) 167; Steenis, Mountain Fl. Java (1972) pl. 25-8. — *Scutellaria cyrtopoda* Miq., Fl. Ned. Ind. 2 (1859) 973. — Type: *Horsfield s.n.* (K), Java.

Stems densely glandular-hairy. *Leaves* ovate to broadly ovate, 3.5–5 by 2–4 cm, chartaceous, apex acute or broadly acute, base rounded, margin crenate-serrate, appressed hirsute above, pilose on the nerves beneath; petiole 0.5–1.5 cm long, pilose. *Bracts* very prominent, lower ones very narrowly ovate, 3–5 mm long, decreasing in size upwards.

Distribution — Java (Mt Malabar eastwards to Mt Jang).

Habitat & Ecology — Shady places, sometimes moist, both in light mixed and in *Casuarina* forest. Altitude: 1600–3200 m. Flowering: throughout the year.

Note — After Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 324): this variety is mainly characterized by the more copiously glandular-hairy stem, rather small ± thicker leaves, and more prominent bracts. Dunn (Notes Roy. Bot. Gard. Edinburgh 6 (1915): 176) referred *Henry 10240* from Yunnan to this taxon, but this is probably not correct.

2. **Scutellaria indica** L.

Scutellaria indica L., Sp. Pl. (1753) 600; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 409; Backer & Bakh.f., Fl. Java 3 (1968) 657. — Lectotype (designated by Paton in Jarvis et al., Taxon 50 (2001) 519): *Herb. Linn. No. 751.15* (lecto LINN), India.

Scutellaria copelandii Merr., Philipp. J. Sci., C 7 (1912) 349. — Type: *Weber 1512* (not located), Philippines, Mindanao, Cotabato dist.

Small herb, usually prostrate, 20–30 cm long, often not branched. *Stems* and *branches* acutely quadrangular, glabrescent or strigose. *Leaves* mostly radical; blade broadly ovate to rounded or reniform, 1.5–2(–3) by 1.5–2 cm, chartaceous, base usually cordate, appressed hirsute on both surfaces, margin crenate; petiole 0.5–1.5 cm long, hirsute and scabrid. *Inflorescences* with 2 opposite flowers in a verticillaster; bracts rounded to ovate, 2–3 mm long, villose; pedicels nearly perpendicular to the rachis. *Calyx* 1–1.5 mm long, in fruit 3–4 mm long, glandular-hairy. *Corolla* pale to deep purple, 12–14 mm long, puberulent. *Nutlets* protuberant, c. 1 by 0.6 mm.

Distribution — Continental E Asia (Indo-China, China, Japan, Taiwan, Hong Kong); in *Malesia*: N Sumatra (Gajo & Batak Lands), W Java (Priangan), Philippines (Mindanao, Mindoro), C Sulawesi (Masamba), Lesser Sunda Islands (Sumbawa, Flores, Timor), Moluccas (Ternate, Halmaheira, Banda), New Guinea.

Habitat & Ecology — On cliffs and boulders along streams, grassy open plain, along tracks in secondary forest, rather rare in Malesia. Altitude: up to 2300 m. Flowering: throughout the year.

Vernacular names — Sumatra: Bangim bangiin batii (Batak). Java: Daun kukiiran. Philippines: Banod (Bagóbo). New Guinea: Samsi (Wapi; Wigote).

Note — Following Keng (1978): "The Papuan specimens tend to have larger and thinner leaves and often the stems are branched, each branch ending in a racemose inflorescence."

3. **Scutellaria javanica** Jungh.

Scutellaria javanica Jungh., Java 1 (1853) 661; Miq., Fl. Ned. Ind. 2 (1859) 974; Backer & Bakh.f., Fl. Java 2 (1965) 620; H.Keng, Gard. Bull. Singapore 24 (1969) 168. — Type: *Junghuhn 24* (holo? L), Java, Dieng.

Slender undershrub, 60–100 cm high, often branched. *Stems* and *branches* acutely 4-angled, pubescent. *Leaves*: blade very narrowly ovate to ovate, 0.5–10 by 1.5–3.5 cm, membranaceous, apex acute to caudate, base rounded or acute, margins crenate or remotely serrate, often only few-toothed, or sometimes entire; puberulent to glabrescent on both surfaces; petiole usually 1–3 cm long, sometimes less than 5 mm long, almost subsessile, hirsute. *Inflorescences* terminal, sometimes also in upper leaf axils, lax, raceme-like, 2–10 cm long; rachis glabrous to densely glandular-hairy, often 2 secund flowers per verticillaster; bracts narrowly ovate, 1–2 mm long; pedicels obliquely at-

tached (60° to 75°) to the rachis. *Calyx* campanulate, 3–4 mm long, in fruit 5–6 mm long, hirsute. *Corolla* trumpet-shaped, blue or white, 14–16 mm long, puberulent, upper lip notched. *Nutlets* broadly oblong, flattened, 1–1.5 mm long, black, finely tuberculate and puberulent.

Distribution — Sumatra (rare), C to E Java (Mts Dieng, E to Mt Ardjuno), Philippines (Luzon, Mindoro), C and N Sulawesi, Moluccas (Ceram) and New Guinea. Four varieties in Malesia.

KEY TO THE VARIETIES

1a. Leaf blades usually over 3 cm long; margin crenate or entire 2
b. Leaf blades usually less than 3 cm long; if longer then the margin often with 2–3 coarse teeth on each side 3
2a. Rachis of inflorescence often densely glandular hairy. Leaf blades 3–4(–5) by 1.5–2(–3) cm . . . . . **a.** var. **javanica**
b. Rachis of inflorescence not or thinly glandular hairy. Leaves 7.5–10 by 3–3.5 cm . . . . . **d.** var. **sumatrana**
3a. Leaf blades 0.5–1.5 cm long; margin remotely crenate or subentire . . . . . **b.** var. **luzonica**
b. Leaf blades 2–3.5(–6.5) cm long; margin with 2–3 coarse teeth on each side . . . . . **c.** var. **russeliifolia**

a. var. **javanica**

Scutellaria javanica Jungh. var. *javanica*: H.Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 325. — Type: as the species.

Scutellaria horsfieldiana Miq., Fl. Ned. Ind. 2 (1859) 974. — *Scutellaria violacea* Heyne var. *horsfieldiana* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 531. — Type: *Horsfield s.n.* (K), Java.

Slender undershrub, 60–100 cm high, often branched. *Leaves*: blades very narrowly ovate to ovate, 3–4(–5) by 1.5–2(–3) cm, membranaceous, apex acute to caudate, base rounded or acute, margins crenate to almost entire; puberulent to glabrescent on both surfaces; petiole 1–3 cm long, hirsute. *Inflorescences* racemes 8–10 cm long; rachis often densely glandular-hairy.

Distribution — Sumatra (rare), C to E Java (Mts Dieng, E to Mt Ardjuno), Philippines (Luzon, Mindoro), C and N Sulawesi, Moluccas (Ceram) and New Guinea.

Habitat & Ecology — Open primary, often light forest, forest edges, trails, on damp soil in savannah forest. Altitude: up to 2300 m, in Java not below 600 m. Flowering: throughout the year.

Vernacular names — Java: Kapunlen, Upar upar (Javanese, Ungaran); Perlutan, Sonkèttan (Javanese, Diëng). New Guinea: Vogelkop Peninsula: Riemos (Tehid).

b. var. **luzonica** (Rolfe) H.Keng

Scutellaria javanica Jungh. var. *luzonica* (Rolfe) H.Keng, Gard. Bull. Singapore 24 (1969) 171. — *Scutellaria luzonica* Rolfe, J. Linn. Soc., Bot 21 (1884) 315; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 410. — Type: *Lobb s.n.* (holo K), Philippines, Luzon.

Scutellaria marivelensis Elmer, Leafl. Philipp. Bot. 2 (1908) 516. — Type: *Elmer 6984* (not located), Philippines, Luzon, Bataan prov., Mt Mariveles.

Ascending, procumbent herb. *Leaves*: blade lanceolate to broadly ovate, 0.5–1.5 by 0.3–1 cm, chartaceous, apex acute to acuminate, base subrounded, margin remotely crenate or subentire; petiole 2–3 mm long or leaf subsessile. *Inflorescences* racemes 2–4 cm long.

Distribution — Philippines (Luzon), Sulawesi (1 collection from Eastern Central area) and New Guinea (Papua and Papua New Guinea).

Habitat & Ecology — Ravines, ridges in mossy forest, grassland, stream banks, forest floor, peaty forest on sand. Altitude: (300–)l000–2400 m, at 3300 m on Mt Suckling (New Guinea), along mountain streams occasionally found at lower altitude. Flowering: throughout the year.

Vernacular names — Philippines: Lupingan, Sidit (Igorot). New Guinea: Buisk (Telefomin).

c. var. **russeliifolia** (Vatke) H.Keng

Scutellaria javanica Jungh. var. *russeliifolia* (Vatke) H.Keng, Gard. Bull. Singapore 24 (1969) 172; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 410. — *Scutellaria russeliifolia* Vatke, Bot. Zeitung (Berlin) 30 (1872) 715. — Type: *Jagor s.n.* (B†), Philippines, in insula Manila.

Small herb, suberect. *Leaves*: blade ovate, 2–2.5(–6.5) by 1–2(–3) cm, chartaceous to thin coriaceous, apex acute or acuminate, base rounded or often subcordate, the margin with 2 or 3 coarse teeth on each side; lateral veins usually very prominent; petiole less than 5 mm long or leaf subsessile, hirsute.

Distribution — Philippines (Luzon, Mindoro, Catanduanes, Basilan, Leyte, Panay), NE Sulawesi (Minahassa).

Habitat & Ecology — Primary forest, often in mossy forest. Altitude: 500–2350 m. Flowering: January to June.

d. var. **sumatrana** (Miq.) Backer ex Bünnemeijer

Scutellaria javanica Jungh. var. *sumatrana* (Miq.) Backer ex Bünnemeijer, Trop. Natuur 10 (1921) 37; Backer & Bakh.f., Fl. Java 2 (1965) 620; H.Keng, Gard. Bull. Singapore 24 (1969) 171. — *Scutellaria sumatrana* Miq., Fl. Ned. Ind. 2 (1859) 974. — Type: *unknown collector HB 1153* (U), Sumatra, bij de Batang Baroes.

Leaf blades 7.5–10 by 3–3.5 cm; margin crenate. *Inflorescences* rachis up to 20 cm long, not or thinly glandular hairy. *Flowers* blue, lip-base white.

Distribution — Sumatra, Philippines (Mindoro, Mindanao), Lesser Sunda Islands (Sumba, Flores).

Habitat & Ecology — In thickets along trails, on ridges and in forest. Altitude: (500–) 1000–2850 m. Flowering: throughout the year.

Vernacular name — N Sumatra: Bangun bangim na gerger (Karo-Batak).

CULTIVATED

Scutellaria splendens Link, Klotzsch & Otto in Link & Otto, Icon. Pl. Rar. (1841) 31, t. 13; Backer & Bakh.f., Fl. Java 2 (1965) 620.

Corolla bright red.

Distribution — Native to Mexico. Cultivated in mountain regions in Java as a garden ornamental.

EXCLUDED

Scutellaria ? japonica Burm.f., Fl. Ind. (1768) 130; Merr., Philipp. J. Sci. 19 (1921) 378.

Note — Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 326) notes that Burman recorded this species for Japan and Java. Bentham concluded that Burman's description is based on a mixture (in A.DC., Prodr. 12 (1848) 431), which he referred in part to *Plectranthus coetsa* D.Don (in A.DC., Prodr. 12 (1848) 58) and in part to *Melissa parviflora* Benth. (in A.DC., Prodr. 12 (1848) 241); he examined the original specimens in the Burman herbarium. However, these two species neither occur in Japan nor in Java. In Merrill's opinion (1921: 378) Burman's description was mainly based on *Melissa*. Burman may have confused these species with the Javanese *Plectranthus teysmannii* Miq. (now *Isodon teysmannii* (Miq.) H.W.Li) and *Melissa axillaris* Bakh.f.; however, at 'Burman's time these mountain plants from the interior of Java had not yet been collected. Koidzumi and later Ohwi (Fl. Jap. (1965) 786) have accepted 'Burman's description as the basis of *Plectranthus japonicus* (Thunb.) Koidz. Since Keng recorded the above in 1978 no further advance in resolving the identity of what Burman cited as *Scutellaria ? japonica*, has been made.

43. SPHENODESME

(L.J. Walsingham & S. Suddee)

Sphenodesme Jack, Malayan Misc. 1, 1 (1820) 19; Calcutta J. Nat. Hist. 4, 13 (1843) 43; C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 600; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1897) 180; Ridl., Fl. Malay Penins. 2 (1923) 637; Gamble, Fl. Madras 2 (1924) 1, 104; Dop in Lecomte, Fl. Indo-Chine 4 (1936) 898; Munir, Gard. Bull. Singapore 21 (1966) 315; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 192. — Type: *Sphenodesme pentandra* Jack.

Lianas or woody climbers, stems quadrangular and lenticillate. *Leaves* opposite, decussate, simple, entire and chartaceous. *Inflorescences* paniculate, axillary and terminal, usually with elongate thyrsoid branches, in axils of leafy bracts, cymes capitate, 3-, 5- or 7-flowered, pedunculate, involucral bracts showy, 6, oblanceolate to obovate to spatulate, prominently veined, much longer than the flowers, conspicuously accrescent, often unequal in fruiting. *Calyx* narrowly infundibular, actinomorphic, ribbed, 5- or 10-lobed, if 10-lobed, five of the lobes accessory, differing in shape to the other five, accrescent in fruit. *Corolla* actinomorphic, longer than the calyx, tube short, cylindric as long as the calyx, villous in throat; lobes 5 or 6, subequal, imbricate in bud. *Stamens* 5 or 6 inserted in the corolla, filaments short, included or shortly exserted; anther lobes

elliptic ovate and parallel. *Ovary* 2-celled, with 2 ovules in each cell; style long, terminal, filiform or minute; stigma 2-lobed. *Fruit* drupaceous, globular or obovoid. *Seeds* 1, included in the capsule formed by the accrescent calyx. — **Plate 7b.**

Distribution — About 14 species, S and E India, E Pakistan, Burma, Thailand, Laos, S and E China, Vietnam, Cambodia; six species in *Malesia*: one endemic to each of the areas Sabah and Sarawak; one occurring in Sumatra only, and the other three species with wider Sundaland distributions (Peninsular Malaysia, Sumatra, Borneo).

Habitat & Ecology — Primary and secondary lowland forest. Altitude: below 220 m.

Note — Munir (1966) favoured retaining the two subsections *Sphenodesme* s.str. and *Pentadontia*, set out much earlier by both Clarke (1885) and Briquet (1897), based on the presence of accessory lobes on the calyx. These subsections appear to create some confusion and anomalies in identification. After detailed study of specimens throughout the region we have identified other more reliable key characters to distinguish species, making the subsections unnecessary.

KEY TO THE SPECIES

1a. Calyx, younger stems and involucral bracts with long ferruginous, simple (glandular) hairs .. . . . **3. S. racemosa**
b. Calyx, younger stems and involucral bracts without hairs or with non-ferruginous hairs, or if densely ferruginous, then hairs short and stellate 2
2a. Calyx 10-lobed, with 5 typical lobes alternating with 5 differently shaped accessory lobes 3
b. Calyx 5- or 6-lobed, with no alternating accessory lobes 4
3a. Calyx with 5 acute to almost truncate lobes alternating with 5 equal to or slightly longer, acuminate, aristate accessory lobes . . . . . **2. S. pentandra**
b. Calyx with 5 acute bifid lobes alternating with 5 much longer, narrowly lanceolate accessory lobes . . . . . **4. S. sarawakensis**
4a. Calyx with 6 lobes; corolla with 6 obovate lobes . . . . . **1. S. involucrata**
b. Calyx with 5 lobes; corolla with 5 acute lobes 5
5a. Young stems, calyx and inflorescence densely tomentose with short stellate hairs mixed with many long branching glandular hairs, giving yellow-white appearance. Calyx lobes narrowly acute . . . . . **5. S. stellata**
b. Young stems, calyx and inflorescence puberulous with short stellate hairs mixed with very few long stellate hairs, with few yellow glands, not giving a yellow white appearance; calyx lobes acute . . . . . **6. S. triflora**

1. Sphenodesme involucrata (C.Presl) B.L.Rob.

Sphenodesme involucrata (C.Presl) B.L.Rob., Proc. Amer. Acad. Arts 51 (1916) 531. — *Vitex involucratus* C.Presl, Abh. Königl. Böhm. Ges. Wiss. 5, 3 (1845) 578. — Type: *Helfer s.n.* (BM), India orientalis, in Bengalia circa Calcuttam.

Sphenodesme odorata H.R.Fletcher, Bull. Misc. Inform. Kew (1938) 207. — Type: *Kerr 11815* (holo E; iso BM), Thailand, Ranawng [Ranong], Kao Tulu.

Sphenodesme involucrata (C.Presl) B.L.Rob. var. *pubescens* Moldenke, Dansk Bot. Ark. 23 (1963) 86. — Type: *Sørensen, Larsen, Hansen 6629* (LL), Thailand, Nakawn Sawan [Nakhon Sawan].

Sphenodesme paniculata auct. non C.B.Clarke: Gamble, Fl. Madras 2, 6 (1924) 1, 104.

Stems, with ferruginous short stellate, glandular hairs. *Leaves*: blades elliptic-oblong, 7.5–15 by 3.5–8 cm, apex acuminate, base cuneate or rounded, upper surface evenly stellate, when young, becoming sparsely stellate when older, lower surface evenly gland dotted and sparsely stellate; petiole up to 15 mm long, hairy. *Inflorescences* yellow, glandular, stellate; cymes 7-flowered; peduncle 2–3.5 cm long, stellate, involucral bracts 1.5–4 cm by 5–13 mm, much enlarged in fruit, up to 4 cm long, evenly stellate, long obovate to spatulate, membranaceous. *Calyx* up 4–6 mm long, stellate tomentose without, tube appressedly hairy within, 6-lobed, lobes acute, equal pubescent on the innerside. *Corolla* 6-lobed, pale yellow, 6–9 mm long, lobes obovate, c. 2 mm wide, puberulous on both sides, tube puberulous without, villous within. *Stamens* 6, included, seated in corolla throat, filaments very short, anthers oblong. *Ovary* obovoid, glabrous, glandular near apex. *Style* minute. *Stigma* bifid. *Fruit* capsular, globular, included in the accrescent calyx, up to 8 mm long.

Distribution — India, Burma, China, Thailand, Vietnam; in *Malesia*: Sumatra (Aceh Prov.).

Habitat & Ecology — Not recorded.

Note — *Sphenodesme involucrata* has so far only been collected from the northern region of Aceh in Sumatra (in his earlier account of the genus, Munir (Gard. Bull. Singapore 21 (1966) 334) included one specimen from Borneo under *S. involucrata*: this is now determined as *Sphenodesme stellata* because of its exserted stamens). *Sphenodesme involucrata* is readily identified by its included stamens (if corollas are available); the only other species in the Flora Malesiana area having this character is *S. racemosa* var. *sabahensis*, but since the latter is densely ferruginous, with long simple hairs it cannot easily be confused with *S. involucrata*, which is densely ferruginous with short stellate hairs only. The involucral bracts of *S. involucrata* narrow more gradually towards the base, thus appearing longer and thinner than in other species. The corolla lobes are wider at the apex and more elongate at the base than in other species, appearing almost spatulate and giving the corolla margin an undulate appearance in dried specimens. Fruiting calyces have not been seen therefore no measurement available.

2. Sphenodesme pentandra Jack

Sphenodesme pentandra Jack, Malayan Misc. 1, 1 (1820) 19; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 335; Ridl., Fl. Malay Penins. 2 (1923) 639; Dop in Lecomte, Fl. Indo-Chine 4 (1936) 904; H.R.Fletcher, Bull. Misc. Inform. Kew (1938) 442; Moldenke, Resume Geogr. Distr. & Syn. (1959) 345, incl. var. *pentandra*. — *Congea pentandra* (Jack) Wall., Numer. List (1829) no. 1734. — *Symphorema pentandrum* (Jack) Kurz, Forest Fl. Burma 2 (1877) 255. — Type: *Jack s.n.* (holo †; iso E), Malaysia, Penang.

Congea jackiana Wall. in Hook., Bot. Misc. 1 (1830) 285. — *Sphenodesme jackiana* (Wall.) Schauer in A.DC., Prodr. 11 (1847) 622. — *Symphorema jackianum* (Wall.) Kurz, Forest Fl. Burma 2 (1877) 255. — Lectotype (designated here): *Wallich Cat. 1735.1* (lecto K; isolecto BM, K-W).

Sphenodesme acuminata Wight, Icon. Pl. Ind. Orient. 4, 3 (1849) 14, t. 1476, nom. inval. (pro synonym *S. jackiana* Schauer).

Young *stems* dark brown, with appressed simple white hairs, older stems glabrous. *Leaves*: blade elliptic-oblong to lanceolate-oblong, 5–18 by 3–7 cm, apex acuminate-acute, often long-acuminate, base cuneate, upper surface glabrous and nitid, lower

surface glabrous, dull with midrib and axils of veins somewhat hairy beneath; petiole 5–15 mm long, pubescent when young, longitudinally channelled, curved. *Inflorescences* puberulous, in pedunculate 7-flowered cymes; peduncles 1.5–3 cm long; bracts oblong-spatulate, 1.5–2.8 by 0.5–1 cm, apex obtuse, glabrous. *Calyx* 4–5 mm long at anthesis, up to 7 mm at fruiting, outer surface glabrous or sparsely hairy, glabrous within or with a thin band of appressed hairs towards the base, 5-lobed; lobes shortly acute to almost truncate alternating with 5 equal to or slightly longer acuminate aristate accessory lobes, upper part of tube and lobes with clear reticulate venation. *Corolla* 5-lobed, lobes rounded to obovate, violet-blue, tube 5–8 mm long, outer surface glabrous, inner surface glabrous at the base then densely villous at the throat. *Stamens* 5, slightly exserted, anthers oblong. *Ovary* densely setose, glandular. *Style* slightly exserted. *Stigma* lobes shortly bifid. *Fruit* globular, setose, c. 4 mm long.

Distribution — Thailand, Vietnam; in *Malesia*: Peninsular Malaysia, Borneo (Sabah, Kalimantan). Two varieties in Malesia.

Note — For a detailed discussion of the typification of this species, see Munir (Gard. Bull. Singapore 21, 3 (1966) 315).

KEY TO THE VARIETIES

1a. Calyx sparsely hairy; the five acute and five longer acuminate aristate accessory lobes easily apparent in inflorescence . . . . . **a.** var. **pentandra**

b. Calyx glabrous; the five acute and five acuminate aristate accessory lobes short to almost truncate, not as conspicuous in inflorescence . . . . . **b.** var. **wallichiana**

a. var. **pentandra**

Sphenodesme pentandra Jack var. *pentandra*. — Type: as the species.

Calyx sparsely hairy; the five acute and five longer acuminate aristate accessory lobes easily apparent in inflorescence.

Distribution — Thailand, Vietnam; in *Malesia*: Peninsular Malaysia, Borneo (Sabah, Kalimantan).

Note — The five calyx lobes with acute tips are often easily apparent in the inflorescence head of dried specimens as they seem to recurve inwards, giving the inflorescence head a compact and rounded look, and thus accentuating the five longer acuminate aristate accessory lobes, and making initial identification easier.

b. var. **wallichiana** (Schauer) Munir

Sphenodesme pentandra Jack var. *wallichiana* (Schauer) Munir, Gard. Bull. Singapore 21 (1966) 360. — *Sphenodesme wallichiana* Schauer in A.DC., Prodr. 11 (1847) 622. — Type: *Wallich Cat. 1734* (G-DC), E Pakistan, Sylhet.

Roscoea pentandra Roxb., Fl. Ind. ed. Carey, 3 (1832) 54. — *Sphenodesme pentandra* (Roxb.) Wall. in Hook., Bot. Misc. 1 (1830) 285, nom. illeg. (non Jack 1820).

Calyx glabrous; the five acute and five acuminate aristate accessory lobes short to almost truncate, not as conspicuous in inflorescence.

Distribution — Peninsular Malaysia (Pahang), Borneo (Sabah: Sandakan division; E Kalimantan).

Note — As noted by Munir (1966), this variety has a strange distribution pattern, being present in Pahang (Peninsular Malaysia) and eastern Sabah. Munir bases var. *wallichiana* on three specimens (*SFN (Symington & Kiah) 28773, Kostermans 13542* and *Cuadra A 1152*, all at SING) and their reduced to almost truncate calyx lobes. The distinction between the lobe characteristics is apparent, though it is possible they are just underdeveloped, malformed or indeterminate, and may all be var. *pentandra*. Therefore we have decided to retain the variety in this account, though a study of more recent specimens when available could help make a more informed decision in the future.

3. **Sphenodesme racemosa** (C.Presl) Moldenke

Sphenodesme racemosa (C.Presl) Moldenke, Revista Sudamer. Bot. 10 (1956) 229; Resume Geogr. Distr. & Syn. (1959) 391. — *Viticastrum racemosum* C.Presl, Abh. Königl. Böhm. Ges. Wiss., 5, 3 (1845) 578. — Type: *Griffith s.n.* (BM, K), Malacca.

[*Sphenodesme ferruginea* Wight, Icon Pl. Ind. Orient. (1849) t. 1474, nom. nud.]

Sphenodesme borneensis Merr., J. Straits Branch Roy. Asiat. Soc. 76 (1917) 114. — Type: *Native collector 1847* (iso K), Borneo.

Sphenodesme winkleri Hallier f., Meded. Rijks.-Herb. 37 (1918) 86. — Type: *Hubert Winkler 2314* (holo L; iso BM, K, NY), Borneo.

Sphenodesme barbata H.J.Lam, Verbenaceae Malayan Archipel. (1919) 333. — Lectotype (designated here): *Wallich Cat. 1738* (lecto K; isolecto BM), [Malaysia,] Penang.

Stems ferruginous-hirsute, with simple glandular hairs. *Leaves*: blade elliptic-oblong to elliptic-ovate, 4–10 by 2.5–4.5 cm, chartaceous, apex obtuse or acuminate to mucronate, base cuneate, young leaves with upper surface evenly hirsute with long white simple hairs, gland dotted at base, hairs becoming more sparse in older leaves except on veins, lower surface ferruginous-tomentose beneath especially on the midrib and veins, older leaves less so on the blade surface, petiole to 0.8 mm long, hairy. *Inflorescences* ferruginous-hirsute; panicles variable in length, usually 10–25 cm long or more; cymes 7-flowered; peduncles 2–3.5 cm long, ferruginous tomentose, young involucral bracts ovate-spatulate, 1.5–2 cm long, 3–8 mm broad, bracts in fruiting specimens membranaceous to coriaceous, 2–3.5 cm long, 10–13 mm broad. *Calyx* c. 5 mm long, outer surface densely ferruginous-hirsute with long simple glandular hairs, puberulent within or with densely appressed white hairs, 10-lobed; 5 acute bifid lobes alternating with 5 acute to aristate accessory lobes, more or less equal to or slightly longer than the bipartite lobes, the 5 accessory lobes either marked, or not, by ribs on outer surface of calyx. *Corolla* infundibuliform, lobes obovate-spatulate, puberulous without, glabrous within except for a villous ring in the throat. *Stamens* 5, exserted; filaments slender, glabrous, anther lobes oval. *Ovary* rounded, setose in the upper half, glabrous in the lower. *Style* slender, exserted. *Stigma* bilobed. *Fruit* capsular, included.

Distribution — Peninsular Malaysia, Lingga Islands, Borneo (Kalimantan, Brunei); with two varieties.

Habitat & Ecology — Hill forest and secondary forest climber. Altitude: up to 150 m.

KEY TO THE VARIETIES

1a. Calyx puberulent within, the 5 acute bifid lobes longer than the 5 acute to aristate accessory lobes, distinctly different in appearance . . . . . **a.** var. **racemosa**
b. Calyx with densely appressed white hairs within, the 5 acute bifid lobes, more or less equal in length to accessory lobes not distinctly different in appearance . . . . . .**b.** var. **sabahensis**

a. var. **racemosa**

Sphenodesme racemosa (C.Presl) Moldenke var. *racemosa*. — Type: as the species.

Bracts in fruiting membranaceous, up to 10 mm broad. *Calyx* puberulent within; ribs on outer surface markedly extending into aristate accessory lobes, these slightly longer than the 5 bipartite lobes.

Distribution — Peninsular Malaysia, Borneo, Kalimantan, Brunei.

b. var. **sabahensis** Munir

Sphenodesme racemosa (C.Presl) Moldenke var. *sabahensis* Munir, Gard. Bull. Singapore 21 (1965–1966) 352. — Type: *Elmer 20838* (holo SING; iso L, M), Borneo, Tawao, Elphinstone prov.

Bracts in fruiting coriaceous, up to 13 mm broad. *Calyx* with densely appressed white hairs within; ribs on outer surface indistinctly extending into acute accessory lobes more or less equal in length to the bifid lobes.

Distribution — Borneo (Sabah).

Note — One of the differences of var. *sabahensis* from the type variety, according to Munir, is the corolla of var. *sabahensis* having a narrower villous ring in the throat of the corolla; however, no flowers of this variety have been seen to give any accurate measurements. The calyx having densely appressed hairs on both sides of the calyx as Munir first described, is a strong and reliable character, most useful in identification. In general appearance, the involucral bracts of this variety appear broader and thicker than those of the typical variety.

4. Sphenodesme sarawakensis Moldenke

Sphenodesme sarawakensis Moldenke, Revista Sudamer. Bot. 10 (1956) 230. — Type: *Native Collector 5227* (NY), Sarawak, Sampadi Hill.

Young *stems* dark brown, glabrous. *Leaves*: blade elliptic-lanceolate, 5–13.5 by 2–4 cm, apex acuminate, base cuneate, both sides glabrous, the upper surface dull greenish brown, the lower surface brown and conspicuously reticulate with the intramarginal nerve prominent; petiole c. 5 mm long. *Inflorescences* spreading 5–7-flowered cymes, puberulous in the rachis when young, later glabrous; peduncles 2.5–3.5 cm long; bracts elliptic or ovate-elliptic, enlarging to 3 by 1.2 cm, membranaceous, apiculate at apex, attenuate towards the base, brown on drying, puberulous when young, later glabrous. *Calyx* up to 1 cm at fruiting, outer surface pubescent, tube pubescent within, 10-lobed; 5 lobes deeply bifid, acute, inflexed, alternating with 5 distinctive, much longer lobes,

narrowly lanceolate, 3–5 mm long, erect and obscurely hairy. *Corolla* not seen. *Fruit* obovoid, grey setulose, 2–3 mm long.

Distribution — Sarawak.

Habitat & Ecology — Lowland primary forest.

Note — Only fruiting material of this species has been seen, so a detailed description of the corolla has not been possible.

5. Sphenodesme stellata Merr.

Sphenodesme stellata Merr., Univ. Calif. Publ. Bot. 15 (1929) 266. — Type: *Elmer 21631* (holo PNH†; iso K, L, M, NY, UC), Borneo, Tawao, Elphinstone prov.

Young *stems*, with short stellate glandular hairs mixed with long simple, shortly branching glandular hairs, giving tomentose yellow-white appearance. *Leaves*: blade ovate to ovate-elliptic, 9–14 by 4–8 cm, apex abruptly and shortly acuminate, base cuneate, upper surface glabrous, lower tomentose with gland dotted stellate hairs; petiole up to 1 cm long, stellate-pubescent. *Inflorescences* in pedunculate 5–7-flowered cymes, stellate-tomentose; peduncles up to 2 cm long; bracts oblanceolate, up to 2.8 cm in fruit, young bracts densely stellate-pubescent; flowers sessile. *Calyx* 3–4 mm long at anthesis, up to 6 mm long at fruiting, 5-lobed, outer surface densely stellate-pubescent, inner surface with long appressed hairs, lobes narrowly acute. *Corolla* c. 5 mm long, with corolla tube slightly longer than calyx, 5-lobed, lobes acute, puberulent outside, tube glabrous, inner surface with narrow villous ring in the throat. *Stamens* exserted, filaments slender, anthers oblong. *Ovary* glabrous. *Style* filiform. *Stigma* shortly bilobed. *Fruit* ovoid, up to 4 mm long.

Distribution — Borneo (Sabah).

Habitat & Ecology — Lowland forest.

6. Sphenodesme triflora Wight

Sphenodesme triflora Wight, Icon. Pl. Ind. Orient. (1849) t. 1478; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 332; in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 99; Ridl., Fl. Malay Penins. 2 (1923) 638; Moldenke, Resume Geogr. Distr. & Syn. (1959) 166, 178, 181, 188, 192, 345. — Type: *Griffith s.n.* (holo K; iso K, NY), Malacca.

Sphenodesme clemensorum Moldenke, Phytologia 4 (1953) 368; Resume Geogr. Distr. & Syn. (1959) 193. — Type: *J & M.S. Clemens 21781* (NY), Borneo (Sarawak), Gat, Upper Rejang river.

Young *stems* dark brown, pubescent with short glandular hairs, older stems less pubescent to glabrous. *Leaves*: blade oblong-lanceolate, 5–13 by 3–6 cm, apex acuminate, base acuminate, upper surface glabrous, lower glabrous or with some simple hairs or with some stellate hairs; petiole 1–1.5 cm long. *Inflorescences* axillary and terminal, in pedunculate 3-, 5- or 7-flowered cymes; peduncles up to 1 cm long; bracts spatulate, slightly longer than calyx when flowering, enlarging to 1.5–2 cm in fruit, pubescent. *Calyx* 4–5 mm at anthesis, up to 10 mm at fruiting, outer surface velutinous pubescent with short white simple and stellate glandular hairs, inner surface densely villous, 5-lobed, lobes acute to triangular. *Corolla* 5-lobed, lobes acute, dark purple, 4–6 mm long, with corolla tube only as long as the calyx, outer surface glabrous, inner surface

with narrow villous ring in the throat. *Stamens* slightly exserted, anthers oblong. *Ovary* glabrous. *Style* slender. *Stigma* lobes, bifid equal, with some hairs on the end. *Fruit* ovoid, up to 5 mm long. — **Plate 7a.**

Distribution — Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo.

Habitat & Ecology — Lowland forest.

KEY TO THE VARIETIES

1a. Cymes 3-flowered . . . . . **a.** var. **triflora**
b. Cymes 5-flowered . . . . . **c.** var. **riparia**
c. Cymes 7-flowered . . . . . **b.** var. **montana**

a. var. **triflora**

Sphenodesme triflora Wight var. *triflora*. — Type: as the species.

Cymes 3-flowered.

Distribution — Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo (Brunei, W Kalimantan).

Habitat & Ecology — Lowland forest.

b. var. **montana** Munir

Sphenodesme triflora Wight var. *montana* Munir, Gard. Bull. Singapore 21 (1966) 371. — Type: *J. & S. Clemens s.n.* (holo SING; iso A, B, L, M, NY), Borneo, Sabah, Mt Kinabalu.

Leaves thicker, subcoriaceous and puberulous on the nerves beneath. *Cymes* 7-flowered.

Distribution — Borneo (Sabah).

Habitat & Ecology — Montane forest.

c. var. **riparia** Munir

Sphenodesme triflora Wight var. *riparia* Munir, Gard. Bull. Singapore 21 (1966) 371. — Type: *Hose 419* (BM), Sarawak, Brama district.

Cymes 5-flowered.

Distribution — Peninsular Malaysia, Borneo (Sarawak, Brunei, Sabah).

Habitat & Ecology — Lowland forest.

44. STACHYS

(G.L.C. Bramley, updated from Keng 1978)

Stachys L., Sp. Pl. (1753) 580; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1896) 260; H.Keng, Gard. Bull. Singapore 24 (1969) 172; in Steenis, Fl. Males., Ser. I, 8 (1978) 362; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 178; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 223. — Type: *Stachys sylvatica* L.

Herbs or undershrubs. *Leaves* simple, opposite, crenate or serrate; hairs simple. *Inflorescences* thyrsoid or racemoid. *Calyx* campanulate, actinomorphic to weakly 2-lipped,

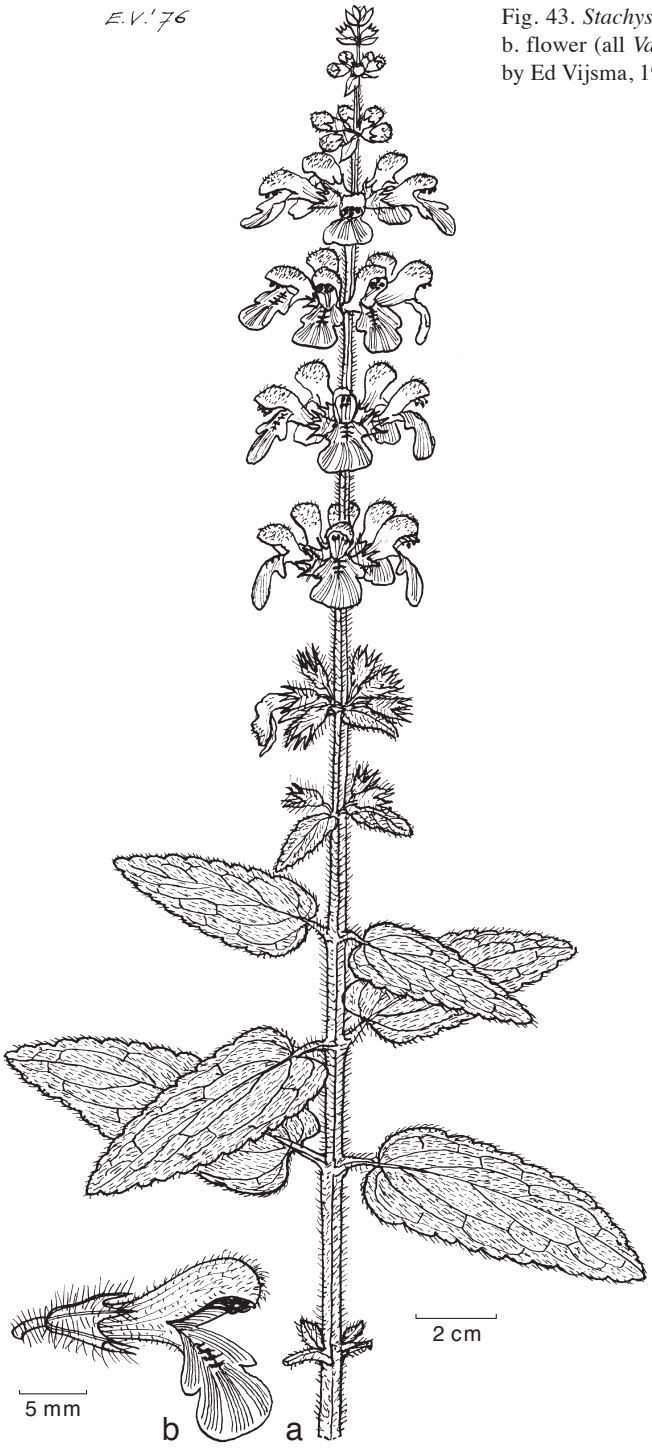

Fig. 43. *Stachys oblongifolia* Benth. a. Habit; b. flower (all *Van Steenis 11657*, L). Drawing by Ed Vijsma, 1976.

5-lobed, lobes equal or subequal. *Corolla* 2-lipped, 4-lobed (1/3), upper lip ascending, concave, entire; lower lip spreading, 3-lobed, the midlobe the largest; tube usually with a ring of hairs within. *Stamens* 4, subequal, ascending, scarcely projecting from upper corolla lip; anthers 2-celled, usually divaricate. *Style* gynobasic, stigma bifid, lobes subequal. *Fruit* a schizocarp of four nutlets. *Nutlets* ovoid, obtuse above, subtriquetrous below, smooth, glabrous, attachment scar small, basal.

Distribution — Approximately 300 species, found in various habitats, cosmopolitan except for Australia and New Zealand. In *Malesia* possibly two species, only found in two close spots in the mountains of W Java and one recently recorded from the Cameron Highlands, Peninsular Malaysia.

1. Stachys oblongifolia Wall. ex Benth.

Stachys oblongifolia Wall. ex Benth. in Wall., Pl. Asiat. Rar. 1 (1830) 64; Hook.f., Fl. Brit. India. 4 (1885) 676; Mukerjee, Rec. Bot. Surv. India 14 (1940) 188; Steenis, Mountain Fl. Java (1972) pl. 25-6. — Type: *Wallich Cat. 2076/2* (K, K-W), Bangladesh, Sillet.

Stachys sericea auct. non Wall. ex Benth. (nom. illeg., non *Stachys sericea* Cav.): Steenis, Bull. Jard. Bot. Buitenzorg Ser. 3, 13 (1934) 223.

Stachys melissifolia auct. non Benth.: Backer & Bakh.f., Fl. Java 2 (1965) 624; H.Keng, Gard. Bull. Singapore 24 (1969) 173.

Annual herb, erect. *Stems* 30–60 cm high, rarely branched, with dense spreading hairs. *Leaves*: blade narrowly elliptic or lanceolate, 4–6 by 1.5–2.5 cm, apex broadly acute, base truncate or subauriculate, margin crenate-serrate, with a dense covering of appressed hairs on upper and lower surfaces; petiole about 0.5 cm long. *Inflorescences* with verticillasters 4–10-flowered, in distant upper axils, forming racemose inflorescence, to 15 cm long or more; rachis tomentose; bracteoles narrowly elliptic, 2–6 mm long. *Calyx* campanulate, in flower 5–6 mm long, in fruit 6–7 mm long, with appressed hairs; lobes narrowly triangular with spinescent tips, the 3 upper lobes slightly longer, distinct from the lower two lobes by a deeper sinus. *Corolla* reddish violet, 10–12 mm long, with some hair on the outer surface, upper lip 3–4 mm long, lower lip 5–6 mm long. *Nutlets* broadly obovoid, flattened, subtriquetrous, c. 1.8 by 1.6 mm. — **Fig. 43.**

Distribution — Himalaya to Taiwan; in *Malesia*: Java, collected twice from the Preanger Mts (Talun and Rantja Gedeh near Kertosari).

Habitat & Ecology — Damp glades in mountain forest and along forest borders, very local but common. Altitude: 1600–1750 m.

Taxonomy — Keng (Fl. Males., Ser. I, 8 (1978) 363) summarised the historic difficulties in species delimitation in *Stachys*, citing a number of authors who had commented on issues they had encountered, for example Hooker f. (Fl. Brit. India 4 (1885) 676), and Backer & Bakhuizen van den Brink Jr. (Fl. Java 2 (1965) 624). After examining the few collections available of *Stachys* from Java, as well as the types of the various names which have been associated with them, all originating from the Himalayan region, I follow Keng (1978). The Javanese collections most closely match the type of *S. oblongifolia*, differing from the other names such as *S. melissifolia*, by their subequal, spinescent calyx lobes and smaller corolla.

Keng (1978) and other authors have noted that species delimitation across *Stachys* is problematic, and that careful comparison of the Asian material with European material

is necessary. Unfortunately, there exist only two collections of *Stachys* from Malesia (a recent additional collection is discussed below) – further study would require a greater amount of material.

POSSIBLY NATURALIZED TAXON

Stachys sylvatica L., Sp. Pl. (1753) 580. — Lectotype (designated by Press in Jarvis, Taxon 41 (1992) 570): *Herb. Clifford: 309, Stachys 1* (BM-000646043).

Note — Based on one collection from Cameron Highlands, Peninsular Malaysia (*KEP FRI 60879*, K, KEP, L). Several unusual species have been found at this collecting locality, all new records for Peninsular Malaysia. This collection of *Stachys* resembles the European and Eurasian *S. sylvatica*, although differing by its leaves that are slightly smaller than typical. This species is known to be cultivated in other parts of Asia such as southern China (X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 179). Further collections are needed to confirm if this species has become naturalized in this area.

CULTIVATED

According to Keng (Fl. Males., Ser. I, 8 (1978) 363) the following taxa have been found in cultivation; because there has been no update to the information reported, what follows is taken from Keng:

Stachys arvensis L.

This was sporadically found in ditches in the Mission Garden, Keglsugl airstrip, New Guinea, by Dr. N.M. Wage, 14 Sept. 1971 (*ANU 13035*). This may become naturalized. It is not known whether it was brought intentionally or came along with other seed as a weed. Identified by J. Mennema, Leiden.

Stachys affinis Bunge, Enum. Pl. China Bor. (1833) 51 (previously listed as *Stachys sieboldii* Miq., Ann. Mus. Bot. Lugduno-Batavi 2 (1865) 112; Koord., Exkurs.-Fl. Java 3 (1912) 147, which is now considered a synonym).

A Japanese species, with edible tubers. Whether this was ever cultivated in Java seems doubtful; it does not even occur in the Catalogues of the Botanic Gardens, Buitenzorg (Bogor), and there is no material to support this record which may be inaccurate.

45. SYMPHOREMA

(L.J. Walsingham)

Symphorema Roxb., Pl. Coromandel 2 (1798) 46, t. 186; C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 599; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 329; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 99; Gamble, Fl. Madras 2, 6 (1924) 1103; Dop in Lecomte, Fl. Indo-Chine 4 (1936) 896; Moldenke, Resume Geogr. Distr. & Syn. (1959) 234, 343, 351, 403;

Munir, Gard. Bull. Singapore 22 (1967) 153; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 192. — Type: *Symphorema involucratum* Roxb.

Sczegleewia Turcz., Bull. Soc. Imp. Naturalistes Moscoi 36, part II (1863) 212. — Type: *Sczegleewia luzonensis* Turcz. (= *Symphorema luzonicum* (Blanco) Fern.-Vill.).

Woody climbers; *branches* almost cylindrical, older *stems* more quadrangular, glabrous with grey pubescent apical parts or stellate subtomentose. *Leaves* simple, entire or toothed, often sinuate-dentate. *Inflorescences* terminal and axillary, often with short, thyrsoid branches from axils of caducous leaves, cymes capitate, 7-flowered, pedunculate; bracts reduced, leaf-like, usually caducous, involucral bracteoles 6, accrescent and conspicuous in fruit, often white- or pink-tinged, becoming wing-like and sometimes scarious, rarely toothed; flowers sessile or shortly pedicellate, sometimes fragrant. *Calyx* narrowly infundibular to cylindrical, accrescent in fruit, actinomorphic, 3- or 4-lobed (3–8 lobed outside Malesia), lobes equal to subequal, triangular, erect, tube indistinctly nerved, glabrous within, longer than lobes. *Corolla* white, pinkish or lilac, actinomorphic, 6- or 7-lobed (6–16-lobed outside Malesia), slightly exserted from calyx, lobes equal, ligulate, erect or curled, delicate, glabrous; tube cylindrical, lobes subequal, glabrous within. *Stamens* 8–16 (6–18 outside Malesia), equal, usually as many as corolla-lobes and alternating with them, slightly shorter than corolla, thecae oblong, parallel, separate. *Ovary* sometimes emarginate at apex; style terminal, elongate, exserted; stigma lobes 2, elongate, truncate or subulate at apex. *Fruit* dry, indehiscent, 1-seeded, ovoid.

Distribution — Three species from India and Ceylon to Burma, Thailand, Cambodia and Vietnam; in *Malesia* a single species: Philippines, Tanimbar Is. (Jamdena).

Habitat & Ecology — Monsoon forests.

Taxonomy — The genus was revised by Munir (1967). Based on Munir's account, and the material available to examine, one species is recognised in the Flora Malesiana area.

1. **Symphorema luzonicum** (Blanco) Fern.-Vill.

Symphorema luzonicum (Blanco) Fern.-Vill. in Blanco, Fl. Filip., ed. 3, 4 (13A) (1880) 162. — *Litsea luzonica* Blanco, Fl. Filip., ed. 2 (1845) 284. — Neotype (designated by Munir, Gard. Bull. Singapore 22 (1967) 163): *Llanos 69* (Neo A), Philippines.

Sczegleewia luzonensis Turcz., Bull. Soc. Imp. Naturalistes Moscou 36, part II (1863) 213. — *Symphorema luzoniense* (Turcz.) S.Vidal, Sin. Gen. Pl. Leños. Filip. (1883) t. 75, f. F. — Type: *Cuming 648* (iso E), Philippines, Luzon.

Symphorema glabrum Hassk., Flora 48 (1865) 402. — Type: *Cuming s.n.* (iso BM), Philippines.

Symphorema cumingianum Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4, 3a (1895) 180. — Type: not located.

Young *stems* cylindrical, pubescent, older stems more quadrangular, becoming glabrous. *Leaves*: blade oblong-elliptic, 5–18 by 3–8 cm, coriaceous, apex obtuse to obtuse-acuminate, base truncate, entire, glabrous, upper surface nitid, lower surface dull; petiole up to 1 cm long, pubescent. *Inflorescences* grey-brown pubescent; involucral bracts broadly obovate-elliptic, narrowed at base, obtusely rounded at apex, pubescent, accrescent, up to 3.5 by 1.6 cm. *Calyx* cylindrical, 7–9 mm long when flowering, only slightly longer in fruit and becoming almost urceolate, somewhat 2-lipped,

distinctly 3- or 4-lobed, lobes subequal, 1–3 mm long, pubescent or minutely tomentose without, hirsute with appressedly distinct long white hairs within. *Corolla* 6- or 7-lobed, 9.5–15 mm long, pubescent without, glabrous within except for villous band in the throat, lobes oblong, 3–5 mm long. *Stamens* 8–16, inserted in the villous corolla throat, much exserted; filaments filiform, up to 12 mm long, often united into pairs at base; anthers oblong-elliptic, glabrous. *Ovary* almost obovoid, glandular at apex, upper half with some deciduous stellate hairs, glabrous below; style long exserted, filiform, up to 1.5 cm long, glabrous, bilobed at apex; lobes sometimes with hairs, stigma peltate, glandular. *Fruit* glabrous, 4–6 mm long.

Distribution — Philippines (Luzon), Tanimbar Islands (Jamdena).

Habitat & Ecology — Lowland forest.

46. TECTONA

(G.L.C. Bramley)

Tectona L.f., Suppl. Pl. (1781 '1782') 151, pl. 20, nom. cons.; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 93; Moldenke, Phytologia 1 (1935) 154; Backer & Bakh.f., Fl. Java 2 (1965) 601; Burkill, Dict. Econ. Prod. Malay Penins. (1966) 2127; Corner, Wayside Trees Mal. 3rd ed. (1988) 450; D.N.Tewari, Monogr. Teak (1992); Phengklai et al. in Soerianegara & Lemmens (eds.), PROSEA 5, 1 (1993) 448; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 267. — Type: *Tectona grandis* L.f.

Theka Adans., Fam. Pl. 2 (1763) 445, nom. rej. — Type: not indicated.

Trees, deciduous. *Leaves* simple, opposite or ternate, rarely alternate. *Inflorescences* terminal and/or axillary, dichotomous cymose panicles. *Calyx* campanulate, 5–7-lobed, lobes unequal, greatly increasing during fruiting (inflated in some species), without wings. *Corolla* funnel-shaped, more or less actinomorphic, 5–7-lobed, lobes subequal, short tube. *Stamens* 5 or 6, shortly exserted, not didynamous; pollen tri-aperturate. *Ovary* 4-locular with one ovule in each locule; placentation axial. *Style* terminal. *Stigma* 2-lobed. *Fruit* globose, drupaceous, surrounded by enlarged calyx, 1–4-seeded, exalbuminous.

Distribution — Three species in India and SE Asia; in *Malesia*: 2 species, 1 of them introduced (*T. grandis*). *Tectona hamiltoniana* Wall. was erroneously cited as occurring in Peninsular Malaysia (Lam 1919).

Habitat & Ecology — Cultivated in plantations, sometimes found in secondary forest or disturbed areas.

Uses — Commercially known as teak, and as one of the foremost timber trees of considerable value.

KEY TO THE SPECIES

1a. Tree to 40 m. Leaves opposite, blade 6–60(–75) by 8–45 cm, petioles 1.5–6 cm long. Corolla tube 1–3 mm long. — Throughout the tropics . . . . . **1. T. grandis**

b. Tree to 15 m. Leaves opposite to occasionally ternate, blade 6–15 by 3–6 cm, petiole 0.5–1 cm long. Corolla tube c. 4 mm long. — Philippines only (rare). . . . . **2. T. philippinensis**

1. **Tectona grandis** L.f.

Tectona grandis L.f., Suppl. Pl. (1781 '1782') 151; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 95; Moldenke, Phytologia 1 (1935) 156; Tewari, Monogr. Teak (1992) 6; Phengklai et al. in Soerianegara & Lemmens (eds.), PROSEA 5, 1 (1993) 453. — *Theka grandis* (L.f.) Lam., Tabl. Encycl. 2 (1797) 211. — Lectotype (designated by Rajendran & Daniel, Indian Verbenac. (Taxonom. Revis.) (2002) 321): Rheede, Hort. Malab. 4 (1683) t. 27.
Tectona theka Lour., Fl. Cochinch. (1790) 137. — Type: unknown.

Trees 6–40 m high, 20–100(–160) cm diam., sometimes fluted; outer bark scaly; slash pale yellow to white; sapwood white to orange, hardwood yellowish brown. *Branchlets* angular, stellately tomentose, with a ridge between opposite leaf pairs. *Leaves* opposite; blade ovate to elliptic or narrowly ovate, sometimes almost round, 6–60(–75) by 8–45 cm, margins entire, apex acuminate to obtuse, base round to decurrent, upper surface glabrous when mature, densely stellate hairy when young, lower surface always with dense stellate hairs, whitish beneath, papery, scabrid; venation pinnate, side veins 7–18; petiole 1.5–6 cm long, stellately tomentose. *Inflorescences* 8–40 cm long, terminal and axillary, yellow, stellately tomentose; bracts lanceolate, 0.5–1 cm long, apex acute to acuminate. *Calyx* 3.5–4 by 3–3.2 mm when flowering, densely stellately hairy, glandular, 5-lobed; lobes deltoid, apex acute, erect; tube 2.5–3 mm long; fruiting calyx, inflated, enclosing the fruit, up to 25 mm diam., sparsely to densely stellately hairy. *Corolla* actinomorphic, puberulent glandular outside, throat densely villous, white to cream, fragrant; tube 1–3 mm long; lobes 1.8–2 by 2–2.2 mm, apex round. *Stamens* inserted at lower part of corolla tube, white; anthers and pollen yellow. *Ovary* globose, c. 2 mm diam., densely stellately hairy; style 3–5 mm long, glabrous. *Fruit* globose, 1.2–2 by 1.2–2 cm diam., densely stellately hairy, pale yellow. — **Fig. 44.**

Distribution — Natural distribution is at least India to Vietnam and Thailand, whether this extends to the Malesian region is a matter of discussion (Tewari 1992). It is now planted throughout the tropics.

Habitat & Ecology — Cultivated and sometimes found in secondary vegetations; soil: clay loam, sometimes over limestone. Altitude: up to 500(–700) m.

Vernacular name — Kaju jati (Malay).

Uses — See under genus.

2. **Tectona philippinensis** Benth. & Hook.f.

Tectona philippinensis Benth. & Hook.f., Gen. Pl. 2 (1876) 1152; Merr., Philipp. J. Sci., C 5 (1910) 227; Madulid & Agoo, Acta Manilana 38 (1990) 41. — *Jatus philippinensis* (Benth. & Hook.f.) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — Type: *Cuming 1432* (iso K 2 sheets, L, M, MO, S), Philippines.
[*Diospyros tectona* Blanco, Fl. Filip., ed. 2 (1845) 609, nom. nud.]

Tree to 15 m high, bark flaky. *Leaves* opposite, occasionally ternate; blade elliptic to narrowly ovate, 6–15 by 3–6 cm, base acute, apex acuminate, margins subentire to somewhat undulate-crenate, upper surface glabrous to glabrescent, verrucose, lower surface paler, with dense stellate hairs, venation distinct below, major veins 5–7 pairs; petioles 5–10 mm long, dense stellate hairs. *Inflorescences* up to 10 cm long, terminal. *Calyx* when flowering c. 5 mm long, densely stellately hairy, 5-lobed; lobes deltoid-

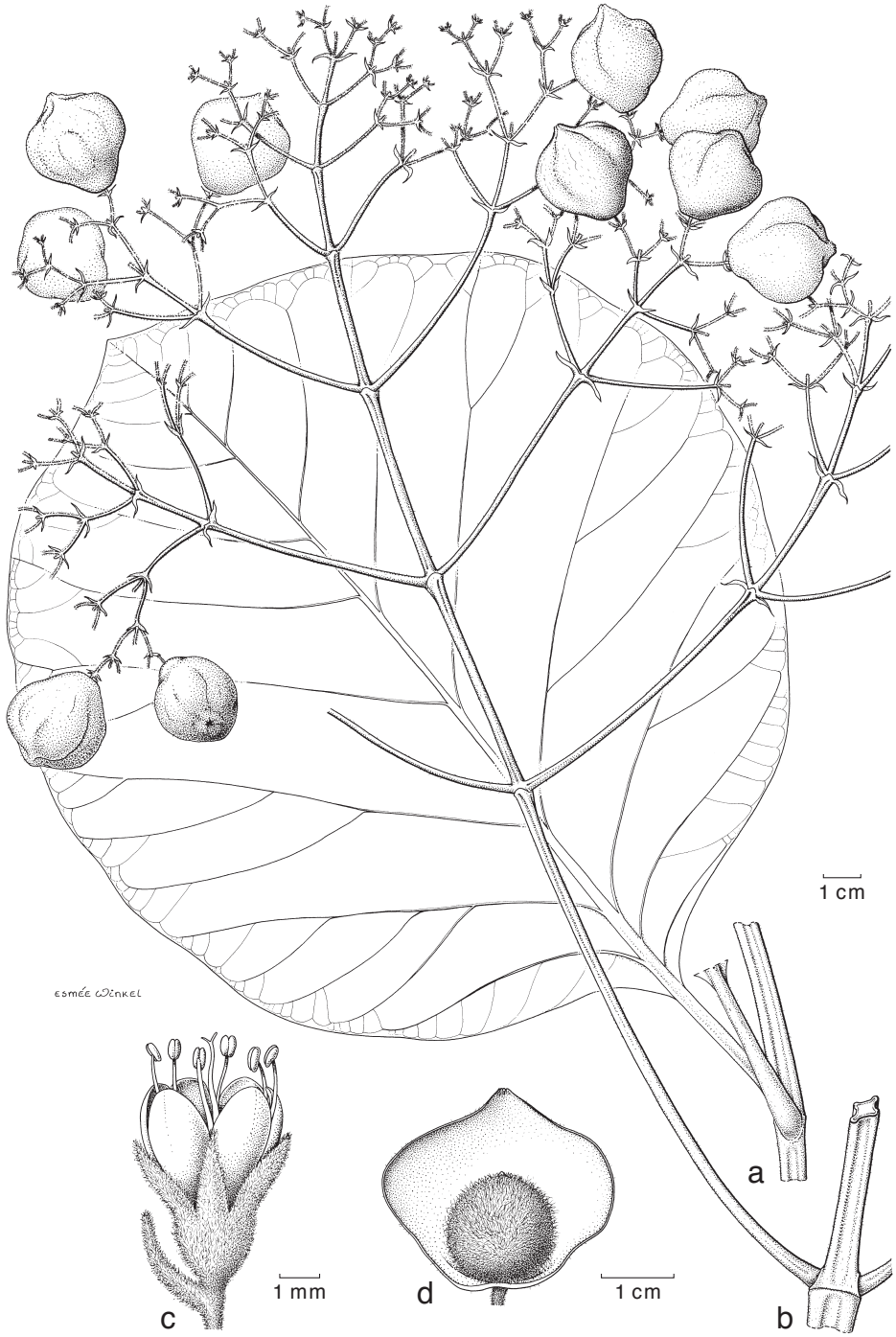

Fig. 44. *Tectona grandis* L.f. a. Leaf; b. infructescence; c. flower; d. fruit (a, c: *W. Griffith s.n.*; b, d: *KEP (Ahmad) 94478*; all L). Drawing by Esmée Winkel, 2012.

ovate, c. 2 mm long; fruiting calyx c. 13 mm long, enclosing drupe but not inflated, pinched in around top of fruit then expanding slightly in lobed portion above fruit. *Corolla* c. 8 mm long, pinkish purple, throat villous, tube narrow at base then abruptly enlarged; tube c. 4 mm long, lobes c. 4 mm long, apex round. *Stamens* with filaments c. 8 mm long. *Fruit* ellipsoid, c. 8 by 4–6 mm, densely stellate hairy.

Distribution — Philippines: two subpopulations, Iling Island (Mindoro) and Luzon Island (Batangas).

Habitat & Ecology — Coastal to lowland limestone forest, tending to dominate the semi-deciduous forests.

Vernacular names — Bunglas (Bisaya); Malapangit (Tagalog).

47. TEIJSMANNIODENDRON

(R.P.J. de Kok)

Teijsmanniodendron Koord., Ann. Jard. Bot. Buitenzorg 19 (1904) 19, f. 2, 3; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1909) 841; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 98; H.J.Lam & Bakh.f., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 29; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 394, 398; Kosterm., Reinwardtia 1 (1951) 75; Moldenke, Phytologia 46 (1980) 460; Phytologia 47 (1980) 18; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 195; de Kok et al., Kew Bull. 64 (2009) 587; Bramley et al., Taxon 58 (2009) 500; Bramley et al., Tree Fl. Sabah & Sarawak 7 (2011) 50. — Type: *Teijsmanniodendron bogoriense* Koord.

Xerocarpa H.J.Lam, Verbenaceae Malayan Archipel. (1919) 98. — Type: *Xerocarpa aviceniifoliola* H.J.Lam (= *Teijsmanniodendron ahernianum* (Merr.) Bakh.).

Trees, up to 50 m tall, dbh up to 120 cm, with or without buttresses. *Bark* smooth to somewhat scaly or flaky. *Twigs* usually round in cross-section to tetragonal, glabrous to variously pubescent; either with a ridge resembling a stipule scar between petioles or not. *Leaves* with petioles thickened or swollen at both ends; decussate, simple or palmately compound with 3–7 leaflets, when compound middle leaflets largest, others gradually smaller, margin entire. *Inflorescences* paniculate with trichotomous cymes, terminal or axillary; bracts leaf-like; bracteoles ovate, lanceolate to linear, usually < 1 mm. *Calyx* persistent, usually enlarged in fruit, 5-lobed. *Corolla* (4- or) 5-lobed, 2-lipped, upper lip (1- or) 2-lobed, lower lip 3-lobed, middle lobe the largest, the throat villous inside, shortly tubular. *Stamens* 4 (or 5), distinctly didynamous, exserted, inserted in the middle or lower part of the corolla tube; anthers 2-thecate, dorsifixed, dehiscing by longitudinal slits. *Style* terminal, slender, with bifid stigma; ovary imperfectly 2-celled, each cell 2-ovuled, only one ovule developing, the other 3 suppressed, hemi-anatropous, attached laterally near the apex of the ovary cells. *Fruit* drupaceous, dry or leathery, the exocarp either thick with scattered sclerenchymatic cells or thin and very brittle. *Seeds* one, pendulous, oblong, with membranaceous testa. *Seedling* with epigeal germination; cotyledons emergent, leafy; hypocotyl elongated.

Distribution — 23 species across India (Nicobar Islands), Peninsular Thailand and South Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines, Sulawesi, New Guinea and the Solomon Islands. The centre of diversity is in Borneo where all 23 currently recognised species in the genus are recorded.

Habitat & Ecology — *Teijsmanniodendron* grows in various kinds of vegetation from the landward edge of mangroves to submontane forest, but most species are found

in primary or secondary lowland rainforest. In primary lowland rainforest they tend to be more common in areas with slightly more disturbance such as on ridges or near streams. Most species seem not to be very common and consequently the numbers of collections are low given their extensive distribution. This contrasts with the closely related genus *Vitex*, with which it shares many ecological characteristics and which is relatively well-represented in collections.

Uses — The wood of *Teijsmanniodendron* is used for general purposes such as house construction (rafters and posts), interior work, salt-water piling, telephone poles, framing, moulding, and for making boxes and crates. The fruits of *T. pteropodum* have been used medicinally, both internally and externally for intestinal complaints.

KEY TO THE SPECIES

1a. Leaves 3–7-foliolate 2
b. Leaves unifoliolate 9
2a. Petioles winged or with pseudo-stipules at base. Fruit 0.8–4.5 by 0.8–5 cm; pericarp woody and thick (2–3 mm) 3
b. Petioles not winged nor with pseudo-stipules at base. Fruit 1–8 by 0.5–5 cm; pericarp thick (2–3 mm) or thin (< 0.1 mm) 4
3a. Petioles usually 2–5(–7.5) cm long, not winged, obtusely oblong pseudo-stipules at base . . . . . **6. T. glabrum**
b. Petioles usually > 5 cm long, winged or with round and straight pseudo-stipules at base . . . . . **12. T. pteropodum**
4a. Petioles < 2 cm long; leaflets narrowly lanceolate (≤ 3 cm wide), apex narrowly acuminate . . . . . **14. T. renageorgeae**
b. Petioles ≥ 1 cm long; leaflets (ob)lanceolate, obovate or (narrowly) elliptic (≥ 2 cm wide), apex round to acuminate 5
5a. Distinct ridge between the petioles (interpetiolar ridge) present. Fruit smooth or only slightly striate, large (mature fruits ≥ 2 cm long and ≥ 2 cm wide); pericarp woody and thick (2–3 mm) . . . . . **3. T. bogoriense**
b. Distinct ridge between the petioles (interpetiolar ridge) absent. Fruit smooth or striate, leathery and small (mature fruits ≤ 2 cm long and ≤ 1.5 cm wide); pericarp thin (< 0.1 mm) 6
6a. Leaflets (3–)5–7, shiny above when dried. Stamens (4 or) 5. Fruit globose, 1.5–2 by 1–1.5 cm, apex round, smooth when dried . . . . . **1. T. ahernianum**
b. Leaflets 3 (or 4), not shiny when dried. Stamens 4. Fruit globose to ellipsoid, 1–2 by 0.5–1.1 cm, apex truncate or depressed, surface striate when dried 7
7a. Mature leaves glabrous, rarely with some soft hairs, < 0.1 mm long . . . . . **5. T. coriaceum**
b. Mature leaves sparsely hairy; hairs hispid and > 2 mm long 8
8a. Leaflets not bullate. — W Sarawak . . . . . **2. T. bintuluense**
b. Leaflets strongly bullate. — E to C Sarawak, Brunei, SW Sabah . **4. T. bullatum**
9a. Lower leaf surface punctate with tiny holes (visible with ×10 lens) 10
b. Lower leaf surface not punctate with tiny holes 12

10a. Young leaves smooth below; lateral veins 13–20 pairs. Mature fruit with a powdery surface . . . . . **9. T. hollrungii**
b. Young leaves (slightly) rough below; lateral veins < 15 pairs. Mature fruit hispid or with a powdery surface 11
11a. Leaflet blades oblanceolate to elliptic; young leaves green. Fruit hispid and glaucous but not powdery . . . . . **11. T. obscurinerve**
b. Leaflet blades ovate to lanceolate; young leaves coppery reddish. Fruit with a powdery surface and only a few hairs at apex . . . . . **13. T. punctatum**
12a. Young twigs, inflorescences and leaf veins covered with hispid hairs . . . . . **16. T. scaberrimum**
b. Young twigs, inflorescences and leaf veins glabrous or covered with soft hairs 13
13a. Nodes of young twigs significantly more hairy than young petioles or stems . 14
b. Nodes of young twigs glabrous or similarly hairy as young petioles or stems. 15
14a. Leaflet blades oblong, ≥ 20 cm long; petiole with short (< 1 mm) white to brownish hairs. Ovary completely villous, more densely at apex . . . . . **10. T. latiffii**
b. Leaflet blades lanceolate, ≤ 22 cm long; petioles with short and long (0.5–2 mm) yellowish hairs. Ovary villous at apex only . . . . . **18. T. simplicioides**
15a. Young twigs square in cross-section 16
b. Young twigs round/terete in cross-section 18
16a. Young twigs glabrous to hairy; petioles 1.5–6 cm long. Fruit not covered with glaucous layer . . . . . **8. T. holophyllum**
b. Young twigs glabrous; petioles ≤ 3.5 cm long. Fruit sometimes covered with glaucous layer 17
17a. Lateral veins usually distinctly white on a green/brown background in both dried and fresh material. Fruit sometimes covered by a dark bluish green powder. . . . . **15. T. sarawakanum**
b. Lateral veins concolorous with leaf blade in both dried and fresh material. Fruit covered with sooty yellow- or greenish brown powder forming a cracked layer when dry . . . . . **22. T. unifoliolatum**
18a. Mature petioles ≤ 1 cm long; leaf blade thick coriaceous. — Only on ultrabasic substrates in NW Sabah . . . . . **23. T. zainudinii**
b. Mature petioles (0.8–)1–4 cm long; leaf blade chartaceous to coriaceous. — Widespread in many types of habitat 19
19a. Leaves with at least one pair of major lateral veins originating at base of leaf, all major lateral veins uniformly prominent and arching towards to apex (as in the genus *Smilax*). . . . . **20. T. smilacifolium**
b. Leaves without a pair of major lateral veins originating at base, all major lateral veins not uniformly prominent and arching towards margin 20
20a. Fruit apex depressed and with few hairs. Young leaves rough below 21
b. Fruit apex round or notched and glabrous. Young leaves smooth below 22
21a. Leaflet blades elliptic, 17–25 cm long, strongly bullate in dried specimens, lateral veins (5–)8–10(–20) pairs; distal petiole pulvinous usually with a distinct black ring. Fruit glabrous, smooth with faint longitudinal groove . . . **19. T. sinclairii**

b. Leaflet blades lanceolate, (8–)15–30(–38) cm long, subbullate in dried specimens, lateral veins 7–10 pairs; distal petiole pulvinous sometimes with a distinct black ring. Fruit glabrous with few hairs at apex, smooth . . **21. T. subspicatum**

22a. Leaflet blades elliptic, rusty-coloured in dried specimens, lateral veins 4–8 pairs. Fruit smooth but glandular. . . . . **7. T. havilandii**

b. Leaflet blades lanceolate, light-brown in dried specimens, lateral veins ≤ 4 pairs. Fruit smooth with fine longitudinal ridges . . . . . **17. T. simplicifolium**

1. Teijsmanniodendron ahernianum (Merr.) Bakh.

Teijsmanniodendron ahernianum (Merr.) Bakh., J. Arnold Arbor. 16 (1935) 74. — *Vitex aherniana* Merr., Publ. Bur. Sci. Gov. Lab. 6 (1904) 18; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 206. — Type: *Merrill 1007* (holo PNH†; iso K, NY, US), Philippines, Luzon, Principe Prov., Baler.

Xerocarpa avicenniifoliola H.J.Lam, Verbenaceae Malayan Archipel. (1919) 98; Kosterm., Reinwardtia 1 (1951) 84. — Syntypes: *Ledermann 9510* (L), [Papua New Guinea,] Etappenberg; *Ledermann 9667* (L), [Papua New Guinea,] near April River; *Ledermann 9789* (L), [Papua New Guinea,] Camp 18, near April River; *Ledermann 9792* (L 2 sheets), [Papua New Guinea,] Camp 18, near April River; *Ledermann 10427* (K, L), [Papua New Guinea,] Camp Malu; *Ledermann 10828* (L), [Papua New Guinea,] Camp Malu.

Vitex curranii H.J.Lam, Verbenaceae Malayan Archipel. (1919) 207; Kosterm., Reinwardtia 1 (1951) 84. — Type: *FB (Curran) 17463* (holo PNH†; iso L), Philippines, Negros.

Vitex bogoriensis H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 60 (non *Teijsmanniodendron bogoriense* Koord.); Kosterm., Reinwardtia 1 (1951) 84. — Type: *Anonymous XI. H. 37* (holo BO), [Indonesia,] Botanic Gardens Buitenzorg [Bogor], originally from Bangka.

Vitex bankae H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 62; Kosterm., Reinwardtia 1 (1951) 84. — Types: *Grashoff 36* (BO 2 sheets, L), [Indonesia,] Bangka, Blinju; *Teijsmann s.n.* (L 2 sheets), [Indonesia,] Bangka, Djebus; *Teijsmann s.n.* (L 2 sheets), [Indonesia,] Bangka, Menumbing; *Teijsmann s.n.* (BO 4 sheets, L), [Indonesia,] Bangka, Blinju.

Vitex bulusanensis Elmer, Leafl. Philipp. Bot. 10 (1939) 3798; de Kok, Kew Bull. 63 (2008) 36. — Type: *Elmer 17004* (holo PNH†; iso BM, L, NY 2 sheets), Philippines, Luzon, Sorsogon Prov., Irosin (Mt Bulusan).

Tree, 9–50 m tall, dbh 10–60 cm; buttresses < 2 m high, thin. *Bark* smooth, fissured or with small flakes, grey to reddish black; slash light yellow to pale-brown; sapwood white to brown; heartwood very hard, blackish brown. *Twigs* round in cross-section, pubescent when young, glabrescent when mature, without a ridge between the opposite petioles, greyish. *Leaves* (3–)5–7-foliolate; leaflets obovate, (7–)25–35 by (2–)8–13 cm (lateral leaflets 5–15 by 2–5 cm), apex acute, base cuneate, margin flat, coriaceous, glabrescent (especially on midrib) to glabrous on both surfaces, shining above when dried; midrib raised on both surfaces; lateral vein pairs 8–15, slightly looping near margin; reticulation obscure or invisible; petioles terete, 6–12 cm long, tomentose, especially basally and distally; petiolules 0.5–5 cm long, equal in all leaflets, furrowed above, tomentose at the base. *Inflorescences* 15–30 cm long; peduncles tomentose, 5–12 cm long; bracteoles ovate, < 1 mm long, persistent. *Calyx* infundibular, 2.5–3 by 2–5 mm, outer surface sericeous when young, glabrescent when mature; lobes 0–5, if present up to 0.5 mm long, apex acute to round; fruiting calyx cupuliform, 5–8 by c. 5 mm, margin entire, outer surface glabrous. *Corolla* (4 or) 5-lobed, sericeous, glabrous at the base, white to yellow or red, with a faint sweet smell; middle lobe of lower

lip spatulate, 3–8 by 5–6 mm, apex round to emarginate, margin serrate and undulate, throat villous; other lobes isomorphic, 3–5 by 1.5–2 mm, apex round, hairy outside; tube 2–3 mm long, glabrous. *Stamens* (4 or) 5; filaments 2–4 mm long, attached to the upper to lower part of the tube, white; anthers blue or black. *Ovary* globose, 1–1.5 mm diam., glabrous; style 3–4 mm long, exerted; stigma white or blue. *Fruit* globose, 1.5–2 by 1–1.5 cm, apex round, smooth, glabrous, purple to (blue) black; pericarp thin.

Distribution — Peninsular Malaysia, Sumatra, Borneo, Java, Philippines, Sulawesi (likely), Moluccas, New Guinea, Solomon Islands.

Habitat & Ecology — Commonly growing in primary and secondary (submontane) forest, sometimes in heath forest or swamps. Soil: clay-loam to white sand, sometimes over granite, (ultra-)mafic or iron-ore rich soil. Altitude: sea-level up to 1000 m. Flowering: throughout the year but mainly from August to April; fruiting: February to August.

Vernacular names — Sumatra: Bangka: Kayu melak (Malay). Borneo: Sarawak: Entabuluh (Iban). Philippines: Dangula, Kulipapan, Salipapa (Tagalog). Maluku, Obi island: Tété. New Guinea: Irian Jaya: Gerèng (Moejoe); Oproere (Biak); Papua New Guinea: East Sepik Province: Koropuitasona, Me mape; (Middle Waria); Miap (Wagu); Neviai (Waskuk); Bougainville: Kanara, Kona.

Uses — The strong timber is used in house construction and as tool handles in Papua New Guinea.

2. **Teijsmanniodendron bintuluense** Moldenke

Teijsmanniodendron bintuluense Moldenke, Phytologia 26 (1973) 355; Phytologia 46 (1980) 471. — Type: *S (Chai) 31713* (holo SAR; iso K, L 2 sheets), Malaysia, Sarawak, 4th Division, Bintulu, Segan Forest Reserve.

Tree, 2.5–8.5 m tall, dbh 10–14 cm. *Bark* smooth, light to greyish brown. *Twigs* tetragonal, densely tomentose when young, without a ridge between the opposite petioles. *Leaves* 3-foliolate; leaflets narrowly elliptic, 12–30 by 5–8 cm, apex acuminate, base acute, margin straight, coriaceous, feeling rough, not bullate, glabrous above, hairs hispid and > 2 mm long beneath; midrib prominent and raised beneath; lateral veins 6–8 pairs; intercostal veins reticulate, distinct on both surfaces and slightly raised beneath; petioles 5–7 cm long, half-terete, densely tomentose; petiolules 2–3 cm long, densely tomentose. *Inflorescences* < 10 cm long, densely tomentose throughout, (dark) purplish (blue); bracteoles narrowly lanceolate, 0.5–0.7 cm long, persistent. *Calyx* 5–5.5 by 1.5–2 mm when flowering, densely tomentose and glandular when young; lobes 2–3 mm long, apex acute to acuminate; fruiting calyx cupuliform, 8–10 mm diam., accrescent; lobes prominently erect, glabrous. *Corolla* purple to pale blue, densely tomentose; middle lobe of lower lip spatulate, 3–3.5 by 2–3 mm, margin round and entire; other lobes 1.5–2 by 1.5–2 mm, apex acute; tube 3.5–4 mm long, glabrous at base. *Stamens* 4; filaments 3–4 mm long, inserted in the lower part of the corolla tube, slightly villous. *Ovary* c. 1 mm diam., globose, apex glabrous to sparsely hairy; style 4–5.5 mm long, light purple; stigma c. 0.5 mm long, apex acute. *Fruit* globose to ellipsoid, 1–2 by 0.5–1 cm, apex truncate, leathery, longitudinally striate, glabrous, bloom sometimes present, orange to dark purple; pericarp thin.

Distribution — Borneo (endemic in W Sarawak).

Habitat & Ecology — Growing in primary dipterocarp or heath forest, often on hills or ridges. Soil: yellow sandy clay or sandstone. Altitude: 10–250 m. Flowering: September to October; fruiting: May to November.

Vernacular name — Sarawak: Entabuluh (Iban).

3. Teijsmanniodendron bogoriense Koord.

Teijsmanniodendron bogoriense Koord., Ann. Jard. Bot. Buitenzorg 19 (1904) 20, f. 2; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 97. — Neotype (designated by De Kok & Rusea, Kew Bull 63 (2008) 593): *Kostermans s.n.* (neo L; isoneo BO, K), [Indonesia,] Bogor Botanic Gardens, section XI.G.82.

Vitex longifolia Merr., Philipp. J. Sci., C 5 (1910) 227. — *Teijsmanniodendron longifolia* (Merr.) Merr., Enum. Philipp. Fl. Pl. 3 (1923) 398; de Kok & Rusea, Kew Bull. 63 (2008) 36. — Type: *Hutchinson 7574* (holo PNH; iso K, US), Philippines, Mindanao, Surigao Prov.

Vitex flabelliflora Hallier f., Meded. Rijks-Herb. 37 (1918) 50; Kosterm., Reinwardtia 1 (1951) 88. — Type: *Jaheri* (*Exp. Nieuwenhuis*) *1539* (holo L; iso BO 3 sheets), [Indonesia, East Kalimantan,] E Borneo, Sungei Talut, Penihier.

Vitex lasiantha Hallier f., Meded. Rijks-Herb. 37 (1918) 50; de Kok & Rusea, Kew Bull. 62 (2007) 600. — Type: *Koch 45* (holo BO; iso L), [Papua New Guinea,] SE Neuguinea, im Walde an der Etnabai.

Vitex merrillii H.J.Lam, Verbenaceae Malayan Archipel. (1919) 212. — *Vitex euphlebia* Merr. ex H.J.Lam, Verbenaceae Malayan Archipel. (1919) 212, nom. in synon.; de Kok & Rusea, Kew Bull. 63 (2008) 36. — Type: *Fénix Bur. Sci. 15906* (holo PNH†; iso BM, K, L, NSW), Philippines, Mindanao, Butuan Province.

Teijsmanniodendron kostermansii Moldenke, Phytologia 4 (1952) 57; de Kok & Rusea, Kew Bull. 63 (2008) 594. — Type: *Lot Obi 75 [bb. 10495]* (holo BO; iso BO, L), [Indonesia, South Kalimantan,] S Borneo, Puruktjahu Subdiv., near Matara Djaän.

Teijsmanniodendron pendulum Kosterm., Reinwardtia 5 (1960) 352, 369; de Kok & Rusea, Kew Bull. 63 (2008) 594. — Type: *Kostermans 13007* (holo BO; iso BM, BO 2 sheets, K, L, SING), Indonesia, Kalimantan, West Kutei, Palimasan, near Tabang.

Teijsmanniodendron bogoriense Koord. var. *pentaphyllum* Moldenke, Phytologia 14 (1967) 400; de Kok & Rusea, Kew Bull. 63 (2008) 594. — Type: *Cuadra A 877* (holo SAN; iso K), Malaysia, Sabah, Sandakan, Sepilok Forest Reserve.

Teijsmanniodendron borneënse Moldenke, Phytologia 46 (1980) 479; de Kok & Rusea, Kew Bull. 63 (2008) 594. — Type: *Kostermans 7555* (holo NY), [Indonesia,] Kalimantan, Balikpapan peak (Gunung Beratus).

Tree, 15–45 m high, bole 2.5–20 m high, dbh 20–145 cm; buttresses 0–2 m high. *Bark* smooth to scaly, lenticellate, greyish brown to light-brown/whitish; slash very hard to brittle, (pale) yellow; sapwood white to yellowish. *Twigs* glabrous to glabrescent, lenticellate, with distinct ridge between petioles. *Leaves* (3–)5(–7)-foliolate; leaflets lanceolate, 9–25 by 2–11 cm (lateral leaflets 5–15 by 1.5–7 cm), apex broadly acuminate, base acute to cuneate, margin slightly recurved, coriaceous to chartaceous, glabrous on both surfaces; midrib prominent, raised on both surfaces; lateral veins 3–12 pairs, looping into an imperfect intramarginal vein near margin; intercostal veins reticulate, prominent on both surfaces; petioles subterete, 1–6 cm long, glabrous; petiolules 0.3–3 cm long, subterete, sparsely pubescent to glabrescent. *Inflorescences* < 30 cm long, pubescent when young, glabrescent when mature; bracteoles caducous. *Calyx* irregularly campanulate, 2–25 by 25–35 mm when flowering; lobes 5, pubescent at base, glabrescent near margin, violet; fruiting calyx shallowly cupuliform, c. 3 by 1 cm,

margin entire, glabrous. *Corolla* 4- or 5-lobed, white to blue, lobes pubescent, fragrant; middle lobe of lower lip spatulate, 0.3–1 by 0.3–0.5 cm, violet with yellow spot at base, densely villous; lateral lobes of lower lip 1.5–3.5 by c. 3 mm, apex acute; lobes of upper lip 1–3.5 by c. 3 mm, apex acute; tube 0.5–2 mm long, white. *Stamens* 4; filaments 3.5–6 mm long, didynamous, exerted, inserted in the middle of the corolla-tube, glabrous to hairy at base, anthers deep purple. *Ovary* globose, glabrous, apex densely hairy and glandular; style 4–7 mm long, stigma apex acute. *Fruit* globose, 2–8 by 2–5 cm, apex round, smooth or only slightly striate, glabrous, shiny, reddish purple to black; pericarp woody, 2–3 mm thick.

Distribution — Southern Thailand; in *Malesia*: Peninsular Malaysia?, Sumatra, Borneo, Philippines, Sulawesi, Moluccas, New Guinea.

Habitat & Ecology — Primary and secondary rainforest (occasional in submontane forest), flood plains or swamps. Soil: sand, black or yellow loam, sometimes over basalt, sandstone or limestone. Altitude: sea-level up to 700(–1200) m. Flowering and fruiting: throughout the year.

Vernacular names — Borneo: Sabah: Buak-buak (Malay); Sarawak: Entabuluh, Memaru (Iban); Pangajen asai (Kenyah); Kalimantan: Galigantan, Gragai (Balikpapan area). New Guinea: Papua (Irian Jaya): Běsokja (Ransiki); Prau (Selogof); Papua New Guinea: Ballebal (Jal); Gugba (Madang); Kossijt (Salawati Island); Ludri (Koropa); Parrapik (Kaigorin); Timiri (Bembi).

Uses — The wood is reported to be used for timber, especially to make planks.

4. **Teijsmanniodendron bullatum** Rusea

Teijsmanniodendron bullatum Rusea in de Kok et al., Kew Bull. 64 (2009) 595. — Type: *S (Ashton) 19587* (holo SAR; iso K, L), Malaysia, Sarawak, Sibu Division, Mukah, Ulu Kenyana.

Tree, 1–12 m tall, dbh 15–20 cm. *Bark* smooth, grey-brown. *Twigs* without a ridge between the opposite petioles. *Leaves* 3-foliolate; leaflets elliptic, asymmetric, 8.5–24 by 3.5–8 cm, lateral leaf base distinctly oblique, central leaf apex acute, base cuneate, margin recurved, strongly bullate, shiny, coriaceous, glabrous above, feeling rough, hairs hispid and > 2 mm long beneath, greenish brown, young leaves bright yellow-green; midrib prominent, flat to sunken above, raised below; lateral veins spaced far apart, prominent, 5–7 pairs, looping near margin; intercostal veins prominent beneath and strongly sunken above; petioles 1–6(–8) cm long, subterete, sparsely to densely tomentose; petiolules 8–13 mm long. *Inflorescences* densely tomentose, purple; bracteole persistent. *Calyx* 1.5–3 by 1.5–2 mm when flowering, tomentose, yellow; lobes 0.5–1 mm long, apex acute; fruiting calyx shallowly infundibular, 6–7 mm diam., glabrous, lobes erect, yellow. *Corolla* tomentose, mauve to purple; middle lobe of lower lip oblong, c. 3 by 1 mm, apex round and entire, yellow blotch in throat, villous inside; other lobes c. 2 by 1 mm, apex acute; tube c. 2 mm long, glabrous at base. *Stamens* 4; filaments 3–4 mm long, exserted, inserted in the lower part of the corolla tube; anthers black. *Ovary* globose, c. 1 mm diam., glabrous; styles c. 3 mm long, stigma c. 0.5 mm long, apex acute. *Fruit* globose to ellipsoid, 1–1.3 by 0.5–1.1 cm, apex truncate, smooth when fresh, striate when dried, glabrous, yellow to pink; pericarp thin.

Distribution — Borneo (C and E Sarawak, Brunei, SW Sabah).

Habitat & Ecology — Primary and secondary dipterocarp and heath (kerangas) forest. Soil: yellow sandy or sandy clays, sometimes over sandstones. Altitude: 15–250 m. Flowering: June to December; fruiting: July to January.

Vernacular names —Sarawak: Entabuluh (Iban); Brunei: Maratubu (Iban).

5. Teijsmanniodendron coriaceum (C.B.Clarke) Kosterm.

Teijsmanniodendron coriaceum (C.B.Clarke) Kosterm., Reinwardtia 1 (1951) 80; Moldenke, Phytologia 46 (1980) 480. — *Vitex coriacea* C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 586. — Lectotype (designated by De Kok et al., Kew Bull. 64 (2009) 596): *Griffith KD 6065* (lecto K; isolecto SING), Malay Peninsula, Malacca.

Vitex venosa H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 61; Kosterm., Reinwardtia 1 (1951) 80. — Syntypes: *Grashoff 890* (BO 2 sheets, L), [Indonesia,] Sumatra, Palembang, Banjuasin and Kubu countries.

Tree, 4–30 m tall, bole 8–20 m high, dbh 6–100 cm. *Bark* smooth, slightly scaly to fissured, grey to pale-brown or brown; slash dull-blackish or pale brown; sapwood orange-ochre. *Twigs* glabrous, without a ridge between the opposite petioles. *Leaves* 3- (or 4-)foliolate; leaflets oblanceolate, 5–18(–20) by (2–)3–5(–7) cm, apex acute to obtuse, base acute, base of lateral leaflets sometimes oblique, margin strongly recurved, coriaceous, strongly bullate or not, not shiny above when dried, glabrous on both surfaces, rarely with some soft, < 0.1 mm long hairs beneath in young leaflets; midrib prominent and raised beneath; lateral veins 5–8 pairs, curving and joined near margin to form an imperfect intramarginal vein, conspicuous above, prominent and raised beneath; intercostal veins reticulate, distinct and raised beneath; petioles 2–5 cm long, glabrous to slightly hairy, subterete in cross-section. *Inflorescences* 4–15 cm long, slightly pubescent; bracteoles linear to oblong, 0.2–0.4 cm long, persistent, pubescent. *Calyx* broadly infundibular, c. 1.5 cm long when flowering, sparsely pubescent; lobes 0.5–1 mm long, apex acute to obtuse; fruiting calyx enlarged, shallowly cupuliform, margin entire. *Corolla* pubescent, white, violet to dark-violet, slightly fragrant; middle lobe of lower lip spatulate, 4.5–5 by 3.5–4 mm, apex round, throat villous inside, violet with a yellow patch at base; lateral lobes of lower lip c. 2 by 1.5 mm, apex round; lobes of upper lip c. 1.5 by 2 mm, apex round to acute; tube 5–6 mm long. *Stamens* 4; filaments 4–5 mm long, distinctly didynamous, exerted, inserted in the lower part of the corolla tube, sparsely pubescent; anthers globose. *Ovary* glabrous, cream-coloured; styles purple, long-exserted; stigmas pale-purple. *Fruit* ellipsoid, 1–1.5 by 0.5–0.8 cm, apex truncate, leathery, striate, glabrous, deep blue or black; pericarp thin.

Distribution — Peninsular Thailand; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo.

Habitat & Ecology — Growing in primary or secondary forests. Soil: sandy, sandy clay or clay, sometimes over sandstone or granite. Altitude: 100–1200 m. Flowering: July to December; fruiting: March to April.

Vernacular names — Peninsular Malaysia: Meroyan batu (Malay). Borneo: Sarawak: Entabuluh (Iban); Madang; Kalimantan: Kaju gading, Kaju krasak (Dayak); Ma-uhi putih, Mahuwi kuning (Samarinda area).

Uses — The heartwood is said to be durable and comparatively strong.

6. Teijsmanniodendron glabrum Merr.

Teijsmanniodendron glabrum Merr., Univ. Calif. Publ. Bot. 15 (1929) 263; Kosterm., Reinwardtia 6 (1962) 166. — *Teijsmanniodendron bogoriense* Koord. var. *glabrum* (Merr.) Bakh. ex Moldenke, Résumé Verben. (1967) 23, nom. in synom.; Phytologia 46 (1980) 484. — Lectotype (designated by De Kok et al., Kew Bull. 64 (2009) 599): *Elmer 21320* (lecto K; isolecto A, BISH, BM, BO, L, NY), [Malaysia, Sabah,] Elphinstone Province [= Tawau District], near Tawao [=Tawau].

Teijsmanniodendron pteropodum (Miq.) Bakh. var. *auriculatum* Bakh. ex Kosterm., Reinwardtia 1 (1951) 94; Moldenke, Résumé Verben. (1959) 354, nom. in synom. ('*auriculata*'); de Kok & Rusea, Kew Bull. 63 (2008) 599. — *Teijsmanniodendron pteropodum* (Miq.) Bakh. forma *auriculatum* (Bakh. ex Kosterm.) Moldenke, Phytologia 47 (1980) 27. — Type: *Abdulhamid 47 [bb. 12563]* (BO 2 sheets), [Indonesia,] Kalimantan, E. Kutai.

Tree, seldom shrub, 4–33 m tall, bole < 20 m high, dbh 6–16 cm, usually straight; buttresses < 1 m high. *Bark* smooth to slightly scaly, whitish, greyish to (greenish) brown; slash brittle, whitish, yellowish to yellowish brown; sapwood white to yellow or brownish. *Twigs* glabrous, ridge between petioles. *Leaves* 3-foliolate; leaflets oblong or ellipsoid, 9–15 by 4–7 cm, apex acuminate with tip slightly to strongly curved, base subequal, margin slightly recurved, slightly shiny above; midrib prominent, raised on both surfaces; lateral veins 6–11 pairs, arching towards the margin, conspicuous beneath; intercostal veins reticulate; petioles 2–5(–7.5) cm long, round in cross-section, glabrous; pseudo-stipular appendages basal, obtusely oblong; petiolules 1–3 cm long. *Inflorescences* up to 20 cm long, younger parts sparsely pubescent, older parts glabrous; bracteoles lanceolate, < 0.3 cm long, glabrous to glabrescent, caducous. *Calyx* campanulate, 2–3 mm long when flowering, externally glabrous to glabrescent, whitish green to purple; lobes 5, triangular-ovate, c. 0.5 mm long, apex acute to rounded; fruiting calyx patelliform, c. 1.5 by 0.5 cm, lobed, glabrous. *Corolla* pubescent, white, fragrant; middle lobe of lower lip 3–4.5 by 2–3 mm, apex round to truncate; other lobes 2–3 by 1.5–2 mm; tube 3–5 mm long. *Stamens* 4; filaments c. 5 mm long, distinctly didynamous when mature, exserted, inserted in the lower part of the corolla tube, villous, white; anthers blue. *Ovary* glabrous, slightly villous at apex; styles 3–5 mm long, stigmas blue or violet. *Fruit* ellipsoid or ovoid-ellipsoid, 0.8–3.5 by 0.8–4.5 cm, apically obtuse, smooth, glabrous, shiny, pale-grey to brown; pericarp woody, 2–3 mm thick. — **Plate 7f.**

Distribution — N Sumatra, Borneo.

Habitat & Ecology — Growing in primary and secondary forests. Soil: sandy loam or blackish soil, sometimes over limestone or sandstone. Altitude: sea-level up to 120 m. Flowering: (February) May to June (November); fruiting: June to October.

Vernacular names — Borneo: Sabah: Buak-buak (Malay); Ragas (Orang Sungei); Salunapid (Dusun).

7. Teijsmanniodendron havilandii (Ridl.) Rusea

Teijsmanniodendron havilandii (Ridl.) Rusea in de Kok et al., Kew Bull. 64 (2009) 600. — *Vitex havilandii* Ridl., Bull. Misc. Inform. Kew (1929) 262. — Lectotype (designated by Rusea 2009): *Haviland 861* (lecto K; isolecto K, SAR, SING), [Malaysia,] Sarawak, Sadong, Coalmine Hill.

Tree, 8–15 m tall, dbh 10–25 cm. *Bark* smooth, grey; slash yellowish; sapwood pale yellow. *Twigs* terete, glabrous, whitish. *Leaves* unifoliolate; blade elliptic, (5–)7–10

(–15) by 2–5(–7) cm, apex acuminate, base acute to rounded, margin slightly recurved, coriaceous, glabrous, not strongly bullate, mature leaves rusty-coloured when dry; midrib prominent and raised beneath; main lateral veins 4–8 pairs, not originating from base, arching towards the margin, prominently raised beneath, some forming incomplete intramarginal veins; intercostal veins reticulate, obscure beneath; petioles 1–1.5 cm long, subterete, glabrous, without a distinct black ring. *Inflorescences* slightly puberulous; bracteoles narrowly lanceolate, c. 1 mm long, persistent. *Calyx* 2–3 by 1.8–3 mm when flowering, with a few hairs, dark reddish; lobes up to 1 mm long, broadly acute; fruiting calyx cupuliform, 7–8 by 7–12 mm, accrescent, glabrous, irregularly lobed. *Corolla* pubescent, purple to pale-blue; middle lobe of lower lip oblong to orbicular, 4–5 by 2.5–4 mm, apex round; lateral lobes of lower lip 2–2.3 mm long, apex acute; lobes of upper lip 1.5–2 mm long, apex round; tube 3.5–5 mm long. *Stamens* 4; filaments 3–5 mm long, didynamous, exserted, inserted in the middle part of the corolla tube. *Ovary* c. 1 mm diam., apex villous; style c. 5 mm long, purple; stigma black. *Fruit* ellipsoid, 12–15 by 8–9 mm, apex round, smooth, glabrous except for few hairs at apex, glandular, dark-brown; pericarp thin.

Distribution — Borneo: Sarawak (Kuching, Sadong hills and Semengoh Arboretum).

Habitat & Ecology — Growing in yellow sandy clay in mixed dipterocarp forests on ridges. Altitude: 50–100 m. Flowering: April to August; fruiting: August to January.

8. Teijsmanniodendron holophyllum (Baker) Kosterm.

Teijsmanniodendron holophyllum (Baker) Kosterm., Reinwardtia 1 (1951) 97; Moldenke, Phytologia 46 (1980) 492. — *Vitex holophylla* Baker, Bull. Misc. Inform. Kew (1896) 25. — Type: *Governor Creagh [= Hugh Low] s.n.* (holo not found; iso K), [Malaysia, Sabah,] North Borneo, Sandakan.

Teijsmanniodendron novo-guineense (Kaneh. & Hatus.) Kosterm., Reinwardtia 1 (1951) 103; de Kok & Rusea, Kew Bull. 63 (2008) 601. — *Vitex novo-guineënsis* Kaneh. & Hatus., Bot. Mag. (Tokyo) 56 (1942) 116. — Type: *Kanehira & Hatusima 12578* (holo not found; iso BO), [Indonesia, Irian Jaya,] Geelvink Bay, Near Nabire, Ayerjat.

Teijsmanniodendron subspicatum (Hallier f.) Kosterm. var. *acutifolium* Moldenke, Phytologia 49 (1981) 431; de Kok et al., Kew Bull. 64 (2009) 601. — Type: *SAN (Gibot & Petrus) 90237* (holo TEX; iso K, KEP, L, SAN), Malaysia, Sabah, Sandakan, foot of Mt Mentapok, Kg. Miruru.

Tree, 2–30 m, bole often straight to 20 m high, dbh 5–60 cm; buttresses to 1 m high. *Bark* smooth to slightly scaly, whitish, grey to brown; slash greenish yellow to pale brownish; sapwood white to pale yellow or yellow. *Twigs* glabrous to pubescent, nodes similarly hairy as young petioles or stems, square in cross-section. *Leaves* unifoliolate; blade elliptic-lanceolate or (ob)lanceolate, 12–35 by 4–7(–12) cm, apex acuminate, base acute, rounded to slightly cordate, margin not to slightly recurved, slightly bullate, coriaceous, not punctuate beneath, glabrous on both surfaces, but slightly tomentose when young; midrib prominent and raised beneath; lateral veins 5–15 pairs, prominent and raised beneath; intercostal veins reticulate, conspicuous above, distinct and raised beneath; petioles 1.5–6 cm long, (sub)terete, glabrous, distal pulvinus sometimes with distinct black ring. *Inflorescences* up to 50 cm long, slightly hirsute; bracteoles lanceolate to elliptic-lanceolate, 2–5 mm long, caducous. *Calyx* campanulate, 2–2.5 by 1.5–2 mm when flowering, tomentose and glandular when young; fruiting calyx campanulate, 12–16 mm diam., glabrous when mature. *Corolla* deep-purple or white, velvety; middle

lobe of lower lip oblong, 3–4 by 2–3 mm, apex round, throat villous inside; other lobes 1.5–2 by 1.2–2 mm, apex acute to round, pale purple; tube 3–4 mm long. *Stamens* 4, with filaments 4–5 mm long, exserted, inserted in the middle or lower part of the corolla tube; filaments slightly villous; anthers c. 0.5 mm long, purple. *Ovary* c. 1 mm diam., villous at the top; styles 6–7 mm long. *Fruit* subglobose, 2–2.2 by 0.9–1.2 cm, apex depressed to acute, smooth with very faint longitudinal stripes, glabrous except few hairs at apex, dark brown to bluish, shiny; pericarp thin.

Distribution — S Vietnam (one collection); in *Malesia*: Peninsular Malaysia (one collection from Johore, one from Terengganu), Sumatra, Borneo, Philippines, West Papua.

Habitat & Ecology — Found growing in primary or secondary forests, on hillsides or ridge-tops, along riverbanks, on sandy, dark-brown or black soils, sometimes ultrabasic. Altitude: 60–265 m. Flowering: February to September; fruiting: June to November.

Vernacular names — Borneo: Sabah: Kemuning (Lahad Datu area); Brunei: Martubu, Mertubu (Iban); Sarawak: Entabuluh (Iban); Kenjau (Penan).

9. Teijsmanniodendron hollrungii (Warb.) Kosterm.

Teijsmanniodendron hollrungii (Warb.) Kosterm., Reinwardtia 1 (1951) 103; Moldenke, Phytologia 46 (1980) 486. — *Vitex hollrungii* Warb., Bot. Jahrb. Syst. 18 (1894) 208. — Type: *Hollrung 377* (holo B; iso BO, K), [Papua New Guinea,] Hatzfeldhafen.

Vitex punctata Schauer in A.DC., Prodr. 11 (1847) 687; de Kok, Kew Bull. 63 (2008) 37. — Type: *Anonymous s.n.* (holo G), [Indonesia,] Moluccas.

Vitex simplicifolia C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 586; Kosterm., Reinwardtia 1 (1951) 103. — Type: *Griffith s.n.* (holo not found; iso K 3 sheets), [Peninsular Malaysia,] Malacca.

Vitex clarkeana King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1909) 845; Kosterm., Reinwardtia 1 (1951) 103. — Syntypes: *Beccari PB 166* (K 2 sheets), Borneo; *Curtis 1611* (K), [Malaysia,] Pangkor Island; *Griffith KD 6064* (K), [Malaysia,] Malacca; *Haviland 1580* (K), Borneo; *King's Collector 8788* (K), [Malaysia,] Bernam River; *Lake & Kelsall 4059* (not found), [Malaysia,] Johore, Sembrong River; *Lobb s.n.* (K), Borneo; *Motley 1269* (not found), Borneo; *Ridley 7990* (K), [Malaysia] Telok Sera; *Scortechini 1383* (K), [Malaysia,] Perak.

Teijsmanniodendron monophyllum Kurata, Bull. Tokyo Univ. Forest. 35 (1947) 203; Kosterm., Reinwardtia 1 (1951) 103. — Type: *Inokuma & Hara 679* (not found), [Indonesia, Irian Jaya,] Netherlands North New Guinea, Bumi River near Nabire.

Tree (seldom shrub), 2–25 m high, bole 2–10 m high, dbh 2–45 cm; buttresses up to 0.8 m high. *Bark* smooth to slightly flaky, soft, white to whitish grey; slash yellowish to pale red or brown; sapwood white or greyish to yellow; heartwood hard. *Twigs* stout, terete, variously pubescent; nodes swollen. *Leaves* unifoliolate; blade lanceolate, 15–35 by 5–13 cm, apex long acuminate, base acute to narrowly rounded, margin straight, coriaceous, above somewhat glossy, feeling smooth beneath, glabrous on both surfaces, densely punctuate beneath, tiny holes visible with ×10 lens; midrib slender, flat or slightly impressed above, slightly rounded and raised beneath; lateral veins 13–20 pairs, arching towards the margin and sometimes joined; intercostal veins reticulate, distinct beneath; petioles slender, up to 0.5 cm long, smooth, terete. *Inflorescences* up to 40 cm long; bracteoles linear, 3–5 mm long, inconspicuous, puberulent, caducous; peduncles sharply tetragonal, densely rusty-pubescent. *Calyx* campanulate, 3.5–4 by 3–3.5 mm when flowering, hairy; lobes c. 1 mm long, apex acute; fruiting calyx much

accrescent, 10–18 mm diam., shallowly cupuliform, unevenly truncate. *Corolla* white, cream yellow to purple, fragrant, velvety; middle lobe of lower lip oblong to spatulate, 4–5 by 3–5 mm, apex rounded, with few hairs to glabrous above, lilac to purple, yellow spot at base; lateral lobes of lower lip 3–4 by 2–2.5 mm, apex acute, white; lobes of upper lip 4–4.5 by 2–2.5, apex round to acute, white; tube 5–7 mm long, funnel-shaped. *Stamens* 4, filaments 7–10 mm long, distinctly didynamous, villous at base, pale purple to yellow or white; anthers c. 1 mm long, white. *Ovary* globose, 1–1.5 mm diam.; apex flattened, pubescent; styles to 10–15 mm long, purple; stigmas yellowish white. *Fruit* globose to clavate, 1.5–2 by 1.5–2 cm, apex round, smooth, glabrous except for few hairs at apex, somewhat fleshy, covered with sooty yellowish or greenish brown powder forming a cracked layer when dry, olive-green to (greyish) black; pericarp thin.

Distribution — Peninsular Malaysia, Borneo, Philippines, Sulawesi, New Guinea, the Solomon Islands.

Habitat & Ecology — Found growing in primary or secondary forests, usually along rivers, tidal creeks, peat swamps or inland side of mangroves. Altitude: sea-level up to 50(–100) m. Soil: sand, clay or loam. Flowering: throughout the year; fruiting: May to March.

Vernacular names — Borneo: Sabah: Kapur-kapur (Brunei); Renggas (Kedayan); Brunei: Putat (Binuni); Sarawak: Entabuluh (Iban), Ladip (Malay), Rengas (Kutching area), Senumpol (Binatang area); Kalimantan: Kaju kolok ampit, Lihampit (Dayak). New Guinea: Papua (Irian Jaya): Ap (Merauke area), Seriga (Salawati Island). Papua New Guinea: La Pone (West Nakanai, New Britain).

Uses — In Sarawak for treating scabies, the ash from the leaves is added to coconut oil and applied to the head.

10. Teijsmanniodendron latiffii Rusea

Teijsmanniodendron latiffii Rusea in de Kok et al., Kew Bull. 64 (2009) 604. — Type: *S (Sibat ak Luang) 22819* (holo SAR; iso K, KEP, L), Malaysia, Sarawak, 4th Div., Marudi Bok-Tisam, Sungai Mentagai.

Tree, 5–15 m tall, dbh 10–20 cm. *Bark* pale brown to greyish, flakey. *Twigs* densely pubescent when young, nodes of young twigs significantly more hairy than young petioles or stems, terete. *Leaves* unifoliolate; blade oblong, 20–40 by 5–10 cm, apex acuminate, base acute, margin straight to strongly recurved, glabrous, coriaceous, slightly bullate, shiny above, not punctuate beneath, feeling slightly rough beneath, dark to dull green; midrib raised with a sharp ridge above and beneath; lateral veins 8–12 pairs, sunken above, raised beneath; intercostal veins scalariform; petioles 1.5–4 cm long, subterete, densely to sparsely hairy; hairs short (< 1 mm), white to brownish hairs. *Inflorescences* up to 30 cm long, densely pubescent; bracteoles lanceolate, < 5 mm long, green or violet. *Calyx* campanulate, 3–4 by 1.5–2 mm when flowering, densely hirsute externally; lobes c. 1 mm long, apex acute; fruiting calyx infundibular, much accrescent; lobes 5, broadly connate, apex acute, densely hirsute externally. *Corolla* white to violet, golden pubescent; middle lobe of lower lip spatulate, c. 1.5 by 3 mm, apex round, white to violet with yellow patch at the base of the lip, throat villous; other lobes 1–1.5 by 1–1.2 mm, apex acute; tube c. 2.5 mm long. *Stamens* 4, filaments 2.5–3

mm long, slightly didynamous, villous at base; anthers black. *Ovary* globose, c. 1 mm diam., villous, more densely at apex; styles c. 5 mm long. *Fruit* globose, c. 5 by 10 mm, apex round, sparsely tomentose, more densely at apex, purple.

Distribution — Borneo (Sarawak, Kalimantan).

Habitat & Ecology — Growing in primary forest on ridges. Altitude: 50–100 m. Flowering and fruiting: September to May.

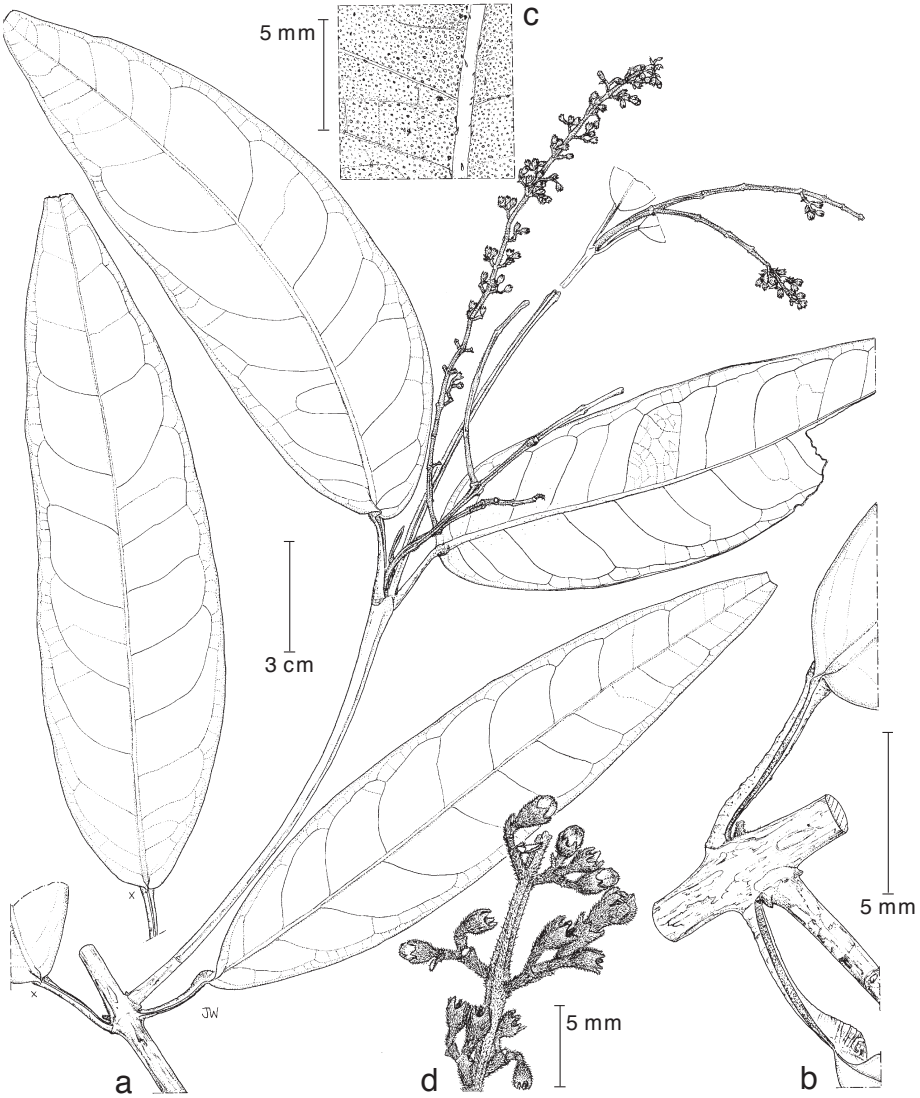

Fig. 45. *Teijsmanniodendron obscurinerve* Rusea. a. Habit; b. detail of node and petiole base; c. underside leaf detail; d. inflorescence detail (all *SAN (Pikkoh) 67646*, K). Drawing by Juliet Beentje.

11. Teijsmanniodendron obscurinerve Rusea

Teijsmanniodendron obscurinerve Rusea in de Kok et al., Kew Bull. 64 (2009) 605. — Type: *SAN (Matin Pikkoh) 67646* (holo SAN; iso K, KEP), Malaysia, Sabah, Sandakan, Kuala Sungai Sasau and Sungai Tongod, Labuk Sugut.

Tree, 3–15 m tall, bole up to 10 m high, dbh 30–40 cm. *Bark* smooth, whitish; slash yellowish; sapwood yellow. *Twigs* smooth, distinctly tetragonal, glabrous. *Leaves* unifoliolate; blade oblanceolate to elliptic, 15–28 by 3–10 cm, apex acuminate, base rounded to cordate, margin thickened and slightly recurved, glossy above, punctuate beneath, tiny holes visible with ×10 lens, coriaceous, glabrous on both surfaces, young leaves green, feeling rough beneath; midrib prominent and raised on both surfaces, whitish beneath when dry; lateral veins obscured above, slightly raised beneath, 8–14 pairs, arching and looping near the margin forming an intramarginal vein, intercostal veins reticulate, obscured on both surfaces; petioles 1.2–2.5 cm long, glabrous, subterete. *Inflorescences* up to 20 cm long, sparsely to densely hairy; bracteoles ovate, 2–2.2 by 0.5–1 mm, apex acute, caducous. *Calyx* campanulate, 1–2 by 1.5–2 mm when flowering, densely appressed tomentose; lobes deltoid, c. 0.5 mm long, apex acute; fruiting calyx accrescent, 5–6 mm diam., cupuliform, 5-lobed to truncate. *Corolla* blue to purple, funnel-shaped, densely pubescent; middle lobe of lower lip absent, throat villous inside. *Stamens* 4, distinctly didynamous, exserted, inserted in the middle part of the corolla tube; filaments unknown. *Ovary* apically obtuse and villous. *Fruit* ellipsoid, 15–20 by 7–15 mm, apex round, smooth, hispid hairs especially at apex, glaucous, not powdery when dried, dark purple; pericarp thin, < 0.1 mm thick. — **Fig. 45.**

Distribution — Borneo (Sabah).

Habitat & Ecology — Found growing on river banks. Altitude: 100–150 m. Flowering: July to September (December); fruiting: June to August.

Vernacular name — Sabah: Buak-buak pulas (Malay).

12. Teijsmanniodendron pteropodum (Miq.) Bakh.

Teijsmanniodendron pteropodum (Miq.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 29. — *Vitex pteropoda* Miq., Fl. Ned. Ind. 1, Eerste Bijv. (1861) 242, 567; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 170. — Type: *Teijsmann s.n.* (holo L; iso BO, K), [Indonesia,] Sumatra, Palembang, Dangku Lematang.

Vitex philippinensis Merr., Bull. Bur. Forest. Philipp. Islands 1 (1903) 52; Kosterm., Reinwardtia 1 (1951) 92. — Type: *Ahern 387* (holo PNH†; iso BO, US 2 sheets), Philippines, Mindanao, Province of Zamboanga.

Vitex peralata King in King & Gamble, Bull. Misc. Inform. Kew (1908) 112, Kosterm., Reinwardtia 1 (1951) 92. — *Teijsmanniodendron peralata* (King) N.P.Balakr., Bull. Bot. Surv. India 22 (1980) 176. — Syntypes: *King's Collector 2064* (K), [Malaysia,] Perak, near Larut; *King's Collector [= Kunstler] 6187* (K), [Malaysia,] Perak, near Larut; *King's Collector 6874* (K), [Malaysia,] Perak, near Larut; *King's Collector 8299* (K), [Malaysia,] Perak, near Larut; *Wray 2029* (K), [Malaysia,] Perak, at Simpang; *Wray 2254* (K), [Malaysia,] Perak; *Wray 2305* (K), [Malaysia,] Perak, at Simpang.

Vitex koordersii H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 64; Kosterm., Reinwardtia 1 (1951) 92. — Syntypes: *Buurman van Vreeden 158* (BO 2 sheets), [Indonesia,] Sumatra, near Palembang; *Koorders 10483β* (BO), [Indonesia,] Central Sumatra, Rawang, Sigati; *Jaheri s.n.* (BO 2 sheets), [Indonesia,] Borneo.

Teijsmanniodendron pteropodum (Miq.) Bakh. forma *cristatum* Moldenke, Phytologia 44 (1979) 473; de Kok & Rusea, Kew Bull. 64 (2009) 608. — Type: *SAN (Mikil) 37769* (holo TEX; iso L 2 sheets), Malaysia, Sabah, Penampang District, Sungai Sosopodon.

Tree, 6–40 m tall, bole 5–20 m high, dbh 12–60 cm; buttresses < 4 m high. *Bark* smooth to flaky, lenticellate, white to yellow to black; slash yellow to purplish mottled; sapwood yellow. *Twigs* glabrous, pale-brown. *Leaves* palmate, 3–7-foliolate; leaflets lanceolate, obovate to ovate, central leaflets 10–55 by 3–19 cm, apex obtuse to acuminate, base attenuate to cuneate, margin slightly to strongly recurved, coriaceous, shiny or glossy, bright- or dark-green above, lighter beneath, glabrous; midrib and lateral veins sunken above, prominent and raised beneath; lateral veins (5–)12–16 pairs; intercostal veins reticulate, conspicuous; petioles 7–30 cm long, triangular in cross-section, glabrous, narrowly to broadly winged or with round and straight pseudostipules at base; petiolule 0–5 cm long, broadly grooved above. *Inflorescences* 20–100 cm long, reddish brown or pale purplish red; bracteoles lanceolate to ovate, 2–10 by 3–7 mm, persistent, apically abruptly acute, glabrescent on both surfaces, whitish or pale-greenish to purple. *Calyx* campanulate, 2–2.5 by 1.5–2 mm when flowering, sparsely pubescent externally, glabrous internally; lobes 1.5–3.5 by 2–2.5 mm, purple to pink; fruiting calyx hypocrateriform, 1.7–5 by 3–4.5 cm, greatly spreading, margin undulating, glabrous, brownish. *Corolla* pubescent, violet to pale-blue violet; middle lobe of lower lip spatulate, 3.5–4 by 3.8–5 mm, apex round, throat brown-striate; lateral lobes of lower lip 2–2.5 by 2–3 mm, apex round, lobes of upper lip 1.5–2 by c. 2 mm, apex acute, reflexed; tube 4–7 mm long. *Stamens* 4, distinctly didynamous, exserted, inserted above or at middle part of the corolla tube; filaments 2–6.5 mm long, white to pale-violet, slightly villous at base; anthers dark-violet or dark-purple, glabrous. *Ovary* globose, apex depressed, villous at apex; style 8–10 mm long, exserted, glabrous; stigmas shortly bifid. *Fruit* ellipsoid, sometimes lobed when dry, 1.5–4.5 by 2–5 cm, smooth, irregularly wrinkled when young, glabrous, brown; pericarp woody, 2–3 mm thick. — **Plate 7c–e.**

Distribution — India, Nicobar Islands, Southern Thailand; in *Malesia*: Sumatra, Borneo, the Philippines.

Habitat & Ecology — Growing in primary and secondary forests, including heath forest, often along riverbanks or in freshwater swamps. Soils: clay or sandy soils, sometimes over basalt, sandstone or limestone. Altitude: sea-level up to 960 m. Flowering: December to October; fruiting: February to December.

Vernacular names — Sumatra: Lipanoeh Pajo, Tjiempana (Simalur Islands). Borneo: Sabah: Buak-buak, Buak-buak tapak itik (Malay); Sarawak: Entabuluh (Iban); Brunei: Mengkulat, Merkulat (Iban); Kalimantan: Miang (Dayak).

Note — The distinctive winged petiole is a very variable character: sometimes plants can be found to have leaves with complete wings, wings only along the basal part of the petiole or petioles with no wings at all.

13. **Teijsmanniodendron punctatum** Rusea

Teijsmanniodendron punctatum Rusea in de Kok et al., Kew Bull. 64 (2009) 609. — Type: *S (Ismawi) 40040* (holo SAR; iso K 2 sheets, KEP, L), Malaysia, Sarawak, Kuching, Semengoh Forest Reserve.

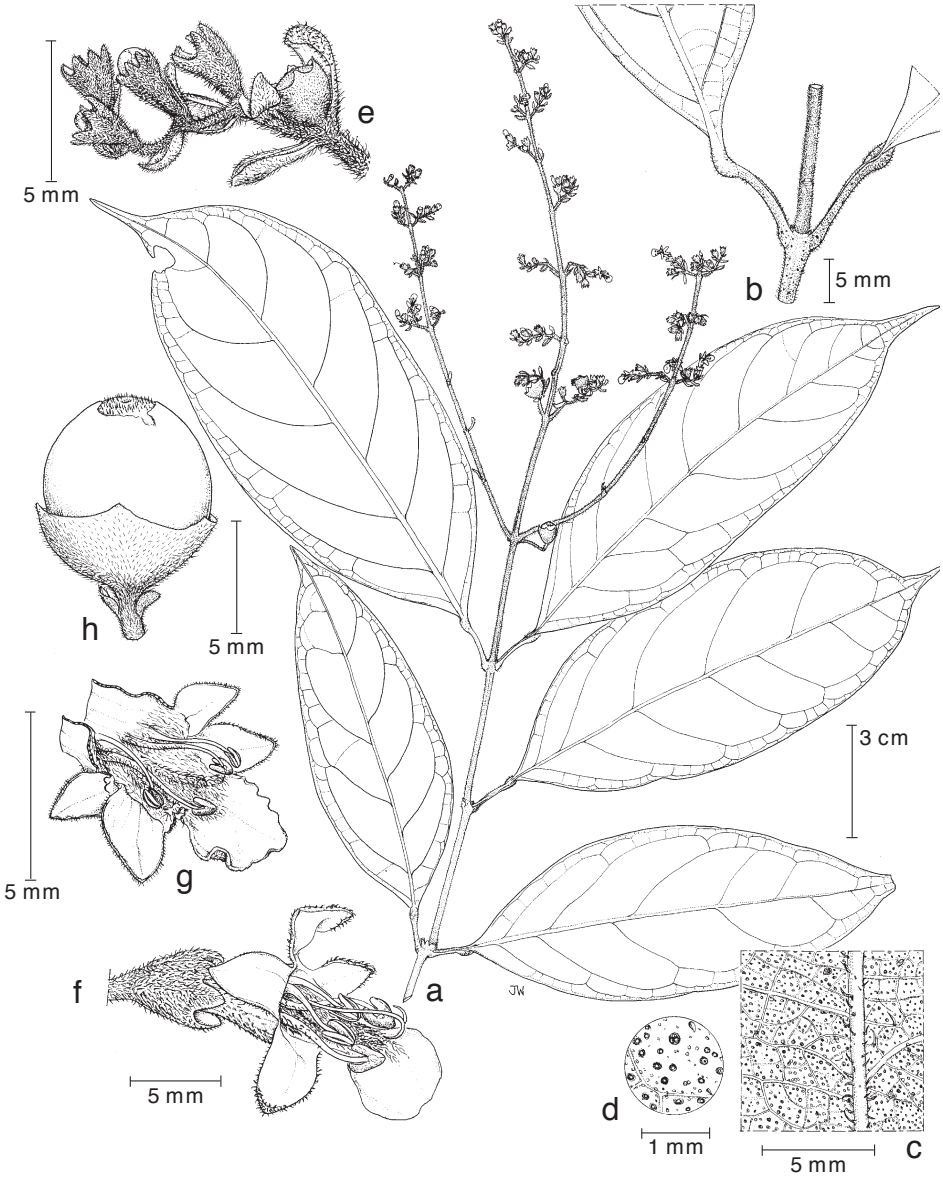

Fig. 46. *Teijsmanniodendron punctatum* Rusea. a. Habit; b. detail of node and petiole; c. underside leaf detail; d. underside leaf closer detail; e. inflorescence detail; f. flower side view; g. corolla opened; h. fruit, side view (a: *S (Bujang) 32547*; b: *S (Rantai et al.) 66077*; c–h: *S (Ismawi) 40040*; all K). Drawing by Juliet Beentje.

Tree, 4–8 m tall, dbh 10–30 cm. *Bark* greyish. *Twigs* tetragonal, scabrous. *Leaves* unifoliolate; blade ovate to lanceolate, 11–17 by 4–6 cm, apex acuminate, base round to acute, margin flat, coriaceous, glabrous, sparsely punctuate beneath, tiny holes visible with ×10 lens, feeling rough beneath; midrib prominent and raised on both surfaces; lateral veins 6–11 pairs, prominent and raised beneath, arching towards margin and looping into imperfect intramarginal vein; intercostal veins obscure above, visible beneath, subscalariform to reticulate, young leaves coppery-reddish; petioles 1–2 cm long, terete, sparsely tomentose. *Inflorescences* 3–4 cm long, densely tomentose; bracteoles narrowly lanceolate, densely pubescent. *Calyx* campanulate, 2–2.5 by 1.5–2.2 mm when flowering, densely pubescent and whitish at base; lobes 0.8–1 mm long; fruiting calyx shallowly infundibular, irregularly lobed, densely pubescent. *Corolla* purple, middle lobe of lower lip spatulate, 2.5–3.5 by 1.5–2.5 mm, apex round, undulate, throat pinkish violet with yellow streak inside; lateral lobes of lower lip 2–3 by 1–1.5 mm, apex acute; lobes of upper lip 2–2.5 by 1.5–2 mm, apex acute; tube 3–3.5 mm long, purple, densely pubescent. *Stamens* 4, filaments 3–4 mm long, distinctly didynamous, exserted, inserted in lower part of the corolla tube, white; anthers ellipsoid, brown. *Ovary* globose, c. 1 mm diam., apex slightly villous; styles c. 5.5 mm long, stigma c. 0.5 mm long, blue to white. *Fruit* globose, 1–1.5 cm (immature) diam., apex round, smooth, surface powdery, apex with a few hairs; pericarp thin. — **Fig. 46.**

Distribution — Borneo (Sarawak, only known from the Semengoh Arboretum, Kuching).

Habitat & Ecology — Understorey trees of primary lowland forests on yellow sandy clay soil. Altitude: c. 100 m. Flowering: July to October; fruiting: July.

Vernacular name — Sarawak: Entabuluh (Iban).

14. Teijsmanniodendron renageorgeae Rusea

Teijsmanniodendron renageorgeae Rusea in de Kok et al., Kew Bull. 64 (2009) 611. — Type: *S (George) 43074* (holo SAR; iso K, KEP, L, SAN), Malaysia, Sarawak, Limbang, Ulu Medamit, Sungai Ensungai, Tg. Long Amok.

Tree, 4–13 m tall, dbh 15–20 cm. *Bark* smooth, greyish brown. *Twigs* terete, scabridulous when young, glabrescent when mature, without a ridge between opposite petioles, greyish brown. *Leaves* 3-foliolate; leaflets narrowly lanceolate, 8–10 by 2–3 cm, apex narrowly acuminate, base symmetric (lateral leaflets with distinctly oblique bases), margin strongly recurved, glabrous, coriaceous, shining above, glaucous beneath; midrib sunken above, prominent and slightly raised beneath; lateral veins 5 or 6 pairs, obscure above, prominent beneath; intercostal veins obscure on both surfaces; petioles subterete, grooved above, < 2 cm long, scabrous; petiolules 1–1.3 cm long. *Inflorescences* 9–14.5 cm long, glabrous to sparsely hairy; bracteoles narrowly lanceolate, pubescent. *Calyx* campanulate, 2–2.5 by 1–1.5 mm when flowering, scabridulous, dark green; lobes 1–1.5 mm long, apex acute; fruiting calyx c. 3.5 by 4 mm, fleshier than flowering calyx. *Corolla* pubescent, violet with yellow spot on the lip; middle lobe of lower lip seen damaged only; lateral lobes of lower lip c. 2 by 1 mm, apex round; lobes of upper lip seen damaged only; tube c. 3 mm long. *Stamens* 4, didynamous; anthers black. *Ovary* c. 1 mm diam., glabrous with few hairs at apex. *Fruit* when fresh unknown;

seen dried (immature), c. 2.5 by 3.5 cm, globose, apex depressed, smooth, glabrous with few hairs at apex.

Distribution — Known from two localities on Borneo: Sarawak (Ulu Medamit, Limbang) and from Brunei (Batu Melintang Hot Spring).

Habitat & Ecology — An understory tree in mixed dipterocarp forest on loamy soil. Altitude: sea-level up to 150 m. Flowering: September to January; fruiting (young fruits): September.

15. Teijsmanniodendron sarawakanum (H.Pearson) Kosterm.

Teijsmanniodendron sarawakanum (H.Pearson) Kosterm., Reinwardtia 1 (1951) 100. — *Vitex sarawakana* H.Pearson, Bull. Misc. Inform. Kew (1907) 60. — Lectotype (designated by De Kok et al., Kew Bull. 64 (2009) 613): *Beccari PB 2280* (lecto K), [Malaysia,] Sarawak.

Vitex tetragona Hallier f., Meded. Rijks-Herb. 37 (1918) 53; Kosterm., Reinwardtia 1 (1951) 100. — Type: *Amdjah 955* (holo L; iso BO), [Indonesia, East Kalimantan,] East Borneo, Gunung Pembliangan.

Tree, (2–)7–40 m tall, bole 8–16 m high, dbh 10–50(–165) cm; buttresses c. 0.5 m out. *Bark* smooth to slightly scaly to flaky, white, grey to black; sapwood hard or soft, yellowish or light brown to white. *Twigs* glabrous, square in cross-section. *Leaves* unifoliolate; blade elliptic to oblanceolate or lanceolate, 8.5–30 by 2–11 cm, apex acuminate, base acute to rounded, margin strongly recurved to slightly recurved, chartaceous, glabrous, strongly bullate or not, shiny above, not punctuate beneath; midrib prominent; lateral veins 5–12 pairs, arching and looping near the margin, prominent and slightly sunken above, raised beneath, distinctly white on a green/brown background; intercostal veins scalariform-reticulate, distinct, raised and whitish beneath; petioles 1–3.5 cm long, subterete, glabrous. *Inflorescences* up to 25 cm long, glabrous, sometimes hairy at base; purplish; bracteoles persistent, densely appressed-puberulous, caducous. *Calyx* campanulate, 1.5–2.5 by 1.5–2 mm when flowering, purple, densely minutely pubescent; lobes c. 1 mm long, apex acute; fruiting calyx shallowly cupuliform, 5–8 by 10–12 mm, irregularly lobed. *Corolla* white or whitish purple to pale pinkish mauve or blue, velvet, pubescent; middle lobe of lower lip spatulate, 2.5–3 by 2.5–3 mm, apex round, white to purple with yellow or purple markings at base, erect hairs at base; lateral lobes of lower lip 1.5–2 by 1–2 mm, apex acute, whitish violet to yellow; lobes of upper lip 1.5–2 by 1–2 mm, apex acute, whitish violet to yellow; tube 3–3.5 mm long, violet. *Stamens* 4; filaments 3–4 mm long, slightly didynamous, exserted, inserted halfway on tube, hairy at base, white to yellow; anther c. 0.5 mm long, black. *Ovary* globose, glabrous with velutinous upper half; styles 3–8 mm long; stigma c. 0.5 mm long, apex acute. *Fruit* globose, 10–25 by 15–25 mm, smooth, apex round to depressed, smooth, glabrous with velutinous apex or covered by a dark bluish green powder, dark grey to orange, later black; pericarp thin.

Distribution — Borneo.

Habitat & Ecology — Growing in primary and secondary, sometimes heath forests. Soil: clays to (sandy) loams, sometimes over shale, sandstone, limestone or ultrabasic rock. Altitude: 35–900 m. Flowering: February to October; fruiting: May to November.

Vernacular names — Sarawak: Entabuluh (Iban). Brunei: Mertuboh (Iban).

16. **Teijsmanniodendron scaberrimum** Kosterm. ex Rusea

Teijsmanniodendron scaberrimum Kosterm. [ex Moldenke, Fifth Summary Verbenac. 1 (1971) 911; Phytologia 47 (1980) 31, nom. nud.] ex Rusea in de Kok et al., Kew Bull. 64 (2009) 613. — Type: *Kostermans 13644* (holo K; iso BO, KEP, L, NY), Indonesia, Kalimantan, Sangkulirang District, at Karangan River near Batu Pondang.

Teijsmanniodendron holophyllum (Baker) Kosterm. var. *pubescens* Moldenke, Phytologia 4 (1952) 57; de Kok et al., Kew Bull. 64 (2009) 613. — Type: *Van der Zwaan 609 (bb. 12144)* (holo BO; iso L, NY), [Indonesia, Kalimantan,] Borneo, Berouw [= Berau].

Tree, 2–20 m tall, dbh 15–30 cm; buttresses absent or up to 3 m high. *Bark* smooth to scaly, grey to light brown; wood yellowish to pale brown. *Twigs* terete, with stiff hairs to glabrescent. *Leaves* unifoliolate; blade elliptic, 15–18 by 7–9 cm, apex broadly acute, base broadly acute, margin strongly recurved, strongly bullate, coriaceous, glabrous and shiny above, densely hispid hairs, especially on veins beneath; midrib sunken above, sharply raised beneath; lateral veins 5 or 6 pairs, arching and looping towards margin, distinct and raised beneath; intercostal veins reticulate, distinct and raised on both surfaces; petioles 3–4 cm long, terete, densely scabrous. *Inflorescences* up to 25 cm long, covered with hispid hairs, dark brown; bracteoles linear, < 4 mm long, pubescent, persistent, red. *Calyx* campanulate, 2.5–3 by 2–3 mm when flowering, densely hairy; lobes 1–1.2 mm long, apex acute; fruiting calyx shallowly infundibular, 12–15 mm diam., slightly pubescent at base, rim entire to slightly irregularly lobed. *Corolla* dark violet to dark reddish brown; middle lobe of lower lip oblong to spatulate, 3.5–4 by 2–3 mm, apex round, purple, covered with white hairs; lateral lobes of lower lip 2.5–3 by 2–2.3 mm, apex acute; lobes of upper lip 2.2–3 by 1.8–2 mm, apex acute; tube 5–7 mm long. *Stamens* 4, filaments 5–7 mm long, didynamous, with few white hairs. *Ovary* globose, c. 1 mm diam., with a dense tuft of hairs at apex; style 8–8.5 mm long, glabrous to with few white hairs. *Fruit* ellipsoid, 1–1.6 by 0.9–1.3 cm, smooth, impressed apically, glabrous with some hairs at apex, dark yellowish orange; pericarp thin.

Distribution — Borneo (Brunei, East Kalimantan).

Habitat & Ecology — Growing in primary or secondary forests, near rivers in floodplains, sometimes over sandstone. Altitude: 25–1000 m. Flowering: June to November; fruiting: July to September.

17. **Teijsmanniodendron simplicifolium** Merr.

Teijsmanniodendron simplicifolium Merr., Univ. Calif. Publ. Bot. 15. (1929) 263. — Type: *Elmer 21837* (holo PNH; iso A 2 sheets, BISH, BM, BO, K, L 2 sheets, NY, SING 2 sheets), [Malaysia,] British North Borneo [= Sabah], Elphinstone Province [= Tawau District], Tawao [=Tawau].

Teijsmanniodendron simplicifolium Merr. var. *cordifolium* Moldenke, Phytologia 43 (1979) 252; de Kok, Kew Bull. 64 (2009) 615. — Type: *SAN (Gibot) 60725* (holo SAN), Malaysia, Sabah, Ranau, Simpang trail.

Tree, 5–32 m tall, bole 3–14 m high, dbh 12–60 cm; buttresses to 2 m high, c. 50 cm out. *Bark* smooth to slightly scaly or fissured, white to whitish green or brown; sapwood hard, heavy, yellow to brown. *Twigs* terete, glabrous to hairy, nodes similarly hairy as young petioles or stems. *Leaves* unifoliolate; blade lanceolate, 7–13 by 2–5 cm, apex

acuminate, base acute to rounded (to cordate), margin flat, not bullate, coriaceous, glabrous, light brown when dried; midrib prominent; lateral veins 3 (or 4) pairs, curving and ascending, arching towards the margin, very conspicuous beneath; intercostal veins densely reticulate, distinct beneath; petioles 0.8–1.2 cm long, subterete, grooved above, glabrous, rarely with few hairs in particular on the swollen articulations, distal pulvinus sometimes with distinct black ring. *Inflorescences* up to 15 cm long, glabrous; bracteoles small, lanceolate to elliptic-lanceolate, caducous. *Calyx* campanulate, 1–2 by 1–2 mm when flowering, glabrous, yellow or whitish; lobes up to 0.5 mm long, apex acute; fruiting calyx broadly infundibular, 7–10 by 3–8 mm, irregularly lobed, glabrous. *Corolla* glabrous outside, pale-yellow or white, fragrant; middle lobe of lower lip spatulate, 2–2.5 by 2–2.5 mm, apex round, with a dark-yellow spot at the base; lateral lobes of lower lip 1.5–2.5 by 1–1.5 mm, apex acute; lobes of upper lip 1–2.5 by 1–1.5 mm, apex acute to round; tube 3–4 mm long, with blue-purple longitudinal stripes. *Stamens* 4, filaments 3–4 mm long, didynamous, exserted, inserted in the lower part of the corolla tube; anthers dark-purple. *Ovary* globose, c. 1 mm diam., apex glabrous, covered in glands; style 3–5 mm long, stigma c. 0.1 mm long. *Fruit* ovoid, 13–20 by 11–15 mm, apex notched, smooth with fine longitudinal ridges, glabrous; pericarp thin.

Distribution — Peninsular Malaysia, Sumatra, Borneo.

Habitat & Ecology — Found in primary and secondary forests. Soil: (sandy) clay or yellow sands, sometimes over sandstone, basalt, shale or ultrabasic substrates. Altitude: sea-level up to 1200 m. Flowering: February to August (September, December); fruiting: March to October (December).

Vernacular names — Borneo: Sabah: Buak-buak (Malay); Sarawak: Entabuluh, Ubah Sireh (Iban), Esak, Punok (Kayan); Kalimantan: Kaju Gadang, Kemuning (Dayak).

Uses — The wood is used in Sabah and said to be durable against insect attack; in Sarawak the wood is used for canoes and the bark for roofing.

18. Teijsmanniodendron simplicioides Kosterm.

Teijsmanniodendron simplicioides Kosterm., Reinwardtia 6 (1962) 303, 325. — *Teijsmanniodendron simplicioides* Kosterm. var. *kostermansii* Moldenke, Phytologia 4 (1952) 57, nom. illeg. (not autonym). — Type: *Van der Zwaan 1074* (*bb 19034)* (holo BO; iso A, BO, L, NY), [Indonesia, SE Kalimantan,] South East Borneo, Berouw Betemoean [= Berau Betemuan].

Tree, 5–60 m tall, bole 3–20 m high, dbh 10–120 cm, fluted or with steep buttresses. *Bark* whitish, pale yellow to greyish brown, smooth; inner bark yellowish; sapwood yellowish, hard. *Young twigs* densely golden pubescent, nodes of young twigs significantly more hairy than young petioles or stems, terete. *Leaves* unifoliolate, sometimes pseudowhorled; blade lanceolate, 6–10(–22) by 3–8 cm, apex acuminate, base rounded to broadly acute, margin flat, glabrous on both surfaces, coriaceous; midrib prominent above, prominent and slightly raised beneath; lateral veins 4–10 pairs, sunken above, raised beneath, arching towards the margin, not looping but becoming faint near margin towards apex; intercostal veins prominent; petioles 0.5–3 cm long, densely pubescent when young, sometimes glabrous when old; hairs short and long, 0.5–2 mm long, yellowish. *Inflorescences* densely pubescent to at least densely hairy at base; bracteoles 1–5 mm long, caducous. *Calyx* campanulate, 1.5–2 by 2–3 mm when flowering,

margin undulating and uneven, glabrous; fruiting calyx 7–10 mm diam., erect. *Corolla* yellowish white to (bluish) yellow or purple; middle lobe of lower lip spatulate, 3–4 by 3–5 mm, apex round, throat villous inside; lateral lobes of lower lip 2–2.5 by 1.8–2 mm, apex round; lobes of upper lip 2–2.5 by 2–3 mm, apex round; tube 4.5–5 mm long. *Stamens* 4, filaments 3–4 mm long, didynamous, yellow; anther c. 0.5 mm long, round. *Ovary* globose, c. 1 mm diam., villous at apex; style 3–4 mm long, stigma c. 0.1 mm long. *Fruit* ellipsoid, 1–2.2 by 0.6–1.2 cm, smooth, apex round, glabrous with a few glands; pericarp thin.

Distribution — Peninsular Malaysia (Terengganu), Borneo (Sabah, E Kalimantan).

Habitat & Ecology — In primary and secondary forests often on ridges. Soil: sandy, clay or clay loam, sometimes over sandstone or ultrabasic. Altitude: 60–150 m. Flowering: September to April; fruiting: March to October.

Vernacular names — Sabah: Buak-buak (Malay); Kilons (Dusun-Papar).

19. Teijsmanniodendron sinclairii Kosterm.

Teijsmanniodendron sinclairii Kosterm., Gard. Bull. Singapore 17 (1958) 6. — Type: *SFN (Sinclair & Kiah) 40877* (holo SING; iso BO, E, K 2 sheets, L), Peninsular Malaysia, Terengganu, Kuala Terengganu, Besut Road, Sungai Nerus riverbank.

Tree, 3–20 m tall, dbh 2–45 cm. *Bark* smooth, grey; sapwood white to pale yellowish brown. *Twigs* terete, stout; young twigs minutely scabrous, nodes similarly hairy as young petioles or stems, older ones glabrous. *Leaves* unifoliolate; blade elliptic, 17–25 by 8–13 cm, apex acuminate, base acute, margin strongly recurved, distinctly bullate, coriaceous, glabrous (hairy on veins below in Peninsular specimens), shiny; feeling rough beneath; midrib sunken above, raised beneath; lateral veins (5–)8–10(–20) pairs, sunken above, prominent and raised beneath, arching towards the margin; intercostal veins densely reticulate, impressed above, distinct and raised beneath; petioles 2–4 cm long, terete, glabrous, distal pulvinus usually with distinct black ring. *Inflorescences* up to 30 cm long, sparsely scabrous; bracteoles narrowly ovate to elliptic-lanceolate, c. 3 by 8 mm, persistent, apex acute. *Calyx* campanulate, 2–3 by 2–3 mm when flowering, with few hairs; lobes c. 0.5 mm long, apex broadly acute, erect; fruiting calyx shallowly cupuliform, 10–12 by 5–7 mm, rim irregularly lobed, minutely pubescent. *Corolla* funnel-shaped, petals blue, dark-violet or purple, pubescent; middle lobe of lower lip oblong to round, 3.5–3.8 by 2–3 mm, apex round, yellow-brown patch at base, throat villous at base; lateral lobes of lower lip, 2–2.2 by 1.5–2 mm, apex round; lobes of upper lip 1.5–2 by 1–1.2 mm, apex round; tube 2–4 by c. 2 mm. *Stamens* 4, filaments 5–7 mm long, didynamous, exserted, inserted in the middle part of the corolla tube, white; anther black. *Ovary* globose, c. 1 mm diam., pubescent at apex; style 6.5–7 mm long; stigma blue. *Fruit* ellipsoid, 15–17 by 10–12 mm, apex depressed, glabrous, smooth with faint longitudinal groove, glabrous, dark-green; pericarp thin.

Distribution — Peninsular Malaysia (Terengganu), Borneo.

Habitat & Ecology — Primary and secondary forests, often along riverbanks. Soil: alluvium, sometimes over sandstone or basalt. Altitude: sea-level up to 500 m. Flowering: March to October; fruiting: September to December.

Vernacular name — Sarawak: Entabuluh (Iban).

Note — The specimens from Peninsular Malaysia differ from the Borneo collections in having hairs on the leaf veins beneath and a more densely pubescent inflorescence.

20. Teijsmanniodendron smilacifolium (H.Pearson) Kosterm.

Teijsmanniodendron smilacifolium (H.Pearson) Kosterm., Reinwardtia 1 (1951) 95. — *Vitex smilacifolium* H.Pearson, Bull. Misc. Inform. Kew (1907) 59; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 48, 51. — Lectotype (designated by De Kok et al., Kew Bull. 64 (2009) 618): *Beccari PB 1097* (lecto K; isolecto BM, NY), [Malaysia,] Sarawak.

Tree, 4–30 m high, bole 10–25 m high, dbh 10–55 cm; buttresses present. *Bark* smooth, powdery to scaly, whitish grey to yellow or black; slash yellow, grey to pale-brown; sapwood white to yellowish brown, soft. *Twigs* round in cross-section, glabrous. *Leaves* unifoliolate; blade oblanceolate, 12–20 by 4–8 cm, apex acute or broadly acuminate, base broadly acute to rounded, margin slightly recurved, glabrous on both surfaces, coriaceous, shiny above, not punctuate beneath; midrib prominent above and below; lateral veins 3 or 4 pairs, at least one pair of major lateral veins originating at base of leaf, all major lateral veins uniformly prominent and arching towards to apex, intercostal veins finely reticulate, obscure above, prominent beneath; petioles 1–2 cm long, subterete, glabrous. *Inflorescences* up to 30 cm long, glabrous; bracteoles small or minute, caducous. *Calyx* campanulate, 1–2 by 1–2 mm when flowering, sparsely and minutely glandulous; lobes c. 0.5 mm long, apex acute; fruiting calyx cupuliform, 6–9 mm diam., accrescent, irregularly lobed, glabrous. *Corolla* dull dark glaucous; pale-purple or blue to white, pale mauve, white (yellow); middle lobe of lower lip darkish violet near the villous throat, with a distal pale-yellow spot, cream; lateral lobes of lower lip cream; lobes of upper lip cream; tube funnel-shaped, upper part marked externally with glands. *Stamens* 4, distinctly didynamous, slightly exserted, inserted below the middle part of the corolla tube; filaments dark-purple to faint-violet, basally dilated and villous; anthers dark-purple or black. *Ovary* globose, c. 1 mm diam., glabrous, densely glandular-dotted; styles c. 6 mm long, white. *Fruit* globose, 1.2–1.8 by 0.8–1.2 cm, apex round to acute, finely ribbed when dry, glabrous, black; pericarp thin.

Distribution — Borneo.

Habitat & Ecology — Primary or secondary forests. Soil: clay or black stony soil, sometimes over shale. Altitude: sea-level up to 1000 m. Flowering: November to July; fruiting: October to November.

21. Teijsmanniodendron subspicatum (Hallier f.) Kosterm.

Teijsmanniodendron subspicatum (Hallier f.) Kosterm., Reinwardtia 1 (1951) 99. — *Vitex subspicata* Hallier f., Meded. Rijks-Herb. 37 (1918) 52; H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 52. — Lectotype (designated by De Kok et al., Kew Bull. 64 (2009) 619): *Forbes 3204* (lecto L; isolecto BM, BO, L 2 sheets, SING), [Indonesia,] Sumatra.

Tree, 3–20 m high, dbh 6–40 cm; buttresses to 1 m high. *Bark* smooth to flaky-cracked, yellow to grey; slash white or light-greenish, yellow or orange, granular, soft; sapwood pale brown to yellowish. *Twigs* white or pale ochraceous, stout, round in cross-section, glabrous. *Leaves* unifoliolate; blade lanceolate, (8–)15–30(–38) by

(3–)10–14(–16) cm, apex acuminate, base broadly acute to rounded, margin recurved, coriaceous, subbullate beneath, shiny and glabrous on both surfaces, rough below when young, not punctuate beneath; midrib impressed above, prominent and raised beneath; lateral veins 7–10 pairs, arching towards the margin and sometimes forming an (imperfect) intramarginal vein, prominent and raised beneath; intercostal veins reticulate, prominulent and slightly raised beneath; petioles 1–3 cm long, subterete, glabrous, distal pulvinus sometimes with distinct black ring. *Inflorescences* up to 25 cm long, dark purplish red, very minutely puberulent; bracteoles minute, linear, persistent. *Calyx* campanulate, 1.5–2 by 2–2.2 mm when flowering, puberulent, green to dark red-purple; lobes up to 0.3 mm long, apex broadly acute; fruiting calyx shallowly infundibular, 6–8 by 10–18 mm, much accrescent, irregularly dentate, dirty brownish yellow. *Corolla* pubescent, lilac to purple; middle lobe of lower lip round to spatulate, 2–4 by 1.5–2 mm long, band of white hairs along length of lip, lilac-blue with yellow blotch at base; lateral lobes of lower lip 1.5–2.8 by 0.8–1 mm, apex round to acute, dark violet; lobes of upper lip 1–1.2 by 0.8–1 mm, apex round, dark violet; tube 2.5–3.5 mm long, pale yellow or white to pale-dark purple. *Stamens* 4, filaments 3–5 mm long, distinctly didynamous, exserted, inserted in the lower part of the corolla tube, white, basally pale-blue, villous; anthers black, c. 0.5 mm long. *Ovary* globose, c. 1 mm diam., villous at apex; style 5–7 mm long, exserted, white to pale blue. *Fruit* ellipsoid, 9–20 by 8–15 mm, apex depressed, smooth, glabrous with few hairs at apex, black; pericarp thin.

Distribution — Sumatra, Borneo.

Habitat & Ecology — Primary and secondary forests, sometimes swamps or kerangas forest or along on riverbanks. Soil: white sand to sandy or loamy clays, sometimes on acid soils or limestone. Altitude: 10–400(–1000) m. Flowering: September to June (August); fruiting: July to May.

Vernacular names — Borneo: Sabah: Kedaras (Dusun); Sarawak: Entabuluh, Medang sisit, Selumpo (Iban); Ubah Putih (Malay); Brunei: Mertubu (Iban-Brunei).

22. Teijsmanniodendron unifoliolatum (Merr.) Moldenke

Teijsmanniodendron unifoliolatum (Merr.) Moldenke, Phytologia 4 (1952) 58. — *Vitex unifoliolata* Merr., Philipp. J. Sci. 20 (1922) 438. — Type: *BS (Ramos & Edaño) 37048* (holo PNH; iso K, US), Philippines, Mindanao, Zamboanga District, Melangas.

Tree, 1.5–26 m tall, dbh 10–35(–100) cm, sometimes fluted. *Bark* smooth to flaky, whitish to greyish green or brown; sapwood soft, white to pale-yellow; hardwood brown, hard. *Twigs* glabrous, smooth, square in cross-section. *Leaves* unifoliolate; blade narrowly elliptic to lanceolate, 12–40 by 4–11 cm, apex acuminate, base acute to rounded, margin flat to recurved, shiny above, glabrous on both surfaces, slightly bullate, young leaves feeling rough beneath, not punctuate beneath, coriaceous; midrib prominent and raised on both surfaces; lateral veins 6–12 pairs, arching towards the margin, sometimes forming intramarginal veins, prominent and raised beneath; intercostal veins laxly reticulate, distinct and slightly raised beneath, obscured above, concolorous with leaf blade; petioles 1–3 cm long, subterete, glabrous. *Inflorescences* up to 40 cm long; peduncles c. 6 cm long, glabrescent, violet; bracteoles lanceolate to elliptic-lanceolate, caducous. *Calyx* campanulate, 1.8–3 by 1–2 mm when flowering,

green to (dark) purple, pubescent; lobes c. 0.5 mm long, apex acute to obtuse; fruiting calyx cupuliform, 0.7–1.2 cm diam., erect, lobed to entire, glabrous to pubescent. *Corolla* velvety, scented, blue to violet or (white) purple; middle lobe of lower lip orbicular to spatulate, 2.5–4 by 2–3 mm, apex round, yellow spot at base, erect hairs at base; lateral lobe of lower lip 2.5–3 mm long, apex acute, blue; lobes of upper lip 1.5–3 mm long, apex acute, blue; tube 3–5 mm long, purple to violet. *Stamens* 4, filaments 2–5.5 mm long, distinctly didynamous, greatly to shortly exserted, inserted in the middle or lower part of the corolla tube, villous at base, white to faintly violet; anthers black. *Ovary* globose, c. 1 mm diam., villous at apex; styles c. 6 mm long, white; stigma c. 0.5 mm long. *Fruit* globose, 0.7–2 by 1–1.7 cm, smooth, apex round to depressed, glabrous except for a few hairs at apex, covered with sooty yellow- or greenish brown powder forming a cracked layer when dry, pale purple to black; pericarp thin with pithy layer within.

Distribution — Borneo, S Philippines.

Habitat & Ecology — Primary and secondary, sometimes in heath (kerangas) forests, often along rivers or in seasonally inundated forest. Soil: sand, clay or sandy loam or shale-derived soil, sometimes over basalt, sandstone or limestone. Altitude: sea-level up to 800 m. Flowering: August to April; fruiting: June to January.

Vernacular names — Borneo: Sarawak: Entabuluh (Iban); C Kalimantan: Kayu Sanaman (Dayak). Philippines: Babako (Tagalog).

23. Teijsmanniodendron zainudinii Rusea

Teijsmanniodendron zainudinii Rusea in de Kok et al., Kew Bull. 64 (2009) 622. — Type: *Zainudin AZ 5009* (holo UKMB; iso KEP, L, SAN), Malaysia, Sabah, Sandakan, Telupid, Bukit Tawai Forest Reserve.

Teijsmanniodendron subspicatum (Hallier f.) Kosterm. var. *parvifolium* Moldenke, Phytologia 43 (1979) 252; de Kok et al., Kew Bull. 64 (2009) 622. — Type: *SAN (Meijer) 39328* (holo SAN; iso K), Malaysia, Sabah, Sandakan District, Tawai Plateau, Ulu Karamuak.

Tree, 2–10(–25) m tall, dbh 3–20 cm. *Bark* smooth, pale green to whitish; sapwood yellow to yellowish ochre; resin yellowish ochre turning brown on exposure. *Twigs* greyish brown, glabrous, round in cross-section. *Leaves* unifoliolate; blade elliptic to lanceolate, 7–9 by 3–5 cm, apex acuminate to acute, base round to slightly cordate, margin flat or recurved, thick coriaceous, glabrous above, feeling smooth beneath, not punctuate beneath; midrib prominent, flat to slightly raised above, raised beneath; lateral veins 5–7 pairs, faint above, rather prominent beneath but not raised, arching towards margin and looping into a faint intramarginal vein; intercostal veins invisible above, fairly faint beneath, finely reticulate; petioles < 1 cm long, subterete, scabrous. *Inflorescences* panicles of subsessile branched cymes, violet; bracteoles narrowly lanceolate, < 3 mm long, caducous. *Calyx* infundibular, 1–2 by 1.5–2 mm when flowering, glabrous, reddish purple; lobes up to 0.5 mm long, apex acute, glabrous; fruit calyx cupuliform, 12–14 by 4–5 mm, lobes irregular, glabrous, dark greyish brown. *Corolla* slightly pubescent on both surfaces; purple to violet or white with yellow hairs; middle lobe of lower lip spatulate, 2–2.5 by 3–3.5 mm, apex round or emarginate, reflexed, throat villous inside; lateral lobes of lower lip 2–3 by 2–2.5 mm, apex round; lobes of

upper lip 2–3 by 1.5–2 mm, apex round; tube 4–5.5 mm long. *Stamens* 4, filaments 4–6 mm long, didynamous, exerted, inserted in the lower part of the tube. *Ovary* globose, 1–2 mm diam., glabrous, apex covered with glands; style 3–5 mm long. *Fruit* ellipsoid, 14–17 by 10–12 mm, apex acute with slight notch at apex, smooth, glabrous; pericarp thin.

Distribution — Borneo (Sabah: only known from a few collections from the ultrabasic outcrops north-west of Sandakan).

Habitat & Ecology — Lowland dipterocarp forests and heath forest dominated by *Gymnostoma sumatrana* (Jungh. ex de Vriese) L.A.S.Johnson. Soil: clay over ultrabasic substrates. Altitude: 150–850 m. Flowering: February to April; fruiting: March to November.

48. TEUCRIUM

(G.L.C. Bramley, updated from Keng 1978)

Teucrium L., Sp. Pl. (1753) 562; Hook.f., Fl. Brit. India 4 (1885) 701; H.Keng, Gard. Bull. Singapore 24 (1969) 175; in Steenis, Fl. Males., Ser. I, 8 (1978) 317; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 201. — Type: *Teucrium fruticans* L.

Shrubs or perennial herbs; hairs sometimes capitate-glandular. *Leaves* simple, decussate. *Inflorescences* axillary cymes, or paniculiform to spiciform thyrses, sometimes cymes reduced to single flowers in leaf axils or bracteate heads. *Calyx* actinomorphic to zygomorphic, accrescent or not, tube often ± gibbous, 5-lobed, lobes all similar or upper lobe different from other four, or upper, lateral and lower lobes with the upper and lateral lobes slightly longer, less conspicuously 2-lipped, or lobes subequal. *Corolla* exserted, zygomorphic, deciduous in fruit, usually split dorsally to near base of tube giving 1-lipped appearance, the lip 5-lobed, middle lobe much larger than others, usually concave. *Stamens* 4, exserted, two lower ones longest; anthers reniform, 2-celled, at length confluent. *Disc* absent to well-developed, symmetrical. *Ovary* lobed from a quarter to half its length; style 2-fid, branches subequal, subterminal. *Nutlets* obovoid to oblate or subglobose, rugose or reticulate, not winged, attachment scar lateral, large.

Distribution — About 250 species worldwide but mostly extratropical, many in the Mediterranean area; in *Malesia* three species.

KEY TO THE SPECIES

1a. Inflorescence a cylindric thyrse, each verticillaster consisting of a pair of 3–9-flowered dichasia . . . . . **1. T. corymbosum**
b. Inflorescence raceme-like, with 2 flowers in each verticillaster or paniculate . . . 2
2a. Plant with retrorse, viscose glandular hairs on stems and rachis, hispid hairs on leaves. Calyx 2–3 mm long in flower, 3–6 mm long in fruit. Corolla 5–8(–12) mm long . . . . . **2. T. viscidum**
b. Plant with distinct, often dense patent, often yellowish long-hairs on stems, rachis, and at least the underside of the leaf. Calyx 3–5 mm long in flower, 6–7 mm long in fruit. Corolla 15–20 mm long . . . . . **3. T. wightii**

1. **Teucrium corymbosum** R.Br.

Teucrium corymbosum R.Br., Prodr. (1810) 504; Benth., Fl. Austral. 5 (1870) 134. — Type: *Brown s.n.* (holo BM 2 sheets, no. BM001040992, BM001040993), Australia, New South Wales, Sydney, Port Jackson.

Scoparia australis Sieber in Schult., Mant. Pl. Altera (1822) 66. — *Anisomeles australis* (Sieber) Spreng., Syst. Veg. 4 (2) (1827) 226. — Type: *Sieber 184* (K, others not located), Novae Hollandae.

Teucrium lanceolatum Benth., Labiat. Gen. Spec. (1835) 666. — *Teucrium corymbosum* R.Br. var. *lanceolatum* (Benth.) Domin, Biblioth. Bot. 89 (1928) 570. — Type: *Cunningham s.n.* (holo K), Australia, New South Wales, Bathurst.

Teucrium petrophilum F.Muell., Linnaea 25 (1853) 426. — *Teucrium corymbosum* R.Br. var. *petrophilum* (F.Muell.) Domin, Biblioth. Bot. 89 (1928) 570. — Type: *F. von Mueller s.n.* (MEL), [Australia,] inter Wulpena et Arkaba ad rivulos exarescentes, et ad montium apices petraeous juxta Baruta et Crystal-brook.

Teucrium corymbosum R.Br. var. *hirsutum* Benth., Fl. Austral. 5 (1870) 134. — *Teucrium hirsutum* (Benth.) Domin, Biblioth. Bot. 89 (1928) 570. — Type: not located.

Erect or sprawling perennial, to 1 m high, weakly woody beneath. *Stems*, *branches* and leaves covered with short white hairs. *Leaves*: blade narrowly elliptic to narrowly obovate, 2–5.5 by 0.8–2 cm, margin remotely serrate or deeply toothed, apex acute, base attenuate; petiole 0.5–1 cm long. *Inflorescences* terminal and in the upper axils, 12–15(–25) cm long, a cylindric thyrse consisting of 6–10 verticillasters, each verticillaster consisting of a pair of 3–9-flowered dichasia; pedicels 3–5 mm long; bracts linear, minute. *Calyx* campanulate, pilose, 2–2.5 mm long, 5-lobed, lobes very narrowly triangular, spreading, upper and lateral lobes slightly longer than the lower lobes. *Corolla* white, 5–6 mm long, the lower lobe shallowly boat-shaped. *Nutlets* elliptical, flattened, 1–1.2 mm long (immature), hispid.

Distribution — Australia (Queensland, New South Wales, Victoria, S Australia, Tasmania); in *Malesia*: Papua New Guinea (once collected: Kainantu, Eastern Highlands, *NGF (Henty & Carlquist) 16526*).

Habitat & Ecology — On riverside. Altitude: c. 1450 m.

2. **Teucrium viscidum** Blume

Teucrium viscidum Blume, Bijdr. (1826) 827; Miq., Fl. Ned. Ind. 2 (1859) 991; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 409; Backer & Bakh.f., Fl. Java 2 (1965) 618; H.Keng, Gard. Bull. Singapore 24 (1969) 176; X.W.Li & Hedge in C.Y.Wu & P.H.Raven, Fl. China 17 (1994) 57. — Type: *Blume 1809* (holo L; iso L 2 sheets, NY), Java.

Teucrium viscidum Blume var. *densiflorum* Miq., Fl. Ned. Ind. 2 (1859) 991. — Type: *Anonymous* '14' (holo L), Timor.

Teucrium stoloniferum Roxb., Fl. Ind. ed. Carey, 3 (1832) 3; Miq., Fl. Ned. Ind. 2 (1859) 990. — Type: Roxburgh illustration in Icon. Roxb. t. 1456 (K).

Teucrium stoloniferum Roxb. var. *typicum* Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 9 (1877) 825, nom. inval.

Melissa inodora Hassk., Tijdschr. Natuurl. Gesch. Physiol. 10 (1843) 127; Miq., Fl. Ned. Ind. 2 (1859) 969. — Type: not located.

Teucrium philippinense Merr., Philipp. J. Sci., C 7 (1912) 100 — Syntypes: *FB (Curran) 4935* (not located), Philippines, Luzon, Benguet subprovince, Baguio; *Vanoverbergh 1374* (not located), Philippines, Luzon, Bontoc subprovince, Bauco.

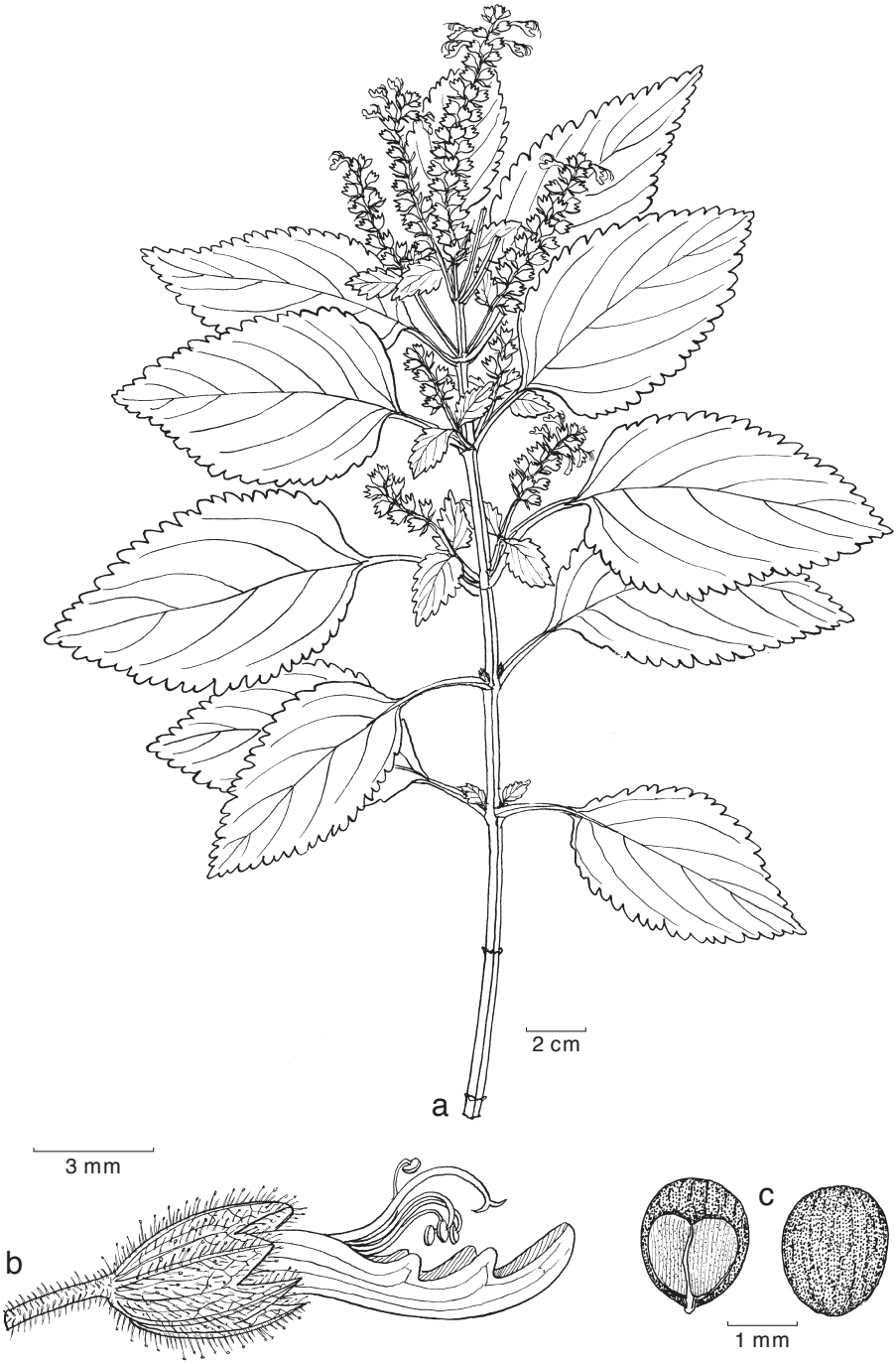

Fig. 47. *Teucrium viscidum* Blume. a. Habit; b. flower; c. seed from two sides, left with large hilum (all *J.J. Smith 840*, L). Drawing by Ed Vijsma.

Erect annual, 20–80 cm high, often branched and stoloniferous. *Stems* and *branches* with retrorse hairs, viscous glandular. *Leaves*: blade narrowly ovate to ovate, 4–7(–10) by 3–4 cm, membranaceous, slightly fetid, margin distinctly crenate-serrate, apex acute or broadly acute, base cuneate or rounded, both surfaces scattered with hispid hairs; petiole slender, 1.5–3 cm long. *Inflorescences* terminal and axillary, 2–3 cm long, appearing raceme-like with 2 flowers in each verticillaster, in fruit up to 10 cm long, densely or sparsely covered with both non-glandular and viscous, glandular hairs; pedicels 2–3 mm long; bracts lanceolate, 2–3 mm long, pilose. *Calyx* campanulate, 2–3 mm long in flower, in fruit urceolate or tubular, 3–6 mm long, glandular-ciliate, upper lobe broadest, narrowly ovate, two lateral lobes deltoid, slightly shorter and narrower, the two median lobes slightly narrower, more acute, rarely slightly longer. *Corolla* pinkish to purple, slender, exserted, 5–8(–12) mm long, slightly concave. *Nutlets* shallowly ridged, ovoid or globoid, c. 1.5 mm long. — **Fig. 47.**

Distribution — India, Burma, Thailand, Indo-China, Hong Kong to China, Korea, Taiwan, Japan; in *Malesia*: C Sumatra, Java (mainly in W, Mt Gedeh-Mt Tjeremai, rare eastward: Mt Wilis, ?Tengger), Philippines (Luzon), Lesser Sunda Islands (Bali, Lombok, Timor), New Guinea.

Habitat & Ecology — Shaded localities, in forests and thickets, also sometimes on limestone rocks, occasionally in coffee estates, usually locally common. Altitude: (550–)800–1700 m. Flowering: throughout the year, mainly March to June.

Vernacular names — Java: Rukuku; Sangket (Sundanese). New Guinea: Funeh (Musa, Safia dial.); Kalal-anarg (Amele, Amele dial.); Tebiyhaai (Hattam).

3. Teucrium wightii Hook.f.

Teucrium wightii Hook.f., Fl. Brit. India 4 (1885) 701; Mukerjee, Rec. Bot. Surv. India 14 (1940) 220. — Syntypes: *Hohenacker 1396* (K 2 sheets, L 2 sheets, NY), [India,] Nilghiri Hills; *Wight KD 2168* (K, L), [India,] Nilghiri Hills.

Teucrium tomentosum Wight, Icon. Pl. Ind. Orient. 4 (1850) t. 1458, nom. illeg. (non *Teucrium tomentosum* Lam., Fl. Franç. 2 (1779) 407). — Type: not located.

Teucrium quadrifarium auct. non Ham. ex D. Don: H.Keng, Gard. Bull. Singapore 24 (1969) 175.

Erect annual, 0.5–1 m high. *Stems*, *branches* and leaves rather densely patent-pubescent, often yellowish. *Leaves*: blade narrowly elliptic to narrowly ovate, 6–9 by 2–4 cm, margin serrulate, apex bluntly acute, base truncate or cordate, often oblique; both surfaces with silky appressed hairs, especially dense on the venation, lamina surface more or less obscured but yellow sessile glands present beneath hairs; petiole 1–1.5 cm, uppermost leaves subsessile. *Inflorescences* axillary and terminal, generally forming panicles 7–10 cm long, in fruit to 15 cm long or more; axes hairy; pedicels 2–3 mm long; bracts narrowly ovate, acuminate, cuneate at base, smaller than the calyx. *Calyx* tubular-campanulate, with erect hairs (glandular in continental Asia), purple, 3–5 mm long in flower, in fruit 6–7 mm long; upper tooth ovate, broad; 2 lower lobes narrowly triangular, 1.5–2 mm long; the lateral lobes about half the length of the others, broad-ovate deltoid, acute. *Corolla* white with pink markings on lip, expanded and recurved, 15–20 mm long. *Nutlets* ovoid, c. 1.5 by 1 mm, rugose, dark-brown.

Distribution — India, Thailand, to China (Kwantung); in *Malesia*: N Sumatra (Gajo Lands: Takengon, one collection).

Habitat & Ecology — Moist secondary forest, locally common. Altitude: 1300–1400 m. Flowering: August.

Note — *Teucrium wightii* is known in Malesia from a collection from N Sumatra. Keng (1969) referred this collections to the name *T. quadrifarium* Ham. ex D.Don, but later (Keng in Steenis, Fl. Males., Ser. I, 8 (1978) 318) changed his opinion and used instead the name *T. wightii* on the basis that "Hooker's interpretation of Don's species shows that this is clearly distinct from the Sumatran plant by the very much larger, broader bracts broadly rounded or almost truncate at base, which especially at the tips of racemes conceal the flowers and are neatly arranged in a 4-ranking strobiloid shape". Re-examination of the Sumatran collection shows it to differ from the continental Asian material in its lack of glandular hairs on the calyces but shares all other characters.

DOUBTFUL AND EXCLUDED

[*Teucrium melissaefolium* Noronha, Verh. Batav. Genootsch. Kunsten 5, 4 (1790) 27, nom. inval., nom. nud.].

Teucrium oliganthum Hassk., Cat. Hort. Bot. Bogor. (1844) 310.

According to Keng (in Steenis, Fl. Males., Ser. I, 8 (1978) 318), this was described from Japanese specimens cultivated in the Botanic Gardens, Bogor. No record of specimens with this name was found.

Teucrium virginicum auct. non L.: Thunb., Fl. Jav. (1825) 15.

Identity unchecked, possibly *T. viscidum* Blume.

49. VITEX

(R.P.J. de Kok)

Vitex L., Sp. Pl. (1753) 638; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 164; in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 47; Harley et al. in Kubitzki, Fam. Gen. Vasc. Pl. 7 (2004) 195; de Kok, Kew Bull. 62 (2007) 587; 63 (2008) 17; Bramley et al., Taxon 58 (2009) 500; Tree Fl. Sabah & Sarawak 7 (2011) 77. — Type: *Vitex agnus-castus* L.

Viticipremna H.J.Lam, Verbenaceae Malayan Archipel. (1919) 162; in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 47; Munir, J. Adelaide Bot. Gard. 7 (1985) 181; Moldenke, Phytologia 50 (1982) 267; Bramley et al., Taxon 58 (2009): 500. — Lectotype (designated by Munir 1985: 181): *Viticipremna philippinensis* (Turcz.) H.J.Lam (= *Vitex philippinensis* Merr.).

Trees, shrubs, rarely lianas. *Leaves* (1–)3–5(–7)-palmate, decussate; leaflets elliptic, apex rounded to acuminate, base cuneate, sometimes oblique, margin entire, seldom toothed or lobed, herbaceous; upper surface glabrous except on the veins; lower surface glabrous except with hairs on the veins to velutinous; venation pinnate, usually prominent below and sunken above; glands shortly stalked, on both surfaces; hairs simple, multicellular; petiole round to laterally flatted in cross-section. *Inflorescences*

terminal or axillary, cymose or paniculate, usually dichasial; axis round to flattened in cross-section; bracts morphological similar to leaves, persistent; bracteole triangular, elliptic-linear, often not persistent. *Calyx* (0–)4- or 5-lobed, campanulate, rarely 2-lipped, usually accrescent. *Corolla* (4- or) 5-lobed, strongly to weakly 2-lipped, usually glabrous inside, lobes heteromorphic to isomorphic, apex emarginate to rounded to acute, hairs concentrated at corolla mouth and along centre of lip, tube base glabrous. *Stamens* 4, usually equal, glabrous but usually with hairs at base, inserted in middle to lower half of tube. *Ovary* globose, apex usually rounded, usually glabrous, sometimes wholly or only the apex covered with glands; style terminal, usually straight, seldom with hooked apex, glabrous; stigma bifid, apex acute to acuminate. *Fruit* drupaceous, fleshy, globose, not splitting; mericarps 1–4.

Distribution — *Vitex* is pantropical with about 300 species; in *Malesia* 21 species, widespread, but the number of species decreases sharply south and west from New Guinea.

Habitat & Ecology — Members of the genus are common in swamps and primary rainforests and are often prominent in secondary, coastal or fire-influenced vegetations or in drier evergreen forests.

Uses — Throughout the Malesian region the timber of most of the larger tree species is used in house and boat building and to make tools, weapons and kitchen utensils. A number of species (in particular *V. trifolia* and *V. negundo*) are extensively used and grown for both medicinal use and as ornamentals.

KEY TO THE SPECIES

1a. Inflorescences cymose (dichasial) 2
b. Inflorescences paniculate 9
2a. Inflorescences terminal and axillary. Lower leaf surface glabrous to hairy, but with a distinct hair tuft domatia in the axils between midrib and the secondary veins. Corolla white to purple with a darker apex, with a clear distinctly bigger lower lip . . . . . **5. V. glabrata**
b. Inflorescences axillary, seldom terminal. Lower leaf surface glabrous or evenly hairy or hairs on the veins only. Corolla (whitish pink to) yellow (to dark orange) without a clear bigger lower lip and with sometimes isomorphic lobes 3
3a. Leaves 1-foliolate, petiole with small swelling at apex. — N Sumatra . . . . . **20. V. vansteenisii**
b. Leaves 3-foliolate, petiole without a small swelling at apex 4
4a. Bracteoles > 5 mm long; often persistent at least in flowering stage 5
b. Bracteoles < 3 mm long; seldom persistent 7
5a. Corolla lobes 4. — N Sumatra . . . . . **7. V. medusaecalyx**
b. Corolla lobes 5 6
6a. Bracteoles elliptic. Flowering calyx lobes 2.5–4 mm long. — Sarawak . . . . . **3. V. flava**
b. Bracteoles lanceolate to spatulate. Flowering calyx lobes 4–5 mm long. — Peninsular Malaysia, Thailand . . . . . **6. V. longisepala**

7a. Leaves glabrous, rarely moderately hairy. Calyx with 4 lobes (one enlarged upper lobe and 3 smaller lower lobes) . . . . . **4. V. gamosepala**
b. Leaves glabrous to moderately to densely hairy. Calyx with 5 usually isomorphic lobes (in *V. millsii* one lobe usually bigger than others) 8
8a. Flowering calyx lobes usually not isomorphic, one lobe usually bigger than others, flowering calyx 1–2 mm diam. — Peninsular Malaysia . . . . . **8. V. millsii**
b. Flowering calyx lobes ± isomorphic; flowering calyx 2.5–5 mm diam. — Peninsular Malaysia, Sumatra, Borneo . . . . . **21. V. vestita**
9a. Leaves 1-foliolate with a distinct circular-scar around a swelling in distal part, often with two leaf scars at apex beneath the only leaflet . . . . . **2. V. cofassus**
b. Leaves (1–)3–7-foliolate and without a circular-scar or swelling on the petiole, nor with 2 leaf scars 10
10a. Bracteoles in upper part of inflorescence leaf-like and clavate, > 6 mm long (in some old collections bracteoles may be absent). Leaves hairy, hairs yellowish when dry . . . . . **12. V. pinnata**
b. Bracteoles in upper part of inflorescence scale-like, triangular, elliptic, lanceolate, linear, ≤ 5 mm long. Leaves glabrous or hairs whitish when dry 11
11a. Climber or small tree (up to 3 m high). Corolla lobes more or less isomorphic. — New Guinea . . . . . **15. V. scandens**
b. Tree or (prostrate) shrub. Corolla lobes usually differentiated into a distinctly bigger lower lip and smaller lateral and upper lobes (almost isomorphic in *V. turczaninowii*) 12
12a. Corolla lower lip ≤ 2.8 mm long and flowering calyx < 2 mm diam. Ovary apex velutinous. — Limestone outcrops in Peninsular Malaysia and Thailand . . . . . **16. V. siamica**
b. Corolla lower lip ≥ 1.8 mm long and flowering calyx ≥ 1 mm diam. Ovary glabrous or seldom with a few hairs at apex 13
13a. Most corollas 4-lobed 14
b. Most corollas 5-lobed 16
14a. Leaves upper surface pubescent; lower surface densely hairy . **17. V. tomentosa**
b. Leaves glabrous (except for nerves in *V. novae-pommeraniae*) 15
15a. Leaflets ovate, ovate-oblong or ovate-lanceolate; base unequally obtuse or subtruncate, rarely cuneate. Stamens inserted in the upper part of the corolla-tube . . . . . **10. V. novae-pommeraniae**
b. Leaflets lanceolate to narrowly elliptic-lanceolate; base cuneate. Stamens inserted in the lower part of the corolla-tube . . . . . **19. V. turczaninowii**
16a. Fruiting calyx flattened not enclosing fruit, patent. Trees ≥ 4 m tall. Lower leaf surface glabrous with veins usually with some appressed hairs 17
b. Fruiting calyx partly enclosing fruit. Small trees and (prostrate) shrubs 1–4(–8) m tall. Lower leaf surface velutinous 18
17a. Inflorescences glabrous to densely hairy. Mature calyces always clearly less hairy than the inflorescences . . . . . **11. V. parviflora**
b. Inflorescences moderately to densely hairy. Mature calyces always as hairy as the inflorescences . . . . . **13. V. quinata**

18a. Leaves always 1-foliolate; leaflets apex rounded, sometimes subacute. Prostrate to small erect shrub and rooting at the nodes . . . . . **14. V. rotundifolia**
b. Leaves 1–6-foliolate; leaflets apex acute to acuminate. Trees or shrubs, rarely prostrate and never rooting at the nodes 19
19a. Leaves 3–6-foliolate; most leaflet margins dentate, some leaflets entire. Calyx lobe apex acuminate to aristate or with umbo. Bracteoles linear, up to 3 mm long, patent. Inflorescences paniculate consisting of lateral cymes in dense clusters . . . . . **9. V. negundo**
b. Leaves 1–5-foliolate; leaflet margins entire. Calyx lobe apex acute. Bracteoles triangular to linear, up to 2 mm, appressed. Inflorescences paniculate consisting of lateral cymes in lax clusters 20
20a. Leaves (1–)3–5-foliolate; terminal leaflet always distinctly petiolulate; base cuneate; lateral leaflets mostly petiolulate; leaflets ovoid-elliptic to narrowly elliptic; apex acuminate; secondary veins usually not very visible. Shrubs or trees . . . . . **1. V. bicolor**
b. Leaves (1–)3-foliolate; terminal leaflet sessile or shortly petiolulate (up to 1.1 cm), base attenuate in compound leaf, rounded or cuneate in simple leaf; lateral leaflets sessile; leaflets oblong-elliptic to obovate or obovate-spatulate; apex acute, rarely acuminate, secondary veins visible. Prostate or upright shrubs to small trees . . . . . **18. V. trifolia**

1. Vitex bicolor Willd.

Vitex bicolor Willd., Enum. Pl. 2 (1809) 660. — *Vitex negundo* L. var. *bicolor* (Willd.) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 191. — *Vitex trifolia* L. var. *bicolor* (Willd.) Moldenke, Known Geogr. Distrib. Verb. Avicenn. ed 2. (1942) 79; Phytologia 6 (1958) 174. — Type: *Herb. Willd. 11709* (holo B-W), 'Habitat in India Orientale', cult. Hort. Berlin from seeds sent by Klein ('Ind. 1797').

Vitex negundo L. var. *philippinensis* Moldenke, Phytologia 38 (1978) 308. — Type: *Elmer 8125* (holo PNH†; iso K, NY), Philippines, Luzon, Laguna Province, Los Baños.

Shrub or tree, up to 1.5–5 m high. *Leaves* (1–)3–5-foliolate; terminal leaflet ovoid-elliptic to narrowly elliptic, 3.8–9.6 by 1.2–4 cm, 1.7–3.4 times as long as wide, terminal petiolules (0.2–)2 cm long; lateral leaflets 2.6–8.2 by 1–2.9 cm, 2–3.5 times as long as wide, lateral petiolules 0–1.5 cm long; basal leaflets, when present, 1.4–4.5 by 0.4–1.6 cm, 2.7–4 times as long as wide, dark dull green above, drying dark brown, pale green below; basal petiolules 0(–0.1) cm long; apex acuminate, base cuneate, margin entire, glabrous above or with only hairs on the veins, velutinous below, secondary veins 6–16 pairs, usually not very visible; hairs whitish, appressed, with powdery exudates on apical cell; petiole 1.5–5.2 cm long, round in cross-section, covered with minute curly hairs. *Inflorescences* paniculate, consisting of lateral cymes in lax clusters, terminal, axis 5.9–15 cm long, angular in cross-section; hairs dense, appressed; bracteoles triangular to linear, up to 2 mm long, velutinous, usually persistent. *Calyx* 5-lobed, clearly 5-ribbed; lobes 0.2–0.8 by 0.3–0.8 mm, acute, clearly developed, persistent, velutinous; glands absent to few; flowering calyx 1–1.5 mm diam., erect; fruiting calyx 2–2.5 mm diam., erect, covering up to 1/3 of the mature fruit. *Corolla*

5-lobed, pale lilac, blue to violet; covered with appressed hairs; glands few or absent, white; lower lip orbicular to ovate, 2.3–3.2 by 2.3–3.3 mm, apex rounded and erect, margin entire, two well-developed ridges at corolla mouth; lateral lobes 1.2–1.5 by 1–2 mm, apex round, patent; upper lip 2-lobed, lobes 1.2–1.5 by 1–1.2 mm, fused up to 10 %, apex round, erect; tube infundibular, 3.2–6.2 mm long. *Stamens*: filaments 2.6–4.1 mm long, slightly to strongly didynamous, inserted 1/2 to 1/3 of the way on the corolla tube; anther c. 0.8 mm long. *Ovary* globose, 0.6–0.8 by 0.5–0.7 mm, glabrous, few glands present at apex; style 3.6–7 mm long; stigma lobes 0.2–0.7 mm long. *Fruit* black or purple when mature; dried ellipsoid, 2.6–5.1 by 2.8–5.8 mm, apex rounded, few glands present, glabrous, smooth.

Distribution — Sri Lanka, S China, Japan: Okinawa; throughout *Malesia*, Australia (Queensland), Pacific (Tonga, Samoa, Gilbert Islands, Marianas islands, Cook Islands).

Habitat & Ecology — Beaches and low hills, growing in sand, pumice or limestone. Altitude: sea-level up to 20(–300) m. Flowering: August to May; fruiting: September to May.

Vernacular names — Sabah: Andami; (East coast Bajau); Lagundi (Brunei).

2. **Vitex cofassus** Reinw. ex Blume

Vitex cofassus Reinw. ex Blume, Bijdr. 14 (1826) 813. — *Vitex cofassus* Reinw. ex Blume var. *typica* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 172, nom. illeg. (not autonym). — Lectotype (designated by De Kok, Kew Bull. 62 (2007) 589): Rumph., Herb. Amboin. 3 (1743) t 14B, Indonesia, Insulis Moluccauis.

Vitex punctata Schauer in A.DC., Prodr. 11 (1847) 687. — Type: *Lambert s.n.* (holo G), [Indonesia,] in Moluccis.

Vitex monophylla K.Schum. in K.Schum. & Hollrung, Fl. Kais. Wilh. Lands (1889) 121. — Type: *Hollrung 505* (holo B†; iso BO), Papua New Guinea, Constantinhafen.

Vitex cofassus Reinw. ex Blume var. *puberula* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 174; de Kok, Kew Bull. 62 (2007) 589. — Syntypes: *Ledermann 6911* (K), [Papua New Guinea,] Kaiser Wilhelmsland, Sepik R., Schluchten camp, Peilung Mt; *Ledermann 6695* (K), Kaiser Wilhelmsland, Sepik R., Malu camp; *Ledermann 7147* (not found), Kaiser Wilhelmsland, Sepik R., Malu camp; *Ledermann 10421* (not found), Kaiser Wilhelmsland, Sepik R., Malu camp.

Vitex cofassus Reinw. ex Blume forma *anomala* Moldenke, Phytologia 3 (1951) 488; de Kok, Kew Bull. 62 (2007) 589. — Type: *Boschproefstation bb. 8579* (holo U; iso L), [Indonesia,] Celebes, Boeloekoemba, Tanaberoe.

Tree (rarely a shrub), 6–40(–60) m high, bole 0.3–26 m high, 15–225 cm dbh, stem often twisted, buttresses absent or up to 6 m high. *Bark* smooth to flaky, (light to greyish) brown to white-yellowish grey; slash cream to straw-coloured with bright orange or yellow-brown streaks; exudate absent to sparse yellowish watery; sapwood creamy to straw-coloured or orange; heartwood (dark to grey) brown or black, very hard, oily. *Leaves* 1-foliolate (appearing simple); blade narrowly elliptic to elliptic, usually obovate, (2.5–)10–30 by (0.8–)3–11 cm, 1.4–3.5 times as long as wide, diminishing in size towards the inflorescence, glabrous, base cuneate to rounded, apex acuminate to rarely rounded, margin entire, medium green on both sides or paler below; venation pinnate, 9–18 pairs of main side veins, prominent beneath, sunken above, pale green or yellow beneath; glands white to orange; petiole 2.5–8 cm long, terete, a distinct circular

scar on a swelling at apex, sometimes with two leaf scars at apex. *Inflorescences* terminal (occasionally axillary), paniculate, 2.5–45 cm long, greyish green, covered with appressed, simple hairs; first-order bracteoles leaf-like, glabrous, diminishing in size towards apex, usually falling off; bracteoles scale-like, triangular to linear, up to 4 mm long, velutinous, usually persistent. *Calyx* 5-lobed (lobes usually obscure), lobes up to 1 mm long, slightly accrescent, (pale) green to yellow-brown, glabrous or with a few hairs at base (young buds can be velutinous); glands few; flowering calyx 2–2.3 mm diam., erect; fruiting calyx 5–6 mm diam., patent to reflexed. *Corolla* 5-lobed, covered externally except for apical margins with appressed hairs, inside with a ring of long erect hairs around the base of filaments, sometime sweetly scented; glands many; lower lip spatulate, 2.5–5 by 5.5–6 mm, apex emarginate, margin crenate and imbricate, patent to reflexed, with erect hairs at base, dark purple, sometimes with a white rim or white spots along the margin or at base; lateral lobes 2.5–3.5 by 2.5–3 mm, recurved, apex acute, white to pale violet-blue; upper lip 2-lobed, lobes 2–3 by 1.7–2 mm, erect to reflexed, fused up to 10 %, apex round, white to pale violet-blue; tube infundibular, 4–5 mm long, purple-white. *Stamens*: filaments 4.5–6 mm long, inserted halfway on the corolla tube, exceeding the corolla tube, glabrous, except for tuft of erect simple multicellular hairs at base, purple to purplish blue; anthers 0.7–1 mm long, subbasifixed, deep mauve to black, pollen yellow. *Ovary* c. 1 mm diam., globose, glabrous; style 6–7 mm long, exceeding the corolla, glabrous, purple; stigma 2-lobed, lobes c. 0.5 mm long. *Fruit* when fresh irregularly globose, 0.7–1 cm diam., glabrous, fleshy, purple to black when mature, shiny, sweet-tasting, purple juice; when dried clavoid, 4–7.5 mm diam. *Seeds* 4 (or less by abortion) per fruit.

Distribution — Sulawesi, Moluccas, Aru Islands, New Guinea, Solomon Islands, Caroline Islands (Koror Island).

Habitat & Ecology — Canopy to small understory tree, often common in coastal vegetation or (primary, secondary, swamp or tidal) forest, often in disturbed areas (roadside and gardens) and often along watercourses. Soil: clay or brownish red loam to sand, sometimes on serpentine, limestone or porous volcanic substrates. Altitude: sea-level up to 400(–1200) m altitude. Flowering and fruiting: throughout the year.

Vernacular names — New Guinea teak (English). Indonesia: Sulawesi: Nau-nau (Palopo); Wanasa (Boeloekoemba). Moluccas: Ambon: Goefsasa; Halmahera: Ogofase mabedeka (Tobaro); Morotai: Gowaha. Aru Islands: Alaua. Papua New Guinea: Bitin, Garamut (Pidgin).

3. **Vitex flava** Ridl.

Vitex flava Ridl., Bull. Misc. Inform. Kew (1929) 261. — Type: *Haviland 2025* (holo K), [Sarawak,] Borneo, path to Tegora.

Small tree, 5–12 m tall, 30–50 cm dbh. *Bark* smooth, pale brown to dark grey. *Leaves* 3-foliolate; central leaflet elliptic, 13.5–17 by 7–10 cm, 1.7–2 times as long as wide; side leaflets 9–14 by 4–7 cm, 2–3 times as long as wide; apex acute to acuminate, base cuneate, sometimes oblique, glabrous except on the veins, young leaves reddish; secondary veins 8–10 pairs; glands many; hairs few, brown, erect; petiole 6.5–8 cm long, round to laterally flattened in cross-section; petiolules 3–4.2 cm long. *Inflores-*

cences axillary, dichasial, compound, axis 1.4–2 cm long, flattened in cross-section; hairs few to moderate, appressed; glands many; bracteoles elliptic, up to 10 mm long, glabrous, often not persistent. *Calyx* 5-lobed, accrescent, (pale) green, hairs sparsely, erect; glands many; flowering calyx lobes 2.5–4 by 2–2.2 mm, apex acute, erect; fruiting calyx lobes c. 2.5 mm long, patent. *Corolla* 5-lobed, (bright) yellow, covered outside with glands; lobes almost isomorphic, c. 2 by 1.5 mm, apex rounded to acute; tube c. 5 mm long. *Stamens*: filaments c. 3 mm long, inserted in lower half of tube, yellow; anther c. 1.5 mm long, pale yellow to brown. *Ovary* globose, c. 1.5 mm diam., apex rounded, glabrous, apex covered with glands; style c. 5.5 mm long, apex hooked, yellow to white; stigma c. 0.8 mm long, apex acuminate with whitish tip. *Fruit* fresh bright yellow; dried globose, 0.7–1.3 cm diam., apex flattened.

Distribution — Sarawak.

Habitat & Ecology — Along paths and on ridges. Soil: rich humus or clayey sand. Altitude: c. 500 m. Flowering: May to December; fruiting: July to December.

Vernacular name — Kepapar (Iban language).

4. Vitex gamosepala Griff.

Vitex gamosepala Griff., Not. Pl. Asiat. 4 (1854) 178, pl. 448, f. 2. — *Vitex gamosepala* Griff. var. *typica* H.J.Lam, Verbenaceae Malayan Archipel. (1919) 210, nom. illeg. (not autonym). — Type: *Griffith KD 6065* (holo K; iso NY), [Malaysia,] Malacca, at Ching Rgingull.

Vitex gamosepala Griff. var. *scortechinii* King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1909) 856; de Kok, Kew Bull. 63 (2008) 21. — Syntypes: *Forbes 3060* (BM), Indonesia, Sumatra; *Ridley 9725* (not located), Perak, Bujong Malacca; *Ridley 10096* (K), Negri Sembilan, Serembau; *Scortechini s.n.* (K 3 sheets), Malaysia, Perak; *Wray 992* (K), Perak, Gunong Batu Dateh, lower camp; *Wray 1080* (K barcode K000222895), Perak, Tapa, Batang Padang; *Wray 1080* (K barcode K000222896), Perak, Gunong Batu Dateh, lower camp.

Vitex gamosepala Griff. var. *kunstleri* King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1909) 856. — Syntypes: *Forbes 2685* (L), [Indonesia,] Sumatra; *King's collector 10605* (K), Malaysia, Perak, at Ulu Bubong; *Rostado (Herb. Ridley 11982)* (K), Malaysia, Trengganu, at Bunda.

Vitex neglecta H.J.Lam var. *glabior* H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 63. — Type: *Jacobson 2675* (syn BO 2 sheets), [Indonesia,] Sumatra, Indrapura, Tapan.

Vitex neglecta H.J.Lam var. *puberula* H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 63. — Type: *Jacobson 182* (holo BO), [Indonesia,] Sumatra, Bencoolen, Rimbo pengadang.

Tree (rarely liana), 4–20 m high, (3–)10–45 cm dbh. *Bark* smooth, (dark) white to grey-brown, slash yellowish brownish or brown, wood whitish yellowish. *Leaves* 3-foliolate; central leaflet elliptic to narrowly elliptic, 8–15 by 3.5–7.5 cm, 2–3 times as long as wide, lateral leaflets 7.5–11 by 2.4–3.1 cm, 2.3–3 times as long as wide; apex acuminate, base cuneate, sometimes slightly oblique, glabrous or with some hairs on the veins, whitish green beneath, young leaves dirty purple or bronze; secondary veins 6–10 pairs; glands few to many, yellowish; petiole 5.5–8 cm long, round in cross-section, few erect hairs, glands few to many; petiolules 1.5–4 cm long, few erect hairs. *Inflorescences* axillary, dichasial, axis 0.2–1 cm long, round to flattened in cross-section; glabrous to sparsely hairy, erect to patent; glands few to many; bracteoles triangular to linear, less than 2.5 mm long, moderately ciliate, often not persistent. *Calyx* 4-lobed, 2-lipped, upper lip one enlarged lobe 0.2–0.5 mm long; lower lip 3-lobed, lobes smaller 1/2–2/3 the length of the upper lobe, not accrescent, apex rounded to

acute, (light) green, hairs few, always erect; glands many. *Corolla* 5-lobed, (bright) yellow, covered outside with glands; lower lip spatulate, 1.5–5 by 1–3.5 mm, apex round, margin entire, patent; lateral lobes reflexed, 1.5–2 by 1–2 mm, apex round; upper lip 2-lobed, lobes 1.5–4 by 1–4 mm, apex round, fused up to 50 %, erect; tube 4–10 mm long. *Stamens*: filaments 4–7 mm long, inserted in middle part of tube, white. *Ovary* c. 1 mm diam., glabrous, apex covered with glands; style 5–12 mm long, only slightly exceeding the corolla tube; stigma 0.5–0.8 mm long. *Fruit* when fresh ellipsoid, c. 8 mm diam., purple black or dark brown; dried ellipsoid to globose, 4–5 by 5–6 mm, apex rounded. — **Plate 8b.**

Distribution — Thailand; in *Malesia*: Peninsular Malaysia, N Sumatra.

Habitat & Ecology — Primary and secondary forest, both deciduous and evergreen. Soil: yellow-red loam or clay, sometimes over limestone or acidic rock. Altitude: 30–730(–1800) m. Flowering: July to August; fruiting: August to April.

Vernacular names — Malay Peninsula: Selangor: Kayu hinai bukit (Temuan). N Sumatra: Belulang.

5. Vitex glabrata R.Br.

Vitex glabrata R.Br., Prodr. Fl. Nov. Holland. (1810) 512; Munir, J. Adelaide Bot. Gard. 10 (1987) 44; P.Daniel & A.Rajendran, Taxon 44 (1995) 601. — Lectotype (designated by Munir 1987): *(Bennets 2319) Brown s.n.* (lecto MEL; isolecto BM, MEL), Australia, Groote Eylandt.

Vitex helogiton K.Schum. in K.Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 369; Munir, J. Adelaide Bot. Gard. 10 (1987) 31; P.Daniel & A.Rajendran, Taxon 44 (1995) 601; de Kok, Kew Bull. 62 (2007) 592. — Type: *Hollrung 672* (holo B†; iso K, L), [Papua New Guinea,] Kaiser Wilhelms Land, Augusta Station.

Vitex pentaphylla Merr., Philipp. J. Sci., C 4 (1909) 320. — Syntypes: *Hutchinson 11245* (PNH, US), Philippines, Mindanao, Siocon River, district of Zamboanga; *FB (Whitford & Hutchinson) 9490* (K, PNH†, US), Philippines, Mindanao, Siocon River, district of Zamboanga; *Williams 2949* (NY, PNH†, US), Mindanao, Santa Cruz.

Vitex nitida Merr., Philipp. J. Sci., C 7 (1912) 343; H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 5 (1922) 175. — Type: *Klemme 19546* (holo PNH†; iso K), Philippines, Mindanao, Tanob, Prov. Misamis.

Tree, 13–25 m high, bole up to 6–15 m, 40–100 cm dbh, fluted. *Bark* light (grey-) brown; slash (brownish) straw-coloured; sapwood cream; heartwood brown, hard. *Leaves* 3–5-foliolate; blades round to elliptic or narrowly elliptic, sometimes ovate, central leaflet 12–25 by 3.5–8.5 cm, 2–3.4 times as long as wide, lateral leaflets 5–16 by 1–7.5 cm, 1.5–2.3 times as long as wide; glabrous, apart from erect to appressed multicellular hairs along and on the veins and at the lower surface, also with hair tuft domatia in the joints with the main side veins, margin entire, base cuneate to caudate, apex round to acuminate; glands absent or few; venation pinnate, 8–17 pairs of main side veins, prominent below, sunken above; petiole 9–16 cm long, sparsely hairy, glands absent; petiolules 1–3 cm long, sparsely hairy. *Inflorescences* terminal and axillary, cymose, axis 3.5–7 cm long, flattened in cross-section; hairs dense to sparse, appressed, simple, multicellular; glands absent; bracteoles triangular to linear, less than 2 mm long, moderately ciliate, persistent. *Calyx* (0–)5-lobed, campanulate, accrescent; lobes c. 0.5 mm long, apex acute; hairs sparse to dense, appressed; glands absent; flowering

calyx 2–2.5 mm diam., erect; fruiting calyx 7–9 mm diam., patent. *Corolla* 5-lobed, white to purple with darker apex; hairs dense to moderate, erect to appressed; lower lip spatulate, 4.5–6.5 by 4–5 mm, apex round to truncated, margin toothed, patent, hairs concentrated at throat; lateral lobes reflexed, 2.5–4.5 by 1.5–2.5 mm, apex round to acute; upper lip 2-lobed, lobes 2–3 by 1.5–2.5 mm, apex round to acute, fused up to 10 %, reflexed; tube 4–6.5 mm long, base glabrous. *Stamens*: filaments 4.5–7 mm long, exserting corolla, inserted halfway on tube; anthers c. 0.5 mm long. *Ovary* 1.2–1.5 mm diam., globose, glabrous or with a few hairs at apex; style 4.5–9 mm long, exserting the corolla tube, glabrous; stigma 2-lobed, lobes c. 0.5 mm long, apex acute. *Fruit* fresh unknown; dried ovoid to clavoid, 3–16 mm diam., smooth, glabrous, apex round. *Seeds* 4 (or fewer by abortion) per fruit.

Distribution — India and Cambodia to Northern Australia; throughout *Malesia*.

Habitat & Ecology — Widespread, but seldom a common tree of rainforest or forest in seasonally inundated swamps and/or along rivers and streams. Soil: sandy clay. Altitude: sea-level up to 750(–900) m. Flowering: August to May; fruiting: August to March (to July). The flowers are visited by bees.

Uses — The fruits are eaten on Timor.

Vernacular names — Malay Peninsula: Meroko. Java: Banges. Lesser Sunda Islands: Timor: Kle'o. North Sulawesi: Wolato bungango. New Guinea: Anpon, Kandotu; Nagal-egal (Amele).

6. **Vitex longisepala** King & Gamble

Vitex longisepala King & Gamble, Bull. Misc. Inform. Kew (1908) 112. — Lectotype (designated by De Kok, Kew Bull. 63 (2008) 23): *Wray 1319* (lecto K), [Malaysia,] Perak, at Tapa.

Vitex longisepala King & Gamble var. *longipes* Moldenke, Phytologia 33 (1976) 375. — Type: *Mahmud bin Sider s.n.* (holo UPM), Malaysia, Selangor, Klang area, Telok Forest Reserve.

Vitex vestita Wall. ex Schauer var. *bracteata* Moldenke, Phytologia 38 (1978) 308. — Type: *Sinclair 9887* (holo NY; iso E, K, L), Malaysia, Perak, Kuala Kangsar Dist., Gunong Bubu Forest Reserve.

Shrub (sometimes scandent) or small tree, 3–15 m high, 6–12 cm dbh. *Bark* smooth, (pale) grey to white-brown; wood white. *Leaves* 3-foliolate; central leaflet (broadly to narrowly) elliptic, 15–20 by 5.5–8 cm, 2.1–3.6 times as long as wide, lateral leaflets 8.5–16 by 3.5–5.3 cm; apex acuminate, base cuneate to slightly oblique, moderately hairy, young leaves red; secondary veins 7–10 pairs; glands many on lower surface, yellow to reddish; petiole 5–10 cm long, round in cross-section, covered with erect hairs, glands few to many; petiolules 0.6–2 cm long. *Inflorescences* axillary, dichasia, compound, axis 2–3.5 cm long, round in cross-section, yellow, covered with erect hairs, glands few, light green; bracteole lanceolate to spatulate, 6–10 mm long, apex rounded to acute, moderately hairy, often persistent, brownish green. *Calyx* 5-lobed, campanulate, (light to brownish) green, hairs few, glands many; flowering calyx lobes 4–5 by 1.6–2 mm, acute, lobes erect; fruiting calyx lobes 4–5 mm lobes, erect to patent. *Corolla* 5-lobed, yellow to dark orange, covered outside with glands; lower lip spatulate, 1–5 by 1–5 mm, apex rounded to truncate, margin entire, patent; lateral lobes reflexed, 1–3 by 1–2 mm, apex round; upper lip 2-lobed, lobes 1–5 by 1–2.5 mm, apex rounded to acute, fused up to 50 %, reflexed; tube 7–11 mm long, pink to orange.

Stamens: filaments 4–7 mm long, inserted in middle part of tube. *Ovary* c. 1 mm diam., glabrous, apex covered with glands; style 6.5–15 mm long, just exserting from corolla; stigma c. 0.5 mm long. *Fruit* when fresh globose, c. 5 by 5 mm, glabrous, covered with many glands, smooth, black, shiny; dried ellipsoid to globose, 3–5 by 5–6 mm, apex rounded. — **Plate 8a.**

Distribution — Thailand; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In and along margins of primary (evergreen) forest. Soil: sandy and sometimes over shale. Altitude: 240–1200 m. Flowering and fruiting: throughout the year and reported to be common.

Vernacular name — Malaysia: Mentua Halban; Nobang (Temuan).

7. Vitex medusaecalyx H.J.Lam

Vitex medusaecalyx H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 59. — Lectotype (designated by De Kok, Kew Bull. 63 (2008) 23): *Lörzing 4761* (lecto BO; isolecto BO), [Indonesia,] Sumatra, Bandar Baru.

Shrub, 3–6.5 m high, c. 15 cm dbh. *Leaves* 3-foliolate; central leaflet elliptic, 12.5–15 by 5.5–7 cm, lateral leaflets 8–10.5 by 3.5–4.5 cm; apex acuminate, base cuneate, young leaves brownish, upper side glabrous except for veins, lower side sparsely to moderately hairy, secondary veins 7–10 pairs; glands many, yellowish; petiole 3–7 cm long, round in cross-section, covered with erect hairs; petiolules 2.5–3 cm long. *Inflorescences* axillary, dichasia, compound, axis 1.5–1.7 cm long, round to flattened in cross-section; covered with erect hairs; bracteoles linear, 7.5–8 by 0.1–1 mm, persistent. *Calyx* 5-lobed, flowering calyx 3–5 mm diam.; lobes largely isomorphic, two slightly longer than others, 1–2 mm long, apex acute, erect; glands many, yellowish. *Corolla* 4-lobed, yellow, densely hairy, glands many; lobes isomorphic, c. 1 mm long, apex round; tube 4–5 mm long. *Stamens*: filaments 4–6 mm long, just exserting corolla, inserted lower to upper half of tube; anthers c. 1 mm long. *Ovary* c. 1 mm diam., globose, glabrous, covered in yellow glands; style 4–6 mm long; stigma c. 0.5 mm long, apex acute. *Fruit* when fresh 5–6.5 mm diam., globose, black, shiny; dried 4–6 mm long, globose.

Distribution — N Sumatra.

Habitat & Ecology — In open places in or at edges of primary lower montane forest. Altitude: 1200–1300 m. Flowering: December to February; fruiting: January to April.

8. Vitex millsii M.R.Hend.

Vitex millsii M.R.Hend., J. Asiatic. Soc. Mal. 5 (1927) 262. — *Vitex vestita* Wall. ex Schauer forma *millsii* (M.R.Hend.) Moldenke, Phytologia 3 (1951) 489. — Type: *SFN (Henderson) 17958* (holo SING; iso BM, BO, K, NY, SING), Malaysia, Pahang, Cameron's Highland, Robinson Falls.

Tree or shrub, 7–10 m high, c. 30 cm dbh. *Bark* smooth, grey; slash greenish to pale yellow; wood white. *Leaves* 3-foliolate; central leaflet elliptic to narrowly elliptic, 9.5–15 by 5.2–7.8 cm; lateral leaflets 7–10 by 3.4–5 cm; apex acute to acuminate, base rounded to cuneate, upper surface glabrous except on the veins, lower surface moderately hairy to glabrous except on the veins, secondary veins 6 or 7 pairs; glands many,

on both surfaces; petiole 2.5–9 mm long, round in cross-section, moderately hairy; petiolules 1.5–4 cm long. *Inflorescences* axillary, dichasial, compound, axis 0.4–1 cm long, round to flattened in cross-section; hairs few to dense, erect to appressed; glands few; bracteoles triangular to linear, less than 2 mm long, moderately ciliate, seldom persistent. *Calyx* 5-lobed, campanulate, lobes usually not isomorphic, 1–2 mm long, one lobe usually bigger than others, hairs sparsely to densely, erect; glands few; flowering calyx 1–2 mm diam., apex acute, erect; fruiting calyx c. 5 mm diam., patent. *Corolla* 5-lobed, covered outside with glands, (light) yellow; lobes 1.5–2.5 by 1.2–1.5 mm, almost equal, apex rounded to acute; tube c. 8 mm long. *Stamens*: filaments 7–8 mm long, inserted in lower half of tube; anther c. 1 mm long. *Ovary* globose, 1–1.2 mm diam., apex acute, glabrous, covered with glands; style c. 8 mm long; stigma c. 0.5 mm long, apex acuminate. *Fruit* fresh unknown; dried globose, 5–6 mm diam., apex rounded to acute.

Distribution — Peninsular Malaysia (mountains of Pahang and Selangor).

Habitat & Ecology — Primary evergreen forest. Altitude: 1200–1600 m. Flowering: October to November; fruiting: October to April.

9. **Vitex negundo** L.

Vitex negundo L., Sp. Pl. (1753) 638 (printed as page 938). — Type: *Linnaeus 811/8* (holo LINN), India.
Vitex elmeri Moldenke, Phytologia 38 (1978) 307; de Kok, Kew Bull. 63 (2008) 25. — Type: *Elmer 5611* (holo NY), Philippines, Luzon, Union Province, Bauang.

Tree or shrub, up to 4 m high. *Leaves* 3(–6)-foliolate; central leaflet oblong-elliptic to narrowly elliptic, 3.4–7 by 1.2–1.6 cm, 2.2–4.6 times as long as wide; lateral leaflets 2.3–5 by 0.8–1.4 cm, 2.8–4.3 times as long as wide; apex acuminate, base cuneate, margin dentate, some leaflets entire, glabrous above or with only hairs on the veins, velutinous whitish below, aromatic when crushed, secondary veins 7–12 pairs; hairs appressed, with a powdery exudate on apical cell; petiole 2.2–3.2 cm long, round in cross-section, covered with minute curly hairs; petiolules 0–6 cm long. *Inflorescences* paniculate, terminal, axis 6–25 cm long, angular in cross-section; flowers in dense lateral clusters on peduncles up to 8 mm long; hairs dense, appressed; bracteoles scale-like, linear, up to 3 mm long, velutinous, patent, usually persistent. *Calyx* 5-lobed, clearly 5-ribbed; lobes 0.5–1 cm long, clearly developed, apex acuminate to aristate or with umbo, persistent, velutinous; glands absent to few; flowering calyx 1–1.5 mm diam., erect; fruiting calyx 2–2.5 mm diam., erect, covering the mature fruit. *Corolla* 5-lobed, white or purple to blue-violet; covered with appressed hairs; glands few or absent, white; lower lip oblong, 1.8–3 by 1.9–2.1 mm, apex rounded and reflexed, margin entire, two well-developed ridges at corolla mouth, blue; lateral lobes 1.2–1.5 by 1–2 mm, apex round, patent, blue; upper lip 2-lobed, lobes 1.2–1.5 by 1–1.2 mm, fused up to 10 %, apex round, reflect to erect, blue; tube infundibular, 2–3.5 mm long. *Stamens*: filaments 1.5–4 mm long, slightly to strongly didynamous, inserted halfway on the corolla tube, pale purple; anther c. 0.8 mm long, pale brown to violet. *Ovary* globose, 0.6–0.8 by 0.5–0.7 mm, glabrous; style 2.5–3 mm long; stigma lobes 0.1–0.5 mm long. *Fruit* when fresh unknown; dried ellipsoid, 2.5–4 by 1.8–2 mm, apex truncate, glabrous, smooth.

Distribution — China, India; in *Malesia*: Java, Philippines. Reported to be introduced and cultivated in at least Sumatra, Java and the Philippines and possibly in the whole of the Malesian area.

Habitat & Ecology — Secondary forest (rarely in primary) and along roads and in wastelands, sometimes in thickets. Altitude: up to 110 m. Flowering and fruiting: throughout the year.

Vernacular names — Malay Peninsula: Merbok. Borneo: Sabah: Talaun mohou. Philippines: Lagundi.

Uses — The species is grown for ornamental and medicinal uses throughout the region.

Note — Most specimens from the Flora Malesiana area only have a few indentations in the leaves. This is unlike the majority of specimens from mainland Asia (especially China), which can have frequent and substantial indentations in the leaves.

10. Vitex novae-pommeraniae Warb.

Vitex novae-pommeraniae Warb., Bot. Jahrb. Syst. 13 (1891) 429. — *Viticipremna novae-pommeraniae* (Warb.) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 163; Munir, J. Adelaide Bot. Gard. 7 (1985) 196; Bramley et al., Taxon 58 (2009) 500. — Lectotype (designated by Munir 1985: 196): *Warburg 21140* (lecto A; isolecto BM), [Papua New Guinea,] Neu-Pommern, ravines of Raluan on the Gazelle-Peninsula.

Small tree or shrub, up to (7.5–)12–30 m high, 12–120 cm dbh. *Bark* scaly, peeling in vertical strips, light (grey) brown; wood cream to straw-coloured. *Leaves* (3- or) 4- or 5-foliolate; central leaflet ovate, ovate-oblong or ovate-lanceolate, (4–)6–18 by 2.5–7(–9) cm; side leaflets 7–17.5 by 3–8 cm; apex acuminate, base unequally obtuse or subtruncate, rarely cuneate, margin entire, upper surface glabrous except on the veins, (light) green, dull to glossy; lower surface glabrous with hairs on the veins, light green, secondary veins 8–11 pairs, glands many on both surfaces; petiole (3–)5–12(–19) cm long, round in cross-section, velutinous; petiolules 0.2–1 cm long. *Inflorescences* terminal, paniculate, 8–30 cm long, densely hairy; bracteoles scale-like, triangular to linear, up to 4 mm long, velutinous, usually caducous. *Calyx* 0–4-lobed, campanulate, densely hairy; glands few; flowering calyx 2.5–3 mm diam., erect; fruiting calyx 5–7 mm diam., erect. *Corolla* 4- (or 5-)lobed, velutinous outside, base glabrous, cream to pale yellow or pale blue; glands few, orange to mauve; lower lip narrowly elliptic-oblong, 2–4.5 by 1.5–3 mm, apex round, margin entire, hairs appressed, cream with purple marks; lateral lobes 1.5–3 by 1.5–2.5 mm, patent, straight to oblique, apex round; upper lip entire to slightly 2-lobed (small suture visible), lobes 3–4 by 2.5–3.5 mm, erect, apex round; tube infundibular, 4.5–6 mm long. *Stamens*: filaments 5–7 mm long, didynamous, glabrous, except for tuft of erect hairs at base, inserted in the upper part of the corolla tube, clearly exceeding the corolla tube, white to yellow green; anther c. 1 mm long, purple to white. *Ovary* 1.5–2 by 1.3–1.5 mm, globose, glabrous; glands absent to rarely a few; style 9–10 mm long, glabrous; stigma unequally 2-lobed, lobes c. 0.1 mm long, apex acuminate. *Fruit* when fresh unknown; dried globose to obovoid, 5–9 by 5–8 mm, glabrous, apex rounded, yellowish green turning to purple-black.

Distribution — Papua New Guinea (Morobe Prov., Manus District), Bismarck Islands.

Habitat & Ecology — Canopy species growing in primary and/or secondary lowland forest. Sometimes over limestone. Altitude: sea-level up to 180(–335) m. Flowering: December to April; fruiting: December to March.

Vernacular names — Sogapai-Waria (Garaina).

Uses — The wood is used for house post and for making drums.

11. Vitex parviflora A.Juss.

Vitex parviflora A.Juss., Ann. Mus. Natl. Hist. Nat. 7 (1806) 76. — Type: *Anonymous s.n.* (holo P-JU), Insulis Philippinis.

Vitex littoralis Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 401. — *Vitex timoriensis* Walp., Repert. Bot. Syst. 4. (1845) 84, nom. superfl. — Syntypes: *Naturalistes de l'expédition de la Favorite s.n.* (K, NY), Timor.

Vitex geniculata Blanco, Fl. Filip. (1837) 514; Merr., Sp. Blancoan. (1918) 333. — Type: lost.

Vitex latifolia Blanco, Fl. Filip. (1837) 514; Merr., Sp. Blancoan. (1918) 333. — Type: lost.

Vitex altissima Blanco, Fl. Filip. (1837) 516, nom. illeg. (non *Vitex alltissima* L.f.); Merr., Sp. Blancoan. (1918) 333. — Type: lost.

Vitex glaberrima Zipp. ex Span., Linnaea 15 (1841) 330. — Type: unknown.

Vitex glandulosa H.J.Lam, Verbenaceae Malayan Archipel. (1919) 199. — Type: *Mangubat 1361* (holo BO; iso L, NY, US), Philippines, Cavite, Mendez Nunez.

Vitex parviflora A.Juss. var. *puberulenta* Moldenke, Phytologia 3 (1951) 489; de Kok, Kew Bull. 63 (2008) 27. — Type: *Mangubat 1361* (holo BO; iso L, NY, US), Philippines, Luzon, Cavite prov., Mendez Nuñez.

Vitex parviflora A.Juss. forma *sterilis* H.J.Lam ex Moldenke Phytologia 6 (1957) 42; de Kok, Kew Bull. 63 (2008) 27. — Type: *BS (McGregor) 1218* (holo BO; iso NY), Philippines, Bohol, May 1906.

Tree, 4–15(–30) m high; 7–50(–200) cm dbh. *Bark* greyish white to darkish grey or dark brown, smooth to slightly fissured; sapwood light coloured; heartwood light straw-coloured, very heavy and hard. *Leaves* (1–)3–5-foliolate; central leaflet elliptic to lanceolate, 10–17 by 3.5–6.5 cm, 2.6–3 times as long as wide; lateral leaflets 8.5–13 by 2.5–5 cm; apex acuminate, base cuneate, sometimes oblique, margin sometimes serrate in immature plants, glabrous with few appressed hairs on veins, dull green, lower surface covered with orange glands, secondary veins 10–13 pairs; petiole 5–7.8 cm long, round in cross-section, covered with minute curly hairs; petiolules 1–12 mm long, channelled. *Inflorescences* paniculate, axis 10–20 cm long, angular in cross-section; glabrous to densely hairy, appressed to erect; bracteoles triangular to lanceolate, up to 5 mm long, sparsely hairy, not persistent. *Calyx* 0–5-lobed, lobes up to 0.5 mm long, sparsely hairy (always clearly less hairy than inflorescence); glands, few, orange to yellow; flowering calyx 1.5–2 mm diam., erect; fruiting calyx 3.5–4 mm diam., patent, not enclosing fruit. *Corolla* 5-lobed, pale violet or blue to white or yellow, glabrous to covered outside with appressed hairs; glands many, orange; lower lip spatulate, 3–4 by 3–4 mm, apex rounded to truncate, margin crenulate, patent, violet to blue; lateral lobes 2–3 by 1.5–2 mm, apex rounded to acute, patent; upper lip 2-lobed, lobes 1.5–2 by 1–2 mm, fused for 10 %, apex oblique, erect; tube infundibular, 4–6 mm long. *Stamens*: filaments 4.5–6 mm long, inserted halfway up the corolla tube, only slightly to greatly exceeding the corolla tube; anther c. 0.5 mm long. *Ovary* globose, 1–1.2 by

1–1.2 mm, glabrous; style 7.5–8 mm long, straight; stigma lobes 0.2–0.5 mm long. *Fruit* when fresh purple to black, glossy; dried 5–8 by 6–7 mm, globose to clavoid, glabrous, smooth.

Distribution — Philippines, Lesser Sunda Islands, Moluccas. Introduced as a timber tree on several Pacific islands and in Central America.

Habitat & Ecology — Secondary or mixed primary forest, often along streams. Reported to be one of the dominant trees in the Philippine monsoon forest (Oldfield et al., The World List of Threatened Trees, 1998). Soil: clay loam or volcanic soils, over limestone or serpentine substrates. Altitude: 30–400(–650) m. Flowering: April to December; fruiting: throughout the year.

Vernacular names — Philippines: Lipapa; Molave (Tagalog). Moluccas: Buru: Gofasa; Tenimbar Island: Basa.

Uses — In some parts of the Philippines, the bark is scraped and drunk as a cure for indigestion.

12. Vitex pinnata L.

Vitex pinnata L., Sp. Pl. (1753) 638. — *Vitex pubescens* L. ex Vahl, Symb. Bot. 3 (1794) 85; de Kok, Kew Bull. 62 (2007) 600, nom. superfl. — *Vitex puberula* Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 242, nom. superfl. — *Vitex pubescens* L. ex Vahl var. *pinata* Kuntze, Revis. Gen. Pl. 2 (1891) 511. — *Aglaia pinnata* (L.) Druce, Rep. Bot. Exch. Club Soc. Brit. Isles, Suppl. 1913 (1914) 413. — *Vitex heterophylla* Roxb. var. *puberula* (Miq.) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 189. — *Vitex pubescens* L. ex Vahl var. *genuina* Hochr., Candollea 5 (1925) 191, nom. illeg. (not autonym). — *Vitex quinata* (Lour.) F.N.Williams var. *puberula* (Miq.) Moldenke, Phytologia 3 (1951) 489. — *Vitex turczaninowii* Merr. forma *puberula* (Miq.) Moldenke, Phytologia 51 (1982) 163. — Type: *Hermann s.n.* (holo BM), Sri Lanka.

Vitex bracteata Horsf. ex Miq., Fl. Ned. Ind. 2 (1856) 862. — Type: not found.

Vitex pubescens L. ex Vahl var. *lilacina* Kuntze, Revis. Gen. Pl. 2 (1891) 511; de Kok, Kew Bull. 63 (2008) 28. — Type: *Kuntze 6086* (holo NY), Java and Singapur.

Vitex pubescens L. ex Vahl var. *bicolor* Kuntze, Revis. Gen. Pl. 2 (1891) 511; de Kok, Kew Bull. 63 (2008) 28. — Type: *Kuntze s.n.* (not located), Java.

Vitex heterophylla Roxb. var. *velutina* Koord. & Valeton, Meded. Lands Plantentuin 42 (1900) 207. — *Vitex velutina* (Koord. & Valeton) Koord., Exkurs.-Fl. Java 3 (1912) 137. — Syntypes: *Koorders 20101β [1039c]* (BO), Java, Noesakembangan; *Koorders 20217β [1127c]* (BO), Java, Noesakembangan; *Koorders 24703β [1039c]* (BO), Java, Noesakembangan; *Koorders 24779β [1127c]* (BO), Java, Noesakembangan; *Koorders 27045β [1039 c]* (BO 2 sheets), Java, Noesakembangan; *Koorders 40231β [1039c]* (not found), Java, Noesakembangan.

Vitex sebesiae H.J.Lam [ex Docters van Leeuwen, Bull. Jard. Bot. Buitenzorg Ser. 3, 4 (1922) 311, nom. nud.] in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 5 (1922) 176; de Kok, Kew Bull. 63 (2008) 28. — Type: *Docters van Leeuwen-Reijnvaan 5355* (syn BO 2 sheets), Sumatra, Sebesy.

Vitex pubescens L. ex Vahl var. *pantjarensis* Hochr., Candollea 5 (1925) 191; de Kok, Kew Bull. 63 (2008) 28. — Type: *Hochreutiner 1846* (holo G), Java, Goenoeng Pantjar.

Vitex buddingii Moldenke, Phytologia 4 (1952) 59; de Kok, Kew Bull. 63 (2008) 28. — Type: *Budding 227* (holo BO; iso NY), [Indonesia,] Western Borneo, Melawi.

Vitex pinnata L. forma *glabrescens* Moldenke, Phytologia 33 (1976) 375; de Kok, Kew Bull. 63 (2008) 28. — Type: *Mahmud Kasim bin Rajab 91* (holo UPM), Malaya, Selangor, along roadside at Damansara.

Tree, 1–15(–25) m high, bole up to 5 m high, 10–45(–120) cm dbh, sometimes fluted. *Bark* white to greyish or light brown, smooth to flaky; slash brownish to pale

yellow, becoming green on exposure; wood orange-yellow. *Leaves* (1–)3(–5)-foliolate; central leaflet elliptic to narrowly elliptic, (3.5–)8.2–24 by 3–9 cm; lateral leaflets 6–15 by 3.4–8.5 cm; apex (emarginate to) rounded to acuminate, base cuneate to oblique, hirsute, yellowish green, hairs yellowish when dry; secondary veins 10–20 pairs; glands many on lower surface, white or yellow; petiole 0–10 cm long, channelled to round in cross-section, hirsute; petiolules 0–4 mm long, channelled. *Inflorescences* paniculate, axis 8–20 cm long, square to round in cross-section, hirsute, purple to greyish or brown; bracteoles unifoliar, leaf-like and clavate, 7–15 by 6–7 mm, persistent. *Calyx* 5-lobed, yellowish to brownish green; hairs appressed; glands few, orange; flowering calyx c. 4 mm diam., erect; fruiting calyx 7–9 mm diam., erect to patent. *Corolla* 5-lobed, (pale) violet to (lavender) white or greenish yellow, fragrant; glands many, orange; lower lip 4–8 by 4–6.5 mm, apex round, margin entire, patent, deep red to blue or (pale) violet, white; lateral lobes 2.5–5 by 2.5–4 mm, apex rounded to acute, patent to reflexed, white, violet to pale blue; upper lip 2-lobed, lobes 2.5–3.5 by 2.5–3 mm, fused up to c. 50 %, apex acute to oblique, erect, white, violet to pale blue; tube infundibular, 5–6 mm long, greenish yellow to white or purplish. *Stamens*: filaments 8–11 mm long, inserted in the lower half of the corolla tube, pale green to white; anther c. 1 mm long, violet to black; pollen (pale) yellow. *Ovary* globose, 1.2–1.5 mm diam., glabrous; style 11–16 mm long, straight, white; stigma lobes c. 1 mm long, pale green to white. *Fruit* when fresh 5–8 cm diam., globose, smooth, glabrous, purple to black, shiny, juice purple; dried 4.5–7.5 mm diam., globose. — **Plate 8d, e.**

Distribution — India, Sri Lanka, Cambodia; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo, Java, Philippines (Palawan, Culion, Tawi Tawi), Sulawesi, Lesser Sunda Islands, Moluccas.

Habitat & Ecology — Primary and secondary forests, savannahs, deciduous forests, heath or coastal vegetations or (peat) swamps. Soil: (white) sand to clay over sandstone, limestone or basalt. Altitude: sea-level up to 300(–1700) m. The species apparently tolerates regular fires. Flowering: November to May (August); fruiting: November to August. The fruits are eaten by birds.

Vernacular names — Malay Peninsula: Bunyak Laban. Sumatra: Aloban-bátu, Aloban búnga, Aloban kardoek; Kopiher (Karo). Lesser Sunda Islands: Sumba: Hiketaroe; Komodo: Pampa.

Uses — Malay Peninsula: Tea made from the boiled bark is used during or after pregnancy. Sarawak: The bark is soaked in warm water in order to make a tea for the relief of stomach ache and juice from the leaves are used to treat eyes.

13. **Vitex quinata** (Lour.) F.N.Williams

Vitex quinata (Lour.) F.N.Williams, Bull. Herb. Boissier Ser. 2, 5 (1905) 431; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 187. — *Cornutia quinata* Lour., Fl. Cochinch. (1790) 387. — *Vitex quinata* (Lour.) Druce, Rep. Bot. Exch. Club Soc. Brit. Isles, Suppl. 2 (1916 '1917') 652 — Type: *Loureiro s.n.* (holo P), [China, Canton,] Canto Sinar.

Vitex heterophylla Roxb., Hort. Bengal. (1814) 46; de Kok, Kew Bull. 62 (2007) 594. — *Vitex heterophylla* Roxb. var. *genuina* H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 55, nom. illeg. (not autonym). — Type: *Harris s.n.* (not found), Tipperah.

[*Vitex undulata* Wall., Numer. List (1828) 1756, nom. nud. — Based on: *Gomez s.n. (Wallich Cat. 1749.2)* (K-W), Java; *Wallich Cat. 1756.1* (K-W), Rangoon.]

Vitex sumatrana Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 567. — Type: *Teijsmann HB 4302* (holo U; iso BO 2 sheets, K, MEL), [Indonesia,] Sumatra, Lampong prov., prope Natar.

Vitex heterohylla Roxb. var. *undulata* C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 585; de Kok, Kew Bull. 63 (2008) 30. — Syntypes: *Helfer 6068* (K 2 sheets), [Burma,] Tenasserim; *McLelland s.n.* (K), [Burma,] Pegu; *Wallich Cat. 1756* (K, K-W), [Burma,] Rangoon.

Vitex loureirii Wight ex C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 585. — Type: unknown.

Vitex urceolata C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 585. — Syntypes: *Griffith KD 6064* (K 2 sheets, U), Malaya; *Maingay 1205* [3368] (K), Malaya, Malacca; *Maingay 1207* [3308] (K 2 sheets), Malaya, Malacca.

Vitex celebica Koord., Meded. Lands Plantentuin 19 (1898) 645. — Type: *Koorders 19544b* (syn BO, L), [Indonesia,] Celebes, Menado, Minahassa.

Vitex padangensis Hallier f., Meded. Rijks-Herb. 37 (1918) 46; de Kok, Kew Bull. 63 (2008) 30. — Syntypes: *Beccari PS 726* (BM, K, L, MEL), [Indonesia,] Sumatra, Padang Provinces, Ajer Mantjur; *Korthals s.n.* (L), [Indonesia,] W Sumatra, Residentschaft Padang, prope Nangallo.

Vitex secundiflora Hallier f. var. *longipes* Moldenke, Phytologia 43 (1979) 252. — Type: *SAN (Muin Chai) 26696* (holo SAN; iso K, L), [Malaysia,] Sabah, Lahad Datu Distr.

Tree, (4–)6–30 m high, bole (4–)7–21 m high; 10–150 cm dbh; buttresses, if present, up to 1.5 m high and up to 1 m out. *Bark* flaky, light to grey brown, slash straw to cream yellow; exudate colourless or ochre, scant; sapwood pale ochre; heartwood yellow to light brown. *Leaves* (1–)3–5-palmate; blades elliptic to narrowly elliptic, central leaflet 7–15 by 3–5.6 cm; lateral leaflets 3.8–9 by 1.7–3.7 cm, glabrous to veins covered with appressed hairs, base cuneate to oblique, apex acuminate, margin entire; lower surface covered with many orange glands; venation pinnate, main side veins 5–14 pairs, prominent beneath, sunken above; petiole 2–11 cm long, round in cross-section to laterally flattened, glabrous to covered with minute curly hairs; petiolules 1–3 cm long. *Inflorescences* terminal, paniculate, 15–27 cm long, angular in cross-section; hairs dense to moderate, appressed, simple; bracteoles scale-like, triangular to linear, up to 4 mm long, velutinous, usually persistent. *Calyx* 5-lobed, lobes clearly developed, lobes up to 0.8 mm long, persistent, accrescent; hairs dense to moderate, always as hairy as the inflorescence, appressed, simple; glands many, orange; flowering calyx 2–3 mm diam., erect; fruiting calyx 4.5–6 mm diam., patent. *Corolla* 5-lobed, covered outside with appressed hairs, base glabrous, violet to white; glands few, orange to mauve; lower lip spatulate, 2–6 by 2.5–4 mm, patent, apex round to acute, margin crenulate, hairs appressed, pale blue with faint honey mark; lateral lobes 2–3 by 1–3 mm, patent, apex round to acute; upper lip 2-lobed, lobes 2–3 by 1.5–2.5 mm, erect, fused up to 10–50 % of length, apex round to oblique; tube infundibular, 5–6 mm long. *Stamens*: filaments 4–6 mm long, slightly didynamous, glabrous, except for tuft of erect simple multicellular hairs at base, inserted halfway on the corolla tube, slightly to clearly exceeding the corolla tube; anther c. 1 mm long. *Ovary* 1–1.2 mm diam., globose, glabrous; glands absent to few; style 4.5–11 mm long, glabrous; stigma 2-lobed, lobes c. 0.1 mm long, apex acuminate. *Fruit* when fresh unknown; dried clavoid, 6–8 by 4.5–6 mm, smooth, deep purple to black. *Seeds* 4 (or fewer by abortion) per fruit.

Distribution — India to South China, throughout *Malesia*.

Habitat & Ecology — Primary to secondary forest or more rarely in submontane forest, often in swamps or periodically inundated areas. Soil: stony to sandy or loamy clay, sometimes over limestone. Altitude: 10–470(–1000) m. Flowering: May to December; fruiting: July to April.

Vernacular names — Malay Peninsula: Leban Taudok, Merboh. Sumatra: Leban boengoen. Borneo: S Kalimantan: Bati Bati Gunung. Sulawesi: Bitti. Moluccas: Kroehoe-kroehoe.

Uses — On the Indonesian island of Halmahera (Moluccas), the bark is mashed in cold water and used against lice.

14. Vitex rotundifolia L.f.

Vitex rotundifolia L.f., Suppl. Pl. (1782) 294; Munir, J. Adelaide Bot. Gard. 10 (1987) 52; de Kok, Gard. Bull. Singapore 68 (2016) 189. — Type: *Thunberg s.n. (Hb. Thunb. 14619)* (holo LINN-SM; iso UPS-THUNB), Japan.

Vitex ovata Thunb. in Murray, Syst. Veg. (1784) 578. — *Vitex trifolia* L. var. *obovata* (Thunb.) Benth., Fl. Austral. 5 (1870) 67, nom. superfl. — *Vitex agnus-castus* L. var. *ovata* (Thunb.) Kuntze, Revis. Gen. Pl. 2 (1891) 511. — *Vitex trifolia* L. var. *ovata* (Thunb.) Makino, Bot. Mag. (Tokyo) 17 (1903) 92, nom. superfl. — Type: *Bladh s.n. (Hb. Thunb. 14618)* (holo UPS-THUNB), China, Macao.

Vitex trifolia L. var. *simplicifolia* Cham., Linnaea 7 (1832) 107; de Kok, Kew Bull. 63 (2008) 32. — Type: *Chamisso s.n.* (holo LE), Philippines, Luzon, Cavite, Dec. 1817 – Jan. 1818.

Vitex repens Blanco, Fl. Filip. (1837) 513; Merr., Sp. Blancoan. (1918) 332. — Type: lost.

Vitex trifolia L. var. *unifiolata* Schauer in A.DC., Prodr. 11 (1847) 683. — Lectotype: *Thunberg s.n.* (lecto UPS-THUNB 14619, designated by Sengun in De Kok 2016: 195), Japan.

Vitex trifolia L. var. *repens* Ridl., Fl. Malay. Penins. 2 (1923) 631; Munir, J. Adelaide Bot. Gard. 10 (1987) 53. — Lectotype: *Ridley s.n.* (lecto K; isolecto SING, designated by Sengun in De Kok 2016: 196), Malaya, Kelantan.

Vitex triolia L. subsp. *littoralis* Steenis, Blumea 8 (1957) 516. — Type: *Bloembergen 3894* (holo L), [Indonesia,] Lesser Sunda Island, Kisar, E of Wonreli, 22 Mar. 1939.

Prostrate to small erect shrub, 10–60 cm high, sometimes forming dense mats of several m diam., rooting at nodes. *Leaves* 1-foliolate, round to obovate or obovate-spatulate, terminal leaflet 1.4–5.3 by 0.8–3.3 cm, upper surface glabrous or with only few hairs on the veins, lower surface velutinous, hairs whitish, base cuneate, apex mostly rounded, sometimes subacute, margin entire, aromatic when crushed; upper surface green; lower surface pale green to grey-green or silvery; venation 4–7(–9) pairs of slightly prominent side veins visible on both surfaces; hairs simple, appressed, with powdery wax; petiole 3–12 mm long, round in cross-section; hairs velutinous, white, appressed, simple. *Inflorescences* terminal and axillary, paniculate, consisting of lateral cymes in dense clusters, 4–12 cm long, angular; hairs dense, appressed, simple; bracts usually reduced relative to leaves; bracteoles triangular to linear, up to 2 mm long, appressed, velutinous, usually caduceus. *Calyx* 5-lobed, velutinous, weakly 5-ribbed, slightly accrescent, lobes 2–6 by 3–11 mm; hairs appressed, simple; glands few; flowering calyx 3–4 mm diam., erect; fruiting calyx 3.5–4.5 mm diam., erect, covering most of the mature fruit. *Corolla* 5-lobed, covered outside with appressed hairs, base glabrous, purplish blue to white; glands many, white; lower lip 3.9–7 by 3.3–7.4. mm, spatulate, apex round to truncated, margin entire, hairs concentrated at base; lateral lobes 3–4.2 by 2–3 mm, reflexed, apex round; upper lip 2-lobed, lobes 3–3.5 by 3–3.5 mm, reflexed to erect, fused from 10–100 % of total length, apex acute; tube 5.3–8.3 mm long, infundibular. *Stamens* with filaments 5.2–8.2 mm long, slightly to strongly didynamous, glabrous except for tuft of erect simple multicellular hairs at base, inserted 1/2 to 1/3 of the way on the corolla tube, clearly exceeding the corolla tube; anthers

c. 1.5–2 mm long. *Ovary* 1–1.5 mm diam., globose, glabrous, apex covered with glands; style 9.8–14.6 mm long, glabrous; stigma 2-lobed, lobes 6–13 mm long, apex pointed. *Fruit* fresh unknown; dried fruit globose, 4.4–5.3 by 4.3–5 mm, glabrous, smooth, turning first purplish, then black when mature. *Seeds* 4 (or fewer by abortion) per fruit.

Distribution — Widespread from Japan, Korea and China and south throughout the whole Flora Malesiana area to the north and east coast of Australia and into the Pacific as far as Samoa and Fiji. The species is apparently absent from most of the central Pacific, but an isolated population occurs in Hawaii.

Habitat & Ecology — On sandy seashores, coastal dunes and on sandbars along river. Sometimes growing just above the high water mark. Flowering and fruiting: June to January.

Vernacular names — Beach Vitex (English); Malaysia: Lagundi, Lagundi Laud; Kelantan: Dĕmunla. Indonesia: Western Flores: Wora tach.

Note — Flowers reported to smell like lavender, however, the whole plant has a pungent smell.

15. Vitex scandens Moldenke

Vitex scandens Moldenke, Phytologia 4 (1952) 63. — Type: *Docters van Leeuwen-Reijnvaan 10703* (holo BO; iso NY) [Indonesia, West Papua,] Dutch New Guinea, Nassau Mountains.

Climber to 30 m long or a small tree up to 3 m high, stem c. 2 cm diam., pithy. *Leaves* 3–5-foliolate; blades elliptic to ovate, obovate; central leaflet 12–19 by 5–9 cm; lateral leaflets 6.5–16 by 3.5–7.5 cm, glabrous, base cuneate to caudate, apex acuminate, margin entire; venation pinnate, main side veins 10–15 pairs, prominent beneath, sunken above; glands round, many; petiole 4.5–9 cm long, round in cross-section, glabrous; glands absent to many; petiolules 3–15 mm long, glabrous, channelled in cross-section. *Inflorescences* terminal, paniculate, lax, 14–37 cm long; primary axis 11–37 cm long, round in cross-section at base to flattened at apex, glabrous; glands many; side axis 4–40 mm long, diminishing towards apex; bracteoles scale-like, less then 2 mm long, margin, slightly ciliate. *Calyx* 5-lobed, campanulate; lobes up to 1 mm long, apex round to acute, glabrous; glands few; flowering calyx 3–5 mm diam., erect; fruiting calyx not seen. *Corolla* 5-lobed, covered except base and margins with appressed hairs, fleshy, buds white, mature corolla red to brown or deep purple; lobes more or less isomorphic, glabrous inside except for hairs at the apex of the lobes; hairs long, erect, multicellular; lower lip 1.5–5 by 2–4.5 mm, apex acute, erect; lateral lobes 1.5–5 by 1.5–4.5 mm, apex upright, acute, erect; upper lip 2-lobed, lobes 1.5–5 by 1.5–4.5 mm, apex acute, erect, fused for 0–10 % of length; tube 1–5 mm long. *Stamens*: filaments 2.5–5 mm long, inserted at base of corolla, not exceeding corolla tube, glabrous with tuft of erect multicellular hairs at base; anthers c. 1.5 mm long. *Ovary* 1–1.2 mm diam., globose, glabrous, glands absent or few at apex; style 2.5–4 mm long, not exceeding corolla; stigma 2-lobed, 0.1–0.2 mm long, broadly lobed. *Fruit* when fresh unknown; dried clavoid, c. 3 mm diam.

Distribution — New Guinea, New Ireland.

Habitat & Ecology — Canopy or subcanopy climber growing in lowland to mid-montane rainforest, sometimes along rivers or in swamps. Altitude: sea-level up to 1300 m. Flowering: November to June; fruiting: July.

16. **Vitex siamica** F.N.Williams

Vitex siamica F.N.Williams, Bull. Herb. Boissier Ser. 2, 5 (1905) 431. — Lectotype (designated by De Kok, Kew Bull. 63 (2008) 31): *Anonymous 1683* (lecto K), [Malaysia,] Langkawi Archipelago, Teruto.

Shrub or small tree, 1.5–18 m high, 20–90 cm dbh. *Bark* flaky or fissured, grey, inner wood brown to yellow, wood pale brown or whitish yellow. *Leaves* 3-foliolate; central leaflet elliptic to narrowly elliptic, 5.9–7.7 by 2.6–3 cm; lateral leaflets 4.5–5.4 by 1.6–2.2 cm, apex acuminate, base cuneate, glabrous; glands covering lower surface, orange; secondary veins c. 10 pairs; petiole 2.5–5 cm long, round in cross-section to lateral flattened, glabrous to covered with minute straight hairs, hairs whitish when dry; petiolules 0.4–1.2 cm long. *Inflorescences* paniculate, axis 5–16 cm long, brownish white; hairs few, erect; bracteoles elliptic, up to 5 mm long, few hairs, persistent. *Calyx* 5-lobed; hairs few, erect to appressed, mainly along margin; glands many, orange; flowering calyx 1.5–2 mm diam., erect; fruiting calyx c. 2.5 mm diam., erect. *Corolla* 5-lobed, white, pinkish to pale blue with purple and yellow markings; gland-covered outside, pale yellow; hairs few; lower lip spatulate, 1.5–2.8 by 1–2 mm, patent, apex acute, margin entire, appressed hairs, pale lilac to (light) purple; lateral lobes 1–1.2 by 1–1.2 mm, patent, apex acute; upper lip 2-lobed, lobes 1–1.2 by 1–1.2 mm, erect, fused up to 10–20 % of length, apex acute; tube infundibular, 2–2.5 mm long. *Stamens*: filaments 2–3 mm long, inserted in the lower half on the corolla tube, purple; anther 0.4–0.5 mm long, black to dark purple. *Ovary* 0.6–1 mm diam., apex velutinous, glands absent to few; style 2.5–4 mm long, straight; stigma lobes 0.1–0.2 mm long, apex acuminate. *Fruit* when fresh violet to pale purple; dried c. 3–5 mm diam., globose, apex flatted, few hairs at apex, smooth.

Distribution — Peninsular Thailand, Peninsular Malaysia.

Habitat & Ecology — Only found growing on limestone were it occurs in rainforest to open rocky places in loose brown soil. Altitude: 160–530(–800) m. Reported to be locally common. Flowering: May to July; fruiting: May to December.

Vernacular names — Peninsular Malaysia: Halban balū, Leban balū.

Uses — The fruits are edible and are described as slightly bitter.

17. **Vitex tomentosa** (Munir) Bramley

Vitex tomentosa (Munir) Bramley in Bramley et al., Taxon 58 (2009) 508. — *Viticipremna tomentosa* Munir, J. Adelaide Bot. Gard. 7 (1985) 184. — Type: *Pullen 6825* (holo CANB; iso K, L, LAE, MEL 2 sheets, SING), Papua New Guinea, Central District, c. 46 miles S.E of Port Moresby, Tavai Creek.

Small trees or shrubs, up to (1.5–)4–10 m high. *Bark* irregularly cracked, light-brown or grey. *Leaves* 3–5-foliolate; central leaflet elliptic-lanceolate to narrowly elliptic, (3.5–)5–17.5 by 2–6.5 cm; lateral leaflets 9–13 by 3–4.5 cm, apex acuminate,

base cuneate, margin entire, upper surface densely hairy, light to dark green, glands many on both surfaces; lower surface densely hairy, (pale) green to whitish; secondary veins 6–8(–10) pairs; petiole 3–7.5 cm long, round in cross-section, velutinous; petiolules 0–8 mm long. *Inflorescences* terminal, paniculate, 16–24 cm long, cymes in dense separated clusters, densely hairy; bracteoles scale-like, triangular to linear, up to 1–4 mm long, velutinous, usually persistent. *Calyx* 0–4- (or 5-)lobed, campanulate, densely hairy; glands many; flowering calyx 1.5–2.7 by 1–1.5 mm, erect; fruiting calyx 5–6 mm diam., erect. *Corolla* 4-lobed, covered outside with appressed hairs, base glabrous, glands many, cream, fragrant; lower lip spatulate, 2–3.5 by 2–3, apex rounded, white; other lobes elliptic-orbicular or elliptic-ovate, 1.5–2.5 by 1.5–2.5 mm, almost isomorphic, apex rounded; tube infundibular, 3–4 mm long. *Stamens*: filaments 2.5–3.5 mm long, didynamous, glabrous, except for tuft of erect hairs at base, inserted halfway on the corolla tube, slightly exceeding the corolla tube; anther 0.5–1 mm long. *Ovary* < 1 mm diam., globose, glabrous; glands present at apex; style 2–3 mm long, glabrous; stigma 2-lobed, lobes c. 0.1 mm long. *Fruit* when fresh reddish brown or purple when mature; dried 6–8.5 by 5–7 mm, globose-ellipsoid, glabrous with few glands, apex rounded; black to blue when mature.

Distribution — Papua New Guinea (SE of Port Moresby).

Habitat & Ecology — Monsoon forest or scrubland to gallery forest along rivers or in grasslands, or in secondary vegetations. Altitude: sea-level up to 180 m. Flowering: February to April; fruiting: February to June.

18. Vitex trifolia L.

Vitex trifolia L., Sp. Pl. (1753) 638, 938 (‘*trifoliis*’); H.J.Lam, Verbenaceae Malayan Archipel. (1919) 180; Moldenke, Phytologia 51 (1982) 330; de Kok, Kew Bull. 62 (2007) 596. — *Vitex trifolia* L. var. *trifoliolata* Schauer in A.DC., Prodr. 11 (1847) 683; H.J.Lam, Bull. Jard. Bot. Buitenzorg Ser. 3, 5 (1922) 178, nom. superfl. — Type: *Herb. Linn. 811/7* (holo LINN!), ‘India’.

Vitex integerrima Mill., Gard. Dict., ed. 8. (1768) — *Vitex indica* Mill., Gard. Dict., ed. 8. (1768), in errat. — Type: *Herb. Linn. 811/7* (holo LINN), ‘India’.

Vitex agnus-castus L. var. *javanica* Kuntze, Revis. Gen. Pl. 2 (1891) 510; de Kok, Kew Bull. 63 (2008) 32. — Type: unknown, [Indonesia,] Java, Plabuan.

Vitex agnus-castus L. var. *subtrisecta* Kuntze, Revis. Gen. Pl. 2 (1891) 510. — *Vitex trifolia* L. var. *subtrisecta* (Kuntze) Moldenke, Phytologia 8 (1961) 88; de Kok, Kew Bull. 62 (2007) 597. — Type: *Kuntze 5817* (holo NY), Java, Willisgebirge.

Shrub (prostrate to small erect shrub on seashore) or tree, 1–8 m high, bole up to 1.5 m high, 15–20 cm dbh. *Bark* smooth to finely fissured, (light to grey) brown or dark grey; light brown to yellow-cream; wood very hard, (pale) straw-coloured. *Leaves* (1–)3-foliolate; blades oblong-elliptic to obovate or obovate-spatulate, terminal leaflet 2.2–9.1 by 1.1–3.1 cm, 1.7–2.8 times as long as wide, sessile or shortly petiolulate, base attenuate in compound leaf, rounded or cuneate in unifoliolate leaf, terminal petiolules 0–0.9(–1.1) cm long; lateral leaflets 1.4–7.6 by 0.5–2.6 cm, 1.6–2.4 times as long as wide, sessile; all leaflets glabrous above or with only hairs on the veins, velutinous below, hairs whitish, apex acute, rarely acuminate, margin entire, aromatic when bruised; lower surface pale green to silvery/whitish or sometimes purplish, above light

to dark dull green; hairs appressed, with powdery wax; venation 9–14 pairs of secondary veins, visible on both surfaces; petiole 0.4–5.5 cm long, round in cross-section, covered with minute curly hairs. *Inflorescences* terminal, paniculate, consisting of lateral cymes in lax clusters, 5.4–18.1 cm long, angular in cross-section, hairs dense, appressed, dull grey-green to mauve tinged or purple; bracts usually 1-foliolate; bracteoles triangular to linear, up to 2 mm long, appressed, velutinous, usually persistent. *Calyx* 5-lobed, clearly accrescent, lobes clearly developed; lobes 2–7 by 3–9 mm, acute, persistent, velutinous; glands many; flowering calyx 2–3 mm diam., erect; fruiting calyx 5–6 mm diam., patent to erect, covering most of the mature fruit. *Corolla* 5-lobed, covered outside with appressed hairs, base glabrous, pale purplish to blue, sometimes with sweet smell; glands few, white; lower lip spatulate, 2–5.5 by 2.5–5 mm, apex round to acute, margin entire, two clear ridges at corolla mouth, reflexed, purplish blue to mauve; hairs concentrated at corolla mouth; lateral lobes 2–3 by 2–2.5 mm, erect, apex round; upper lip 2-lobed, lobes 1.2–2.2 by 1–2 mm, erect, fused up to 10 %, apex acute; tube infundibular, 3.1–7 mm long. *Stamens*: filaments 3–5.8 mm long, slightly didynamous to equal, glabrous, except for tuft of erect simple multicellular hairs at base, inserted 1/2 to 1/3 of the way on the corolla tube, clearly exceeding the corolla tube and in the staminate phase grouped together above the upper part of the corolla mouth, white; anthers c. 1 mm long, beige, pollen beige to whitish. *Ovary* 1–1.5 mm diam., globose, glabrous, apex covered with glands; style 3.6–7 mm long, glabrous, purple; stigma 2-lobed, lobes 0.2–0.7 mm long, acuminate with a whitish appendix at each lobe. *Fruit* when fresh purple, turning brown or black as it matures; dried 2.2–6 by 2.2–6.2 mm, broadly obovoid to globose, glabrous, smooth, glaucous.

Distribution — Widespread from Tahiti to the east and north coast of Australia, north to China, Japan and Hawaii, west to India, Sri Lanka; throughout *Malesia*. Because of its local use as an ornamental and a medicinal plant, it is also widely cultivated in and outside its natural area.

Habitat & Ecology — Beaches, inland edge of mangrove swamps, grasslands, (littoral) forest and in secondary vegetations, often near water. Soil: sands or more rarely in clay, often over limestone, coral, volcanic soils or shale. Altitude: sea-level up to 150(–1500) m , in humid areas the species is usually common at low altitudes, becoming rarer higher up. In dryer areas the species can also be more common at high elevation. Often a solitary tree but sometimes occurring in tickets. Flowering and fruiting: throughout the year.

Vernacular names — Lagundi, Legundi. Sumatra: Epaskè; Salagundih (Karo); Salah puteh (Dolok Merangir). Java: Lamentang, Memeongan (Sundanese). Lesser Sunda Islands: Soembawa: Beloening; Flores: Kajo kemérū (Lamakolot); Kalabali: Kámaling bata; Timor: Tasi (Dawan). Molucas: Halmahera: O Soi.

Uses — Various medicinal and horticultural uses.

Note — *Vitex trifolia* can have a prostrate form on beaches, which looks like *V. rotundifolia*, and therefore, the two species can be confused. However, they can be distinguished by *V. rotundifolia* having only one leaflet and rooting at the nodes.

19. Vitex turczaninowii Merr.

Vitex turczaninowii Merr., Govt. Lab. Philip. 35 (1905) 77 (non *Vitex philippinensis* Merr.); Bramley et al., Taxon 58 (2009) 500. — *Premna philippinensis* Turcz., Bull. Soc. Imp. Naturalistes Moscou 36, part II (1863) 215. — *Gumira philippinensis* (Turcz.) Kuntze, Revis. Gen. Pl. 2 (1891) 508. — *Viticipremna turczaninowii* (Merr.) H.J.Lam, Verbenaceae Malayan Archipel. (1919) 162. — *Viticipremna philippinensis* (Turcz.) H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 47, nom. superfl.; Munir, J. Adelaide Bot. Gard. 7 (1985) 192. — Lectotype (designated by Munir 1985: 192): *Cuming 1294* (lecto MEL; isolecto BM, K 2 sheets, NY), Philippines.

Vitex luteoglandulosa H.J.Lam, Verbenaceae Malayan Archipel. (1919) 199. — Type: *Schlechter 16593* (holo B†), [Papua New Guinea, Madang Province,] Kaiser Wilhelm's Land, near Wabbe.

Vitex luzonica H.J.Lam in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 61; de Kok, Kew Bull. 63 (2008) 36. — Type: *Ahern 706 Q* (holo BO), [Philippines,] Luzon.

Small tree or shrubs, up to 9–28 m high. *Bark* grey. *Leaves* 3–7-foliolate; central leaflet lanceolate to narrowly elliptic-lanceolate, 6–19 by 2.5–8 cm; lateral leaflets 5–14 by 1.4–7 cm, apex acuminate, base cuneate, margin entire, upper surface glabrous, lower surface glabrous, glands present, secondary veins 7–12 pairs; petiole 5–11 cm long, round in cross-section, velutinous; petiolules 0.5–3 cm long. *Inflorescences* terminal, paniculate, 12–25 cm long, glabrous to densely hairy; bracteoles scale-like, triangular to linear, up to 4 mm long, velutinous, caducous. *Calyx* 0–4-lobed, campanulate, densely hairy; glands many; flowering calyx 2–3 by 1.5–2 mm, erect; fruiting calyx 5–6 mm diam., erect. *Corolla* 4-lobed, covered outside with appressed hairs, base glabrous, glands many, pale yellow; glands common, orange to mauve; lobes broadly elliptic-ovate or elliptic-oblong, 2–5 by 1.5–3 mm, almost isomorphic, lower lobes slightly larger, apex rounded; tube infundibular, 3.5–5 mm long. *Stamens*: filaments 4–9 mm long, didynamous, glabrous, except for tuft of erect hairs at base, inserted in the lower part of the corolla tube, clearly exceeding the corolla tube; anther c. 1 mm long. *Ovary* 1–1.5 mm diam., globose, glabrous; glands absent; style 6–11 mm long, glabrous; stigma 2-lobed, lobes c. 0.1 mm long, apex acuminate. *Fruit* when fresh unknown; dried 5–7 by 5–6 mm, globose-ellipsoid, glabrous, apex rounded.

Distribution — Philippines, Moluccas, New Guinea.

Habitat & Ecology — Forest. Flowering: April to November; fruiting: July to November.

20. Vitex vansteenisii Moldenke

Vitex vansteenisii Moldenke, Phytologia 4 (1953) 294. — Type: *Van Steenis 9400* (holo U; iso BM, K, L, NY 2 sheets), [Indonesia,] northern Sumatra, between Gadjah and Blangkedjeren.

Vitex vestita Wall. ex Walp. forma *unifoliolata* Moldenke, Phytologia 49 (1981) 182. — Type: *De Wilde & de Wilde-Duyfjes 13415* (holo US; iso L), [Indonesia,] Sumatra, Atjeh, Gunung Leuser Nature Reserve, Camp 2, ascent of Gunung Bandahara.

Shrub or small tree, 3–8.5 m high, 12–13 cm dbh. *Leaves* 1-foliolate; leaflet elliptic to narrowly elliptic, 4.5–15 by 2–7 cm, apex acuminate, base cuneate, upper side glabrous except on veins, lower side sparsely to moderately hairy, secondary veins 10–15 pairs; glands few to many, yellowish; petiole 1.5–3 cm long, covered with erect hairs, round in cross-section with a small thickening just below the leaf. *Inflorescences* axillary, dichasial, compound, axis 0.2–1 cm long, round to flattened in cross-section;

covered with erect hairs; bracteoles linear, 3–5 by 0.5–1 mm, falling off before fruiting. *Calyx* 5-lobed, 2-lipped, hairs few, erect; glands many; flowering calyx with 3 upper lobes, the largest 1.5–3 by 1–1.5 mm, apex acute to acuminate, erect; 2 lower lobes 0.8–1 mm long, apex acute to acuminate, erect; tube 3–3.5 mm long; fruiting calyx 5–6 mm diam., erect. *Corolla* 5-lobed, yellow, covered with glands; lower lip round to oblong, 2–2.2 by 1.2–2.5 mm, apex round, margin entire; lateral lobes 1–1.5 by c. 1.5 mm, patent, apex acute; upper lip 2-lobed, lobes 1–1.5 by 1–1.5 mm, erect, fused up to 30 %, apex round; tube 5–7 mm long. *Stamens* with filaments just exceeding corolla tube, 3–5 mm long, equal, inserted at middle to lower part of the corolla tube; anther 0.5–1 mm long. *Ovary* globose, c. 1 mm, glabrous, apex covered in glands; style 6.5–7 mm long; stigma lobes 0.1–0.5 mm long, apex acute. *Fruit* when fresh unknown; dried 4–6 mm diam., globose, apex rounded, glabrous, few glands present, smooth, shiny.

Distribution — N Sumatra.

Habitat & Ecology — Edges of lower montane forests. Altitude: 1000–1500 m. Flowering: December to March; fruiting: January to March.

Note — This is a rarely collected species (five collections known) from a small area of N Sumatra, where it can be locally common.

21. Vitex vestita Wall. ex Walp.

Vitex vestita Wall. ex Walp., Repert. Bot. Syst. 4. (1845) 85; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 205. — Lectotype (designated by De Kok, Kew Bull. 63 (2008) 33): *Wallich Cat. 1750* (lecto K; isolecto K-W), East India, Taong-Dong Avoe.

Vitex vestita Wall. ex Walp. forma *glabrescens* Moldenke, Phytologia 3 (1951) 489; de Kok, Kew Bull. 63 (2008) 33. — Type: *Rahmat Si Toroes 4698* (holo NY; iso US), [Indonesia,] Sumatra, Padang division, Si Dimpoean, Tapianoedi, 22–30 June 1933.

Vitex vestita Wall. ex Walp. forma *winkleri* Moldenke, Phytologia 3 (1951) 489; de Kok, Kew Bull. 63 (2008) 33. — Type: *Hubert Winkler 2433* (holo BO; iso L), Indonesia, South-Eastern Borneo.

Small tree or shrub, up to (2.5–)8–15 m high, 3–15(–40) cm dbh; rarely liana (then at least 10 m high and 20 m long). *Bark* smooth to scaly or cracked, (dark) grey to (light) brown; slash light yellowish to (pale) brown, darkening rapidly when cut; wood pale white to pale brown. *Leaves* 3-foliolate; central leaflet elliptic to narrowly elliptic, 8–16.5 by 3.5–6.5 cm; side leaflets 3–7(–11) by 1.3–3.2 cm, apex acuminate, base rounded to cuneate, margin rarely serrate, young leaves pink, upper surface glabrous except on the veins, lower surface from glabrous with hairs on the veins to densely hairy, hairs erect, secondary veins 5–10 pairs, glands many on both surfaces; petiole 4–7.5 mm long, round in cross-section, velutinous; petiolules 1.5–3.5 cm long. *Inflorescences* axillary, dichasial, compound; axis 0.8–2.2 cm long, flattened in cross-section, hairs few to dense, appressed, glands few; bracteoles triangular to linear, less than 2 mm long, moderately ciliate, seldom persistent. *Calyx* 5-lobed, campanulate, (light) green, hairs sparse to dense, erect, lobes isomorphic; glands few; flowering calyx 2.5–5 mm diam., erect; fruiting calyx 3–4 mm diam., patent. *Corolla* 5-lobed, covered outside with glands, whitish pink to (olive-)yellow, mouth cream; scent absent or sour; lobes c. 1 by 0.8–1 mm, almost isomorphic, apex acute; tube 2.5–6.5 mm long, white. *Stamens*: filaments 1–3 mm long, inserted in upper half of tube, yellow; anther white to grey. *Ovary* globose, 1–1.2 mm diam., apex acute, glabrous, glands many (sometimes

covering the whole apex); style 3.5–6.5 mm long, white; stigma c. 2 mm long, pale yellow or white. *Fruit* ellipsoid to ovoid, when fresh c. 5 by 3–4 mm; yellowish green turning to orange or purple and finally black, shiny; dried ellipsoid, 5–6 by 3–4 mm, apex rounded to acute. — **Plate 8c.**

Distribution — Burma, Vietnam; in *Malesia*: Peninsular Malaysia, Sumatra, Borneo.

Habitat & Ecology — Primary or secondary forest and heath forest. Sometimes occurring in waterlogged areas. Soil: clay over sandstone, granite or volcanic rock. Altitude: 50–500(–3000) m. Flowering: October to June (July); fruiting: October to June (July).

Vernacular names — Peninsular Malaysia: Laum leban. Sumatra: Asahan province: Aloban baeugah; Sumatra West Coast: Bóti-bóti.

Uses — Borneo: used in religious ceremonies in connection with the rice harvest in Sarawak.

DOUBTFUL

Vitex altmanni Moldenke, Phytologia 4 (1952) 59; de Kok, Kew Bull. 63 (2008) 35. — Type: *Altman 577* (holo BO), [Indonesia,] Java, Cheribon.

This name is based on a sterile specimen housed at BO. Given the locality, it is most likely to be *Vitex quinata,* but without any flowers or fruits it is impossible to be sure.

Vitex langundi Ridl., J. Straits Branch Roy. Asiat. Soc. 45 (1906) 50; de Kok, Kew Bull. 63 (2008) 35. — Type: unknown.

The only information given is that this is an aromatic shrub with blue flowers and that it is used in traditional medicine. It is most likely to be either *V. trifolia* or *V. negundo*, but without any further information it is impossible to determine this name more accurately.

Vitex leucoxylon Blanco, Fl. Filip. (1837) 516 (non *Vitex leucoxylon* L.f); Merr., Sp. Blancoan. (1918) 332; de Kok, Kew Bull. 63 (2008) 35. — Type: lost.

Merrill interprets this name as based on material from two species, *V. negundo* and *V. parviflora*. He may be right, but given that no type material exists, the true identity of this name will remain unknown.

Vitex minahassae Koord., Meded. Lands Plantentuin 19 (1898) 645; de Kok, Kew Bull. 63 (2008) 35. — Type: *Koorders 19553β* (syn BO 2 sheets, L), [Indonesia, Sulawesi,] Kajoewatoe.

This name is based on two sterile specimens at BO. From the specimens and the scant description it is clear that this must either be *V. glabrata*, *V. quinata* or even a *Teijsmanniodendron*. However, without flowers or fruits it is impossible to identify these specimens any further.

Vitex negundo Noronha, Verh. Batav. Genootsch. Kunst. 5 (1791) 28; de Kok, Kew Bull. 63 (2008) 35. — Type: unknown.

In the original description of *V. negundo*, the only information given is the common Javan name: Lagondi-laut (Noronha 1791: 28). This name is sometimes given to *V. rotundifolia* or *V. trifolia* and without any more information it is impossible to identify this name any further.

Vitex paniculata Lam., Encycl. 2 (1786) 612; de Kok, Kew Bull. 63 (2008) 35. — Syntypes: Rumph., Herb. Amboin. 4 (1743) 50, t. 19; Pluk., Phytographia (1691) t. 321, f. 2; Almagestum Bot. (1696) 390 [as *V. orientalis*]).

This name is based on two different publications with two different plates. The Rumphius plate and description clearly shows a *V. trifolia*. The plate in both Plukenet publications shows a specimen which has long lanceolate leaves and a lax paniculate inflorescence, which suggest something closer to *V. agnus-castus*.

Vitex secundiflora Hallier f., Meded. Rijks-Herb. 37 (1918) 49; de Kok, Kew Bull. 63 (2008) 35. — Type: *Korthals s.n.* (holo ?), [Indonesia,] S.O. Borneo, Gunung Pamatton.

No type material connected with this name was seen and from the original description it is unclear to which genus it belongs. If it is a *Vitex*, then it must represent the sole collection of a distinct taxon. However, the description of a ridge between the petioles points more in the direction of *Callicarpa*. The reported reddish hairs on the corolla also points away from the genus *Vitex*. As no type material was seen, it is impossible to be more precise.

EXCLUDED

Vitex bantamensis Koord. & Valeton, Meded. Lands Plantentuin 42 (1900) 210. — Type: *Koorders s.n.* (holo BO?), [Indonesia, Java,] SW Banten, Tjěmara. = **Vavaea amicorum** Benth. (Meliaceae).

Vitex curtifrutescens Elmer, Leafl. Philipp. Bot. 8 (1915) 2873. — Type: *Elmer 10994* (holo PNH (n.v.); iso E, K, L, NY), Philippines, Mindanao, Todaya (Mt Apo), July 1909. = **Trichadenia philipinensis** Merr. (Achariaceae).

Vitex pinnata L. forma *anomala* Moldenke: See under *Volkameria*.

Vitex premnoides Elmer, Leafl. Philipp. Bot. 8 (1915) 2874. — Type: *Elmer 11644* (holo PNH†; iso K, L, NY, US), Philippines, Mindanao, Todaya (Mt Apo). = **Mastixia premnoides** (Elmer) Hallier f. (Cornaceae).

50. VOLKAMERIA

(J.A. Wearn & D.J. Mabberley)

Volkameria L., Sp. Pl. (1753) 637; Y.W.Yuan et al., Taxon 59 (2010) 131. — Type: *Volkameria inermis* L.

Shrubs, sometimes subherbaceous, lianes, rarely small trees. *Branches* ± tetragonal, usually ash-grey, nodes swollen. *Leaves* simple, decussate (to ternate), subglabrous, with entire margin, never spiny, venation arcuate-reticulate. *Inflorescences* axillary to supra-axillary cymes; flowers resupinate, usually fragrant. *Calyx* campanulate, not accrescent (or rarely fleshy-accrescent), margin with 5 broadly triangular small lobes. *Corolla* hypocrateriform, white, sometimes pink or purple; lobes unequal; buds usually symmetrical, lower lobe same size as others. *Stamens* 4 (or 5), didynamous, inserted within corolla tube, exserted, anthers versatile. *Ovary* cylindrical; style terminal, stigma shortly bifid. *Fruit* generally globose to obovoid, becoming black or brown and separating into 4 corky, 1-seeded pyrenes.

Distribution — Approximately 25–30 species, pantropical but with apparently only one species in Asia and *Malesia*.

1. Volkameria inermis L.

Volkameria inermis L., Sp. Pl. (1753) 637; Y.W.Yuan et al., Taxon 59 (2010) 132. — *Clerodendrum inerme* (L.) Gaertn., Fruct. Sem. Pl. 1 (1788) 271, t. 57, f. 1; Ridl., Trans. Linn. Soc. London, Bot. 3 (1893) 335; H.J.Lam, Verbenaceae Malayan Archipel. (1919) 251; Ridl., Fl. Malay Penins. 2 (1923) 624; Burkill, Econ. Prod. Malay Pen. 1 (1935) 592; Backer & Bakh.f., Fl. Java 2 (1965) 608; Moldenke, Phytologia 61 (1986) 30, 82, 166, see for full synonymy; Mabb., Sci. New Guinea 19 (1992) 39, 40; Valk. & Bunyapraphatsara in Van Valkenburg & Bunyapraphatsara (eds.), PROSEA 12, 2 (2001) 175 (t.); Mabb., Fl. Nouv.-Calédonie 25 (2004) 54, t. 11; C.M.Boo et al., 1001 Gard. Pl. Singapore ed. 2 (2006) 181, f. — Lectotype (designated by Jafir in Nasir & Ali, Fl. W. Pakistan 77 (1974) 33): *Anonymous s.n.* in Herb. Linn. *809/3* (lecto LINN), India.

Ovieda ovalifolia A.Juss., Ann. Mus. Natl. Hist. Nat. 7 (1806) 76. — *Clerodendrum ovalifolium* (A.Juss.) Bakh. in H.J.Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. 3, 3 (1921) 95, nom. illeg. (non A.Gray, Proc. Amer. Acad. Arts 6 (1862) 50). — Type: *Commerson s.n.* (P-JUSS [fiche 347/19]), India, Pondichéry.

Volkameria buxifolia Willd., Enum. Pl. (1809) 658. — *Clerodendrum buxifolium* (Willd.) Spreng., Syst. Veg. 2 (1825) 758. — Type: *Anonymous s.n.* [Hb. Willd. '11681'] (holo B).

Clerodendrum coriaceum Poir. in Lam., Encycl., Suppl. 4 (1816) 353, nom. illeg. (non R.Br., Prodr. (1810) 511). — *Clerodendrum javanicum* Spreng., Syst. Veg. 2 (1825) 759; Moldenke, Phytologia 61 (1986) 31. — Type: *Labillardière s.n.* (holo FI (Hb. Desfont.)), Java.

Volkameria neriifolia Roxb., Fl. Ind. ed., Carey, 3 (1832) 64. — *Clerodendrum neriifolium* (Roxb.) Steud., Nomencl. ed. 2, 1 (1840) 383; C.B.Clarke in Hook.f., Fl. Brit. India 4 (1885) 589; Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 72 (1909) 827. — *Clerodendrum inerme* (L.) Gaertn. var. *neriifolium* (Roxb.) Kurz, Forest Fl. Burma 2 (1877) 266. — Lectotype (designated here by Mabberley): *Roxburgh s.n.* (lecto BM), India.

Clerodendrum capsulare Blanco, Fl. Filip. (1837) 509; Moldenke, Phytologia 61 (1986) 32. — Type: unknown collector (holo PNH†). — Neotype (designated here): *Ramos s.n.* (= *Merrill Species Blancoanae 813*) (neo US), Philippines, Luzon, Batangas, Santiago trail.

Scrambling to scandent evergreen shrub to 3 m tall or a liane to 13 m long. *Stems* to 4 cm diam.; branches ± quadrangular, ash-grey, glabrous to minutely puberulent.

Leaves decussate (to ternate), subglabrous; blade elliptic to lanceolate, 3–8(–10) by 1.5–3.5(–4.5) cm, 2–2.5(–3.2) times as long as wide, apex shortly acuminate, base shortly attenuate, somewhat fleshy, glabrous, margin entire; secondary veins 6 or 7 pairs; petioles 4–15 mm long. *Inflorescences* to 10 cm long, 3–7 fragrant flowers; peduncle 1.5–4 cm long, subglabrous; bracts linear; pedicels 5–13 mm long. *Calyx* c. 4 mm long, not accrescent. *Corolla* white or tinged purple; tube 2.3–3 cm long, glabrous or pubescent within; lobes obovate, 6–7 mm long. *Stamens* 4, exserted by 2.2–3 cm, red to purplish. *Fruit* usually 10–15 by c. 8 mm across (rarely much larger). — **Fig. 28f.**

Distribution — From India and Sri Lanka to southern China and Australia and throughout the western Pacific, introduced elsewhere; in *Malesia*: around the coasts of Peninsular Malaysia, Singapore, Sumatra, Borneo, Java, Philippines, Sulawesi, Lesser Sunda Islands, Moluccas, New Guinea.

Habitat & Ecology — Seashores, mangroves, saltmarshes and tidal riverbanks. The plant is protandrous and moth-pollinated (Primack et al., Austrobaileya 1 (1981) 346).

INSUFFICIENTLY KNOWN TAXON

Vitex pinnata L. forma *anomala* Moldenke, Phytologia 4 (1953) 184; cf. de Kok, Kew Bull. 63 (2008) 35. — Type: *Bünnemeijer 1362* (holo BO), Indonesia, Bangka, Muntok.

Note — This taxon is undoubtedly allied to *Volkameria*, but is only known from the type, the label on which states that the flowers are 'violet'. It is possible that, because the flowers on the type material are in bud, this may just have been a strong purple tinge, which can be observed in some plants of *Volkameria inermis* (see description).

EXCLUDED TAXON

Clerodendrum bakhuizenii Moldenke, Phytologia 4 (1952) 43 ('*backhuizeni*'). — Type: unknown collector *s.n.* (holo BO; iso BO, NY), Java, Botanic Garden of Buitenzorg, cultivated as '*C. glaucum* Wall.', file nr. XV.L.11, 1916.

Leaves almost oval with bluntly acuminate apex, puberulent and ternately arranged. *Calyx* c. 3 mm long, lobes completely united with only minute denticulations to the rim. *Corolla* tube to 9 mm.

Note — This species is a *Volkameria*, closely resembling *V. eriophylla* (Gürke) Mabb. & Y.W.Yuan (see Yuan et al., Taxon 59 (2010) 125). In his description of the species, Moldenke stated that it was a 'puzzling species', noting its similarity to a number of other species, largely of African origin, several of which have now been transferred to *Volkameria*. It is, therefore, very unlikely that the plant on which this species is based was native to Malesia.

DUBIOUSLY NATIVE TAXA

Holmskioldia sanguinea Retz., Observ. Bot. 6 (1791) 31. See Flora of Pakistan (http://www.tropicos.org/Name/33700009?projectid=32, last checked May 2017), for a full description.

Note — As well as specimens from Botanic Gardens (e.g., Sibolangit, Bogor), there are two collections of this species from the Philippines. The latter two are probably the result of garden escapes – the collecting localities are inhabited and are popular mountain trail sites (Intavas, Impasung-ong, Mt Kitanglad (*PPI 3415*) and Mt Santo Tomas (*PPI 8869*)).

Pycnostachys stuhlmanii Gürke in Engl., Pflanzenw. Ost-Afrikas, C (1895) 345. See Paton et al., Flora of Tropical East Africa Lamiaceae (2009) 392, for a full description.

Note — One collection from the Cameron Highlands, Pahang, suggested to be a garden escape.

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Anacardiaceae **8:** 395
Ancistrocladaceae **4:** 8
Apocynaceae **18:** 1
Aponogetonaceae **4:** 11; **7:** 213
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