

APOCYNACEAE
(SUBFAMILIES RAUVOLFIOIDEAE AND APOCYNIOIDEAE)

(David J. Middleton, Edinburgh)¹

Apocynaceae Adans., Fam. Pl. 2 (1763) 167; G. Don, Gen. Hist. 4 (1837) 69; A.DC., Prodr. 8 (1844) 317; Benth. & Hook.f., Gen. Pl. 2 (1876) 681; K. Schum. in Engl. & Prantl., Nat. Pflanzenfam. 4, 2 (1895) 109; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 387; Ridl., Fl. Malay Penins. 2 (1923) 320; Markgr., Nova Guinea 6, 2 (1926) 278; Bot. Jahrb. Syst. 61 (1927) 164; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 137; F.G. Browne, Forest Trees Sarawak & Brunei (1955) 60; Smythies, Common Sarawak Trees (1965) 17; Backer & Bakh.f., Fl. Java 2 (1965) 218; P.F. Burgess, Timbers Sabah (1966) 39; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 1; Cockburn, Trees Sabah 1 (1976) 13; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 25; T.C. Huang, Taiwan 31 (1986) 89; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 16; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 27; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 50; P.T. Li et al., Fl. China 16 (1995) 143; Kochummen, Tree Fl. Pasoh Forest (1997) 150; D.J. Middleton, Fl. Thailand 7 (1999) 1; Kessler et al., Blumea, Suppl. 14 (2002) 13; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 1; Utteridge in R.J. Johns et al., Alp. Subalp. Fl. Mount Jaya (2006) 187. — Type genus: *Apocynum* L.

Asclepiadaceae Borkh., Bot. Wörterb. 1 (1797) 37 (as *Asclepiadeae*), nom. cons. — Type genus: *Asclepias* L.

Vincaceae Vest, Anleit. Stud. Bot. (1818) 273, 299. — Type genus: *Vinca* L.

Cerberaceae Martynov, Tekhno-Bot. Slovar (1820) 119. — Type genus: *Cerbera* L.

Pacouriaceae Martynov, Tekhno-Bot. Slovar (1820) 447. — Type genus: *Pacouria* Aubl.

Plumeriaceae Horan., Prim. Lin. Syst. Nat. (1834) 70. — Type genus: *Plumeria* L.

Stapeliaceae Horan., Prim. Lin. Syst. Nat. (1834) 70. — Type genus: *Stapelia* L.

Cynanchaceae G. Mey., Chloris Han. (1836) 245, 251 (as *Cynancheae*). — Type genus: *Cynanchum* L.

Ophioxylaceae Mart. ex Perleb, Clav. Class. (1838) 23 (as *Ophioxyleae*). — Type genus: *Ophioxylon* L.

Willughbeiaceae J. Agardh, Theoria Syst. Pl. (1858) 256. — Type genus: *Willughbeia* Roxb.

Carissaceae Bertol., Nuovo Giorn. Bot. Ital. 23 (1891) 212. — Type genus: *Carissa* L.

Periplocaceae (Kostel.) Schltr. in K. Schum. & Lauterb., Nachtr. Fl. Schutzgeb. Südsee (1905) 351, nom. cons.

Large to small trees, shrubs, small to very large woody climbers, perennial or, rarely, annual herbs. Latex usually present, most commonly white, occasionally clear, cream,

1) With contributions by Kade Sidiyasa (*Alstonia*), Hendrian (*Ochrosia*), Hendrian & Middleton (*Rauvolfia*), P. Baas, F. Lens & E.A. Wheeler (wood anatomy) and S. Lodder, E.M.J. Rutten & R.W.J.M. van der Ham (pollen morphology). — Drawings courtesy: Blumea, Agricultural University Wageningen Papers, Harvard Papers in Botany, Flora of Thailand. — Artists: J.P. Dirkwzager, P. Kostense, J.H. van Os, Priyono, H. Sommerville, H. de Vries, J.M. de Vries, J. Williamson, Yuen Fang Tan.

yellow or pinkish. *Leaves* simple, mostly entire, rarely crenulate or with spines at the margin (but not in Malesia); mostly petiolate, occasionally sessile; commonly opposite, less often alternate or in whorls; stipules absent or small, then either intrapetiolar or represented only by an interpetiolar line, colleters often present in leaf axils (sometimes also on the petiole, or clustered at juncture of petiole and base of lamina above, or along midrib above in non-Malesian species); venation pinnate. *Inflorescence* cymose, rarely fasciculate or flowers solitary; terminal or axillary. *Flowers* hermaphrodite; 5-merous, rarely 4-merous (in *Leuconotis* and as a very rare occurrence in *Alyxia*). *Sepals* often with colleters inside. *Corolla* actinomorphic (in all native Malesian genera – slightly zygomorphic in the commonly cultivated *Allamanda*) sympetalous; salverform, infundibuliform, campanulate, rotate or urceolate; lobes contorted, sinistrorse or dextrorse, more rarely valvate. *Stamens* inserted on the inside of the corolla tube; completely included or exerted, free or adnate to the style head; anthers sagittate or ovate, sometimes with the base and apex sterile, occasionally with an elongated apex. *Disk* present or absent. Gynoecium superior or, rarely, semi-inferior; 2-carpellate and apocarpous but united into a common style, a syncarpous or partly syncarpous 2(–5)-locular ovary, or a unilocular ovary; style head with a stigmatic base and a 2-cleft apex. *Fruit* a drupe, berry, capsule or follicle. *Seeds* simple, arillate, winged, with a ciliate margin or with an apical and/or basal coma.

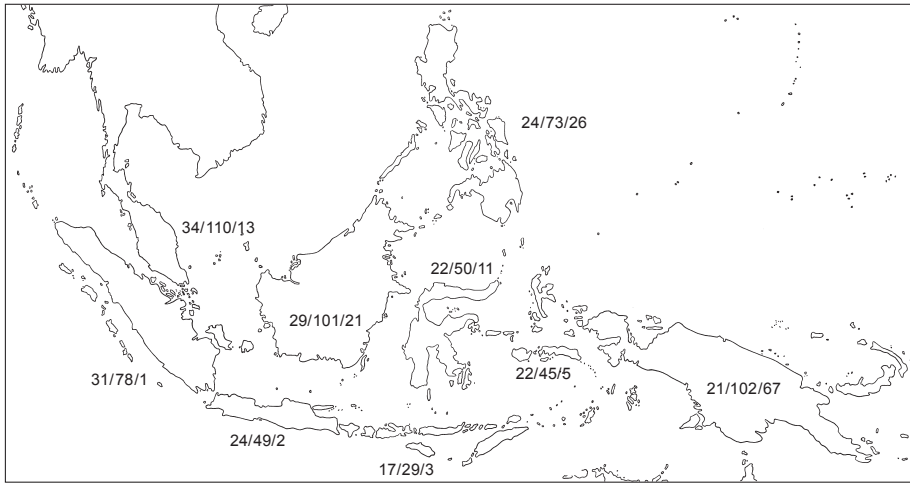
Subfamilies Rauvolfioideae and Apocynoideae form the Apocynaceae as traditionally delimited. A key to all the subfamilies, including those traditionally placed in the Asclepiadaceae, Periplocoideae, Secamonoideae and Asclepiadoideae, is given later along with a further discussion on the relationships within the family.

DISTRIBUTION

The Apocynaceae s.l. is one of the ten largest angiosperm families with about 4000 species in about 425 genera. It is found throughout the world although very much more diverse in the tropics. This work deals only with subfamilies Rauvolfioideae (c. 915 species in 84 genera) and Apocynoideae (c. 822 species in 77 genera), both of which have the same distribution as the family as a whole.

The largest genera within these two subfamilies are *Mandevilla* (c. 150 species) in the Americas, *Alyxia* (c. 106 species) in Southeast Asia, Australia and the islands of the Pacific, *Tabernaemontana* (c. 100 species), which is pantropical, and *Aspidosperma* (c. 70 species) in the Americas.

In Malesia there are 43 native genera in these two subfamilies. The largest genus in Malesia is *Alyxia* with 55 species followed by *Parsonsia* with 27 species (one with 7 varieties), *Kopsia* with 18 species and 2 varieties, *Alstonia* with 16 species, *Kibatalia* with 15 species, and *Anodendron* and *Tabernaemontana* with 14 species each. Altogether there are 295 native species in Malesia, comprising 304 taxa when one includes infraspecific taxa. There is a decrease in the number of genera from West to East with 34 genera in Peninsular Malaysia and only 21 genera in New Guinea. Species and infraspecific taxon diversity is highest in Peninsular Malaysia with 109 taxa



Map 1. Distribution of Apocynaceae in Malesia. Numbers for each region refer to number of genera / total number of species / number of endemic species.

and New Guinea with 108 taxa. Endemism is particularly high in the Philippines and New Guinea. Diversity and endemism is surprisingly low in Sumatra but this may be an artefact of collecting and with better collecting the known diversity may go up (with a possible corresponding decrease in endemism in Peninsular Malaysia if some of those species turn up in Sumatra). — **Map 1.**

HABITAT AND ECOLOGY

Species of Apocynaceae occur in almost all habitats in Malesia up to a maximum of about 3400 m altitude. Most species, however, occur at lower altitudes in primary or secondary forest. The trees may be large with crowns in or above the canopy, although these are almost entirely restricted to the genera *Dyera* and *Alstonia*. Although a number of *Alstonia* species can be very large many form only small trees or even shrubs. Most Malesian tree genera contain species which are rather small understorey trees such as are found in *Hunteria*, *Kibatalia*, *Kopsia*, *Rauvolfia*, *Tabernaemontana*, *Voacanga* and *Wrightia*. In most of these genera some species are small understorey trees and others are merely shrubs.

The climbers are often found at forest margins or river edges (although this may be a collecting artefact). They can be huge lianas climbing up into the canopy or small scramblers over shrubs and rocks, particularly at higher altitudes. It may even vary within a species. Species such as *Micrechites polyphylla* and *M. serpyllifolius* scramble over low vegetation or rocks, and maintain rather delicate branches and leaves when doing so, but if the opportunity arises for them to climb high into the canopy they will then develop a large woody trunk and much larger leaves. This may be a feature that is present but unrecorded in many other Apocynaceae climbing species.

A number of species are found in drier conditions, such as scrub forest, including species in the genera *Holarrhena*, *Spirolobium*, *Carissa*, *Amphineurion*, *Alyxia*, *Aganosma*, *Urceola* and *Parsonsia*. No species are found in true mangrove but *Cerbera* and *Ochrosia* species are often found on the edge of brackish estuaries or on the upper beach and have fruit that are likely spread by water, including by salt water. *Dyera polyphylla*, *Alstonia pneumatophora* and *Alstonia spatulata* are all trees of swamp forest. *Dyera polyphylla* and *Alstonia pneumatophora* both have pneumatophores (which assist in respiration when the soil is waterlogged) often at quite some distance from the tree itself. A number of climbers have also been recorded from swamp forest although in most cases not exclusively so. The highest recorded altitudes species of Apocynaceae, subfamilies Rauvolfioideae and Apocynoideae, in Malesia are in the genera *Alyxia* and *Parsonsia*. In both genera the species found at high altitudes are small scrambling plants.

POLLINATION AND DISPERSAL

The pollination biology of species of Apocynaceae, subfamilies Rauvolfioideae and Apocynoideae, in Malesia has not been reported in any detail. In the family as a whole detailed studies are rare. Most detailed are in the genera *Asclepias* (see Wyatt & Broyles 1997), *Rauvolfia* (Koch et al. 2002) and *Mandevilla* (Torres & Galetto 1998). Albers & Van der Maesen (1994) have reported more generally on the pollination biology of some West African native and cultivated species.

The flowers of Apocynaceae are bisexual and protandrous. In a few cases (in *Rauvolfia* and *Carissa*) the flowers are reported to be functionally dioecious (Koch et al. 2002). This condition could be much more widespread in the family than has been appreciated. Boiteau & Allorge (1978) suggested that the species they placed in their subfamily Plumerioideae (= Rauvolfioideae but with a narrower circumscription) were autogamous and that the species they placed in subfamily Tabernaemontanoideae (= Rauvolfioideae, tribe Tabernaemontaneae) were cross pollinators. Subsequent work has not supported this difference although self-compatibility has been reported in a few species (Albers & Van der Maesen 1994; Koch et al. 2002).

The Apocynaceae s.l. contains a wide range of floral morphologies reflecting a diversity of potential pollination systems. These range from the relatively simple in subfamily Rauvolfioideae to the extremely complex pollination systems in species of subfamily Asclepiadoideae. The basic trend is for more complex floral morphologies and increased synorganisation within the androecium, and between the androecium and the gynoecium, from the Rauvolfioideae to Apocynoideae to Periplocoideae to Secamonoideae to Asclepiadoideae. However, the phylogenetic relationships between these subfamilies is not entirely clear resulting in a lack of detailed knowledge of the evolutionary relationships between taxa with these morphologies and the pollination pressures which may have led to their evolution.

In the Rauvolfioideae and Apocynoideae the pollen is shed shortly before anthesis and may be secondarily presented on the style head. Albers & Van der Maesen (1994) have demonstrated that the tip of the style head is always unreceptive to pollen in Rauvolfioideae and Apocynoideae. In the Rauvolfioideae, where the stamens are not

attached to the style head, the corolla may fall off shortly after the male phase (which often leads to large collections of herbarium specimens with almost no open corollas for examination!). In the Apocynoideae, where the stamens are attached to the style head, the corolla is generally longer lasting.

In the Apocynoideae the margins of the anthers are lignified and the anthers are adnate to the style head. There is only a narrow slit between one anther and the next and the lignified margins likely act as guide-rails for pollinators. As the anthers are also adnate to the style head, effectively forming a plug in or at the top of the corolla tube, the 5 slits between the anthers are the only way to reach the nectar at the base of the flower. In the Rauvolfioideae the morphology is not as complex but with the position of the anthers and sometimes with internal hairs, and in a few cases with corona lobes, a similar function is achieved. In some genera the corolla is not salverform and the pollination system not so readily apparent. In *Beaumontia* the anthers remain adnate to the style head but the corolla is so large and open and the filaments and style are so long that there is no barrier for any pollinator to enter the flower. How pollination is effected is unclear but may be by flies.

Albers & Van der Maesen (1994) suggest that more or less all Apocynaceae, subfamilies Rauvolfioideae and Apocynoideae, are pollinated by Lepidopteran or Hymenopteran insects. They point to their own field studies and to the long narrow tubes of most species as evidence for this. It would certainly take an extremely long-tongued animal to reach the nectar of species such as *Kopsia flavida* with a corolla tube up to 4.9 cm long. Pollen transfer is likely to be on the mouth parts.

Fruit dispersal in Malesian Apocynaceae has largely to be inferred from the fruit morphology rather than because we have much direct evidence, especially in subfamily Rauvolfioideae. All species in subfamily Apocynoideae (with the exception of *Eucorymbia*), plus *Alstonia* and *Dyera* from subfamily Rauvolfioideae, have dehiscent fruits and wind blown seeds. In the Apocynoideae the seeds have a coma of hairs at one or both ends, in *Alstonia* the seeds have a ciliate margin, and in *Dyera* they have a wing, all morphological adaptations to wind dispersal. I can attest to how effective this can be when on many occasions having found seeds on the ground I have subsequently been unable to find the parent plant, suggesting the plant might be quite far away. The fruit of *Cerbera* and *Ochrosia* species are mostly very fibrous or have air-filled cavities, possibly adaptations to dispersal by water. Many species in both genera are riverine or littoral in their distribution which would reflect this. Most species in subfamily Rauvolfioideae, however, are probably dispersed by birds or mammals. Most of them have fleshy berries or drupes and some also a fleshy aril around the seed. There remain, though, many unknowns to explain fruit and seed morphology in the Apocynaceae. It is unclear what would be able to penetrate the hard fruit wall of species of *Melodinus* to access the pulp around the seeds within but may be large-billed birds or rodents. *Chilocarpus* fruits develop as fleshy berry-like fruit suggesting animal dispersal but ultimately they dehisce to expose seeds that have a corky aril. What then would be attracted to these arillate seeds is not known. Why do the seeds of *Eucorymbia alba* from subfamily Apocynoideae not have a coma and without a coma how are the seeds dispersed from the dehiscent fruits?

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TAXONOMY

The Apocynaceae is in the Gentianales along with the Rubiaceae, Gentianaceae, Loganiaceae and Gelsemiaceae (see Backlund et al. 2000). Within the order it is characterised by the possession of latex. The latex is most often white, less often clear, yellowish or bluish, and only rarely absent.

The Apocynaceae is a family in flux due to recent advances made in our understanding of the relationships between and within the families of the Gentianales through molecular phylogenetic studies (Sennblad & Bremer 1996, 2000, 2002; Endress et al. 1996; Sennblad et al. 1998; Potgieter & Albert 2001; Livshultz et al. in press; Simões et al. in press). The principal effect of this is the acceptance by most authors that the Asclepiadaceae is nested within the Apocynaceae and can no longer be maintained as a separate family. These molecular studies, followed on from morphological studies which had already begun to question the distinction between the two families (Wanntorp 1989; Judd et al. 1994). In recent years much of the taxonomic literature on genera traditionally placed in the Asclepiadaceae has been published under the title of a work in the Apocynaceae, qualified by a reference to one of the three former Asclepiadaceae subfamilies (e.g. Livshultz et al. 2005). It may even be the case that the former Asclepiadaceae is not monophyletic and that two separate clades are independently nested within the Apocynaceae s.s. (Livshultz et al., in press). The Apocynaceae s.s. is very clearly paraphyletic. Whether one agrees with the notion that all families must be monophyletic or not there is little doubt, even from a more traditional perspective, that the characters used to delimit the Apocynaceae and Asclepiadaceae, particularly in the nature of the pollination system, are frequently not nearly as clearly demarcated as is often supposed (Goyder 1999). Resistance to change from authors on Apocynaceae s.s. and Asclepiadaceae has been largely absent although this does little to alter the fact that researchers continue to work largely in either one or the other part of the family making comprehensive floristic accounts to include all species of the Apocynaceae s.l. a near impossibility at this stage. Hence this flora account is really the publication of the Apocynaceae in the traditional sense, whilst recognising that it is merely an account of two of the subfamilies of the Apocynaceae s.l. This may not, however, impress strict adherents of monophyletic taxa because it is also clear that subfamilies Rauvolfioideae and Apocynaceae are paraphyletic (see below). What cannot be disputed though is how little is currently known about the taxonomy of most of the genera placed in the subfamilies traditionally included in the Asclepiadaceae. It will take many more years

before accounts of these subfamilies will be ready for publication in Flora Malesiana and to wait to publish subfamilies Rauvolfioideae and Apocynoideae, would be a disservice to Malesian botany.

Endress & Bruyns (2000) have published a classification of the combined family which includes five subfamilies. Two of these, Rauvolfioideae and Apocynoideae, constitute the Apocynaceae in the traditional sense and the other three, Periplocoideae, Secamonoideae and Asclepiadoideae, constitute the former Asclepiadaceae. They also included a tribal classification within these subfamilies, some of which are in need of substantial revision (Livshultz et al. in press; Simões et al. in press), particularly in subfamily Apocynoideae.

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KEY TO THE SUBFAMILIES OF APOCYNACEAE
(adapted from Endress & Bruyns 2000)

- 1a. Anthers free from style head; corolla lobes most often sinistrorse, sometimes dextrorse; fruit dehiscent or indehiscent, syncarpous or apocarpous, a berry, drupe, follicle or capsule; seeds simple or with wings, a ciliate margin or with an aril, without a coma at one end **Rauvolfioideae**
- b. Anthers adnate to the style head, sometimes only weakly so; corolla lobes in bud most often dextrorse, sometimes sinistrorse or valvate; fruit dehiscent, a pair of follicles, mostly apocarpous or reduced to one or postgenitally fused; seeds mostly compressed, mostly with a coma at one end, occasionally at both ends, rarely absent 2

- 2a. Disk, if present, in a ring around the base of the ovary; anthers 4-locular; pollen shed as monads (in Malesia); style head secretions for pollen transport normally a foamy adhesive or gummy, undifferentiated translators, pollinia absent; seeds without a thin margin. **Apocynoideae**
- b. Disk located in alternistaminal troughs on staminal feet or staminal tube; anthers 2–4-locular; pollen shed as tetrads or in pollinia; style head secretions for pollen transport forming differentiated translators with sticky end or consisting of a rigid clip and two flexible arms; seeds often with a thin margin 3
- 3a. Anthers 2-locular, pollen enclosed in pollinia covered by waxy outer wall. **Asclepiadoideae**
- b. Anthers 4-locular, pollen shed as tetrads or, if in pollinia, then without waxy outer wall 4
- 4a. Translators with sticky end which adheres to pollinator for removal; pollen usually shed in tetrads, or occasionally in pollinia, from anthers onto spoon- or cornet-shaped receptacle of translator. **Periplocoideae**
- b. Translators with hardened, cliplike corpusculum in which some part of the pollinators body becomes caught for removal; pollen in 4 minute pollinia attached directly or indirectly to the corpusculum **Secamonoideae**

RAUVOLFIOIDEAE

Trees, shrubs or climbers, rarely herbs. *Leaves* opposite or in whorls or spirally arranged. *Inflorescence* cymose, flowers rarely solitary; terminal or axillary. *Flowers* 5-merous, rarely 4-merous (in *Leuconotis* and occasionally in *Alyxia kabaenae*); actinomorphic or, very rarely, slightly zygomorphic. *Sepals* with or without colleters inside. *Corolla* sympetalous; mostly salverform; lobes usually sinistrorse, rarely dextrorse (in *Alstonia* p.p., *Carissa* p.p., *Kopsia*, *Ochrosia*); corona sometimes present and then usually at the level of the stamens or in throat. *Stamens* inserted on the inside of the corolla tube; completely included; anthers ovate, usually fertile for entire length, free from the style head. *Disk* present or absent. Gynoecium 2-carpellate and apocarpous but united into a common style, a syncarpous 2(–5)-locular ovary (in *Lepinia* only partly syncarpous) or a unilocular ovary; style head with a stigmatic base and a 2-cleft apex. *Fruit* dehiscent or indehiscent; a drupe, berry, capsule or follicle. *Seeds* simple, arillate, winged, or with a ciliate margin.

Native Malesian genera — *Alstonia*, *Alyxia*, *Carissa*, *Cerbera*, *Chilocarpus*, *Dyera*, *Hunteria*, *Kopsia*, *Leuconotis*, *Lepinia*, *Lepiniopsis*, *Melodinus*, *Ochrosia*, *Rauvolfia*, *Tabernaemontana*, *Voacanga*, *Willughbeia*.

APOCYNIOIDEAE

Trees, shrubs or climbers. *Leaves* opposite or, rarely, in whorls; occasionally with domatia on the undersides of the laminae. *Inflorescence* cymose, rarely fasciculate or flowers solitary; terminal or axillary. *Flowers* 5-merous; actinomorphic. *Sepals* usually with colleters inside. *Corolla* sympetalous; salverform, infundibuliform, urceolate or

rotate; lobes mostly dextrorse, more rarely valvate (*Parsonsia* p.p., *Urceola* p.p.) or sinistrorse (*Parameria*, *Wrightia*). *Stamens* inserted on the inside of the corolla tube; completely included or exerted; anthers sagittate, adnate to the style head, sometimes only weakly so; usually with the base and apex sterile. *Disk* present or absent. *Ovary* of 2 separate carpels united into a common style, sometimes postgenitally fused (*Parsonsia*, *Wrightia* p.p.); style head with a stigmatic base and a 2-cleft apex. *Fruit* a pair of follicles, sometimes single by abortion or postgenital fusion. *Seeds* with an apical and/or basal coma, this rarely lacking (*Eucorymbia*).

Native Malesian genera — *Aganosma*, *Amphineurion*, *Anodendron*, *Baharuia*, *Beaumontia*, *Carrutherisia*, *Chonemorpha*, *Cleghornia*, *Ecua*, *Epigynum*, *Eucorymbia*, *Holarrhena*, *Ichnocarpus*, *Kibatalia*, *Micrechites*, *Papuechites*, *Parameria*, *Parsonsia*, *Pottsia*, *Spirolobium*, *Strophanthus*, *Trachelospermum*, *Urceola*, *Vallariopsis*, *Vallaris*, *Wrightia*.

Taxon ranks — Attempts to maintain consistency in species concept across the family have been made. However, with different numbers and quality of specimens to contend with, markedly different suites of characters to evaluate, different taxonomic histories for the taxa studied to take into account, and my accumulated understanding of characters and biogeographic patterns over the period of time that this work was undertaken, to state that all taxa have been evaluated on the same set of criteria would be foolish. I would hope though that my use of the rank of species is fairly consistent even if I could not guarantee it. My use of the rank of subspecies is when I believe a single species can be separated into one or more entities on at least one observable morphological difference and there is no geographical overlap between them. A variety has the same degree of morphological distinctness but is not geographically distinct to the same degree. Again there is a large degree of subjectivity in this assessment coupled, in this region, with the fact that large areas are inadequately collected and it is, therefore, not always possible to tell whether distribution patterns of taxa are real or an artefact of where collecting has occurred. For example in *Parsonsia sanguinea* a number of varieties are recognised, some of which show distinct geographical isolation suggesting that they may better be recognised as subspecies. However, the highlands of New Guinea, where this species occurs, are known to be inadequately collected so the geographical isolation of these taxa and, indeed, the morphological basis for the taxa may disappear as more and better collections are made. Lastly I might add that I have on the whole been rather reluctant to use infraspecific taxa at all, precisely for the reason that it seems to assume a level of understanding of patterns of variation and distribution that are simply not possible with the herbarium material currently available.

VEGETATIVE MORPHOLOGY

Growth form — In Malesia the Apocynaceae, subfamilies Rauvolfioideae and Apocynoideae, may be large or small trees, shrubs, lianas or small twiners. There are no native herbs or succulents in Malesia but these do occur in these two subfamilies in other parts of the world (e.g. *Catharanthus* and *Pachypodium*, respectively). As has been

discussed above the trees tend to be relatively small. Buttresses are fairly uncommon, only ever becoming large in a few of the large species of *Alstonia*. A few species have pneumatophores as discussed above. Some species of *Alstonia* have a pagoda-like growth habit where a whorl of branches grow out almost horizontally forming dense shade underneath. Growth is then continued by an axillary bud which forms a long unbranched vertical pole which then again eventually branches to form another whorl of branching above the first, and so on. This has probably evolved to decrease competition immediately beneath the tree by shading out other plants. In some of the climbing species the trunks and branches may develop quite large corky protuberances, often flat but erect, which can sometimes be as much as 1 cm high. In many other species there are more simple lenticels on the trunks, branches and branchlets of species. The differing lenticels can sometimes be a useful guide to identification. For example, the different form of the lenticels on the pneumatophores of *Dyera polyphylla* and *Alstonia pneumatophora* can serve to distinguish them at some distance from the trunks of the trees. They can also be a guide, rather than a defining character, for some genera where the lenticels are particularly dense on branchlets, such as in *Strophanthus*.

Latex — All native species have latex, usually white but occasionally clear, yellowish or bluish. It is not always immediately apparent in all plant parts. Not enough data has been collected on the colour, distribution in plant parts, or volume produced to know whether this might prove a useful taxonomic character in the family as a whole. It is known to be a useful sectional character in *Alstonia* (see there).

Spines and tendrils — Only one genus, *Carissa*, has species which bear spines and only one, *Willughbeia*, that bear tendrils.

Indumentum — There are hairs at least somewhere on the plant on almost all species of Apocynaceae in Malesia. These hairs are uniseriate or unicellular. Very often the hairs are minute and are lost on mature vegetative parts.

Leaves — In Malesia the leaves of Apocynaceae, subfamily Rauvolfioideae, may be spirally arranged, in whorls or, most commonly, opposite. In all other subfamilies they are primarily opposite, and only very rarely in whorls (in Malesia only in *Parsonsia* and possibly, rarely, in *Parameria*). Stipules, strictly speaking, are absent but there is often a raised interpetiolar line and in some *Alstonia* species and in *Dyera* there are small intrapetiolar stipule-like structures. In *Chilocarpus*, *Tabernaemontana*, and *Voacanga* there are small intrapetiolar ocrea. Colleters, which are small awl-shaped glands, are very often present in the axils of the petioles with the leaves and sometimes in a ring around the node on the interpetiolar line. In some genera these glands may also be found on the petiole and the leaf blade but not in Malesian Rauvolfioideae and Apocynoideae. It is unclear if there are any species that are deciduous in Malesia although some species of *Wrightia*, particularly *W. pubescens* subsp. *lanitii*, are known to be deciduous further north in seasonal climates and may be so in the more seasonal parts of Malesia such as the Lesser Sunda Islands. The leaves are always simple and, in Malesia, almost always entire (but see *Dyera*). The leaves of most species are coriaceous to varying degrees although thinner leaves are known in many genera. Leaves of remarkably dif-

ferent shapes are known within species in *Chilocarpus*, *Micrechites* and *Parsonsia* (and possibly in *Willughbeia*) and may simply be unrecorded in other genera. Changes in leaf shape may be due to differing levels of maturity, growth form (for species that may scramble or climb depending on conditions) or response to light. A number of species from several genera have leaves which are punctate beneath. This is a character for all species in *Chilocarpus* and *Leuconotis* but is a useful diagnostic character for species within other genera such as *Anodendron* and *Alyxia*. The venation is always pinnate and in most species there is an intramarginal vein although this is rarely strong enough to be a noticeable feature.

REPRODUCTIVE MORPHOLOGY

Reproductive morphology is enormously variable in the Apocynaceae and extremely complex in the subfamilies in the former Asclepiadaceae. These forms will not be discussed here.

Inflorescence — Inflorescence structure within the Apocynaceae, subfamilies Rauvolfioideae and Apocynoideae, has been discussed by Steck & Weberling (1989) who analysed several species occurring in Malesia. They conclude that the basic pattern is a determinate inflorescence with variations on a thyrsoidal-paniculate branching pattern. These variations include the fascicle-like inflorescences of *Kibatalia* species and the cincinnate inflorescences of some *Kopsia* species. Most inflorescences, whether axillary or terminal or a combination of both, are quite clearly dichasial.

Calyx — The calyx consists of 5 sepals (4 in *Leuconotis* and rarely in *Alyxia*). The sepals are mostly free but are consistently fused for up to half the length in species of *Chilocarpus* and can be fused for almost the entire length in *Chonemorpha* and *Voa-canga* species. In a few *Alyxia* species the calyx is irregularly 2-lipped. The presence or absence of colleters on the inner face of the sepals and, if present, their arrangement, can be a useful taxonomic character.

Corolla — The corolla is 5-merous (4-merous in *Leuconotis* and, rarely, in *Alyxia*), always sympetalous and most commonly salverform but may also be infundibuliform or, more rarely, rotate or urceolate. In Malesia all native species are actinomorphic (but with a hint of zygomorphy in some *Baumontia* species). The commonly cultivated species of *Allamanda* are weakly zygomorphic. The corolla ranges in size from less than 2 mm long in some *Urceola* species to the flowers of *Baumontia murtonii* which may be about 10 cm long and about 6.5 cm across at the mouth. Many species have long thin corolla tubes and simple, elliptic, spreading or erect petals. The corolla tube often widens at the point of stamen insertion to form a lower tube and a slightly wider, or occasionally funnel form, upper tube. In species that do not widen there is still usually a noticeable bulge in the tube around the anthers.

A number of genera have a corona which, in Malesia, is always in the throat except in the genus *Cerbera* where it may be lower down in the tube. In *Cerbera* the corona would appear to play a very direct role in the pollination system due to its close association with the androecium and gynoecium, whereas in most other genera it would

appear to be only part of the general attraction of the flower to pollinators. There is, however, no published work to back up these musings. The corona found in the throat ranges from the very small and simple in *Papuechites* and most *Melodinus* species to the frequently highly complex and multiseriate of some species of *Wrightia*. The form of the corona is a useful taxonomic character in the genera in which it is present, especially in *Wrightia*.

The aestivation of the corolla lobes is a very important character within the family. Aestivation may be dextrorse, sinistrorse or valvate. In Malesia valvate corolla lobes only occur in genera where other congeneric species are dextrorse. The lobes themselves vary from simple symmetrical triangular lobes in some *Urceola* species to symmetrical ovate lobes to strongly falcate elongated lobes to the long and thin ribbon-like lobes of some *Strophanthus* species.

Androecium — There are 5 stamens (4 in *Leuconotis*) arising from the inside of the corolla tube. In subfamilies Rauvolfioideae and Apocynoideae they are clearly differentiated into filaments and anthers, each with 2 thecae, and each of these with 2 pollen sacs. The filaments can be long (e.g. *Beaumontia*) to more or less absent. In most Rauvolfioideae the filament is short and thin; in most Apocynoideae it is short and wide. In *Vallaris* there is a large protuberance on the back of the insertion of the filament to the anther. The anthers are mostly introrse, more rarely slightly latrorse. In most Rauvolfioideae the anthers are relatively undifferentiated, ovate, basally cordate, apically acute and fertile for more or less the entire length. In some *Tabernaemontana* species, *Voacanga* and most Apocynoideae the anthers have lignified guide rails along the margins and have a sagittate base and an acuminate apex. In these taxa pollen production is restricted to near the apex of the anthers. In most genera the stamens are completely included within the corolla tube but in some genera of Apocynoideae the stamens may be slightly to wholly exerted from the corolla tube. The anthers in *Strophanthus* (and the non-Malesian *Nerium*) have long drawn out awns at the apex.

In subfamily Rauvolfioideae the stamens are not attached to the style head and in Apocynoideae they are attached to the style head. In *Carruthersia*, *Holarrhena* and *Spirolobium*, all in the Apocynoideae, the attachment is so weak as to appear absent (see Endress et al. 1990). In *Eucorymbia* the attachment is also weak but nevertheless apparent. The form of the attachment of the stamens to the style head was termed the retinacle by Pichon (1948). He recognised several different kinds of retinacle around the basic theme of a pad of hairs on the front of the connective being attached to the style head. Sometimes there is also a second cellular attachment from the front of the anthers to the style head.

Disk — A disk, or nectary, is present in most genera. Its function is to produce nectar for pollinator attraction and reward. It may be a simple small or large annular ring, a ring with a crenate or dentate apex or of 2 or 5 distinct lobes. Its presence, absence or form is a useful taxonomic character.

Gynoeceium — The most common type of gynoeceium in the Apocynaceae, subfamilies Rauvolfioideae and Apocynoideae (and indeed sensu lato), is of two apocarpous carpels which unite to form a common style. In Asia only *Lepinia* and *Lepiniopsis* have more

than two carpels, both with 3–5 carpels. A number of genera in Rauvolfioideae have congenitally syncarpous ovaries (e.g. *Carissa*, *Chilocarpus*, *Lepinia*, *Leuconotis*, *Melodinus*, *Willughbeia*) and these may be unilocular (e.g. *Willughbeia*) or bilocular (e.g. *Carissa*). Sometimes the ovaries can be syncarpous only at the base and apocarpous apically (e.g. in *Lepinia* and some species of *Ochrosia* and *Rauwolfia*). Congenital syncarpy is absent in all other subfamilies but postgenital syncarpy is found in all species of *Ecua* and *Parsonsia* and some species of *Wrightia*. Postgenital syncarpy is also found in one species of *Alstonia* from the Rauvolfioideae. The placentation is parietal when unilocular, mostly axile when bilocular. Each carpel has 2–many ovules. In some genera (e.g. *Hunteria*, *Kopsia*) only one of the ovules develops in each carpel. The style is always syncarpous, even when the carpels are apocarpous. The style is topped with a style head. In most genera this style head is differentiated into a number of regions, each of which has a separate function and only one of which is the receptive stigmatic surface. The stigmatic surface is mostly in the lower portion or beneath a collar at the base of the style head. Other parts of the style head are secretory and, in all but the Rauvolfioideae, these secretions form the adhesive that binds the stamens to the style head or forms the translators in the subfamilies of the former Asclepiadaceae. Characters from the gynoecium are enormously important for generic delimitation in the Apocynaceae.

Fruit — As most genera of Apocynaceae have two apocarpous carpels they develop paired fruits. In subfamily Apocynoideae these are uniformly paired follicles except in *Ecua*, *Parsonsia* and those species of *Wrightia* with postgenitally syncarpous carpels where there is a solitary follicle quite clearly composed of two parts. Dehiscence is along the line where the carpels fuse. In the Rauvolfioideae the fruits are much more variable and may be capsules, berries, drupes or follicles. In many genera and species the fruits are still paired but in those that have developed from a syncarpous ovary the fruits are solitary. In some species of *Ochrosia* and *Rauwolfia* the fruit is hemisyncarpous reflecting the partial nature of the fusion in the ovaries of these species. Follicles in both subfamilies are usually fusiform to linear but the other fruit types come in a variety of shapes and sizes. These include the simple globular berries of species in *Carissa* and *Willughbeia*, the woody-walled berries of *Melodinus*, and the moniliform drupes of *Alyxia*. Perhaps the most bizarre in Malesia are in *Kopsia* where the paired drupes of most species have a projection, often curved, arising from the edges facing each other, and in *Lepinia*, where the fruit forms an open-sided basket-like effect. This projection is generally air-filled but *Kopsia* species are not generally maritime or riverine so it is unlikely to serve as flotation device. What its function is, if any, remains a mystery.

Seeds — The seeds of all species of subfamily Apocynoideae are comose with the exception of *Eucorymbia* which lacks a coma. The coma is most commonly micropylar, i.e. with the coma directed towards the apex of the follicles. In *Kibatalia* and *Wrightia* the coma is chalazal, i.e. directed towards the base of the fruit. In *Strophanthus* there is a coma at both ends although the chalazal coma is generally smaller and easily falls off. The grain of most species is somewhat flattened and more often glabrous than pubescent. The seeds of Rauvolfioideae are much more variable and may be simple, ciliate, winged or arillate. *Seeds* in both subfamilies provide useful taxonomic characters.

Shrinkage — The dimensions given in the descriptions are for dried plants except for the gynoecium and androecium characters which have been measured from flowers reconstituted by boiling in water. Flower parts are, generally speaking, 10–15% larger after reconstitution.

References: Endress, M.E., M. Hesse, S. Nilsson, A. Guggisberg & J.-P. Zhu, The systematic position of the Holarrheninae (Apocynaceae). *Pl. Syst. Evol.* 171 (1990) 157–185. — Pichon, M., Classification des Apocynacées. 19: Le Rétinacle des Echitoidées. *Bull. Soc. Bot. France* 95 (1948) 211–216. — Steck, H.-J. & F. Weberling, Inflorescenzuntersuchungen an Apocynaceae. *Trop. Subtrop. Pflanzenwelt* 71 (1989) 1–62.

CHROMOSOMES

The most comprehensive information on the chromosomes of the Apocynaceae is by Van der Laan & Arends (1985) and, for the former Asclepiadaceae, Albers & Meve (2001). In subfamilies Rauvolfioideae and Apocynoideae basic chromosome numbers of $x = 6, 8, 9, 10, 11, 12, 16, 18, 20, 21$ and 23 have been found. The most common basic chromosome number is $x = 11$. Polyploidy has been reported within species (e.g. *Rauvolfia serpentina*), although these represent a small minority of species studied. Differing basic chromosome numbers within genera and/or infrageneric polyploidy has been reported for *Alstonia* ($2n = 22, 42, 44, 88$), *Alyxia* ($2n = 36, 160–190$), *Carissa* ($2n = 22, 66$), *Kopsia* ($2n = 36, 72$), *Rauvolfia* ($2n = 22, 44, 66, 88$) and *Tabernaemontana* ($2n = 22, 66$).

References: Albers, F. & U. Meve, A karyological survey of Asclepiadoideae, Periplocoideae and Secamonoideae, and evolutionary considerations within Apocynaceae s.l. *Ann. Missouri Bot. Gard.* 88 (2001) 624–656. — Van der Laan, F.M. & J.C. Arends, Cytotaxonomy of the Apocynaceae. *Genetica* 68 (1985) 3–35.

USES

Information on uses for Apocynaceae species in Malesia has been collated in the PROSEA series from where the following information has been gleaned (see <http://www.prosea.nl>). Almost all genera of Apocynaceae have species that are used to varying degrees and in a variety of ways. The principal uses of Apocynaceae species are, or were, in horticulture, medicine and the use of the latex. Some of the tree species have relatively minor uses in the timber industry and a few have edible fruits or leaves used for dyes.

Several Apocynaceae species are very familiar all through Southeast Asia from their frequent appearance in gardens and public spaces. The most commonly cultivated species are *Allamanda cathartica*, *Allamanda schottii*, *Plumeria obtusa*, *Plumeria rubra*, *Thevetia peruviana*, all from Central and South America, *Nerium oleander* from the Mediterranean region, *Adenium obesum* from Africa and Southwest Asia and *Catharanthus roseus* from Madagascar. Some native genera have commonly cultivated non-native species such as *Tabernaemontana divaricata* from Continental Asia, *Carissa carandas* from India and *Kopsia fruticosa*, probably native only in Burma. It is unclear whether the attractive shrub *Wrightia religiosa* is native in Peninsular Malaysia or only

further north, it is so commonly grown that its natural distribution has become rather obscure. Relatively few native species are as popular in gardens although a number of *Tabernaemontana* species are grown and *Cerbera odollam* is frequently grown as a street tree.

There is an increasingly large body of literature on the medicinal uses of Apocynaceae species. Some of this information is summarised under the relevant species below. The most promising medicinal plant in the family to date is *Catharanthus roseus* from Madagascar but now widely cultivated and naturalised throughout the tropics. In traditional medicine a decoction of all parts of the plant is used to treat malaria, diarrhoea, diabetes, cancer and skin diseases. Extracts prepared from the leaves are used externally as an antiseptic on wounds, against haemorrhage and as a treatment for toothache. It is also said to be effective against indigestion, dysentery and wasp stings and can be used as vomitive, purgative, vermifuge and a general purifier of the body. Indeed this list of traditional uses has led to pharmaceutical investigation and extracts of the plant are now industrially produced and prescribed in a wide range of anti-cancer chemotherapies. Extracts of the roots are also used to treat some of the effects of senility, dizziness, tinnitus, cranial traumas and other neurological problems by increasing the blood flow to the brain. Some antiviral, fungicidal and nematocidal activity has also been reported for this species, as well as its use in the protection of stored grain against insect attack. However, in all these treatments the toxic effects of the plant must also be considered. Very little of the commercial cultivation of *Catharanthus roseus* for the medical industry occurs in Southeast Asia.

The only other species to have attracted a similar level of attention are in the genus *Rauvolfia*, particularly *R. serpentina*. It has been used in the ancient practice of Ayurvedic medicine for the treatment of snake bites, mental illnesses and epilepsy. In other areas it has been used as a treatment for high blood pressure, for a wide range of mental health problems, liver diseases, dysentery and in childbirth. It has also been used externally for eye problems and as a treatment for wounds. Its commercial exploitation, however, has been much reduced in recent years because of the harmful side effects of the most important of the alkaloids that were extracted for the medical industry, reserpine. Other extracts are still used for the treatment of psychological and behavioural problems. Uses more specific to individual species are described under those species below. Several other species have important medicinal uses but are described under the relevant taxa below.

Some species were previously important for the production of rubber before *Hevea brasiliensis* came to dominate the industry. In particular the two *Dyera* species were tapped for making rubber and then later for the manufacture of chewing gum. However, this latter use is also now in decline. The latex of other species such as *Chonemorpha verrucosa*, *Leuconotis eugeniifolius*, *Leuconotis griffithii*, *Melodinus orientalis*, *Micrechites serpyllifolius*, *Urceola brachysepala*, *Urceola elastica*, *Urceola lucida*, *Urceola micrantha*, *Urceola torulosa*, *Willughbeia angustifolia*, *Willughbeia coriacea*, *Willughbeia edulis*, *Willughbeia flavescens*, *Willughbeia grandiflora*, *Willughbeia oblonga* and *Willughbeia tenuiflora* have also been exploited for use as rubber of varying quality.

A few species have edible fruits, particularly from subfamily Rauvolfioideae where berries occur. *Ochrosia ackeringae* is said to have edible seeds.

The trees in the Apocynaceae are generally not particularly important in the timber trade except possibly for some species of *Alstonia* which are separable into a light hardwood, corresponding to section *Alstonia*, and a medium-heavy hardwood, corresponding to section *Monuraspermum*. The latter can be used in construction. Further information can be found under the species. Most of the other tree species in the Apocynaceae yield a wood which is not of great quality and are used for small items like axe handles, light furniture, carving etc.

WOOD ANATOMY

(Pieter Baas, Frederic Lens & Elisabeth A. Wheeler)

Information on the wood anatomy of Apocynaceae is scattered in many publications. Those of the 20th century are comprehensively enumerated in Gregory's bibliography of systematic wood anatomy (1994). Only 20 out of the 43 Malesian genera have been studied in any wood anatomical detail. Information on the wood structure of these genera is summarized in standardized and coded form (following recommendations of the IAWA Committee 1989) on the InsideWood webpage (<http://Insidewood.lib.ncsu.edu>). The general description of the wood anatomy of the Malesian Apocynaceae given below is based on these coded descriptions, which in turn are largely based on literature cited at the end of this section. For the anatomy of Apocynaceae woods of commercial importance see the PROSEA Handbook Series (Soerianegara & Lemmens 1993; Lemmens et al. 1995; Sosef et al. 1998). Sidiyasa (1998) included a very detailed study of the systematic and ecological wood anatomy of *Alstonia* in his revision of the genus, and demonstrated the great phylogenetic and diagnostic value of wood anatomy in this genus at the sectional level.

Wood description of the Malesian Apocynaceae

Heartwood typically indistinct and white to grey or shades of yellow or light brownish. Grain of the tree species typically straight (but interlocked in *Hunteria*); texture fine and even.

Growth ring boundaries usually indistinct or absent, but clearly marked in some species (e.g. belonging to *Alyxia*, *Cerbera*, *Ichnocarpus*, *Ochrosia*, *Vallaris* and *Wrightia*).

Wood diffuse-porous, vessels solitary and in short to long radial multiples (of > 4 vessels, in *Alstonia*, *Cerbera* p.p., *Holarrhena*, *Lepiniopsis*, *Tabernaemontana* p.p., *Vallaris* p.p., *Voacanga* and *Wrightia*); vessels almost exclusively solitary and rounded in outline in *Alyxia**, *Carruthersia**, *Epigynum**, *Hunteria*, *Ichnocarpus**, *Ochrosia* p.p. and *Vallaris** p.p. (the asterixed genera are climbers); vessels solitary and in short multiples in other genera. Vessel frequency mostly over 20 per mm², but in lower densities in *Alstonia* sect. *Alstonia* (8–15 per mm²), *Carruthersia*, *Cerbera* p.p., *Dyera*, *Ichnocarpus* p.p. and *Vallaris*. Average vessel diameters usually well below 100 µm, but in *Alstonia* sect. *Alstonia*, *Carruthersia*, *Dyera* and *Ichnocarpus* vessels usually > 100 µm. Vessel element length ranging from short (< 350 µm) in *Wrightia* p.p. to medium (350–800 µm) in most species, to long (> 800 µm) in *Alstonia* p.p., *Cerbera* p.p., *Dyera*, *Hunteria*, *Ochrosia*, *Tabernaemontana* and *Vallaris*.

Vessel perforations simple in oblique to nearly horizontal end walls. Intervessel pits vestured, alternate, usually minute ($< 4 \mu\text{m}$) to/or small ($4\text{--}7 \mu\text{m}$), but up to medium-sized ($7\text{--}10 \mu\text{m}$) in some species of *Alstonia* sect. *Alstonia*. Vessel-ray pits with distinct borders, similar to intervessel pits. Helical vessel wall thickenings absent. Tyloses absent. Vessel deposits only recorded for *Alyxia*, *Epigynum* and *Wrightia* p.p.

Fibres mostly non-septate and with distinctly bordered pits (fibre-tracheids), but with simple to minutely bordered pits in *Ichnocarpus*, *Lepiniopsis*, *Rauvolfia* p.p., *Tabernaemontana* and *Voacanga*, and septate fibres present in *Rauvolfia* p.p., *Tabernaemontana* p.p. and *Voacanga*. Fibre walls usually of medium thickness ('thin- to thick-walled'), but fibres predominantly thin-walled in *Alstonia* sect. *Alstonia*, *Cerbera* p.p., *Dyera* p.p. and *Kibatalia* p.p. and fibres up to very thick-walled in *Alstonia* sect. *Monuraspermum*, *Alyxia*, *Hunteria*, *Lepiniopsis* and *Tabernaemontana* p.p. Fibres typically of medium lengths ($900\text{--}1600 \mu\text{m}$), but shorter in *Wrightia* p.p. and longer in *Alstonia* sect. *Alstonia* and *Tabernaemontana* p.p.

Parenchyma typically apotracheal diffuse, diffuse-in-aggregates and scanty paratracheal; absent or extremely rare in *Alyxia*, *Tabernaemontana* p.p. and *Voacanga*; vasicentric parenchyma recorded in *Cerbera* and *Ichnocarpus*; narrowly banded parenchyma, sometimes including marginal bands, typical of *Alstonia* sect. *Alstonia*, *Cerbera*, *Dyera*, *Hunteria*, *Kibatalia* and *Vallaris*. Parenchyma strand length covering the full range from two to over eight cells, most frequently 3–8 cells, but mostly shorter (2–4 cells) in *Wrightia*, and longer (including > 8 cells) in some species of *Alstonia* and *Holarrhena*.

Rays typically 1–3-seriate, but wider rays occur in *Alyxia*, *Dyera* p.p., *Holarrhena*, *Ichnocarpus*, *Ochrosia* p.p., *Rauvolfia*, *Tabernaemontana* p.p., *Voacanga* and *Wrightia* p.p. (in most of the latter taxa there is also a tendency for the rays to be of two distinct size classes); with multiseriate ray portions tending to be as narrow as uniseriate portions in *Alstonia* sect. *Alstonia* p.p., *Cerbera* p.p., *Kibatalia*, *Kopsia*, *Tabernaemontana* p.p. and *Wrightia* p.p. Rays typically heterocellular with procumbent body ray cells and usually over four rows of square to upright, marginal cells; rays with fewer rows (1–4) of upright cells common in *Alstonia* sect. *Alstonia*, *Cerbera* p.p., *Dyera* p.p., *Kibatalia* p.p., *Ochrosia* p.p. and *Tabernaemontana* p.p. Sheath cells typically absent, but present in *Voacanga* p.p.

Laticifers (fairly narrow latex tubes) present in the rays of *Alstonia* sect. *Alstonia*, *Dyera*, *Ichnocarpus*, *Tabernaemontana* p.p., and *Ochrosia* p.p. Large radial latex traces occasionally present in *Alstonia*, *Dyera*, *Rauvolfia*, *Tabernaemontana* and *Vallaris*.

Prismatic crystals common, rare or absent. In the most thoroughly studied genus *Alstonia* (Sidiyasa 1998) the whole range occurs of crystals in ordinary or chambered ray or axial parenchyma cells, and in procumbent and/or upright ray cells. In other genera crystals are recorded to be of more restricted distribution. Crystal sand coded as variable feature (in addition to prismatic crystals) in *Tabernaemontana* p.p. Silica bodies absent.

Preliminary analysis of diversity pattern

Despite the variation recorded above, the wood anatomy of the Apocynaceae s.s. (consisting of the subfamilies Apocynoideae and Rauvolfioideae sensu Endress &

Bruyns 2000) is fairly homogeneous. The wood of the former Asclepiadaceae (now considered as three subfamilies, Asclepiadoideae, Periplocoideae and Secamonoideae within the Apocynaceae sensu Endress & Bruyns 2000) shares many characters with that of the Apocynaceae s.s. (cf. Metcalfe & Chalk 1950) but tends to show more 'derived' character suites in some of its genera (like vasicentric/vascular tracheids, radial and flame-like vessel groups, ring-porosity, shorter vessel elements and fibres, storied structure and included phloem).

The differences between the wood of climbers and erect trees and shrubs of the Malesian Apocynaceae deserves further study. The above survey suggests a divergence in vessel grouping between the erect (vessels in multiples common, except in *Hunteria*) and climbing habit (predominantly solitary vessels). The considerable range in quantitative values of vessel diameter, vessel density and vessel element and fibre length summarized above is probably related to habit (climbing vs erect; shrub or small tree vs tall emergent trees) and ecology.

Since the wood anatomical diversity within the genus *Alstonia* has proven to contain such strong phylogenetic signals (Sidiyasa 1998), it seems most worthwhile to subject the wood anatomy of the entire family to a detailed modern wood anatomical analysis. This is currently in preparation by Frederic Lens et al. from the Catholic University of Leuven, Belgium.

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POLLEN MORPHOLOGY

(S. Lodder, E.M.J. Rutten & R.W.J.M. van der Ham)

The pollen of the Apocynaceae s.s. is mostly shed as monads. Tetrads occur in the Rauvolfioideae (tribes Tabernaemontaneae, Melodineae, Alyxieae) as well as in the Apocynoideae (tribe Apocyneae). Pollen grains of Rauvolfioideae are usually colporate, while those of Apocynoideae are nearly always porate. Psilate-perforate is the most common ornamentation type. Below, Apocynaceae pollen is described for each tribe separately, based on the literature provided by the 'Bibliographic index to the pollen morphology of Angiosperms' (Thanikaimoni & Van der Ham 1999) and a few more recent studies. The taxonomy follows Endress & Bruyns (2000), who listed 14 tribes with 161 genera, Hendrian (2004), who reduced *Neisosperma* to *Ochrosia* and Middleton (2006), who resurrected *Amphineurion* and *Micrechites*. 43 genera are native

to Malesia. The pollen of 20 out of the 162 genera is unknown, while that of 46 genera is known only from the general observations and schematic drawings in the taxonomic papers by Pichon published from 1946 to 1950 (Thanikaimoni 1976). More informative literature includes Huang (1986, 1989), Nilsson (1986, 1990a, b), Pire (1989), Endress et al. (1990, 1996, 2007), Roubik & Moreno Patiño (1991), Nilsson et al. (1993), Kuijt & Van der Ham (1997), Van der Ham et al. (2001), Van de Ven & Van der Ham (2006).

Rauvolfioideae

Tribe Alstonieae (9 genera; Malesia: *Alstonia*; Kuijt & Van der Ham 1997, Sidiyasa 1998). Pollen grains monads, mostly medium-sized (22–56 μm) and suboblate (P/E = 0.73–1.25), 3- or 5-colporate, but 2-colporate in several species of *Alstonia* section *Alstonia* and usually 4- or 5-colporate in *Aspidosperma*. Endoapertures circular to ellipsoidal, but H-shaped in *Alstonia* (sections *Blaberopus*, *Dissuraspermum* and *Monuraspermum*) and *Tonduzia*, and fused into an endocingulum in *Vallesia*. Ornamentation usually psilate to perforate, in *Alstonia* often slightly coarser (microfossulate) in the mesocolpium centres. More or less prominent extracolpal ridges occur in *Aspidosperma*, *Geissospermum* and *Vallesia*. — **Plate 1a–c.**

Tribe Vinceae (8 genera; Malesia: *Kopsia*, *Ochrosia*, *Rauvolfia*; Huang 1986, Endress et al. 1996, 2007). Pollen grains monads, medium-sized to large (29–95 μm), mostly subspheroidal (P/E = 0.65–1.28), 3- (or 4-)colporate. Ectoapertures usually long colpi, but sometimes short colpi (brevicolporate) or colpi fused at the poles (syn-colporate). Ornamentation usually psilate to perforate, sometimes also reticulate or with verrucae that diminish towards the mesocolpium centres (*Ochrosia*). In *Catharanthus*, *Kopsia*, *Petchia*, *Rauvolfia* and *Vinca* the mesocolpium centres are more or less depressed and have a slightly coarser ornamentation. — **Plate 1d, e.**

Tribe Willughbeieae (18 genera; Malesia: *Leuconotis*, *Willughbeia*). Pollen grains monads, medium-sized (27–47 μm), oblate to spheroidal, 3- or 4-aperturate, usually colporate with short colpi (brevicolporate; *Saba*), sometimes porate (*Lacmellea*). Ornamentation psilate-scabrate in *Lacmellea*, foveolate and psilate-perforate in *Saba*. Only *Lacmellea* and *Saba* have been sufficiently studied. Pollen unknown: *Cylindropsis*, *Pacouria*. — **Plate 1f.**

Tribe Tabernaemontaneae (19 genera; Malesia: *Tabernaemontana*, *Voacanga*; Huang 1986). Pollen grains monads, except for *Callichilia* and rarely *Tabernaemontana* (tetrahedral tetrads), medium-sized (25–67 μm), mostly suboblate (P/E = 0.68–0.93), sometimes more prolate (P/E = 1.06–1.71; *Stemmadenia*, *Tabernaemontana*), 3–5-colporate (*Macoubea* also 2-colporate), with short colpi (brevicolporate) and lalongate endopores, which are fused into an endocingulum (mostly with equatorial costae) in *Stemmadenia*, *Tabernaemontana* and *Voacanga*. The colpi are not meridional in *Carvalhoa*, *Schizozygia* and *Tabernanthe*, but seem to lie in the equatorial plane (Pichon 1948). Ornamentation usually psilate-perforate or foveolate, sometimes rugulate (*Neocouma*). Pollen unknown: *Bonafousia*, *Stenosolen*, *Woytkowskia*.

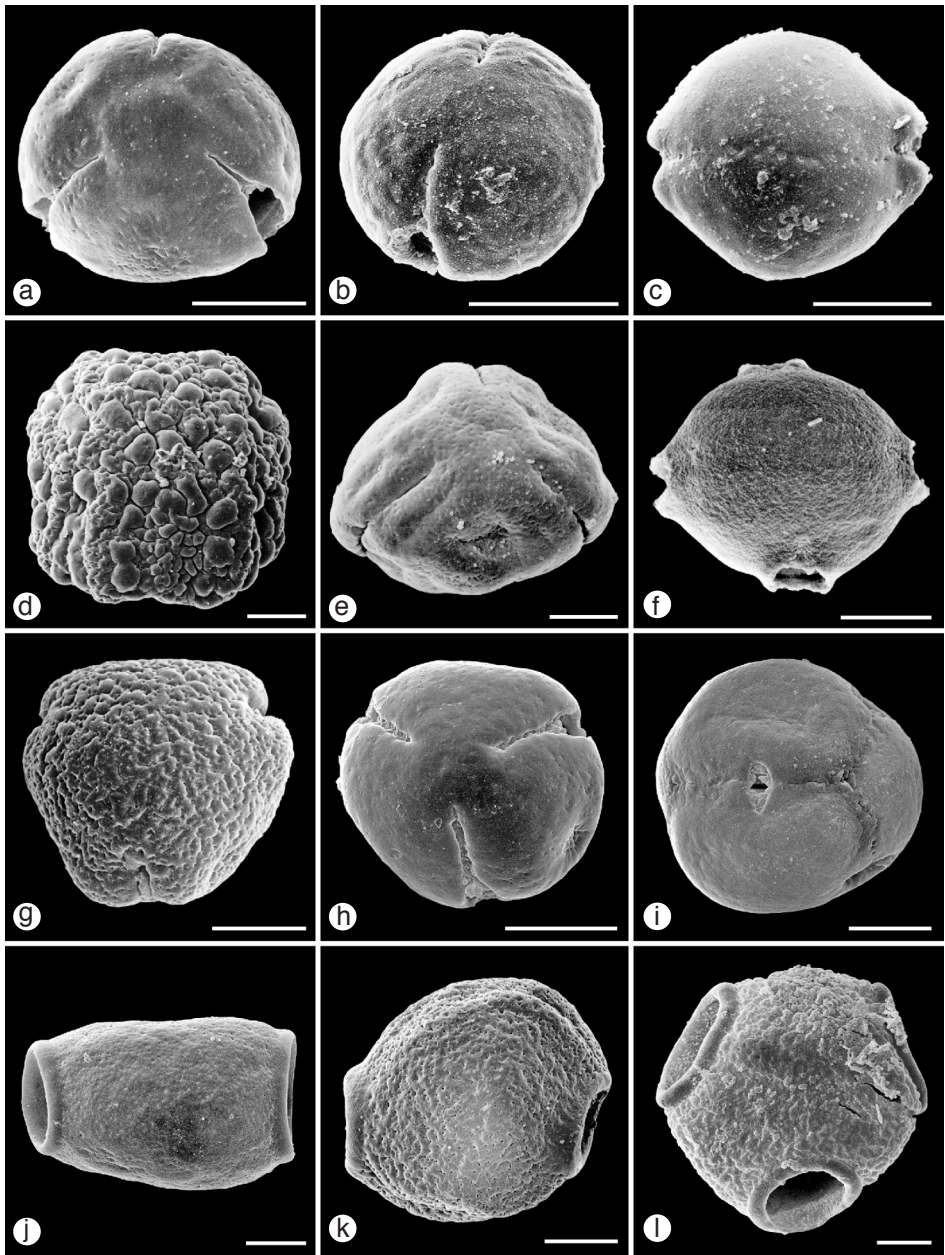


Plate 1. Pollen of Malesian Apocynaceae (Rauvolfioideae); scanning electron micrographs. **a.** *Alstonia beatricis* Sidiy., 3-colporate grain (New Guinea, Van Royen 5535); **b.** *Alstonia angustiloba* Miq., 2-colporate grain (Singapore, Henderson 37007); **c.** *Alstonia pneumatophora* Backer ex Den Berger, 2-brevicolporate grain (Borneo, Kostermans 4537); **d.** *Ochrosia coccinea* (Teijsm. & Binn.) Miq., 4-colporate grain (Bogor Bot. Gard. 30/8/1982a); **e.** *Ochrosia glomerata* (Blume) Valetton, 3-colporate grain (Bogor Bot. Gard. 30/8/1982c); **f.** *Leuconotis eugeniifolia* (Wall. ex G. Don) A.DC., 4-brevi-

Tribe Melodineae (8 genera; Malesia: *Dyera*, *Melodinus*; Huang 1986, Sidiyasa 1998, Van de Ven & Van der Ham 2006). Pollen grains monads, except in *Craspidospermum* (tetrads: mostly decussate or \pm flat, rarely T-shaped) and two species of *Melodinus* (tetrahedral tetrads), medium-sized (27–36 μm), suboblate to oblate spheroidal (P/E = 0.80–0.97), usually 3-colporate (*Melodinus* also 4-colporate) with short to long colpi, 5–10-periporate in *Craspidospermum*. Ornamentation psilate to perforate, or finely fossulate (*Dyera*); in *Melodinus* the mesocolpium centres may be more or less deviating, rugulate to fossulate or scabrate. — **Plate 1g–i.**

Tribe Hunterieae (3 genera; Malesia: *Hunteria*). Pollen grains monads, medium-sized (25–47 μm), suboblate to oblate spheroidal (P/E = 0.83–0.91), 3-colporate (*Hunteria* also 2-colporate) with short colpi (brevicolporate) and large endopores. Ornamentation rugulate-fossulate in *Hunteria*, scabrate in *Picralima* (unknown in *Pleiocarpa*).

Tribe Plumerieae (10 genera; Malesia: *Cerbera*; Huang 1986). Pollen grains monads, medium-sized (23–55 μm ; *Himatanthus*, *Mortoniella*, *Plumeria*, *Skytanthus*) to large (41–110 μm ; other genera), usually oblate spheroidal, rarely oblate or subprolate (P/E = 0.68–1.32), 3-colporate. Ornamentation usually psilate-perforate or psilate-scabrate.

Tribe Carisseae (2 genera; Malesia: *Carissa*; Nilsson 1986). Pollen grains monads, medium-sized (29–41 μm), prolate spheroidal, in *Carissa* sometimes suboblate (P/E = 0.86–1.09), 3-colporate (*Carissa* also 4-colporate) with short to long colpi. Ornamentation psilate-perforate, with more or less rugulate mesocolpium centres. Inner exine surface with endocracks in *Carissa*.

Tribe Alyxieae (7 genera; Malesia: *Alyxia*, *Chilocarpus*, *Lepinia*, *Lepiniopsis*; Huang 1986, Van der Ham et al. 2001, Endress et al. 2007). Pollen grains monads, except in *Condylocarpon* (tetrads, probably decussate), small to medium-sized (20–39 μm ; *Chilocarpus*, *Condylocarpon*, *Plectaneia*) or large (56–77 μm ; other genera), depressed to more or less barrel-shaped, sometimes spheroidal to ellipsoidal (position P and E axes unknown), 2- (or 3-)porate (*Alyxia*, *Chilocarpus*, *Plectaneia*, *Pteralyxia*), 2- or 3-porate (*Lepiniopsis*), 3–5-porate (*Lepinia*) or inaperturate (*Condylocarpon*); sometimes also 1-porate in *Chilocarpus* and *Plectaneia*. Pores usually with distinct, psilate annuli. Ornamentation psilate-perforate to fossulate (*Alyxia*, *Chilocarpus*, *Plectaneia*, *Pteralyxia*), psilate-imperforate (*Condylocarpon*) or fossulate-verrucate (*Lepinia*, *Lepiniopsis*). *Condylocarpon* pollen shows a set of deviating features (tetrads, inaperturate, very thin exine), which suggest that it is neotenic ('underdeveloped', yet viable). — **Plate 1j–l.**

colporate grain (De Vogel & Vermeulen 7488); **g.** *Dyera costulata* (Miq.) Hook.f., 3-brevicolporate grain (Sumatra, Endert 37E.ip.627); **h.** *Melodinus orientalis* Blume, 3-colporate monad (Flores, Schmutz 3168a); **i.** *Melodinus orientalis* Blume, 3-brevicolporate tetrad (Java, Winckel 1856b); **j.** *Alyxia rostrata* (Markgr.) Markgr., 2-porate grain (New Guinea, Widjaja & Hamzah 2982); **k.** *Chilocarpus torulosus* (Boerl.) Markgr., 2-porate grain (Borneo, Chai 33804); **l.** *Lepiniopsis ternatensis* Valetton, 3-porate grain (Moluccas, Mochtar Idjan 306). — Scale bar = 10 μm .

Apocynoideae

Tribe Wrightieae (7 genera; Malesia: *Strophanthus*, *Wrightia*). Pollen grains monads, small to medium-sized (21–49 μm), oblate to oblate spheroidal (P/E = 0.73–0.90), usually (2–)3–4(–6)-stephanoporate, rarely 5-periporate (*Isonema*). Ornamentation mostly psilate-perforate, sometimes rugulate (*Isonema*). Pollen unknown: *Stephanostema*.

Tribe Malouetieae (12 genera; Malesia: *Carruthersia*, *Holarrhena*, *Kibatalia*, *Spirolobium*; Endress et al. 1990, Nilsson 1990a). Pollen grains monads, usually medium-sized (23–40 μm), sometimes large (49–67 μm ; *Mascarenhasia*, *Pachypodium*), oblate to oblate spheroidal (P/E = 0.72–0.92), mostly 3- or 4-stephanoporate, sometimes 2–4-stephanoporate (*Mascarenhasia*, *Pachypodium*), 5-stephanoporate (*Holarrhena*) or periporate (*Carruthersia*). Ectoapertures annulate. Annuli psilate (*Spirolobium*) to scabrate (*Holarrhena*). Ornamentation psilate-perforate, sometimes vermiculate (*Holarrhena*), rugulate (*Spirolobium*) or scabrate (*Malouetia*). Pollen unknown: *Allowoodsonia*, *Farquharia*, *Malouetiella*.

Tribe Apocyneae (29 genera; Malesia: *Aganosma*, *Amphineurion*, *Anodendron*, *Baharuia*, *Beaumontia*, *Chonemorpha*, *Cleghornia*, *Epigynum*, *Eucorymbia*, *Ichnocarpus*, *Micrechites*, *Papuechites*, *Parameria*, *Trachelospermum*, *Urceola*, *Vallariopsis*, *Valularis*; Huang 1986). Pollen grains monads, except in *Apocynum* (loosely to firmly united in rhomboidal, tetragonal or, less often, tetrahedral or decussate tetrads, which are often accompanied by triads, dyads and monads), small to medium-sized (11–46 μm) or medium-sized to large (24–62 μm), sometimes up to very large (44–117 μm ; *Chonemorpha*), mostly 3- or 4-stephanoporate, sometimes 2- or 3-stephanoporate (*Anodendron*, *Odontadenia*, *Parameria*) or 4- or 5-stephanoporate (*Beaumontia*, *Odontadenia*), periporate (4–12 pores in *Apocynum*, 17–19 pores in *Micrechites*, 15–22 pores in *Trachelospermum* and *Vallariopsis*) or colpate (*Cleghornia*; Pichon 1950), oblate to prolate (P/E = 0.64–1.46). Ornamentation psilate to scabrate, sparsely to densely perforate or imperforate (*Anodendron*, *Beaumontia*, *Elytropus*, *Odontadenia*, *Urceola*). Pollen unknown: *Baharuia*, *Parepigynium*.

Tribe Mesechiteae (9 genera; Malesia: none). Pollen grains monads, medium-sized to large (40–67 μm), sometimes small (18–33 μm ; *Secondatia*) or very large (100–133 μm ; *Mandevilla*), oblate to subprolate (P/E = 0.67–1.26), sometimes irregular (*Tintinnabularia*), 3- or 4-porate, rarely also 5- or 6-porate (*Mandevilla*, *Mesechites*). Ornamentation psilate-perforate, sometimes slightly scabrate (*Allomarkgrafia*, *Mandevilla*). Pollen unknown: *Macrosiphonia*, *Quiotania*, *Telosiphonia*.

Tribe Echiteae (22 genera; Malesia: *Ecua*, *Parsonsia*, *Pottsia*; Huang 1986). Pollen grains monads, mostly small to large (19–82 μm), suboblate to prolate spheroidal (P/E = 0.86–1.02), usually (2–)3–4(–6)-stephanoporate, rarely 4–8-periporate (*Prestonia*). Ornamentation psilate-perforate to (finely) scabrate (*Echites*, *Fernaldia*, *Peltastes*) or rugulate (*Parsonsia*). Pollen unknown: *Ecua*, *Hylaea*, *Macropharynx*, *Rhabdadenia*, *Salpinctes*.

Phylogenetic studies have shown that the family Apocynaceae s.s. represents a paraphyletic group (e.g. Sennblad & Bremer 2002). Inclusion of the Asclepiadaceae would make it monophyletic. Endress & Bruyns (2000) distinguished five subfamilies within the Apocynaceae s.l., of which the Rauvolfioideae is basal. According to the consensus tree provided by Sennblad & Bremer (2002), the generally porate and inaperturate conditions in most Apocynoideae, Periplocoideae, Secamonoideae and Asclepiadoideae, as opposed to the (brevi)colporate state in most Rauvolfioideae, represent derived features. The character pollen dispersal unit shows a general trend towards larger units. Pollen grains of Rauvolfioideae and Apocynoideae (together Apocynaceae s.s.) are usually monads, while tetrads occur only sporadically in these subfamilies. In contrast, pollen grains of Periplocoideae are always tetrads, which are sometimes united in pollinia (without waxy outer wall). The pollen of Secamonoideae and Asclepiadoideae is always shed as pollinia, without and with an outer waxy layer, respectively (see also Civeyrel et al. 1998). Clearly, tetrads and pollinia are derived structures within the Apocynaceae s.l. and correlate well with increasing floral morphological complexity within the family.

Within the Apocynaceae s.s., tetrads occur in only six out of the 162 genera: in *Callichilia* and rarely *Tabernaemontana* (tribe Tabernaemontaneae), *Craspidospermum* and *Melodinus* p.p. (tribe Melodineae) and *Condylocarpon* (tribe Alyxieae) in subfamily Rauvolfioideae, and in *Apocynum* in subfamily Apocynoideae. Tetrads of *Callichilia*, *Tabernaemontana* and *Melodinus* are tetrahedral and colporate, while those of *Craspidospermum*, *Condylocarpon* and *Apocynum* are mostly nontetrahedral (decussate, rhomboidal, tetragonal, T-shaped), sometimes irregularly tetrahedral or rarely more or less regular tetrahedral. Tetrads of *Craspidospermum* and *Apocynum* are periporate, those of *Condylocarpon* inaperturate. In *Tabernaemontana* and *Melodinus* both species with tetrads and species with monads are found. In *Apocynum* the tetrads are loosely to firmly united and often accompanied by triads, dyads and monads. On the basis of pollen morphology, Van de Ven & Van der Ham (2006) hypothesised that within the tribe Melodineae tetrads evolved independently in *Craspidospermum* and *Melodinus*. *Craspidospermum* tetrads are deviating within subfamily Rauvolfioideae. They are not even comparable to the nontetrahedral tetrads of *Condylocarpon*, which are inaperturate, have a very thin wall, and are considered neotenous (Van der Ham et al. 2001). *Craspidospermum* tetrads are similar in exine ultrastructure to those of *Apocynum* of subfamily Apocynoideae which, however, is otherwise rather remote from *Craspidospermum* in the molecular phylogenetic tree in Sennblad & Bremer (2002). If this tree is a good reflection of the actual relationships within the Apocynaceae, then the tetrads of *Craspidospermum* and *Apocynum* represent a remarkable case of parallel or convergent evolution.

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CHEMOTAXONOMY

Detailed notes on the chemistry and chemotaxonomy of the Apocynaceae s.s. have been provided by Hegnauer (1964, 1989).

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NOTE ON SPELLING

Very many species in the Apocynaceae were originally described in the genus *Echites* which was later split up to form many of the genera of subfamily Apocynoideae. A number of these genera were given a suffix of *-echites*, e.g. *Micrechites*, *Papuechites*, *Sindechites*. All of these have always been treated as feminine. However, following Art. 62.4 of the Code all of these names, unfortunately, have to be treated as masculine. Therefore, these names are herein treated as masculine and without the reader being further informed that the name was originally published in the feminine.

SCOPE

The northern boundary within Thailand of Flora Malesiana treatments is not always entirely clear. In the Apocynaceae there are no species known from the limits of everwet forests in the Thai provinces of Yala, Pattani and Narathiwat (the Alor Setar–Pattani boundary) that are not also in Peninsular Malaysia. However, there are 6 species in Thailand in the region between this line and the Isthmus of Kra: *Alstonia curtisii* King & Gamble, *Beaumontia macrantha* (Ridl.) Rudjiman, *Epigynum cochinchinensis* (Pierre) D.J. Middleton, *Kibatalia macrophylla* (Pierre ex Hua) Woodson, *Urceola minutiflora* (Pierre) D.J. Middleton and *Wrightia lecomtei* Pit. These species are not included in this account but can be viewed in Middleton (1999).

KEY TO THE GENERA

- 1a. Trees or shrubs 2
- b. Climbers 24
- 2a. Leaves spirally arranged 3
- b. Leaves opposite or in whorls 5
- 3a. Gynoecium 2-carpellate, apocarpous but apically united into a common style; corolla tube 8–43 mm long; fruit of paired single-seeded drupes, sometimes only one developing **10. Cerbera**
- b. Gynoecium 3–5-carpellate, apocarpous but apically united into a common style, or syncarpous; corolla tube 6.5–16 mm long; fruit a distinctive basket-like structure or a solitary 1–5-seeded drupe 4
- 4a. Gynoecium apocarpous but apically united into a common style; fruit a distinctive basket-like structure **23. Lepinia**
- b. Gynoecium syncarpous; fruit not forming a basket-like structure **24. Lepiniopsis**
- 5a. Leaves in whorls, sometimes with some opposite pairs but never exclusively so 6
- b. Leaves exclusively opposite 12
- 6a. Large unbuttressed trees; branchlets strongly ribbed; corolla tube much shorter than lobes; fruit a follicle with winged seeds **14. Dyera**
- b. Shrubs to large trees, with or without buttresses or fluted trunks; branchlets not or only weakly ribbed; corolla tube longer than lobes; fruit a drupe or a follicle with ciliate or arillate seeds 7
- 7a. Small intrapetiolar stipule-like structures present in the axils of the petiole with the stem; fruit of follicles with arillate seeds **36. Tabernaemontana**
- b. Small intrapetiolar stipule-like structures absent in the axils of the petiole with the stem; fruit a drupe or a follicle with ciliate seeds 8
- 8a. Corolla lobes dextrorse; fruit of paired follicles or of drupes with a stony or fibrous mesocarp 9
- b. Corolla lobes sinistrorse; fruit of paired or single follicles or of drupes with a fairly thin mesocarp 10
- 9a. Disk absent or of two lobes; fruit of paired or syncarpous indehiscent drupes **28. Ochrosia**
- b. Disk a small annular thickening at base of ovaries; fruit of paired dehiscent follicles **2. Alstonia**

- 10a. Disk absent; fruit of paired drupes with a thin endocarp, often in moniliform chains; seeds ruminant **3. Alyxia**
- b. Disk present (but often small); fruit of paired or syncarpous non-moniliform drupes with a hard pericarp or paired or syncarpous follicles 11
- 11a. Style head with a basal collar; fruit of paired or syncarpous indehiscent drupes **33. Rauvolfia**
- b. Style head without a basal collar; fruit of paired or solitary dehiscent follicles **2. Alstonia**
- 12a. Shrubs or small trees armed with thorns **8. Carissa**
- b. Shrubs to large trees without thorns 13
- 13a. Small intrapetiolar stipule-like structures present; corolla lobes sinistrorse; stamens free from the style head; fruit with arillate seeds 14
- b. Small intrapetiolar stipule-like structures absent; flower and fruit characters variable 15
- 14a. Stamens coherent with style head; calyx lobes free or connate into a tube for at least half their length **41. Voacanga**
- b. Stamens not coherent with style head; calyx lobes not connate or only connate at base and not forming a tube. **36. Tabernaemontana**
- 15a. Leaves with domatia on the undersurface **21. Kibatalia**
- b. Leaves without domatia on the undersurface. 16
- 16a. Corolla lobes sinistrorse 17
- b. Corolla lobes dextrorse 20
- 17a. Stamens not adnate to the pistil; corolla without a corona, fruit a berry or drupe 18
- b. Stamens adnate to the pistil; corolla with or without a corona; fruit a follicle **43. Wrightia**
- 18a. Calyx not connate into a tube; stamens not sagittate at base; fruit of paired drupes or paired berries 19
- b. Calyx often connate into a tube or lobes free; stamens sagittate at base; fruit with arillate seeds **41. Voacanga**
- 19a. Shrub; disk present; fruit of paired drupes (rare forms of *Rauvolfia* with opposite leaves) **33. Rauvolfia**
- b. Shrub or tree; disk absent; fruit of paired berries **19. Hunteria**
- 20a. Shrubs; corolla infundibuliform, widening around the middle; fruit of paired follicles held erect **34. Spirolobium**
- b. Trees or shrubs; corolla salverform; fruit of paired or solitary drupes or of paired pendulous or erect follicles 21
- 21a. Flowers in fascicles; stamens clearly adnate to the style head; fruit of paired follicles **21. Kibatalia**
- b. Flowers not in fascicles; stamens apparently free from the style head; fruit of paired follicles, berries or drupes or of syncarpous drupes 22
- 22a. Corolla completely puberulent outside; fruit of paired follicles; seeds with a coma **18. Holarrhena**
- b. Corolla glabrous or only sparsely puberulent around the top outside; fruit of paired or syncarpous drupes; seeds without a coma 23

- 23a. Disk >0.5 times height of ovaries; corolla tube 7–45 mm long; fruit of thin-walled drupes, often with a spur on one side **22. Kopsia**
- b. Disk, if present, < 0.5 times height of ovaries; corolla tube 3–14.3 mm long; fruit of thick-walled fibrous or stony drupes without a spur on one side **28. Ochrosia**
- 24a. Climbing with tendrils; gynoecium syncarpous; fruit a berry . . **42. Willughbeia**
- b. Climbing without tendrils; gynoecium syncarpous or apocarpous but united into a single style; fruit various 25
- 25a. Leaves in whorls of 3 or more 26
- b. Leaves strictly opposite 27
- 26a. Stamens adnate to the style head; fruit a follicle; seeds with a coma **31. Parsonsia**
- b. Stamens free from the style head; fruit of paired drupes, often in moniliform chains; seeds without a coma **3. Alyxia**
- 27a. Corolla lobes sinistrorse; fruit of paired or solitary berries, drupes, or follicles 28
- b. Corolla lobes dextrorse or valvate in bud; fruit of paired or solitary follicles . 32
- 28a. Stamens adnate to the style head; fruit of paired torulose follicles; seeds with a coma **30. Parameria**
- b. Stamens free from the style head; fruit of paired or solitary drupes, a berry, or a berry-like fleshy fruit that later dehisces; seeds without a coma 29
- 29a. Flowers 4-merous; fruit a berry **25. Leuconotis**
- b. Flowers 5-merous; fruit various 30
- 30a. Corolla with a corona in the throat; fruit a hard walled berry . . . **26. Melodinus**
- b. Corolla without a corona; fruit berry-like and fleshy but later dehiscent, or of paired, often moniliform, drupes 31
- 31a. Leaves punctate beneath, bases with small intrapetiolar ocrea; gynoecium syncarpous, unilocular; fruit berry-like, various shapes, fleshy but later dehiscent; seeds with a corky aril **11. Chilocarpus**
- b. Leaves punctate or not beneath, bases without small intrapetiolar ocrea; gynoecium apocarpous but apically united into a single style; fruit drupaceous, moniliform (or reduced to one part), indehiscent; seeds without an aril **3. Alyxia**
- 32a. Calyx fused into a tube, 5-dentate around edge **12. Chonemorpha**
- b. Calyx of 5 free sepals 33
- 33a. Corolla with a narrow basal tube and then opening up into a wide open upper tube; stamens with a bulbous growth facing outwards **40. Vallaris**
- b. Corolla various; stamens without a bulbous growth 34
- 34a. Style distinctly swollen in the middle; stamens strongly exerted from corolla tube **32. Pottsia**
- b. Style not distinctly swollen in the middle; stamens exerted or included in corolla tube 35
- 35a. Corolla with a corona at the throat (often quite small – observe carefully) . . . 36
- b. Corolla without a corona at the throat 37
- 36a. Anthers with an elongated acumen; corolla lobes drawn out into long tails or not; seeds without an apical coma-bearing beak **35. Strophanthus**
- b. Anthers without an elongated acumen; corolla lobes not drawn out into long tails; seeds with an apical coma-bearing beak **29. Papuechites**

- 37a. Stamens partially or completely exerted from corolla tube 38
 b. Stamens completely included within the corolla tube 41
- 38a. Corolla infundibuliform with a large open upper tube; corolla tube ≥ 2 cm long
 **7. Beaumontia**
 b. Corolla salverform, upper part of tube not large and open; corolla tube < 1.5 cm
 long 39
- 39a. Only tips of anthers exerted from corolla throat; gynoecium apocarpous but with
 an apically united style; fruit of paired follicles 40
 b. Anthers completely or mostly exerted from corolla throat; gynoecium syncar-
 pouis; fruit of bilocular solitary follicles **31. Parsonsia**
- 40a. Inflorescence ≥ 3 cm long; corolla inside pubescent around the top of tube or
 glabrous **37. Trachelospermum**
 b. Inflorescence < 3 cm long; corolla inside pubescent near base . **39. Vallariopsis**
- 41a. Corolla tube ≥ 18 mm long 42
 b. Corolla tube < 18 mm long 45
- 42a. Corolla infundibuliform with a large open upper tube; filaments > 1 cm long . .
 **7. Beaumontia**
 b. Corolla salverform, upper part of the tube not large and open; filaments < 1 cm
 long 43
- 43a. Stamens only weakly attached to the style head; secondary veins on leaf blades
 quite straight and forming a stong intramarginal vein **17. Eucorymbia**
 b. Stamens firmly attached to the style head; secondary veins on leaf blades arcuate
 ascending, if forming an intramarginal vein this strongly looped and weak . . 44
- 44a. Inflorescence umbelliform; sepals ≤ 5 mm long; corolla lobes < 20 mm long . .
 **16. Epigynum**
 b. Inflorescence not umbelliform; sepals > 5 mm long; corolla lobes > 20 mm long
 **12. Chonemorpha**
- 45a. Leaf blades with domatia in the axils of the secondary veins and midrib beneath
 (check several leaves) 46
 b. Leaf blades without domatia beneath (check several leaves). 47
- 46a. Colleters many in a row on the inside of the sepals; corolla lobes dextrorse; seeds
 linear, glabrous **6. Baharuia**
 b. Colleters few or absent on the inside of the sepals; corolla lobes dextrorse or val-
 vate in bud; seeds elliptic, densely pubescent **38. Urceola**
- 47a. Inflorescence umbelliform; corolla tube much longer than lobes **16. Epigynum**
 b. Inflorescence various but not umbelliform; corolla tube shorter or longer than
 lobes 48
- 48a. Gynoecium pubescent 49
 b. Gynoecium glabrous 54
- 49a. Gynoecium syncarpous; stamens filaments at first curving downwards and then
 upwards; corolla urceolate. — Moluccas **15. Ecuia**
 b. Gynoecium apocarpous but uniting into a single style; stamens not as above;
 corolla various. — Throughout Malesia 50
- 50a. Leaves with a very well developed intramarginal vein **4. Amphineurion**
 b. Leaves without a well developed intramarginal vein, sometimes weakly developed
 and strongly looped (if in doubt take this lead) 51

- 51a. Corolla tube > 8 mm long; corolla lobes > 8 mm long **1. Aganosma**
- b. Corolla tube < 8 mm long; corolla lobes < 8 mm long 52
- 52a. Stamens inserted at base of corolla tube; corolla urceolate or campanulate; seed grain pubescent **38. Urceola**
- b. Stamens inserted around middle of corolla tube; corolla salverform; seed grain glabrous 53
- 53a. Disk lobes free and narrow, never shorter than the ovaries; anthers appearing elliptic; secondary veins 4–8 pairs **20. Ichnocarpus**
- b. Disk entire and 5-dentate or of 5 wide lobes, mostly shorter than the ovaries; anthers narrowly triangular; secondary veins 5–21 pairs **27. Microchites**
- 54a. Disk of 2 lobes alternating between the ovaries; stamens only weakly attached to the style head. — Philippines (maybe also in New Guinea) . . . **9. Carruthersia**
- b. Disk a 5-lobed ring or of 5 separate lobes; stamens firmly attached to the style head. — Throughout Malesia 55
- 55a. Disk of 5 separate lobes 56
- b. Disk in a 5-crenate or 5-dentate ring 57
- 56a. Corolla lobes > 2 times as long as wide, usually slightly inrolled at margins; anthers pubescent externally **13. Cleghornia**
- b. Corolla lobes < 2 times as long as wide, not inrolled at margins; anthers glabrous externally **37. Trachelospermum**
- 57a. Leaves with an intramarginal vein that is as strong as the secondary veins and prominent beneath; seeds with the coma arising more or less from a single point **4. Amphineurion**
- b. Leaves without a strong intramarginal vein; seeds with a long beak along which the coma arises **5. Anodendron**

KEY TO EXOTIC COMMONLY CULTIVATED SPECIES

Only genera which are not at all native to Malesia are included here. Native genera with non-native cultivated species (e.g. *Carissa*, *Kopsia*, *Tabernaemontana*, *Wrightia*) and some native species which also happen to be cultivated (e.g. *Cerbera odollam*) are included in the main body of the treatment. If the key to commonly cultivated species does not yield any results then the main keys should be used. It is possible, even probable, that many more exotic species are occasionally cultivated in Malesia but this key deals only with the commonly encountered exotic species found throughout the region.

- 1a. Herbs, sometimes with a woody base **Catharanthus roseus**
- b. Trees or shrubs or climbers 2
- 2a. Leaves spirally arranged 3
- b. Leaves opposite or in whorls 6
- 3a. Leaves narrowly oblong, < 1 cm wide **Thevetia peruviana**
- b. Leaves obovate or elliptic, > 2 cm wide 4
- 4a. Succulent shrub; corolla tube wide; anthers with long bristly appendages **Adenium obesum**
- b. Small trees; corolla tube narrow; anthers without long bristly appendages 5
- 5a. Leaf blade rounded at apex, dark green, shiny above **Plumeria obtusa**
- b. Leaf blade acute or acuminate at apex, glaucous, dull above . . . **Plumeria rubra**

- 6a. Corolla tube not yellow, < 3 cm long; anthers with long appendages **Nerium oleander**
 b. Corolla tube yellow, infundibuliform, > 3.5 cm long, anthers without appendages 7
- 7a. Sepals without colleters inside; lower, narrow corolla tube about equal in length to upper, wider corolla tube **Allamanda cathartica**
 b. Sepals with colleters inside; lower, narrow corolla tube much shorter than upper, wider corolla tube **Allamanda schottii**

1. AGANOSMA

Aganosma (Blume) G. Don, Gen. Hist. 4 (1837) 77; A.DC., Prodr. 8 (1844) 432; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 173; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1222; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 31; Backer & Bakh.f., Fl. Java 2 (1965) 237; D.J. Middleton, Kew Bull. 51 (1996) 456; Fl. Thailand 7 (1999) 104; PROSEA 12, 3 (2003) 43; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 10. — *Echites* P. Browne sect. *Aganosma* Blume, Bijdr. (1826) 1040. — *Aganosma* (Blume) G. Don sect. *Meiadenia* A.DC., Prodr. 8 (1844) 432. — *Ichnocarpus* R.Br. sect. *Meiadenia* (A.DC.) Benth. & Hook.f., Gen. Pl. 2 (1876) 717. — Type species: *Aganosma caryophyllata* G. Don (= *Aganosma wallichii* G. Don).

Large or medium woody climbers. *Leaves* opposite; usually with an interpetiolar ridge bearing colleters. *Inflorescence* terminal, sometimes also axillary, cymose, often forming a panicle; flowers 5-merous. *Sepals* narrowly ovate to linear, quite large and showy; colleters in sepal sinuses inside. *Corolla* lobes dextrorse in bud; mature corolla with spreading or erect lobes. *Stamens* inserted in lower half of corolla tube, completely included in the tube; filaments short; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base; adnate to the style head. *Disk* a continuous ring, flat-topped or 5-lobed. Gynoecium 2-carpellate, apocarpous but apically united into a common style; ovaries numerous; ovaries pubescent or glabrous; style consisting of a basal part which widens at the top, then a ring to which the stamens are attached, then a columnar upper part to the top of which the stamens are attached again and then a small sharp point on the very top. *Fruit* of paired follicles; linear. *Seeds* flattened, narrowly ellipsoid, glabrous; with an apical coma.

Distribution — 7 species from India and southern China to western *Malesia* (1 species).

Note — The genus *Amphineurion* is here treated as distinct from *Aganosma*. *Amphineurion* includes the common *Amphineurion marginatum*, formerly *Aganosma marginata*.

Aganosma wallichii G. Don

Aganosma wallichii G. Don, Gen. Hist. 4 (1837) 77; Kerr in Craib, Fl. Siam. 2 (1939) 470; D.J. Middleton, Kew Bull. 51 (1996) 478; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 122; D.J. Middleton, Fl. Thailand 7 (1999) 108; PROSEA 12, 3 (2003) 44. — *Aganosma calycina* A.DC., Prodr. 8 (1844) 432; Kurz, Forest Fl. Burma 2 (1877) 186; Hook.f., Fl. Brit. India 3 (1882) 664; G. Watt, Dict. Econ. Prod. India 1 (1889) 128; Brandis, Indian Trees (1906) 464; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 497; Koord.-Schum., Syst. Verz. 1 (1912) 181; Ridl., Fl. Malay Penins. 2 (1923) 365; Tsiang, Sunyatsenia 4 (1939) 38. — *Echites calycinus* Wall., Numer. List

1653 (1829), nom. nud. — Type: *Wallich 1653* (lecto K-W, designated by Middleton (1996) op. cit.; iso BM, G-DC, K), Burma, Tavoy.

Aganosma blumei A.DC., Prodr. 8 (1844) 432, p.p.; Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1305; Miq., Fl. Ned. Ind. 2 (1857) 446; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; Tsiang, Sunyatsenia 4 (1939) 38; Backer & Bakh.f., Fl. Java 2 (1965) 237. — Type: *Blume s.n.* (lecto U, designated by Middleton (1996) op. cit.), Java.

Echites caryophyllatus auct. non Roxb.: Blume, Bijdr. (1826) 1041, p.p. (excluding citation of Rheede drawing). — *Aganosma caryophyllata* G. Don, Gen. Hist. 4 (1837) 77. — Type: Untraced.

Aganosma roxburghii auct. non G. Don: Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 440.

Stems lenticellate or not; stems strigose or tomentose, often becoming glabrous. *Leaves*: petiole 8–15 mm long, glabrous or sparsely strigose; blade elliptic, oblong or weakly obovate, 4.5–15.5 by 1.7–8.5 cm, 1.2–3.5 times as long as wide, apex acuminate, base rounded or obtuse, rarely acute or weakly cordate, glabrous, sparsely strigose on midrib or tomentose beneath, 5–13 pairs of secondary veins. *Inflorescence* robust and lax, 4.6–19.5 cm long, strigose or tomentose; pedicels 6–17 mm long. *Sepals* 9–23 by 1.8–6.1 mm, 3.2–10 times as long as wide, narrowly ovate, tomentose; colleters few in sinuses or frequently absent. *Corolla* white or yellowish; tube 8.3–14 by 6 mm, 0.4–1.1 times as long as lobes, 0.6–0.9 times as long as calyx, tomentose or strigose outside, glabrous in throat, pubescent behind anthers inside; lobes obovate, falcate, apex flattened or rounded, sometimes with one corner acute or acuminate, 8.8–23 by 3.7–11.5 mm, 1.3–2.8 times as long as wide. *Stamens* inserted at 2.3–4.5 mm from corolla base which is 0.2–0.4 of tube length; anthers 4.7–7.5 by 1–1.6 mm, 3.3–6.1 times as long as wide. *Disk* narrower at top, 5-dentate; 1.1–3 mm long, 1.1–3.8 times as long as ovary. *Ovaries* 0.8–1.8 mm long; pubescent; style 1.9–3.5 mm long, sometimes pubescent; style head 2.2–3 mm long. *Fruit* unknown.

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

Habitat & Ecology — In evergreen forest to 400 m.

Uses — Recorded as being used to treat diseases of the bile and blood.

2. ALSTONIA

(Kade Sidiyasa)

Alstonia R.Br., Asclepiadeae (1810) 64, nom. cons.; Mem. Wern. Nat. Hist. Soc. 1 (1811) 75; Benth. & Hook.f., Gen. Pl. 2 (1876) 705; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 138; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1161; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 294; Monach., Pacific Sci. 3 (1949) 137; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 168; Backer & Bakh.f., Fl. Java 2 (1965) 226; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 11; Cockburn, Trees Sabah 1 (1976) 15; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 88; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 40; Kochummen & Wong, Blumea 29 (1984) 515; Lý, Feddes Repert. 97 (1986) 610; PROSEA 5, 1 (1993) 82; P.T. Li et al., Fl. China 16 (1995) 154; Sidiy., Blumea, Suppl. 11 (1998) 77; D.J. Middleton, Fl. Thailand 7 (1999) 41; PROSEA 12, 2 (2001) 61; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 14. — *Pala* A. Juss., Ann. Mus. Paris 15 (1810) 346. — Type species: *Alstonia scholaris* (L.) R.Br.

Winchia A.DC., Prodr. 8 (1844) 326; Benth. & Hook.f., Gen. Pl. 2 (1876) 695; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 125; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1100; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 298; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 95; Lý, Feddes Repert. 97 (1986) 613. — Type species: *Winchia calophylla* A.DC. (= *Alstonia rostrata* C.E.C. Fisch.).

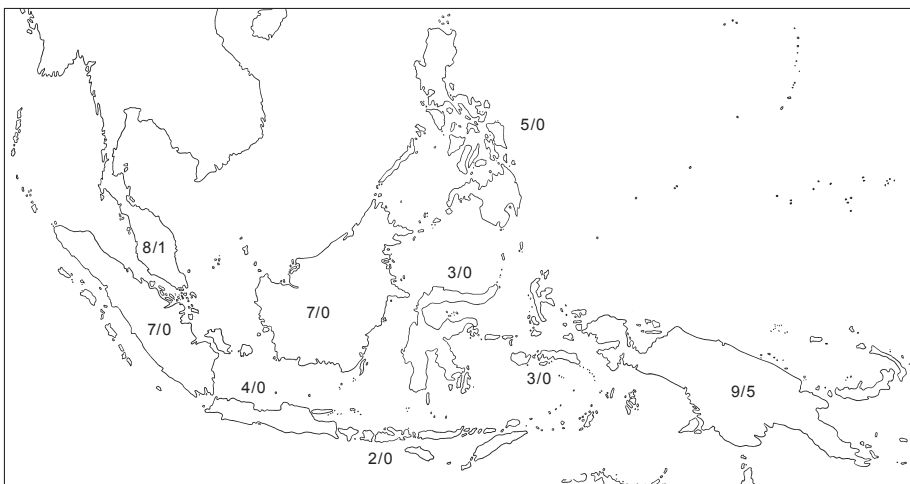
Blaberopus A.DC., Prodr. 8 (1844) 410; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 300; Backer & Bakh.f., Fl. Java 2 (1965) 226; Lý, Feddes Repert. 97 (1986) 615. — Type species: *Blaberopus venenatus* (R.Br.) A.DC. (= *Alstonia venenata* R.Br.).

Amblyocalyx Benth. in Benth. & Hook.f., Gen. Pl. 2 (1876) 689. — Type species: *Amblyocalyx beccarii* Benth. (= *Alstonia angustifolia* Wall. ex A.DC.).

Paladelpa Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 299. — Type species: *Paladelpa angustiloba* (Miq.) Pichon (= *Alstonia angustiloba* Miq.).

Shrubs or trees. *Branches* smooth to slightly rough, lenticellate or not; puberulous or pubescent. *Leaves* in whorls (in Malesia); petiolate or sessile, colletter(s) present in the axils. *Inflorescence* compound, cymose, terminal, pedunculate, frequently in whorls or umbellate, few- to many-flowered. *Flowers* 5-merous, actinomorphic, mostly fragrant. *Sepals* without colleters in the axils. *Corolla* lobes sinistrorse or dextrorse; tube cylindrical or slightly widened around stamens; lobes spreading. *Stamens* free from the pistil; filaments short, filiform; anthers ovate or narrowly ovate, apex acute, locules more or less equal and with longitudinal slits. *Disk* a thickening at the base, or 2-lobed and alternating with the carpels (sect. *Blaberopus* – not in Malesia). Gynoecium 2-carpellate, apocarpous but apically united into a common style, or syncarpous (in *A. rostrata*), glabrous or pubescent; style mostly filiform; style head simple. *Fruit* a pair of follicles (a single 2-celled follicle only in *A. rostrata*). *Seeds* numerous, elliptic, narrowly elliptic or oblong, ends rounded to acuminate, or caudate, glabrous or pubescent, long cilia forming a coma of simple hairs.

Distribution — The genus has 43 species, ranging from tropical Africa to Central America, and from the Himalayas and China to New South Wales, Australia. However, it is likely that the Central American species should be removed from *Alstonia*, and the genus *Tonduzia* resurrected, as molecular work shows them not to be at all closely related (Endress, pers. comm.). In Malesia 16 species in two sections, sect. *Alstonia* and sect. *Monuraspermum*. — **Map 2.**



Map 2. Distribution of *Alstonia* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

Habitat & Ecology — Secondary and primary forests, in swamps or dry habitats, on various soils: sandy, clay, or limestone. Altitude 0–2870 m.

KEY TO THE SECTIONS IN MALESIA

- 1a. Colleter(s) in the leaf-axils deltoid and usually more or less as wide as the leaf-scars, or narrowly triangular and 0.3–0.7 mm wide; corolla lobes sinistrorse; seeds rounded at both ends; leaves in whorls of 3–9; copious white latex from the trunk bark of the tree. Sect. **Alstonia**
- b. Colleters minute or shortly lingulate or narrow, 0.1–0.15 wide; corolla lobes dextrorse; seeds acuminate at one end; leaves in whorls of 3 or 4; without white latex from the trunk bark of the tree. Sect. **Monuraspermum**

Section Alstonia

Alstonia R.Br. sect. *Pala* (A. Juss.) Benth. in Benth. & Hook.f., Gen. Pl. 2 (1876) 705; Monach., Pacific Sci. 3 (1949) 139; Markgr., Blumea 22 (1974) 21. — *Alstonia* R.Br. sect. *Pala* (A. Juss.) Benth. ser. *Pilosae* Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 296. — Type species: *Alstonia scholaris* R.Br.

Alstonia R.Br. sect. *Pala* (A. Juss.) Benth. ser. *Glabrae* Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 296. — Type species: *Alstonia spatulata* Blume, designated by Sidiyasa (1998) op. cit.

Alstonia R.Br. sect. *Winchia* (A.DC.) Monach., Pacific Sci. 3 (1949) 139. — *Winchia* A.DC., Prodr. 8 (1844) 326. — Type species: *Alstonia glaucescens* (K. Schum.) Monach. (= *Alstonia rostrata* C.E.C. Fisch.).

Malesian species — *Alstonia actinophylla* (A. Cunn.) K. Schum., *A. angustiloba* Miq., *A. iwahigensis* Elmer, *A. pneumatophora* Backer ex Den Berger, *A. rostrata* C.E.C. Fisch., *A. scholaris* (L.) R.Br., *A. spatulata* Blume.

Section Monuraspermum

Alstonia R.Br. sect. *Monuraspermum* Monach., Pacific Sci. 3 (1949) 141; Sidiy., Blumea, Suppl. 11 (1998) 80. — *Alstonia* R.Br. sect. *Dissuraspermum* (A. Gray) Benth. ser. *Occidentales* Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 297. — Type species: *Alstonia spectabilis* R.Br., designated by Monachina (1949) op. cit.

Malesian species — *Alstonia angustifolia* Wall. ex A.DC., *A. beatricis* Sidiy., *A. breviloba* Sidiy., *A. macrophylla* Wall. ex G. Don, *A. muelleriana* Domin, *A. parvifolia* Merr., *A. penangiana* Sidiy., *A. rubiginosa* Sidiy., *A. spectabilis* R.Br.

KEY TO THE SPECIES

- 1a. Trunk with copious white latex from the inner bark; colleter(s) in the leaf-axils deltoid and usually more or less as wide as the leaf-scars, or narrowly triangular, 0.3–0.7 mm wide; corolla lobes sinistrorse; seeds rounded at both ends; leaves in whorls of (3–)4–9. 2

- b. Trunk without white latex from the inner bark; colleters in the leaf-axils minute or narrowly lingulate, 0.1–0.15 mm wide; corolla lobes dextrorse; seeds acuminate or caudate; leaves consistently in whorls of 3 or 4 8
- 2a. Branches or branchlets usually with a distinctly shorter internode at the end; leaves long-acuminate; ovary syncarpous; follicles solitary **12. A. rostrata**
- b. Branches or branchlets without a distinctly shorter internode at the end; leaf apex retuse to shortly acuminate; ovary apocarpous; follicles in pairs. 3
- 3a. Leaves with the tertiary venation more or less conspicuous above; petiole with a distinct narrow intrapetiolar stipule at the base; colleters narrowly triangular; corolla (sometimes partly) pubescent outside **14. A. scholaris**
- b. Leaves with the tertiary venation mostly inconspicuous or obscure above; petioles without intrapetiolar stipule at the base; colleters deltoid; corolla glabrous outside 4
- 4a. Leaves elliptic or narrowly so, rarely slightly obovate, apex usually obtuse or shortly acuminate 5
- b. Leaves strongly obovate or spatulate, apex rounded or retuse. 7
- 5a. Sepals pubescent outside; leaves 1.5–7 cm wide. — Thailand, Western Malesia. 6
- b. Sepals glabrous outside; leaves 0.7–2.2 cm wide. — Papua New Guinea, Australia **1. A. actinophylla**
- 6a. Flowers very densely clustered, usually forming two clusters; corolla tube 1.8–2.8 times as long as the lobes which are 2.6–4 mm long; follicles glabrous **6. A. iwahigensis**
- b. Flowers rather lax; corolla tube 1–1.7 times as long as the lobes which are 4–6.5 mm long; follicles pubescent **3. A. angustiloba**
- 7a. Leaves usually sessile, rarely petiolate; flowers many and densely clustered, usually into two clusters; sepals pubescent outside; corolla lobes 3–4.3(–5) by 2–3.2 mm; follicles pubescent **11. A. pneumatophora**
- b. Leaves petiolate; inflorescences few-flowered, lax; sepals glabrous outside; corolla lobes 6.7–11 by 3.5–6 mm, follicles glabrous. **15. A. spatulata**
- 8a. Sepals grey- or rusty-pubescent outside. 9
- b. Sepals glabrous or laxly puberulous outside 15
- 9a. Corolla glabrous or very sparsely hairy outside (usually around the apex), dark brown or blackish when dried 10
- b. Corolla pubescent outside, sometimes puberulous only around the apex, usually pale or rusty brown due to the hairs. 12
- 10a. Leaves glabrous on both sides, secondary veins 12–17 pairs; sepals pubescent (except on the fused part) inside 11
- b. Leaves glabrous or sparsely hairy above, densely velutinous beneath, secondary veins 23–26 pairs; sepals glabrous inside **13. A. rubiginosa**
- 11a. Sepals 2.5–3.7 mm long, usually ovate; corolla tube 3.8 mm long; corolla lobes 3.5–5.8 mm long, ciliate or not. — Philippines **9. A. parvifolia**
- b. Sepals c. 1.7 mm long, turbinate; corolla tube c. 2 mm long; corolla lobes c. 2 mm long, ciliate. — Waigeo Island, Papua **4. A. beatricis**
- 12a. Corolla lobes suborbicular, ovate, or sometimes shortly lingulate, 1–2.1 times as long as wide, apex rounded or obtuse 13

- b. Corolla lobes narrowly ovate, rarely ovate, more than (2.6–)3.1 times as long as wide, apex acute or obtuse. **8. *A. muelleriana***
- 13a. Sepals pubescent inside on the lobed part. — Peninsular Malaysia, Sumatra, Borneo. 14
- b. Sepals glabrous or laxly puberulous only around the apex inside. — Java, Sulawesi, Philippines to Australia and Solomon Islands **16. *A. spectabilis***
- 14a. Sepals with a thick margin, usually reflexed, obovate, connate at the base at least 0.5 of the length; corolla tube 3–4.5 mm long; corolla lobes 1–2.3 by 1–1.8 mm; seeds 1.2–1.6 mm wide **2. *A. angustifolia***
- b. Sepals with a thin margin, not reflexed, ovate, connate at the base less than 0.5 of the length; corolla tube 5.4–5.6 mm long; corolla lobes 3–4.5 by 1.8–2.3 mm; seeds 1.8–2 mm wide **10. *A. penangiana***
- 15a. Corolla tube 2–3 times as long as the lobes which are ovate or subtriangular, 1–1.3 times as long as wide, not ciliate; seeds 7–9 by 3–3.3 mm; leaves thickly coriaceous, usually abruptly acuminate **5. *A. breviloba***
- b. Corolla tube 0.7–1.5 times as long as the lobes which are ovate, narrowly ovate or oblong, 2.2–5 times as long as wide, ciliate or not; seeds 5–12 by 1.6–2.5 mm; leaves chartaceous or coriaceous **7. *A. macrophylla***

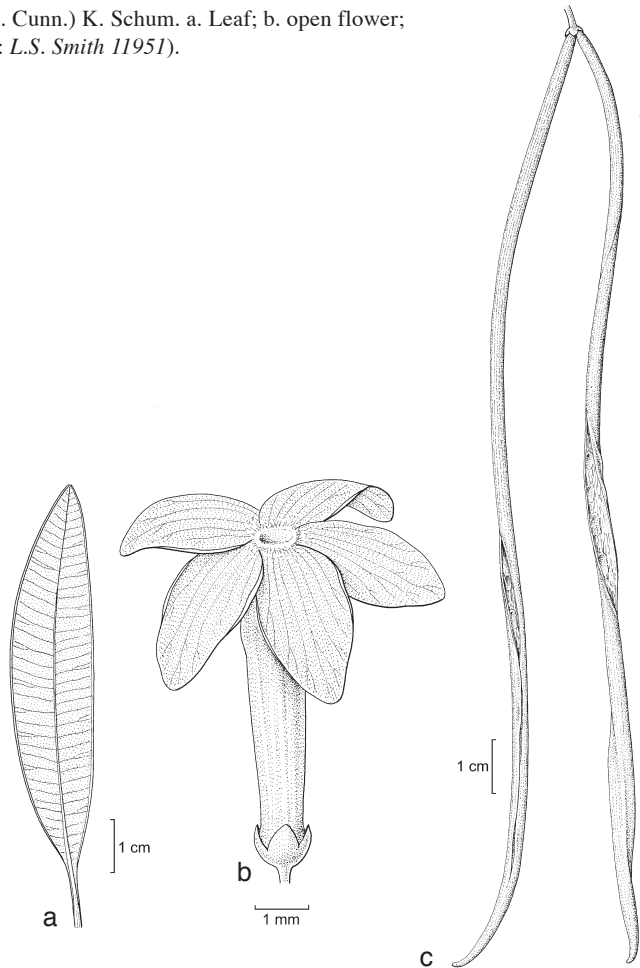
1. *Alstonia actinophylla* (A. Cunn.) K. Schum.

Alstonia actinophylla (A. Cunn.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 38; Markgr., Bot. Jahrb. Syst. 61 (1927) 177; Monach., Pacific Sci. 3 (1949) 154; Markgr., Blumea 22 (1974) 26; P.I. Forst., Austral. Syst. Bot. 5 (1992) 750; Fl. Australia 28 (1996) 119; Whitmore et al., Checklist Irian Jaya (1997) 16; Sidiy., Blumea, Suppl. 11 (1998) 98. — *Alyxia actinophylla* A. Cunn., Bot. Mag. 61 (new ser. 8) (1834) 3313. — Type: *Cunningham 205* (lecto GH, designated by Monachina (1949) op. cit.; iso BM, K, MO), Western Australia, Montague Sound.

Alstonia verticillosa F. Muell., Fragm. 6 (1868) 116; Markgr., Nova Guinea 14, 2 (1926) 279. — Type: *Daemel s.n.* (holo MEL; iso K, MO, W), Australia, Queensland, Cape York.

Tree 25–40 m high, 35–60 cm dbh. Bark deeply longitudinally and horizontally fissured and peeling off in rectangular flakes, greyish; inner bark soft, granular, pale yellow, with copious white latex. *Branchlets* terete, glabrous. *Leaves* in whorls of (4–)5–6(–8); petiole (0–)3–6(–10) mm long; colleters deltoid (rarely persistent) in the leaf axils; blade thinly coriaceous, narrowly elliptic, 3.5–11 by 0.7–2.2 cm, 3.3–7.5 times as long as wide, apex acute or obtuse, mostly pointed, base acute or decurrent onto the petiole, glabrous on both sides; 23–40 pairs of secondary veins, very fine, rather straight, forming an angle of 80–90° with the midrib, 1–3 mm from each other, short interstitial veins present, tertiary venation reticulate. *Inflorescences* 3–10(–18) cm long, 1–4 together, many-flowered; pedicels (1–)2–4(–5) mm long, slender, glabrous, usually with 1 or 2 bracteoles. Bracts and bracteoles sepal-like, ovate or triangular, 0.5–0.7(–1) mm long, ciliate or not, glabrous on both sides, acute or obtuse. *Flowers* fragrant. *Sepals* light green or pale yellow, connate at the base for 0.2–0.3 mm, ovate, (0.8–)1–1.5 by 0.7–1 mm, erect, obtuse, glabrous on both sides, ciliate. *Corolla* lobes sinistrorse; white or pale yellow, 8–12.4 mm long in the mature bud and forming an ovoid head, 2.5–4 by 1–1.5 mm, glabrous or minutely ciliate on corolla lobes outside; tube 7–8 mm long, 1.4–1.9 mm wide around the stamens; lobes ovate, 4–5.1

Fig. 1. *Alstonia actinophylla* (A. Cunn.) K. Schum. a. Leaf; b. open flower; c. follicles (a, b: Pullen 7196; c: L.S. Smith 11951).



by 1.8–2.5 mm, 2–2.8 times as long as wide, sometimes oblique or slightly falcate, with white or yellow hairs at extreme base inside, apex obtuse or rounded, mostly not ciliate in open flowers. *Stamens* inserted at 5.2–6.4 mm from the base; anthers ovate, 1–1.2 by 0.4–0.5 mm, obtuse. *Pistil* 5.6–7.1 mm long; ovary ovoid, 1–1.4 by 0.8–1 mm, of 2 carpels, glabrous; style 4–6.5 mm long; style head pagoda-shaped, 0.6–0.8 mm high, with a robust cleft stigmoid apical part 0.2–0.3 mm high. *Fruit* a pair of follicles, 8–20 cm by 2–2.5 mm, glabrous. *Seeds* oblong, 4–5 by 1.1–1.3 mm, glabrous on both surfaces, ends rounded, longest cilia 8–10 mm long, reduced and becoming short or glabrous towards the margins. — **Fig. 1.**

Distribution — Australia (Western, Northern, Queensland); in *Malesia*: New Guinea.

Habitat & Ecology — Woodlands with sandy or clay soils, or on rocky sandstone slopes. Altitude 2–270 m.

Uses — Exudate of this species used by local people as ingredient in making of intoxicating beverage, known as ‘tuba’ (Eddowes & Kumul NGF 36056).

2. *Alstonia angustifolia* Wall. ex A.DC.

Alstonia angustifolia Wall. ex A.DC., Prodr. 8 (1844) 409; Miq., Fl. Ned. Ind. 2 (1857) 437; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 440; Merr., Bibliogr. Enum. Born. Pl. (1921) 497; Ridl., Fl. Malay Penins. 2 (1923) 348; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 112; Masam., Enum. Phan. Born. (1942) 617; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 141; F.G. Browne, Forest Trees Sarawak & Brunei (1955) 65; Smythies, Common Sarawak Trees (1965) 18; Markgr., Blumea 22 (1974) 26; J.A.R. Anderson, Checklist Trees Sarawak (1980) 147; Whitmore & Tantra, Checklist Sumatra (1986) 18; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 20; Whitmore & Tantra, Checklist Sulawesi (1989) 14; Whitmore et al., Checklist Kalimantan (1990) 24; PROSEA 5, 1 (1993) 87; I.M. Turner, Gard. Bull. Singapore 45 (1993) 34; Coode et al., Checklist Pl. Brunei (1996) 24; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 123; Sidiy., Blumea, Suppl. 11 (1998) 101; PROSEA 12, 2 (2001) 65; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 15. — Type: *Wallich 1650* (lecto G-DC, designated by Sidiyasa (1998) op. cit.; iso G, K-W, SING), Singapore.

Amblyocalyx beccarii Benth. in Hooker, Icon. Pl. 3, 2 (1876) 69, t. 1179; Merr., Bibliogr. Enum. Born. Pl. (1921) 500; Masam., Enum. Phan. Born. (1942) 618. — *Alstonia beccarii* (Benth.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 297. — Type: *Beccari 1628* (holo K; iso G, P), Sarawak.

Alstonia angustifolia Wall. ex A.DC. var. *elliptica* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 441. — Type: *Curtis s.n.* (holo CAL n.v.), Peninsular Malaysia, Penang.

Alstonia angustifolia Wall. ex A.DC. var. *latifolia* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 441; Monach., Pacific Sci. 3 (1949) 160; Whitmore, Tree Fl. Malaya 2 (1973) 9; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 51. — *Alstonia latifolia* (King & Gamble) Ridl., Fl. Malay Penins. 2 (1923) 347; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 142. — Type: *Maingay 1070/1* (lecto L, designated by Monachina (1949) op. cit.; iso BO, K), Peninsular Malaysia.

Tree 5–35(–46) m high, 8–70 cm dbh, fluted at base, or with small or steep buttresses. Bark smooth, shallowly fissured, or scaly in horizontal and longitudinal fissures, sometimes with large scattered protruding lenticels, grey or brownish; inner bark yellowish, without latex from the trunk. *Branchlets* glabrous or puberulent. *Leaves* in whorls of 3 (rarely 4); petiole 8–30 mm long; colleters minute or shortly lingulate, 20–35 in the axils; blade chartaceous or thinly coriaceous, obovate to narrowly obovate (rarely elliptic), 4–18 by 1.5–7 cm, 1.9–4.7 times as long as wide, apex acuminate, with a blunt point, base acute to decurrent onto the petiole, glabrous above, glabrous or puberulous beneath; 10–20 pairs of secondary veins, forming an angle of 60–80° with the midrib, 4–10(–12) mm from each other, forming a thin submarginal vein; tertiary venation reticulate, sometimes conspicuous on both sides. *Inflorescence* 3–9 cm long, many-flowered; pedicels 0.5–2(–3) mm long, pubescent. Bracts and bracteoles sepal- or scale-like, up to 0.7 mm long, acute or acuminate, ciliate. *Flowers* fragrant. *Sepals* pale green, connate at the base for 0.8–1.5 mm, obovate, 1.3–2 by 0.7–1.2 mm, acute, obtuse or rounded, reflexed or not, rusty pubescent outside and at the lobed parts inside. *Corolla* lobes dextrorse; white, cream, pale yellow or pink, 3–5(–6) mm long in the mature bud and forming a subglobose or ovoid head, 0.8–1.6 by 0.8–1.3 mm, rusty pubescent outside (except the basal part within the calyx or sometimes at the apex of which glabrescent or puberulous); tube 3–4.5 mm long, almost cylindrical, 0.8–1.6 mm wide around the stamens; lobes suborbicular or ovate, 1–2.3 by 1–1.8 mm, 1–1.5 times as long as wide, pilose inside, ciliate. *Stamens* inserted at 2–2.8 mm from the base; anthers ovate, 0.7–1 by 0.3–0.4 mm, obtuse or sometimes acute. *Pistil* 2–3 mm long; ovary ovoid or broadly ovoid, 0.5–1 by 0.6–0.8(–1) mm, of 2 carpels, glabrous, with

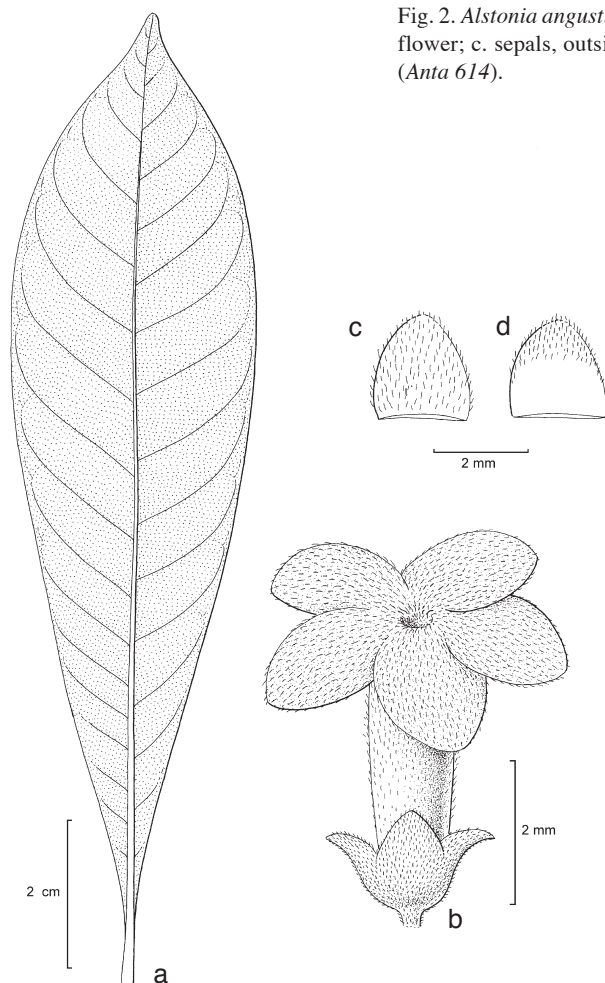


Fig. 2. *Alstonia angustifolia* Wall. ex A.DC. a. Leaf; b. open flower; c. sepals, outside surface; d. sepals, inside surface (*Anta* 614).

a narrow disk-like thickening at the base, 0.1–0.3 mm high; style 1–1.8 mm long; style head ovoid or funnel-form, 0.3–0.5 by 0.2–0.3 mm, with a cleft stigmoid apical part up to 0.1 mm high. *Fruit* a pair of follicles, 20–53 cm by 1.7–2.6(–3) mm, glabrous. *Seeds* densely pubescent, elliptic to oblong, (4–)6–8.6 by 1.2–1.8(–2) mm, one end acuminate up to 4 mm long, the other end rounded; longest cilia 5–13 mm long, reduced and becoming shorter gradually towards the side margins. — **Fig. 2.**

Distribution — *Malesia*: Sumatra (including Bangka Island), Peninsular Malaysia, Singapore, Borneo.

Habitat & Ecology — Primary forests, peat swamps or hillsides, on sandy or granite soils. Altitude 5–750(–1700) m.

Uses — The hard wood can be used for construction work but the trees are usually not large enough for heavy construction.

Note — For species circumscriptions see Sidiyasa, *Blumea*, Suppl. 11 (1998) 101.

3. *Alstonia angustiloba* Miq.

Alstonia angustiloba Miq., Fl. Ned. Ind. 2 (1857) 438; Merr., Bibliogr. Enum. Born. Pl. (1921) 497; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 438; Ridl., Fl. Malay Penins. 2 (1923) 347; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 112; Masam., Enum. Phan. Born. (1942) 617; Monach., Pacific Sci. 3 (1949) 152 (excl. syn. *A. iwahigensis* Elmer); Corner, Wayside Trees Malaya ed. 2, 1 (1952) 142; F.G. Browne, Forest Trees Sarawak & Brunei (1955) 63; Smythies, Common Sarawak Trees (1965) 18; Backer & Bakh.f., Fl. Java 2 (1965) 226; Markgr., Blumea 22 (1974) 24; Cockburn, Trees Sabah 1 (1976) 16; J.A.R. Anderson, Checklist Trees Sarawak (1980) 148; Whitmore & Tantra, Checklist Sumatra (1986) 18; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 22; Whitmore et al., Checklist Kalimantan (1990) 25; PROSEA 5, 1 (1993) 87; I.M. Turner, Gard. Bull. Singapore 45 (1993) 34; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 52; Coode et al., Checklist Pl. Brunei (1996) 25; Kochummen, Tree Fl. Pasoh Forest (1997) 151; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 123; Sidiy., Blumea, Suppl. 11 (1998) 104; D.J. Middleton, Fl. Thailand 7 (1999) 42; PROSEA 12, 2 (2001) 65; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 17. — *Paladelpa angustiloba* (Miq.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 299. — Type: *Blume 910* (lecto L, designated by Sidiyasa (1998) op. cit.; iso L, 3 sheets), Java.

Alstonia calophylla Miq., Fl. Ned. Ind. 2 (1857) 439. — Type: *Teysmann HB.994* (lecto L, designated by Monachina (1949) op. cit.; iso K, U), Sumatra, Loeboe Aloeng (= Lubuk Alung).

Alstonia angustiloba Miq. var. *glabra* Koord. & Valetton, Bijdr. Boomsort. Java 1 (1894) 120. — Type: *Koorders 4* (lecto BO, designated by Sidiyasa (1998) op. cit.), Java, Pekalongan.

Tree up to 40 m high, up to 60(–100) cm dbh, fluted at base and forming tall buttresses up to 8 m high. Bark rough, fissured and peeling off in rectangular flakes, greyish or brownish; inner bark cream, yellow, with copious white latex. *Branchlets* glabrous. *Leaves* in whorls of 4–7(–9); petiole glabrous, (7–)10–20(–30) mm long, with a deltoid or scale-like colleter in the axils; blade subcoriaceous to coriaceous when dried, narrowly elliptic to obovate (rarely ovate), 4.5–22 by 2.1–7 cm, 2.2–4.1 times as long as wide, apex obtuse, sometimes shortly acuminate with a blunt acumen up to 0.6 cm long, base obtuse or acute, glabrous on both sides; 30–60(–70) pairs of secondary veins, straight, forming an angle of 80–90° with the midrib, 1–3(–4) mm from each other; tertiary venation from the middle ramified, inconspicuous or almost so. *Inflorescence* 3–9(–14) cm long, usually forming 2 umbels above each other, many-flowered; pedicels (0–)1–3 mm long, pubescent. Bracts and bracteoles linear or sepal-like, up to 2(–3) mm long, acute, ciliate. *Flowers* fragrant. *Sepals* pale green, connate at the base for 0.2–0.6 mm, erect or slightly spreading when dried, ovate, 1.2–2 by 0.7–1 mm, obtuse, sometimes acute, pubescent outside, glabrous or puberulous around the apex inside, ciliate. *Corolla* lobes sinistrorse; white, yellow or cream, 8–11 mm long in the mature bud and forming a narrowly ovoid head, 3–5 by 1–1.4 mm, glabrous outside; tube 5.6–8 mm long, 1.2–1.8 mm wide around the stamens; lobes oblique, ovate to narrowly ovate or oblong, 4–6.5 by 1.6–3 mm, 1.8–3.3 times as long as wide, densely pubescent at extreme base inside. *Stamens* inserted at 4.2–5.8 mm from the base; anthers ovate, 0.8–1 by 0.35–0.4 mm, obtuse. *Pistil* 4.8–6.3 mm long; ovary ovoid or broadly ovoid, 0.8–1.1 by 0.8–1 mm, of 2 carpels, mostly entirely glabrous, rarely sparsely hairy around the apex, with or without a narrow disk-like thickening at the base; style 3.7–5 mm long; style head pagoda shape, 0.5–0.7 mm high, with a short and robust cleft stigmatic apical part 0.2–0.3 mm high. *Fruit* a pair of follicles, (15–)20–35 cm by 1.6–2.3 mm, brownish tomentose. *Seeds* dark brown, oblong, 5–7 by 1.3–1.5

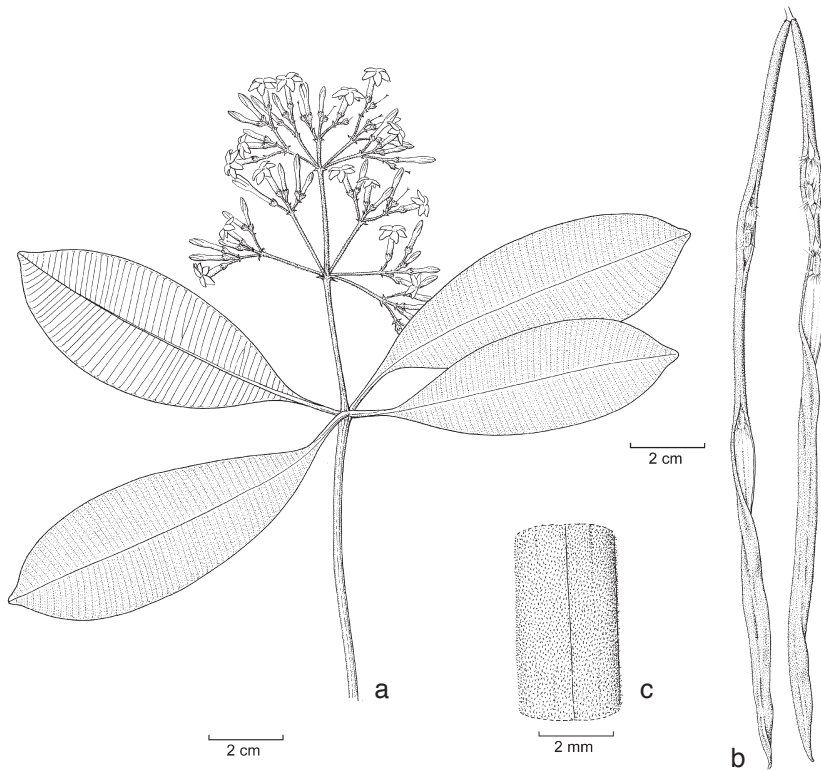


Fig. 3. *Alstonia angustiloba* Miq. a. Habit; b. pair of follicles; c. surface of follicle in detail (a: *Elsener 201*; b, c: *Bojeng Sitam 8981*).

mm, minutely undulate and pubescent on the hilar side (except surrounding the hilum which is a glabrous elliptic belt), smooth and glabrous on the other side, ends rounded or obtuse, longest cilia 10–15 mm long. — **Fig. 3.**

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

Habitat & Ecology — Secondary and primary forests, on hillsides, along streams, swampy areas (usually at the edges), on loamy or sandy soils and limestone. Altitude 15–200 m.

Uses — The latex is used in medicine to heal boils and abscesses. The wood is soft but can be used for matches and household items.

4. *Alstonia beatricis* Sidiy.

Alstonia beatricis Sidiy., *Blumea* 41 (1996) 30; *Blumea*, Suppl. 11 (1998) 111. — Type: *Van Royen 5535* (holo L; iso A, BO, K, WAG), Papua, Waigeo Island, path from Poean to Tofak Bay.

Small tree 5 m high, 3 cm dbh. *Branchlets* glabrous. *Leaves* in whorls of 3; petiole 10–20 mm long, colleters minute or linear and densely packed together in the axils; blade narrowly obovate (sometimes elliptic), 6.2–16 by 1.5–5.2 cm, (2.6–)3.1–4.1

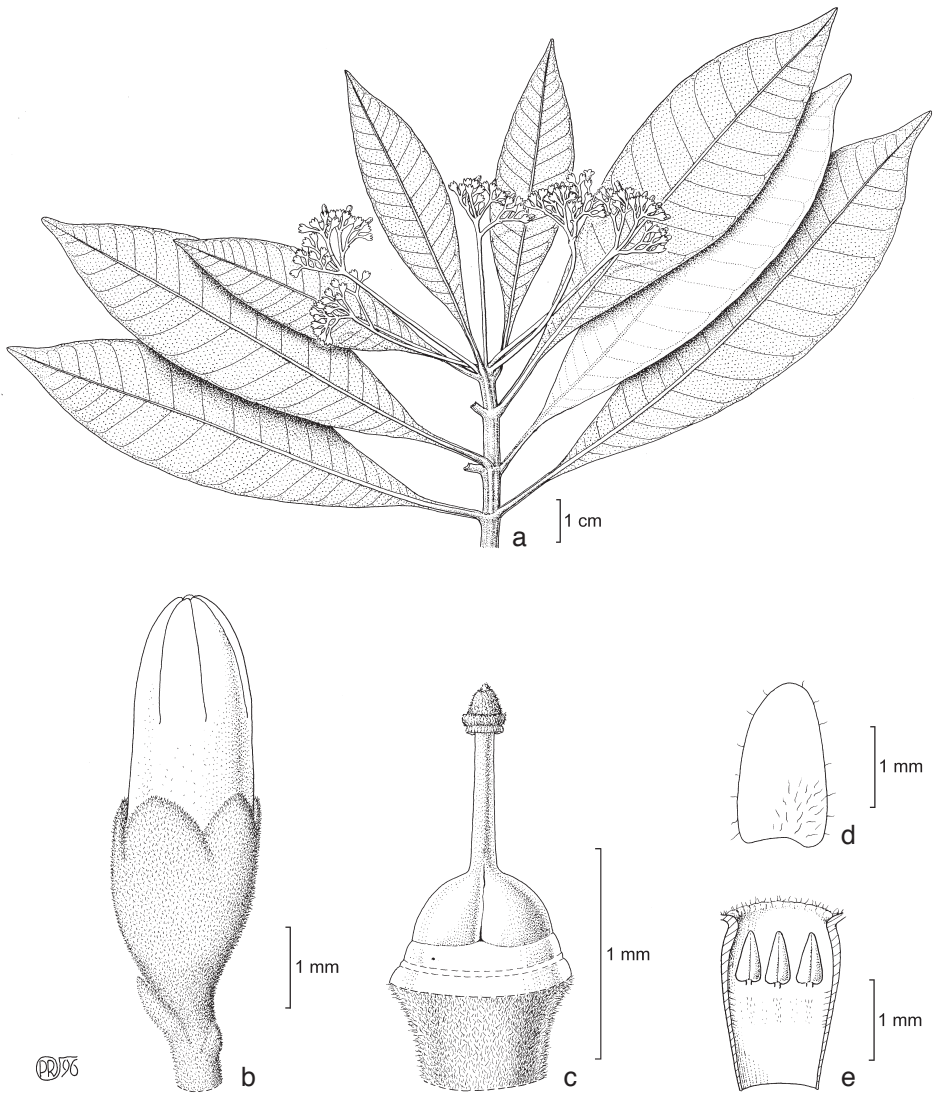


Fig. 4. *Alstonia beatricis* Sidiy. a. Habit; b. flower in bud; c. pistil surrounded by annular disk-like thickening (corolla and calyx removed); d. corolla lobe from inside; e. corolla tube, dissected slightly stretched to show 3 anthers inserted in the glabrous zone (Van Royen 5535).

times as long as wide, apex shortly acuminate with a blunt point, base acute to decurrent onto the petiole, glabrous on both sides; 12–16 pairs of secondary veins (short interstitial veins present), parallel and slightly arched, forming an angle of 70–80° with the midrib, 3–12 mm from each other, joining near the margin forming a thin submarginal vein; tertiary venation reticulate, usually inconspicuous on both sides. *Inflorescence* 3–6.5 cm long, many-flowered; pedicels 1–2 mm long, softly pubescent.

Bracts and bracteoles sepal- or scale-like, ovate to broadly ovate or triangular 0.4–0.9 mm long, obtuse or acute, ciliate, softly pubescent outside, glabrous inside. *Flowers*: *Sepals* connate at the base for 0.75 mm, turbinate, c. 1.7 by 1 mm, apex rounded, ciliate, softly pubescent except at the fused part inside, erect, glaucous when dried. *Corolla* lobes dextrorse; white, c. 3 mm long in the mature bud and forming an ovoid head, c. 1.5 by 1 mm, partly puberulous on the tube and on the lobe margins outside, blackish when dried; tube almost cylindrical or slightly widening around the stamens, c. 2 by c. 1.2 mm; lobes ovate, c. 2 by 1.1–1.2 mm, pilose with white hairs on basal half inside, ciliate, apex rounded, auriculate at the base on the right side. *Stamens* inserted at c. 1.3 mm from the base; anthers ovate, c. 0.7 by 0.3 mm, acute. *Pistil* glabrous, 1.5 mm long; ovary broadly ovoid, 0.4 by 0.6 mm, of 2 carpels, with an annular disk-like thickening at the base 0.15 mm high; style 0.7 mm long; style head ovoid 0.4 by 0.25 mm, with a minute cleft stigmatic apical part c. 0.05 mm high. *Fruit* unknown. — **Fig. 4.**

Distribution — *Malesia*: New Guinea (Papua).

Habitat & Ecology — Low vegetation (open woodland) dominated by *Decaspermum*. Altitude 70 m.

IUCN conservation category — Vulnerable due to acute restriction in area (VU D2).

5. *Alstonia breviloba* Sidiy.

Alstonia breviloba Sidiy., Blumea, Suppl. 11 (1998) 118. — Type: *Hartley TGH 11952* (holo L; iso A, ECON, K), Papua New Guinea, Eastern Highlands District, 3 km north of Omaura.

Tree 17–28 m high, 30–60 cm dbh, without buttresses. Bark scaly or both shallowly longitudinally and horizontally fissured (sometimes corky areas present), grey; inner bark cream, straw, or pink-brown with scattered dark fibres, paler towards cambium, without white latex. *Branchlets* glabrous. *Leaves* in whorls of 3; petiole 10–15 mm long, with many minute colleters densely packed together in the axils; blade thickly coriaceous when dried, obovate, 6.5–14 by (2.7–)3.2–7.5 cm, 1.8–2.8 times as long as wide, apex abruptly shortly acuminate (sometimes rounded), acumen up to 12 mm long with a blunt point, base acute, sometimes obtuse, or decurrent onto the petiole, glabrous above, sparsely hairy (at least on the midrib) beneath; 10–16 pairs of secondary veins (short interstitial veins sometimes present), forming an angle of 70–80° with the midrib, 5–12 mm from each other, hardly prominent beneath, submarginal vein inconspicuous; tertiary venation reticulate, mostly conspicuous on both sides. *Inflorescence* 4–5 cm long, many-flowered; pedicels rather stout, 1–3 mm long, puberulous or pubescent. Bracts and bracteoles sepal- or scale-like, ovate to narrowly ovate, triangular, or sometimes uncertainly shaped, 0.6–2 mm long, obtuse, acute, acuminate or irregularly lobed at the apex, ciliate, puberulous outside, glabrous inside. *Flowers*: *Sepals* connate at the base for c. 0.9 mm, ovate, 2.2–2.6 by 1.2–2 mm, apex obtuse or rounded, ciliate, glabrous or minutely hairy at the base outside, glabrous inside, erect. *Corolla* lobes dextrorse; white, 7–8 mm long in the mature bud and forming an ovoid head, 1.5–2 by 1.5–2 mm, glabrous or minutely hairy around the stamens outside; tube c. 6 mm long, c. 2 mm wide around the stamens; lobes ovate, 2–3 by 2–2.3 mm, 1–1.3 times as long as wide, pilose on the basal half inside, not ciliate, apex rounded, auriculate at the base on the right side. *Stamens* inserted at 3.1–3.8 mm from the base; anthers ovate, 1.1–1.3 by

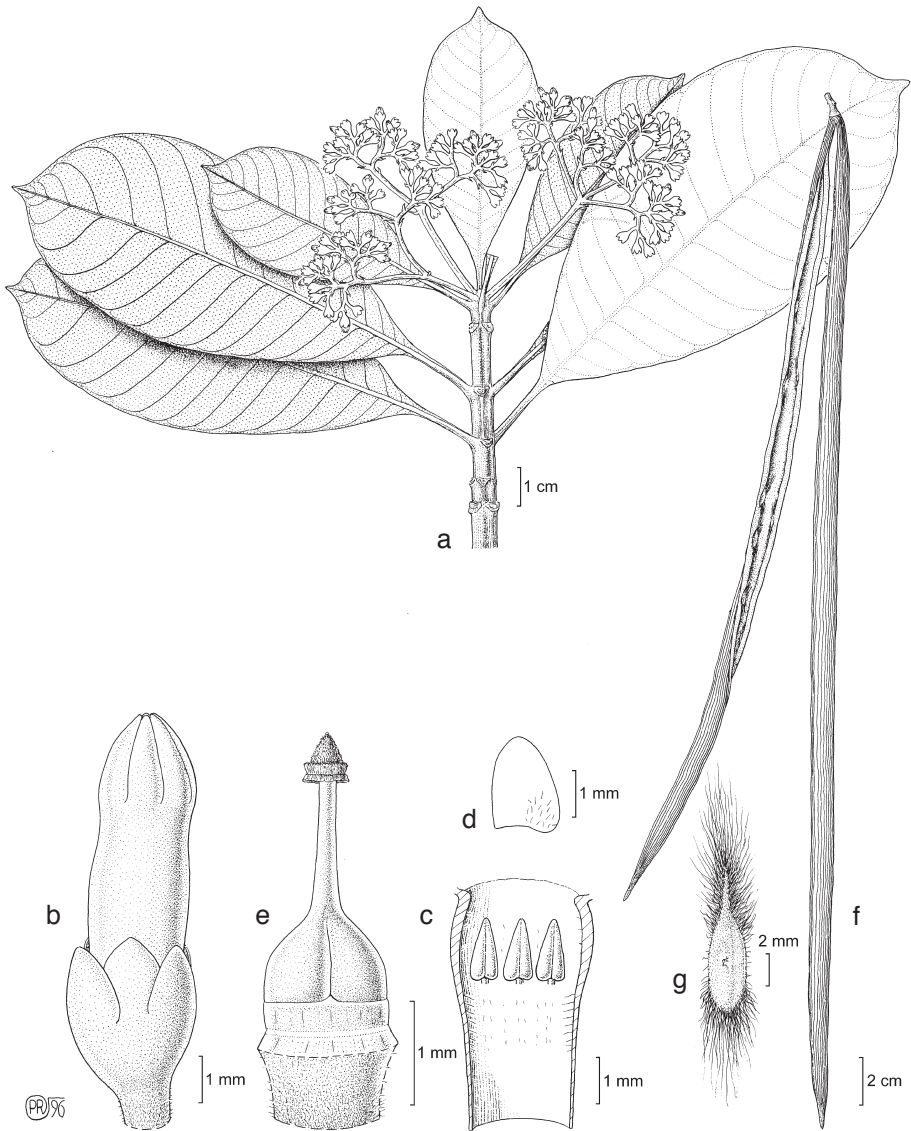


Fig. 5. *Alstonia breviloba* Sidiy. a. Habit; b. flower in bud; c. dissected corolla tube, showing 3 anthers; d. corolla lobe; e. pistil, showing an annular disk-like thickening at the base; f. follicles; g. seed (a–e: Hartley TGH 11952; f, g: Coode & Lelean NGF 29940).

0.4–0.6 mm, obtuse. *Pistil* glabrous, 4–4.1 mm long; ovary ovoid, c. 1.2 by 1.2 mm, of 2 carpels, with an annular disk-like thickening at the base c. 0.4 mm high; style 1.9–2.1 mm long; style head ovoid, 0.8–1 by 0.4–0.6 mm, with a cleft stigmoid apical part up to 0.35 mm high. *Fruit* a pair of follicles, 20–45 cm by 4–5 mm, glabrous. *Seeds* dark brown, elliptic, 7–9 by 3–3.3 mm, pubescent on both sides, one end acuminate with an

acumen 1–2.6 mm long, the other end rounded (sometimes obtuse); longest cilia 5–7 mm long, becoming gradually shorter towards the side margins. — **Fig. 5.**

Distribution — *Malesia*: Papua New Guinea.

Habitat & Ecology — Primary and secondary forests, in the broad-leaved *Araucaria* community. Altitude 1400–1800 m.

IUCN conservation category — Vulnerable due to fragmented and declining area (VU B1+2c).

6. *Alstonia iwahigensis* Elmer

Alstonia iwahigensis Elmer, Leafl. Philipp. Bot. 4 (1912) 1447; Sidiy., Blumea, Suppl. 11 (1998) 135; PROSEA 12, 2 (2001) 66; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 19. — Type: *A.D.E. Elmer 13167* (lecto L., designated by Sidiyasa (1998) op. cit.; iso A, BO, G, GH, HBG, MICH, MO, NY, US, Z), Philippines, Palawan, Puerto Princesa (Mt Pulgar).

Tree 15–45(–70?) m high, 20–80 cm dbh, fluted at base and forming tall buttresses up to 6 m high, spreading at the base up to 2 m away from the trunk. Bark smooth to slightly rough, scaly or both longitudinally and horizontally fissured, greyish, yellowish or dark brown; inner bark yellow or pale yellow, with copious white latex. *Branchlets* glabrous. *Leaves* in whorls of 4–7; petiole (5–)10–20(–28) mm long, without distinct intrapetiolar stipule at the base, widening or scale-like colleters in the axils; blade thinly coriaceous when dried, elliptic to narrowly elliptic or obovate, 3.5–10 by 1.5–4 cm, 1.6–3.4 times as long as wide, apex obtuse or rounded, sometimes shortly acuminate, base acute, obtuse or rounded, glabrous on both sides; 25–40 pairs of secondary veins, straight, forming an angle of 85–90° (mostly nearly 90°) with the midrib, 1–3 mm from each other; tertiary venation from the middle ramified, somewhat conspicuous above. *Inflorescence* 2.5–10 mm long, usually forming of two bunches of dense and many clustered flowers; pedicels 0–1 mm long, pubescent. Bracts and bracteoles ovate to broadly triangular up to 2 mm long, acute. *Flowers* fragrant. *Sepals* pale green, connate at the base for 0.3–0.5 mm, erect or slightly spreading, ovate to narrowly ovate, 1.5–2.1 by 0.6–1 mm, obtuse, puberulous or densely pubescent outside, glabrous or minutely pubescent around the apex inside, ciliate. *Corolla* lobes sinistrorse; yellow or pinkish, 8–10 mm long in the mature bud and forming an ovoid head, 2.5–3 by 0.8–1.1 mm, glabrous or only sparsely ciliate around the apex of the lobe margins outside; tube 6–7.5 mm long, 1–1.7 mm wide around the stamens; lobes ovate or lingulate, mostly slightly oblique, 2.6–4 by 1.3–2.8 mm, 1.1–2.5 times as long as wide, pilose at extreme base inside. *Stamens* inserted at 5–5.8 mm from the base; anthers ovate or triangular, 0.8–0.9 by 0.3–0.5 mm, obtuse. *Pistil* glabrous, 6–6.3 mm long; ovary ovoid or broadly ovoid, 0.8–1.1 by 0.7–1 mm, of 2 carpels, with or without a disk-like thickening at the base (up to 0.3 mm high); style 4.5–4.9 long; style head pagoda shape, 0.6–0.8 mm high, with a short and robust cleft stigmatic apical part 0.2–0.3 mm high. *Fruit* a pair of follicles, 25–35 cm by c. 1.5(–2) mm, glabrous. *Seeds* brown, oblong, 5–6 by 1 mm, ends rounded, glabrous on both sides, longest cilia 13–17 mm long. — **Fig. 6.**

Distribution — *Malesia*: Borneo, Philippines (Palawan).

Habitat & Ecology — Secondary and primary forests, on hillsides, on loamy or sandy soils. Altitude 20–500 m.

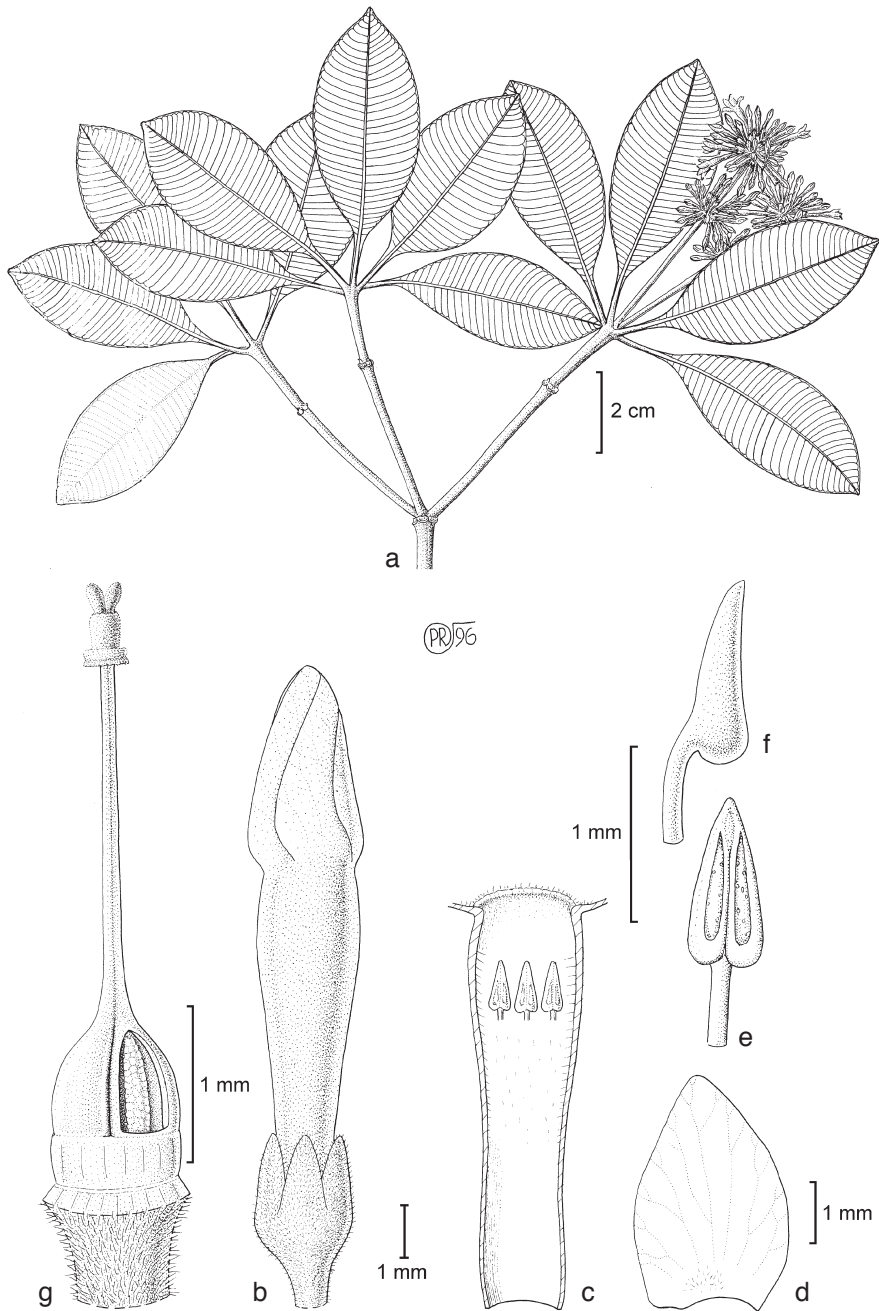


Fig. 6. *Alstonia iwahigensis* Elmer. a. Habit; b. flower in bud; c. dissected corolla tube, showing 3 anthers inserted above the hairy belt; d. corolla lobe; e. anthers, front view; f. anthers, side view; g. pistil, showing numerous ovules from the dissected ovary, annular disk-like thickening at the base, and a robust cleft apical part of the stigma (Ambriansyah & Arifin AA 898).

Uses — The latex (which is collected from the bark) mixed in honey is used as a tonic.

Note — For discussion and species circumstance see Sidiyasa, *Blumea*, Suppl. 11 (1998) 135.

7. *Alstonia macrophylla* Wall. ex G. Don

Alstonia macrophylla Wall. ex G. Don, Gen. Syst. 4 (1837) 87; A.DC., Prodr. 8 (1844) 409; Miq., Fl. Ned. Ind. 2 (1857) 438; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 439; Merr., Bibliogr. Enum. Born. Pl. (1921) 497; Ridl., Fl. Malay Penins. 2 (1923) 347; Markgr., Bot. Jahrb. Syst. 61 (1927) 178; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 113; Kerr in Craib, Fl. Siam. 2 (1939) 440; Masam., Enum. Phan. Born. (1942) 617; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 142; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 12; Cockburn, Trees Sabah 1 (1976) 18; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 41; Whitmore & Tantra, Checklist Sumatra (1986) 19; Checklist Sulawesi (1989) 14; Whitmore et al., Checklist Kalimantan (1990) 25; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 31; PROSEA 5, 1 (1993) 88; Sidiy., *Blumea*, Suppl. 11 (1998) 149; D.J. Middleton, Fl. Thailand 7 (1999) 44; PROSEA 12, 2 (2001) 66; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 20. — Type: *Wallich 1648* (lecto K-W, designated by Huber (1973) op. cit.; iso P), India, Hort. Bot. Calcutta.

Alstonia macrophylla Wall. ex G. Don var. *glabra* A.DC., Prodr. 8 (1844) 410; Markgr., Bot. Jahrb. Syst. 61 (1927) 178. — *Alstonia costata* Wall. ex Miq., Fl. Ned. Ind. 2 (1857) 439, non R.Br. (1811); Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 556. — Type: *Wallich 1649* (lecto K-W, designated by Sidiyasa (1998) op. cit.; iso K), Peninsular Malaysia, Penang.

Alstonia batino Blanco, Fl. Philipp. 2 (Suppl.) (1845) 589. — Type: Untraced. Neotype: *Merrill Species Blancoanae 335* (neo L, designated by Sidiyasa (1998) op. cit.; iso A, BM, BO, F, K, MO, NY, P, W), Philippines, Luzon, Bulacan Province, Angat.

Alstonia acuminata Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 140. — *Alstonia macrophylla* Wall. ex G. Don var. *acuminata* (Miq.) Monach., Pacific Sci. 3 (1949) 166; Whitmore et al., Checklist Maluku (1989) 14. — Type: *De Vriese & Teijsmann s.n.* (holo L), Moluccas, Ceram.

Alstonia subsessilis Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 140. — Type: *De Fretes 5574* (lecto L, designated by Monachina (1949) op. cit.; iso U), Moluccas, Amboina (= Ambon).

Alstonia pangkorensis King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 442; Ridl., Fl. Malay Penins. 2 (1923) 348. — Type: *Scortechini 1024* (lecto CAL, designated by Monachina (1949) op. cit.; iso BM), Peninsular Malaysia, Pangkor Island.

Alstonia paucinervia Merr., Philipp. J. Sci., Bot. 5 (1910) 224; Markgr., Bot. Jahrb. Syst. 61 (1927) 179. — Type: *Darling (For. Bur.) 18726* (lecto US, designated by Monachina (1949) op. cit.), Philippines, Luzon, Camarines Province.

Alstonia oblongifolia Merr., Philipp. J. Sci., Bot. 10 (1915) 65. — Type: *Curran (For. Bur.) 4495* (lecto K, designated by Sidiyasa (1998) op. cit.; iso NY, P, US), Philippines, Palawan.

Alstonia macrophylla Wall. ex G. Don var. *mollis* Merr., Enum. Philipp. Fl. Pl. 3 (1923) 322. — Type: *Curran (For. Bur.) 17128* (lecto L, designated by Monachina (1949) op. cit.; iso BO), Philippines, Luzon, Nagayan Province.

Alstonia glabriflora Markgr., Bot. Jahrb. Syst. 61 (1927) 179; Monach., Pacific Sci. 3 (1949) 167; Whitmore et al., Checklist Irian Jaya (1997) 16. — Type: *Ledermann 12649* (lecto L, designated by Sidiyasa (1998) op. cit.), Papua New Guinea, Sepik.

Alstonia brassii Monach., Pacific Sci. 3 (1949) 166; Whitmore et al., Checklist Irian Jaya (1997) 16. — Type: *Brass 5138* (holo NY; iso A, BM, BO), Papua New Guinea, Central District, Mafulu.

Alstonia brassii × *spectabilis* Markgr., *Blumea* 22 (1974) 29, nom. illeg.

Small or big tree 3–40(–50) m high, 5–100 cm dbh, buttresses usually absent or small up to 1 m high and spreading up to 2 m at the base. Bark smooth or rough,

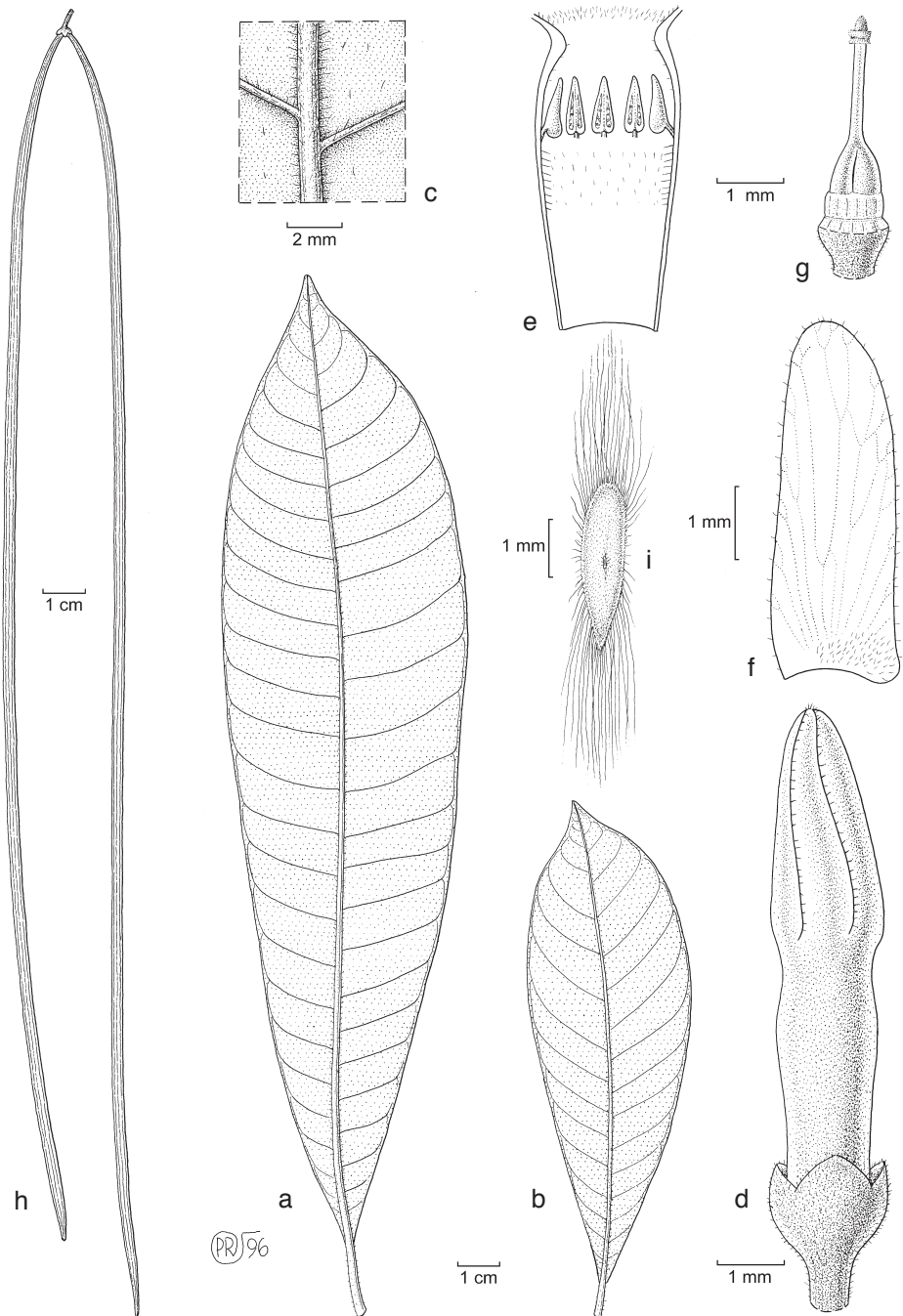


Fig. 7. *Alstonia macrophylla* Wall. ex G. Don. a, b. Leaves; c. detailed leaf beneath; d. flower in bud; e. dissected corolla tube; f. corolla lobe; g. pistil, showing an annular disk-like thickening at the base; h. follicles; i. seed (a, d–g: Ramos 1895; b: Tandon 3567; c, h, i: Tandon 3257).

minutely scaly, shallowly longitudinally fissured or both longitudinally and horizontally fissured, silver grey to dark brown; inner bark brittle, hard, creamy, yellowish brown with cream or orange streaks, whitish inside. *Branchlets* glabrous. *Leaves* in whorls of 3 or 4; petiole 2–25 mm long, colleters minute and densely packed together in the axils; blade chartaceous or coriaceous when dried, obovate or narrowly obovate, sometimes elliptic or narrowly elliptic, 4.5–25(–32) by 1.5–10.5 cm, 1.7–4.8(–5.8) times as long as wide, apex varies from rounded to narrowly acuminate, acumen up to 20 mm long with a blunt tip, base acute to decurrent onto the petiole, sometimes abruptly so, glabrous above, glabrous or densely pubescent beneath; 12–25(–31) pairs of secondary veins (short intermediate veins sometimes present), forming an angle of (45–)60–80(–90)° with the midrib, 3–15 mm from each other, sometimes joining near the margin forming a submarginal vein; tertiary venation reticulate, conspicuous beneath or sometimes on both sides. *Inflorescence* 2–11 cm long, many-flowered; pedicels (0–)1–4(–6) mm long, puberulous or glabrescent. Bracts and bracteoles sepal- or scale-like, ovate, triangular, up to 1.5(–2) mm long, obtuse or acute, ciliate, glabrous or puberulous outside, glabrous inside. *Flowers* fragrant. *Sepals* connate at the base for 0.5–0.8 mm, ovate or broadly ovate, sometimes turbinate, 1–2.5 by 0.8–1.8 mm, obtuse or rounded, sometimes mucronulate, ciliate, glabrous or puberulous outside, glabrous inside, erect or slightly spreading. *Corolla* lobes dextrorse; white or cream (sometimes pinkish on the tube), 5–12 mm long in the mature bud and forming an ovoid or narrowly ovoid head, 2–6 by 0.8–1.5 mm, glabrous or sparsely hairy around the stamens and on the lobed margins outside; tube 4–6.3 mm long, 0.9–1.8 mm wide around the stamens; lobes ovate or narrowly ovate, sometimes slightly falcate or oblique, (2.8–)3.6–7 by 1–2.6 mm, 2.2–5 times as long as wide, pilose at the base to over half the length of the lobes inside, ciliate (rarely not), apex rounded, auriculate at the base on the right side. *Stamens* inserted at 2.5–3.8(–4.1) mm from the base; anthers ovate, 0.8–1.5 by 0.3–0.6 mm, obtuse, sometimes acute or mucronulate. *Pistil* glabrous, 2.6–4.2 mm long; ovary ovoid (rarely broadly ovoid), (0.6–)0.8–1.4 by 0.7–1 mm, of 2 carpels, with an annular disk-like thickening at the base 0.2–0.4 mm high, mostly conspicuous; style 1.4–2.5(–2.9) mm long; style head ovoid 0.4–1 mm long, with a minute or narrow cleft stigmatic apical part 0.1–0.4 mm high. *Fruit* a pair of follicles, 25–62 cm by 2–4(–4.5) mm, glabrous. *Seeds* elliptic (sometimes slightly ovate), 5–10.5(–12) by 1.6–2.5 mm, pubescent on both sides, one end acuminate with an acumen 1–5 mm long (sometimes bifid at the apex), the other end rounded (rarely obtuse); longest cilia 5–10 mm long, becoming gradually shorter along the margins. — **Fig. 7.**

Distribution — Sri Lanka, India (Nicobar Islands), Thailand, Cambodia, Vietnam; in *Malesia*: throughout (except Java, Sulawesi, Nusa Tenggara).

Habitat & Ecology — Lowland to montane primary and secondary forests, on level lands, slopes or ridges, edge of mangrove, sometimes on flooded areas and heath forests, with the soil types sandy clay or loam, volcanic, or limestone. Altitude 0–2870 m.

Uses — Powdered bark mixed with water is used as a traditional medicine, especially against skin diseases. It is also used to treat dysentery. The wood is hard and attractive and is very suitable for making furniture and flooring.

Note — *Alstonia macrophylla* is a widespread and very variable species. For discussion see Sidiyasa, Blumea, Suppl. 11 (1998) 149.

8. *Alstonia muelleriana* Domin

Alstonia muelleriana Domin, Biblioth. Bot. 89 (1928) 1081; Monach., Pacific Sci. 3 (1949) 163; Markgr., Blumea 22 (1974) 27; P.I. Forst., Austral. Syst. Bot. 5 (1992) 752; Fl. Australia 28 (1996) 120; Whitmore et al., Checklist Irian Jaya (1997) 16; Sidiy., Blumea, Suppl. 11 (1998) 155. — *Alstonia villosa* F. Muell., Fragm. 6 (1868) 117, non Blume (1826). — Type: *Domin* 7855 (lecto PR, designated by P.I. Forster (1992) op. cit.), Queensland, Cook District, Lake Eacham.

Alstonia muelleriana Domin var. *parvifolia* Domin, Biblioth. Bot. 89 (1928) 1081. — Type: *Domin* 7857 (lecto PR, designated by P.I. Forster (1992) op. cit.), Queensland, Cook District, Yarraba.

Small to medium-sized tree 5–25 m high, 4–40 cm dbh. Bark rough, shallowly longitudinally and horizontally fissured, grey or pale brown; inner bark yellow or yellowish brown, without exudate. *Branchlets* glabrous or pubescent. *Leaves* in whorls of 3 or 4; petiole glabrous or pubescent, 4–17 mm long, few or many minute colleters and densely packed together in the axils; blade subcoriaceous when dried, obovate to very narrowly obovate, 3–15 by 1–5.5 cm, 2.7–4.6 times as long as wide, apex shortly acuminate with a blunt tip, sometimes obtuse, base cuneate or decurrent onto the petiole, glabrous above or pubescent only on the midrib and on the secondary veins, pubescent beneath; 10–15 pairs of secondary veins, rather straight, forming an angle of 50–80° with the midrib, 4–12 mm from each other; tertiary venation reticulate, conspicuous beneath or sometimes on both sides. *Inflorescence* 4–9 mm long, many-flowered; pedicels 1–2.5 mm long, pubescent. Bracts and bracteoles scale- or sepal-like, ovate, 1–2 mm long. *Flowers* fragrant. *Sepals* pale green, connate at the base for 0.5–1(–1.5) mm, ovate, 1.7–2.5 by 0.7–1.3 mm, obtuse, pubescent outside, pubescent or puberulous inside, ciliate, erect. *Corolla* lobes dextrorse; white, 4–9.2 mm long in the mature bud and forming an ovoid or narrowly ovoid head, 1–4.2 by 0.9–1.2 mm, pubescent outside, ciliate on corolla lobes; lobes obliquely strap-shaped, more or less falcate, 2.1–5 by 0.8–1.4 mm, 2.6–5 times as long as wide, pilose inside, acute or obtuse. *Stamens* inserted at 1.7–2.3 mm from the base; anthers ovate, 0.8–1 by 0.3–0.5 mm, obtuse. *Pistil* 1.8–2.6 mm long; ovary ovoid, 0.7–1.3 by 0.6–1 mm, glabrous or sparsely hairy, a disk-like thickening at the base and 0.15–0.35 mm high; style 0.8–1.3 mm long; style head ovoid, 0.4–0.8 by 0.3–0.5 mm, with a cleft stigmatic apical part c. 0.1 mm high, glabrous or minutely hairy. *Fruit* a pair of follicles, 13–32 cm by 2.5–3 mm, glabrous. *Seeds* oblong (rarely elliptic), c. 7.5 by 1.3 mm, one end rounded and the other long acuminate up to 2.5 mm long, pubescent on both sides, longest cilia 8–10 mm long, reducing gradually towards the margins.

Distribution — Australia (Queensland); in *Malesia*: New Guinea.

Habitat & Ecology — Primary or secondary forests, on dry soils. Altitude 0–700 m.

9. *Alstonia parvifolia* Merr.

Alstonia parvifolia Merr., Publ. Bur. Sci. Gov. Lab. 35 (1906) 59; Philipp. J. Sci. 1, Suppl. 1 (1906) 116; Enum. Philipp. Fl. Pl. 3 (1923) 322; Markgr., Blumea 22 (1974) 25; Sidiy., Blumea, Suppl. 11 (1998) 160. — Type: *Meyer* (*For. Bur.*) 2209 (lecto K, designated by Sidiyasa (1998) op. cit.; iso NY), Philippines, Luzon, Bataan Province, Mt Mariveles.

Small tree up to 8 m high. *Branchlets* glabrous. *Leaves* in whorls of 4 (rarely of 3); petiole 10–26(–35) mm long, many minute or shortly lingulate colleters densely

packed together in the axils; blade thinly coriaceous when dried, elliptic, narrowly elliptic or narrowly obovate, 6.5–20 by 2–5.5 cm, (2.7–)3–4.4 times as long as wide, apex acuminate, acumen up to 1 cm long, base acute, glabrous on both sides; 13–17 pairs of secondary veins, slightly curved near margin, forming an angle of 60–80° with the midrib, 4–11(–16) mm from each other, sometimes alternating with less conspicuous interstitial veins; tertiary venation inconspicuous, rarely conspicuous beneath. *Inflorescence* 4–11 cm long, many-flowered; pedicels 1–3.5 mm long, pubescent. Bracts and bracteoles sepal- or scale-like, ovate or narrowly ovate, up to 2.5 mm long, pubescent except at the base inside. *Flowers* fragrant. *Sepals* pale green, grey-green or brown when dried, connate at the base for (0.7–)1–1.6 mm, ovate, 2.5–3.2(–3.7) by 1.2–2.5 mm, obtuse or rounded and with a thick margin, densely pubescent except on the fused part inside, erect or slightly spreading (sometimes reflexed). *Corolla* lobes dextrorse; white, (5–)6–8 mm long in the mature bud and forming an ovoid head, 2.5–4 by 1.2–1.7 mm, glabrous or very sparsely and shortly hairy around the apex outside, dark brown or blackish when dried; tube almost cylindrical, 3.8–5 by 1.3–2 mm; lobes ovate, sometimes slightly oblique, 3.5–5.8 by 1.7–3 mm, 1.7–2.8 times as long as wide, pilose at the base inside, ciliate or not, auriculate at the base on the right side. *Stamens* inserted at 2.3–3.2 mm from the base; anthers ovate, 1–1.2 by 0.3–0.4 mm, pointed. *Pistil* 2.6–3.2 mm long, glabrous; ovary ovoid or broadly ovoid, 0.9–1.3 by 0.7–1 mm, of 2 carpels, with a disk-like thickening at the base 0.2–0.4(–0.5) mm high; style 1.1–1.9 mm long; style head 0.5–0.6 mm high, with a cleft stigmatic apical part up to 0.1 mm high. *Fruit* 16–21(–24?) cm by c. 3 mm, glabrous, with narrow and acutish apex, blackish when dried. *Seeds* narrowly elliptic, 5.5–7 by 1.5–1.7 mm, dark brown, pubescent on both sides, one end rounded, the other end acuminate, which is bifid at the apex up to 1 mm long; longest cilia 4–6 mm long, gradually becoming shorter towards the side margins.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Secondary growth in logged-over forests. Altitude 700–850 m.

Note — The sterile material of *A. parvifolia* looks like that of *A. angustifolia*. For the distinction see Sidiyasa, Blumea, Suppl. 11 (1998) 160.

10. *Alstonia penangiana* Sidiy.

Alstonia penangiana Sidiy., Blumea, Suppl. 11 (1998) 162. — Type: Whitmore FRI 20548 (holo L; iso K, KEP), Peninsular Malaysia, Pinang Island, Penang Hill, Moniots Rd.

Tree 17–32 m high, 35 cm dbh. Bark smooth, grey or pale brown. *Branchlets* glabrous. *Leaves* in whorls of 3 or 4; petiole 12–24 mm long; colleters minute and densely packed together in the axils; blade chartaceous, obovate to narrowly obovate, 9.5–23 by 3.2–9.5 cm, 2.7–3.5 times as long as wide, apex shortly acuminate, acumen up to 10 mm long with a blunt point, base acute to decurrent onto the petiole, glabrous on both sides; 15–22 pairs of secondary veins, forming an angle of 60–80° with the midrib, 5–14(–18) mm from each other, joining at the ends and forming a thin submarginal vein; tertiary venation reticulate, mostly conspicuous on both sides. *Inflorescences* 5.5–12 cm long, many-flowered; pedicels 1.5–4 mm long, pubescent. Bracts and bracteoles sepal- or scale-like, ovate to broadly ovate, up to 1 mm long (the bracteoles are usually

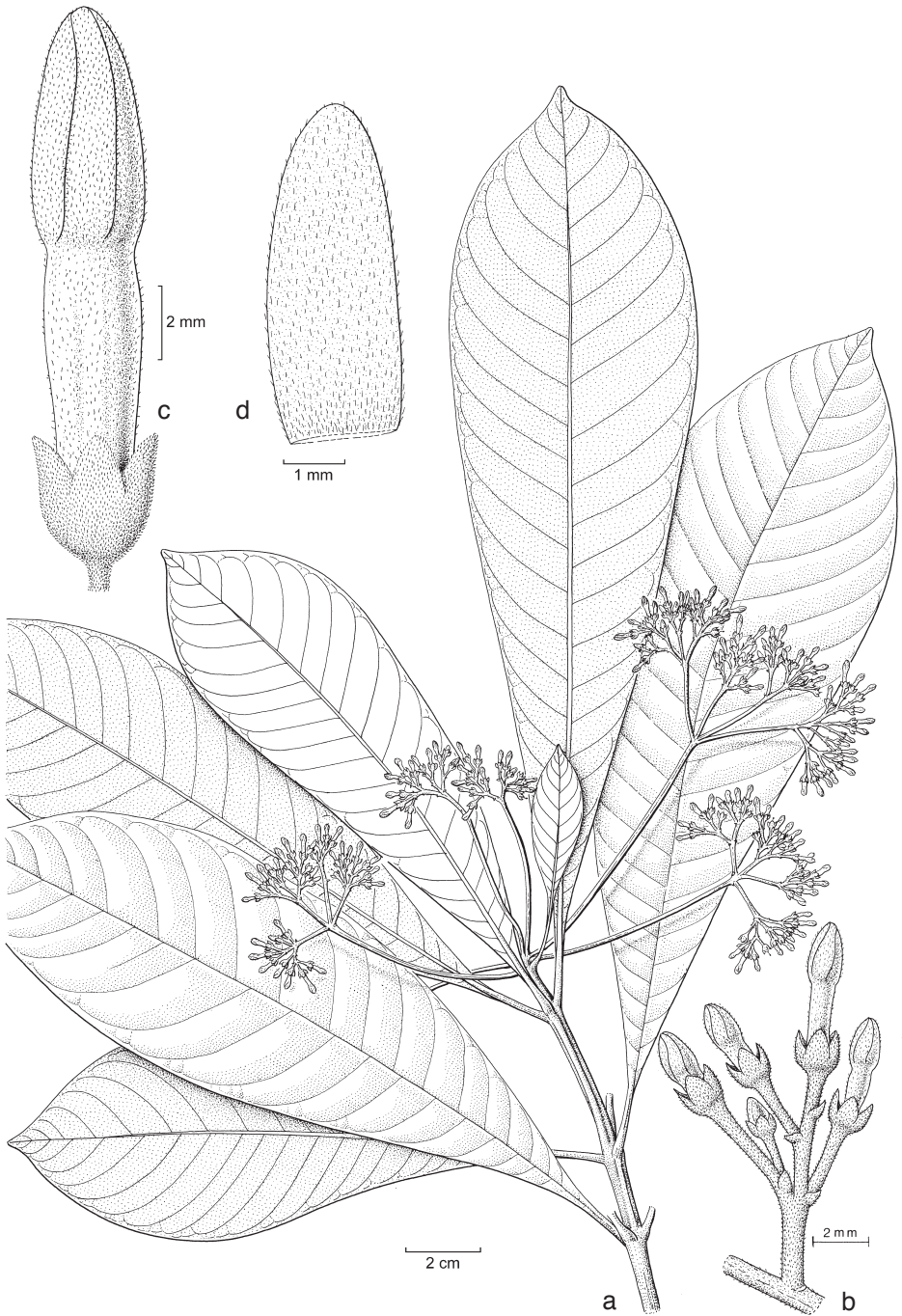


Fig. 8. *Alstonia penangiiana* Sidiy. a. Habit; b. cluster of flowers; c. flower in bud; d. corolla lobe (Whitmore FRI 20458).

much smaller), obtuse to acuminate, ciliate, pubescent outside, glabrous inside. *Flowers* with a slightly sour odour. *Sepals* connate at the base for 0.8–1 mm, ovate, 1.7–2.5 by 0.8–1.5 mm, acute or obtuse, pubescent outside and on the free parts inside. *Corolla* lobes dextrorse; white, 6.5–7.2 mm long in the mature bud and forming an ovoid head, 2.3–3.5 by 1.2–1.5 mm, shortly pubescent outside (except the basal part within the calyx which is glabrous); tube 5.4–5.6 mm long, 1.2–1.5 mm wide around the stamens; lobes ovate, 3–4.5 by 1.8–2.3 mm, 1.7–2 times as long as wide, pilose inside, ciliate. *Stamens* inserted at 3.5 mm from the base; anthers ovate, c. 1 by 0.35 mm, obtuse or mucronulate. *Pistil* 3.1–3.7 mm long, glabrous; ovary ovoid, 0.7–1 by 0.6–0.8 mm, of 2 carpels, with a slightly wavy disk-like thickening at the base, 0.2–0.3 mm high; style 2–2.2 mm long; style head ovoid or funnel-form, 0.5–0.7 by 0.3 mm, with a minute cleft stigmatic apical part up to 0.15 mm high. *Fruit* (known only from the type specimen) a pair of follicles, 60 cm by 3.5 mm, glabrous. *Seeds* dark brown, narrowly ovate or elliptic, 8.5 by 1.8–2 mm, pubescent, one end acute or acuminate, acumen 1–1.5 mm long, the other end obtuse or rounded; longest cilia 10–12 mm long, gradually becoming shorter towards the margins. — **Fig. 8.**

Distribution — *Malesia*: Peninsular Malaysia (Penang).

Habitat & Ecology — Primary or disturbed forests, on hillsides. Altitude 200–600 m.

IUCN conservation category — Vulnerable due to acute restriction in area (VU D2).

Note — For discussion and species distinction see Sidiyasa, *Blumea*, Suppl. 11 (1998) 162.

11. *Alstonia pneumatophora* Backer ex Den Berger

Alstonia pneumatophora Backer ex Den Berger, *Meded. Proefstat. Thee* 97 (1926) 153; Smythies, *Common Sarawak Trees* (1965) 18; J.A.R. Anderson, *Tr. Peat Swamp For. Sarawak* (1972) 22; Markgr., *Blumea* 22 (1974) 25; J.A.R. Anderson, *Checklist Trees Sarawak* (1980) 148; Whitmore & Tantra, *Checklist Sumatra* (1986) 19; P.S. Ashton, *Man. non-Dipt. Trees Sarawak* 2 (1988) 22; Whitmore & Tantra, *Checklist Sulawesi* (1989) 14; Whitmore et al., *Checklist Kalimantan* (1990) 25; PROSEA 5, 1 (1993) 88; Sidiy., *Blumea*, Suppl. 11 (1998) 165; Kessler et al., *Blumea*, Suppl. 14 (2002) 13; D.J. Middleton, *Tree Fl. Sabah & Sarawak* 5 (2004) 21. — Type: *Endert 28E.iP.505* (lecto L, designated by Sidiyasa (1998) op. cit.; iso BO, U), S Sumatra, Banjoeasin (= Banyuasin).

Alstonia pneumatophora Backer ex Den Berger var. *petiolata* Monach., *Pacific Sci.* 3 (1949) 153; Whitmore, *Tree Flora of Malaya* 2 (1973) 11; Kessler & Sidiy., *Trees Balikpapan-Samarinda* (1994) 52. — Type: *Endert 28E.iP.537* (holo L; iso BO, U), South Sumatra, Palembang, Bayung Lincir, Banyuasin.

Tree 25–55 m high, 30–100(–200) cm dbh, fluted at base or forming tall and steep buttresses up to 8 m high, spreading for up to 3 m at the base. Bark smooth or sparsely scaly, grey; inner bark pale yellow or orange-brown, soft, granular, with copious white latex. *Branchlets* glabrous. *Leaves* in whorls of (3–)4–6; petiole 0–5(–20) mm long, laterally compressed, or shallowly caniculate above, slightly winged, with deltoid or scale-like colleters in the axils; blade coriaceous, spatulate, sometimes obovate, 4.3–13 by 1.5–4.3 cm, 1.7–3.4(–4.2) times as long as wide, apex rounded, sometimes retuse, base acute or decurrent onto the petiole, rarely obtuse, glabrous on both sides, not glaucous beneath; 18–30 pairs of secondary veins, straight, forming an angle of (70–) 80–90° with the midrib, 1.5–4(–6) mm from each other; tertiary venation admedial

ramified, usually inconspicuous on both sides. *Inflorescence* 3–9 cm long, composed of two bunches of densely clustered flowers; pedicels 0–1 mm long, puberulous or densely pubescent. Bracts and bracteoles ovate or triangular, sepal-like, up to 2(–3) mm long, ciliate, pubescent outside, laxly puberulous around the apex inside, glabrous at the base, acute or obtuse. *Flowers* fragrant. *Sepals* connate at the base for 0.2–0.4(–0.6) mm, ovate, 1.5–2(–3.5) by 0.5–1.2 mm, obtuse, pubescent outside, laxly puberulous around the apex and glabrous at the base inside, ciliate, erect, very often spreading when dried. *Corolla* lobes sinistrorse; white, 8–13 mm long in the mature bud and forming an ovoid head, 2–3.6 by 1.1–1.6 mm, glabrous outside; tube almost cylindrical, 7–10 by 0.8–1 mm; lobes ovate, 3–5 by 2–3.2 mm, 1.2–1.5(–2.5) times as long as wide, apex obtuse or rounded, pilose with white hairs at the extreme base inside. *Stamens* inserted at 5.2–8.4 mm from the base; anthers ovate, 0.7–0.9 by 0.3–0.4 mm, obtuse. *Pistil* glabrous, (6–)7.5–8.9 mm long; ovary ovoid, 0.8–1.2 by 0.7–0.9 mm, of 2 carpels, with or without a disk-like thickening at the base (if present c. 0.25 mm high); style 5–8 mm long; style head 0.4–0.7 mm high, with a short robust cleft stigmatic apical part c. 0.1(–0.3) mm high. *Fruit* a pair of follicles, 10–20(–40) cm by 1.5–2 mm, shortly pubescent or tomentose, with a blunt or narrowly acute apex. *Seeds* oblong, 4–4.9 by 1–1.2 mm, ends rounded, glabrous on both sides, longest cilia 8–12 mm long, reduced and becoming shorter (sometimes glabrous) toward the margins.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Sulawesi.

Habitat & Ecology — Swamps or on periodically inundated areas along streams, on sandy loam or heavy loam soils. Altitude 0–50 m.

Uses — The wood is soft and suitable for carving. The wood of the aerial roots make a substitute for cork. The latex can be applied to wounds.

12. *Alstonia rostrata* C.E.C. Fisch.

Alstonia rostrata C.E.C. Fisch., Bull. Misc. Inform. Kew (1929) 315; D.J. Middleton & M. Gilbert, Taxon 43 (1994) 478; Sidiy., Blumea, Suppl. 11 (1998) 168; D.J. Middleton, Fl. Thailand 7 (1999) 44. — Type: *C.E. Parkinson 6563* (holo K), Burma, Thanton, Yattheytaung.

Winchia calophylla A.DC., Prodr. 8 (1844) 326, not *Alstonia calophylla* Miq. (1857). — *Winchia glaucescens* K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 125. — *Alstonia glaucescens* (K. Schum.) Monach., Pacific Sci. 3 (1949) 144; Whitmore & Tantra, Checklist Sumatra (1986) 18. — Type: *Wallich 1607* (lecto NY, designated by Monachina (1949) op. cit.; iso C, E, G, K-W, L, M, NY, P, W), Burma, Martabania.

Alstonia pachycarpa Merr. & Chun, Sunyatsenia 2 (1935) 310. — Type: *N.K. Chun & C.L. Tso 44317* (holo IBSC; iso A, K, P, US), China, Hainan, Mocheung Ling, Ting-on.

Alstonia undulifolia Kochummen & K.M. Wong, Blumea 29 (1984) 513. — Type: *Kochummen FRI 32505* (holo KEP; iso A, K, L, SAN), Peninsular Malaysia, Kedah, Gunong Jerai.

Tree 8–35 m high, 15–80 cm dbh, sometimes slightly fluted at the base, without buttresses. Bark shallowly and/or irregularly fissured, pale or yellowish brown; inner bark yellow-orange, light brown or straw-coloured, granular, with copious white latex. *Branchlets* glabrous. *Leaves* in whorls of 3–4(–6); petiole 8–20(–25) mm long, sometimes with a very small (obscure) intrapetiolar stipule at the base, with deltoid or scale-like colleters in the axils; blade elliptic or narrowly elliptic, rarely ovate or obovate, 4.5–13(–20) by 1.5–5.5 cm, 1.9–4.8 times as long as wide, apex usually abruptly

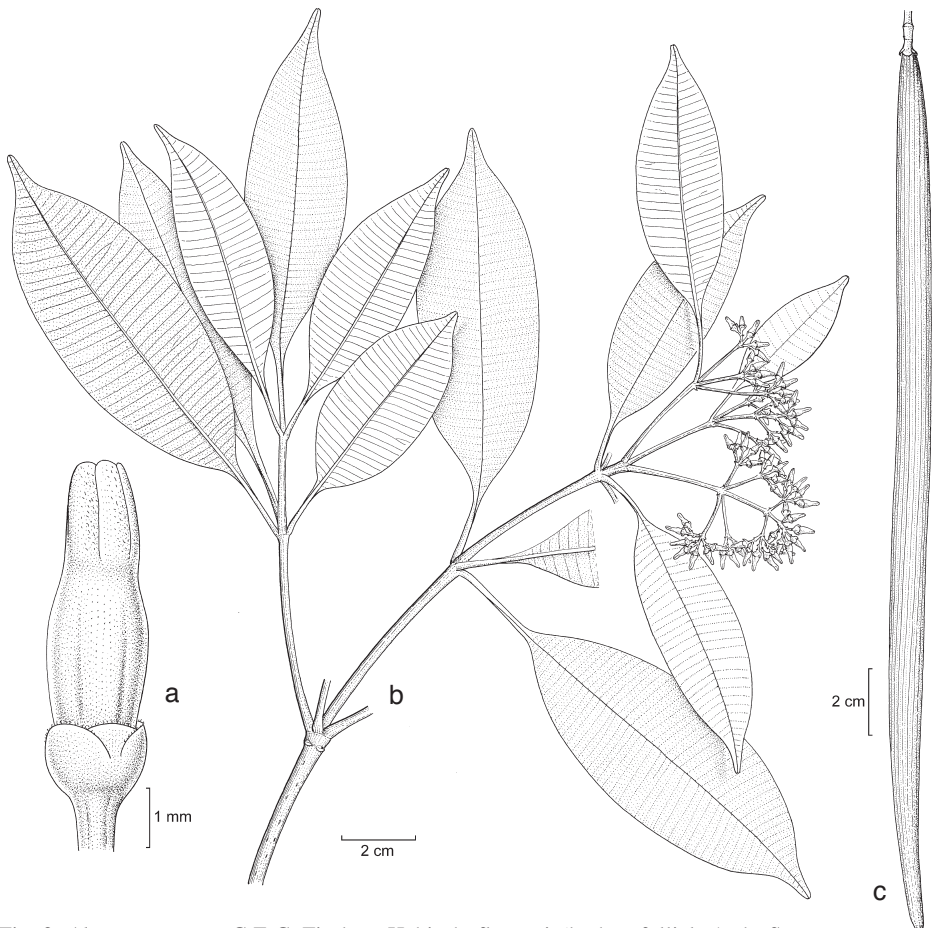


Fig. 9. *Alstonia rostrata* C.E.C. Fisch. a. Habit; b. flower in bud; c. follicle (a, b: *Siriruga* 457; c: *Poilane* 2085).

acuminate, up to 12 mm long with a blunt acumen, base obtuse or acute, sometimes rounded, mostly continuing downwards onto the petiole and forming a slightly winged petiole, glabrous on both sides; 23–60 pairs of secondary veins, rather straight, forming an angle of $80\text{--}90^\circ$ with the midrib, 1–3(–5) mm from each other, joining near margin to form a thin submarginal vein; tertiary venation admedial ramified, mostly conspicuous on both sides, descending towards the midrib and more or less parallel with the secondary veins. *Inflorescence* 2–5 cm long, many-flowered; pedicels (0.5–)1–2 mm long, glabrous or puberulous. Bracts and bracteoles scale- or sepal-like, ovate or subtriangular, up to 1 mm long, curving or not, obtuse or acute, glabrous on both sides, not ciliate, leafy bracts sometimes present. *Flowers* fragrant. *Sepals* dark green or pink, sometimes red, connate at the base for 0.2–0.4 mm, ovate or suborbicular, 0.9–1.2(–1.7) by 0.9–1.2(–1.5) mm, erect, rounded, glabrous outside, glabrous or laxly puberulous around the apex inside, ciliate. *Corolla* lobes sinistrorse; white or pink,

5.5–7 mm long in the mature bud and forming an ovoid head, 1.5–2.5 by 1–1.5 mm; partly puberulous outside (usually on the lobed part); tube 5–6 mm long, 1.5–2 mm wide around the stamens; lobes ovate, 2.3–3 by 1.7–2.5 mm, 1.2–1.4 times as long as wide, pilose inside. *Stamens* inserted at 3–3.3 mm from the base; anthers ovate or subtriangular, 1–1.2 by 0.35–0.5 mm, obtuse or acute. *Pistil* 3.2–4 mm long; ovary subglobose, 0.6–0.9 by 0.6–0.9 mm, syncarpous, lobed on top at the insertion of the style, glabrous or minutely hairy, disk-like thickening at the base obscure; style 1.5–2.6 mm long; style head 0.9–1 mm high, with an elongate and robust cleft stigmatic apical part 0.4–0.6 mm high. *Fruit* solitary, composed of a united pair of follicles, 16–30 cm by 8–12 mm, slightly laterally compressed and with distinct and narrow grooves on both sides on the flattened parts, glabrous, roughly striate and thick-walled. *Seeds* elliptic or oblong, 9–11 by 2.8–3 mm, glabrous and a tuberculous on both sides (except surrounding the hilum, which is smooth), ends rounded; margin slightly thickened, longest cilia 10–17 mm long. — **Fig. 9.**

Distribution — China (Yunnan, Hainan), Burma, Thailand; in *Malesia*: Sumatra (known only from North and West Provinces), Peninsular Malaysia.

Habitat & Ecology — Secondary and primary forests, open places or hillsides. Altitude 367–1800 m.

13. *Alstonia rubiginosa* Sidiy.

Alstonia rubiginosa Sidiy., Blumea, Suppl. 11 (1998) 171. — Type: *Foreman & Vinas LAE 60288* (holo M; iso K), Papua New Guinea, Central District, Port Moresby Subdistrict, near Boridi.

Tree 12–25 m high. Bark dark brown; inner bark light brown, without white latex from the trunk. *Branchlets* glabrescent. *Leaves* in whorls of 3 or 4; petiole puberulous or glabrescent, 5–11 mm long, colleters minute and densely packed together in the axils; blade coriaceous when dried, elliptic to narrowly elliptic or narrowly obovate, 10–18 by 3–6.7 cm, 2.4–3.5 times as long as wide, apex narrowly acuminate (sometimes abruptly acuminate), acumen up to 2 cm long with a blunt point, base acute or decurrent onto the petiole, glabrous or glabrescent above, densely pubescent (velutinate) beneath; 23–26 pairs of secondary veins (short interstitial veins sometimes present), parallel and slightly arched, forming an angle of 70–80(–90)° with the midrib (the widest angles usually at the base of the leaves), 3–8 mm from each other, submarginal vein very distinct; tertiary venation reticulate, mostly conspicuous on both sides. *Inflorescence* 3.5–5 cm long, many-flowered; pedicels stout 1–2(–3) mm long, softly pubescent. Bracts and bracteoles sepal- or scale-like, ovate or triangular, 1–1.5 mm long, acute or acuminate, ciliate, densely pubescent outside, glabrous inside, the linear bracts (17–25 by 1–1.5 mm) and leafy bracts (c. 4.5 by 1 cm) sometimes present at the base of the inflorescence. *Flowers* fragrant. *Sepals* connate at the base for 0.8–1 mm, ovate, 2.4–2.8 by 1.6–2 mm, obtuse, ciliate, densely pubescent outside, glabrous inside, erect. *Corolla* lobes dextrorse; white, 8–8.5 mm long in the mature bud and forming an ovoid (acuminate) head, c. 4 by 1.5 mm, glabrous or minutely hairy around the stamens outside; tube 5.5–5.8 mm long, c. 2(–2.5) mm wide around the stamens; lobes lingulate, slightly oblique, 4.6–5.2 by 2–2.5 mm, c. 2.1 times as long as wide, pilose on the lower half inside, not ciliate, apex rounded, auriculate at the base on the

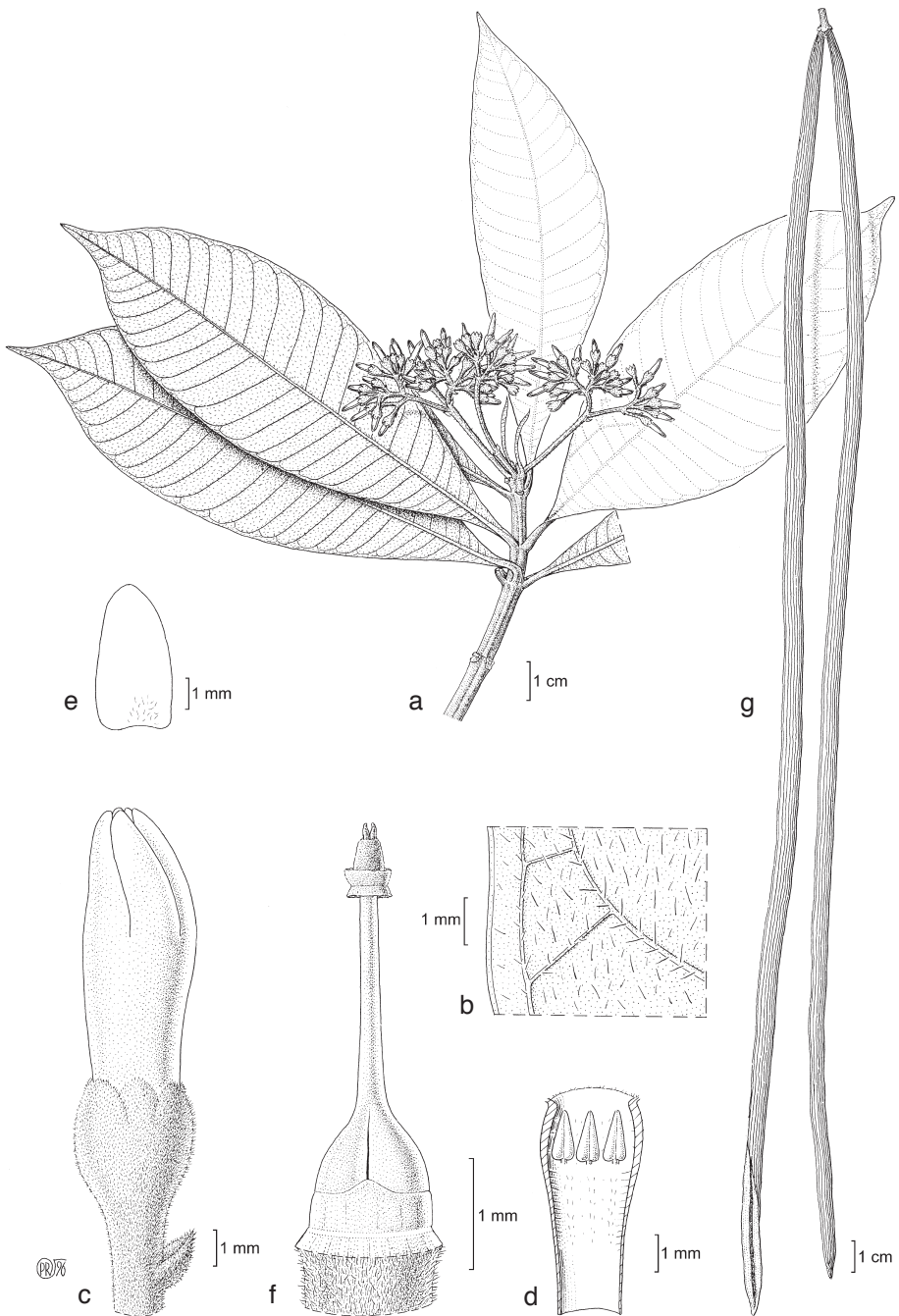


Fig. 10. *Alstonia rubiginosa* Sidiy. a. Habit; b. leaf beneath in detail; c. flower in bud, also showing one bracteole on the pedicel; d. dissected follicle tube; e. corolla lobe; f. pistil; g. follicles (a–f: Foreman & Vinas LAE 60288; g: Veldkamp & Stevens 5921).

right side. *Stamens* inserted at 3.6–3.7 mm from the base; anthers ovate 1.2–1.4 by 0.4–0.6 mm, obtuse or mucronulate. *Pistil* glabrous, 4–4.1 mm long; ovary ovoid, c. 1 by 1 mm, of 2 carpels, with a disk-like thickening at the base, c. 0.5 mm high; style c. 2.5 mm long; style head ovoid, c. 0.7 mm long, with a cleft stigmatic apical part 0.2 mm high. *Fruit* a pair of follicles, c. 4.3 cm by 4.7–5 mm, glabrous. *Seeds* dull-brown, elliptic or ovate, 6–8.5 by 2.6–3 mm, pubescent on both sides, one end acuminate with an acumen 1.5–3 mm long, the other end rounded; longest cilia 3–5 mm long, becoming gradually shorter towards the margins. — **Fig. 10.**

Distribution — *Malesia*: Papua New Guinea.

Habitat & Ecology — Primary and secondary forests, in forests dominated by *Ficus* and *Euphorbia*. Altitude 1370–1420 m.

IUCN conservation category — Vulnerable due to fragmented and declining area (VU B1+2c).

Note — *Alstonia rubiginosa* is very similar to *A. beatricis* and *A. parvifolia*, for comparison see Sidiyasa, Blumea, Suppl. 11 (1998) 171.

14. *Alstonia scholaris* (L.) R.Br.

Alstonia scholaris (L.) R.Br., Asclepiadeae (1810) 65; Mem. Wern. Nat. Hist. Soc. 1 (1811) 76; A.D.C., Prodr. 8 (1844) 408; Miq., Fl. Ned. Ind. 2 (1857) 436; Fl. Ned. Ind., Eerste Bijv. (1861) 555; K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 112; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 15; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 501; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 436; Merr., Bibliogr. Enum. Born. Pl. (1921) 498; Ridl., Fl. Malay Penins. 2 (1923) 346; Markgr., Bot. Jahrb. Syst. 61 (1927) 177; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 113; Masam., Enum. Phan. Born. (1942) 617; Monach., Pacific Sci. 3 (1949) 146 (excl. of syn. *Tabernaemontana alternifolia* Burm.); Corner, Wayside Trees Malaya ed. 2, 1 (1952) 142; Backer & Bakh.f., Fl. Java 2 (1965) 226; Smythies, Common Sarawak Trees (1965) 20; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 12; Markgr., Blumea 22 (1974) 23; J.A.R. Anderson, Checklist Trees Sarawak (1980) 148; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 42; Whitmore & Tantra, Checklist Sumatra (1986) 19; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 23; Whitmore & Tantra, Checklist Sulawesi (1989) 14; Whitmore et al., Checklist Bali, Nusa Tenggara Timor (1989) 13; Checklist Maluku (1989) 14; Checklist Kalimantan (1990) 25; PROSEA 5, 1 (1993) 88; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 52; Coode et al., Checklist Pl. Brunei (1996) 25; P.I. Forst., Fl. Australia 28 (1996) 120; Whitmore et al., Checklist Irian Jaya (1997) 16; Sidiy., Blumea, Suppl. 11 (1998) 176; D.J. Middleton, Fl. Thailand 7 (1999) 45; Pradhan in Singh et al., Fl. Maharashtra State, Dicot. 2 (2001) 318; PROSEA 12, 2 (2001) 67; Kessler et al., Blumea, Suppl. 14 (2002) 13; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 22. — *Echites scholaris* L., Mant. Pl. (1767) 53; Blanco, Fl. Filip. (1837) 107. — Type: LINN. 302.2 (holo LINN).

Echites pala Ham., Trans. Linn. Soc. London 13 (1822) 518. — Type: 'Pala' Rheede, Hort. Malab. 1 (1678) 81, t. 45.

Alstonia scholaris (L.) R.Br. var. *avae* A.D.C., Prodr. 8 (1844) 409. — Type: *Wallich 1644f* (lecto G-DC, designated by Sidiyasa (1998) op. cit.; iso K, K-W), 'in montibus Tong-Dong prove Avam', Ava is in Burma.

Alstonia scholaris (L.) R.Br. var. *blumii* A.D.C., Prodr. 8 (1844) 409. — Type: (Blume, Bijdr. 1037), Java, at the base of Salak Mt (untraced).

Alstonia kurzii Hook.f., Fl. Brit. India 3 (1882) 643; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 31. — Type: *Kurz s.n.* (untraced), Andaman Islands.

Alstonia scholaris (L.) R.Br. var. *velutina* Monach., Pacific Sci. 3 (1949) 150. — Type: *R.E. Holttum s.n.* (*Singapore field no. 24680*) (holo SING; iso NY), Peninsular Malaysia, Pahang.

Medium-sized to big tree 10–50(–60) m high, 20–80(–130) cm dbh, fluted at the base or forming tall and steep buttresses up to 10 m high, spreading for up to 4 m at the base. Bark smooth, scaly or shallowly fissured and peeling off in rectangular flakes, fawn or light brown; inner bark granular, creamy, yellow or straw-coloured, with copious white latex. *Branchlets* glabrous. *Leaves* in whorls of 4–8(–9); petiole 5–20(–25) mm long, slightly winged, with intrapetiolar stipule at the base and 1–3 mm long, colleters narrowly triangular and densely packed together in the axils; blade narrowly elliptic to obovate, (5–)6–17(–22) by (1.5–)2.5–7.5(–8.5) cm, 1.7–4.5 times as long as wide, apex obtuse or rounded or often retuse (in young trees, the leaves usually much larger, shortly acuminate and with blunt acumen up to 1 cm long), base often decurrent onto the petiole, less often acute or obtuse, glabrous or velutinous beneath; 25–45(–55) pairs of secondary veins, rather straight, forming an angle of (70–)80–90° with the midrib, (1.5–)2–5(–7) mm from each other; tertiary venation reticulate, sometimes ad-medial ramified, conspicuous above. *Inflorescence* 4–13(–17) cm long, many-flowered,

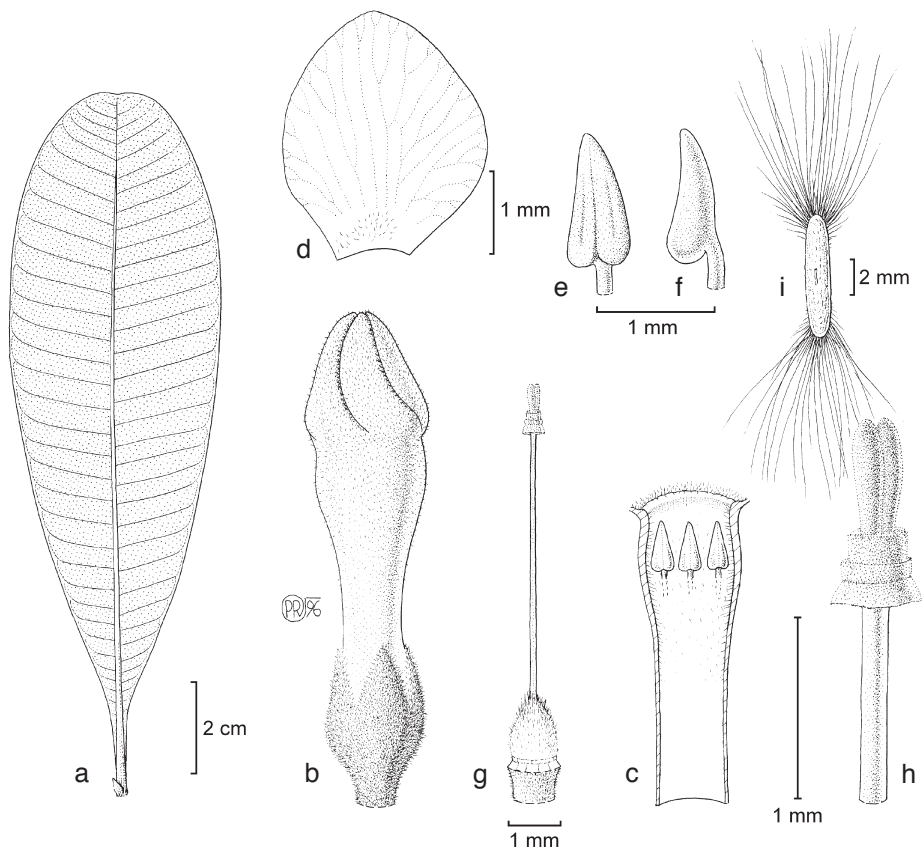


Fig. 11. *Alstonia scholaris* (L.) R.Br. a. Leaf; with an intrapetiolar stipule at base of petiole; b. flower in bud; c. dissected corolla tube, showing 3 anthers; d. corolla lobe; e. anthers, front view; f. anthers, side view; g. pistil, showing the pubescent ovary; h. pistil head, supported by the style and showing a cleft stigmatic apex; i. seed (a: Maxwell 75-1083; b–i: Henty & Sayer NGF.20588).

mostly formed of two dense bunches of flowers; pedicels 0–2 mm long, pubescent. Bracts and bracteoles scale- or sepal-like, ovate or narrowly ovate, acuminate or sometimes trilobed or irregularly lobed at the apex, 1–3 mm long, ciliate. *Flowers* fragrant. *Sepals* pale green, connate at the base for 0.3–0.7(–1) mm, ovate, 1.5–2.4 by 0.8–1.9 mm, obtuse, sometimes acute or mucronulate, pubescent outside, minutely pubescent or less often glabrous inside, erect, ciliate. *Corolla* lobes sinistrorse; white, yellow or cream, 7–12 mm long in the mature bud and forming an ovoid head, 2.5–3.5 by 1.7–2.4 mm; pubescent or partly pubescent outside (frequently glabrous on basal half, at least within the calyx); tube almost cylindrical, slightly widening around the anthers and at the base around the ovary, 7–10 by 0.8–1.6 mm; lobes broadly ovate or suborbicular, 3–5 by 2.5–4.5(–7) mm, 0.6–1.1 times as long as wide, pilose inside. *Stamens* inserted at 5.2–8.4 mm from the base; anthers ovate, 0.9–1.2 by 0.4–0.5 mm, obtuse. *Pistil* 6–9.5 mm long; ovary ovoid or broadly ovoid, 0.9–1.5 by 0.7–1 mm, densely pubescent, with or without a narrow disk-like thickening at the base; style 4.2–8 mm; style head pagoda shape, 0.5–1 mm high, glabrous, with an elongate and robust cleft stigmatic apical part 0.3–0.7 mm high. *Fruit* a pair of follicles, 20–40(–63) cm by c. 2(–2.5) mm, glabrous. *Seeds* dark brown, oblong, 4.5–5.5(–7) by 1.2–1.6(–2) mm, glabrous on both sides, ends rounded; margin slightly thickened, longest cilia 8–12(–14) mm long, becoming much shorter or glabrous towards the margins. — **Fig. 11.**

Distribution — Pakistan, Nepal, Bhutan, India, Sri Lanka, Bangladesh, China, Burma, Thailand, Cambodia, Laos, Vietnam, Australia, Solomon Islands; in *Malesia*: throughout.

Habitat & Ecology — Secondary and primary forests, savannahs, along streams (rarely in swamps), in coastal plains, on ridges or montane, on clay or ultrabasic soils, granite bedrock and limestone. Altitude 0–1230 m.

Uses — This species is the most important source of the *pulai* timber. This timber is used for household items and the pulp makes a high quality paper. As it is so light it can be used for fishing net floats. It can be used for the treatment of diarrhoea and stomach ache, snake bites, and for treating *Herpes zoster* by applying the latex on the affected parts. The tree is also sometimes used as an ornamental.

15. *Alstonia spatulata* Blume

Alstonia spatulata Blume, Bijdr. (1826) 1037; Miq., Fl. Ned. Ind. 2 (1857) 437; Hook.f., Fl. Brit. India 3 (1882) 642; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 437; Merr., Bibliogr. Enum. Born. Pl. (1921) 498; Ridl., Fl. Malay Penins. 2 (1923) 346; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 115; Masam., Enum. Phan. Born. (1942) 617; Monach., Pacific Sci. 3 (1949) 153; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 142; F.G. Browne, Forest Trees Sarawak & Brunei (1955) 63; Smythies, Common Sarawak Trees (1965) 20; Backer & Bakh.f., Fl. Java 2 (1965) 226; J.A.R. Anderson, Tr. Peat Swamp For. Sarawak (1972) 23; Markgr., Blumea 22 (1974) 25; Cockburn, Trees Sabah 1 (1976) 18; J.A.R. Anderson, Checklist Trees Sarawak (1980) 148; Whitmore & Tantra, Checklist Sumatra (1986) 19; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 26; Whitmore et al., Checklist Kalimantan (1990) 25; PROSEA 5, 1 (1993) 89; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; Coode et al., Checklist Pl. Brunei (1996) 25; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 123; Sidiy., Blumea, Suppl. 11 (1998) 181; D.J. Middleton, Fl. Thailand 7 (1999) 46; PROSEA 12, 2 (2001) 68; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 23. — Type: *Blume s.n.* (holo L [898.129-143]), W Java, near Rompin (= Rumpin).

Alstonia cuneata Wall. ex G. Don, Gen. Syst. 4 (1837) 87. — Type: *Govan s.n.* in *Wallich 1645* (holo K-W), India, Punjab, Sermore (= Sirmur). — The locality is incorrect according to Hooker (1882) and King & Gamble (1907).

Tree 10–25 m high, 15–40 cm dbh, sometimes forming plank symmetrical buttresses up to 1.20 m high (bottle-shaped at the base known in New Guinea). Bark smooth, scaly or finely fissured and peeling off in square or rectangular flakes, pale to dark grey or almost black; inner bark white, creamy or pale yellow, with copious white latex. *Branchlets* glabrous. *Leaves* in whorls of 3 or 4 (or 5); petiole 4–10(–15) mm

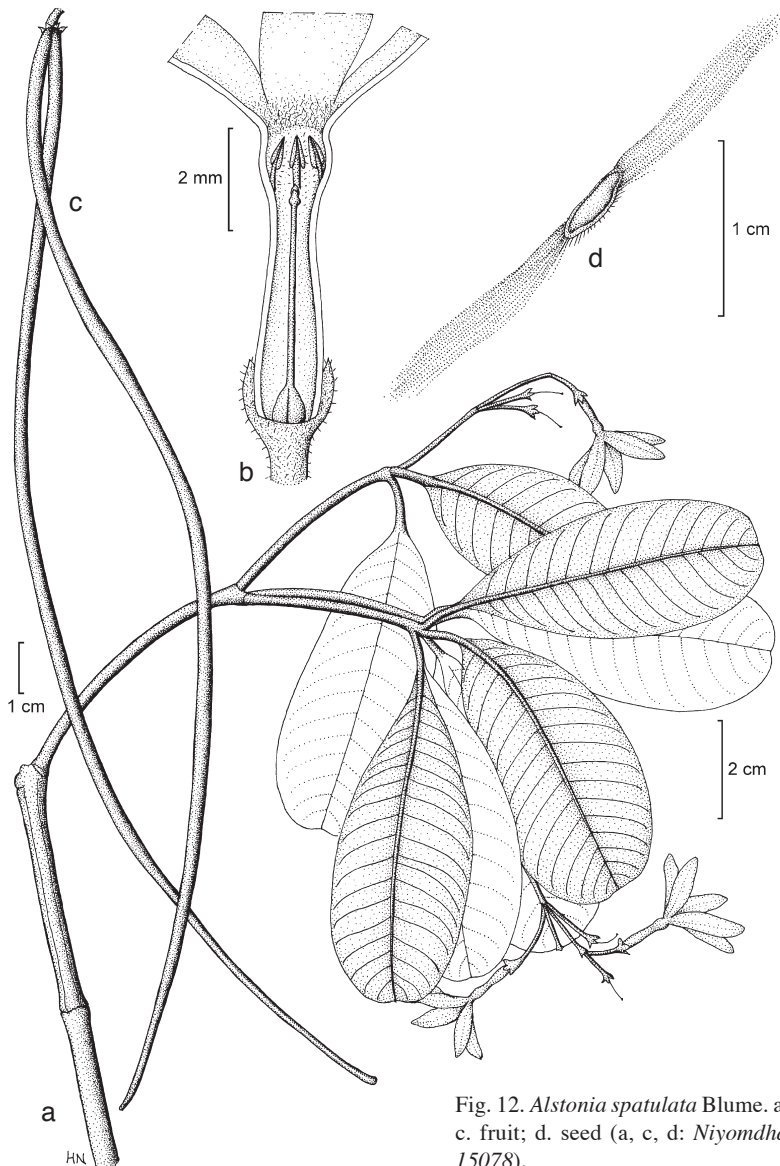


Fig. 12. *Alstonia spatulata* Blume. a. Habit; b. flower; c. fruit; d. seed (a, c, d: *Niyomdham 1920*; b: *Kerr 15078*).

long, flattened above, sometimes slightly winged; colleters deltoid in the axils, mostly not persistent; blade spatulate or obovate, 3–12 by 1.8–4.8 cm, 1.6–2.5(–3) times as long as wide, apex rounded, sometimes retuse, base obtuse, acute or decurrent onto the petiole, glabrous on both sides; 20–35(–40) pairs of secondary veins, straight, forming an angle of 70–80° with the midrib, 1.5–3(–4) mm from each other; tertiary venation admedial ramified, inconspicuous. *Inflorescence* 3–11 cm long, few (3–6)-flowered on each cluster; pedicels (2.5–)4–9 mm long, glabrous. Bracts and bracteoles sepal-like, ovate or triangular, up to 1(–1.7) mm long, acute, ciliate or not. *Flowers* fragrant. *Sepals* connate at the base for 0.2–0.4 mm, ovate, sometimes broadly ovate or subtriangular, (1.2–)1.5–2 by 1–1.6(–2) mm, erect, obtuse or rounded, ciliate, glabrous on both sides. *Corolla* lobes sinistrorse; white, yellow or cream, 14–15 mm long in the mature bud and forming a narrowly ovoid head, 6.5–7.5 by 2–3 mm (much wider than the corolla tube), glabrous outside; tube almost cylindrical, 7–8 mm long, 1–1.5 mm wide around the stamens; lobes elliptic, 6.7–11 by 3.5–6 mm, 1.4–2.1 times as long as wide, mostly undulate, pilose with white hairs at the base inside, not ciliate. *Stamens* inserted at 5–6.5 mm from the base; anthers ovate, 1–1.4 by 0.4–0.5 mm, obtuse. *Pistil* glabrous, 5.3–7 mm long; ovary ovoid or broadly ovoid, 0.8–1.5 by 0.9–1.5 mm, of 2 carpels, disk-like thickening absent; style 4.3–5.5 mm long; style head 0.7–0.8 mm high, with a short (sometimes robust) cleft stigmatic apical part c. 0.1(–0.2) mm high. *Fruit* a pair of follicles, 12–25 cm by 2.5–3 mm, glabrous. *Seeds* oblong, 5–6 by 1.6–2.2 mm, ends obtuse or rounded, glabrous with very minute reticulate structure on both surfaces, thickened margin distinct on the hilar side, longest cilia (12–)15–22 mm long, becoming shorter (rarely glabrous) at the margins. — **Fig. 12.**

Distribution — Burma, Thailand, Cambodia, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, New Guinea.

Habitat & Ecology — Swamps, mostly in secondary vegetation, on sandy soils. Altitude 0–600 m.

Uses — The wood can be used for household items, carving and plywood. The root wood is light and can be used as a substitute for cork. The latex is used in medicine for sores and skin ailments.

16. *Alstonia spectabilis* R.Br.

- Alstonia spectabilis* R.Br., Asclepiadeae (1810) 66; Mem. Wern. Nat. Hist. Soc. 1 (1811) 77; Miq., Fl. Ned. Ind. 2 (1857) 437; Monach., Pacific Sci. 3 (1949) 161; Backer & Bakh.f., Fl. Java 2 (1965) 226; Markgr., Blumea 22 (1974) 27; Whitmore & Tantra, Checklist Sulawesi (1989) 14; Whitmore et al., Checklist Bali, Nusa Tenggara Timor (1989) 13; Checklist Maluku (1989) 14; PROSEA 5, 1 (1993) 90; P.I. Forst., Fl. Australia 28 (1996) 122; Whitmore et al., Checklist Irian Jaya (1997) 16; Sidiy., Blumea, Suppl. 11 (1998) 184; PROSEA 12, 2 (2001) 68; Kessler et al., Blumea, Suppl. 14 (2002) 13. — Type: *R. Brown s.n.* (holo BM), Lesser Sunda Islands, Timor, Coepang (= Kupang).
- Alstonia villosa* Blume, Bijdr. (1826) 1038, non Seem.; Markgr., Bot. Jahrb. Syst. 61 (1927) 177. — *Blaberopus villosus* (Blume) Miq., Fl. Ned. Ind. 2 (1857) 440. — Type: *Blume 1006* (lecto L., designated by Monachina (1998) op. cit.; iso L., 2 sheets), Java, Kuripan.
- Alstonia ophioxylodes* F. Muell., Fragm. 1 (1857) 57. — *Alstonia spectabilis* R.Br. subsp. *ophioxylodes* (F. Muell.) P.I. Forst., Austral. Syst. Bot. 5 (1992) 758; Fl. Australia 28 (1996) 122. — Type: *F. Mueller s.n.* (lecto K, designated by P.I. Forster (1992) op. cit.), Australia, Northern Territory, Fitzmaurice River.

- Blaberopus villosus* (Blume) Miq. var. *petiolata* Miq., Fl. Ned. Ind. 2 (1857) 440. — Type: *Horsfield s.n.* (Apoc. 15) (lecto K, designated by Monachina (1998) op. cit.; iso K), E Java, Belambangan.
- Alstonia linearis* Benth., Fl. Australiensis 4 (1869) 314; P.I. Forst., Austral. Syst. Bot. 5 (1992) 748. — Type: *Cunningham 204* (lecto K, designated by Monachina (1949) op. cit.; iso BM, K), Western Australia, Brunswick Bay.
- Alstonia longissima* F. Muell., Papuan Plants (1877) 91. — Type: *D'Albertis s.n.* (holo FI n.v.), Papua New Guinea, Fly River.
- Alstonia villosa* Blume var. *glabra* Koord. & Valetton, Bijdr. Boomsort. Java 1 (1894) 123. — Type: ex insula Nusabarung ('tantum nobis cognita'), Java (untraced).
- Alstonia somersetensis* F.M. Bailey, Queensland Agric. J. 1 (1897) 229. — Type: *F.L. Jardin s.n.* (holo BRI [AQ332794]), Queensland, Cook District, Somerset.
- Alstonia villosa* Blume forma *calvescens* Markgr., Bot. Jahrb. Syst. 61 (1928) 178. — Type: *K. & L. Rechinger 4114* (lecto W, designated by Sidiyasa (1998) op. cit.; iso W), Solomon Islands, Matupi Island, Neu-Pommern.

Small or big tree (sometimes shrub) 3–30 m high, up to 90 cm dbh, sometimes with small buttresses. Bark smooth, scaly or longitudinally fissured, corky, grey, brownish or dark brown; inner bark yellowish or straw-coloured, hard, granular, without white latex. *Branchlets* glabrous or puberulous. *Leaves* in whorls of 3 or 4; petiole glabrous or puberulous, slender or rather stout, (0–)5–27 mm long, many minute colleters densely packed together in the axils; blade chartaceous or thinly coriaceous when dried, linear to obovate, 3–32 by (0.2–)1–12 cm, 1.8–16(–47.5) times as long as wide, apex acute, obtuse or shortly abruptly acuminate, acumen up to 10 mm long, base acute or decurrent onto the petiole, sometimes with slightly rounded base and then running down onto the petiole as a narrow wing, glabrous (rarely puberulous) above, glabrous or puberulous to velutinous beneath; 10–30(–40) pairs of secondary veins (rather obscure for the linear-form), forming an angle of 60–80(–90)° with the midrib, 2–15 mm from each other; tertiary venation reticulate, sometimes scalariform, mostly conspicuous beneath (or sometimes on both sides). *Inflorescences* 2.5–11 cm long, many-flowered; pedicels 1–3 mm long, puberulous or tomentose. Bracts and bracteoles scale-like, up to 1(–1.5) mm long, ovate or broadly ovate, acute or acuminate, ciliate, puberulous or pubescent outside, glabrous inside. *Flowers* fragrant. *Sepals* connate at the base for 0.3–1.2 mm, ovate, sometimes obovate or suborbicular, 1.1–3 by 1–1.8 mm, apex obtuse or rounded, sometimes mucronulate, erect, ciliate, pubescent outside, glabrous inside (less often laxly puberulous around the apex). *Corolla* lobes dextrorse; white, cream or yellow, 4–7.5 mm in the mature bud and forming an ovoid head, 1.2–3 by 0.8–1.5 mm, puberulous or pubescent outside; tube 3–5.5 mm long, 1–2 mm wide around the stamens; lobes suborbicular or ovate, 2–3.5 by 1.2–2.8 mm, 1–2.1 times as long as wide, ciliate, apex obtuse or rounded, pilose inside, auriculate at the base on the right side. *Stamens* inserted at 1.6–3.4 mm from the base; anthers ovate, 0.9–1.2 by 0.3–0.5 mm, acute, obtuse or sometimes mucronulate with a pointed tip. *Pistil* 1.9–3.8 mm long; ovary ovoid or broadly ovoid, 0.5–1 by 0.6–1 mm, of 2 carpels, glabrous, with a disk-like thickening at the base, 0.2–0.4 mm high; style 1–2.1 mm long; style head ovoid or funnellform 0.4–0.7 by 0.2–0.45 mm, with a minute cleft stigmatic apical part 0.1–0.2 mm high. *Fruit* a pair of follicles, (15–)20–50 cm by (2.5–)3–4 mm, glabrous. *Seeds* elliptic or narrowly so, sometimes ovate, 5–9 by 1.5–2.7 mm, dark brown, mostly blackish at the margin, pubescent on both sides, one end acuminate with an acumen

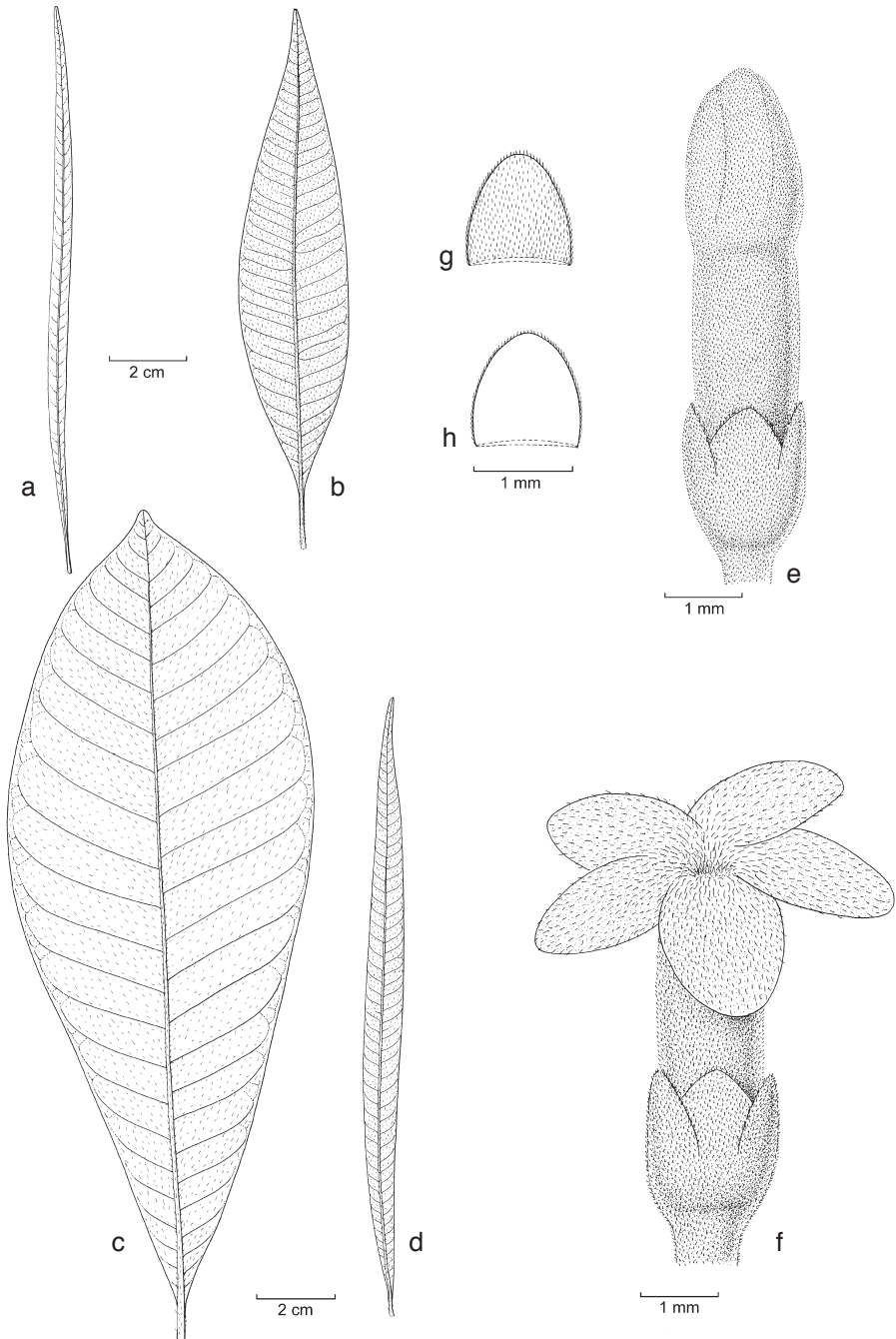


Fig. 13. *Alstonia spectabilis* R.Br. a–d. Leaves; e. flower in bud; f. fopen flower; g. surface of sepals, outside; h. surface of sepals, inside (a: *Kenneally 7138*; b: *Hartley 14735*; c, e–h: *Schodde & Craven 4519*; d: *Kenneally 10893*).

up to 2.7 mm long (sometimes acute or cuneate), other end rounded or obtuse; longest cilia 6–13 mm long, becoming gradually shorter towards the margins. — **Fig. 13.**

Distribution — Northern parts of Australia and the Solomon Islands; in *Malesia*: Philippines, Java, Sulawesi, Lesser Sunda Islands, the southern part of the Moluccas, New Guinea incl. New Britain.

Habitat & Ecology — Primary and secondary forests, coastal forests, on alluvial, clay, limestone or lateritic soils. Once reported in swamp forest. Altitude 5–800 m.

Uses — The wood is hard and can be used for construction work and household items.

Note — For notes on this species see Sidiyasa, *Blumea*, Suppl. 11 (1998) 184.

3. ALYXIA

Alyxia R.Br., Prodr. (1810) 469, nom. cons.; Spreng., Anleit. Kenntn. Gew., ed. 2 (1817) 494; Roem. & Schult., Syst. Veg. 4 (1819) 439; G. Don, Gen. Hist. 4 (1837) 96; A.DC., Prodr. 8 (1844) 345; Benth. & Hook.f., Gen. Pl. 2 (1876) 697; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1118; Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 164; Backer & Bakh.f., Fl. Java 2 (1965) 230; D.J. Middleton, Fl. Thailand 7 (1999) 55; *Blumea* 45 (2000) 1; PROSEA 12, 2 (2001) 69; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 7. — *Alyxia* R.Br. sect. *Gynopogon* Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 165, nom. illeg. — *Alyxia* R.Br. ser. *Alyxia*: Markgr., *Blumea* 23 (1977) 390. — Type species: *Alyxia spicata* R.Br.

Pulassarium [Rumph., Herb. Amboin. 5 (1747) 430, nom. inval.]; Kuntze, Revis. Gen. Pl. 2 (1891) 416, nom. illeg.

Gynopogon J.R. Forst. & G. Forst., Char. Gen. Pl. (1775) 35, nom. rejic.; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 151 — Type species: *Gynopogon stellatus* J.R. Forst. & G. Forst. (= *Alyxia stellata* (J.R. Forst. & G. Forst.) Roem. & Schult.).

Alexia Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1293, orth. var.

Paralstonia Baill., Bull. Mens. Soc. Linn. Paris 1 (1888) 750. — Type species: *Paralstonia clusiacea* Baill. (= *Alyxia concatenata* (Blanco) Merr.).

Discalyxia Markgr., Nova Guinea 14, 2 (1926) 282. — *Alyxia* R.Br. ser. *Discalyxia* (Markgr.) Markgr., *Blumea* 23 (1977) 410; Boiteau, Fl. Nouv. Caledonie 10 (1981) 98. — Type species: *Discalyxia ridleyana* (Wernham) Markgr. (= *Alyxia rostrata* Markgr.).

Alyxia R.Br. ser. *Reinwardtiana* Markgr., *Blumea* 23 (1977) 380; Boiteau, Fl. Nouv. Caledonie 10 (1981) 100. — *Alyxia* R.Br. ser. *Reinwardtiana* Markgr. subser. *Reinwardtiana* Markgr., *Blumea* 23 (1977) 386. — Type species: *Alyxia reinwardtii* Blume.

Alyxia R.Br. ser. *Reinwardtiana* Markgr. subser. *Clusiaceae* Markgr., *Blumea* 23 (1977) 380. — Type species: *Alyxia clusiacea* (Baill.) Pichon (= *Alyxia concatenata* (Blanco) Merr.).

Alyxia R.Br. ser. *Reinwardtiana* Markgr. subser. *Pilosae* Markgr., *Blumea* 23 (1977) 382. — Type species: *Alyxia pilosa* Miq.

Alyxia R.Br. ser. *Laurinae* Markgr., *Blumea* 23 (1977) 391. — Type species: *Alyxia laurina* Gaudich.

Alyxia R.Br. ser. *Globuliferae* Markgr., *Blumea* 23 (1977) 392; Boiteau, Fl. Nouv. Caledonie 10 (1981) 98. — Type species: *Alyxia concatenata* (Blanco) Merr.

Alyxia R.Br. ser. *Megalocarphae* Markgr., *Blumea* 23 (1977) 393. — Type species: *Alyxia scortechinii* King & Gamble (= *Alyxia pilosa* Miq.).

Alyxia R.Br. ser. *Floribundae* Markgr., *Blumea* 23 (1977) 394. — Type species: *Alyxia maluensis* Markgr. (= *Alyxia acuminata* K. Schum.).

Alyxia R.Br. ser. *Defoliatae* Markgr., *Blumea* 23 (1977) 398. — Type species: *Alyxia defoliata* Markgr.

Alyxia R.Br. ser. *Subalpinae* Markgr., *Blumea* 23 (1977) 402. — Type species: *Alyxia subalpina* Markgr.

Alyxia R.Br. ser. *Microphyllae* Markgr., Blumea 23 (1977) 404. — Type species: *Alyxia microphylla* Markgr.

Alyxia R.Br. ser. *Laxiflorae* Markgr., Blumea 23 (1977) 406. — Type species: *Alyxia laxiflora* Merr. (= *Alyxia luzoniensis* Merr.).

Alyxia R.Br. ser. *Ruscifoliae* Markgr., Blumea 23 (1977) 412. — Type species: *Alyxia ruscifolia* R.Br.

Alyxia R.Br. ser. *Baillonianae* Boiteau, Adansonia sér. 2, 18 (1979) 444; Fl. Nouv. Caledonie 10 (1981) 100. — Type species: *Alyxia baillonii* Guillaumin.

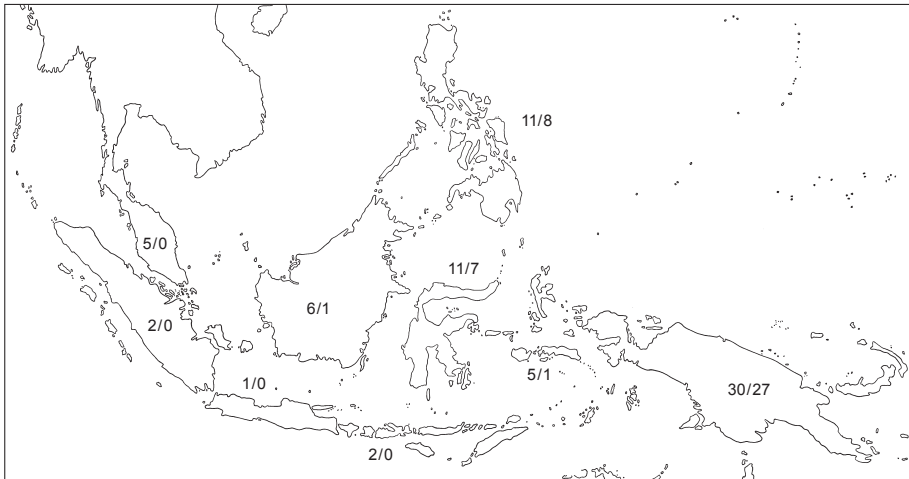
Alyxia R.Br. ser. *Suaves* Boiteau, Adansonia sér. 2, 18 (1979) 444; Fl. Nouv. Caledonie 10 (1981) 100. — Type species: *Alyxia suavis* (Baill.) Schltr. (= *Alyxia clusiophylla* (Baill.) Guillaumin).

Alyxia R.Br. ser. *Cylindrocarpae* Boiteau, Adansonia sér. 2, 18 (1979) 445; Fl. Nouv. Caledonie 10 (1981) 101. — Type species: *Alyxia cylindrocarpa* Guillaumin.

Alyxia R.Br. ser. *Bracteolosae* A.C. Sm., Fl. Vit. Nova 4 (1988) 56. — Type species: *Alyxia bracteolosa* A. Gray.

Alyxia R.Br. sect. *Monospermae* Tsiang & P.T. Li, J. S. China Agric. Coll. 11 (1990) 27. — Type species: *Alyxia balansae* Pit.

Climbers, scramblers or shrubs. *Branches* sometimes with large corky protuberances. *Leaves* opposite or in whorls of 3–7, more or less equal in size within a whorl but often of extremely different sizes and shapes on different parts of the plant; colleters present in the axils. *Inflorescences* axillary and/or terminal, consisting of solitary flowers, of simple pleiochasia, or of compound pleiochasia and then sometimes forming large terminal panicles; flowers 5-merous (but see *Alyxia kabaenae*). *Sepals* ovate to linear; colleters absent. *Corolla* lobes sinistrorse; tube cylindrical, somewhat inflated around stamens; lobes erect, spreading or reflexed. *Stamens* inserted mostly in the upper half of the corolla tube, more rarely around or just beneath the middle, not exerted from corolla throat; filaments straight, short and thin; anthers ovate, fertile for most of the length; free from style head. *Disk* absent. Gynoecium 2-carpellate, apocarpous but apically united into a common style; glabrous to pubescent; style filiform; style head



Map 3. Distribution of *Alyxia* taxa in Malaysia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

small. Ovules several. *Fruit* a pair of drupes from each flower, very frequently with one aborted, consisting of one or more articles with one seed in each article, when more than one then forming a moniliform chain; articles globose or ellipsoid (in Malesia); endocarp thin and papery, sometimes somewhat thicker to quite tough, mesocarp fleshy, often very thinly so; pericarp thin and coloured. *Seeds* simple; endosperm ruminant (or with longitudinal ridges outside Malesia). Embryo with flat to strongly undulate cotyledons.

Distribution — 106 species found from North-East India through Southern China to Taiwan and southwards through Southeast Asia to Australia and eastwards through the Solomon Islands out into the Pacific west as far as Henderson Island and north to Hawaii. In Malesia there are 55 species. This is by far the largest genus of Apocynaceae s.s. in Malesia. — **Map 3.**

Note — More detailed notes for many of the species in this large genus can be seen in Middleton, *Blumea* 45 (2000) 1–146. Some species of *Alyxia* from outwith Malesia have been observed to have leaves that are remarkably different in shape between the older and younger growth. Although this has not been observed to the same extent in Malesian species many are known from relatively few collections and may well be present.

KEYS TO THE SPECIES

A single key to all the species in Malesia was published by Middleton (2000). As the genus is large and the previous key very long and complex only regional keys are given here. For some very widespread and variable species, such as *Alyxia reinwardtii*, the keys may reflect only the degree of variation for the species in the region to which the key pertains.

KEY TO THE SPECIES OF PENINSULAR MALAYSIA, SUMATRA AND BORNEO

- 1a. Corolla tube > 4 mm long 2
- b. Corolla tube < 4 mm long 7
- 2a. Corolla tube densely to sparsely pubescent all over outside . . **11. A. ganophylla**
- b. Corolla tube glabrous to very sparsely puberulent (then not all over) outside . . . 3
- 3a. Bracts < 1 mm long; leaves mostly oval in shape with equally rounded base and apex; secondary veins obscure above **28. A. mujongensis**
- b. Bracts > 1 mm long; leaves variable in shape but not as above; secondary veins usually visible above, rarely obscure 4
- 4a. Leaves mostly thickly coriaceous with strongly inrolled margins and venation obscure beneath; corollas fairly fleshy. 5
- b. Leaves papery to coriaceous, margins flat or weakly inrolled; corollas not fleshy 6
- 5a. Leaves ovate to elliptic, if narrowly so then not pubescent beneath; inflorescence usually glabrous, rarely pubescent; fruit articles 13–28.2 mm long, fruit stalks 3.4–15 mm long **32. A. oleifolia**

- b. Leaves mostly narrowly elliptic or linear, rarely to ovate, usually sparsely puberulent beneath, sometimes only on the midrib; inflorescence puberulent; fruit articles 7.5–10.2 mm long, fruit stalks 1.8–2.1 mm long **2. A. angustifolia**
- 6a. Inflorescence 2.5–9 cm long, usually densely pubescent, rarely to glabrous; fruit articles 17–30 cm long. — Sumatra, Peninsular Malaysia **36. A. pilosa**
- b. Inflorescence 1–3.5 cm long, only very rarely densely pubescent; fruit articles 6–20(–25.3) mm long. — Widespread in W Malesia **41. A. reinwardtii**
- 7a. Corolla bud head 0.35–0.49 of bud length; corolla lobes 1.1–1.2 mm long. — Not in Peninsular Malaysia. **33. A. palawanensis**
- b. Corolla bud head 0.18–0.32(–0.42) of bud length; corolla lobes 1.2–3.8 mm long. — Peninsular Malaysia **41. A. reinwardtii**

KEY TO THE SPECIES OF JAVA AND THE LESSER SUNDA ISLANDS

- 1a. Inflorescence mostly unbranched; flowers pedicellate; fruits ellipsoid **41. A. reinwardtii**
- b. Inflorescence sometimes branched; flowers sessile; fruit (sub)globose **50. A. spicata**

KEY TO THE SPECIES OF SULAWESI

- 1a. Flowers solitary; leaves to 1.7 cm long **54. A. uniflora**
- b. Flowers 3–15 in an inflorescence; leaves to 15 cm long 2
- 2a. Calyx fused into a 2-lipped tube 3
- b. Calyx of free sepals or only irregularly fused and then not in a 2-lipped tube . . . 4
- 3a. Inflorescence puberulent, delicate, peduncle 1–1.3 mm wide; corolla tube 2.8–3 mm long, 1.1–1.6 times as long as lobes, c. 1.5 times as long as sepals; fruit articles 24.5–27 by 14–16 mm **15. A. kabaenae**
- b. Inflorescence glabrous, robust, peduncle c. 1.8 mm wide; corolla tube 7–7.5 mm long, 2.1–2.7 times as long as lobes, c. 3.2 times as long as sepals; fruit articles 10.4–11.2 by 7.5–8 mm **6. A. celebica**
- 4a. Corolla tube > 4 mm long 5
- b. Corolla tube < 4 mm long 8
- 5a. Leaves in whorls of 6, blade thickly coriaceous; sepal apex obtuse **18. A. lackii**
- b. Leaves in whorls of 3 or 4, blade coriaceous or subcoriaceous; sepal apex acute or acuminate 6
- 6a. Leaves pubescent beneath, at least on midrib; corolla pubescent outside **11. A. ganophylla**
- b. Leaves glabrous beneath; corolla glabrous outside 7
- 7a. Corolla lobes 4.5–4.8 mm long, 4.5–4.6 times as long as wide **16. A. kendarica**
- b. Corolla lobes 2.1–2.4 mm long, 1.4–1.9 times as long as wide. **14. A. halmaheirae**
- 8a. Inflorescence simple and unbranched with 5 or fewer flowers 9
- b. Inflorescence branched or with more than one whorl of flowers, 6 or more flowers altogether 10

- 9a. Branchlets glabrous; leaf blade 1.8–4.7 cm wide; inflorescence glabrous **52. *A. sulana***
 b. Branchlets puberulent; leaf blade 0.3–1 cm wide; inflorescence puberulent **33. *A. palawanensis***
- 10a. Leaves in whorls of 3 or 4; inflorescence with 6–8 flowers **12. *A. globosa***
 b. Leaves in whorls of 5; inflorescence with > 10 flowers **26. *A. minutiflora***

KEY TO THE SPECIES OF THE MOLUCCAS

- 1a. Erect shrubs or small trees; leaf apex mucronate; corolla lobes 3.5–5.9 mm long **30. *A. oblongata***
 b. Climbers; leaf apex not mucronate; corolla lobes 1.6–2.6 mm long 2
- 2a. Pedicels with short stiff bracts; corolla tube 8.5–11.2 mm long **7. *A. composita***
 b. Pedicels lacking bracteoles or bracteoles only on pedicel of terminal flower; corolla tube 3–4.9 mm long 3
- 3a. Inflorescence sparsely to densely puberulent; corolla tube > 4 mm long; corolla lobes > 2 mm long; ovary densely pubescent all over **14. *A. halmaheirae***
 b. Inflorescence glabrous; corolla tube < 4 mm long; corolla lobes < 2 mm long; ovary glabrous or pubescent only in a tuft between the carpels 4
- 4a. Leaves in whorls of 3 or 4, blades 1–7 cm long; ovary glabrous **55. *A. vera***
 b. Leaves in whorls of 5, blades 4.5–13.1 cm long; ovary pubescent in a tuft between the carpels **52. *A. sulana***

KEY TO THE SPECIES OF NEW GUINEA

- 1a. Leaf apex clearly mucronate; shrubs **30. *A. oblongata***
 b. Leaf apex not clearly mucronate; shrubs or climbers 2
- 2a. All leaves opposite 3
 b. At least some leaves in whorls of 3 or more 5
- 3a. Secondary veins numerous, close together and barely distinguishable from tertiary venation, > 80 pairs; leaf margin strongly undulate; sepal apices rounded **29. *A. multistriata***
 b. Secondary veins variable, 18–58 pairs; leaf margin strongly undulate to flat; sepal apices obtuse to acute 4
- 4a. Leaf margin strongly undulate; corolla tube c. 2.6 mm long; stamen insertion c. 0.35 of tube length; anther apex c. 1.4 mm from corolla mouth **49. *A. sogerensis***
 b. Leaf margin not undulate to weakly undulate; corolla tube 8.5–11.2 mm long; stamen insertion 0.67–0.87 of tube length; anther apex 0–1 mm from corolla mouth **7. *A. composita***
- 5a. Leaves punctate beneath 6
 b. Leaves not punctate beneath 7
- 6a. Secondary veins 33–79 pairs, tertiary venation parallel to secondary veins and weakly prominent above; inflorescence with several clear internodes and unbranched side branches; corolla bud head c. 0.43 of bud length, apex acuminate **48. *A. sleumeri***

- b. Secondary veins 14–23 pairs, tertiary venation obscure; flowers solitary or inflorescence a simple unbranched pleiochasium; corolla bud head 0.26–0.37 of bud length, apex obtuse to acute **39. *A. punctata***
- 7a. Flowers solitary **46. *A. semipallescens***
- b. Flowers in inflorescences 8
- 8a. Inflorescence a simple unbranched pleiochasium or of axillary unbranched pleiochasia and a terminal compound pleiochasium with only 1 or 2 nodes 9
- b. No inflorescences of simple unbranched pleiochasia, all compound 18
- 9a. Corolla tube ≤ 3 mm long 10
- b. Corolla tube > 3 mm long 12
- 10a. Bracteoles present 11
- b. Bracteoles absent or only on pedicel of terminal flower in an inflorescence **4. *A. arfakensis***
- 11a. Branchlets glabrous; corolla tube glabrous outside; leaf short to long acuminate and rounded at the tip, leaves reaching 5.1–6.6 cm long **34. *A. papuana***
- b. Branchlets densely puberulent, corolla tube sparsely puberulent around the top of the tube outside; leaf acuminate but notched at the apex, leaves reaching c. 2.4 cm long **25. *A. microphylla***
- 12a. Inflorescence robust; corolla tube > 8 mm long 13
- b. Inflorescence not robust; corolla tube ≤ 8 mm long 14
- 13a. Pedicels without bracteoles; corolla tube not continuously pubescent most of tube length inside. — Not on mainland New Guinea **17. *A. kwalotabaa***
- b. Pedicels with bracteoles; corolla tube continuously pubescent except for base inside. — Mainland New Guinea **7. *A. composita***
- 14a. Bracteoles present 15
- b. Bracteoles absent or only on pedicel of terminal flower in an inflorescence . . 16
- 15a. Corolla tube 3.4–6 mm long, usually pubescent outside **51. *A. subalpina***
- b. Corolla tube c. 8 mm long, glabrous outside **44. *A. royeniana***
- 16a. Secondary veins not visible above **51. *A. subalpina***
- b. Secondary veins distinguishable above 17
- 17a. Corolla tube 4.1–5 mm long; branchlets pubescent, sometimes glabrescent **5. *A. cacuminum***
- b. Corolla tube 6.3–6.9 mm long; branchlets glabrous **38. *A. pullei***
- 18a. Inflorescence frequently branched and forming large, lax terminal panicles formed from axillary and terminal inflorescences, often longer than the leaves 19
- b. Inflorescence of various sorts of compound pleiochasia but not forming large lax panicles and generally shorter than the leaves 23
- 19a. Pedicels with one bracteole immediately beneath the calyx; stamens inserted above the middle of the corolla tube 20
- b. Pedicels with two bracteoles on the pedicel or without bracteoles; stamens inserted below the middle of the corolla tube (latter character not known in *A. manusiana*) 21
- 20a. Corolla lobes elliptic, c. 0.9 mm wide; corolla tube 1.6 times as long as lobes; stamens inserted at 1.2 mm from corolla base which is 0.52 of tube length **40. *A. purpureoclada***

- b. Corolla lobes ovate or orbicular, c. 1.1 mm wide; corolla tube 2.5–2.7 times as long as lobes; stamens inserted at 2.2–2.3 mm from corolla base which is 0.65–0.7 of tube length **10. A. floribunda**
- 21a. Leaf margin weakly inrolled; inflorescence 3.5–7 cm long; fruit articles 5.3–7.3 mm long **23. A. manusiana**
- b. Leaf margin flat; inflorescence 4.3–16.5 cm long; fruit articles 5.5–19 mm long 22
- 22a. Sepals 1.2–1.7 mm long; ovary pubescent around base only or pubescent in tuft between carpels; fruit articles 5.5–9.9 by 4.3–6.5 mm **43. A. rostrata**
- b. Sepals 2.1–2.9 mm long; ovary densely pubescent all over; fruit articles 11.5–19 by 8.7–13 mm **42. A. ridleyana**
- 23a. Inflorescence exclusively terminal 24
- b. Inflorescence not exclusively terminal 25
- 24a. Leaf apex caudate; secondary veins 50–58 pairs; inflorescence c. 2 cm long, delicate; pedicels 4–5 mm long; corolla tube c. 2.6 mm long **49. A. sogerensis**
- b. Leaf apex emarginate to acuminate and then often notched at the apex; secondary veins 28–46 pairs; inflorescence 1.1–1.5 cm long, robust; pedicels 0–0.8 mm long; corolla tube 6.7–7.4 mm long **19. A. laurina**
- 25a. Secondary veins prominent, not particularly distinct from prominent tertiary venation so appearing densely packed, ≥ 100 pairs 26
- b. Secondary veins variable, distinct or not, sometimes obscure, < 100 pairs . . . 27
- 26a. Inflorescence glabrous, 4–9 cm long **10. A. floribunda**
- b. Inflorescence sparsely puberulent only in upper parts to densely puberulent, 1–2.5 cm long **29. A. multistriata**
- 27a. Corolla lobes ≥ 4 mm long **21. A. longiloba**
- b. Corolla lobes < 4 mm long 28
- 28a. Corolla tube > 8 mm long **7. A. composita**
- b. Corolla tube < 8 mm long 29
- 29a. Corolla lobes ≥ 2 times as long as wide; flowers subsessile **50. A. spicata**
- b. Corolla lobes < 2 times as long as wide, or if more then clearly pedicellate . . 30
- 30a. Bracteoles present on pedicels 31
- b. Bracteoles absent or only on pedicel of terminal flower in an inflorescence . . 38
- 31a. Only one bracteole immediately beneath the calyx 32
- b. Bracteoles one on pedicel, two in various positions, or several 35
- 32a. Branchlets sparsely to densely minutely puberulent **45. A. scabrida**
- b. Branchlets glabrous 33
- 33a. Corolla tube c. 2.1 mm long, 1.4–1.9 times as long as lobes **40. A. purpureoclada**
- b. Corolla tube 2.8–3.3 mm long, 2.5–5.1 times as long as lobes 34
- 34a. Inflorescence 1.1–3 cm long with 4–12 flowers **34. A. papuana**
- b. Inflorescence 4–9 cm long with 16–51 flowers **10. A. floribunda**
- 35a. Corolla bud head acuminate, lobes 1.9–2.8 times as long as wide **48. A. sleumeri**
- b. Corolla bud head rounded to acute, lobes 0.9–1.6 times as long as wide 36

- 36a. Corolla tube < 3 mm long; fruit articles > 25 mm long; inflorescence to 9 cm long **45. *A. scabrida***
 b. Corolla tube ≥ 3 mm long; fruit articles < 25 mm long; inflorescence to 3.5 cm long 37
- 37a. Flowers 13–25 in an inflorescence which is very robust; corolla tube c. 3.4 mm long, c. 3.1 times as long as lobes; leaves reaching 10.1–18 cm long **53. *A. tetraquetra***
 b. Flowers 3–10 in an inflorescence which is not particularly robust; corolla tube 3.4–6.2 mm long, 1.6–2.9 times as long as lobes; leaves reaching 2.5–8.7 mm long **51. *A. subalpina***
- 38a. Corolla tube ≥ 6 mm long 39
 b. Corolla tube < 6 mm long 40
- 39a. Corolla glabrous outside; ovary pubescent in a tuft between the carpels; leaves spatulate, sometimes obovate **38. *A. pullei***
 b. Corolla mostly pubescent outside, rarely glabrous; ovary densely pubescent all over; leaves never spatulate **51. *A. subalpina***
- 40a. Leaves in whorls of 3 or 4 42
 b. Leaves in whorls of 5 or more 41
- 41a. Corolla tube 1.8–3.8 mm long; leaf apex not folded back; 1.6–9.3 mm between fruit articles **24. *A. markgrafii***
 b. Corolla tube 4.1–5 mm long; leaf apex often folded back; 0–1 mm between fruit articles **5. *A. cacuminum***
- 42a. Corolla lobe apex acuminate; leaves strongly undulate at margin, apex long acuminate to caudate **48. *A. sleumeri***
 b. Corolla lobe apex rounded to acute; leaf margin variable, apex variable but rarely long acuminate 43
- 43a. Inflorescence with 25 or more flowers in an inflorescence **45. *A. scabrida***
 b. Inflorescence with 3–16 flowers in an inflorescence 44
- 44a. Inflorescence glabrous 45
 b. Inflorescence sparsely to densely puberulent 46
- 45a. Ovaries pubescent in a tuft between the carpels or very sparsely pubescent only around the base; fruits with up to 7 articles in a chain **24. *A. markgrafii***
 b. Ovaries pubescent all over or densely pubescent only around base; fruits with only up to 2 articles in a chain **9. *A. defoliata***
- 46a. Largest leaves on a plant at least 8.6 cm long **1. *A. acuminata***
 b. Leaves no longer than 8 cm long 47
- 47a. Ovaries glabrous or pubescent only in a tuft between carpels; corolla lobes 0.7–1 mm wide 48
 b. Ovaries densely pubescent all over to pubescent around base; corolla lobe 1.1–2.3 mm wide 49
- 48a. Branchlets glabrous **37. *A. pugio***
 b. Branchlets sparsely to densely puberulent **4. *A. arfakensis***
- 49a. Bracts 0.9–1 mm long **13. *A. graciliflora***
 b. Bracts 1.6–5 mm long 50

- 50a. Corolla sparsely to densely pubescent outside; fruit articles 12.8–21.5 mm long
 **51. A. subalpina**
 b. Corolla glabrous outside; fruit articles 9–10.5 mm long **9. A. defoliata**

KEY TO THE SPECIES OF THE PHILIPPINES

- 1a. Leaves opposite 2
 b. Leaves in whorls of 3 or more 3
 2a. Leaf blade ratio 10.7–20 times as long as wide, leaf blade linear, flowers solitary
 **20. A. linearis**
 b. Leaf blade ratio 1.6–8.8 times as long as wide, leaf blade not linear, if narrow
 then sides not parallel; flowers in cymes **22. A. luzoniensis**
 3a. Leaves pubescent above and beneath **31. A. obovatifolia**
 b. Leaf pubescence variable but not pubescent all over above 4
 4a. Flowers solitary or an inflorescence of only 2 flowers 5
 b. Flowers in cymes with 3 or more flowers 6
 5a. Bracteoles several along pedicel; pedicels 1–3 mm long; sepal apices obtuse, 2.3–
 2.8 mm long, sparsely to densely puberulent **35. A. parvifolia**
 b. Bracteoles 2 immediately beneath calyx; pedicels c. 6 mm long; sepal apices
 acuminate, c. 1.8 mm long, sepals glabrous **3. A. angustissima**
 6a. Corolla tube < 4 mm long¹. — Palawan **33. A. palawanensis**
 b. Corolla tube > 4 mm long. — Throughout the Philippines 7
 7a. Bracteoles present on the pedicels of all flowers. — Throughout the Philippines
 8
 b. Bracteoles absent or only on the pedicel of the terminal flower in an inflorescence.
 — Palawan 12
 8a. Many bracteoles on pedicels; inflorescence densely puberulent; 39–55 pairs of
 secondary veins **27. A. muguma**
 b. 1 or 2 bracteoles on pedicels, very rarely more but then inflorescence at most
 sparsely pubescent and secondary veins < 39 pairs 9
 9a. Corolla lobe apex acuminate; leaves reaching 2.5–7 cm long, often notched at the
 apex even if acuminate; ovary pubescent all over **22. A. luzoniensis**
 b. Corolla lobe apex rounded to acute, very rarely to acuminate but then leaves > 10
 cm long, not notched; ovary glabrous, pubescent around base only or pubescent
 all over 10
 10a. Inflorescence with more than 1 whorl of flowers and clear internodes, not robust;
 fruit usually with several globose articles **8. A. concatenata**
 b. Inflorescence with only 1 whorl of flowers at the end of the peduncle, rarely with
 more but then internodes short, inflorescence robust and fruit with 1 or 2 ellipsoid
 articles 11

1) Note that the small flowers occasionally found in the widespread and variable *Alyxia reinwardtii* and which would overlap with *A. palawanensis* in this couplet are found only in Peninsular Malaysia and are, therefore, not accounted for in the key to the species in the Philippines.

- 11a. Corolla tube continuously pubescent except for base inside; leaves to 20 cm long.
— Not in Palawan or Sulu **47. *A. sibuyanensis***
- b. Corolla glabrous or pubescent in upper half only inside; leaves < 10 cm long (in the Philippines). — Palawan, Sulu **41. *A. reinwardtii***
- 12a. Leaves thickly coriaceous, often somewhat fleshy, margin weakly to strongly inrolled; corolla slightly fleshy **2. *A. angustifolia***
- b. Leaves papery to coriaceous, not fleshy, margin flat or weakly inrolled; corolla not fleshy **41. *A. reinwardtii***

1. *Alyxia acuminata* K. Schum.

Alyxia acuminata K. Schum. in K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 110; Markgr., Nova Guinea 14, 2 (1926) 279; Bot. Jahrb. Syst. 61 (1927) 181; Blumea 23 (1977) 390, p.p.; D.J. Middleton, Blumea 45 (2000) 27. — *Gynopogon acuminatus* (K. Schum.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 151; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 504. — Type: *Hollrung 762* (lecto K, designated by Middleton (2000) op. cit.; iso BO, MEL, P), Papua New Guinea, West Sepik Province, August.

Alyxia acuminata K. Schum. var. *lancifolia* Markgr., Nova Guinea 14, 2 (1926) 280; Bot. Jahrb. Syst. 61 (1927) 182. — Type: *Gjellerup 987* (holo U; iso A (scrap), BO, K, L), Papua, Humboldt Bay.

Alyxia acuminata K. Schum. var. *montana* Markgr., Bot. Jahrb. Syst. 61 (1927) 182. — Type: *Ledermann 10967, 11429, 12941, 12915*, syntypes, all lost. — Markgraf himself synonymised this variety in 1977.

Alyxia maluensis Markgr., Bot. Jahrb. Syst. 61 (1927) 185; Blumea 23 (1977) 395, p.p. — Type: *Ledermann 6942* (lecto SING, designated by Middleton (2000) op. cit.), Papua New Guinea, East Sepik, Malu.

Alyxia clemensiae Markgr., Blumea 23 (1977) 396 (but not all paratypes). — Type: *Clemens 2973* (holo Z; iso BR, Z), Papua New Guinea, Morobe Province, Yungzaing.

Alyxia lata auct. non Markgr.: Markgr., Blumea 23 (1977) 381, p.p.

Alyxia multistriata auct. non Markgr.: Markgr., Blumea 23 (1977) 397, p.p.

Alyxia scabrada auct. non Markgr.: Markgr., Blumea 23 (1977) 397, p.p.

Alyxia fragrans auct. non Merr. & L.M. Perry: Markgr., Blumea 23 (1977) 398, p.p.

Alyxia blancoi auct. non Merr.: Markgr., Blumea 23 (1977) 401, p.p.

Alyxia sogerensis auct. non Wernham ex S. Moore.: Markgr., Blumea 23 (1977) 407, p.p.

Climber. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, glabrous or sparsely and minutely puberulent, glabrescent. *Leaves* in whorls of 3 or 4; petiole 0.3–1.1 cm long, glabrous or pubescent; blade coriaceous or subcoriaceous, elliptic, obovate or oblong, 3.1–18 by 1.1–7.8 cm, 1.5–3.8 times as long as wide, apex obtuse to acuminate or cuspidate, base obtuse to decurrent onto petiole, margin strongly undulate or not, glabrous beneath, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins 15–55 pairs, 60–80° from midrib. *Inflorescence* axillary, a compound pleiochasium, either congested or with clear internodes, or with several internodes and unbranched side branches, sparsely puberulent in upper parts to densely puberulent all over, 1–7.8 cm long; peduncle 0.8–3 cm by 0.9–2 mm; bracts caducous or persistent, ovate or deltoid, 1.1–3 by 0.8–2.2 mm; bracteoles absent; flowers 6–14; pedicels 0–3.5 mm long. *Sepals* ovate, 0.8–2.7 by 0.6–1.3 mm, 1.1–2.1 times as long as wide, apex obtuse to acuminate, ciliate, glabrous to densely puberulent. *Corolla* cream, yellow, with a brown tube and green or white lobes or with a yellowish tube and white lobes; bud head 0.8–2.1 mm long which is 0.29–0.38 of bud length, globular,

ovate or deltoid, apex rounded to acute; tube cylindrical or slightly inflated, 2.5–5.8 by 1.2–2 mm, 1.3–3.9 times as long as sepals, 1.5–2.5 times as long as lobes, sparsely to densely puberulent around top of tube to densely puberulent for most of outside, glabrous, sparsely pubescent around stamens and more densely in a band beneath them or very sparsely pubescent in upper half of tube inside; lobes ovate or orbicular, apex rounded or obtuse, base auriculate, 1.2–2.4 by 1–3 mm, 0.8–1.6 times as long as wide, sparsely or densely puberulent outside, glabrous, pubescent at base of lobes or papillate inside, ciliate or not ciliate. *Stamens* inserted at 2–3.2 mm from corolla base which is 0.57–0.65 of tube length; filaments 0.3–0.7 mm long; anther apex 0–0.5 mm from corolla mouth; anthers 0.8–1.3 by 0.3–0.5 mm. *Ovaries* 0.5–1 mm high, densely pubescent all over; style 1–1.6 mm long; style head 0.4–0.8 mm long, glabrous or pubescent. *Fruit* yellow, black, yellow-orange, orange, orange turning black, green to bright orange, finally dark purple, or orange-brown (most likely these recorded fruit colours all suggest an orangish or yellowish fruit which turns black or dark purple when mature), stalks 2.4–8.1 mm long, with 1–3 articles in each string, glabrous, articles dry smooth, fleshy or with thin flesh, 12.5–34 by 9.6–20 mm, ellipsoid or subglobose, symmetrical, apex rounded to acuminate. *Seeds* 10.8–30 by 7.3–15 by 6.9–12 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In primary or secondary lowland to montane evergreen, mixed or swamp forest on limestone, well drained to marshy or volcanic soil at 0–1950 m.

Note — *Alyxia acuminata* is a very variable species.

2. *Alyxia angustifolia* Ridl.

Alyxia angustifolia Ridl., J. Fed. Malay States Mus. 6 (1915) 161; Fl. Malay Penins. 2 (1923) 333; Markgr., Blumea 23 (1977) 385, p.p.; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 123; D.J. Middleton, Blumea 45 (2000) 29. — Type: *Ridley 16060* (lecto K, designated by Middleton (2000) op. cit.; iso A (scrap), BM, SING), Peninsular Malaysia, Pahang, Gunong Tahan.

Alyxia pachyphylla Merr., J. Straits Branch Roy. Asiat. Soc. 77 (1917) 237; Bibliogr. Enum. Born. Pl. (1921) 499; Masam., Enum. Phan. Born. (1942) 618; Markgr., Blumea 23 (1977) 383, p.p. — Type: *Native Collector 2224* (lecto PNH, designated by Middleton (2000) op. cit.; iso A), Borneo, Sarawak, Gunong Santubong.

Alyxia pagonensis Markgr., Blumea 23 (1977) 385, p.p.; Coode et al., Checklist Pl. Brunei (1996) 25. — Type: *P.S. Ashton BRUN 1886* (holo L), Brunei, Pagon Ridge.

Climber. *Branchlets* weakly angled, sparsely lenticellate or not, glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 3 or 4; petiole 0.1–0.5 cm long, glabrous or pubescent; blade thickly coriaceous, linear, narrowly elliptic, elliptic or narrowly ovate, 1–7.3 by 0.4–1.2 cm, 1.9–12 times as long as wide, apex rounded to acuminate, not mucronate, base rounded to decurrent onto petiole, margin not undulate, glabrous to sparsely puberulent only on midrib or all over beneath and glabrous to puberulent on midrib only or all over above, secondary veins indistinct above, obscure beneath. *Inflorescence* axillary or terminal, a simple unbranched pleiochasium, sparsely puberulent all over, c. 2.3 cm long; peduncle 0.3–0.9 cm by 0.7–1 mm; bracts caducous or persistent, deltoid, c. 2 by 1 mm; bracteoles absent or only on pedicel of terminal flower; flowers usually 4; pedicels 1.6–5.3 mm long. *Sepals* ovate or narrowly ovate, 1.2–3 by 0.6–1 mm, 2–3.3 times as long as wide, apex acute, ciliate, glabrous or sparsely puberulent.

Corolla white, cream or yellow, slightly fleshy; bud head 1.6–2.8 mm long which is 0.22–0.3 of bud length, narrowly ovate or ovate, apex acute; mature tube cylindrical, 5.7–6.5 by 1.5–1.7 mm, 3–5.4 times as long as sepals, 2.2–3.25 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, sparsely pubescent around stamens and more densely in a band beneath them or very sparsely pubescent in upper half of tube inside; lobes ovate or orbicular, base auriculate, apex rounded or obtuse, not ciliate or ciliate near tips only, 2–2.6 by 1.6–2.1 mm, 1.2–1.25 times as long as wide, glabrous outside, glabrous or pubescent at base of lobes inside. *Stamens* inserted at 4.2–4.5 mm from corolla base which is 0.62–0.66 of tube length; filaments 0.4–0.6 mm long; anther apex 0.8–0.9 mm from corolla mouth, anthers 1–1.4 by 0.4–0.5 mm. *Ovaries* 0.6–0.9 mm high, densely pubescent all over or pubescent around base only; style 2.9–3.9 mm long; style head 0.4–0.6 mm long. *Fruit* with 1 article; stalks 1.8–2.1 mm long; articles 7.5–10.2 by 5.8–7.7 mm, ellipsoid, symmetrical, apex rounded to acuminate, sparsely puberulent at ends. *Seeds* c. 6.5 by 4.8 by 4.4 mm.

Distribution — *Malesia*: Peninsular Malaysia, Borneo, Palawan.

Habitat & Ecology — In forest, scrub, swamp forest or kerengas from 100–1677 m altitude. Reported from ultramafic soils.

3. *Alyxia angustissima* Merr. & Quisumb.

Alyxia angustissima Merr. & Quisumb., Philipp. J. Sci. 82 (1954) 334; Markgr., Blumea 23 (1977) 410; D.J. Middleton, Blumea 45 (2000) 31. — Type: *Celestino 8018* (holo A; iso A, K, L, PNH), Philippines, Luzon, Mountain Province, Mt Polis.

Climber. *Branchlets* weakly angled, sparsely lenticellate, sparsely puberulent, sometimes glabrescent. *Leaves* in whorls of 3–5; petiole 0.1–0.3 cm long, glabrous or pubescent; blade subcoriaceous to papery, linear to narrowly elliptic, 1.9–6.5 by 0.2–0.8 cm, 5.8–15.2 times as long as wide, apex acuminate, base cuneate, margin weakly undulate or not, midrib weakly sunken above, no clear intramarginal vein, glabrous or puberulent only on midrib beneath, glabrous above, secondary veins weakly prominent above, obscure beneath. *Inflorescence* of 2 flowers or of solitary axillary flowers, delicate, glabrous or sparsely puberulent, 1.5–1.7 cm long; bracts persistent, deltoid or leafy; pedicels c. 6 mm long; bracts in a ring around the middle of the pedicel; 2 small bracteoles immediately beneath calyx. *Sepals* ovate, c. 1.8 by 1 mm, c. 1.8 times as long as wide, apex acuminate, ciliate, glabrous. *Corolla* unknown. *Fruit* with 1 article; stalks 3.4–3.7 mm long; articles with thin flesh, 9–11.4 by 6.2–10 mm, ellipsoid or subglobose, apex rounded, black when mature. *Seeds* c. 6.7 by 5.5 by 5.2 mm.

Distribution — *Malesia*: Philippines (Luzon, Mindanao).

Habitat & Ecology — Reported from dipterocarp forest on clay or along rivers.

4. *Alyxia arfakensis* Kaneh. & Hatus.

Alyxia arfakensis Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 489; Markgr., Blumea 23 (1977) 400, p.p.; D.J. Middleton, Blumea 45 (2000) 33. — Type: *Kaneh. & Hatus. 13717* (holo FU n.v., photo of holotype in L; iso A, BO, TI), New Guinea, Papua, Manokwari District, Arfak Mts, Anggi Lakes. *Alyxia punctata* auct. non Kaneh. & Hatus.: Markgr., Blumea 23 (1977) 404, p.p.; P. Royen, Alpine Fl. New Guinea 4 (1983) 2853, p.p. *Alyxia microphylla* auct. non Markgr.: Markgr., Blumea 23 (1977) 405, p.p.

Reported as an erect shrub (see note). *Branchlets* weakly angled, sparsely lenticellate or not, sparsely to densely and minutely puberulent, sometimes glabrescent. *Leaves* in whorls of 3, coriaceous or subcoriaceous; petiole 0.1–0.4 cm long, glabrous or pubescent; blade elliptic or obovate, 1.4–5 by 0.4–2.3 cm, 2–4.2 times as long as wide, apex acute, shortly acuminate with an obtuse acumen or acuminate but notched at the apex, not mucronate, base cuneate, margin weakly or strongly undulate, glabrous beneath, glabrous or puberulent on midrib only above, secondary veins 18–41 pairs, 65–75° from midrib. *Inflorescence* axillary, a simple unbranched pleiochasium or with 1 or 2 internodes and unbranched side branches, delicate, sparsely to densely puberulent, 0.8–3 cm long; peduncle 0.4–1.7 cm by 0.6–0.9 mm; bracts persistent, deltoid, leafy or narrowly ovate, 0.6–1.3 by 0.4–0.9 mm; bracteoles absent or only on pedicel of terminal flower; flowers 4–8; pedicels 0.7–6.5 mm long. *Sepals* ovate, c. 1.1 by 0.6–0.7 mm, 1.6–1.8 times as long as wide, apex obtuse or acute, ciliate, glabrous or sparsely puberulent on centre line or all over. *Corolla* white; bud head 1.2 mm long which is 0.32–0.34 of bud length, ellipsoid, apex rounded; tube slightly inflated, 2.3–2.7 by 0.9–1 mm, 2.1–2.5 times as long as sepals, 1.6–2.25 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes elliptic or ovate, base auriculate, apex rounded or obtuse, not ciliate, 1.2–1.4 by 0.9–1 mm, 1.3–1.4 times as long as wide, glabrous outside and inside. *Stamens* inserted at 1.2–1.8 mm from corolla base which is 0.46–0.56 of tube length; filaments 0.5 mm long; anther apex 0.2–0.5 mm from corolla mouth, anthers 0.7–0.8 by 0.3–0.4 mm. *Ovaries* 0.5 mm high, glabrous or pubescent in tuft between carpels; style 0.8–0.9 mm long; style head 0.5 mm long, pubescent. *Fruit* stalks 1.9–2.2 mm long; articles 8.5–10.3 by 6.2–7.2 mm, ellipsoid, symmetrical, apex obtuse, glabrous. *Seeds* c. 8.7 by 4.8 by 4.2 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest from 1950–2400 m.

Note — This species is reported from one herbarium specimen as being an erect shrub. I find this unlikely except when very young. Unfortunately there are very few collections and most have no habit information.

5. *Alyxia cacuminum* Markgr.

Alyxia cacuminum Markgr., Nova Guinea 14, 2 (1926) 281; Bot. Jahrb. Syst. 61 (1927) 186; Blumea 23 (1977) 403, p.p.; P. Royen, Alpine Fl. New Guinea 4 (1983) 2851, p.p.; D.J. Middleton, Blumea 45 (2000) 36; Utteridge in R.J. Johns et al., Alp. Subalp. Fl. Mount Jaya (2006) 187. — Type: *Versteeg 2463* (lecto L., designated by Middleton (2000) op. cit.; iso A (fragm.), BO, K, U), New Guinea, Papua, Kajan Mt.

Alyxia punctata auct. non Kaneh. & Hatus.: Markgr., Blumea 23 (1977) 404, p.p.; P. Royen, Alpine Fl. New Guinea 4 (1983) 2853, p.p.

Alyxia semipallescens auct. non F. Muell.: Markgr., Blumea 23 (1977) 403, p.p.

Erect shrub, ground creeper or climber. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, glabrous to densely and minutely puberulent, often glabrescent. *Leaves* in whorls of 5–7; petiole 0–0.7 cm long, glabrous; blade coriaceous, obovate or spatulate, 1–6.3 by 0.5–2.7 cm, 1.7–3.4 times as long as wide, apex emarginate to acuminate, and then often notched at the apex, or cuspidate, often folded back, base

cuneate or decurrent onto petiole, margin strongly undulate or not, glabrous beneath and above, not punctate beneath, secondary veins 12–30 pairs, 60–70° from midrib. *Inflorescence* axillary, a simple unbranched pleiochasium or with several internodes and unbranched side branches, delicate to robust, glabrous to densely puberulent, 1.3–2.8 cm long; peduncle 0.5–1.5 cm by 1.1–2.1 mm; bracts persistent, deltoid, 0.8–1.8 by 0.7–1.4 mm; bracteoles absent or only on pedicel of terminal flower; flowers 3–9; pedicels 1–4.5 mm long. *Sepals* ovate, 1.2–2.5 by 0.9–2 mm, 0.9–1.9 times as long as wide, apex rounded or obtuse, ciliate, glabrous or sparsely puberulent all over or only on central line. *Corolla* white, cream or with tube purplish brown and lobes creamy; bud head 1.5–2.8 mm long which is 0.23–0.43 of bud length, ellipsoid or ovate, apex obtuse or acute; tube cylindrical or slightly inflated, 4.1–5 by 1.5–1.9 mm, 1.7–3.6 times as long as sepals, 1.7–3.2 times as long as lobes, glabrous or sparsely puberulent all over outside, pubescent in a band below the stamens inside or sparsely pubescent around stamens and more densely in a band beneath them; lobes elliptic, ovate or orbicular, apex rounded to acute, base auriculate, 1.5–2.6 by 1.2–2.7 mm, 1–1.5 times as long as wide, glabrous outside, glabrous or pubescent at tips of lobes inside, not ciliate. *Stamens* inserted at 2.2–3.5 mm from corolla base which is 0.5–0.64 of tube length; filaments 0.5–0.8 mm long; anther apex 0.3–1 mm from corolla mouth, anthers 1.1–1.5 by 0.4–0.5 mm. *Ovaries* 0.6–1 mm high, pubescent around base only, very sparsely pubescent all over or pubescent in tuft between carpels; style 1.2–2.3 mm long; style head 0.6–1 mm long. *Fruit* black, purple or orange-brown, stalks 0–5.2 mm long, with 1–3 articles in each string, 0–1 mm between articles, glabrous, with thin flesh, 7.5–11.5 by 5–7.7 mm, ellipsoid, globose, subglobose or cylindrical, symmetrical, apex rounded to acute. *Seeds* ovoid, 6.9–8.2 by 4.3–5.6 by 4.2–5.2 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In submontane, mossy, subalpine or ridge forest, or alpine grassland or scrub on sandstone or peat soil from 2100–3550 m.

6. *Alyxia celebica* D.J. Middleton

Alyxia celebica D.J. Middleton, *Blumea* 45 (2000) 38; Kessler et al., *Blumea*, Suppl. 14 (2002) 13.
— Type: *Jermy, Walker & Sands 468* (holo K; iso A, BO, C, K, L), Moluccas, Sulawesi Selatan, Enkerang District, Latimojong Mts, Ridge SW of Bunte Tjejeng at 1900 m.

Probably a climber. *Branchlets* weakly angled, sparsely lenticellate, glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 3; petiole 0.6–1.2 cm long, glabrous; blade coriaceous, elliptic, 4–12 by 1–4.4 cm, 2–5 times as long as wide, apex acute to shortly acuminate, base cuneate, margin weakly undulate, dark green and dull above, yellowish green beneath, glabrous beneath, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins 26–46 pairs, 75–80° from midrib. *Inflorescence* axillary, with 1 or 2 internodes and unbranched side branches, robust, glabrous, 2–3 cm long; peduncle 0.8–0.9 cm by 1.8 mm; bracts persistent, deltoid, 2.6–3.2 by 2–2.4 mm; bracteoles absent; flowers c. 7; pedicels 1.6–2.5 mm long. *Sepals* fleshy, fused into a 2-lipped tube, 2.2–2.6 mm long, not ciliate, glabrous. *Corolla* bud head c. 3.8 mm long which is 0.34 of bud length, ovate, apex acute or acuminate; tube cylindrical, 7–7.5 by 1.6 mm, 3.2 times as long as calyx, 2.1–2.7 times as long as

lobes, glabrous outside, pubescent in a band below the stamens inside; lobes orbicular, base auriculate, apex rounded, 2.6–3.5 by 2.2 mm, 1.2 times as long as wide, glabrous outside, glabrous or pubescent at base of lobes inside, not ciliate. *Stamens* inserted at 3.5–4.5 mm from corolla base which is 0.56–0.6 of tube length; filaments 0.7–0.8 mm

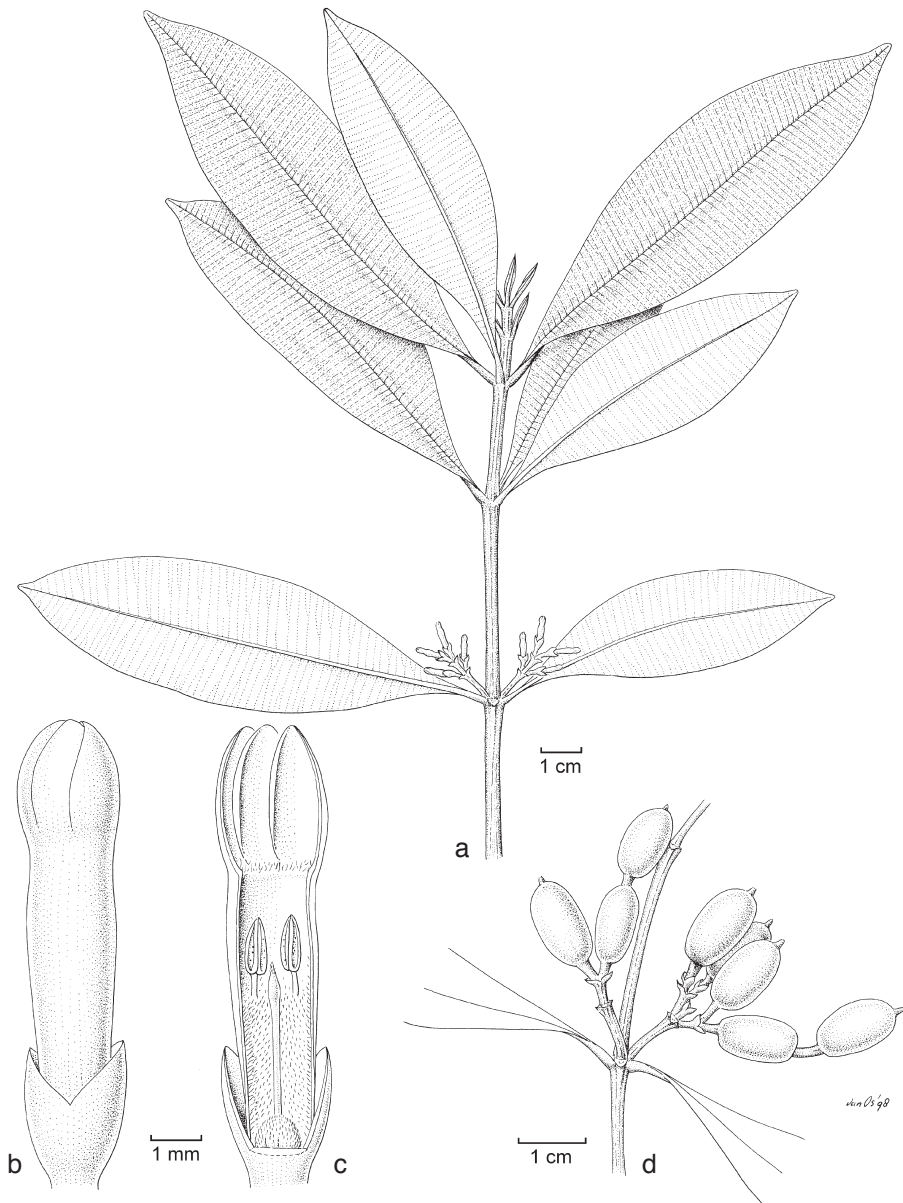


Fig. 14. *Alyxia celebica* D.J. Middleton. a. Habit; b. flower bud; c. flower dissection; d. fruit (a: Walker & Sands 468; b–d: fl. & fr. Jermy, Walker & Sands 468).

long; anther apex 1 mm from corolla mouth, anthers c. 1.3 by 0.5 mm. *Ovaries* c. 0.8 mm high, densely pubescent all over; style c. 2.4 mm long; style head c. 0.8 mm long. *Fruit* stalks 2–2.7 mm long, 1 or 2 articles in each string, 0.8–1.7 mm between articles, with thin flesh, 10.4–19.5 by 7.5–12.5 mm, ellipsoid or cylindrical. *Seeds* c. 9.2 by 6.3 by 5.8 mm. — **Fig. 14.**

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — Reported from montane forest, oak-*Podocarpus* montane forest and scrub at 300–1900 m.

7. *Alyxia composita* Warb.

Alyxia composita Warb., Bot. Jahrb. Syst. 13 (1891) 404; D.J. Middleton, Blumea 45 (2000) 40. — Type: *Warburg 21334* (lecto A, designated by Middleton (2000) op. cit.; iso E), New Guinea, Papua, near Sigar.

Alyxia lata Markgr., Bot. Jahrb. Syst. 61 (1927) 187; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 493; Markgr., Blumea 23 (1977) 381, p.p. — Type: *Beccari 6360* (holo FI n.v.; photos in A, L), New Guinea, Papua, Pulau Miosnum.

Alyxia maluensis auct. non Markgr.: Markgr., Blumea 23 (1977) 395, p.p.

Climber. *Branchlets* terete or weakly angled, not lenticellate, glabrous. *Leaves* opposite or in whorls of 3; petiole 0.2–0.9 cm long, glabrous; blade coriaceous or subcoriaceous, elliptic to obovate, 2.9–13.6 by 0.8–6.3 cm, 1.75–2.8 times as long as wide, apex obtuse to acuminate, not mucronate, base acute or cuneate, margin weakly undulate or not, glabrous beneath and above, not punctate beneath, secondary veins 18–56 pairs, 60–75° from midrib. *Inflorescence* axillary or terminal, of unbranched pleiochasia or short congested to laxer compound pleiochasia, delicate or robust, sparsely puberulent in upper parts to densely puberulent all over, 2.2–3.3 cm long; peduncle 0.3–1 cm by 1.1–2.1 mm; bracts and bracteoles stiff and apparent, bracts persistent, deltoid, 1.4 by 0.9–1.4 mm; bracteoles one immediately beneath calyx or on pedicel; flowers 2–9; pedicels 0–1.6 mm long. *Sepals* not fleshy, ovate, 1.4–2.2 by 1.2–1.6 mm, 1–1.8 times as long as wide, apex acute, ciliate, sparsely or densely puberulent. *Corolla* white; tube cylindrical, 8.5–11.2 by 1.5–1.9 mm, 5–6.4 times as long as sepals, 4–5.1 times as long as lobes, glabrous outside, continuously pubescent except for base inside; lobes elliptic, ovate or orbicular, apex rounded or obtuse, base auriculate, 2–2.6 by 1.7–2.3 mm, 1.1–1.2 times as long as wide, glabrous outside and inside, not ciliate. *Stamens* inserted at 6.7–8.8 mm from corolla base which is 0.74–0.82 of tube length; filaments 0.7–0.9 mm long; anther apex 0.6–0.8 mm from corolla mouth, anthers 1.1–1.2 by 0.5–0.6 mm. *Ovaries* 1.1–1.2 mm high, densely pubescent all over; style 6.6–8 mm long; style head 0.5 mm long. *Fruit* orange turning black, stalks 3–4.5 mm long, with 1 or 2 articles in each string, 3.5–4 mm between articles, glabrous or sparsely puberulent at ends, articles with thin flesh, 4.7–7.9 by 7.9–9.4 mm, ellipsoid, symmetrical, rounded or obtuse at apex. *Seeds* ovoid, 8.4–9.8 by 6.4–6.7 by 5.7–5.8 mm.

Distribution — *Malesia*: Moluccas, New Guinea.

Habitat & Ecology — In forest on limestone, serpentine or clay soils to 650 m altitude.

8. *Alyxia concatenata* (Blanco) Merr.

- Alyxia concatenata* (Blanco) Merr., Sp. Blancoan. (1918) 310; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 327; Markgr., Blumea 23 (1977) 393; D.J. Middleton, Blumea 45 (2000) 41; PROSEA 12, 2 (2001) 71. — *Brabejum concatenatum* Blanco, Fl. Filip., ed. 2 (1845) 40. — Type: Untraced. Neotype: *Merrill Species Blancoanae 159* (L neo, designated by Middleton (2000) op. cit.; isoneo A (scrap), BM, BO, GH, K, MO, NSW, NY, P, US, W), Philippines, Luzon, Rizal Province, Bosoboso.
- Alyxia monilifera* S. Vidal, Revis. Pl. Vasc. Filip. (1886) 182. — *Gynopogon moniliferus* (S. Vidal) Merr., Publ. Bur. Sci. Gov. Lab. 29 (1905) 46. — Type: *Vidal 461* (lecto K, designated by Middleton (2000) op. cit.; iso K), Philippines, Tayabas Province, Mt Banahao.
- Paralstonia clusiacea* Baill., Bull. Mens. Soc. Linn. Paris 1 (1888) 750. — *Alyxia clusiacea* (Baill.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 166; Markgr., Blumea 23 (1977) 380, p.p. — Type: *Barthe s.n.* (lecto P, designated by Middleton (2000) op. cit.; iso P), Philippines.
- Alyxia confertiflora* Merr., Philipp. J. Sci., Bot. 10 (1915) 64; Enum. Philipp. Fl. Pl. 3 (1923) 327. — Type: *Reillo 16143* (lecto US, designated by Middleton (2000) op. cit.; iso A, BM), Philippines, Basilan Island.
- Alyxia quadrata* Elmer ex Merr., Enum. Philipp. Fl. Pl. 3 (1923) 327, nom. nud. — *Alyxia quadrata* Elmer, Leaflet Philipp. Bot. 10 (1939) 3692, nom. inval. — Based on: *Elmer 15827* (A, BISH, BM, BO, C, G, GH, HBG, K, L, NA, NY, P, S, U, UC, US, Z), Philippines, Sorsogon Province, Irosin, Mt Bulusan.
- Alyxia luzoniensis* auct. non Merr.: Markgr., Blumea 23 (1977) 392, p.p.

Climber. *Branchlets* weakly or strongly angled; not lenticellate; glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 3 or 4; petiole 0.3–1.9 cm long, glabrous or pubescent; blade coriaceous or subcoriaceous, elliptic to broadly elliptic, 2.2–12.5 by 0.9–5.7 cm, 1.4–4.3 times as long as wide, apex rounded to acuminate or cuspidate, base acute to decurrent onto petiole, margin weakly undulate, dark green and shining above, pale green beneath, glabrous or sparsely puberulent only on midrib beneath, glabrous or puberulent on midrib only above, midrib clearly to deeply sunken above, intramarginal nerve clear at margin, secondary veins 20–38 pairs, 65–75° from midrib, weakly prominent above and obscure to prominent beneath. *Inflorescence* axillary, a compound pleiochasium, sparsely or densely puberulent, 1.5–4 cm long; peduncle 0.2–2.1 cm by 0.8–1.9 mm; bracts caducous or persistent, deltoid or narrowly ovate, 2–3.1 by 1.3–2.1 mm; bracteoles two immediately beneath calyx; flowers 5–11; pedicels 0–2.6 mm long. *Sepals* ovate or narrowly ovate, not fleshy, 1.7–3.3 by 1–2 mm, 1–2.2 times as long as wide, apex obtuse, acute or acuminate, ciliate or not, glabrous or sparsely to densely puberulent, sometimes only on centre line. *Corolla* white; bud head 2–3.1 mm long which is 0.17–0.34 of bud length, globular, narrowly ovate or ovate, apex acute or acuminate; tube cylindrical, 7.6–12 mm long, 1.3–2.3 mm wide, glabrous outside, continuously pubescent except for base inside, only around stamens and more densely in a band beneath them, or very sparsely pubescent in upper half of tube to beneath the stamens, tube 2.4–5.2 times as long as lobes, 3–6.7 times as long as sepals; lobes ovate, apex rounded to acute, not ciliate or ciliate near tips only, 2–3.2 by 1.2–2.7 mm, 0.85–1.9 times as long as wide, glabrous outside, glabrous or papillate inside. *Stamens* inserted at 6.7–10.1 mm from corolla base which is 0.72–0.82 of tube length; filaments 0.7–1.1 mm long; anther apex 0.2–0.8 mm from corolla mouth, anthers 1.1–1.4 by 0.5–0.6 mm. *Ovaries* 0.6–0.8 mm high, densely pubescent all over, pubescent around base only or only on top; style 6.1–9.2 mm long; style head 0.4–0.8 mm long.

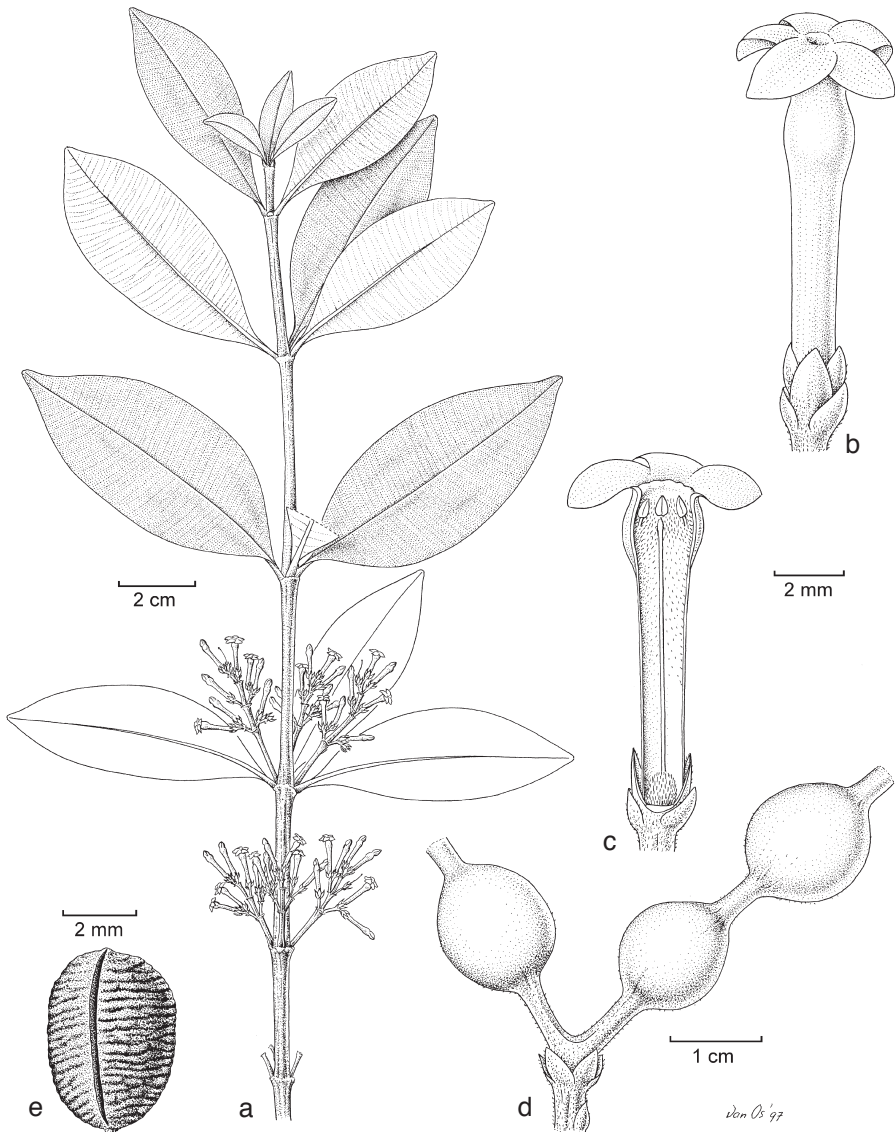


Fig. 15. *Alyxia concatenata* (Blanco) Merr. a. Habit; b. open flower; c. flower dissection; d. fruit; e. seed (a–c: Conklin & Buwaya 80646; d, e: McGregor 19752).

Fruit yellow or orange, stalks 3.2–6.2 mm long, with 1–4 articles in a string, 1.1–4.2 mm between articles, articles 4.5–8.8 by 4.3–6.8 mm, globose, symmetrical, sparsely puberulent all over. *Seeds* ovoid, 4.1–5.1 by 3–3.9 by 2.8–3.6 mm. — **Fig. 15.**

Distribution — *Malesia*: Philippines.

Habitat & Ecology — In lowland primary or secondary forest, or lower montane, mossy or montane forest from 200–2200 m, on clay soils.

9. *Alyxia defoliata* Markgr.

Alyxia defoliata Markgr., Nova Guinea 14, 2 (1926) 280; Bot. Jahrb. Syst. 61 (1927) 186; Blumea 23 (1977) 399; D.J. Middleton, Blumea 45 (2000) 44; Utteridge in R.J. Johns et al., Alp. Subalp. Fl. Mount Jaya (2006) 189. — Type: *Pulle 1115* (lecto L, designated by Middleton (2000) op. cit.; iso A, BO), New Guinea, Papua, Treub Mts.

Alyxia defoliata Markgr. subsp. *orientalis* Markgr., Blumea 23 (1977) 399 (but not all paratypes). — Type: *C. Versteegh BW 10475* (holo L; iso A), New Guinea, Papua, Baliem Valley, Wiligimaan.

Alyxia arfakensis auct. non Kaneh. & Hatus.: Markgr., Blumea 23 (1977) 400, p.p.

Alyxia purpureoclada auct. non Kaneh. & Hatus.: Markgr., Blumea 23 (1977) 400, p.p.

Erect shrub or climber. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 3; petiole 0.2–1.1 cm long, glabrous; blade coriaceous or subcoriaceous, narrowly to broadly elliptic or obovate, 1.3–8 by 0.6–3.6 cm, 1.4–3.1 times as long as wide, apex obtuse to acuminate but slightly notched at the apex, base cuneate, margin weakly undulate, glabrous beneath and above, not punctate beneath, secondary veins 24–51 pairs, 70–75° from midrib. *Inflorescence* axillary, a compound pleiochasium with clear internodes or with 1 or 2 internodes and unbranched side branches, glabrous to densely puberulent, 1.8–3.8 cm long; peduncle 0.5–1.5 cm by 1.4–1.5 mm; bracts caducous or persistent, deltoid, 1.6–2.5 by 1.2–1.4 mm; bracteoles absent; flowers 4–16; pedicels 1.8–3.5 mm long. *Sepals* ovate, 1.2–1.5 by 1.1–1.3 mm, 1.1–1.2 times as long as wide, apex rounded or obtuse, ciliate, glabrous. *Corolla* white; tube slightly inflated, 3.5–3.7 by 1.6–1.8 mm, 2.3–3.1 times as long as sepals, 2.2–2.3 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes ovate or orbicular, apex rounded or obtuse, base auriculate, 1.6 by 1.1–1.9 mm, 0.8–1.5 times as long as wide, glabrous outside, glabrous or papillate inside, not ciliate. *Stamens* inserted at 1.8–2.8 mm from corolla base which is 0.56–0.64 of tube length; filaments 0.7–0.8 mm long; anther apex 0.1–0.6 mm from corolla mouth, anthers 0.9–1.2 by 0.3–0.5 mm. *Ovaries* 0.7–0.9 mm high, densely pubescent all over or pubescent around base only; style 0.8–1.9 mm long; style head 0.5–0.8 mm long. *Fruit* yellow, stalks 2.1–3.2 mm long, with 1 or 2 articles in each string, c. 2.7 mm between articles, sparsely puberulent at ends or all over, 9–10.5 by 7.7–8 mm, ellipsoid, globose or cylindrical, symmetrical, rounded at apex. *Seeds* c. 9.3 by 5.9 by 5.4 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Reported from forest edge at 1600–2500 m.

10. *Alyxia floribunda* Markgr.

Alyxia floribunda Markgr., Bot. Jahrb. Syst. 61 (1927) 184; Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 211; Markgr., Blumea 23 (1977) 397, p.p.; D.J. Middleton, Blumea 45 (2000) 47. — Type: *Schlechter 17705* (lecto L, designated by Middleton (2000) op. cit.; iso A, BM, BRI, C, G, K, MO, S, UC, US), Papua New Guinea, Madang Province, Kani Mts.

Alyxia rostrata auct. non (Markgr.) Markgr.: Markgr., Blumea 23 (1977) 411, p.p.

Alyxia ridleyana auct. non Wernham: Markgr., Blumea 23 (1977) 411, p.p.

Climber. *Branchlets* strongly angled, densely lenticellate to not lenticellate, glabrous. *Leaves* in whorls of 3–5; petiole 0.3–2 cm long, glabrous; blade coriaceous to papery, elliptic, 4.3–18.5 by 1.5–7.5 cm, 1.7–3 times as long as wide, apex rounded

to shortly acuminate, acumen obtuse, base obtuse to decurrent onto petiole, margin weakly undulate, glabrous beneath and above, secondary veins 45–109 pairs, 80–85° from midrib. *Inflorescence* axillary, a compound pleiochasium with clear internodes, glabrous, 4–9 cm long; peduncle 1–5.4 cm by 1.2–2.5 mm; bracts persistent, deltoid, 0.8–0.9 by 0.8–1 mm; bracteoles present, one immediately beneath calyx; flowers 16–51; pedicels 0.5–2.5 mm long. *Sepals* ovate, somewhat fused at base, 1.3–1.7 by 1.2–1.3 mm, 1–1.4 times as long as wide, apex rounded or obtuse, usually reflexed, ciliate, glabrous. *Corolla* white; bud head 0.9–1.2 mm long which is 0.25–0.33 of bud length, ellipsoid or ovate, apex acute; tube slightly inflated, 2.8–3.3 by 1.4 mm, 2–2.2 times as long as sepals, 2.5–2.7 times as long as lobes, glabrous outside, pubescent around stamens and more densely in a band beneath them or very sparsely pubescent only beneath filaments inside; lobes ovate or orbicular, apex rounded or obtuse, base auriculate, 1.1–1.2 by 1.1 mm, 1–1.1 times as long as wide, glabrous outside and inside, not ciliate. *Stamens* inserted at 2.2–2.3 mm from corolla base which is 0.65–0.7 of tube length; filaments 0.2–0.7 mm long; anther apex 0.2–0.3 mm from corolla mouth, anthers 0.7–1 by 0.3–0.4 mm. *Ovaries* 0.6–0.8 mm high, glabrous or with varying degrees of pubescence; style 1.1–1.5 mm long; style head 0.4–0.7 mm long, pubescent. *Fruit* orange-brown, stalks 2–5.5 mm long, with 1–5 articles in a string, 1.8–2.7 mm between articles, sparsely puberulent at ends, articles dry and smooth, 8.3–9.7 by 6 mm, ellipsoid or cylindrical, symmetrical, rounded at apex. *Seeds* not studied.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In primary or secondary forest, sometimes in swamp forest at 10–2200 m. Reported once from limestone.

11. *Alyxia ganophylla* Markgr.

Alyxia ganophylla Markgr., Bot. Jahrb. Syst. 60 (1926) 314; Masam., Enum. Phan. Born. (1942) 618; D.J. Middleton, Blumea 45 (2000) 49. — Type: *Hackenbergl 123* (holo B†). Neotype: *Buwalda 7781* (neo L, designated by Middleton (2000) op. cit.; iso A, BO, K, L), Borneo, Kalimantan Tengah, Sampit.

Alyxia induta Markgr., Bot. Jahrb. Syst. 60 (1926) 315, nom. nud. — [*Gynopogon indutus* K. Schum., ined.]. — Based on: *Beccari 2121* (FI, G, K, P), Borneo.

Alyxia markgrafiana O. Schwartz, Mitt. Inst. Allg. Bot. Hamburg 7 (1931) 258. — Type: *Winkler 1429* (holo HBG; iso C, E, HBG), Borneo, Kalimantan Barat, Sungei Bika.

Alyxia pagonensis Markgr., Blumea 23 (1977) 385, p.p. (not including type).

Alyxia pilosa auct. non Miq.: Hook.f., Fl. Brit. India 3 (1882) 635; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 416; Ridl., Fl. Malay Penins. 2 (1923) 332, p.p.; Merr., Bibliogr. Enum. Born. Pl. (1921) 499; Masam., Enum. Phan. Born. (1942) 618; Markgr., Blumea 23 (1977) 382, p.p.; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; 47 (1997 [‘1995’]) 123; Coode et al., Checklist Pl. Brunei (1996) 25.

Climber. *Branchlets* weakly angled, not lenticellate, sparsely to densely puberulent, hispid or tomentose. *Leaves* in whorls of 3 or 4; petiole 0.3–1.5 cm long, pubescent; blade coriaceous, elliptic, obovate or spatulate, 3–12.8 by 1–5.7 cm, 1.8–4 times as long as wide, apex emarginate to acuminate or apiculate, base obtuse to decurrent onto petiole, margin weakly to strongly revolute, undulate or not, sparsely puberulent only on midrib, puberulent all over or tomentose beneath, puberulent on midrib only or all over above, secondary veins 12–37 pairs, 70–85° from midrib. *Inflorescence* axillary

or terminal, a compound pleiochasium with clear internodes or with 1 or 2 internodes and unbranched side branches, densely puberulent, tomentose or hispid, 1.4–6 cm long; peduncle 0.3–4 cm by 1.1–3.8 mm; bracts caducous or persistent, deltoid or narrowly ovate, 2.5–6 by 1.6–2.4 mm; bracteoles immediately beneath calyx or on pedicels; flowers 5–15; sessile or with pedicels up to 1.5 mm long. *Sepals* linear to ovate, 1.8–3.2 by 0.9–1.8 mm, 1.6–2.7 times as long as wide, apex acute, ciliate, densely puberulent. *Corolla* white or cream; bud head 2.3–3.9 mm long which is 0.22–0.37 of bud length, ovate or deltoid, apex obtuse or acute; tube cylindrical, 6.8–8.6 by 1.8–2.3 mm, 2.7–3.9 times as long as sepals, 2.4–2.8 times as long as lobes, densely to sparsely puberulent, rarely only papillate, outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes elliptic, ciliate, ovate or orbicular, base auriculate, 2.5–3.5 by 1.7–2.2 mm, 1.3–1.9 times as long as wide, apex obtuse, glabrous, sparsely or densely puberulent outside, glabrous or pubescent at base of lobes inside. *Stamens* inserted at 6–7.5 mm from corolla base which is 0.72–0.8 of tube length; filaments 0.6–0.7 mm long; anther apex 0.4–0.6 mm from corolla mouth, anthers 1.2–1.4 by 0.4–0.5 mm. *Ovaries* 0.5–0.8 mm high, densely pubescent all over; style 6–6.8 mm long; style head 0.6–0.7 mm long. *Fruit* with 1 or 2 articles in each string and then close together, stalks 2.9–8.2 mm long; articles with thin flesh, 6.4–13.4 by 5.7–8 mm, ellipsoid or globose, apex rounded to acuminate, black or purple, sparsely puberulent at ends or all over. *Seeds* 7.1–9.5 by 4.8–6.8 by 4.8–6.3 mm.

Distribution — *Malesia*: Peninsular Malaysia, Singapore, Borneo, Sulawesi (? see below). This species was incorrectly recorded as occurring in the Philippines by Middleton (2000) due to mistaken synonymy of *A. obovatifolia* under this species.

Habitat & Ecology — In forest, often disturbed, or kerengas on sandy, podsolic or poorly drained soils, sometimes ultramafic, at 5–1500 m.

Note — This species is not always easy to distinguish from *A. reinwardtii*. In *A. ganophylla* the outside of the corolla always has hairs more than just dotted around the top of the tube and these hairs are usually extensive and much longer than those in the rare occasions when hairs occur on the tube in *A. reinwardtii*. In addition, the ovary is always densely hairy all over in *A. ganophylla*, again a character of rare occurrence in *A. reinwardtii*. The record from Sulawesi is not without doubt and better collections are needed to clarify this.

12. *Alyxia globosa* D.J. Middleton

Alyxia globosa D.J. Middleton, Blumea 45 (2000) 51. — Type: *Van Balgooy 3685* (holo L; iso A, BO, K, KLU), Moluccas, Celebes, Lake Matana, Nuhakampi Otede.

Climber. *Branchlets* weakly angled, sparsely lenticellate, glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 3 or 4; petiole 0.3–0.8 cm long, glabrous; blade coriaceous or subcoriaceous, elliptic or obovate, 1.4–7.4 by 0.5–2.8 cm, 1.8–6.4 times as long as wide, apex emarginate to shortly acuminate with an obtuse acumen or acuminate but notched at the apex, base cuneate or decurrent onto petiole, margin weakly undulate, glabrous beneath and above, secondary veins 16–24 pairs, 80–85° from midrib. *Inflorescence* axillary, with several clear internodes and unbranched side branches, delicate, sparsely puberulent all over, 1.3–1.9 cm long; peduncle 0.5–1 cm

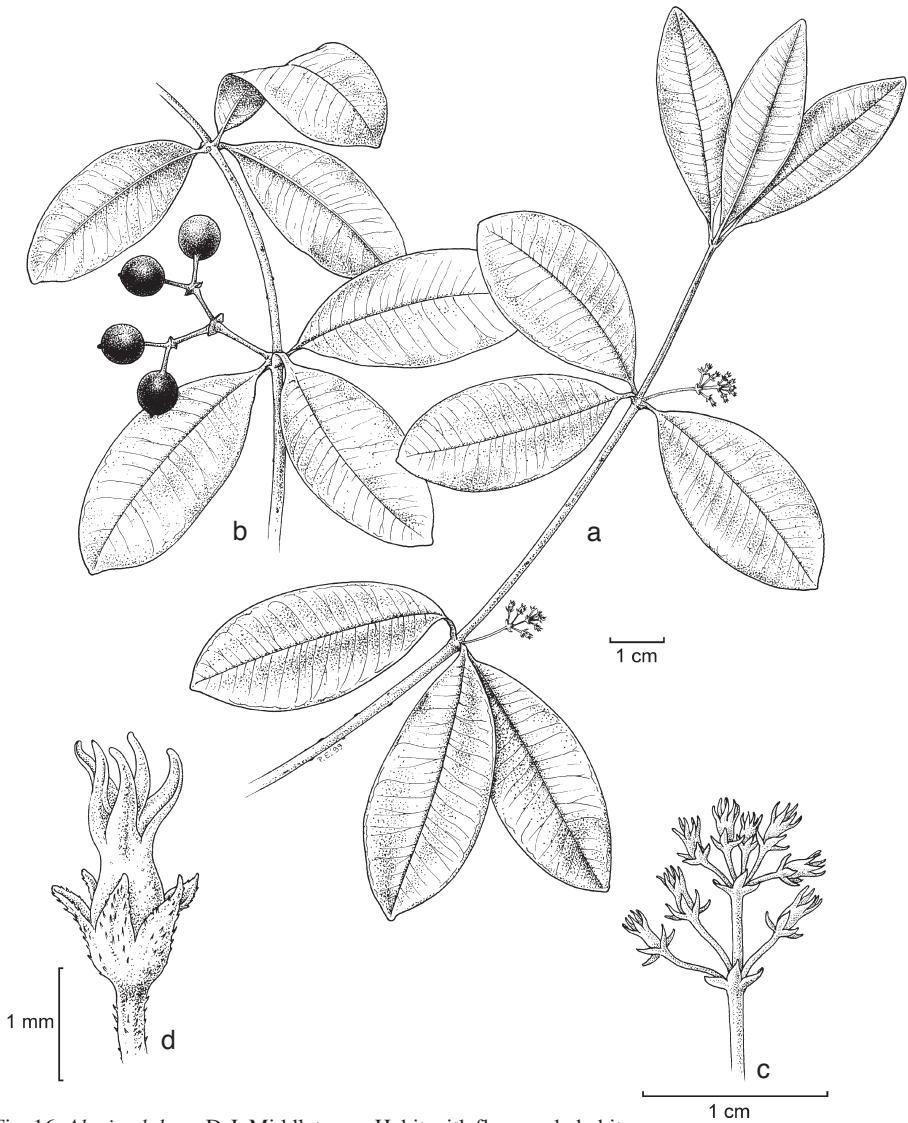


Fig. 16. *Alyxia globosa* D.J. Middleton. a. Habit with flowers; b. habit with fruits; c. inflorescence; d. open flower (Van Balgooy 3685).

by 0.7–0.9 mm; bracts caducous or persistent, deltoid, 0.9–1 by 0.6–0.7 mm; bracteoles absent; flowers 6–8; pedicels 0.6–2 mm long. *Sepals* not fleshy, ovate, 1–1.2 by 0.6–0.8 mm, 1.4–1.8 times as long as wide, apex acute or acuminate, ciliate, sparsely puberulent on centre line or all over. *Corolla* bud head c. 1.9 mm long which is 0.63 of bud length, narrowly ovate, apex acuminate; tube slightly inflated, 1.1–2.2 by 0.9 mm, 1.1–2 times as long as sepals, 0.6–1.1 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside;

lobes linear, apex acuminate, 1.8–2.2 by 0.6 mm, 3–3.7 times as long as wide, glabrous outside and inside, not ciliate. *Stamens* inserted at 0.6–1.6 mm from corolla base which is 0.4–0.55 of tube length; filaments 0.3 mm long; anther apex 0.2–0.6 mm from corolla mouth, anthers 0.7–0.8 by 0.25–0.3 mm. *Ovaries* 0.5 mm high, densely pubescent all over; style 1.2 mm long; style head 0.4 mm long. *Fruit* black or purple, stalks 1.7–3.2 mm long, with 1 or 2 articles in each string, glabrous or sparsely puberulent at ends, articles with thin flesh, 5.8–7.4 by 4.8–7 mm, globose, symmetrical, rounded at apex. *Seeds* ovoid, 4.7–6.6 by 4.2–5 by 3.8–4.5 mm. — **Fig. 16.**

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — In secondary or primary forest or on river banks on limestone or ultrabasic soils at 275–400 m.

13. *Alyxia graciliflora* D.J. Middleton

Alyxia graciliflora D.J. Middleton, *Blumea* 45 (2000) 53. — Type: *Benjamin LAE 67976* (holo US; iso A, BISH, BRI, CANB, E, K, L, LAE, M, NSW), Papua New Guinea, Milne Bay Province, Goodenough Island, Mt Oiamadawa'a.

Alyxia acuminata auct. non K. Schum.: *Markgr.*, *Blumea* 23 (1977) 390, p.p.

Climber. Bark brown. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 3; petiole 0.3–0.6 cm long, glabrous or pubescent; blade subcoriaceous, elliptic, 1.7–7.2 by 0.4–2.9 cm, 1.8–4.3 times as long as wide, apex obtuse or shortly acuminate, acumen obtuse, base cuneate, margin weakly undulate, glabrous or sparsely puberulent only on midrib beneath, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins 24–38 pairs, 70–75° from midrib. *Inflorescence* axillary, a compound pleiochasium with clear internodes or with 1 or 2 internodes and unbranched side branches, delicate, sparsely to densely puberulent, 1–2.9 cm long; peduncle 0.3–0.9 cm by 0.7–0.9 mm; bracts caducous or persistent, deltoid, 0.9–1 by 0.6–0.8 mm; bracteoles absent; flowers 4–12; pedicels 0.9–2 mm long. *Sepals* ovate, 1–1.2 by 0.4–0.8 mm, 1.5–2.5 times as long as wide, apex acute, ciliate, glabrous to densely puberulent. *Corolla* tube brown with green lobes or with pink tube and white lobes; bud head c. 1.9 mm long which is 0.48 of bud length, narrowly ovate, apex obtuse or acute; tube slightly or strongly inflated, 2.7–3.1 by 1–1.7 mm, 2.3–2.8 times as long as sepals, 1.5–2.1 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, glabrous inside or very sparsely pubescent in upper half of tube; lobes elliptic, apex obtuse, base auriculate, 1.3–2.1 by 1.1–1.3 mm, 1.2–1.6 times as long as wide, glabrous or sparsely puberulent outside, pubescent at base of lobes inside, ciliate or ciliate near tips only. *Stamens* inserted at 1.6–1.9 mm from corolla base which is 0.51–0.57 of tube length; filaments 0.5–0.6 mm long; anther apex 0–0.5 mm from corolla mouth, anthers 0.9–1 by 0.3–0.4 mm. *Ovaries* c. 0.8 mm high, densely pubescent all over; style 0.6–0.7 mm long; style head 0.5 mm long, glabrous or pubescent. *Fruit* stalks c. 1.8 mm long, with 1 article, glabrous, articles fleshy, 15–16.2 by 6.9–8.2 mm, ellipsoid, symmetrical, apex rounded.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest at 500–1400 m.

14. *Alyxia halmaheirae* Miq.

Alyxia halmaheirae Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 140; Markgr., Blumea 23 (1977) 408, p.p.; Widjaya, Floribunda. Sisipan 2 (1992) 6; D.J. Middleton, Blumea 45 (2000) 57; PROSEA 12, 2 (2001) 71. — *Pulassarium halmaheirae* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — Type: *Teijsmann HB5647* (lecto U, designated by Middleton (2000) op. cit.; iso BO, L), Moluccas, Halmahera.

Alyxia stellata auct. non (J.R. Forst. & G. Forst.) Roem. & Schult.: Koord., Meded. Lands Plantentuin 19 (1898) 528.

Climber. Bark grey. *Branchlets* weakly angled, sparsely lenticellate or not, glabrous to sparsely and minutely puberulent, sometimes glabrescent. *Leaves* opposite or in whorls of 3 or 4, never all opposite on a branch; petiole 0.1–1 cm long, glabrous or pubescent; blade coriaceous or subcoriaceous, elliptic, 2.7–13.5 by 0.4–3 cm, 2.3–7 times as long as wide, apex acuminate, base acute to decurrent onto petiole, margin weakly or strongly undulate, glabrous beneath and above, secondary veins 19–80 pairs, 65–85° from midrib. *Inflorescence* axillary or terminal, a simple unbranched pleiochasium or with few internodes and unbranched side branches, delicate, sparsely to densely puberulent all over, 1–2.2 cm long; peduncle 0.5–4.5 cm by 0.5–0.8 mm; bracts persistent, deltoid or narrowly ovate, 1.3–3.5 by 0.8–1.2 mm; bracteoles absent or only on pedicel of terminal flower; flowers 4–7; pedicels 1.8–4.3 mm long. *Sepals* ovate, occasionally with sepals irregularly fused giving the appearance of fewer sepals, 1.2–1.8 by 0.8–1.1 mm, 1.4–1.6 times as long as wide, apex acute or acuminate, ciliate, glabrous or sparsely to densely puberulent, sometimes only on centre line. *Corolla* tube yellowish, lobes white; bud head 2.2–2.6 mm long which is 0.37–0.4 of bud length, narrowly ovate, apex acuminate; tube cylindrical or slightly inflated, 4.2–4.9 by 1.3–1.5 mm, 2.4–3.6 times as long as sepals, 0.5–2.1 times as long as lobes, glabrous outside, pubescent in upper part, sometimes almost to base, or only in a band beneath the stamens inside; lobes elliptic or ovate, 2.1–2.4 by 1.2–1.6 mm, 1.4–1.9 times as long as wide, apex obtuse or acute, base auriculate, glabrous outside, glabrous or pubescent at base of lobes inside, not ciliate. *Stamens* inserted at 2.4–3.1 mm from corolla base which is 0.56–0.61 of tube length; filaments 0.4–0.7 mm long; anther apex 0.4–0.8 mm from corolla mouth, anthers 0.9–1.1 by 0.4 mm. *Ovaries* 0.7–0.8 mm high, densely pubescent all over; style 1.7–1.9 mm long; style head 0.3–0.4 mm long, pubescent. *Fruit* orange, turning black when mature, stalks 2.3–3.2 mm long, with 1 article, glabrous, articles with thin flesh, 9.3–14.5 by 7–10 mm, ellipsoid, globose or cylindrical, rounded at apex. *Seeds* 7.5–9.3 by 6.1–6.4 by 5.3–5.4 mm.

Distribution — *Malesia*: Sulawesi, Moluccas.

Habitat & Ecology — In open or dense primary or secondary forest at 20–2000 m. Reported from porous nickel and thin sandstone soils.

15. *Alyxia kabaenae* Markgr.

Alyxia kabaenae Markgr., Blumea 23 (1977) 398; D.J. Middleton, Blumea 45 (2000) 59; Kessler et al., Blumea, Suppl. 14 (2002) 13. — Type: *Elbert 3415* (holo L; iso A, BO, K), Celebes, Kabaena Island, Balo District, Eempuhu.

Climber. *Branchlets* weakly angled, sparsely lenticellate or not, glabrous. *Leaves* in whorls of 3 or 4; petiole 0.2–1.2 cm long, glabrous; blade coriaceous or subcoriaceous,

elliptic, 2.2–15 by 0.6–5.4 cm, 2.3–3.8 times as long as wide, apex short to long acuminate, acumen obtuse, base acute or cuneate, margin weakly undulate, glabrous beneath and above, secondary veins 27–58 pairs, 65–80° from midrib. *Inflorescence* axillary, a compound pleiochasium with clear internodes or with several clear internodes and unbranched side branches, delicate, sparsely to densely short puberulent, 1.1–2.7 cm long; peduncle 0.3–0.9 cm by 1–1.3 mm; bracts persistent, ovate or narrowly ovate, 1.4–2.9 by 0.8–1.4 mm; bracteoles absent; flowers 7–11, reported as being unpleasant in smell, sometimes 4-merous but always also with 5-merous flowers in same inflorescences; pedicels 0.6–2 mm long. *Sepals* fused into a 2-lipped tube or partial tube, 1.9–2 mm long, ciliate, glabrous or sparsely puberulent. *Corolla* white or tube yellowish, lobes white; bud head 1.5–2.4 mm long which is 0.35–0.44 of bud length, ellipsoid or ovate, apex acute; tube cylindrical, 2.8–3 by 1.1–1.4 mm, 1.5 times as long as sepals, 1.1–1.6 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, glabrous or pubescent only around stamens inside; lobes elliptic or orbicular, apex rounded or obtuse, base auriculate, 1.8–2.8 by 1.2–2 mm, 0.9–1.6 times as long as wide, glabrous or sparsely puberulent outside, glabrous or pubescent at base of lobes inside, not ciliate. *Stamens* inserted at 1.9–2.1 mm from corolla base which is 0.57–0.63 of tube length; filaments 0.4–0.6 mm long; anther apex 0.3–0.5 mm from corolla mouth, anthers c. 0.7 by 0.3 mm. *Ovaries* 0.5–0.8 mm high, densely pubescent all over; style 1–1.5 mm long; style head 0.4–0.5 mm long. *Fruit* with 1 article, glabrous, articles with thin flesh, 24.5–27 by 14–16 mm, ellipsoid, symmetrical, apex obtuse. *Seeds* elliptic, c. 21.5 by 12 by 10 mm.

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — Coastal forest, mixed grassland and short forest on limestone, serpentine or karst from 200–1500 m.

16. *Alyxia kendarica* Markgr.

Alyxia kendarica Markgr., Blumea 23 (1977) 410; D.J. Middleton, Blumea 45 (2000) 60. — Type: *Beccari* 6365 (holo FI n.v.; photos A, L), Celebes, Wawo-Sondu to Mar Amu, near Kendari.

Climber. *Branchlets* weakly angled, sparsely lenticellate or not, glabrous or sparsely puberulent, glabrescent. *Leaves* in whorls of 4; petiole 0.3–6 cm long, glabrous; blade subcoriaceous, elliptic, usually narrowly so, 3.1–12 by 0.8–3.4 cm, 2.3–5.8 times as long as wide, apex long acuminate, acumen obtuse, base cuneate, margin weakly undulate, glabrous beneath and above, midrib sunken above, secondary veins 29–55 pairs, 70° from midrib, weakly prominent above, weakly visible beneath. *Inflorescence* axillary, with several clear internodes and unbranched side branches, delicate, sparsely puberulent all over, 2–2.8 cm long; peduncle 0.9–1.3 cm by 0.6 mm; bracts caducous or persistent, deltoid, 0.9–1.2 by 0.6–0.7 mm; bracteoles absent; flowers 6 or 7; pedicels 2.4–4.5 mm long. *Sepals* ovate, 1.2–1.4 by 0.6–0.7 mm, 1.9–2 times as long as wide, apex acute, ciliate, sparsely puberulent, glabrous inside. *Corolla* white with orange tube; bud head c. 2.8 mm long which is 0.44 of bud length, narrowly ovate, apex acuminate; tube slightly inflated, 4.2–4.6 by 1.2–1.3 mm, 3.5 times as long as sepals, 0.9–0.93 times as long as lobes, glabrous outside, pubescent in upper half and around stamens inside; lobes linear, apex acuminate, base auriculate, 4.5–4.8 by 1 mm, 4.5–4.6 times as long as wide, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 2.3 mm

from corolla base which is 0.53 of tube length; filaments c. 0.6 mm long; anther apex c. 0.8 mm from corolla mouth, anthers c. 1 by 0.4 mm. *Ovaries* c. 1 mm high, densely pubescent all over; style c. 1.4 mm long; style head c. 0.4 mm long, pubescent. *Fruit* not seen.

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — In forest, reported at 1850 m.

17. *Alyxia kwalotabaa* D.J. Middleton

Alyxia kwalotabaa D.J. Middleton, *Blumea* 45 (2000) 6; 47 (2002) 30. — Type: *Schodde & Craven 3803* (holo CANB; iso A, K, L, LAE), Papua New Guinea, Bougainville Island, Lake Loloru, c. 15 miles N of Buin.

Alyxia acuminata auct. non K. Schum.: Markgr., *Blumea* 23 (1977) 390, p.p.

Alyxia clemensiae auct. non Markgr.: Markgr., *Blumea* 23 (1977) 396, p.p.

Climber. *Branchlets* weakly angled, sparsely lenticellate, glabrous. *Leaves* in whorls of 3 or 4; petiole 0.8–1.3 cm long, glabrous; blade coriaceous or thickly coriaceous, elliptic or obovate, 4.3–14 by 1.8–7.4 cm, 1.5–3.6 times as long as wide, apex short or long acuminate, acumen obtuse, not mucronate, base acute to cuneate, margin flat or weakly undulate, glabrous beneath, not punctate, glabrous above, secondary veins 35–70 pairs, 70–80° from midrib. *Inflorescence* axillary, a simple unbranched pleiochadium, robust, glabrous to sparsely or densely puberulent all over, 1.7–2.4 cm long; peduncle 0.2–2.2 cm by 1.3–2.8 mm; bracts persistent, deltoid, 1.4–2.6 by 1.4–2 mm; bracteoles absent; flowers 4; pedicels 1.2–1.8 mm long. *Sepals* not fleshy, ovate, 1.5–2.6 by 1–2 mm, 1.1–1.7 times as long as wide, apex obtuse to acute, ciliate, glabrous outside. *Corolla* white or cream; bud head 3.6–3.8 mm long which is 0.25–0.32 of bud length, ovate, apex acute; tube cylindrical, 8.1–11.2 by 1.6–2.2 mm, 4.3–5.4 times as long as sepals, c. 2.7 times as long as lobes, glabrous outside, pubescent in upper half and around stamens or in a band below the stamens inside; lobes ovate, apex obtuse to acute, base auriculate, c. 3 by 2.7 mm, 1.1 times as long as wide, glabrous outside and inside, not ciliate. *Stamens* inserted at 6.6–10 mm from corolla base which is 0.82–0.83 of tube length; filaments c. 0.8 mm long; anther apex 0.1–0.4 mm from corolla mouth, anthers 1.1–1.4 by 0.5 mm. *Ovaries* 0.9–1.1 mm high, densely pubescent all over; style 6–9 mm long; style head c. 0.4 mm long. *Fruit* black; stalks 1.5–5 mm long; with 1 article; glabrous or sparsely puberulent all over, fleshy or with thin flesh, 16.5–36 by 13–21 mm, ellipsoid, symmetrical, apex rounded to acuminate and hooked. *Seeds* elliptic, 18.5–22 by 12.5–16 by 11.2–14.5 mm. — **Fig. 17.**

Distribution — *Malesia*: New Guinea (New Britain, Bougainville), Solomon Islands.

Habitat & Ecology — In a wide range of primary and secondary forest types and scrub on well drained and ridge top soils at 30–1524 m.

18. *Alyxia lackii* D.J. Middleton

Alyxia lackii D.J. Middleton, *Blumea* 45 (2000) 64. — Type: *Lack & Grimes 1760* (holo K), Celebes, Mt Tambusisi.

Erect shrub or climber. *Branchlets* terete, weakly or strongly angled, sparsely lenticellate or not, glabrous or densely and minutely puberulent. *Leaves* in whorls of 6;

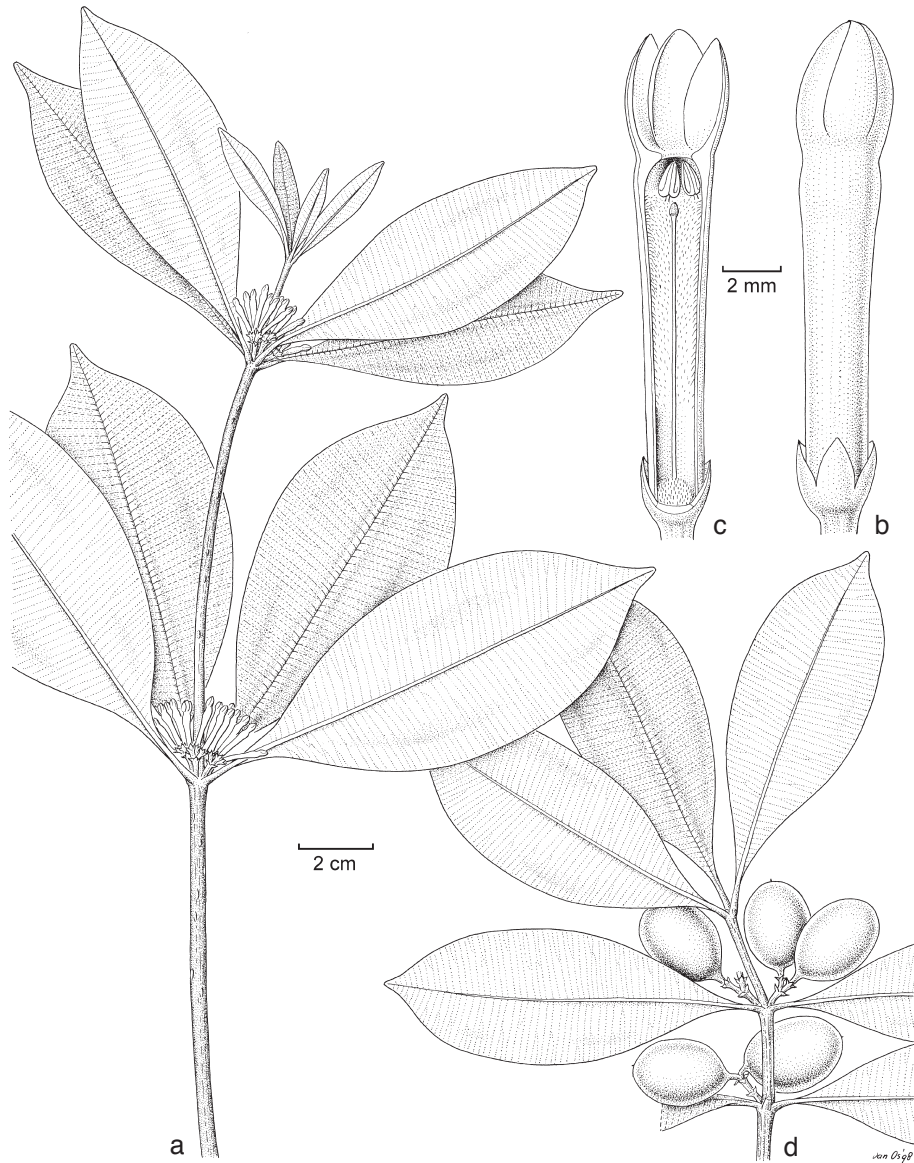


Fig. 17. *Alyxia kwalotabaa* D.J. Middleton. a. Habit; b. flower bud; c. flower dissection; d. fruit (a–c: Schodde & Craven 3803; d: Mauriasi *et al.* BSIP.12231).

petiole 0.4–0.5 cm long, glabrous or pubescent; blade subcoriaceous to thickly coriaceous, broadly elliptic to obovate, 3–5.3 by 1.6–3 cm, 1.5–2 times as long as wide, apex emarginate to obtuse, base cuneate or decurrent onto petiole, margin strongly in-rolled, weakly undulate, glabrous beneath, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins 14–19 pairs, 60–75° from midrib. *Inflorescence*

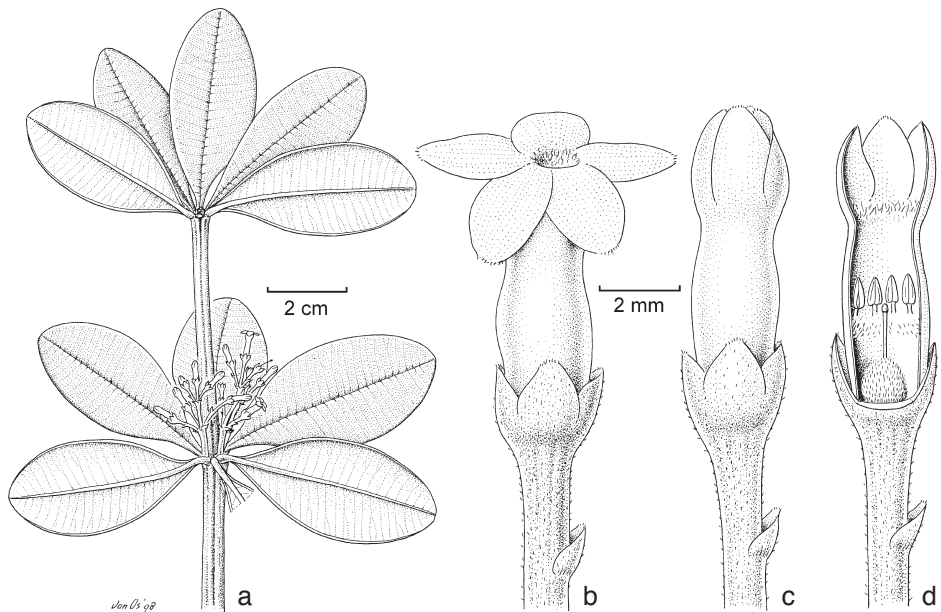


Fig. 18. *Alyxia lackii* D.J. Middleton. a. Habit (with one leaf removed from each whorl); b. flower; c. flower bud; d. flower dissection (Lack & Grimes 1760).

axillary, a compound pleiochasium with clear internodes, robust, densely puberulent, 2.8–3 cm long; peduncle 0.7–0.8 cm by 2.3 mm; bracts caducous, deltoid, 1.1–1.5 by 1.1–1.5 mm; bracteoles one on pedicel; flowers c. 10; pedicels 4–6 mm long. *Sepals* ovate, c. 1.2 by 0.9 mm, 1.3 times as long as wide, apex obtuse, ciliate, glabrous or sparsely puberulent. *Corolla* white; bud head c. 2.6 mm long which is 0.45 of bud length, ellipsoid, apex obtuse; tube cylindrical, c. 4.5 by 1.4 mm, 3.75 times as long as sepals, 1.8 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes elliptic, c. 2.5 by 1.6 mm, 1.6 times as long as wide, apex obtuse, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 2.7 mm from corolla base which is 0.57 of tube length; filaments c. 0.5 mm long; anther apex c. 0.8 mm from corolla mouth, anthers c. 1 by 0.4 mm. *Ovaries* c. 0.9 mm high, densely pubescent all over; style c. 1.3 mm long; style head c. 0.4 mm long. *Fruit* unknown. — **Fig. 18.**

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — Unknown.

19. *Alyxia laurina* Gaudich.

Alyxia laurina Gaudich., Voy. Uranie, Bot. (1829) 451, t. 62; G. Don, Gen. Hist. (1837) 96; A.DC., Prodr. 8 (1844) 347; Miq., Fl. Ned. Ind. 2 (1857) 408; Markgr., Bot. Jahrb. Syst. 61 (1927) 186; Blumea 23 (1977) 391; D.J. Middleton, Blumea 45 (2000) 65. — *Pulassarium laurinum* (Gaudich.) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — *Gynopogon laurinus* (Gaudich.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 151. — Type: *Gaudichaud s.n.* (lecto P, designated by Middleton (2000) op. cit.; iso G, G-DC), New Guinea, Papua, Waigeo, Rawak Island (= Pulau Lawak).

Climber. *Branchlets* weakly angled, sparsely lenticellate or not, sparsely or densely minutely puberulent. *Leaves* in whorls of 3; petiole 0.2–0.3 cm long, glabrous or pubescent; blade coriaceous or subcoriaceous, elliptic, 1.1–9.2 by 0.4–2.7 cm, 1.8–5.9 times as long as wide, apex emarginate, acute or acuminate, sometimes notched at the apex, base acute or cuneate, margin weakly undulate or not, sometimes yellowish green beneath, glabrous beneath, puberulent only on midrib above, secondary veins 28–46 pairs, 65–70° from midrib. *Inflorescence* terminal, a short congested compound pleiochasium, robust, densely puberulent, 1.1–1.5 cm long; peduncle 0.3–0.6 cm by 1.4–1.6 mm; bracts persistent, deltoid; bracteoles present, two immediately beneath calyx; flowers 4–10; pedicels 0–0.8 mm long. *Sepals* ovate, 1.6 by 1.1 mm, 1.5 times as long as wide, apex acute, ciliate, densely puberulent. *Corolla* with tube purplish brown, lobes creamy; bud head 1.7–2.1 mm long which is 0.24–0.25 of bud length, ovate, apex acute; tube cylindrical, 6.7–7.4 by 1 mm, 4.6 times as long as sepals, 2.7–2.8 times as long as lobes, glabrous outside, continuously pubescent except for base inside; lobes ovate, 2.4–2.7 by 1.2–2.1 mm, 1.3–2 times as long as wide, apex obtuse, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at 5.3–6.3 mm from corolla base which is 0.79–0.81 of tube length; filaments 0.5–0.6 mm long; anther apex 0.2–0.4 mm from corolla mouth, anthers c. 1 by 0.5 mm. *Ovaries* c. 0.9 mm high, densely pubescent all over; style 5.2–5.4 mm long; style head 0.6 mm long, pubescent. *Fruit* stalks c. 2 mm long, with 1 article, articles dry smooth, 8.7–9.3 by 7.5–8 mm, ellipsoid, rounded. *Seeds* not seen.

Distribution — *Malesia*: New Guinea (Waigeo and surrounding islands).

Habitat & Ecology — In xerophytic vegetation at 25–40 m.

20. *Alyxia linearis* Markgr.

Alyxia linearis Markgr., Blumea 23 (1977) 406; D.J. Middleton, Blumea 45 (2000) 66. — *Alyxia rosmarinifolia* Merr. & Quisumb., Philipp. J. Sci. 82 (1954) 335, non *Alyxia rosmarinifolia* (Baill.) Guillaumin. — Type: *Edaño 176* (holo A; iso A, L, PNH), Philippines, Palawan, Puerto Princesa District, Bacuñgan.

Delicate climbers or scramblers. *Branchlets* weakly angled, sparsely lenticellate, glabrous. *Leaves* opposite, coriaceous; petiole 0.2–0.3 cm long, glabrous; blade linear or very narrowly elliptic, 1.9–5.8 by 0.2–0.45 cm, 10.7–20 times as long as wide, apex rounded, base obtuse, margin not undulate, glabrous beneath and above. *Flowers* solitary. *Sepals* ovate, c. 1.2 by 0.8 mm, 1.5 times as long as wide, apex obtuse, ciliate, glabrous. *Corolla* unknown. *Fruit* with 1 article, stalks c. 2 mm long; articles 6–7 by 5.2–5.7 mm, globose, yellow, glabrous. *Seeds* c. 4.4 by 3.2 by 3.3 mm.

Distribution — *Malesia*: Philippines (Palawan).

Habitat & Ecology — Forest.

Note — This is a poorly known species close to *A. angustissima*.

21. *Alyxia longiloba* D.J. Middleton

Alyxia longiloba D.J. Middleton, Blumea 45 (2000) 67. — Type: *Paijmans 129* (holo CANB; iso LAE), Papua New Guinea, Northern Province, North of Aiari, Upper Musa Valley.

Climber. *Branchlets* strongly angled, sparsely lenticellate, sparsely and minutely puberulent. *Leaves* in whorls of 5; petiole 0.7–1.6 cm long, pubescent; blade coriaceous, elliptic to spatulate, 5.2–8.6 by 2.8–4.9 cm, 1.7–2.1 times as long as wide, apex emarginate, rounded, apiculate or cuspidate, base cuneate or decurrent onto petiole, margin not undulate, sparsely puberulent only on midrib beneath, sparsely puberulent or puberulent only on midrib above, not punctate beneath, secondary veins 30–39 pairs, 65° from midrib. *Inflorescence* axillary, a compound pleiochasium with clear internodes, robust, densely puberulent, 2.3–2.8 cm long; peduncle 0.4–0.5 cm by 1.4–1.5 mm; bracts persistent, 0.8–1 by 0.6–0.7 mm; bracteoles absent or present with one on pedicel; flowers 20; pedicels 1–1.5 mm long. *Sepals* ovate, 1.1–1.4 by 0.8–0.9 mm, 1.2–1.75 times as long as wide, apex acute or acuminate, ciliate, densely puberulent. *Corolla* white; bud head 5 mm long which is 0.5 of bud length, narrowly ovate, apex acute; tube cylindrical, 5–6 by 1.5 mm, 3.6–4.5 times as long as sepals, 1–1.2 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes linear, 4.1 by 4.3 by 1–1.1 mm, 4.1–4.7 times as long as wide, apex acute, glabrous outside and inside, ciliate near tips only. *Stamens*

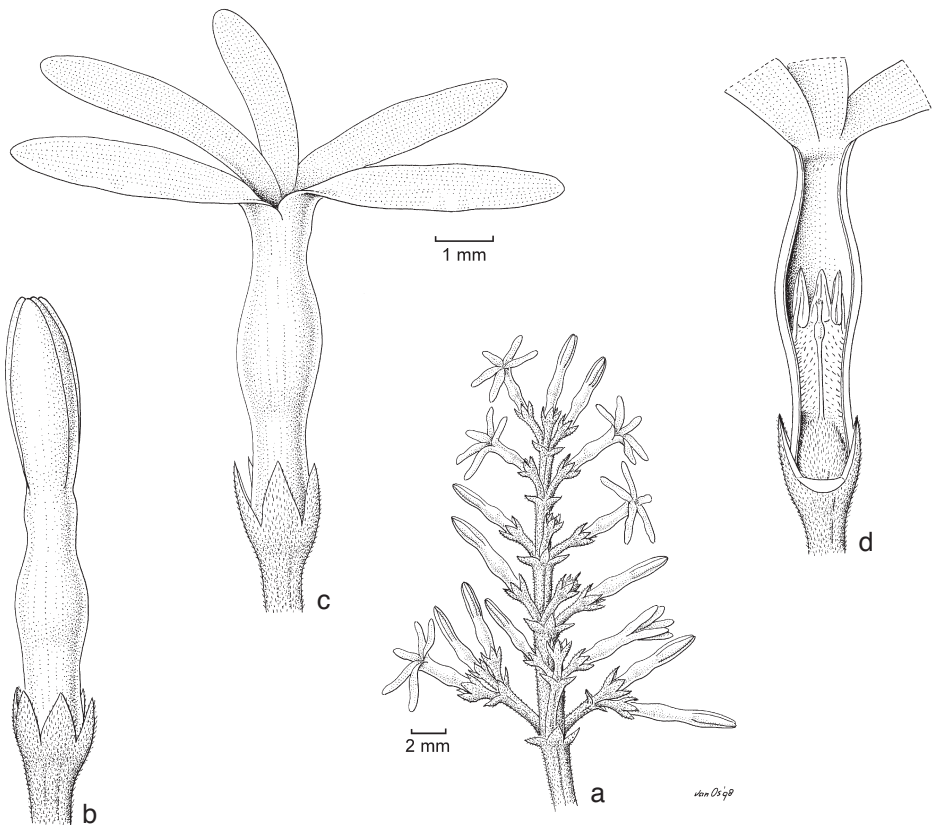


Fig. 19. *Alyxia longiloba* D.J. Middleton. a. Inflorescence; b. flower bud; c. open flower; d. flower dissection (Pajmans 129).

inserted at 2.1–2.7 mm from corolla base which is 0.45–0.47 of tube length; filaments c. 0.5 mm long; anther apex 1.2–2.2 mm from corolla mouth, anthers 1.1–1.2 by 0.4–0.5 mm. *Ovaries* c. 0.9 mm high, densely pubescent all over; style c. 1.2 mm long; style head c. 0.6 mm long, pubescent. *Fruit* unknown. — **Fig. 19.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Collected once in forest at 610 m.

22. *Alyxia luzoniensis* Merr.

Alyxia luzoniensis Merr., Philipp. J. Sci., Bot. 4 (1909) 313; Enum. Philipp. Fl. Pl. 3 (1923) 328; Markgr., Blumea 23 (1977) 392, p.p.; D.J. Middleton, Blumea 45 (2000) 69. — Type: *M. Ramos 7007* (holo PNH[†]). Neotype: *Ramos 5107* (neo P, designated by Middleton (2000) op. cit.; isoneo NY), Philippines, Luzon, Mountain Province, Bontoc.

Brabejum lucidum Blanco, Fl. Filip., ed. 2 (1845) 40. — *Alyxia blancoi* Merr., Philipp. J. Sci., Bot. 7 (1912) 330; Enum. Philipp. Fl. Pl. 3 (1923) 327; Markgr., Blumea 23 (1977) 401, p.p. — Type: Untraced. Neotype: *Ramos 11118* (neo L, designated by Middleton (2000) op. cit.; isoneo A, BM, K, P, US), Philippines, Cebu Province, hills above Cebu City.

Alyxia lanceolata Merr., Philipp. J. Sci., Bot. 13 (1918) 53; Enum. Philipp. Fl. Pl. 3 (1923) 328. — Type: *Ramos & Edaño 29209* (lecto A, designated by Middleton (2000) op. cit.; iso BO, K, NY, P, US), Philippines, Luzon, Tayabas Province, Infanta-Siniloan trail.

Alyxia laxiflora Merr., Philipp. J. Sci., Bot. 13 (1918) 54; Enum. Philipp. Fl. Pl. 3 (1923) 328; Markgr., Blumea 23 (1977) 408. — Type: *Fénix 28371* (lecto A, designated by Middleton (2000) op. cit.; iso BO, K, L, NY, P, US), Philippines, Luzon, Apayao, Mt Sulu.

Alyxia stenophylla Merr., Philipp. J. Sci. 17 (1921) 305; Enum. Philipp. Fl. Pl. 3 (1923) 329; Markgr., Blumea 23 (1977) 410. — Type: *Martelino & Edaño 35574* (lecto A, designated by Middleton (2000) op. cit.; iso BM, BO, K, L, P, US), Philippines, Panay Island, Capiz Province, Mt Sali-bongbong.

Alyxia ecostata Merr. & Quisumb., Philipp. J. Sci. 82 (1954) 335; Markgr., Blumea 23 (1977) 408. — Type: *M.D. Sulit 6421* (holo A; iso BM, K, L, PNH, US), Philippines, Samar, Mt Calbiga, near Wright.

Alyxia halmaheirae auct. non Miq.: Markgr., Blumea 23 (1977) 408, p.p.

Climber. *Branchlets* weakly angled, sparsely lenticellate or not, glabrous or sparsely and minutely puberulent. *Leaves* opposite to whorls of 4; petiole 0.2–0.8 cm long, glabrous or pubescent; blade coriaceous, subcoriaceous or papery, elliptic, obovate or spatulate, 1.3–7 by 0.5–2.8 cm, 1.6–8.8 times as long as wide, apex emarginate to acuminate or caudate, sometimes notched even when acuminate, base acute or cuneate, margin weakly undulate or not, glabrous or sparsely puberulent only on midrib beneath, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins 17–38 pairs, 55–70° from midrib. *Inflorescence* axillary or terminal, a simple unbranched pleiochasium or with clear internodes and unbranched side branches, delicate, glabrous to sparsely puberulent, 1.5–5.2 cm long; peduncle 0.5–2.3 cm by 0.4–0.8 mm; bracts caducous or persistent, ovate, deltoid or linear; bracteoles present, two immediately beneath calyx or several along pedicel; flowers 3–6; pedicels 1–8 mm long. *Sepals* ovate, 1.3–2 by 0.7–1.1 mm, 1.4–2.1 times as long as wide, apex acute or acuminate, ciliate, glabrous to sparsely puberulent. *Corolla* white; bud head 2.2–3.2 mm long which is 0.26–0.34 of bud length, narrowly ovate, ovate or deltoid, apex acuminate; tube cylindrical, 5.9–7.6 by 1.4–1.8 mm, 3.6–5 times as long as sepals, 1.9–2.6 times as long as lobes, glabrous outside, pubescent in upper half and around

stamens or pubescent in a band below the stamens inside, sometimes very sparsely so; lobes elliptic or ovate, 2.3–3.8 by 1–2.2 mm, 1.4–2.3 times as long as wide, apex acuminate, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at 4.5–5.7 mm from corolla base which is 0.73–0.81 of tube length; filaments 0.5–0.7 mm long; anther apex 0–0.4 mm from corolla mouth, anthers 1–1.2 by 0.4–0.5 mm. *Ovaries* 0.7–0.9 mm high, sparsely or densely pubescent all over; style 2.4–4.7 mm long; style head 0.3–0.6 mm long, glabrous or pubescent. *Fruit* green or yellow-orange, stalks 2.8–5.5 mm long, with 1 or 2 articles in each string, 1.5 mm between articles, glabrous or sparsely puberulent at ends, articles fleshy, 6.6–15 by 6.6–9.6 mm, ellipsoid, symmetrical. *Seeds* ovoid, 9.4–10.2 by 5–5.3 by 4.6–4.7 mm. — **Fig. 20.**

Distribution — *Malesia*: Philippines.

Habitat & Ecology — In forest from 600–700 m. One specimen reported on clay.

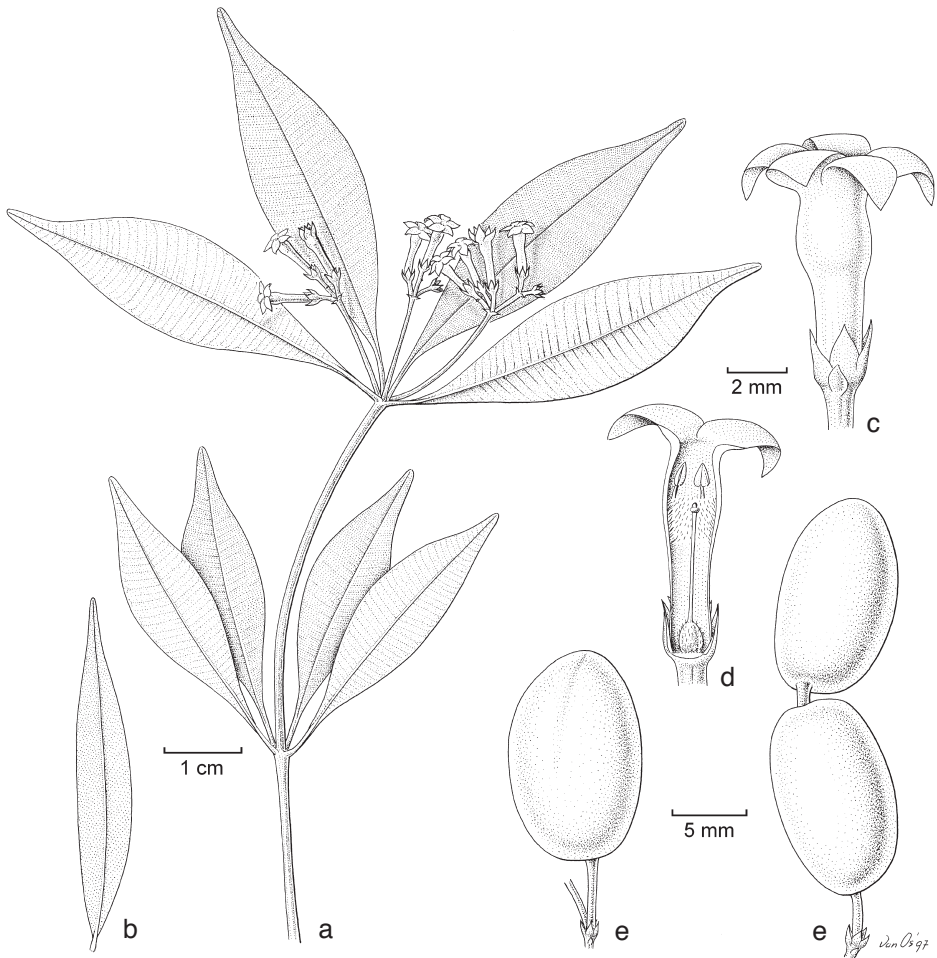


Fig. 20. *Alyxia luzoniensis* Merr. a. Habit; b. narrow leaf form; c. open flower; d. flower dissection; e. fruits (a–d: *Edaño 18076*; e: *Gaerland et al. PPI 9874*).

23. *Alyxia manusiana* D.J. Middleton

Alyxia manusiana D.J. Middleton, *Blumea* 45 (2000) 71. — Type: *Kerenga et al.* LAE 77516 (holo L; iso CANB, K, LAE), Papua New Guinea, Manus Island, Mt Dremsel.

Climber. *Branchlets* strongly angled, not lenticellate, glabrous. *Leaves* in whorls of 4 or 5; petiole 0.7–1 cm long, glabrous; blade subcoriaceous, elliptic, 7–12 by 2.5–4.5 cm, 0.4–3.3 times as long as wide, apex long acuminate, not mucronate, base cuneate or decurrent onto petiole, margin weakly undulate, glabrous beneath and above, not punctate beneath, midrib sunken above, intramarginal nerve clear at margin, secondary veins 55–79 pairs, 75° from midrib, weakly prominent above, weakly visible beneath. *Inflorescence* axillary, large lax panicles frequently branched, delicate, glabrous, 3.5–7 cm long; flowers 30–40. Calyx of free sepals. *Corolla* unknown. *Fruit* orange, stalks 1.7–3.8 mm long, with 1 or 2 articles in each string, glabrous, articles dry smooth or with thin flesh, 5.3–7.3 by 4.8–6.2 mm, globose, subglobose or cylindrical, symmetrical, apex rounded or apiculate. *Seeds* ovoid, 4.7–9.8 by 4–4.4 by 3.7–4.1 mm.

— **Fig. 21.**

Distribution — *Malesia*: New Guinea (Manus Island).

Habitat & Ecology — In lower montane or evergreen forest at 30–610 m.

Note — This is a rather poorly known species close to *A. rostrata*.

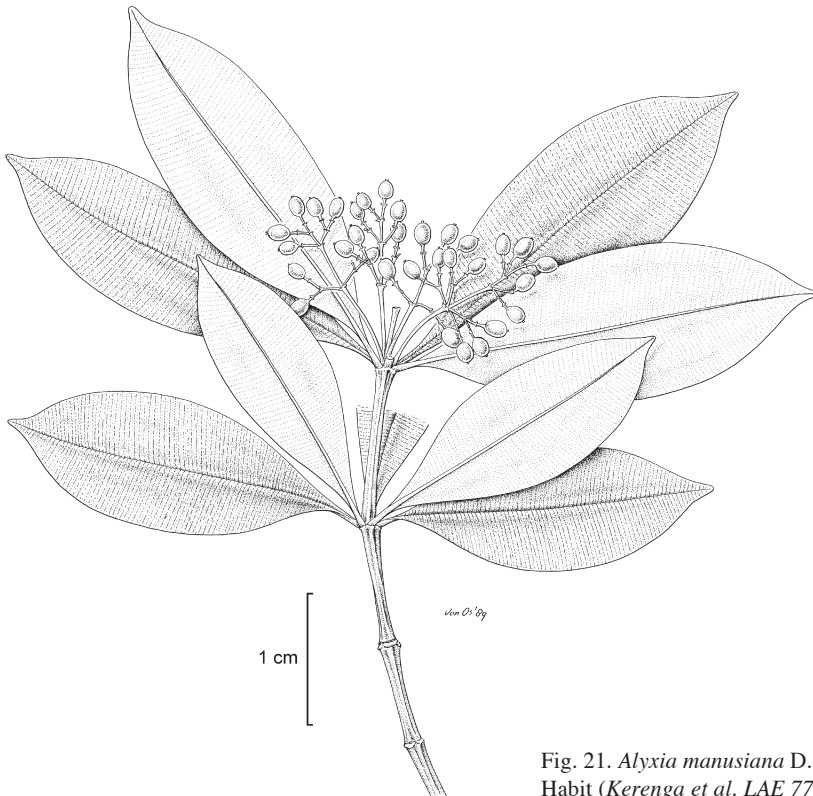


Fig. 21. *Alyxia manusiana* D.J. Middleton. Habit (*Kerenga et al.* LAE 77516).

24. *Alyxia markgrafii* Tsiang

Alyxia markgrafii Tsiang, Sunyatsenia 2 (1934) 105; Markgr., Blumea 23 (1977) 409; D.J. Middleton, Blumea 45 (2000) 73. — *Alyxia schlechteri* Markgr., Bot. Jahrb. Syst. 61 (1927) 184, non H. Lév. (1911). — *Alyxia novoguineensis* Tsiang, Sunyatsenia 6 (1941) 115. — Type: *Schlechter 19243* (holo B⁺; lecto K, designated by Middleton (2000) op. cit.), China, Guizhou, Lo-fou, south of Tinfan.

Alyxia sleumeri Markgr., Blumea 23 (1977) 409, p.p. (not including type).

Alyxia rostrata auct. non (Markgr.) Markgr.: Markgr., Blumea 23 (1977) 411, p.p.

Alyxia riddleana auct. non Wernham: Markgr., Blumea 23 (1977) 411, p.p.

Climber. *Branchlets* weakly to strongly angled, sparsely lenticellate or not, glabrous. *Leaves* in whorls of 3–6, coriaceous; petiole 0–2 cm long, glabrous; blade narrowly to broadly elliptic, obovate or spatulate, 3–13 by 0.7–5.7 cm, 1.9–5 times as long as wide, apex emarginate, rounded, obtuse, acute, acuminate or apiculate, base cuneate to decurrent onto petiole, margin weakly or strongly undulate, dark green, dull or shining above, dark or pale green beneath, glabrous, secondary veins 45–90 pairs, 60–80° from midrib. *Inflorescence* axillary, with several clear internodes and unbranched side branches or, very rarely, an aggregate pleiochasium forming lax panicles (see note), delicate, glabrous, 2.4–6.7 cm long; peduncle 0.7–4.5 cm by 0.5–1.5 mm; bracts caducous or persistent, ovate or deltoid, c. 1.3 by 0.8 mm; bracteoles present on pedicel or absent; flowers 9–12; pedicels 0.7–5 mm long. *Sepals* ovate, 1.1–1.8 by 0.8–1.5 mm, 1.2–2 times as long as wide, apex rounded to obtuse, ciliate or not, glabrous. *Corolla* white, cream or with a pink tube and white lobes; bud head 1.8–2 mm long which is 0.32–0.38 of bud length, ellipsoid, apex obtuse to acute; tube cylindrical or slightly inflated, 1.8–3.8 by 0.9–1.4 mm, tube 1.6–2.8 times as long as sepals, 1.3–2 times as long as lobes, glabrous outside, pubescent in a band below the stamens inside or sparsely pubescent around stamens and more densely in a band beneath them; lobes elliptic or ovate, 1.4–2 by 0.8–1.5 mm, 1.3–1.9 times as long as wide, apex rounded to acute, not ciliate, glabrous outside, glabrous or pubescent at base of lobes inside. *Stamens* inserted at 1.4–2.5 mm from corolla base which is 0.56–0.71 of tube length; filaments 0.3–0.5 mm long; anther apex 0–0.5 mm from corolla mouth, anthers 0.7–0.9 by 0.3–0.4 mm. *Ovaries* 0.6–0.9 mm high, pubescent in tuft between carpels or very sparsely pubescent around base only; style 1.2–1.9 mm long; style head 0.3–0.4 mm long. *Fruit* with 1–7 articles in a string, 1.6–9.3 mm between articles, stalks 2.8–7 mm long; articles dry smooth, 4.7–11.7 by 4.6–8.3 mm, ellipsoid or subglobose, apex rounded, yellow or orange, maturing black, glabrous. *Seeds* oblong, 4.9–8.1 by 4–5.3 by 3.5–4.2 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In primary, secondary, swamp or montane forest, or in scrub or savannah on clay, volcanic or sandy soils at 15–1200 m.

Note — The inflorescence of this species is usually a single axis with whorls of flowers at the nodes. Specimens with a more complex branched inflorescence may actually represent another species or a variety of this species but unfortunately the material is too poor to be sure.

25. *Alyxia microphylla* Markgr.

Alyxia microphylla Markgr., Blumea 23 (1977) 405 (but not including all paratypes); D.J. Middleton, Blumea 45 (2000) 75. — Type: *Brass 12180* (holo L; iso A, BM, BO, BRI, K, LAE), New Guinea, Papua, Idenburg River, 18 km SW of Bernhard Camp.

Alyxia subalpina auct. non Markgr.: Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 212.

Climber. *Branchlets* weakly angled, sparsely lenticellate or not, densely long puberulent. *Leaves* in whorls of 4; petiole 0.1–0.3 cm long, pubescent; blade coriaceous, elliptic, 1.2–2.8 by 0.4–1.2 cm, 1.9–2.7 times as long as wide, apex acuminate and notched at the apex, base acute or cuneate, margin weakly undulate, glabrous beneath and above, secondary veins 14–17 pairs, 60° from midrib. *Inflorescence* axillary, a simple unbranched pleiochasium, delicate, sparsely long pubescent all over, 1.2–2 cm long; peduncle 0.5–0.9 cm by 0.4–0.6 mm; bracts persistent, narrowly ovate, c. 1.4 by 1 mm; bracteoles present, one on pedicel; flowers 4; pedicels 5–6.5 mm long. *Sepals* ovate, 1.1–1.2 by 0.9–1 mm, 1.2 times as long as wide, apex obtuse, ciliate, glabrous. *Corolla* with orange tube and yellow lobes; bud head 1.8 mm long which is 0.42 of bud length, deltoid, apex acute; tube slightly inflated, c. 2.7 by 1.5 mm, 2.2 times as long as sepals, 1.8 times as long as lobes, sparsely puberulent around top of tube outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes orbicular, 1.5 by 1.3 mm, 1.2 times as long as wide, apex rounded, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 1.4 mm from corolla base which is 0.5 of tube length; filaments 0.5 mm long; anther apex c. 0.5 mm from corolla mouth, anthers c. 0.7 by 0.3 mm. *Ovaries* c. 0.5 mm high, pubescent around base only; style c. 1 mm long; style head c. 0.4 mm long, pubescent. Articles ellipsoid (only immature fruit seen).

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In scrub or mossy forest at 1700–2150 m.

26. *Alyxia minutiflora* D.J. Middleton

Alyxia minutiflora D.J. Middleton, Blumea 45 (2000) 76. — Type: *Kjellberg 2418* (holo S; iso BO), Celebes, Waroe Waroe.

Climber. *Branchlets* terete or weakly angled, sparsely lenticellate, glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 4 or 5; petiole 0.3–0.5 cm long, glabrous; blade subcoriaceous, elliptic, 5.5–9.8 by 1.7–3.3 cm, 2.6–4.2 times as long as wide, apex shortly acuminate, acumen rounded, base cuneate to decurrent onto petiole, margin weakly undulate, glabrous beneath and above, secondary veins 40–48 pairs, 50–60° from midrib. *Inflorescence* axillary, with several clear internodes and unbranched side branches, delicate, densely and minutely puberulent, 1.1–1.6 cm long; peduncle 0.3–0.6 cm by 0.8–1.1 mm; bracts persistent, deltoid, 0.6–0.8 by 0.7–0.9 mm; bracteoles absent; flowers c. 15 in an inflorescence; pedicels 1.8–2.2 mm long. *Sepals* ovate, c. 0.6 by 0.6 mm, 1 times as long as wide, apex acute, ciliate, densely puberulent all over outside. *Corolla* with a yellow tube and white lobes; bud head 1.3–1.4 mm long which is 0.35–0.38 of bud length, ellipsoid, apex acute to acuminate; tube slightly inflated around stamens, 2.3–2.7 by 0.8 mm, 3.8–4.2 times as long as sepals, 1.6–1.8 times as long as lobes, sparsely to densely pubescent around top of tube outside,

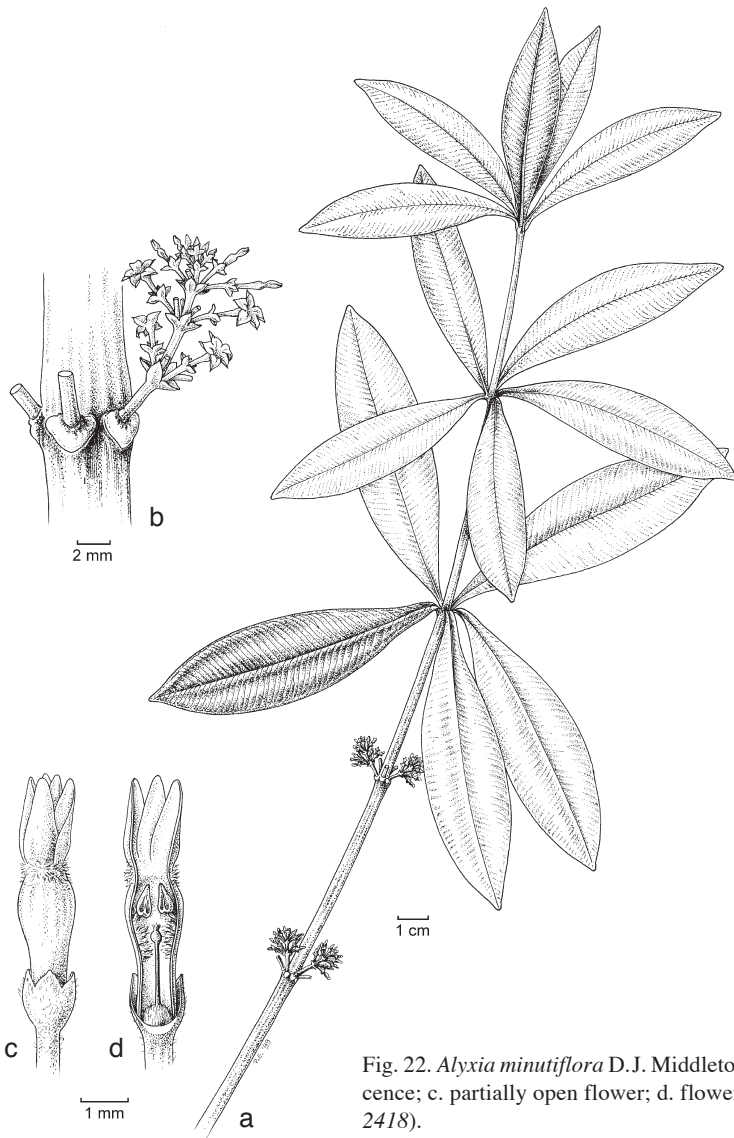


Fig. 22. *Alyxia minutiflora* D.J. Middleton. a. Habit; b. inflorescence; c. partially open flower; d. flower dissection (Kjellberg 2418).

sparsely pubescent around stamens and more densely in a band beneath them inside; lobes elliptic, 1.4–1.5 by 0.5–0.6 mm, 2.3–3 times as long as wide, apex acute, base auriculate, sparsely puberulent outside, sparsely pubescent at the tips and base of lobes inside, ciliate near tips only. *Stamens* inserted at 1.4–1.7 mm from corolla base which is c. 0.6 of tube length; filaments 0.5 mm long; anther apex c. 0.4 mm from corolla mouth, anthers 0.6–0.7 by 0.3 mm. *Ovaries* 0.4–0.5 mm high, densely pubescent all over; style 1–1.1 mm long; style head 0.2 mm long. *Fruit* unknown. — **Fig. 22.**

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — Unknown.

27. *Alyxia muguma* D.J. Middleton

Alyxia muguma D.J. Middleton, *Blumea* 45 (2000) 78. — Type: *Conklin & Del Rosario 72704* (holo L; iso A, K, PNH), Philippines, Luzon, Mountain Province, Sumigar, near Banaue.

Climber. *Branchlets* weakly angled, densely lenticellate, glabrous. *Leaves* in whorls of 3, coriaceous; petiole 1–1.3 cm long, glabrous; blade broadly elliptic, 6–10 by 3.1–5.3 cm, 1.6–2.3 times as long as wide, apex long sharp acuminate, base obtuse to acute, margin weakly undulate, dark green, pale green beneath, glabrous, secondary veins 39–55 pairs, 70° from midrib, weakly prominent above and beneath. *Inflorescence* axillary, once or twice branched and congested at top of peduncle, delicate, densely puberulent; bracts persistent, deltoid; bracteoles multiple, on all flowers. *Sepals* apex acute, ciliate, glabrous. *Corolla* only known from immature flowers, bud head deltoid, apex acute, tube glabrous outside, very sparsely pubescent beneath filaments inside; lobes ovate, base auriculate, apex acute, not ciliate, glabrous outside and inside. *Ovaries* pubescent in tuft between carpels. *Fruit* with 1–3 articles in each string, c. 2.5 mm between articles, stalks 2–2.1 mm long; articles with thin flesh, 6.7–7.6 by 4.6–5.3 mm, ellipsoid or subglobose, apex rounded or obtuse. *Seeds* 6.2–7.5 by 4.6–5 by 3.8–4.3 mm.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Reported from a slope at 1680 m.

28. *Alyxia mujongensis* Markgr.

Alyxia mujongensis Markgr., *Blumea* 23 (1977) 384; D.J. Middleton, *Blumea* 45 (2000) 79. — Type: *A. ak Unyong S.21186* (holo L; iso K, SAR, SING), Borneo, Sarawak, 3rd Division, Ulu Chenaning, Amau, Mujong, Balleh.

Alyxia spec. 1 Coode et al., Checklist Pl. Brunei (1996) 25.

Climber. Bark grey. *Branchlets* terete or weakly angled, sparsely lenticellate or not, densely and minutely puberulent or with longer hairs, sometimes glabrescent. *Leaves* in whorls of 3 or 4; petiole 0.2–0.4 cm long, pubescent; blade coriaceous or thickly coriaceous, elliptic, ovate or oblong, 0.9–4.5 by 0.35–1.6 cm, 1.5–4 times as long as wide, apex rounded to obtuse, rarely to shortly acuminate, acumen obtuse, base rounded to acute, margin weakly undulate or not, glabrous or sparsely puberulent on midrib and major venation to puberulent all over beneath, puberulent only on midrib or all over above, not punctate beneath, secondary veins 8–11 pairs. *Inflorescence* axillary, flowers solitary or in a simple unbranched pleiochasium, delicate, glabrous to densely puberulent, 0.7–1.2 cm long; peduncle 0.1–1.4 cm by 0.7–0.8 mm; bracts persistent, deltoid, 0.9 by 0.6 mm; bracteoles only on pedicel of terminal flower; flowers 1–4; pedicels 1.1–2.3 mm long. *Sepals* free, not fleshy, ovate, 0.9–1 by 0.6 mm, 1.5–1.7 times as long as wide, apex acute, ciliate or not ciliate, glabrous. *Corolla* white with orange tube or with a pale orange tube and cream lobes; bud head c. 1.6 mm long which is 0.36 of bud length, ovate, apex acute; tube cylindrical, c. 5.2 by 1.3 mm, 5.8 times as long as sepals, 3.5 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes orbicular, c. 1.5 by 1.6 mm, 0.9 times as long as wide, apex rounded, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 4.1 mm from corolla base which is 0.72 of tube length; filaments c. 0.5 mm long;

anther apex 0.6 mm from corolla mouth, anthers 0.8–0.9 by 0.4 mm. *Ovaries* c. 0.5 mm high, pubescent in tuft between carpels or very sparsely pubescent around base only; style 2.4–3.6 mm long; style head 0.4–0.5 mm long. *Fruit* with 1 article, articles with thin flesh, 7–8.2 by 5.5–6.5 mm, ellipsoid, subglobose or cylindrical, symmetrical, apex rounded. *Seeds* elliptic, 6.2–7.7 by 4.7–6.2 by 4.1–4.8 mm.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — On open ridges and kerengas with a sandstone or shale substrate at 900–1770 m.

29. *Alyxia multistriata* Markgr.

Alyxia multistriata Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 15 (1940) 131; Blumea 23 (1977) 397, p.p.; D.J. Middleton, Blumea 45 (2000) 81. — Type: *Docters van Leeuwen 11293* (lecto U, designated by Middleton (2000) op. cit.; iso A (scrap), BO, K, L), New Guinea, Papua, Mamberamo, Albatros Bivak.

Climber. *Branchlets* weakly or strongly angled, sparsely lenticellate, glabrous. *Leaves* opposite or in whorls of 3; petiole 0.5–0.8 cm long, glabrous; blade subcoriaceous or papery, elliptic, obovate or oblong, 4.9–20 by 1.6–7.2 cm, 1.7–4 times as long as wide, apex long acuminate to caudate, acumen rounded, not mucronate, base rounded to cuneate, margin mostly strongly undulate, glabrous beneath and above, not punctate beneath, secondary veins 100–120 pairs, 80–85° from midrib, weakly prominent or indistinct above, weakly visible or prominent beneath. *Inflorescence* axillary, a short congested compound pleiochasium or compound pleiochasium with clear internodes, delicate, sparsely puberulent in upper parts or densely puberulent, 1–2.5 cm long (but only known with immature flowers). Calyx of free sepals, sepal apex rounded. *Corolla* tube glabrous outside. *Fruit* orange turning black, stalks 3–3.8 mm long, with 1 article, glabrous, articles with thin flesh, 12.8–17.6 by 10–12.7 mm, ellipsoid, symmetrical, apex rounded. *Seeds* ovoid, 12–14.2 by 8–9.1 by 6.8–8.3 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest on heavy clay loam at 30–450 m.

Note — All the material known only bears very immature flowers so no description of mature flowers is given. It would appear from the buds that the flowers are very small.

30. *Alyxia oblongata* Domin

Alyxia oblongata Domin, Biblioth. Bot. 89 (1928) 523; D.J. Middleton, Blumea 45 (2000) 83; 47 (2002) 38. — Type: *Domin Iter Australiense 7831* (holo PR), Australia, Queensland, Cook District, Waterfall Creek.

Alyxia ruscifolia R.Br. subsp. *major* P.I. Forst., Austral. Syst. Bot. 5 (1992) 557; Fl. Australia 28 (1996) 128. — Type: *P.I. Forster & Tucker 5574* (holo BRI; iso BISH, DNA, LAE, MO), Australia, Queensland, Cook District, Big Tableland road, near First Falls.

Alyxia ruscifolia auct. non R.Br.: Markgr., Blumea 23 (1977) 412.

Erect shrub or treelet to 2 m high. *Branchlets* weakly angled, densely lenticellate to no lenticels, glabrous to densely and minutely puberulent, sometimes glabrescent. *Leaves* in whorls of 3 or 4; petiole 0.1–0.4 cm long, glabrous; blade coriaceous, el-

liptic, ovate or obovate, 0.4–7.8 by 0.15–2.8 cm, 1.5–5.7 times as long as wide, apex long acuminate, sharply mucronate, base acute or cuneate, glabrous beneath and above, secondary veins 9–29 pairs, 35–40° from midrib. *Inflorescence* terminal or, rarely, axillary; flowers solitary, in a simple unbranched or a short congested compound pleiochasium, delicate, glabrous, 1.2–1.4 cm long; peduncle 0.1–0.5 cm by 1.2 mm, more or less terete; bracts caducous or persistent, narrowly ovate, 1–1.8 by 0.6–0.8 mm; bracteoles one on pedicel; flowers 1–5 in an inflorescence; pedicels 0.1–0.5 mm long. *Sepals* not fleshy, ovate or narrowly ovate, 1.8–2.6 by 0.9–1.5 mm, 1.4–2.6 times as long as wide, apex acute or acuminate, not reflexed, glabrous, ciliate. *Corolla* white, not fleshy; bud head 4.7–6.8 mm long which is 0.37–0.44 of bud length, narrowly ovate, apex acuminate; tube cylindrical, 5.8–9.5 by 1–1.5 mm, 3.1–4.8 times as long as sepals, 1.5–2.2 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside or pubescent around and below anthers and in throat with a glabrous gap between; lobes linear, elliptic or oblong, 3.5–5.9 by 1–2 mm, 2.3–4.8 times as long as wide, apex obtuse, acute or acuminate, glabrous outside and inside, not ciliate. *Stamens* inserted at 3.2–5.9 mm from corolla base which is 0.37–0.58 of tube length; filaments 0.3–0.5 mm long; anther apex 2.5–4.2 mm from corolla mouth, anthers 1–1.3 by 0.35–0.4 mm. *Ovaries* 0.5–0.7 mm high, sparsely or densely pubescent all over; style 2–2.7 mm long; style head 0.4–0.6 mm long. *Fruit* red; stalks c. 1.5 mm long, with 1 or 2 articles in each string; articles with thin flesh, 6–9.6 by 4.5–7.5 mm, ellipsoid or subglobose, symmetrical, rounded or obtuse at apex. *Seeds* c. 5.3 by 3.9 by 3 mm.

Distribution — Australia; in *Malesia*: Moluccas, New Guinea.

Habitat & Ecology — In swamp forest or dry forest at 10–1370 m.

31. *Alyxia obovatifolia* Merr.

Alyxia obovatifolia Merr., Philipp. J. Sci. 17 (1921) 306; Enum. Philipp. Fl. Pl. 3 (1923) 328; D.J. Middleton, Blumea 47 (2002) 75. — Type: *Ramos & Pascasio 34492* (lecto K, designated by Middleton (2000) op. cit.), Philippines, Mindanao, Surigao Province.

Branchlets weakly angled, not lenticellate, sparsely and minutely puberulent. *Leaves* in whorls of 4; petiole 0.4–0.7 cm long, pubescent; blade coriaceous, spatulate, 2.3–4.7 by 1.5–2.1 cm, 1.5–2.8 times as long as wide, apex rounded, not mucronate, base cuneate or decurrent onto petiole, margin strongly inrolled, not undulate, dark green, shining above, pale green beneath, puberulent all over above and beneath, secondary veins indistinct above and beneath. *Inflorescence* axillary, flowers solitary or a simple 2-flowered unbranched pleiochasium, densely puberulent, c. 1.5 cm long; when cymose subsessile; bracteoles present; pedicels c. 0.5 mm long. *Sepals* narrowly ovate, c. 2.3 by 1.4 mm, 1.4–1.6 times as long as wide, apex acute, ciliate, densely puberulent. *Corolla* bud head c. 2.6 mm long which is 0.23 of bud length, ovate, apex obtuse; tube columnar, c. 9 by 1.4 mm, 3.9 times as long as sepals, 3.75 times as long as lobes, sparsely puberulent around top of tube outside, sparsely pubescent inside; lobes elliptic, c. 2.4 by 1.5 mm, 1.6 times as long as wide, apex obtuse, sparsely puberulent outside, glabrous inside, ciliate. *Stamens* inserted at c. 7.5 mm from corolla base which is 0.78 of tube length; filament c. 0.8 mm long; anther apex c. 0.5 mm from corolla mouth; anthers

c. 1.1 by 0.4 mm. *Ovaries* c. 1 mm high, densely pubescent all over; style c. 6.9 mm long; style head c. 0.6 mm long. *Fruit* unknown.

Distribution — *Malesia*: Philippines (Mindanao).

Note — This species is known only from the type specimen.

32. *Alyxia oleifolia* King & Gamble

Alyxia oleifolia King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 419; Ridl., Fl. Malay Penins. 2 (1923) 333; Markgr., Blumea 23 (1977) 384; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 123; D.J. Middleton, Blumea 45 (2000) 84. — Type: *Wray 3846* (lecto K, designated by Middleton (2000) op. cit.), Peninsular Malaysia, Perak, Gunong Bubu.

Alyxia kinabaluensis Markgr., Mitt. Bot. Staatssamml. München 1 (1950) 26. — Type: *Clemens & Clemens 33817* (holo M; iso A, B, BM, BO, G, HBG, K, L, NY, UC), Borneo, Sabah, Mt Kinabalu, Colombon.

Alyxia atjehensis Markgr., Blumea 23 (1977) 393, p.p. (not including type).

Alyxia pachyphylla auct. non Merr.: Merr., Bibliogr. Enum. Born. Pl. (1921) 499.

Alyxia angustifolia auct. non Ridl.: Markgr., Blumea 23 (1977) 385, p.p.

Alyxia oleifolia King & Gamble var. *tenuifolia* auct. non Ridl.: Markgr., Blumea 23 (1977) 385, p.p.

Climber. *Branchlets* weakly angled, sparsely lenticellate or not, glabrous, sparsely or densely and minutely puberulent, sometimes glabrescent. *Leaves* in whorls of 3; petiole 0.2–0.7 cm long, glabrous; blade thickly coriaceous, narrowly elliptic to ovate, 1–13.3 by 0.7–4.2 cm, 1.4–10 times as long as wide, apex acute or acuminate, not mucronate, base obtuse to cuneate, margin weakly or strongly inrolled, weakly undulate or not, glabrous beneath, glabrous or puberulent only on midrib above, secondary veins 20–60 pairs, 80° from midrib. *Inflorescence* axillary or terminal, a simple unbranched pleiochasium or with 1 or 2 internodes and unbranched side branches, glabrous, rarely to densely puberulent, 1.6–6 cm long; peduncle 0.2–3 cm by 0.9–1.3 mm; bracts caducous or persistent, deltoid, linear or narrowly ovate, c. 2.5 by 1 mm; bracteoles absent or only on pedicel of terminal flower; flowers 3–7; pedicels 1.3–7 mm long. *Sepals* not fleshy, ovate or narrowly ovate, 1.3–3.4 by 0.7–1.4 mm, 1.2–2.8 times as long as wide, apex acute or acuminate, ciliate or not ciliate, glabrous to densely puberulent or puberulent on tips only. *Corolla* white, cream, yellow or with a purplish brown tube and creamy lobes, somewhat fleshy; bud head 2.9–5 mm long which is 0.27–0.41 of bud length, ellipsoid, narrowly ovate or ovate, apex obtuse, acute or acuminate; tube cylindrical, 6.6–10.5 by 1.6–2.2 mm, 3.1–5 times as long as sepals, 1.4–3.1 times as long as lobes, glabrous outside, pubescent in upper half and around stamens inside or sparsely pubescent around stamens and more densely in a band beneath them; lobes elliptic or ovate, 2.7–5.5 by 2–3 mm, 1.2–2.2 times as long as wide, apex rounded, obtuse or acute, base auriculate, glabrous outside, glabrous, papillate or pubescent at tips of lobes inside, not ciliate or ciliate near tips only. *Stamens* inserted at 4.9–7.1 mm from corolla base which is 0.63–0.78 of tube length; filaments 0.6–1 mm long; anther apex 0.3–1.2 mm from corolla mouth, anthers 1.2–1.4 by 0.5–0.6 mm. *Ovaries* 0.6–1.1 mm high, pubescent all over or pubescent around base only; style 1.5–6 mm long; style head 0.6–1 mm long. *Fruit* black or purple, stalks 3.4–15 mm long, with 1 article, glabrous, articles fleshy or with thin flesh, 13–28.2 by 7.3–15.7 mm, ellipsoid or cylindrical, symmetrical or asymmetrical, apex rounded or obtuse. *Seeds* ovoid or elliptic, 6.6–21 by 5–14 by 4.6–13 mm.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.
 Habitat & Ecology — In forest or scrub at 600–3400 m.

33. *Alyxia palawanensis* Markgr.

Alyxia palawanensis Markgr., *Blumea* 23 (1977) 400; Coode et al., Checklist Pl. Brunei (1996) 25; D.J. Middleton, *Blumea* 45 (2000) 86. — Type: *Sulit 12397* (holo L; iso A, BO, PNH, SING), Philippines, Palawan, Victoria Mts.

Climber. *Branchlets* terete or weakly angled, sparsely lenticellate or not, sparsely and minutely puberulent. *Leaves* in whorls of 3–5; petiole 0.2–0.4 cm long, pubescent; blade coriaceous or papery, narrowly elliptic or narrowly ovate, 0.6–5.1 by 0.3–1 cm, 2.9–6 times as long as wide, apex acute or acuminate, acumen obtuse, base cuneate, margin weakly undulate, glabrous, sparsely puberulent only on midrib to puberulent all over beneath, sparsely puberulent, glabrous or puberulent only on midrib above, secondary veins 17–31 pairs, 70° from midrib. *Inflorescence* axillary or terminal, a simple unbranched pleiochasium, delicate, sparsely to densely puberulent, 1.2–1.7 cm long; peduncle 0.55–1 cm by 0.5–0.8 mm; bracts caducous or persistent, deltoid, c. 1.4 by 0.8 mm; bracteoles one on pedicel or absent; flowers 3–5; pedicels 1.2–3.4 mm long. *Sepals* ovate, 0.7–1.4 by 0.5 mm, 1.4–2.8 times as long as wide, apex acute, ciliate, sparsely puberulent all over or only on centre line. *Corolla* white; bud head 1.2–1.3 mm long which is 0.35–0.49 of bud length, ellipsoid or ovate, apex acute; tube slightly inflated, 1.8–3.8 by 0.8–1.1 mm, 2.7–4.3 times as long as sepals, 1.6–2.5 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes orbicular, 1.1–1.2 by 0.9 mm, 1.2–1.3 times as long as wide, apex obtuse, base auriculate, sparsely puberulent outside, sparsely pubescent at the tips and base of lobes inside, not ciliate or ciliate at tips only. *Stamens* inserted at c. 2.2 mm from corolla base which is 0.63 of tube length; filaments c. 0.5 mm long; anther apex c. 0.2 mm from corolla mouth, anthers c. 0.8 by 0.4 mm. *Ovaries* c. 0.6 mm high, densely pubescent all over; style c. 1.5 mm long; style head c. 0.5 mm long. *Fruit* stalks c. 2.8 mm long, with 1 article, sparsely puberulent all over, articles with thin flesh, 9–11.5 by 5.1–7.8 mm, ellipsoid, symmetrical, apex rounded, obtuse or apiculate. *Seeds* elliptic, c. 7.6 by 5 by 4.4 mm.

Distribution — *Malesia*: Borneo, Philippines (Palawan), Sulawesi.

Habitat & Ecology — In primary or mossy forest, on sandstone or schist at 900–1950 m.

34. *Alyxia papuana* D.J. Middleton

Alyxia papuana D.J. Middleton, *Blumea* 45 (2000) 87. — Type: *Craven & Schodde 1166* (holo L; iso A, BRI, CANB, G, K, LAE), Papua New Guinea, Morobe Province, near Haumga.

Alyxia defoliata Markgr. subsp. *orientalis* Markgr., *Blumea* 23 (1977) 399, p.p. (not including type).
Alyxia purpureoclada auct. non Kaneh. & Hatus.: Markgr., *Blumea* 23 (1977) 400, p.p.

Climber. *Branchlets* terete or weakly angled, sparsely lenticellate or not, glabrous. *Leaves* in whorls of 3; petiole 0.2–0.8 cm long, glabrous; blade coriaceous or subcoriaceous, elliptic, 1.3–6.6 by 0.4–2.6 cm, 2.2–5 times as long as wide, apex acuminate,

acumen obtuse, base cuneate, margin weakly undulate, glabrous beneath and above, secondary veins 23–42 pairs, $65\text{--}70^\circ$ from midrib. *Inflorescence* axillary, a simple unbranched pleiochasium, or a compound pleiochasium with clear internodes, or with 1 or 2 internodes and unbranched side branches, delicate, glabrous or sparsely puberulent all over, 1.1–3 cm long; peduncle 0.3–1.3 cm by 1–1.1 mm; bracts caducous or persistent, deltoid, 0.9–1.3 by 0.7–1.3 mm; bracteoles present, one immediately beneath calyx; flowers 4–12; pedicels 1.7–5 mm long. *Sepals* ovate, 1–1.2 by 0.8–1.4 mm, 0.9–1.3 times as long as wide, apex rounded or obtuse, ciliate, glabrous. *Corolla* cream or tube yellowish and lobes white; bud head ovate, apex obtuse or acute; tube cylindrical or slightly inflated, 2.7–3 by 0.9–1 mm, 2.2–3 times as long as sepals, 2.5–3.3 times as long as lobes, glabrous outside, pubescent in a band below the stamens inside or sparsely pubescent around stamens and more densely in a band beneath them; lobes ovate or orbicular, 0.9–1.1 by 0.7–1 mm, 1.1–1.3 times as long as wide, apex obtuse, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at 1.5–1.6 mm from corolla base which is 0.53–0.56 of tube length; filaments 0.8–1 mm long;

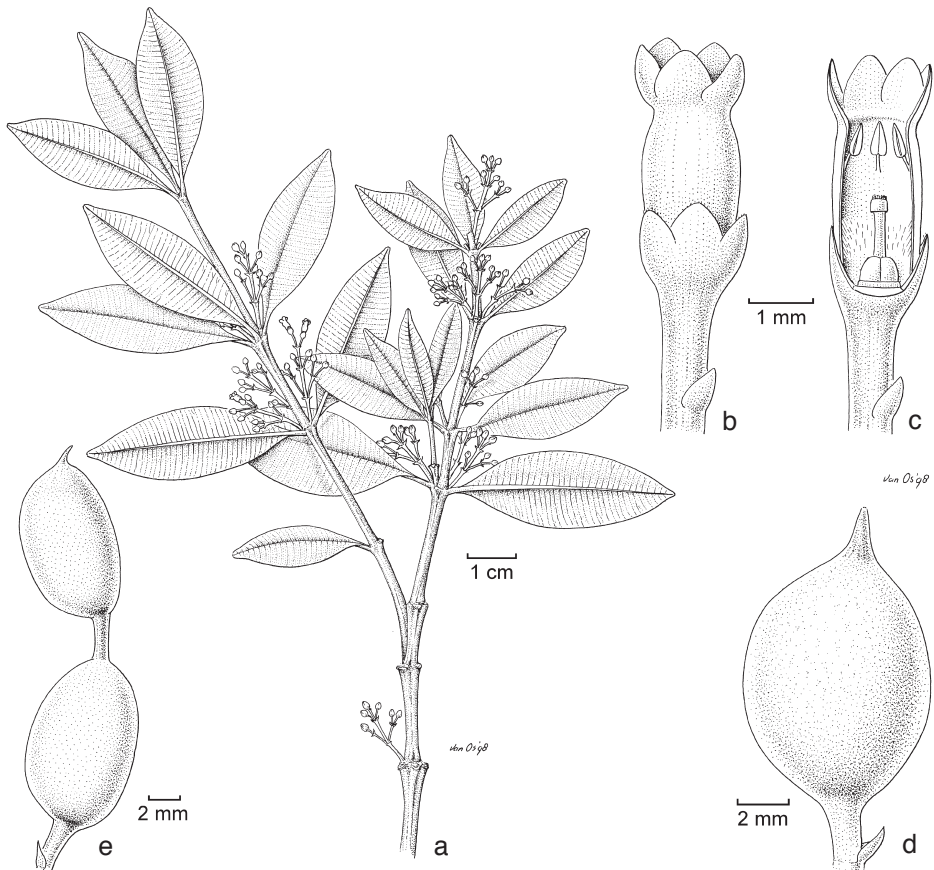


Fig. 23. *Alyxia papuana* D.J. Middleton. a. Habit; b. flower; c. flower dissection; d, e. fruits (a–c: Craven & Schodde 1166; d, e: Woods 2719).

anther apex 0.2–0.3 mm from corolla mouth, anthers c. 0.8 by 0.3 mm. *Ovaries* 0.5–1 mm high, pubescent around base only or in a tuft between the carpels; style 0.8–1.1 mm long; style head 0.5 mm long. *Fruit* black or yellowish green, stalks 2.3–3.2 mm long, with 1 or 2 articles in each string, 2.5 mm between articles, glabrous, dry smooth, 10.7–12.6 by 6.6–7.5 mm, ellipsoid or subglobose, symmetrical, apex acuminate or apiculate. *Seeds* not seen. — **Fig. 23.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In open or dense forest, mossy forest, at the forest edge, lower montane forest, *Araucaria* forest or *Nothofagus* forest at 1220–2300 m.

35. *Alyxia parvifolia* (Merr.) Merr.

Alyxia parvifolia (Merr.) Merr., Philipp. J. Sci., Bot. 4 (1909) 313; Enum. Philipp. Fl. Pl. 3 (1923) 328; Markgr., Blumea 23 (1977) 392; D.J. Middleton, Blumea 45 (2000) 89. — *Gynopogon parvifolius* Merr., Publ. Bur. Sci. Gov. Lab. 29 (1905) 46. — Type: *Elmer 5800* (lecto US, designated by Middleton (2000) op. cit.; iso BO, G, K, NY, P, PNH, PR), Philippines, Luzon, Benguet Province, Mt Santo Tomas.

Climber. *Branchlets* weakly or strongly angled, densely lenticellate or not, sparsely or densely and minutely puberulent. *Leaves* in whorls of 4 or 5; petiole 0.1–0.3 cm long, pubescent; blade coriaceous, elliptic, 0.7–4.7 by 0.3–1.3 cm, 1.8–6.8 times as long as wide, apex rounded to shortly acuminate, acumen obtuse, not mucronate, folded back or flat, base cuneate, margin weakly or strongly inrolled, weakly undulate, glabrous or sparsely puberulent all over beneath, puberulent only on midrib above, not punctate beneath, secondary veins 8–22 pairs, 45–55° from midrib. *Inflorescence* of solitary axillary flowers, sparsely to densely pubescent, 1.3–1.5 cm long; bracteoles caducous or persistent, deltoid, 1.3–1.8 by 1.2–1.8 mm, several along pedicel; pedicels 1–3 mm long. *Sepals* not fleshy, ovate, 2.3–2.8 by 1–1.7 mm, 1.5–2.3 times as long as wide, apex obtuse, ciliate, sparsely or densely puberulent. *Corolla* white with orange tube; bud head c. 2.3 mm long which is 0.23 of bud length, narrowly ovate, apex acute; tube cylindrical, 6–8 by 1.9–2.2 mm, 2.1–3.7 times as long as sepals, 2.2–3.3 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes ovate, 2.4–3.4 by 1.6–2.4 mm, 1–1.7 times as long as wide, apex acuminate, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 7.1 mm from corolla base which is 0.78 of tube length; filaments 0.6–0.7 mm long; anther apex 0.6–0.9 mm from corolla mouth, anthers 1.2–1.3 by 0.5–0.6 mm. *Ovaries* 0.7–1 mm high, densely pubescent all over; style 5.5–5.6 mm long; style head 0.6–0.7 mm long. *Fruit* yellow or purple, stalks 1–3.7 mm long, with 1–3 articles in each string, glabrous, articles with thin flesh, 5.2–8.4 by 4.8–7.7 mm, globose or cylindrical, symmetrical, apex rounded or apiculate. *Seeds* 4.7–5.3 by 3.9–4.1 by 3.7–4.1 mm.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Primary forest at 1700–2500 m on rotting tree stumps or sandy-loamy soil.

Note — The flowers are solitary but often in all the leaf axils of a node so they appear as several clumped together.

36. *Alyxia pilosa* Miq.

Alyxia pilosa Miq., Fl. Ned. Ind. 2 (1857) 408; Fl. Ned. Ind., Eerste Bijv. (1861) 228; Ridl., Fl. Malay Penins. 2 (1923), p.p.; Markgr., Blumea 23 (1977) 382, p.p.; D.J. Middleton, Blumea 45 (2000) 90. — *Pulassarium pilosum* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — Type: *Teijsmann HB983* (lecto U, designated by Middleton (2000) op. cit.; iso BO, K (but without the number), L), W Sumatra, Alahan Panjang.

Alyxia scortechinii King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 421; Ridl., Fl. Malay Penins. 2 (1923) 334; Markgr., Blumea 23 (1977) 394; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 124. — Type: *Scortechini s.n.* (lecto K, designated by Middleton (2000) op. cit.), Peninsular Malaysia, Perak.

Alyxia selangorica King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 422; Ridl., Fl. Malay Penins. 2 (1923) 334. — Type: *Ridley 8558* (lecto K, designated by Middleton (2000) op. cit.; iso SING), Peninsular Malaysia, Selangor, Gua Batu.

Alyxia triptera Merr., Pap. Michigan Acad. Sci. 24 (1939) 88. — Type: *Rahmat si Boeea 8619* (holo A; iso L, MICH, NY, UC, US), N Sumatra, Dolok, Adian Rindang.

Alyxia atjehensis Markgr., Blumea 23 (1977) 393 (but not all paratypes). — Type: *Yates 2005* (holo B; iso B, BM, BO, K, NY, UC), N Sumatra, Aceh, Berastagi.

Climber. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, glabrous, sparsely puberulent or hispid. *Leaves* opposite or in whorls of 3–6; petiole 0.3–1.3 cm long, glabrous or pubescent; blade coriaceous or subcoriaceous, narrowly to broadly elliptic, ovate, obovate or oblong, 2.5–17 by 1–6.8 cm, 1.4–7.9 times as long as wide, apex rounded to caudate, base obtuse to cuneate, margin weakly to strongly inrolled or flat, weakly undulate, glabrous, sparsely puberulent only on midrib or puberulent all over beneath, glabrous, puberulent only on midrib or all over above, not punctate beneath, secondary veins 42–53 pairs, 70–80° from midrib. *Inflorescence* axillary or terminal, a compound pleiochasium with clear internodes, sometimes congregated together forming lax panicles, or with several clear internodes and unbranched side branches, glabrous or sparsely to densely puberulent all over, 2.5–9 cm long; peduncle 0.6–6.3 cm by 1.1–2.3 mm; bracts caducous or persistent, ovate, deltoid, linear or narrowly ovate, 1.5–14 by 0.8–1.1 mm; bracteoles one on pedicel or absent; flowers 6–15; pedicels 0–8.5 mm long. *Sepals* not fleshy, linear, ovate or narrowly ovate, 1.8–3.2 by 0.8–1.3 mm, 2–3.2 times as long as wide, apex acute or acuminate, ciliate, sparsely to densely long pubescent or puberulent on tips only. *Corolla* white or cream; bud head 2.8–3.2 mm long which is 0.26–0.27 of bud length, ovate, apex obtuse or acuminate; tube cylindrical, 8.5–9.1 by 1.7–2.2 mm, 3.4–4.9 times as long as sepals, 2.8–3.4 times as long as lobes, glabrous or very sparsely puberulent around top of tube outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes elliptic or orbicular, 2.5–3.4 by 1.7–2.8 mm, 1.2–1.6 times as long as wide, apex rounded or obtuse, base auriculate, glabrous outside and inside, not ciliate or ciliate near tips only. *Stamens* inserted at 7.5–7.9 mm from corolla base which is 0.77–0.81 of tube length; filaments 0.6–0.8 mm long; anther apex 0.4–0.6 mm from corolla mouth, anthers 1.2–1.4 by 0.5–0.6 mm. *Ovaries* c. 0.8 mm high, densely pubescent all over; style 6–7 mm long; style head 0.6–0.7 mm long. *Fruit* black or purple, stalks 6.3–12 mm long, with 1 article, glabrous, articles fleshy, 17–37 by 9–14 mm, ellipsoid, symmetrical, apex rounded to acuminate, often hooked at the top. *Seeds* 15–22.5 by 10–11.1 by 8–10.2 mm. — **Fig. 24.**

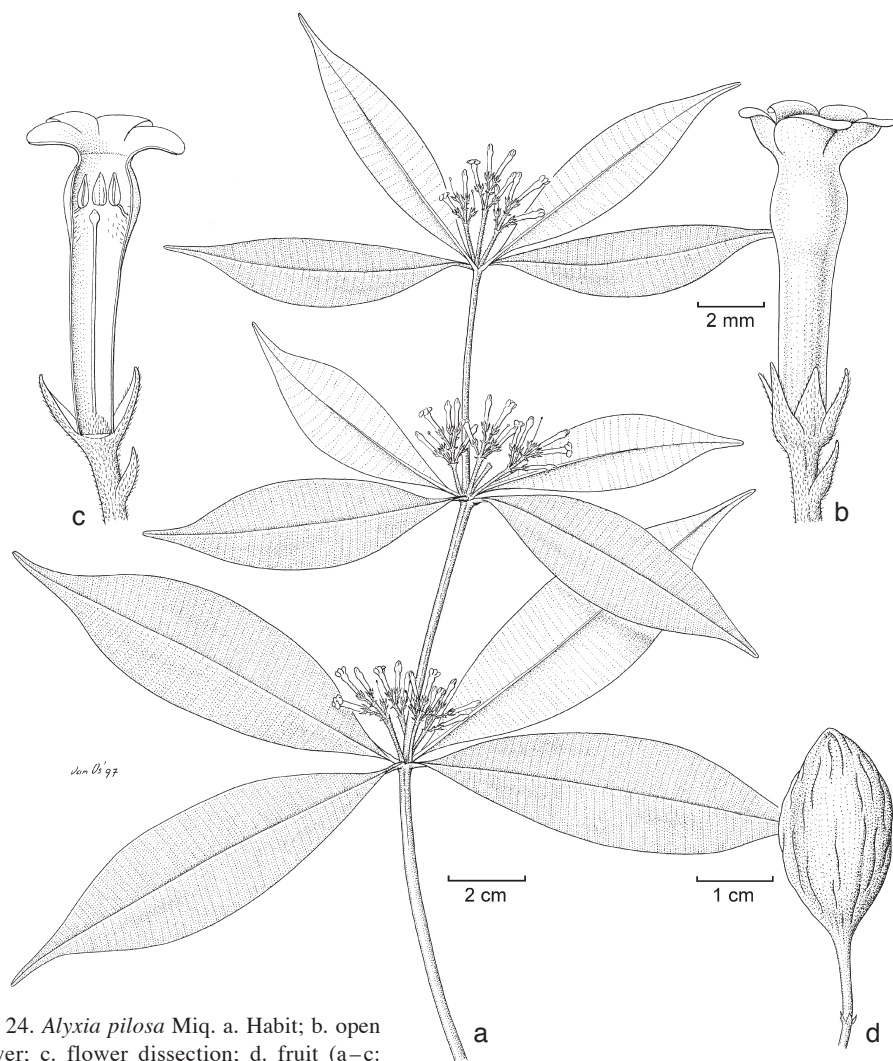


Fig. 24. *Alyxia pilosa* Miq. a. Habit; b. open flower; c. flower dissection; d. fruit (a–c: Lörzing 6125; d: Laumonier TFB 3638).

Distribution — *Malesia*: Sumatra, Peninsular Malaysia.

Habitat & Ecology — In primary, mossy, ridge or open forest at 100–2700 m.

Note — This species has often been used in either too wide a sense or in sense that did not include its type in much of the previous literature.

37. *Alyxia pugio* Markgr.

Alyxia pugio Markgr., Bot. Jahrb. Syst. 61 (1927) 182; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 491; Markgr., Blumea 23 (1977) 406; D.J. Middleton, Blumea 45 (2000) 94. — Type: *Ledermann 9941* (holo B⁺; lecto L, designated by Middleton (2000) op. cit.; iso WRS�), Papua New Guinea, East Sepik Province, Lordberg.

Climber. *Branchlets* weakly angled, sparsely lenticellate, glabrous. *Leaves* in whorls of 3; petiole 0.2–0.3 cm long, glabrous; blade coriaceous or subcoriaceous, narrowly elliptic or elliptic, 2.7–7.7 by 0.3–1.8 cm, 3.7–7.8 times as long as wide, apex long acuminate to caudate, acumen obtuse, base cuneate, glabrous beneath and above, not punctate beneath, secondary veins indistinct above, obscure or weakly visible beneath. *Inflorescence* axillary, a compound pleiochasium with clear internodes, delicate, sparsely puberulent, 2–2.5 cm long; peduncle 1.1–1.4 cm by 0.6–0.7 mm; bracts caducous; bracteoles absent; flowers 7–10; pedicels 1.6–2.2 mm long. *Sepals* ovate, c. 0.9 by 0.5 mm, 1.8 times as long as wide, apex obtuse, ciliate, glabrous or sparsely puberulent on centre line. *Corolla* bud head c. 1 mm long which is 0.32 of bud length, ellipsoid, apex obtuse; tube slightly inflated, c. 2.2 by 1 mm, 2.4 times as long as sepals, 2.4 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes ovate, c. 0.9 by 0.7 mm, 1.3 times as long as wide, apex rounded, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 1.2 mm from corolla base which is 0.55 of tube length; filaments c. 0.4 mm long; anther apex c. 0.2 mm from corolla mouth, anthers c. 0.6 by 0.3 mm. *Ovaries* c. 0.8 mm high, pubescent in tuft between carpels; style c. 0.8 mm long; style head c. 0.3 mm long. *Fruit* black, stalks 1.2–1.6 mm long, with 1 or 2 articles in each string, c. 1 mm between articles, glabrous, articles 8–10 by 7–7.9 mm, globose, symmetrical, apex rounded. *Seeds* 6.7 mm long.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Reported in forest on well-drained soil at 1000–1350 m.

38. *Alyxia pullei* Markgr.

Alyxia pullei Markgr., Nova Guinea 14, 2 (1926) 281; Bot. Jahrb. Syst. 61 (1927) 186; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 492; Markgr., Blumea 23 (1977) 384; P. Royen, Alpine Fl. New Guinea 4 (1983) 2849; D.J. Middleton, Blumea 45 (2000) 94; PROSEA 12, 2 (2001) 71; Utteridge in R.J. Johns et al., Alp. Subalp. Fl. Mount Jaya (2006) 189. — Type: *Pulle* 952 (lecto L, designated by Middleton (2000) op. cit.; iso A, BO, K, U), New Guinea, Papua, Mt Hellwig.

Climber. *Branchlets* strongly angled, sparsely lenticellate or not, glabrous. *Leaves* in whorls of 4–6; petiole 0–0.9 cm long, glabrous; blade coriaceous or subcoriaceous, obovate or spatulate, 4.3–11.7 by 1.5–4.1 cm, 2.1–3.3 times as long as wide, apex emarginate and not folded back, rounded, obtuse or cuspidate, base decurrent onto petiole, margin weakly undulate or not, glabrous beneath and above, not punctate beneath, secondary veins 19–43 pairs, 55–70° from midrib. *Inflorescence* axillary, a simple unbranched pleiochasium or with 1 or 2 internodes and unbranched side branches, delicate to robust, glabrous or sparsely puberulent in upper parts, 1.8–3.6 cm long; peduncle 0.6–2 cm by 1–2.1 mm; bracts caducous or persistent, deltoid or narrowly ovate, 1.6–2.4 by 1–1.6 mm; bracteoles absent; flowers 4–10; pedicels 0.5–6.5 mm long. *Sepals* ovate, 1.5–2 by 1.1–1.8 mm, 0.9–1.7 times as long as wide, apex rounded to acute, ciliate, glabrous outside. *Corolla* with pink tube and white lobes; bud head 3.1–3.2 mm long which is 0.34–0.39 of bud length, ellipsoid or ovate, apex acute to acuminate; tube cylindrical or slightly inflated, 6.3–6.9 by 1.4–2.2 mm, 3.4–4.4 times as long as sepals, 2–3.3 times as long as lobes, glabrous outside, sparsely pubescent

around stamens and more densely in a band beneath them inside; lobes elliptic, ovate or orbicular, 2–3.5 by 1.7–2.6 mm, 1–1.7 times as long as wide, apex rounded to acute, base auriculate, glabrous outside, glabrous or pubescent at tips of lobes inside, not ciliate or ciliate near tips only. *Stamens* inserted at 4.1–5.1 mm from corolla base which is 0.59–0.69 of tube length; filaments 0.6–1.2 mm long; anther apex 0.6–1.2 mm from corolla mouth, anthers 1.4–1.9 by 0.5 mm. *Ovaries* 0.8–1.1 mm high, pubescent in tuft between carpels; style 2.6–3.4 mm long; style head 0.6–1 mm long. *Fruit* yellow turning black, stalks 1.7–3.5 mm long, with 1–3 articles in each string, 0–1.3 mm between articles, glabrous, articles with thin flesh, 8–13 by 6.2–8 mm, ellipsoid or globose, symmetrical, apex rounded. *Seeds* c. 8.6 by 4.4 by 4.3 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Reported from forest on clay at 1760–2600 m.

39. *Alyxia punctata* Kaneh. & Hatus.

Alyxia punctata Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 491; Markgr., Blumea 23 (1977) 404, p.p.; P. Royen, Alpine Fl. New Guinea 4 (1983) 2853, p.p.; D.J. Middleton, Blumea 45 (2000) 96.

— Type: *Kanehira & Hatusima 13717a* (holo FU n.v.; photo of holotype in L), New Guinea, Papua, Arfak Mts, Mt Koebre.

Alyxia sleumeri Markgr., Blumea 23 (1977) 409, p.p. (not including type).

Alyxia purpureoclada auct. non Kaneh. & Hatus.: Markgr., Blumea 23 (1977) 400, p.p.

Erect shrub or climber. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, glabrous to densely and minutely puberulent, sometimes glabrescent. *Leaves* in whorls of 3 or 4; petiole 0.1–0.6 cm long, glabrous or pubescent; blade coriaceous or subcoriaceous, elliptic or obovate, 1–7.3 by 0.4–2.1 cm, 1.8–4 times as long as wide, apex rounded to acuminate and not folded back, not mucronate, base cuneate, margin weakly undulate or not, glabrous and punctate beneath, glabrous or puberulent only on midrib above, secondary veins 14–23 pairs, 70° from midrib. *Inflorescence* axillary, flowers solitary or a simple unbranched pleiochasium, sparsely to densely puberulent, 1–2 cm long; peduncle 0.7–0.8 cm by 1.1–1.2 mm; bracts persistent, ovate, deltoid or narrowly ovate, 1.6–2.9 by 0.8–1.8 mm; bracteoles present, two on pedicel; flowers 1–3; pedicels 1.7–4 mm long. *Sepals* free, not fleshy, ovate, 1.2–1.3 by 1–1.4 mm, 0.9–1.2 times as long as wide, apex rounded or obtuse, ciliate, glabrous or sparsely puberulent. *Corolla* yellow or with pale brown tube and white lobes; bud head 1.8–2.5 mm long which is 0.26–0.37 of bud length, ellipsoid or ovate, apex obtuse or acute; tube cylindrical, 4.2–5.2 by 1.4–1.7 mm, 3.5–4 times as long as sepals, 1.9–2.9 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes ovate or orbicular, 1.8–2.2 by 1.4–1.8 mm, 1–1.6 times as long as wide, apex obtuse, base auriculate, glabrous outside, glabrous or pubescent at base of lobes inside, not ciliate. *Stamens* inserted at 3.1–3.7 mm from corolla base which is 0.6–0.66 of tube length; filaments 0.9–1 mm long; anther apex 0.3–0.5 mm from corolla mouth, anthers 1.2–1.3 by 0.4 mm. *Ovaries* 0.8–1.1 mm high, densely pubescent all over; style 0.6–1.9 mm long; style head 0.4–0.6 mm long. *Fruit* green or yellowish green (probably immature), stalks 2.4–3.6 mm long, with 1 or 2 articles in each string, 0.5–1 mm between articles, glabrous or sparsely puberulent at ends, with

thin flesh, 9.6–16.2 by 8–11.2 mm, ellipsoid or cylindrical, symmetrical, apex rounded or apiculate. *Seeds* elliptic, 8.2–13.4 by 7.5–8.7 by 6.6–8 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest or scrub at 1650–2400 m.

40. *Alyxia purpureoclada* Kaneh. & Hatus.

Alyxia purpureoclada Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 491; Markgr., Blumea 23 (1977) 400, p.p.; D.J. Middleton, Blumea 45 (2000) 97. — Type: *Kanehira & Hatusima 13466* (holo FU n.v., photo of holotype in L; iso A, BO), New Guinea, Papua, Manokwari District, Arfak Mts, Anggi Lakes.

Alyxia clemensiae Markgr., Blumea 23 (1977) 396, p.p. (not including type).

Alyxia floribunda auct. non Markgr.: Markgr., Blumea 23 (1977) 397, p.p.

Alyxia ridleyana auct. non Wernham: Markgr., Blumea 23 (1977) 411, p.p.

Climber. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, glabrous. *Leaves* in whorls of 3–6; petiole 0–1 cm long, glabrous or pubescent; blade coriaceous or subcoriaceous, elliptic, obovate or oblong, 2.1–16 by 0.6–8 cm, 2–3.8 times as long as wide, apex emarginate to shortly acuminate or cuspidate, base acute to decurrent onto petiole, margin weakly undulate, glabrous beneath, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins 42–92 pairs, 65–75° from midrib. *Inflorescence* axillary, a compound pleiochasium with clear internodes, with several clear internodes and unbranched side branches, or large lax panicles frequently branched, glabrous or sparsely to densely puberulent, 2–7.5 cm long; peduncle 0.8–2.8 cm by 1.2–1.6 mm; bracts persistent, ovate or deltoid, 1.2–1.5 by 1–1.2 mm; bracteoles present, one immediately beneath calyx; flowers 12–80; pedicels 0.6–1.5 mm long. *Sepals* often fused around the base, ovate, 1–1.2 by 0.7–1 mm, 1.2–1.4 times as long as wide, apex rounded to acute, ciliate or not ciliate, glabrous or sparsely puberulent outside. *Corolla* yellow or tube dark yellow and lobes white; bud head c. 1 mm long which is 0.33 of bud length, ovate, apex obtuse or acute; tube slightly inflated, c. 2.1 by 0.9 mm, 1.75 times as long as sepals, 1.6 times as long as lobes, glabrous outside, pubescent in a band below the stamens inside or sparsely pubescent around stamens and more densely in a band beneath them inside; lobes elliptic, c. 1.3 by 0.9 mm, 1.4 times as long as wide, apex rounded or obtuse, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 1.2 mm from corolla base which is 0.52 of tube length; filaments c. 0.3 mm long; anther apex 0–0.3 mm from corolla mouth, anthers 0.8 by 0.3–0.4 mm. *Ovaries* 0.5–0.8 mm high, glabrous, pubescent only on top or in a tuft between the carpels; style 0.6 mm long; style head 0.5 mm long. *Fruit* black, yellow-orange or orange, stalks 1.4–5 mm long, with 1–4 articles in a string, 1.5–4.6 mm between articles, glabrous, sparsely puberulent at ends or all over, articles dry smooth or with thin flesh, 5.5–20 by 4.9–11.5 mm, ellipsoid or subglobose, symmetrical, apex rounded, obtuse or apiculate. *Seeds* 4.8–20.5 by 4.1–18.4 by 3.4–4.3 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Reported from forest on clay, stony soil and limestone at 35–2430 m.

41. *Alyxia reinwardtii* Blume

- Alyxia reinwardtii* Blume, Catalogus (1823) 43; Hochr., Candollea 5 (1931) 179; Merr., Contr. Arnold Arbor. 8 (1934) 144; Kerr in Craib, Fl. Siam. 2 (1939) 432; Backer & Bakh.f., Fl. Java 2 (1965) 230; Markgr., Blumea 23 (1977) 386; P.T. Li, J. S. China Agric. Coll. 11 (1990) 27; Widjaya, Floribunda. Sisipan 2 (1992) 6; P.T. Li et al., Fl. China 16 (1995) 160; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 124; D.J. Middleton, Fl. Thailand 7 (1999) 55; Blumea 45 (2000) 100; PROSEA 12, 2 (2001) 72; Kress et al., Checklist Pl. Myanmar (2003) 147. — *Gynopogon reinwardtii* (Blume) Koord., Exkurs.-Fl. Java 3 (1912) 74; Fl. Tjibodas 3, 3 (1918) 55; Hochr., Candollea 5 (1934) 179. — Type: *Blume s.n.* (lecto L [898.129-217], designated by Middleton (2000) op. cit.; iso GH, NY), Java.
- Alyxia lucida* Wall. in Roxb., Fl. Ind. 2 (1824) 540; Hook.f., Fl. Brit. India 3 (1882) 635; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 417; Merr. & Rolfe, Philipp. J. Sci., Bot. 3 (1908) 121; Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 129; Merr., Bibliogr. Enum. Born. Pl. (1921) 499; Enum. Philipp. Fl. Pl. 3 (1923) 328; Ridl., Fl. Malay Penins. 2 (1923) 332; Masam., Enum. Phan. Born. (1942) 618; M.R. Hend., Malay. Wild Fls., Monocots. (1959) 279; Backer & Bakh.f., Fl. Java 2 (1965) 230. — *Alyxia reinwardtii* Blume var. *lucida* (Wall.) Markgr., Blumea 23 (1977) 389; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 32; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; Coode et al., Checklist Pl. Brunei (1996) 25; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 123. — Type: *Wallich 1605.1* (lecto K-W, designated by Middleton (2000) op. cit.; iso A (scrap), BM, K, K-W), Singapore.
- Alyxia stellata* Roem. & Schult. var. *latifolia* Blume, Bijdr. (1826) 1031. — *Alyxia reinwardtii* Blume var. *latifolia* (Blume) Bakh.f., Blumea 6 (1950) 390; Backer & Bakh.f., Fl. Java 2 (1965) 230. — Type: *Blume s.n.* (holo L [898.129-237]), C Java, Nusa Kambangan.
- Alyxia gynopogon* sensu Wall., Numer. List 1605 (1829), nom. nud.
- Alyxia odorata* Wall. ex G. Don, Gen. Hist. 4 (1837) 97; A.DC., Prodr. 8 (1844) 347; Miq., Fl. Ned. Ind. 2 (1857) 408; Hook.f., Fl. Brit. India 3 (1882) 636; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 418; Merr., Bibliogr. Enum. Born. Pl. (1921) 499; Masam., Enum. Phan. Born. (1942) 618. — *Pulassarium odoratum* (Wall. ex G. Don) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — Type: *Wallich 1606* (holo K-W; iso G-DC), Burma, Tenasserim, between Chappedong and Amherst.
- Alyxia aromatica* Reinw. ex A.DC., Prodr. 8 (1844) 346, nom. illeg. (in synonymy). — Based on: *Blume 511a* (L), Java.
- Alyxia quinata* Miq., Fl. Ned. Ind. 2 (1857) 407; Fl. Ned. Ind., Eerste Bijv. (1861) 228. — *Pulassarium quinatum* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — Type: *Teijsmann HB1000* (lecto U, designated by Middleton (2000) op. cit.; iso BO, K (but without a number), L), Sumatra, Siboga.
- Alyxia pumila* Hook.f., Fl. Brit. India 3 (1882) 635; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 420; Ridl., Fl. Malay Penins. 2 (1923) 333; Kerr in Craib, Fl. Siam. 2 (1939) 432. — *Pulassarium pumilum* (Hook.f.) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — *Gynopogon pumilus* (Hook.f.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 151. — *Alyxia reinwardtii* Blume var. *pumila* (Hook.f.) Markgr., Blumea 23 (1977) 388; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 124. — Type: *Lobb s.n.* (lecto K, designated by Middleton (2000) op. cit.), Peninsular Malaysia, Johor, Mt Ophir.
- Alyxia lucida* Wall. var. *meiantha* Stapf, Trans. Linn. Soc. London, Bot. 4 (1894) 207; Merr., Bibliogr. Enum. Born. Pl. (1921) 499; Masam., Enum. Phan. Born. (1942) 618. — *Alyxia reinwardtii* Blume var. *meiantha* (Stapf) Markgr., Blumea 23 (1977) 389; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; 47 (1997 [‘1995’]) 124. — Type: *Haviland 1185* (holo K; iso SAR), Borneo, Sarawak, Kira Batu.
- Alyxia pisiformis* [Pierre in L. Planch., Prod. Apocyn. (1894) 261, nom. nud.]; Pierre ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1126; Kerr in Craib, Fl. Siam. 2 (1939) 432; Lý, Feddes Repert. 97 (1986) 435. — [*Gynopogon pisiformis* Pierre in L. Planch., Prod. Apocyn. (1894) 261, nom. nud.]. — [*Pulassarium pisiforme* Pierre in L. Planch., Prod. Apocyn. (1894) 261, nom. nud.]. — Type: *Pierre 96* (lecto HM, designated by Lý (1986) op. cit., 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 293, 2nd step), Vietnam, Dong Nai Province, Mt Dinh.

- Alyxia flavescens* [Pierre in L. Planch., Prod. Apocyn. (1894) 261, nom. nud.]; Pierre ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1127; Lý, Feddes Repert. 97 (1986) 435. — [*Gynopogon flavescens* Pierre in L. Planch., Prod. Apocyn. (1894) 261, nom. nud.]. — [*Pulassarium flavescens* Pierre in L. Planch., Prod. Apocyn. (1894) 261, nom. nud.]. — Type: *Pierre 4421* (lecto HM, designated by Lý (1986) op. cit.; iso A, K, NY, P), Vietnam, Bien-hoa, Bao-chiang.
- Alyxia forbesii* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 420; Ridl., Fl. Malay Penins. 2 (1923) 334; Burkill & M.R. Hend., Gard. Bull. Straits Settlements 3 (1925) 396; Merr., Contr. Arnold Arbor. 8 (1934) 144; Tsiang, Sunyatsenia 3 (1936) 136; Kerr in Craib, Fl. Siam. 2 (1939) 431; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 69. — Type: *Wallich 1604.1* (lecto K-W, designated by Middleton (2000) op. cit.), Peninsular Malaysia, Penang.
- Gynopogon spec. A* Koord.-Schum., Syst. Verz. 1 (1913) 173 from E Java.
- Gynopogon spec. C* Koord.-Schum., Syst. Verz. 1 (1913) 173 from C Java.
- Gynopogon spec. B* Koord.-Schum., Syst. Verz. 1 (1913) 174 from W Java.
- Alyxia oleifolia* King & Gamble var. *tenuifolia* Ridl., Fl. Malay Penins. 2 (1923) 333; Markgr., Blumea 23 (1977) 385, p.p.; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 123. — Type: *Robinson s.n.* (lecto K, designated by Middleton (2000) op. cit.; iso BM, SING), Peninsular Malaysia, Selangor, Gunung Mengkuang.
- Alyxia nitens* Kerr, Bull. Misc. Inform. Kew 1937 (1937) 41; Kerr in Craib, Fl. Siam. 2 (1939) 432. — Type: *Kerr 19005* (lecto K, designated by Middleton (2000) op. cit.; iso ABD, BM, E, K, L, P, TCD), Thailand, Trang Province, Sikao.
- Alyxia spec.* Kerr in Craib, Fl. Siam. 2 (1939) 434. — Based on: *C. Curtis 2547* (SING), Peninsular Malaysia, Kedah, Langkawi Island, Gunung Raya.
- Alyxia cinerea* Bakh.f., Blumea 6 (1950) 390; Backer & Bakh.f., Fl. Java 2 (1965) 230. — *Alyxia reinwardtii* Blume var. *cinerea* (Bakh.f.) Markgr., Blumea 23 (1977) 387. — Type: *Blume s.n.* (holo L [898.129-235]), Java.
- Alyxia winckelii* Bakh.f., Blumea 6 (1950) 390; Backer & Bakh.f., Fl. Java 2 (1965) 230; Markgr., Blumea 23 (1977) 383. — Type: *Winckel 685* (holo L; iso A, L), W Java, Gunung Limus.
- Alyxia jasminea* Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 362; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 72; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 521. — Type: *Feng 4911* (holo KUN; iso IBSC, PE), China, Yunnan, Ping-Pien.
- Alyxia reinwardtii* Blume var. *insularis* Markgr., Blumea 23 (1977) 387; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 123. — Type: *Seimund s.n.* (holo SING; iso BO, UC), Peninsular Malaysia, Perak, Pulau Lalang.
- Alyxia reinwardtii* Blume var. *obovata* Markgr., Blumea 23 (1977) 388. — Type: *P.S. Ashton BRUN 71* (holo SING; iso A, AAU, BO, BRI, BRUN, K, L, SING), Brunei, Berakas.
- Alyxia calcicola* Markgr., Blumea 23 (1977) 405. — Type: *T. Smitinand & H. Sleumer 1275* (holo L; iso BKF, BO, C, K, SING), Thailand, Surat Thani, Khao Pak Chong.
- Alyxia kerrii* D.J. Middleton, Blumea 40 (1995) 111. — Type: *Floto 7402* (holo BKF; iso C, Z), Thailand, Loei, Phu Kradung.
- Alyxia spp. indet.* Coode et al., Checklist Pl. Brunei (1996) 25.
- Alyxia stellata* auct. non (J.R. Forst. & G. Forst.) Roem. & Schult.: Blume, Bijdr. (1826) 1031; A.DC., Prodr. 8 (1844) 346; Miq., Fl. Ned. Ind. 2 (1857) 407; Fl. Ned. Ind., Eerste Bijv. (1861) 228; Hook.f., Fl. Brit. India 3 (1882) 636; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 393.
- Gynopogon stellatus* auct. non J.R. Forst. & G. Forst.: Kurz, J. Asiat. Soc. Bengal 46, 2 (1877) 251; Forest Fl. Burma 2 (1877) 176.
- Alyxia selangorica* auct. non King & Gamble: Kerr in Craib, Fl. Siam. 2 (1939) 433.
- Alyxia angustifolia* auct. non Ridl.: Markgr., Blumea 23 (1977) 385, p.p.
- Alyxia schlechteri* auct. non H. Léév.: I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 124.

Ground creepers or climbers. *Branchlets* terete, weakly or strongly angled, densely lenticellate or not, glabrous to sparsely or densely puberulent. *Leaves* opposite or in whorls of 3–5; petiole 0.1–1.8 cm long, glabrous or pubescent; blade coriaceous to

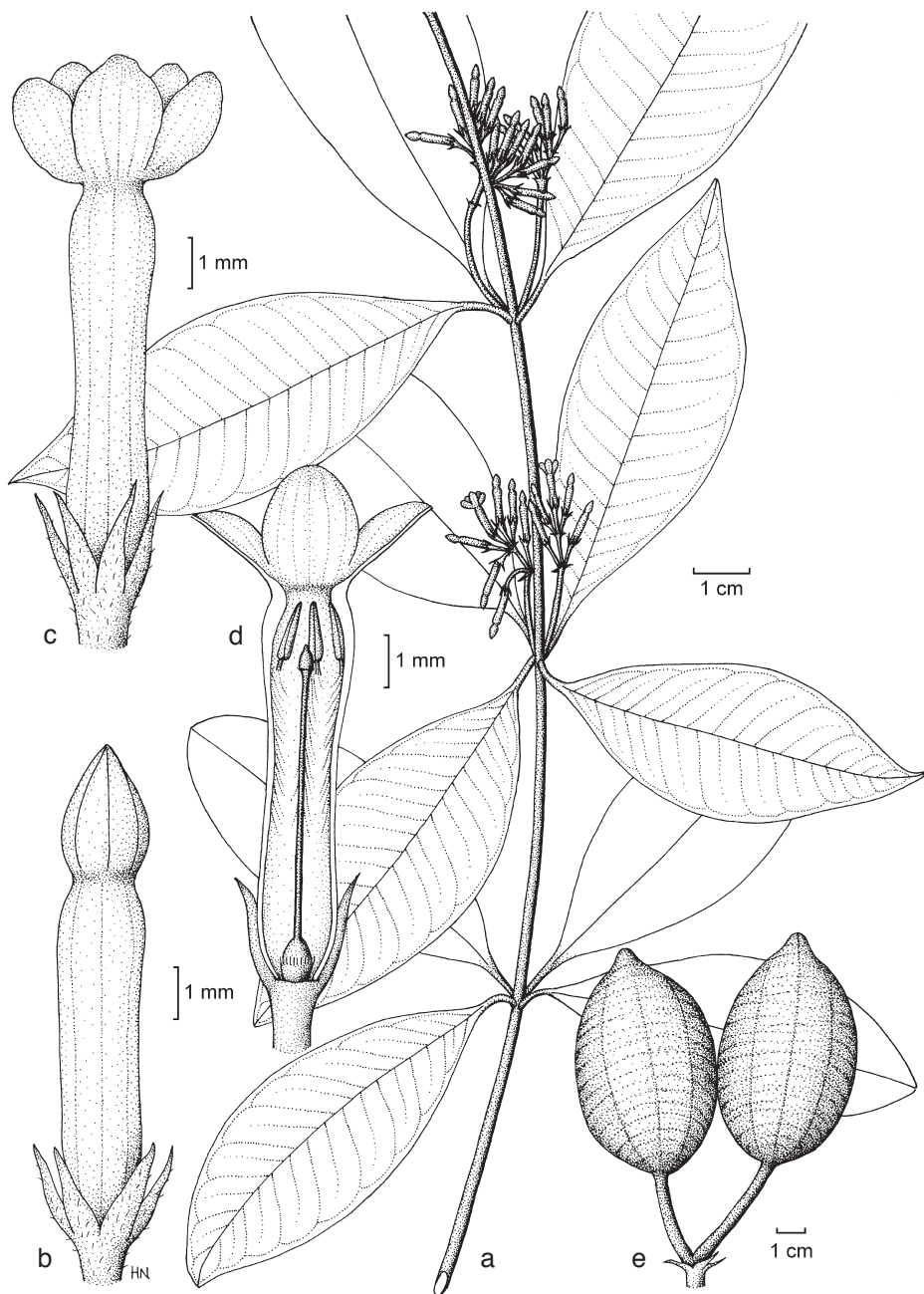


Fig. 25. *Alyxia reinwardti* Blume. a. Habit; b. flower bud; c. flower; d. dissected flower; e. fruit (a–d: Kerr 15048; e: Clemens 30530).

papery, elliptic, obovate or oblong, 1.1–17 by 0.3–6.1 cm, 1.5–5.1 times as long as wide, apex obtuse to acuminate, rarely caudate, not mucronate, base obtuse to decurrent onto petiole, margin weakly undulate or not, glabrous, sparsely puberulent only on midrib or puberulent all over beneath, glabrous, puberulent only on midrib or all over above, not punctate beneath, secondary veins 12–57 pairs, 60–90° from midrib. *Inflorescence* axillary or terminal, most frequently a simple unbranched pleiochasium, occasionally with a terminal compound pleiochasium with 1 or 2 nodes, much more rarely more complex with 1 or 2 internodes and branched or unbranched side branches, glabrous to puberulent in upper parts or all over, 1–3.5 cm long; peduncle 0.2–1.9 cm by 0.5–1.4 mm; bracts caducous or persistent, ovate, deltoid, linear, leafy or narrowly ovate, 1.1–4.5 by 0.5–1.2 mm; bracteoles one on pedicel or two immediately beneath calyx or on pedicel, absent or only on pedicel of terminal flower; flowers 3–12; pedicels 0.5–4.4 mm long. *Sepals* free, not fleshy, linear, ovate or narrowly ovate, 1–3.5 by 0.4–1.8 mm, 1.2–3.8 times as long as wide, apex obtuse to acuminate, ciliate, glabrous or sparsely to densely puberulent all over or puberulent on tips only. *Corolla* white, cream, yellow, pink, or with an orange or pale brown tube and white lobes; bud head 1.2–3.7 mm long which is 0.18–0.32(–0.42) of bud length, globular, ellipsoid, narrowly ovate, ovate or deltoid, apex rounded, obtuse, acute or acuminate; tube cylindrical, 3–14 by 1.1–2 mm, 1.6–10 times as long as sepals, 1.2–5.3 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, glabrous or pubescent in upper half and around stamens inside; lobes elliptic, oblong, ovate or orbicular, 1.2–3.8 by 1–3.1 mm, 0.7–3.1 times as long as wide, apex rounded to acute, base auriculate, glabrous or sparsely puberulent outside, glabrous or pubescent at tips of lobes inside, ciliate, not ciliate or ciliate near tips only. *Stamens* inserted at 2.7–9.4 mm from corolla base which is 0.67–0.87 of tube length; filaments 0.2–0.8 mm long; anther apex 0–1 mm from corolla mouth, anthers 0.6–1.5 by 0.3–0.6 mm. *Ovaries* 0.4–1.2 mm high, glabrous, pubescent all over or pubescent around base only; style 0.9–8.5 mm long; style head 0.4–0.7 mm long. *Fruit* maturing black; stalks 1–14 mm long; with 1 or 2 articles in each string, 1 mm between articles, glabrous or sparsely puberulent at ends, articles with thin flesh, 6–20(–25.3) by 4.8–11.4 mm, ellipsoid or globose, symmetrical, apex rounded, acuminate or apiculate. *Seeds* 4.6–11 by 3.9–6.7 by 3–6.2 mm. — **Fig. 25.**

Distribution — Southern China, Burma, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Philippines (Palawan), Java, Bali.

Habitat & Ecology — In a wide range of habitats from primary or secondary lowland to montane or peat swamp forest or in scrub or open ridges. On granitic, sandy, clay or ultrabasic soils. Altitude to 3050 m.

Note — A discussion of the typification of this widespread species can be found in Middleton (2000). As this species is so variable it is not easily delimited from its nearest relatives *A. angustifolia*, *A. ganophylla* and *A. pilosa*, all of which can also be quite variable. Specimens with the smallest flowers are found in northern Peninsular Malaysia and southern Thailand. Even greater variability in *A. reinwardtii* is found in continental Southeast Asia.

42. *Alyxia ridleyana* Wernham

Alyxia ridleyana Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 108; Markgr., Blumea 23 (1977) 411, p.p.; D.J. Middleton, Blumea 45 (2000) 106. — *Discalyxia ridleyana* (Wernham) Markgr., Nova Guinea 14, 2 (1926) 283; Bot. Jahrb. Syst. 61 (1927) 188. — Type: *Kloss s.n.* (holo BM; iso BM), New Guinea, Papua, Utkwa River to Mt Carstensz.

Alyxia fragrans Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 212; Markgr., Blumea 23 (1977) 398, p.p. — Type: *Brass 11577* (holo A), New Guinea, Papua, Bele River, 18 km NE of Lake Habbema.

Climber. *Branchlets* terete to strongly angled, sparsely lenticellate or not, glabrous to densely and minutely puberulent, sometimes glabrescent. *Leaves* in whorls of 3 or 4; petiole 0.2–1 cm long, glabrous or pubescent; blade subcoriaceous to thickly coriaceous, elliptic, ovate or obovate, 2.2–10 by 1.1–5.9 cm, 1.4–4.2 times as long as wide, apex rounded to shortly acuminate, base rounded to cuneate, margin weakly undulate or not, glabrous, sparsely puberulent only on midrib or puberulent all over beneath, glabrous or puberulent all over above, not punctate beneath, secondary veins 17–38 pairs, 70–80° from midrib. *Inflorescence* axillary or terminal, large lax panicles frequently branched, robust, sparsely to densely puberulent, pale-coloured, 9.5–16 cm long; peduncle 5–7.7 cm by 1.5–2.5 mm; bracts caducous or persistent, deltoid, 2.5–3.7 by 2–3.1 mm; bracteoles present, two on pedicel; flowers 80 to more than 100 in an inflorescence; pedicels 1.1–3 mm long. *Sepals* fleshy or not, ovate, 2.1–2.9 by 1.2–2.4 mm, 1–1.8 times as long as wide, apex obtuse or acute, ciliate, sparsely or densely puberulent. *Corolla* white; bud head 2–2.4 mm long which is 0.4–0.43 of bud length, ellipsoid, narrowly ovate or ovate, apex obtuse or acute; tube cylindrical or slightly inflated, 3.6–4.3 by 1.1–1.5 mm, 1.4–1.7 times as long as sepals, 1.7–3.2 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, inside sparsely pubescent around stamens and more densely in a band beneath them or pubescent around and below anthers and in throat with a glabrous gap between; lobes elliptic or ovate, 1.2–2.1 by 0.9–1.4 mm, 1.3–1.6 times as long as wide, apex rounded, obtuse or acute, base auriculate, glabrous or sparsely puberulent outside, glabrous or pubescent at base of lobes inside, not ciliate. *Stamens* inserted at 1.3–2.2 mm from corolla base which is 0.39–0.47 of tube length; filaments 0.5–0.7 mm long; anther apex 0.9–1.3 mm from corolla mouth, anthers 0.9–1.4 by 0.3–0.4 mm. *Ovaries* 0.7–1 mm high, densely pubescent all over; style 0.1–0.4 mm long; style head 0.6–1 mm long. *Fruit* ochraceous ripening purplish brown, stalks 1.5–6.2 mm long, with 1 or 2 articles in each string, 0–5 mm between articles, sparsely puberulent all over, articles dry smooth or with thin flesh, 11.5–19 by 8.7–13 mm, ellipsoid, subglobose or cylindrical, symmetrical, apex rounded, obtuse or apiculate. *Seeds* 9.4–11.9 by 6.6–8.7 by 5.4–7.8 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In lowland to mossy forest or on heath at 150–2350 m. Reported from clay and limestone soils.

Note — Markgraf (1977) interpreted this species in rather a different way to its treatment here. Further discussion can be seen in Middleton (2000).

43. *Alyxia rostrata* (Markgr.) Markgr.

Alyxia rostrata (Markgr.) Markgr., Blumea 23 (1977) 411, p.p.; D.J. Middleton, Blumea 45 (2000) 108. — *Discalyxia rostrata* Markgr., Nova Guinea 14, 2 (1926) 282; Bot. Jahrb. Syst. 61 (1927) 187; PROSEA 12, 2 (2001) 72. — Type: *Ledermann 12466* (holo B \dagger ; lecto L, designated by Middleton (2000) op. cit.), Papua New Guinea, East Sepik Province.

Discalyxia pullei Markgr., Nova Guinea 14, 2 (1926) 282; Bot. Jahrb. Syst. 61 (1927) 188. — Type: *Pulle 682* (holo L; iso BO), New Guinea, Papua, Mt Hellwig, Bijenkorf-Bivak.

Alyxia ridleyana auct. non Wernham: Markgr., Blumea 23 (1977) 411, p.p.

Climber. *Branchlets* weakly angled, sparsely lenticellate, glabrous or sparsely and minutely puberulent, sometimes glabrescent. *Leaves* in whorls of 4 or 5; petiole 0.2–0.9 cm long, glabrous; blade coriaceous, narrowly to broadly elliptic, obovate or oblong, 2–16 by 1.5–4.5 cm, 1.3–4 times as long as wide, apex long acuminate or caudate, not mucronate, base rounded to cuneate, margin flat to strongly undulate, glabrous beneath and above, not punctate beneath, secondary veins 48–70 pairs, 75–85° from midrib. *Inflorescence* axillary or terminal, large lax panicles frequently branched, glabrous to puberulent, 4.3–16.5 cm long; peduncle 2.2–6.5 cm by 1–2 mm; bracts caducous or persistent, deltoid; bracteoles two on pedicel or absent; flowers > 100 in whole panicle; pedicels 1–6 mm long. *Sepals* ovate, 1.2–1.7 by 0.7–1.1 mm, 1.5–2 times as long as wide, apex rounded to acute, ciliate or not ciliate, glabrous or sparsely puberulent. *Corolla* white or with pink tube and white lobes; bud head 1.2–1.8 mm long which is 0.32–0.4 of bud length, ellipsoid or narrowly ovate, apex acute; tube cylindrical or slightly inflated, 2.7–4 by 0.8–1.1 mm, 1.6–2.5 times as long as sepals, 1.9–3.6 times as long as lobes, glabrous outside, pubescent around and below anthers and in throat with a glabrous gap between inside; lobes oblong or ovate, 1–1.4 by 0.8 mm, 1.25–1.75 times as long as wide, apex rounded or obtuse, base auriculate, glabrous outside, pubescent at base of lobes inside, not ciliate. *Stamens* inserted at 1.3–1.4 mm from corolla base which is 0.32–0.38 of tube length; filaments 0.3–0.5 mm long; anther apex 1.3–1.9 mm from corolla mouth, anthers 0.8–1 by 0.2–0.35 mm. *Ovaries* 0.6–0.7 mm high, pubescent around base only or in tufts between the carpels; style 0.1 mm long; style head 0.4–0.6 mm long. *Fruit* orange, maturing black, stalks 1.6–3.7 mm long, with 1–7 articles in a string, 1.5–3.6 mm between articles, glabrous, articles dry smooth or with thin flesh, 5.5–9.9 by 4.3–6.5 mm, ellipsoid or cylindrical, symmetrical, apex rounded or obtuse. *Seeds* 5.4–8.2 by 3.9–4.8 by 3.4–4.6 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In closed or open primary or secondary forest or scrub at 1220–2100 m.

Note — The inflorescence of this species is a large terminal panicle. It is composed of a terminal cyme with axillary cymes in the axils of normal to extremely reduced leaves. These leaves are often deciduous resulting in the appearance of a robust ‘peduncle’ with a whorl of cymes at the top. In the description the inflorescence length is taken from where these cymes radiate and the peduncle length is the length from here to the first branching in the inflorescence and does not include the length of this false peduncle. There is often a pair of opposite bracteoles in some specimens but not in others. These bracteoles may be interpreted as bracts with the flowers missing in some specimens.

44. *Alyxia royeniana* Markgr.

Alyxia royeniana Markgr., Blumea 23 (1977) 404; P. Royen, Alpine Fl. New Guinea 4 (1983) 2854; D.J. Middleton, Blumea 45 (2000) 109. — Type: *Van Royen NGF 20398* (holo L; iso A, BRI, CANB, K, LAE), Papua New Guinea, Central Province, Mt Awormange, East of Waitape.

Erect shrub, ground creeper or climber. *Branchlets* weakly angled, sparsely lenticellate, densely and minutely puberulent. *Leaves* in whorls of 3 or 4; petiole 0.1–0.3 cm long, pubescent; blade coriaceous or thickly coriaceous, elliptic or broadly elliptic, 0.4–2 by 0.3–1 cm, 1.1–2.3 times as long as wide, apex rounded, obtuse or apiculate, not mucronate, slightly reflexed at apex or flat, base obtuse or acute, margin not undulate, glabrous beneath, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins weakly distinguishable or indistinct above, obscure beneath. *Inflorescence* axillary, flowers in a simple unbranched pleiochasium (possibly only one remaining in fruit), sparsely puberulent all over or densely puberulent, c. 1 cm long; peduncle c. 0.2 cm by 1 mm; bracts persistent, linear, c. 2.3 by 1 mm; bracteoles present, immediately beneath calyx or on pedicel; flowers c. 4; pedicels 2.1–3 mm long. *Sepals* narrowly ovate, 2.5–2.6 by 1.5 mm, c. 1.7 times as long as wide, apex acute, ciliate, glabrous or sparsely puberulent outside. *Corolla* tube cylindrical, c. 8 mm long, 3.2 times as long as sepals, 3.2 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes ovate, c. 2.5 by 2.1 mm, 1.2 times as long as wide, apex acute, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 5.5 mm from corolla base which is 0.69 of tube length; filaments 0.6 mm long; anther apex 0.7 mm from corolla mouth, anthers 1.5 by 0.5 mm. *Ovaries* 1 mm high, pubescent around base only; style 3.1 mm long; style head 0.8 mm long. *Fruit* black or yellow turning black, stalks 1.7–3 mm long, with 1 or 2 articles in each string, 0.2 mm between articles, glabrous or sparsely puberulent at ends; articles with thin flesh, 7.8–12.5 by 5.6–9.5 mm, ellipsoid or subglobose, symmetrical, apex rounded or acuminate. *Seeds* elliptic, c. 5 by 3.6 by 2.8 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In upper montane forest or subalpine scrub at 2130–3230 m.

45. *Alyxia scabrida* Markgr.

Alyxia scabrida Markgr., Bot. Jahrb. Syst. 61 (1927) 184; Blumea 23 (1977) 397, p.p.; D.J. Middleton, Blumea 45 (2000) 110. — Type: *Schlechter 16841* (holo B†; lecto L, designated by Middleton (2000) op. cit.; iso A, BM, BRI, C, G, K, MO, S, UC), Papua New Guinea, Madang Province, Kaulo River.

Alyxia clemensiae Markgr., Blumea 23 (1977) 396, p.p. (not including type).

Climber. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, sparsely or densely puberulent. *Leaves* in whorls of 4; petiole 0.2–0.5 cm long, glabrous or pubescent; blade subcoriaceous or papery, narrowly elliptic or elliptic, 3.8–14 by 1–5.1 cm, 2.1–3.9 times as long as wide, apex obtuse or acuminate, base cuneate or decurrent onto petiole, margin flat or weakly to strongly undulate, glabrous or sparsely puberulent only on midrib beneath, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins 42–55 pairs, 65–80° from midrib. *Inflorescence* axillary, a compound pleiochasium with clear internodes, sometimes congregated and forming lax panicles, or once or twice branched and congested at top of peduncle, delicate, densely

puberulent, 1.7–9.5 cm long; peduncle 0.8–2.3 cm by 1.1–1.8 mm; bracts caducous or persistent, ovate or deltoid, 1.8–2.5 by 1.4–2 mm; flowers 25–27; pedicels 0–1 mm long. *Sepals* not fleshy, very slightly fused around the base and slightly reflexed, ovate, 1.5–1.9 by 1–1.6 mm, 1.2–1.5 times as long as wide, apex obtuse or acute, ciliate, sparsely or densely puberulent. *Corolla* white or yellow; bud head c. 1 mm long which is 0.38 of bud length, ovate, apex rounded or obtuse; tube cylindrical or slightly inflated, 1.4–2.1 by 0.9–1 mm, 0.7–1.2 times as long as sepals, 1.4–1.9 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, glabrous inside; lobes ovate or orbicular, 1–1.2 by 0.9–1.2 mm, 0.9–1.3 times as long as wide, apex rounded or obtuse, base auriculate, glabrous or sparsely puberulent outside, glabrous inside, not ciliate. *Stamens* inserted at 1.1–1.3 mm from corolla base which is 0.5–0.59 of tube length; filaments 0.3 mm long; anther apex 0.2–0.5 mm from corolla mouth, anthers 0.7 by 0.35–0.4 mm. *Ovaries* 0.5–0.8 mm high, densely pubescent all over; style 0.4–0.7 mm long; style head 0.3 mm long. *Fruit* orange (maturing black?), stalks 8–18 mm long, with 1 article, glabrous, articles with thin flesh, 26–60 by 15–29.5 mm, ellipsoid, symmetrical or asymmetrical, apex rounded to acuminate, often hooked. *Seeds* c. 31 by 19.2 by 17.1 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest at 30–900 m.

46. *Alyxia semipallescens* F. Muell.

Alyxia semipallescens F. Muell., Trans. Roy. Soc. Victoria 1 (1889) 28; Markgr., Bot. Jahrb. Syst. 61 (1927) 183; Blumea 23 (1977) 403, p.p.; P. Royen, Alpine Fl. New Guinea 4 (1983) 2852, p.p.; D.J. Middleton, Blumea 45 (2000) 112. — Type: *McGregor s.n.* (holo MEL), Papua New Guinea, Central Province, Mt Musgrave.

Habit unknown (probably low scrambler or climber). *Branchlets* weakly angled, densely puberulent. *Leaves* in whorls of 4; petiole 0.2 cm long; blade elliptic, 1.6–2.4 by 0.8–1.1 cm, 1.2–2.5 times as long as wide, apex obtuse or acute, not mucronate, base acute. *Sepals* ovate, c. 1.2 by 0.8 mm, 1.5 times as long as wide, apex acute, ciliate, sparsely puberulent on central line. *Corolla* tube cylindrical, c. 4.7 mm long, 3.9 times as long as sepals, 2.5 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; corolla lobes elliptic, c. 1.9 by 1 mm, 1.9 times as long as wide, apex obtuse, base auriculate, glabrous outside, pubescent at base of lobes inside, not ciliate. *Stamens* inserted at c. 2.7 mm from corolla base which is 0.57 of tube length; filaments c. 0.5 mm long; anther apex c. 0.6 mm from corolla mouth, anthers c. 1.2 by 0.5 mm. *Ovaries* c. 0.5 mm high, pubescent around base only. *Fruit* unknown.

Distribution — *Malesia*: New Guinea.

Note — This is a very poorly known species (see Middleton 2000).

47. *Alyxia sibuyanensis* Elmer

Alyxia sibuyanensis Elmer, Leafl. Philipp. Bot. 4 (1912) 1448; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 328; Markgr., Blumea 23 (1977) 381, p.p.; D.J. Middleton, Blumea 45 (2000) 115. — Type: *Elmer 12137a* (lecto L, designated by Middleton (2000) op. cit.; iso A, BISH, BM, BO, E, G, GH, HBG,

- K, NSW, NY, US, W, WRSL, Z), Philippines, Romblon Province, Sibuyan Island, Magallanes, Mt Guitinguitin.
- Alyxia monticola* C.B. Rob., Philipp. J. Sci., Bot. 6 (1911) 356; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 328. — Type: *Robinson 9359* (untraced, probably destroyed in PNH during WW II), Philippines, Luzon, Tayabas, Mt Binuang.
- Alyxia revoluta* Merr., Philipp. J. Sci., Bot. 13 (1918) 52; Enum. Philipp. Fl. Pl. 3 (1923) 328. — Type: *Yates 25515* (lecto US, designated by Middleton (2000) op. cit.; iso K, P), Philippines, Luzon, Tayabas, Mt Cadig.
- Alyxia glabra* Merr., Philipp. J. Sci., Bot. 13 (1918) 53; Enum. Philipp. Fl. Pl. 3 (1923) 327. — Type: *Ramos & Edaño 29207* (lecto K, designated by Middleton (2000) op. cit.; iso P, US), Philippines, Luzon, Tayabas, Infanta-Sinaloan trail.
- Alyxia retusa* Merr., Philipp. J. Sci. 14 (1919) 448; Enum. Philipp. Fl. Pl. 3 (1923) 328; Markgr., Blumea 23 (1977) 381. — Type: *Ramos 33330* (lecto K, designated by Middleton (2000) op. cit.; iso A, P, US), Philippines, Luzon, Ilocos Norte Province, Mt Palimlim.
- Alyxia insularis* Kaneh. & Sasaki, Trans. Nat. Hist. Soc. Formosa 24 (1934) 402; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 64; H.-L. Li, Fl. Taiwan 4 (1978) 203; T.C. Huang, Taiwania 31 (1986) 91; P.T. Li et al., Fl. China 16 (1995) 161. — Type: *Kawakami & Sasaki* in *Kanehira 3496* (holo TI), Taiwan, Kwasyoto (= Lanyu) Island.
- Alyxia clusiacea* auct. non (Baill.) Pichon: Markgr., Blumea 23 (1977) 380, p.p.

Ground creepers or climbers; bark brown. *Branchlets* terete, square in cross section, weakly or strongly angled, sparsely lenticellate or not, glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 3–5; petiole 0.4–4.5 cm long, glabrous; blade coriaceous, elliptic, obovate, spatulate or oblong, 2.9–20 by 1.1–8.5 cm, 1.7–7.5 times as long as wide, apex emarginate to acuminate, often rounded and apiculate, base cuneate or decurrent onto petiole, margin weakly undulate or not, glabrous beneath and above, not punctate beneath, often glaucous beneath, secondary veins 21–90 pairs, 60–80° from midrib. *Inflorescence* axillary or terminal, a simple unbranched pleiochasium or with 1 or 2 internodes and unbranched side branches, glabrous or sparsely to densely puberulent, 1.7–3.3 cm long; peduncle 0.4–1.7 cm by 0.6–2.2 mm; bracts caducous or persistent, deltoid, 1.2–2.5 by 1.2–1.5 mm; bracteoles present, two immediately beneath calyx or on pedicel; flowers 2–9; pedicels 0–5 mm long. *Sepals* ovate, 1.3–3.1 by 1.2–2 mm, 0.9–1.8 times as long as wide, apex rounded to acuminate, ciliate or not, glabrous, sparsely to densely puberulent, sometimes only on centre line, or puberulent on tips only. *Corolla* white, white and orange or with a pale brown tube and white lobes; bud head 2.2–3.5 mm long which is 0.21–0.3 of bud length, globular, ellipsoid or ovate, apex rounded to acuminate; tube cylindrical, 7.9–12 by 1.5–2.9 mm, 3.6–6.7 times as long as sepals, 2–4.1 times as long as lobes, glabrous outside, continuously pubescent except for base inside, sometimes sparsely so; lobes ovate, obovate or orbicular, 2.5–4.2 by 1.5–3.2 mm, 1–1.7 times as long as wide, apex rounded to acuminate, base auriculate, glabrous outside and inside, sometimes ciliate near tips only. *Stamens* inserted at 6.6–9.8 mm from corolla base which is 0.75–0.83 of tube length; filaments 0.4–1.2 mm long; anther apex 0–1.1 mm from corolla mouth, anthers 1.1–1.7 by 0.5–0.8 mm. *Ovaries* 0.9–1.3 mm high, glabrous, only pubescent around base or densely pubescent all over; style 6–8.7 mm long; style head 0.3–1 mm long, glabrous. *Fruit* yellow or greenish orange, stalks 2–16 mm long, with 1 or 2 articles in each string, 0–4.1 mm between articles, glabrous or sparsely puberulent at ends, articles fleshy or with thin flesh, 8.6–24.4 by 6.5–16 mm, ellipsoid, symmetrical, apex rounded or apiculate. *Seeds* 8–17 by 4.8–7.8 by 5–7.4 mm.

Distribution — Taiwan (Lanyu Island); in *Malesia*: Philippines.

Habitat & Ecology — In primary or secondary lowland to montane or gallery forest, or in thickets or mangroves at 0–1735 m. On clay, rocky, volcanic or ultrabasic soils.

48. *Alyxia sleumeri* Markgr.

Alyxia sleumeri Markgr., Blumea 23 (1977) 409 (but not including all paratypes); D.J. Middleton, Blumea 45 (2000) 120. — Type: *Van Royen & Sleumer 7904* (holo L; iso A, BO, BRI, CANB, K, LAE, MICH, PNH, SING), New Guinea, Papua, Nettoti Range, Mt Nettoti, southern slope.

Alyxia pugio auct. non Markgr.: Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 491.

Alyxia sogerensis auct. non Wernham ex S. Moore: Markgr., Blumea 23 (1977) 407, p.p.

Erect shrub or climber. *Branchlets* weakly or strongly angled, sparsely lenticellate, glabrous. *Leaves* in whorls of 3; petiole 0.2–0.6 cm long, glabrous; blade coriaceous or subcoriaceous, elliptic, often very narrowly so, 3.7–10 by 0.5–2.9 cm, 2.1–10.2 times as long as wide, apex long acuminate or caudate, base obtuse to decurrent onto petiole, margin strongly undulate, glabrous beneath and above, often punctate beneath, secondary veins 33–79 pairs, 70° from midrib. *Inflorescence* axillary, with several clear internodes and unbranched side branches, delicate, glabrous or sparsely puberulent all over, 1.7–3 cm long; peduncle 0.3–1.6 cm by 0.5–0.7 mm; bracts caducous or persistent, deltoid, linear or narrowly ovate, 1–4 by 0.4–0.7 mm; bracteoles absent or one on pedicel; flowers 4–7; pedicels 2.8–4 mm long. *Sepals* ovate, 0.8–1 by 0.5 mm, 1.6–2 times as long as wide, apex acute or acuminate, ciliate, glabrous or sparsely puberulent. *Corolla* yellow or white with orange tube; bud head 2–2.1 mm long which is c. 0.43 of bud length, narrowly ovate, apex acuminate; tube slightly inflated, 2.7–3 by 1.1–1.2 mm, 3–3.4 times as long as sepals, 1.3–1.8 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes elliptic, 1.5–2.3 by 0.7–0.8 mm, 1.9–2.8 times as long as wide, apex acuminate, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 1.9 mm from corolla base which is 0.54 of tube length; filaments c. 0.6 mm long; anther apex c. 0.5 mm from corolla mouth, anthers c. 1 by 0.3 mm. *Ovaries* c. 0.7 mm high, pubescent in tuft between carpels; style c. 0.9 mm long; style head c. 0.4 mm long. *Fruit* stalks c. 2.5 mm long, with 1 article, glabrous, articles dry and smooth, 12.5–14 by 7.2–8.6 mm, ellipsoid, symmetrical, apex rounded. *Seeds* ovoid, 10.5–12.6 by 6.1 by 3.5–5.4 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest at 400–1800 m.

Note — Bracteoles are present on some pedicels but not on others. In the cases where there is a single bracteole the pedicel tends to be quite long so it is quite possible that the bracteole is actually a sterile bract. The secondary venation is not distinguishable from the parallel tertiary giving the impression of a very densely veined leaf like a *Calophyllum* leaf.

49. *Alyxia sogerensis* Wernham ex S. Moore

Alyxia sogerensis Wernham ex S. Moore, J. Bot. 61, Suppl. (1923) 31; Markgr., Bot. Jahrb. Syst. 61 (1927) 182; Blumea 23 (1977) 407, p.p.; D.J. Middleton, Blumea 45 (2000) 121. — Type: *Forbes 591* (holo BM; iso L, MEL, P; photo in LAE), Papua New Guinea, Sogeri.

Alyxia pugio auct. non Markgr.: Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 211.

Climber. *Branchlets* weakly angled, sparsely lenticellate, glabrous. *Leaves* opposite or in whorls of 3; petiole 0.3–0.4 cm long, glabrous; blade subcoriaceous or papery, elliptic or broadly elliptic, 4.7–10.2 by 1.7–3.8 cm, 2.3–3.7 times as long as wide, apex caudate, not mucronate, base obtuse to cuneate, margin strongly undulate, glabrous beneath and above, not punctate beneath, secondary veins 50–58 pairs, 80° from midrib. *Inflorescence* terminal, with several clear internodes and unbranched side branches, delicate, sparsely puberulent all over, c. 2 cm long; peduncle c. 1 cm by 0.7–0.8 mm; bracts caducous or persistent; bracteoles one or two on pedicel; pedicels 4–5 mm long. *Sepals* ovate, c. 2.1 by 1 mm, 2.1 times as long as wide, apex obtuse or acute, ciliate, glabrous or sparsely puberulent. *Corolla* bud head c. 1.6 mm long which is 0.38 of bud length, narrowly ovate, apex acuminate; tube c. 2.6 mm long, glabrous outside; lobes glabrous outside, not ciliate (mature flowers not known). *Stamens* inserted at c. 1.4 mm from corolla base which is 0.35 of tube length; filaments c. 0.3 mm long; anther apex c. 1.4 mm from corolla mouth, anthers c. 1.1 by 0.3 mm. *Ovaries* c. 0.8 mm high, densely pubescent all over or pubescent in tufts between the carpels; style c. 0.1 mm long; style head c. 0.6 mm long. *Fruit* yellowish green, stalks 1.5 mm long, with 1 article, glabrous, articles dry smooth, 11–11.5 by 8.8–9.2 mm, ellipsoid or globose, symmetrical, apex rounded. *Seeds* elliptic, 7.8 by 5.6 by 5.4 mm.

Distribution — *Malesia*: New Guinea.

Note — The material on which this species' description is based is rather poor. This species is unusual in having the stamens inserted very low down in the corolla tube which also leads to an extremely short style. Unfortunately, due to the poor material, this finding is the result of the dissection of only one mature flower bud on the type specimen.

50. *Alyxia spicata* R.Br.

Alyxia spicata R.Br., Prodr. (1810) 470; Roem. & Schult., Syst. Veg. 4 (1819) 439; Spreng., Syst. Veg. 1 (1824) 835; G. Don, Gen. Hist. (1837) 96; A.DC., Prodr. 8 (1844) 346; F. Muell., Fragm. 6 (1868) 117; Benth., Fl. Australiensis 4 (1869) 308; F.M. Bailey, Syn. Queensl. Fl. (1883) 306; Engl., Bot. Jahrb. Syst. 7 (1886) 470; F.M. Bailey, Cat. Pl. Queensl. (1890) 29; Queensl. Fl. 3 (1900) 980; Markgr., Bot. Jahrb. Syst. 61 (1927) 185; Domin, Biblioth. Bot. 89 (1928) 524; Markgr., Blumea 23 (1977) 391; J.R. Wheeler, Fl. Kimberley (1992) 702; P.I. Forst., Austral. Syst. Bot. 5 (1992) 569; Fl. Australia 28 (1996) 131; D.J. Middleton, Blumea 45 (2000) 123; 47 (2002) 53. — *Pulassarium spicatum* (R.Br.) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — *Gynopogon spicatus* (R.Br.) Britten in Banks & Sol., Ill. Austral. Pl. Cook's Voy. (1901) 60 — Type: *Brown Iter Australiense* 2857 (lecto BM, designated by P.I. Forster (1992) op. cit.; iso E, P), Australia, Northern Territory, Carpentaria, Vanderlin Island.

Alyxia tetragona R.Br., Prodr. (1810) 470; Roem. & Schult., Syst. Veg. 4 (1819) 439; Spreng., Syst. Veg. 1 (1824) 835; G. Don, Gen. Hist. (1837) 96; A.DC., Prodr. 8 (1844) 346. — Type: *Banks & Solander s.n.* (BM designated by P.I. Forster (1992) op. cit.; iso BM), Australia, Queensland, Cook District, Endeavour River.

Fagraea tetragona Span., Linnaea 15 (1841) 326. — *Alyxia spanogheana* Miq., Fl. Ned. Ind. 2 (1857) 409; Markgr., Blumea 23 (1977) 401. — *Pulassarium spanogheanum* (Miq.) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — Type: *Spanoghe s.n.* (no specimens found). Lectotype: Spanoghe illustration in Leiden (941.6-217), designated by Markgraf (1977).

Alyxia thyrsiflora Benth., Fl. Australiensis 4 (1869) 309. — *Alyxia thyrsifolia* P.I. Forst., Austral. Syst. Bot. 5 (1992) 570, sphalm. — *Pulassarium thyrsiflorum* (Benth.) Kuntze, Revis. Gen. Pl. 2

(1891) 417. — Type: *Dallachy & Fitzalan s.n.* (lecto K, designated by P.I. Forster (1992) op. cit.; iso MEL), Australia, Queensland, Port Denison.
Alyxia acuminata auct. non Markgr.: Markgr., Blumea 23 (1977) 390, p.p.

Climber, more rarely an erect shrub. Bark brown or grey. *Branchlets* weakly or strongly angled, sparsely lenticellate or not, glabrous or sparsely and minutely puberulent. *Leaves* in whorls of 3 or 4; petiole 0.2–1 cm long, glabrous or pubescent; blade subcoriaceous or papery, elliptic or obovate, 2.4–9.2 by 0.9–3.6 cm, 1.5–5.3 times as long as wide, apex emarginate, rounded, obtuse, acute or shortly acuminate, not mucronate, base obtuse to cuneate, glabrous, sparsely puberulent only on midrib or puberulent all over beneath, glabrous or puberulent only on midrib above, secondary veins 17–40 pairs, 70–75° from midrib. *Inflorescence* axillary, with several clear internodes and unbranched side branches (but see note), delicate or robust, densely puberulent, especially further up the inflorescence, 1.2–3.2 cm long; peduncle 0.3–1.4 cm by 0.9–1.1 mm, weakly flattened, bracts caducous rarely persistent, deltoid or narrowly ovate, 1.9–2.6 by 1.3–2.6 mm, bracteoles one or two immediately beneath calyx, generally deciduous; flowers 12–15; pedicels 0.1–0.5 mm long. *Sepals* not fleshy, ovate or narrowly ovate, fused for up to half length at base, 1–2.2 by 0.6–1.2 mm, 1.4–3 times as long as wide, apex obtuse or acute, slightly reflexed, ciliate, sparsely or densely puberulent. *Corolla* white, yellow, white with an orange tube or greenish with a brown tube, fragrant; bud head 1.4–2.5 mm long which is 0.44–0.51 of bud length, ellipsoid or narrowly ovate, apex obtuse, acute or acuminate; tube cylindrical or slightly inflated, 2–2.7 by 0.8–1.25 mm, 1–2.4 times as long as sepals, 1–1.4 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, pubescent in upper half and around stamens inside, sparsely pubescent around stamens and more densely in a band beneath them or very sparsely pubescent in upper half of tube; lobes elliptic or oblong, 1.6–2.4 by 0.5–1.2 mm, 2–4.6 times as long as wide, apex obtuse, acute or acuminate, glabrous outside and inside, not ciliate. *Stamens* inserted at 1.3–2.1 mm from corolla base which is 0.52–0.7 of tube length; filaments 0.2–0.6 mm long; anther apex 0–0.6 mm from corolla mouth, anthers 0.6–0.9 by 0.2–0.4 mm. *Ovaries* 0.4–0.7 mm high, densely pubescent all over or pubescent only on top; style 0.8–1.4 mm long; style head 0.2–0.6 mm long. *Fruit* yellow, black or yellow-orange; stalks 1–2.6 mm long; with 1 article, glabrous, with thin flesh, 9.2–10.5 by 6.9–9.5 mm, globose or subglobose, symmetrical, apex rounded. *Seeds* ovoid, 8.1–9 by 6–7.2 by 5.4–6.7 mm.

Distribution — Australia; in *Malesia*: Lesser Sunda Islands, New Guinea.

Habitat & Ecology — Found in a wide variety of habitats from cliffs, dunes and coastal vine thickets to savannah and scrubland to various types of forest: monsoon, evergreen or mixed, at 0–1200 m. The most frequently recorded soil type is sand or sandstone but it has also been recorded from basalt.

51. *Alyxia subalpina* Markgr.

Alyxia subalpina Markgr., Bot. Jahrb. Syst. 61 (1927) 183; Blumea 23 (1977) 402; P. Royen, Alpine Fl. New Guinea 4 (1983) 2850; D.J. Middleton, Blumea 45 (2000) 125; Utteridge in R.J. Johns et al., Alp. Subalp. Fl. Mount Jaya (2006) 189. — Type: *Ledermann 12760* (holo B \ddot{u} ; lecto L, designated by Middleton (2000) op. cit.; iso A (scrap)), Papua New Guinea, East Sepik Province.

Alyxia lamii Markgr., Nova Guinea 14, 2 (1926) 280; Bot. Jahrb. Syst. 61 (1927) 183; Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 212. — Type: *Lam 1757* (lecto L, designated by Middleton (2000) op. cit.; iso BO), New Guinea, Papua, Mt Doorman.

Alyxia clemensiae Markgr., Blumea 23 (1977) 396, p.p. (not including type).

Alyxia defoliata Markgr. subsp. *orientalis* Markgr., Blumea 23 (1977) 399, p.p. (not including type).

Alyxia maluensis auct. non Markgr.: Markgr., Blumea 23 (1977) 395, p.p.

Alyxia purpureoclada auct. non Kaneh. & Hatus.: Markgr., Blumea 23 (1977) 400, p.p.

Alyxia cacuminum auct. non Markgr.: Markgr., Blumea 23 (1977) 403, p.p.; P. Royen, Alpine Fl. New Guinea 4 (1983) 2851, p.p.

Alyxia semipallescens auct. non F. Muell.: Markgr., Blumea 23 (1977) 403, p.p.; P. Royen, Alpine Fl. New Guinea 4 (1983) 2852, p.p.

Climber. *Branchlets* terete, weakly or strongly angled, sparsely lenticellate or not, glabrous to sparsely or densely and minutely puberulent, sometimes glabrescent. *Leaves* in whorls of 3 or 4; petiole 0.1–1 cm long, glabrous or pubescent; blade subcoriaceous to thickly coriaceous, narrowly to broadly elliptic or obovate, 0.8–8 by 0.4–4 cm, 1–3.9 times as long as wide, apex rounded to acuminate, not mucronate, base rounded to cuneate, margin weakly undulate or not, glabrous or sparsely puberulent only on midrib beneath, sparsely puberulent, glabrous or puberulent only on midrib above, not punctate beneath, secondary veins 11–36 pairs, 70–80° from midrib. *Inflorescence* axillary, a simple unbranched pleiochasium, with clear internodes and unbranched side branches, delicate or robust, sparsely to densely puberulent, 0.8–3.5 cm long; peduncle 0.3–1.5 cm by 0.7–1.8 mm; bracts caducous or persistent, ovate, deltoid, linear, leafy or narrowly ovate, 1.7–5 by 1–1.8 mm; bracteoles mostly absent, rarely one on pedicel; flowers 3–10; pedicels 0.7–4 mm long. *Sepals* ovate, 1.1–2.5 by 0.9–1.6 mm, 1.2–2 times as long as wide, apex rounded to acute, ciliate, glabrous or sparsely to densely puberulent. *Corolla* tube white to orange to purplish brown, lobes white, cream or yellowish; bud head 1.3–2.7 mm long which is 0.26–0.37 of bud length, ellipsoid, narrowly ovate, ovate or deltoid, apex rounded to acute; tube cylindrical to slightly or strongly inflated, 3.4–6.2 by 1.2–2.1 mm, 1.9–5.1 times as long as sepals, 1.6–2.9 times as long as lobes, sparsely to densely pubescent around top of tube outside, very rarely glabrous, inside pubescent in upper half and around stamens or sparsely pubescent around stamens and more densely in a band beneath them; lobes orbicular, 1.5–2.7 by 1.4–2.3 mm, 0.9–1.6 times as long as wide, apex rounded or obtuse, base auriculate, sparsely to densely puberulent outside, very rarely glabrous, inside glabrous, pubescent at base of lobes or papillate, ciliate, not ciliate or ciliate near tips only. *Stamens* inserted at 2.2–3.7 mm from corolla base which is 0.57–0.67 of tube length; filaments 0.6–0.8 mm long; anther apex 0.1–0.7 mm from corolla mouth, anthers 0.9–1.3 by 0.3–0.6 mm. *Ovaries* 0.6–1.1 mm high, pubescent all over, sometimes more densely around base; style 1–2.4 mm long; style head 0.6–1 mm long. *Fruit* yellow or orange turning black or dark purple, stalks 2–3.5 mm long, with 1 article, glabrous or sparsely puberulent at ends, articles dry, smooth or with thin flesh, 12.8–21.5 by 10–14.8 mm, ellipsoid to globose, symmetrical, apex rounded, obtuse or apiculate. *Seeds* elliptic, 10–13.2 by 8–9.6 by 6.6–8.5 mm.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest to subalpine scrub at (650–)1400–3260 m. Reported from limestone. The single specimen from 650 m was collected from heath forest where many other normally higher altitude plants were also reported.

52. *Alyxia sulana* Markgr.

Alyxia sulana Markgr., Blumea 23 (1977) 401; D.J. Middleton, Blumea 45 (2000) 127. — Type: *Atjeh exp. Van Hulstijn 59* (holo L; iso BO), Moluccas, Sula Islands, Taliabu, Tanjung Berpua.

Climber. *Branchlets* terete, sparsely lenticellate or not, glabrous. *Leaves* in whorls of 5; petiole 0.3–0.7 cm long, glabrous; blade subcoriaceous, obovate, 4.5–13.1 by 1.8–4.7 cm, 2.1–3.6 times as long as wide, apex shortly acuminate to rounded, not mucronate, base cuneate, margin weakly or strongly undulate, glabrous beneath and above, not punctate beneath, secondary veins 30–40 pairs, 70–80° from midrib. *Inflorescence* axillary, a simple unbranched pleiochasium, delicate, glabrous, 1–1.7 cm long; peduncle 0.1–0.9 cm by 0.9 mm; bracts persistent, deltoid, 0.9 by 0.7 mm; bracteoles absent or only on pedicel of terminal flower; flowers c. 4; pedicels 3.5–4.5 mm long. *Sepals* free, not fleshy, ovate, c. 1 by 0.8 mm, 1.25 times as long as wide, apex acute, ciliate, glabrous. *Corolla* tube slightly inflated, c. 3.1 by 1.2 mm, 3.1 times as long as sepals, 2 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes elliptic, c. 1.7 by 0.9 mm, 1.9 times as long as wide, apex rounded, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 1.8 mm from corolla base which is 0.53 of tube length; filaments c. 0.5 mm long; anther apex c. 0.4 mm from corolla mouth, anthers c. 0.9 by 0.3 mm. *Ovaries* c. 0.7 mm high, pubescent in tufts between the carpels; style c. 1.4 mm long; style head c. 0.4 mm long. *Fruit* black, stalks 4–6.7 mm long, with 1 article, sparsely puberulent at ends, articles with thin flesh, 13.2–20.5 by 9.5–15 mm, ellipsoid or cylindrical, symmetrical, apex rounded or apiculate. *Seeds* 14–14.6 by 7–9.6 by 6–8 mm.

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — In forest on ultrabasic or deep hard red clayey soil at 150–420 m.

53. *Alyxia tetraquetra* Markgr.

Alyxia tetraquetra Markgr., Bot. Jahrb. Syst. 61 (1927) 185; Blumea 23 (1977) 396. — *Gynopogon tetraqueter* K. Schum. ex Markgr., Bot. Jahrb. Syst. 61 (1927) 185 (in synonymy); D.J. Middleton, Blumea 45 (2000) 128. — Type: *Holrung 747* (holo B†; lecto HBG, designated by Middleton (2000) op. cit.; iso BO, K, MEL, P), Papua New Guinea, West Sepik Province, August.

Alyxia sibuyanensis auct. non Elmer: Markgr., Blumea 23 (1977) 381, p.p.

Alyxia maluensis auct. non Markgr.: Markgr., Blumea 23 (1977) 395, p.p.

Climber. *Branchlets* weakly or strongly angled, densely lenticellate or not, glabrous. *Leaves* in whorls of 3–5; petiole 0.8–1.2 cm long, glabrous; blade coriaceous or thickly coriaceous, broadly elliptic or spatulate, 4.5–18 by 2.6–8.2 cm, 1.6–3 times as long as wide, apex emarginate to very shortly acuminate or apiculate, not mucronate, base acute to decurrent onto petiole, margin weakly undulate, glabrous beneath and above, not punctate beneath, secondary veins 32–51 pairs, 55–80° from midrib. *Inflorescence* axillary, a short congested compound pleiochasium, very robust, sparsely puberulent in upper parts, 2–3.5 cm long; peduncle 0.9–1.2 cm by 1.9–3.4 mm; bracts caducous or persistent, deltoid, 1.3–2.4 by 1.3–2.4 mm; bracteoles two immediately beneath calyx; flowers 13–25; pedicels 0.5–1 mm long. *Sepals* free, not fleshy, ovate, c. 2 by 1.5 mm, 1.3 times as long as wide, apex rounded to obtuse, ciliate, sparsely puberulent. *Corolla*

white; bud head c. 1.7 mm long which is 0.4 of bud length, globular or deltoid, apex rounded or acute; tube cylindrical, c. 3.4 by 1.2 mm, 1.7 times as long as sepals, 3.1 times as long as lobes, densely pubescent around top of tube outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes orbicular, c. 1.1 by 1 mm, 1.1 times as long as wide, apex rounded, base auriculate, sparsely or densely puberulent outside, glabrous inside, ciliate. *Stamens* inserted at c. 2.3 mm from corolla

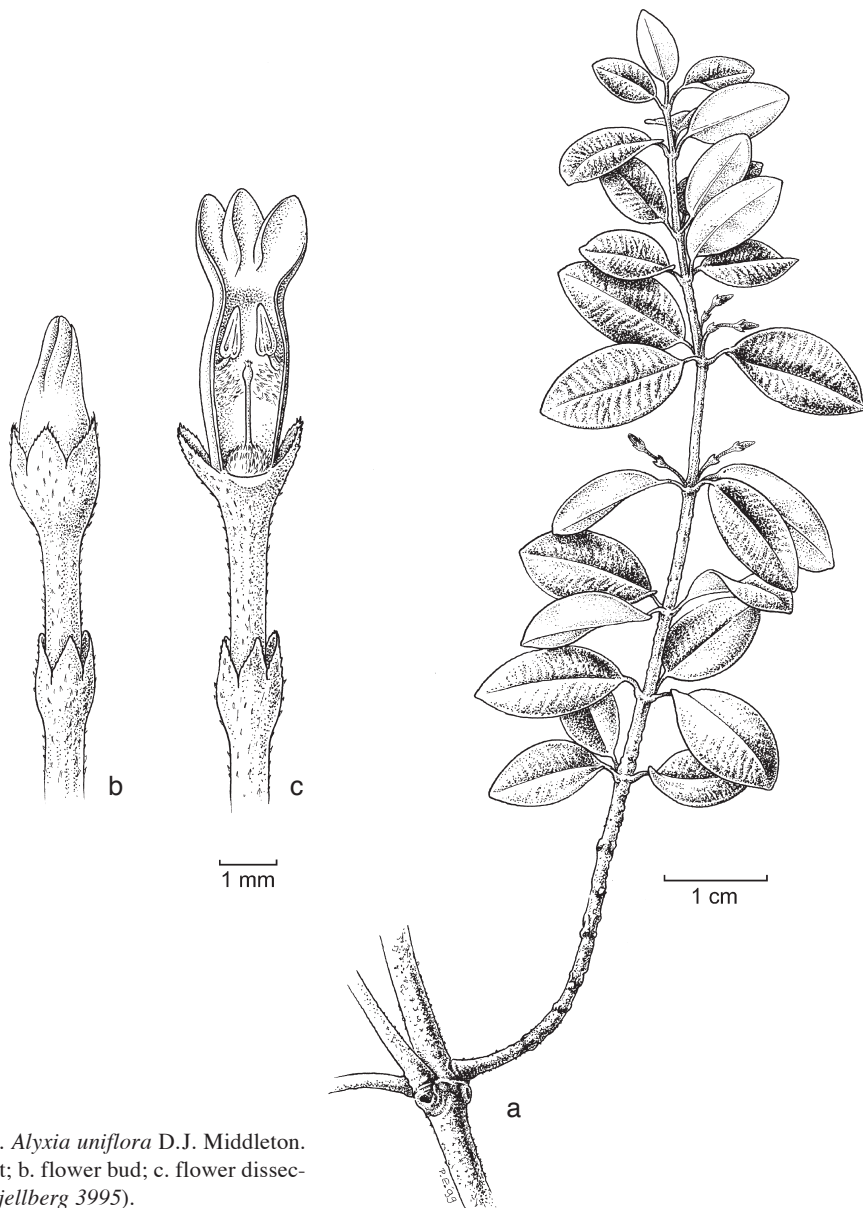


Fig. 26. *Alyxia uniflora* D.J. Middleton. a. Habit; b. flower bud; c. flower dissection (Kjellberg 3995).

base which is 0.62 of tube length; anther apex c. 0.2 mm from corolla mouth, anthers c. 1 by 0.4 mm. *Ovaries* c. 0.8 mm high, densely pubescent all over; style c. 0.9 mm long; style head c. 0.5 mm long. *Fruit* orange (black when mature?), stalks c. 2.3 mm long, with 1 or 2 articles in each string, 0 mm between articles, articles with thin flesh, 17–19 by 12.3–13.5 mm, ellipsoid, symmetrical, apex rounded.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In primary or secondary forest or ridge forest or river banks on sandstone, sandy soils or ultrabasic soils.

54. *Alyxia uniflora* D.J. Middleton

Alyxia uniflora D.J. Middleton, *Blumea* 45 (2000) 130. — Type: *Kjellberg 3995* (holo S; iso BO), S Celebes, Enkerang District, Latimojong Mts, Bukit Poka Pindjang.

Climber. *Branchlets* weakly angled, not lenticellate, densely puberulent. *Leaves* in whorls of 3; petiole 0.1–0.2 cm long, pubescent; blade coriaceous, elliptic to ovate, 0.6–1.7 by 0.3–0.8 cm, 1.6–2.3 times as long as wide, apex obtuse to acute, not mucronate, base obtuse, margin not undulate, dark green and shining above, pale green beneath, glabrous beneath, not punctate beneath, puberulent only on midrib above, secondary veins 8–12 pairs. *Inflorescence* of solitary axillary flowers, delicate, 0.9–1.1 cm long; bracts in a ring around the middle of the pedicel; pedicels 4.5–6 mm long, densely puberulent. *Sepals* ovate, apex acute, c. 1.3 by 0.9 mm, 1.4 times as long as wide, ciliate, glabrous. *Corolla* tube slightly inflated, c. 3.8 mm long, 2.9 times as long as sepals, 2.5 times as long as lobes, glabrous outside, very sparsely pubescent in upper half of tube; lobes elliptic, c. 1.5 by 1.5 mm, 1 times as long as wide, apex obtuse, base auriculate, glabrous outside, pubescent or sparsely pubescent at the tips and base of lobes inside, ciliate near tips only. *Stamens* inserted at c. 2 mm from corolla base which is 0.53 of tube length; filaments c. 0.3 mm long; anther apex c. 0.6 mm from corolla mouth, anthers c. 1.1 by 0.5 mm. *Ovaries* c. 0.8 mm high, pubescent around base only; style c. 0.7 mm long; style head c. 0.4 mm long. *Fruit* stalks c. 2 mm long, with 1 article, sparsely puberulent at ends; articles with thin flesh, c. 9.4 by 6.5 mm, ellipsoid, symmetrical, apex rounded. *Seeds* not seen. — **Fig. 26.**

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — In rain forest at 2000–2800 m.

55. *Alyxia vera* D.J. Middleton

Alyxia vera D.J. Middleton, *Blumea* 45 (2000) 132. — Type: *Robinson 74* (holo L; iso BO, K, P, US), Moluccas, Ambon.

Pulassarium verum Rumph., *Herb. Amboin.* 5 (1747) 32, t. 20, nom. inval.

Alyxia stellata auct. non (J.R. Forst. & G. Forst.) Roem. & Schult.: Roxb., *Fl. Ind.* 2 (1824) 539; Spreng., *Syst. Veg.* 4, 2 (1827) 109; Roxb., *Fl. Ind. ed. 2*, 1 (1832) 699; *Fl. Ind.* (1874) 235.

Alyxia laurina auct. non Gaudich.: Merr., *Interpr. Herb. Amboin.* (1917) 430.

Climber. *Branchlets* weakly angled, not lenticellate, glabrous. *Leaves* in whorls of 3 or 4; petiole 0.1–0.3 cm long, glabrous; blade coriaceous or subcoriaceous, elliptic, 1–7 by 0.4–2.6 cm, 2–4.3 times as long as wide, apex acuminate, sometimes notched

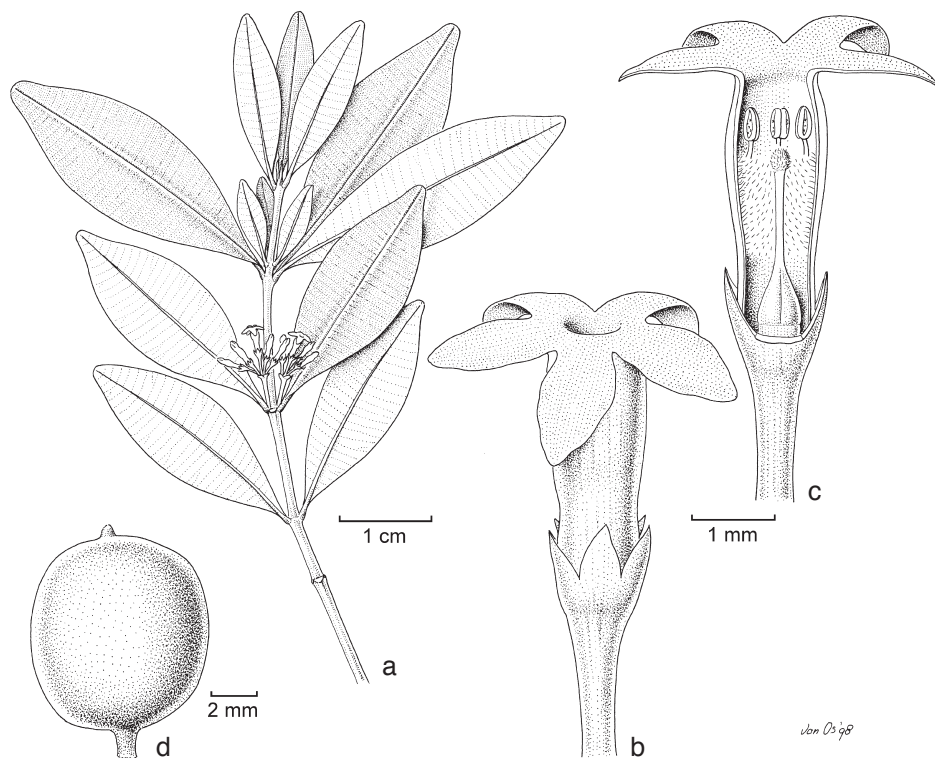


Fig. 27. *Alyxia vera* D.J. Middleton. a. Habit; b. flower; c. flower dissection; d. fruit (a–c: *Unknown s.n.*, G; d: *Robinson 74*).

at the apex, base cuneate or decurrent onto petiole, margin weakly undulate or not, glabrous beneath and above, secondary veins 26–32 pairs. *Inflorescence* axillary, a simple unbranched pleiochasium, delicate, glabrous, 0.7–1.5 cm long; peduncle 0.2–0.8 cm by 0.6–0.7 mm; bracts persistent, deltoid, 0.8–0.9 by 0.5 mm; bracteoles absent; flowers 4; pedicels 2–3 mm long. *Sepals* ovate, 0.8–0.9 by 0.6–0.7 mm, 1.1–1.5 times as long as wide, apex obtuse to acute, ciliate or not, glabrous. *Corolla* bud head c. 1.4 mm long which is 0.33 of bud length, ellipsoid, apex acute; tube slightly inflated, c. 3 by 1.1 mm, 3.8 times as long as sepals, 1.9 times as long as lobes, glabrous outside, sparsely pubescent around stamens and more densely in a band beneath them inside; lobes ovate, c. 1.6 by 1.2 mm, 1.3 times as long as wide, apex obtuse, base auriculate, glabrous outside and inside, not ciliate. *Stamens* inserted at c. 2.3 mm from corolla base which is 0.77 of tube length; filaments c. 0.4 mm long; anther apex c. 0.1 mm from corolla mouth, anthers c. 0.8 by 0.3 mm. *Ovaries* c. 0.7 mm high, glabrous; style c. 1 mm long; style head c. 0.4 mm long. *Fruit* with 1 article, glabrous, articles with thin flesh, 8.6–9.3 by 7.3–8.2 mm, globose, symmetrical, apex rounded. *Seeds* elliptic, c. 8 by 6.8 by 6 mm. — **Fig. 27.**

Distribution — *Malesia*: Moluccas.

4. AMPHINEURION

Amphineurion (A.DC.) Pichon, Bull. Soc. Bot. France 95 (1948) 215; Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 56. — *Aganosma* (Blume) G. Don sect. *Amphineurion* A.DC., Prodr. 8 (1844) 433. — *Ichnocarpus* R.Br. sect. *Amphineurion* (A.DC.) Benth. & Hook.f., Gen. Pl. 2 (1876) 717. — *Aganosma* (Blume) G. Don sect. *Amphineurion* Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399, sphalm. — Type species: *Amphineurion acuminatum* (G. Don) Pichon (= *Amphineurion marginata* (Roxb.) D.J. Middleton).

Large or medium woody climbers, often shrub-like when young but then with scandent or arching stems. *Leaves* opposite; usually with an interpetiolar ridge bearing colleters; blade with a very conspicuous intramarginal vein. *Inflorescence* terminal, sometimes also axillary, cymose, often forming a panicle; flowers 5-merous. *Sepals* narrowly ovate to linear, quite large and showy; colleters in a continuous row inside. *Corolla* lobes dextrorse in bud; mature corolla with spreading or erect lobes. *Stamens* inserted in lower half of corolla tube, completely included in tube; filaments short; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base; adnate to the style head. *Disk* a 5-lobed ring. Gynoecium 2-carpellate, apocarpous but apically united into a common style; ovules numerous; ovaries minutely puberulent to glabrous; style consisting of a narrower basal part and a conical upper part to which the stamens are attached near the top. *Fruit* of paired follicles; linear. *Seeds* flattened; with an apical coma.

Distribution — 1 species in India, Bangladesh, China, Burma, Thailand, Laos, Cambodia, Vietnam; in *Malesia* as far east as Ambon.

Amphineurion marginatum (Roxb.) D.J. Middleton

Amphineurion marginatum (Roxb.) D.J. Middleton, Taxon 55 (2006) 502. — *Echites marginatus* Roxb., Fl. Ind. 2 (1832) 16. — *Aganosma marginata* (Roxb.) G. Don, Gen. Hist. 4 (1837) 77; Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 425; Kurz, Forest Fl. Burma 2 (1877) 186; Hook.f., Fl. Brit. India 3 (1882) 663; G. Watt, Products of India 1 (1889) 129; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; Spire, Contr. Apocyn. (1905) 110; Brandis, Indian Trees (1906) 464; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 495; Ridl., Fl. Malay Penins. 2 (1923) 365; C.E. Parkinson, Forest Fl. Andaman Isl. (1923) 207; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1222; Kerr in Craib, Fl. Siam. 2 (1939) 468; Backer & Bakh.f., Fl. Java 2 (1965) 237; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 29; D.J. Middleton, Kew Bull. 51 (1996) 469; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 122; M.F. Watson, Fl. Bhutan 2 (1999) 680; D.J. Middleton, Fl. Thailand 7 (1999) 106; PROSEA 12, 3 (2003) 44. — Type: *Wallich 1661a* (lecto K-W [as 1661.1], designated by Middleton (1996) op. cit.: iso BM, BR, E, G, K, P).

Echites reticulatus Wall., Numer. List 1662 (1829), nom. nud. [1662.2 in K-W].

Echites acuminatus Roxb., Fl. Ind. 2 (1832) 15, non Ruiz. & Pav. (1799). — *Aganosma acuminata* G. Don, Gen. Hist. 4 (1837) 77; Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 424; Miq., Fl. Ned. Ind. 2 (1857) 447; Merr., Fl. Manila (1912) 374; Enum. Philipp. Fl. Pl. 3 (1923) 334; Tsiang, Sunyatsenia 2 (1934) 156; Chun & C.C. Chang, Fl. Hainan. 3 (1974) 240; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 182; Lý, Feddes Repert. 97 (1986) 658. — *Ichnocarpus acuminatus* Fern.-Vill., Novis App. (1880) 131. — *Amphineurion acuminata* (Roxb.) Pichon, Bull. Soc. Bot. France 95 (1948) 215. — *Echites apoxys* Voigt, Hort. Suburb. Calcutt. (1845) 522, nom. illeg. — Type: Illustration 2461 of *Echites acuminatus* in the Roxburgh collection in Kew library.

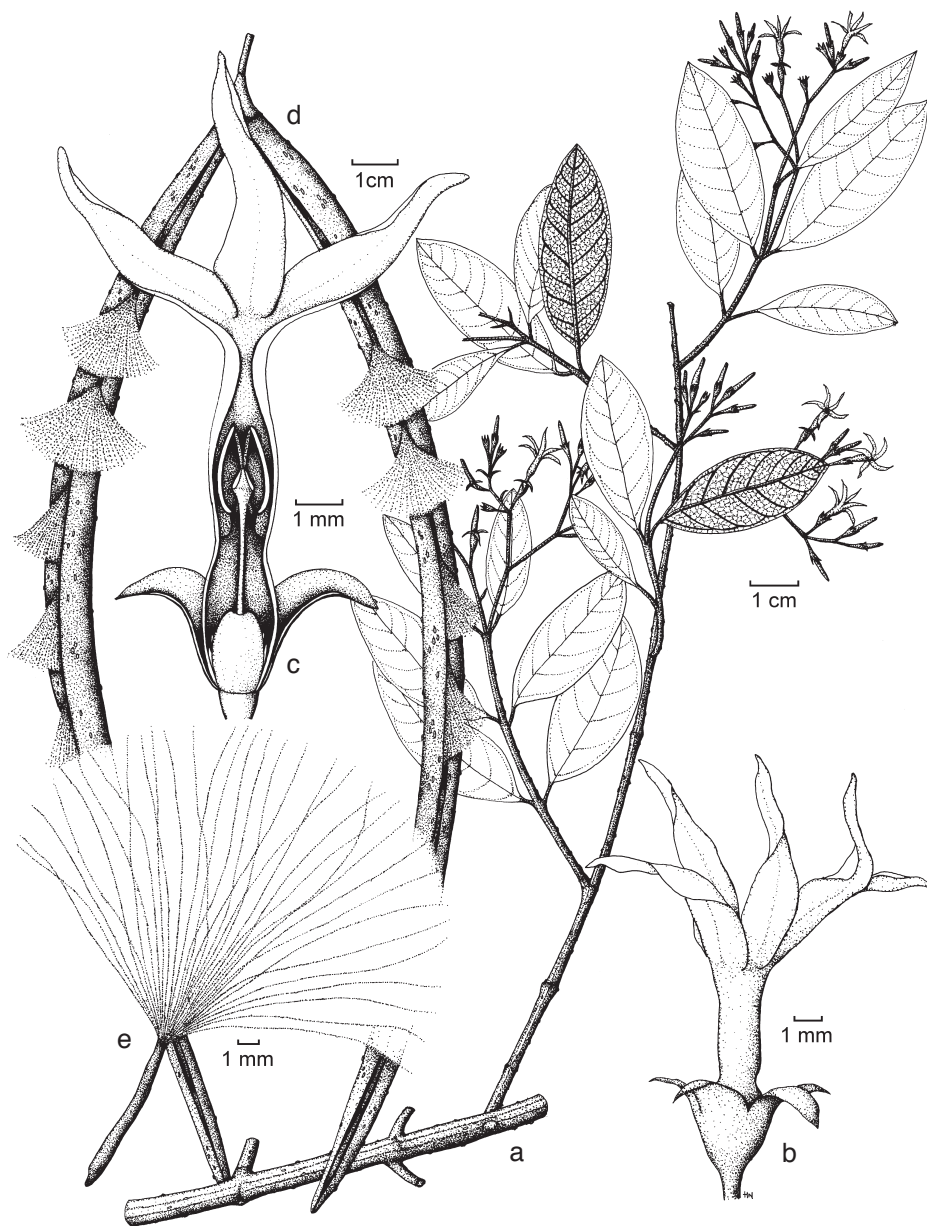


Fig. 28. *Amphineurion marginatum* (Roxb.) D.J. Middleton. a. Habit; b. flower; c. dissected flower; d. fruit; e. seed (a–c: *Poilane 14969*; d, e: *Tixier s.n.*).

- Echites repens* Blanco, Fl. Filip. (1837) 109; A.DC., Prodr. 8 (1844) 478. — *Echites procumbens* Blanco, Fl. Filip., ed. 2 (1845) 78. — *Holarrhena procumbens* (Blanco) Merr., Publ. Bur. Sci. Gov. Lab. 27 (1905) 59. — Type: Untraced. Neotype: *Merrill Species Blancoanae* 372 (neo K, designated by Middleton (1996) op. cit.; iso BM, L, MO, P, US, W), Philippines, Palawan, Taytay.
- Echites reticulatus* Bojer, Hortus Maurit. (1837) 211, non Roth (1819). — A specimen collected by Bojer from a cultivated plant in Mauritius is in G-DC.
- Aganosma macrocarpa* A.DC., Prodr. 8 (1844) 434; Miq., Fl. Ned. Ind. 2 (1857) 447. — *Ichnocarpus macrocarpus* (A.DC.) Fern.-Vill., Novis App. (1880) 131. — *Echites macrocarpus* Wall., Numer. List 1662 (1829), nom. nud. — Type: *Wallich 1662* (lecto G-DC, designated by Middleton (1996) op. cit.; iso K, K-W [as 1662.1]), Burma. — The lectotype is the only one of the three duplicates in G-DC that is flowering.
- Aganosma velutina* A.DC., Prodr. 8 (1844) 434; Miq., Fl. Ned. Ind. 2 (1857) 447; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 334; Bakh.f., Blumea 6 (1950) 387; Backer & Bakh.f., Fl. Java 2 (1965) 238. — *Ichnocarpus velutinus* Fern.-Vill., Novis App. (1880) 131. — *Amphineurion velutinum* (A.DC.) Pichon, Bull. Soc. Bot. France 95 (1948) 215. — Type: *Cuming 1803* (lecto G, designated by Middleton (1996) op. cit.; iso E, G, K, L, MO, NY, P, TCD, UPS, W).
- Aganosma euloba* Miq., Fl. Ned. Ind. 2 (1857) 447; Boerl., Handl. Fl. Ned. Ind 2 (1899) 400. — Type: *Horsfield s.n.* (lecto K, designated by Middleton (1996) op. cit.; iso K, L (fragm.), U).

Shrub-like when young with arching stems, climber when possible. Stems densely lenticellate; glabrous to short puberulent. *Leaves*: petiole 3–11 mm long; blade 2.2–14 by 0.7–4.7 cm, 1.3–7 times as long as wide, elliptic, oblong or narrowly ovate, apex acuminate, base rounded to cuneate, glabrous to puberulent, then more densely beneath, especially on veins, 8–18 pairs of secondary veins, prominent beneath, anastomosing before margin forming a strong intramarginal nerve. *Inflorescence* lax, terminal and axillary, glabrous to sparsely puberulent, 4–20 cm long; pedicels 0.6–9.5 mm long. *Sepals* 2–8 by 0.8–2.1 mm, 1.7–5.3 times as long as wide, puberulent to glabrous, oblong to narrowly ovate, apex acute or acuminate; with a continuous row of colleters on the inside. *Corolla* white; tube 4.4–9.9 by 1.6–1.9 mm, 0.4–1 times as long as lobes, 1.3–2.1 times as long as calyx, glabrous or minutely puberulent outside, short puberulent inside and densely puberulent just beneath stamen insertion; lobes 5.5–21.9 by 1.2–3.3 mm, 3–9.5 times as long as wide, linear, apex acute to acuminate. *Stamens* inserted at 2.2–4 mm from corolla base which is 0.3–0.5 of corolla tube length; anthers 2.5–3.2 by 0.4–0.7 mm, 3.7–7 times as long as wide. *Disk* of 5 wide rounded lobes to annular; 0.2–0.6 mm long, 0.3–1 times as long as ovary. *Ovaries* 0.4–1.2 mm high, minutely puberulent to glabrous; style 1.5–3.1 mm long, style head 0.8–2 mm long. *Fruit* linear, 16.5–74 cm by 4–10 mm, lenticellate, glabrous to sparsely puberulent. *Seeds* 4.7–13.6 by 0.6–2.3 mm; coma 2–5.1 cm long. — **Fig. 28.**

Distribution — India, Bangladesh, China, Burma, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines, Sulawesi, Lesser Sunda Islands, Moluccas.

Habitat & Ecology — Wide variety of habitats especially in drier evergreen and deciduous forest and as a scrambler in scrubland, to 850 m.

Uses — A decoction of the roots is said to be used internally to treat urinary problems, as a tonic against fevers, as a treatment for anaemia and loss of appetite, and as an aid to menstruation. The leaves are also said to be edible with a sweetish taste. The fibrous bark can be used for binding.

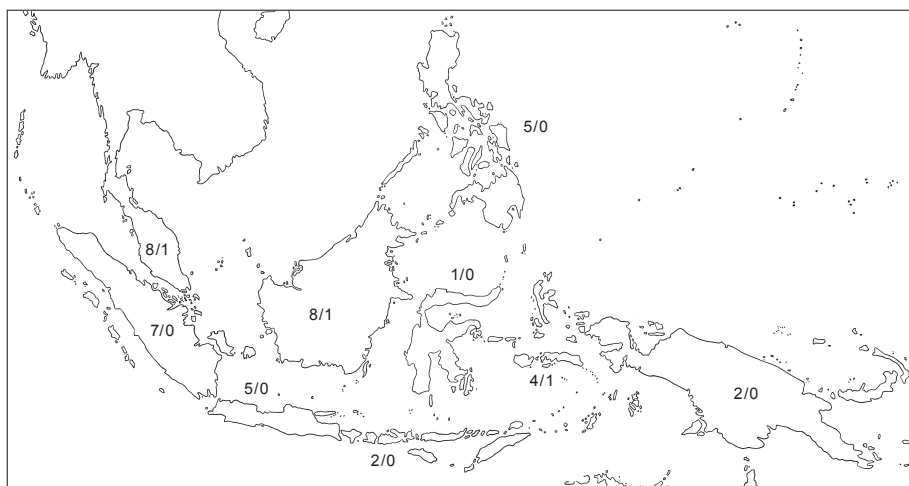
5. ANODENDRON

Anodendron A.DC., Prodr. 8 (1844) 443; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1229; Backer & Bakh.f., Fl. Java 2 (1965) 236; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 26; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 69; D.J. Middleton, Blumea 41 (1996) 38; Fl. Thailand 7 (1999) 127; PROSEA 17 (2003) 75; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 7. — *Anodendron* A.DC. sect. *Micranodendron* Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 92. — Type species: *Anodendron paniculatum* A.DC.

Formosia Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 300. — Type species: *Formosia benthamianum* (Hemsl.) Pichon (= *Anodendron benthamianum*).

Anodendron A.DC. sect. *Macranodendron* Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 92. — Type species: *Anodendron affine* (Hook. & Arn.) Druce.

Climbers or scramblers; producing white latex. *Branches* lenticellate or not; branchlets glabrous or, rarely, pubescent. *Leaves* opposite, those of a pair equal; petiolate; coriaceous to papery, entire. *Inflorescence* of axillary and/or terminal cymes, often forming panicles; flowers 5-merous, actinomorphic. *Sepal* lobes free; colleters at sepal margins at the base inside. *Corolla* lobes dextrorse; consisting of a narrow cylindrical tube which widens slightly at the point of stamen insertion into the upper tube and then with spreading lobes; lobes usually narrowly oblong or narrowly elliptic, rarely ovate, falcate. *Stamens* included in the corolla tube, attached in a ring to the style head; anthers subsessile (except in the non-Malesian *A. benthamianum*), fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* annular, 5-dentate or 5-crenate. Gynoecium 2-carpellate, apocarpous but apically united into a common style, superior, ovoid, glabrous; ovules numerous; style glabrous, short; style head ovoid with a basal ring and no collar and short sharp projection on top. *Fruit* of paired follicles; divergent or subdivergent; wide at base, narrowing to end; longitudinally dehiscent. *Seeds* beaked, grain narrow ovate or elliptic, flattened; glabrous; coma pointing towards end of fruit.



Map 4. Distribution of *Anodendron* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

Distribution — 17 species from India, Japan and China southwards to Vanuatu. — **Map 4.**

KEY TO THE SPECIES

- 1a. Corolla lobes in bud strongly twisted to the left, 1.8–9.5 times as long as wide 2
 b. Corolla lobes in bud not strongly twisted, 0.9–1.8 times as long as wide 14
 2a. Leaves minutely punctate beneath 3
 b. Leaves not minutely punctate beneath 6
 3a. Inflorescence mostly axillary, shorter than subtending leaves, often minutely puberulent 4
 b. Inflorescence terminal panicles, usually longer than subtending leaves, glabrous **1. A. affine**
 4a. Corolla tube ≥ 5 mm long, lobes > 6 mm long; 7–11 strong pairs of secondary veins **10. A. pauciflorum**
 b. Corolla tube < 5 mm long, lobes ≤ 5 mm long; 7–23 pairs of secondary veins, if ≤ 13 then only weakly distinct from tertiary venation 5
 5a. Inflorescence 1–3.7 cm long; disk 0.6–0.8 times as long as ovary; tube densely pubescent inside **2. A. axillare**
 b. Inflorescence 3.9–13.2 cm long; disk 0.3–0.6 times as long as ovary; tube glabrous or sparsely pubescent only at top inside **13. A. whitmorei**
 6a. Inflorescence minutely puberulent, mostly axillary **8. A. oblongifolium**
 b. Inflorescence glabrous, axillary or terminal 7
 7a. Inflorescence mostly axillary, if terminal not forming large panicles 8
 b. Inflorescence terminal, sometimes also axillary, forming panicles 10
 8a. Leaves thickly coriaceous; petiole (1.5–)2–5.2 cm long; corolla lobes 1.7–2.9 mm long. **4. A. candolleianum**
 b. Leaves coriaceous to subcoriaceous; petiole 0.5–2.1 cm long; corolla lobes 2.7–8.5 mm long. 9
 9a. Inflorescence robust; leaves mostly narrow elliptic **1. A. affine**
 b. Inflorescence delicate; leaves broad elliptic, oblong or obovate **8. A. oblongifolium**
 10a. Bracteoles on flower pedicels 11
 b. Bracteoles at base of flower pedicels 12
 11a. Inflorescence delicate; anthers 1–1.3 by 0.3–0.4 mm. — Peninsular Thailand to Malesia **5. A. coriaceum**
 b. Inflorescence robust; anthers 1.1–4 by 0.4–0.8 mm. — Japan and China to Indochina and the Philippines **1. A. affine**
 12a. Corolla tube 4.7–8 mm long; leaf apex rounded to apiculate **14. A. wrayii**
 b. Corolla tube 1.2–4.1(–4.7) mm long; leaf apex acuminate, very rarely to apiculate 13
 13a. Leaves glaucous beneath, secondary veins thin and not prominent **7. A. nervosum**
 b. Leaves not glaucous beneath, secondary veins prominent or not **9. A. paniculatum**

- 14a. Corolla tube > 5 mm long; leaves 8–14 cm long **3. A. borneense**
 b. Corolla tube < 2 mm long; leaves 2.6–10.7 cm long 15
 15a. Inflorescence < 2 cm long; pedicels ≤ 1.2 mm long **12. A. tubulosum**
 b. Inflorescence > 3 cm long; pedicels ≥ 2 mm long 16
 16a. Leaf secondary veins arcuate ascending. — Ceram, Ambon . . **11. A. seramense**
 b. Leaf secondary veins ± straight, almost perpendicular to midrib. — Peninsular
 Malaysia, Borneo **6. A. gracile**

1. *Anodendron affine* (Hook. & Arn.) Druce

- Anodendron affine* (Hook. & Arn.) Druce, Rep. Bot. Exch. Club Brit. Isles 1916 (1917) 605; Tsiang, Sunyatsenia 2 (1934) 127; 3 (1936) 140; Chun & C.C. Chang, Fl. Hainan. 3 (1974) 241; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 175; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 534; T.C. Huang, Taiwania 31 (1986) 92; Lý, Feddes Repert. 97 (1986) 649; P.T. Li, J. S. China Agric. Univ. 11 (1990) 30; D.J. Middleton, Blumea 41 (1996) 40; Fl. Thailand 7 (1999) 128. — *Holarrhena affinis* Hook. & Arn., Bot. Beechey Voy. (1837) 198. — Type: Untraced. Neotype: *Tsang 20357* (neo US, designated by Middleton (1996) op. cit.; iso BO, K, MO, W), China.
- Aganosma laevis* Champ. ex Benth., Hooker's J. Bot. Kew Gard. Misc. 4 (1852) 335. — *Anodendron laeve* (Champ. ex Benth.) Maxim. ex Franch. & Sav., Enum. Pl. Jap. 1 (1875) 315; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1230. — Type: *Champion 198* (lecto K, designated by Middleton (1996) op. cit.; iso K), China, Hong Kong.
- Epigynum laevigatum* Hook.f., Fl. Brit. India 3 (1882) 666. — *Echites laevigatus* Wall., Numer. List 1669 (1829), nom. nud. — Type: *Wallich 1669* (lecto K-W, designated by Middleton (1996) op. cit.; iso K), Bangladesh, Sylhet.
- Anodendron loheri* Merr., Philipp. J. Sci., Bot. 7 (1912) 332; Enum. Philipp. Fl. Pl. (1923) 333. — Type: *Loher 6494* (lecto US, designated by Middleton (1996) op. cit.; iso K, M), Philippines, Luzon, Zambales Province, Mt Pinatubo.
- Anodendron suishaense* Hayata, Icon. Pl. Formosan 6 (1916) 29. — Type: *Hayata s.n.* (May 1916) (holo TAI n.v.; photo A), Taiwan, Suisha.
- Anodendron affine* (Hook. & Arn.) Druce var. *effusum* Tsiang, Sunyatsenia 2 (1934) 128; Chun & C.C. Chang, Fl. Hainan. 3 (1974) 242; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 176. — Type: *How 70620* (holo SYS; iso IBSC), China, Hainan, Ngai Yuen.
- Anodendron fangchengense* Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 378; Fl. Reipubl. Popularis Sin. 63 (1977) 176. — Type: *Chun 4848* (holo IBSC), China, sine loc.
- Anodendron affine* (Hook. & Arn.) Druce var. *pingpienense* Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 379; Fl. Reipubl. Popularis Sin. 63 (1977) 176; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 534. — Type: *Feng 5062* (holo IBSC), China, Yunna, Ping-Pien.

Branchlets glabrous. *Leaves*: petiole 0.5–1.8 cm long; blade elliptic, rarely slightly obovate, 3–16.6 by 0.7–5.4 cm, (1.9–)2.3–6.3 times as long as wide, apex acuminate or apiculate, base cuneate, rarely to rounded, 6–12 pairs of secondary veins, tertiary venation largely obscure, rarely somewhat prominent, glabrous above and beneath, rarely obscurely punctate beneath. *Inflorescence* axillary and terminal forming panicles, glabrous, 3.2–19.2 cm long; pedicels 1.5–5.8 mm long, bracteoles present on pedicel. *Sepals* ovate, 1.1–3.4 by 0.5–1.5 mm, 1.1–3.6 times as long as wide, apex acute to acuminate, glabrous, sparsely ciliate or not. *Corolla* white to greenish yellow; tube 2.4–6.8 mm long, 0.5–1.4 times as long as lobes; lobes 2.7–8.5 by 0.9–2.3 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.5–1.9 mm from corolla base which is 0.1–0.3 of tube length; anthers 1.1–2(–4) by 0.4–0.8 mm.

Disk annular to 5-crenate, 0.3–0.7 mm long, 0.5–1.4 times as long as ovary. *Ovaries* 0.5–0.9 mm long; style and style head 0.8–2 mm long. *Fruit* 7.3–12.5 by 1.4–2.3 cm. *Seeds*: grain 11.8–17 by 4.3–7.1 mm; beak 2.4–7.8 mm long; coma 4–5.6 cm long.

Distribution — Bangladesh, Burma, Thailand, China, Taiwan, Japan, Laos, Vietnam; in *Malesia*: Philippines.

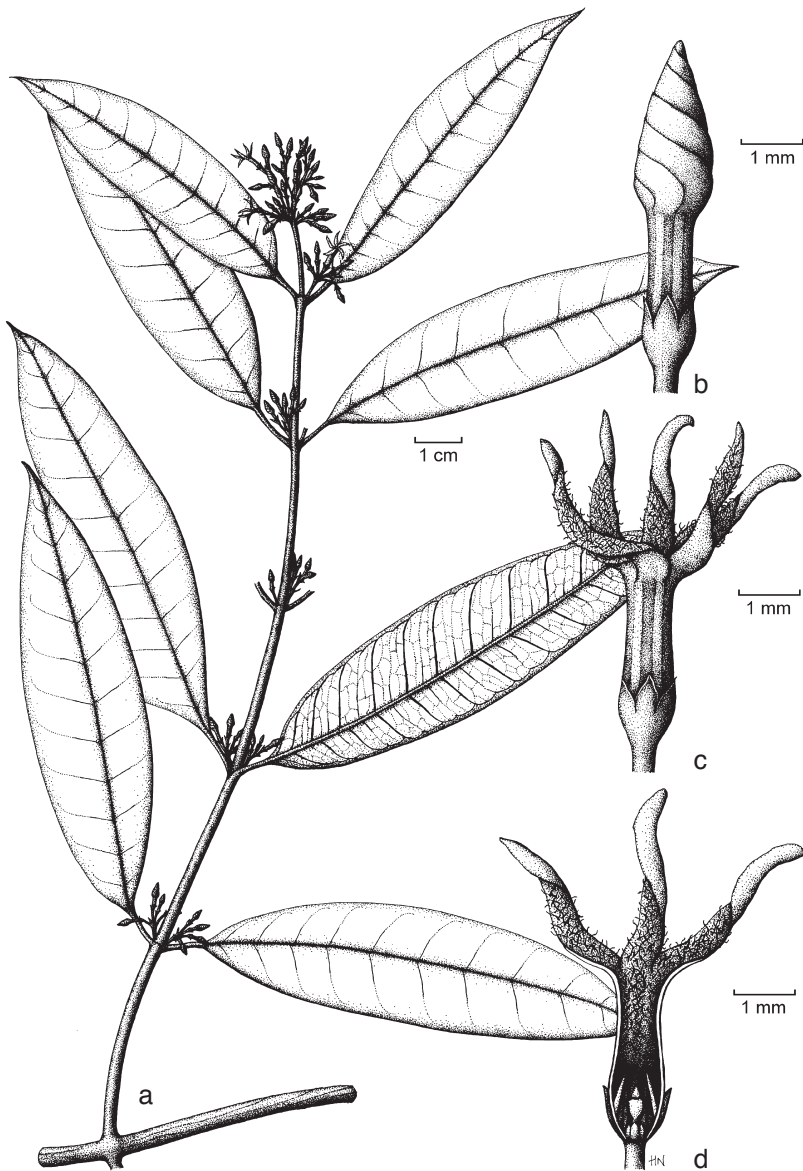


Fig. 29. *Anodendron axillare* Merr. a. Habit; b. flower in bud; c. open flower; d. flower dissection (Wenzel 3086, B).

2. *Anodendron axillare* Merr.

Anodendron axillare Merr., Philipp. J. Sci., Bot. 7 (1912) 331; Enum. Philipp. Fl. Pl. (1923) 333; D.J. Middleton, Blumea 41 (1996) 42; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 124. — Type: *Meyer & Foxworthy 13572* (lecto US, designated by Middleton (1996) op. cit.), Philippines, Negros, Farolan.
Chilocarpus denudatus auct. non Blume: Leeuwenb., Syst. Geogr. Pl. 72 (2002) 138, p.p.

Branchlets glabrous. *Leaves*: petiole 5–11 mm long; blade elliptic, oblong or weakly obovate, 5.5–12.3 by 1.1–4.5 cm, 2–5 times as long as wide, apex acuminate, base cuneate to obtuse, 13–16 pairs of secondary veins, fairly straight and prominent with weaker intercalated tertiary veins, glabrous above and beneath, punctate beneath. *Inflorescence* of short congested axillary cymes, occasionally also terminal, minutely densely puberulent to almost glabrous, 1–3.3 cm long; pedicels 1.7–3.3 mm long, bracteoles at base. *Sepals* ovate, 0.9–1.6 by 0.6–1.1 mm, 1.2–1.8 times as long as wide, apex acute, glabrous, ciliate. *Corolla* yellow; tube 3.4–4.8 mm long, 0.8–1 times as long as lobes; lobes 4–5 by 0.8–1.5 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.6–0.7 mm from corolla base which is 0.1–0.2 of tube length; anthers 1.3–1.5 by 0.4–0.6 mm. *Disk* annular or 5-dentate, 0.3–0.5 mm long, 0.6–0.8 times as long as ovary. *Ovaries* 0.5–0.7 mm long; style and style head 0.7–1.2 mm long. *Fruit* unknown. — **Fig. 29.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines.

3. *Anodendron borneense* (King & Gamble) D.J. Middleton

Anodendron borneense (King & Gamble) D.J. Middleton, Blumea 41 (1996) 46; Coode et al., Checklist Pl. Brunei (1996) 25. — *Cleghornia borneensis* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 492; Merr., Bibliogr. Enum. Born. Pl. (1921) 501; Masam., Enum. Phan. Born. (1942) 619; Z.R. Xu, Agric. Univ. Wageningen Pap. 88-6 (1988) 16. — *Micrechites borneensis* (King & Gamble) P.T. Li, J. S. China Agric. Univ. 11 (1990) 34. — Type: *Haviland & Hose 2169* (lecto SING, designated by Xu (1988) op. cit.; iso BM, CGE, K, L, SAR, SING), Borneo, Sarawak, Kuching.

Branchlets glabrous. *Leaves*: petiole 5–9 mm long; blade elliptic to weakly obovate, 8–15.2 by 2.4–6.8 cm, 2.1–3.8 times as long as wide, apex acuminate, base rounded to obtuse, 9–19 pairs of secondary veins, somewhat prominent, glabrous above and beneath, punctate beneath. *Inflorescence* axillary and/or terminal, glabrous, 4.4–10.5 cm long, bract position variable; pedicels 2.2–4.4 mm long. *Sepals* ovate, 1.2–1.8 by 0.7–1 mm, 1.4–2.1 times as long as wide, apex acute to obtuse, glabrous. *Corolla* yellow or cream; head ovoid, acute in bud, not strongly twisted; tube 5.3–6.1 mm long, 2–2.5 times as long as lobes; lobes oblong, rounded, 2.5–2.6 by 1.4–1.5 mm; glabrous outside, densely pubescent inside. *Stamens* inserted at 0.3–0.6 mm from corolla base which is c. 0.1 of tube length; anthers 1.4–1.8 by 0.3–0.5 mm. *Disk* 5-crenate, 0.4–0.5 mm long, 1–1.3 times as long as ovary. *Ovaries* 0.4–0.5 mm long; style and style head 0.4–0.9 mm long. *Fruit* of almost parallel follicles, somewhat stipitate, 9–19 cm by 5–6 mm. *Seeds*: grain 22–24 by 3.1–3.2 mm; beak 8–10.5 mm long; coma 3.4–3.7 cm long.

Distribution — *Malesia*: Borneo (Sarawak, Sabah, Brunei), Philippines (Palawan).
 Habitat & Ecology — In forest to 900 m.

4. *Anodendron candolleianum* Wight

Anodendron candolleianum Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1309; Miq., Fl. Ned. Ind. 2 (1857) 455; Hook. f., Fl. Brit. India 3 (1882) 669; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 487; Merr., Bibliogr. Enum. Born. Pl. (1921) 501; Ridl., Fl. Malay Penins. 2 (1923) 362; Burkill & M.R. Hend., Gard. Bull. Straits Settlements 3 (1925) 397; Masam., Enum. Phan. Born. (1942) 618; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; D.J. Middleton, Blumea 41 (1996) 47; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 124; D.J. Middleton, Fl. Thailand 7 (1999) 128. — Type: *Wight s.n.* (lecto K, designated by Middleton (1996) op. cit.; iso K), Peninsular Malaysia.

Ecdysanthera scandens Hassk., Cat. Hort. Bot. Bogor. (1844) 309; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 398. — *Anodendron scandens* (Hassk.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 191. — Type: *Hasskarl s.n.* (holo BO; iso P (scrap)), cultivated in Bogor Botanic Garden.

Dendrocharis rubescens Teijsm. & Binn., Tijdschr. Ned.-Indië 25 (1863) 403. — *Anodendron rubescens* (Teijsm. & Binn.) Teijsm. & Binn., Cat. Hort. Bot. Bogor. (1866) 127. — *Ecdysanthera rubescens* (Teijsm. & Binn.) Boerl., Handl. Fl. Ned. Ind. 2 (1899) 398; Merr., Bibliogr. Enum. Born. Pl. (1921) 500; Masam., Enum. Phan. Born. (1942) 620. — Type: *Binnendyck s.n.* (lecto K, designated by Middleton (1996) op. cit.), cultivated in Bogor Botanic Garden.

Anodendron spec. A Koord.-Schum., Syst. Verz. 1 (1912) 181, p.p.

Anodendron tenuiflorum auct. non (Miq.) Miq.: Backer & Bakh.f., Fl. Java 2 (1965) 236.

Branchlets glabrous. *Leaves*: petiole 1.5–5.2 cm long; blade thickly coriaceous, elliptic or oblong, 4.6–25 by 1.7–11.6 cm, 1.6–3.1 times as long as wide, apex acuminate to abruptly acuminate or apiculate, base rounded to obtuse, 8–12 strong pairs of secondary veins, tertiary venation oblique to midrib, glabrous above and beneath. *Inflorescence* mostly axillary delicate cymes, sometimes also terminal, glabrous, 3–23 cm long; pedicels 2.1–4 mm long, bracteoles at base. *Sepals* ovate, 0.6–1 by 0.3–0.6 mm, 1.2–3 times as long as wide, apex acute to rounded, glabrous. *Corolla* pinkish or cream coloured; tube 1.4–2.3 mm long, 0.5–1.1 times as long as lobes; lobes 1.7–2.9 by 0.5–1 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.5–0.7 mm from corolla base which is 0.3–0.4 of tube length; anthers 0.6–0.8 by 0.3–0.4 mm. *Disk* 5-dentate or 5-crenate, 0.4 mm long, 0.7–0.8 times as long as ovary. *Ovaries* 0.5–0.6 mm long; style and style head 0.7–0.8 mm long. *Fruit* 10.7–19.8 by 0.9–1.5 cm. *Seeds*: grain c. 22.5 by 5 mm; beak 15 mm long; coma 9 cm long.

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

5. *Anodendron coriaceum* (Blume) Miq.

Anodendron coriaceum (Blume) Miq., Fl. Ned. Ind. 2 (1857) 455; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; Merr., Bibliogr. Enum. Born. Pl. (1921) 501; Masam., Enum. Phan. Born. (1942) 618; Backer & Bakh.f., Fl. Java 2 (1965) 236; D.J. Middleton, Blumea 41 (1996) 48; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 124; D.J. Middleton, Fl. Thailand 7 (1999) 128. — *Echites coriaceus* Blume, Bijdr. (1826) 1039; A.DC., Prodr. 8 (1844) 478. — *Chonemorpha coriacea* (Blume) G. Don, Gen. Hist. 4 (1837) 76. — Type: *Blume 1760* (lecto L, designated by Middleton (1996) op. cit.; iso L, W), Java.

Anodendron coriaceum (Blume) Miq. var. *salaccensis* Hochr., Candollea 5 (1934) 182. — Type: *Hochreutiner 1713* (lecto G, designated by Middleton (1996) op. cit.; iso G, L, MO, UC, Z), W Java, Mt Salak, Suka Mantri.

Anodendron gracilentum Markgr., Mitt. Bot. Staatssamml. München 1 (1950) 26. — Type: *Clemens & Clemens 32148* (lecto M, designated by Middleton (1996) op. cit.; iso A, B, BM, BO, K, L, MO, NY, UC), Borneo, Sabah, Mt Kinabalu, Penibukan.

Branchlets glabrous. *Leaves*: petiole 5–19 mm long; blade elliptic, 2.2–10 by 0.4–3.9 cm, 2.7–5.3 times as long as wide, apex acuminate, base cuneate, 6–13 pairs of secondary veins, tertiary venation obscure, glabrous above and beneath. *Inflorescence* of delicate axillary and terminal cymes often forming a terminal panicle, glabrous, 3.6–9.5 cm long; pedicels 0.5–3.5 mm long, bracteoles on pedicel. *Sepals* ovate, 1.1–1.9 by 0.4–0.9 mm, 1.6–3 times as long as wide, apex acute or acuminate, glabrous, ciliate or eciliate. *Corolla* cream coloured or greenish; tube (1.8–)2.7–4.1 mm long, 0.3–0.9 times as long as lobes; lobes strap-shaped, falcate, 3.9–6.3 by 0.6–1.3 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.5–0.9 mm from corolla base which is 0.2–0.3 of tube length; anthers 1–1.3 by 0.3–0.4 mm. *Disk* 5-dentate or 5-crenate, 0.3–0.6 mm long, 0.8–1 times as long as ovary. *Ovaries* 0.3–0.6 mm long; style and style head 0.8–1.1 mm long. *Fruit* 6.8–8 by 1.2 cm. *Seeds*: grain 15.5–17.6 by 4.5–10 mm; beak 2.6–11 mm long; coma 3.4–4 cm long.

Distribution — Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Lesser Sunda Islands (Sumbawa).

6. *Anodendron gracile* (King & Gamble) D.J. Middleton

Anodendron gracile (King & Gamble) D.J. Middleton, *Blumea* 41 (1996) 50; I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 125. — *Cleghornia gracilis* King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 491; Ridl., *Fl. Malay Penins.* 2 (1923) 363; Burkill & M.R. Hend., *Gard. Bull. Straits Settle.* 3 (1925) 397; Z.R. Xu, *Agric. Univ. Wageningen Pap.* 88-6 (1988) 20. — *Micrechites gracilis* (King & Gamble) P.T. Li, *J. S. China Agric. Univ.* 11 (1990) 34. — Type: *Scortechini* 384 (holo K), Peninsular Malaysia, Perak, Lawfield’s Hill.

Branchlets glabrous. *Leaves*: petiole 4–9 mm long; blade elliptic to ovate, 2.6–8 by 0.6–2.6 cm, 1.9–5.5 times as long as wide, apex acuminate to caudate, base cuneate to rounded, 9–18 pairs of secondary veins almost perpendicular to midrib, somewhat obscure, glabrous above and beneath. *Inflorescence* paniculate, glabrous, 3.2–10 cm long; pedicels 2–7.5 mm long, bracteoles at base. *Sepals* ovate, 0.5–0.9 by 0.4–0.7 mm, 0.8–1.8 times as long as wide, apex rounded, glabrous. *Corolla* yellow; head rounded in bud, not twisted; tube 1.1–1.8 mm long, 0.8–2.5 times as long as lobes; lobes rounded or obtuse, 0.7–2.1 by 0.7–1 mm; glabrous outside, pubescent inside. *Stamens* inserted at 0.2–0.5 mm from corolla base which is 0.1–0.2 of tube length; anthers 0.9–1.1 by 0.4 mm. *Disk* 5-crenate or 5-dentate, 0.4–0.5 mm long, 1–1.7 times as long as ovary. *Ovaries* 0.3–0.4 mm long; style and style head 0.8–1 mm long. *Fruit* unknown.

Distribution — *Malesia*: Peninsular Malaysia, Borneo, Philippines (Palawan).

7. *Anodendron nervosum* Kerr

Anodendron nervosum Kerr, *Bull. Misc. Inform. Kew* 1937 (1937) 93; D.J. Middleton, *Blumea* 41 (1996) 51. — Type: *Kerr* 5784 (lecto K, designated by Middleton (1996) op. cit.; iso BM, K, P, TCD), Thailand, Phetchabun, Phu Lom Lo, Dan Sai.

Micrechites formicinus Tsiang & P.T. Li, *Acta Phytotax. Sin.* 11 (1973) 385; *Fl. Reipubl. Popularis Sin.* 63 (1977) 189; Ying & P.T. Li, *Fl. Yunnan* 3 (1983) 540. — *Anodendron formicina* (Tsiang & P.T. Li) D.J. Middleton, *Novon* 4 (1994) 152. — Type: *Wang* 73452 (holo PE; iso A, IBSC), China, Yunnan, Nan-Chiao.

Branchlets glabrous. *Leaves*: petiole 7.5–17 mm long; blade elliptic to oblong, rarely obovate, 4.6–16.9 by 1.6–5.2 cm, 2.4–5.1 times as long as wide, apex acuminate, base rounded to cuneate, 11–29 pairs of secondary veins, not prominent, tertiary venation obscure, glabrous above and beneath, glaucous beneath. *Inflorescence* of large terminal panicles, glabrous, 9–22 cm long; pedicels 2.1–7 mm long, bracteoles at base. *Sepals* ovate, 0.8–1.6 by 0.5–0.8 mm, 1.3–2.8 times as long as wide, apex obtuse to acute, glabrous. *Corolla* yellow-green; tube 1.9–4(–4.7) mm long, 0.5–0.8 times as long as lobes; lobes strap-shaped, falcate, 3–8.5 by 0.7–1.8 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.4 mm from corolla base which is 0.2 of tube length; anthers 1.2–1.6 by 0.4–0.5 mm. *Disk* 5-crenate or 5-dentate, 0.4–0.6 mm long, 1–1.2 times as long as ovary. *Ovaries* 0.4–0.6 mm long; style and style head 0.6–1.2 mm long. *Fruit* thin walled; 8.3–11.5 by 1–1.2 cm. *Seeds*: grain 16–20 by 4.5–6 mm; beak 7–22 mm long; coma 3.5–4.5 cm long.

Distribution — India, China, Thailand, Laos, Vietnam; in *Malesia*: Sumatra, Java.

8. *Anodendron oblongifolium* Hemsl.

Anodendron oblongifolium Hemsl., Ann. Bot. 5 (1891) 504; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 507; D.J. Middleton, Blumea 41 (1996) 52. — Type: *Comins 40* (lecto K, designated by P.I. Forster, Kew Bull. 48 (1993) 140), Solomon Islands, San Cristobal.

Anodendron paniculatum auct. non A.DC.: Markgr., Bot. Jahrb. Syst. 61 (1927) 208; P.I. Forst., Kew Bull. 48 (1993) 139.

Branchlets glabrous. *Leaves*: petiole 0.6–2.1 cm long; blade elliptic, oblong or obovate, 6.1–16.1 by 2.6–7.6 cm, 2.1–3.8 times as long as wide, apex acuminate, base cuneate to rounded, 9–13 strong pairs of secondary veins, tertiary venation weaker, oblique when visible, glabrous above and beneath. *Inflorescence* of axillary cymes, sometimes also terminal, minutely puberulent, rarely glabrous, 1.8–10.2 cm long; pedicels 1.1–3.8 mm long, bracteoles at base. *Sepals* ovate, 1.1–2.4 by 0.6–1.2 mm, 1.4–2.7 times as long as wide, apex rounded to acute, glabrous, ciliate. *Corolla* white or yellowish; tube 1.6–3.4 mm long, 0.4–0.7 times as long as lobes; lobes strap-shaped, falcate, 3–6.2 by 0.7–1.7 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.5–0.9 mm from base, 0.2–0.3 of tube length; anthers 0.9–1.2 by 0.3–0.4 mm. *Disk* 5-crenate, 0.3–0.5 mm long, 0.6–1 times as long as ovary. *Ovaries* 0.4–0.5 mm long; style and style head 0.7–1 mm long. *Fruit* 11.1–15 by 1.1–1.8 cm. *Seeds*: grain 12.5–17.6 by 5.4–7.4 mm; beak 6–9 mm long; coma 5.4–9 cm long.

Distribution — Solomon Islands, Vanuatu; in *Malesia*: Borneo, Philippines, Moluccas (Ceram), New Guinea.

9. *Anodendron paniculatum* A.DC.

Anodendron paniculatum A.DC., Prodr. 8 (1844) 444; Miq., Fl. Ned. Ind. 2 (1857) 454; Thwaites, Enum. Pl. Zeyl. (1860) 194; Dalzell & Gibson, Bombay Fl. (1861) 147; Kurz, J. Asiat. Soc. Bengal 46 (1877) 255; Forest Fl. Burma 2 (1877) 188; Hook.f., Fl. Brit. India 3 (1882) 668; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 486; Cooke, Fl. Bombay 2 (1908) 141; Ridl., Fl. Lower Siam (1911) 134; Koord.-Schum., Syst. Verz. 1 (1912) 180; Ridl., Fl. Malay Penins. 2 (1923) 361; C.E. Parkinson, Forest Fl. Andaman Isl. (1923) 207; Markgr., Bot. Jahrb. Syst. 61 (1927) 208; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1231; Backer &

- Bakh.f., Fl. Java 2 (1965) 236; Lý, Feddes Repert. 97 (1986) 650; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 33; P.I. Forst., Kew Bull. 48 (1993) 139; D.J. Middleton, Blumea 41 (1996) 54; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 124; D.J. Middleton, Fl. Thailand 7 (1999) 129. — *Echites paniculatus* [Wall., Numer. List 1663 (1829), nom. nud.]; Roxb., Fl. Ind. 2 (1832) 17, non Poir.; G. Don, Gen. Hist. 4 (1837) 75. — *Ichnocarpus paniculatus* Moon, Cat. Pl. Ceylon (1824) 20, nom. nud. — *Echites manubriatus* Wall., Numer. List 1663 (1829), nom. nud. — *Anodendron manubriatum* Merr., Philipp. J. Sci., Bot. 7 (1912) 333; Enum. Philipp. Fl. Pl. (1923) 333; Tsiang, Sunyatsenia 2 (1934) 131; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 26; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 69; Pradhan in Singh et al., Fl. Maharashtra State, Dicot. 2 (2001) 319. — Type: *Wallich 1663* (lecto K-W [as 1663.1], designated by H. Huber (1973) op. cit.; iso BR, G-DC, P), Bangladesh, Sylhet.
- Echites polyanthus* Wall., Numer. List 1664 (1829), nom. nud.
- Echites coriaceus* Wall., Numer. List 1664a (1829), non Blume, nom. nud.
- Anodendron rhinosporum* Thwaites, Enum. Pl. Zeyl. (1860) 194; Hook.f., Fl. Brit. India 3 (1882) 669; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 26; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 70. — Type: *Thwaites 2579* (lecto K, designated by H. Huber (1973) op. cit.; iso B, BM, BO, BR, G, GH, K, NY, P, TCD, UPS, W), Sri Lanka.
- Tabernaemontana tenuiflora* Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 554. — *Anodendron tenuiflorum* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 140; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; Bakh.f., Blumea 6 (1950) 387. — Type: *Diepenhorst 2234* (lecto U, designated by Middleton (1996) op. cit.; iso L), Sumatra, Priman.
- Anodendron moluccanum* Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 140; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400. — Type: *Teijsmann s.n.* (lecto U, designated by Middleton (1996) op. cit.; iso L), Moluccas, Ambon.
- Strophanthus balansae* Franch., Nouv. Arch. Mus. Hist. Nat. 3, 5 (1893) 262. — Type: *Balansa 2128* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 303; iso P), Vietnam, Tu Phap.
- Anodendron spec. A* Koord.-Schum., Syst. Verz. 1 (1912) 181, p.p.
- Anodendron spec. B* Koord.-Schum., Syst. Verz. 1 (1912) 181.
- Anodendron sutepense* Kerr, Bull. Misc. Inform. Kew 1937 (1937) 94. — Type: *Kerr 1748* (lecto K, designated by Middleton (1996) op. cit.; BM, E, K, L, P, TCD), Thailand, Chiang Mai, Doi Sutep.
- Parsonsia bulusanensis* Elmer ex Merr., Enum. Philipp. Fl. Pl. 3 (1923) 333, nom. illeg. (in synonymy of *Anodendron manubriatum* (= *A. paniculatum*)).

Branchlets glabrous. *Leaves*: petiole 0.7–2.6 cm long; blade elliptic, oblong or obovate, 13.9–28.5 by 1.3–10.4 cm, 1.7–4.6 times as long as wide, apex acuminate, more rarely apiculate, base cuneate to rounded, 8–18 pairs of secondary veins, usually slightly prominent beneath, tertiary venation obscure, glabrous above and beneath. *Inflorescence* axillary and terminal, usually forming a panicle, glabrous, 5.5–15.2 cm long; pedicels 1.4–3.3 mm long, bracteoles at base. *Sepals* ovate, 0.7–1.3 by 0.8–1.2 mm, 1–3 times as long as wide, apex rounded to acute, glabrous, ciliate or not. *Corolla* white to greenish yellow; tube 1.2–2.7 mm long, 0.4–1.4 times as long as lobes; lobes strap-shaped, falcate, 1.7–4.4 by 0.6–1 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.3–1 mm from corolla base which is 0.2–0.4 of tube length; anthers 0.7–1.3 by 0.2–0.4 mm. *Disk* annular, 5-dentate or 5-crenate, 0.3–0.4 mm long, 0.7–1.3 times as long as ovary. *Ovaries* 0.3–0.6 mm long; style and style head 0.6–0.8 mm long. *Fruit* 8–15.5 by 1–3 cm. *Seeds*: grain 14–22 by 6–9 mm; beak 6–17 mm long; coma 5.2–9 cm long. — **Fig. 30.**

Distribution — India, Sri Lanka, Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines, Sulawesi, Lesser Sunda Islands, Moluccas.

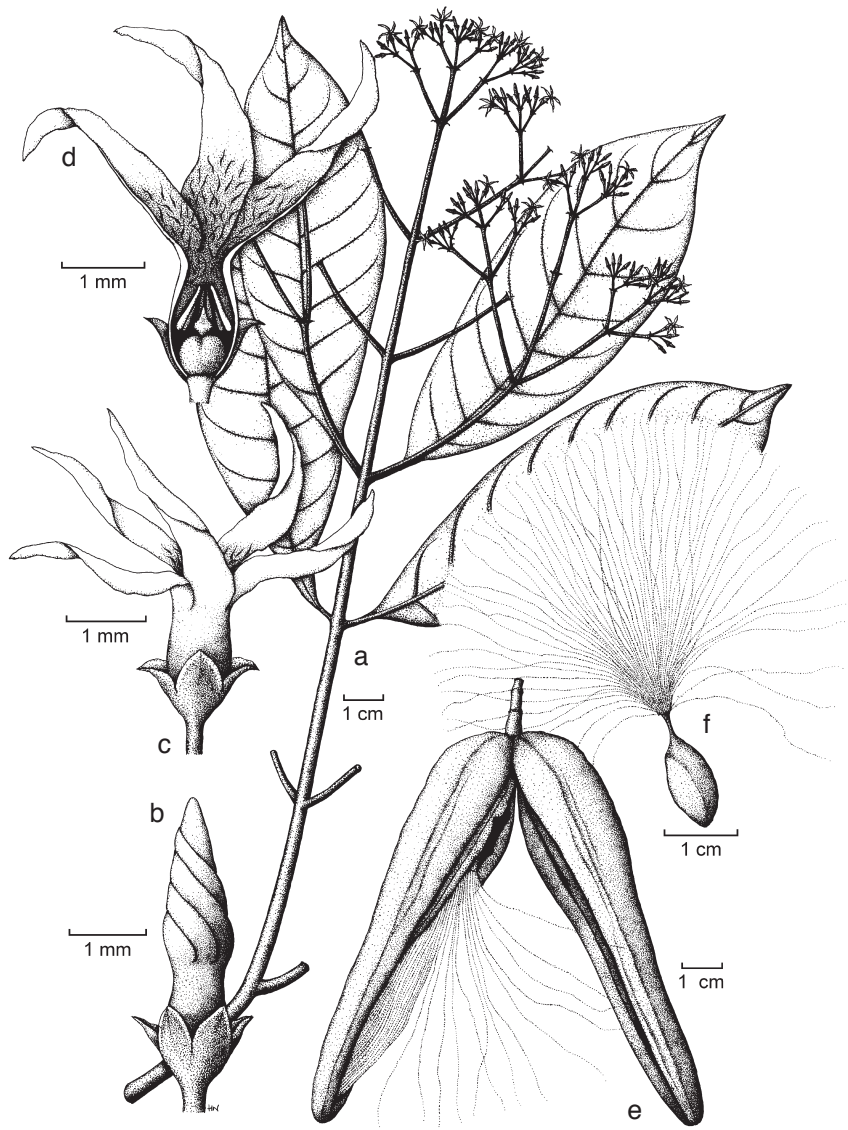


Fig. 30. *Anodendron paniculatum* A.DC. a. Habit; b. flower in bud; c. flower; d. dissected flower; e. fruit; f. seed (a–d: Kloss 6798, K; e, f: Kloss 6669, K).

10. *Anodendron pauciflorum* Hook.f.

Anodendron pauciflorum Hook.f., Fl. Brit. India 3 (1882) 669; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 488; Ridl., Fl. Malay Penins. 2 (1923) 362; Burkill & M.R. Hend., Gard. Bull. Straits Settlement. 3 (1925) 397; D.J. Middleton, Blumea 41 (1996) 58; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 124. — Type: *Maingay 1101* (lecto K, designated by Middleton (1996) op. cit.; iso BM, CGE, G, GH, K, L), Peninsular Malaysia, Penang.

Branchlets glabrous or minutely puberulent. *Leaves*: petiole 4–25 mm long; blade elliptic or weakly obovate, 3.8–12.6 by 1.8–4.7 cm, 1.8–3.6 times as long as wide, apex acuminate or apiculate, base acute to rounded, 7–11 clearly visible pairs of secondary veins, tertiary venation obscure, glabrous above and beneath, usually obscurely punctate beneath. *Inflorescence* of congested axillary cymes, sometimes also terminal, densely minutely puberulent, 2–4 cm long; pedicels 1.4–3.3 mm long, bracteoles at base. *Sepals* ovate, 1.6–2.7 by 0.8–1.2 mm, 1.6–2.3 times as long as wide, apex acute to obtuse, glabrous or minutely puberulent, ciliate. *Corolla* greenish yellow; tube 5–8 mm long, 0.6–1 times as long as lobes; lobes strap-shaped, falcate, 6.1–9.2 by 1.3–2 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.8–1.4 mm from corolla base which is 0.1–0.2 of tube length; anthers 1.4–1.9 by 0.5–0.6 mm. *Disk* annular, 5-dentate or 5-crenate, 0.5–0.6 mm long, 0.6–0.9 times as long as ovary. *Ovaries* 0.7–0.9 mm long; style and style head 1.1–1.3 mm long. *Fruit* 10.2–14 by 1.3–1.8 cm. *Seeds*: grain 8.5–13.5 by 3.5–6 mm; beak 6–7.9 mm long; coma 5–9.5 cm long.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

11. *Anodendron seramense* D.J. Middleton

Anodendron seramense D.J. Middleton, *Blumea* 41 (1996) 59. — Type: *Burley, Tukirin & Ismail 4397* (holo L; iso A, BISH, BO, E, K, KEP, S, SING), Moluccas, Ceram, 5 km ENE of Mahariki on River Noa.

Branchlets glabrous. *Leaves*: petiole 5–16 mm long; blade elliptic, 5–10.7 by 1.8–3.6 cm, 2.5–4.5 times as long as wide, apex acuminate, base cuneate to acute, 7–12 pairs of secondary veins, tertiary venation oblique to midrib, glabrous above and beneath. *Inflorescence* a delicate terminal cyme, glabrous, 4–9.1 cm long; pedicels 2.1–6.2 mm long, bracteoles on pedicel. *Sepals* ovate, 0.8–1.2 by 0.6–1 mm, 1.1–1.8 times as long as wide, apex rounded to obtuse, glabrous, eciliate. *Corolla* pale yellow or yellow-green; tube 1.6–1.9 mm long, 1.1–1.4 times as long as lobes; lobes ovate, 1.1–1.7 by 1.2–1.4 mm, apex obtuse; glabrous outside, pubescent on inside of lobes and sparsely in tube. *Stamens* inserted at 0.4–0.7 mm from corolla base which is 0.2–0.3 of tube length; anthers 0.7–0.9 by 0.4 mm. *Disk* 5-dentate, 0.4–0.5 mm long, 1–1.3 times as long as ovary. *Ovaries* 0.4 mm long, style and style head 0.7–1 mm long. *Fruit* unknown.

— **Fig. 31.**

Distribution — *Malesia*: Moluccas (Ceram, Ambon).

Habitat & Ecology — In primary evergreen forest to 70 m.

12. *Anodendron tubulosum* (Ridl.) D.J. Middleton

Anodendron tubulosum (Ridl.) D.J. Middleton, *Blumea* 39 (1994) 89; 41 (1996) 61; I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 124. — *Micrechites tubulosus* Ridl., *Fl. Malay Penins.* 5 (1925) 321; Burkill & M.R. Hend., *Gard. Bull. Straits Settlements* 3 (1925) 397. — Type: *Burkill & Haniff 12785* (lecto K, designated by Middleton (1996) op. cit.; iso BO, SING), Peninsular Malaysia, Perak, Maxwell’s Hill.

Branchlets glabrous. *Leaves*: petiole 5–7 mm long; blade elliptic, 5–7.2 by 1.7–2.6 cm, 2.8–3.4 times as long as wide, apex acuminate, base cuneate, 8–10 pairs of second-

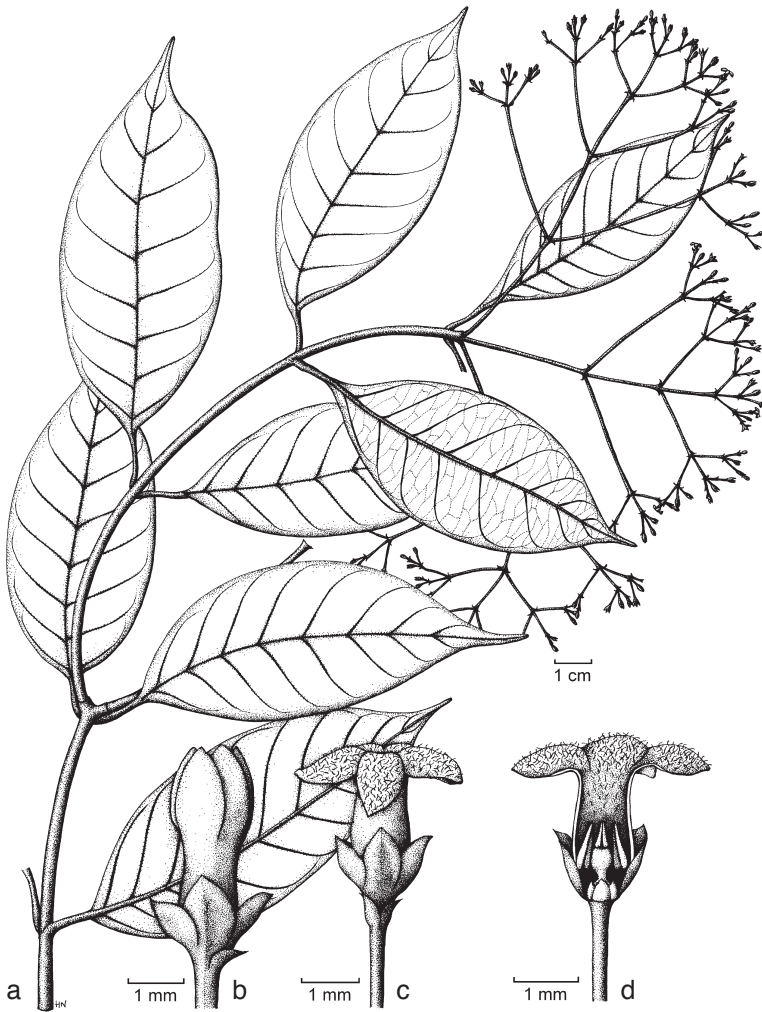


Fig. 31. *Anodendron seramense* D.J. Middleton. a. Habit; b. flower in bud; c. open flower; d. flower dissection (Burley et al 4397, A).

ary veins, tertiary venation obscure, glabrous above and beneath. *Inflorescence* of short axillary cymes, glabrous, 1.3–1.8 cm long; pedicels 1–1.5 mm long, with bracteoles at middle. *Sepals* ovate, 0.8–0.9 by 0.5–0.7 mm, 1.3–1.6 times as long as wide, apex acute, glabrous. *Corolla* tube 1.9–2 mm long, 1.2–2 times as long as lobes; lobes oblong, 0.9–1.6 by 1.2 mm, apex rounded; glabrous outside, densely pubescent inside. *Stamens* inserted at c. 0.3 mm from corolla base which is 0.1 of tube length; anthers c. 1.2 by 0.3 mm. *Disk* 5-dentate, c. 0.4 mm long, 1 times as long as ovary. *Ovaries* c. 0.4 mm long; style and style head c. 0.8 mm long. *Fruit* narrow, tapering, 5.2–8 cm by 4–5 mm. *Seeds*: grain 11 by 3–4 mm; beak 3–4 mm long; coma 2.1–4.2 cm long.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia.

13. *Anodendron whitmorei* D.J. Middleton

Anodendron whitmorei D.J. Middleton, *Blumea* 41 (1996) 63. — Type: *Whitmore BSIP 3898* (holo K; iso L), Solomon Islands, Malaita, Central, Are Are district, Mota 5 miles from Kiu.
Anodendron paniculatum auct. non A.DC.: P.I. Forst., *Kew Bull.* 48 (1993) 139, p.p.

Branchlets glabrous or minutely puberulent. *Leaves*: petiole 5–12 mm long; blade elliptic, 5.7–13.5 by 1.5–6.1 cm, 2.2–4.1 times as long as wide, apex acuminate, base cuneate to obtuse, 12–23 pairs of secondary veins, not particularly distinct from tertiary venation, prominent above and beneath, glabrous above and beneath, punctate

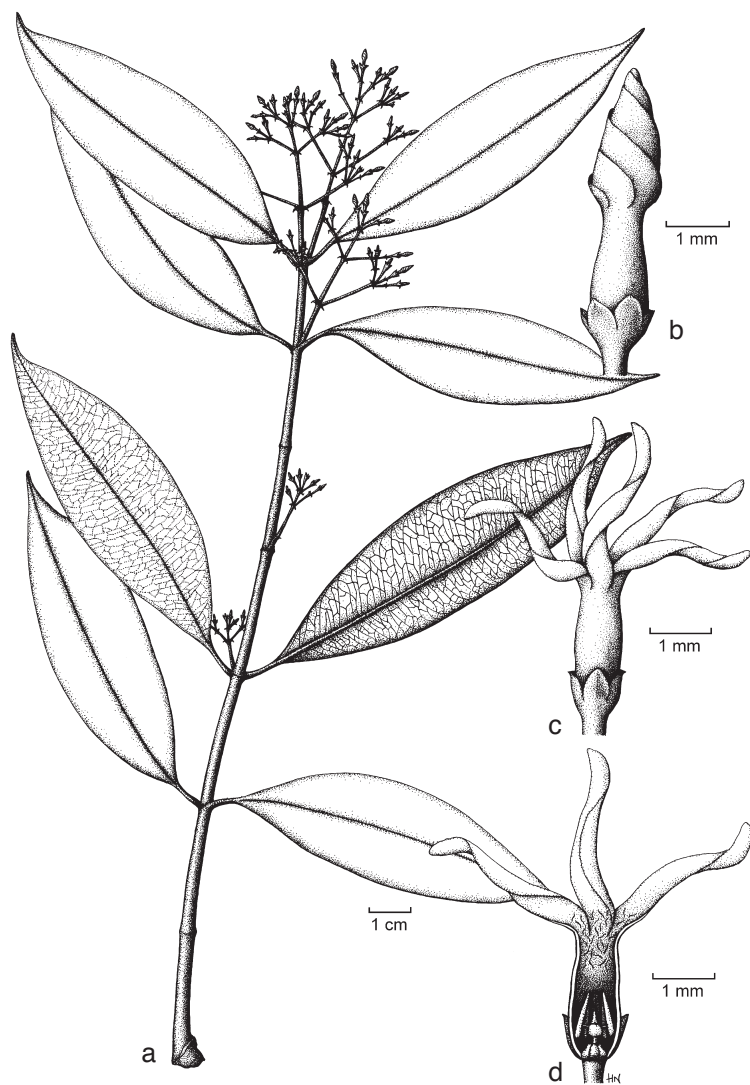


Fig. 32. *Anodendron whitmorei* D.J. Middleton. a. Habit; b. flower in bud; c. open flower; d. flower dissection (*Whitmore BSIP 3898*, L).

beneath. *Inflorescence* mostly axillary robust cymes, sometimes also terminal, glabrous or minutely puberulent, 3.9–13.2 cm long; pedicels 1.9–4 mm long, bracteoles at base. *Sepals* ovate, 0.9–1.6 by 0.7–1.2 mm, 0.8–1.6 times as long as wide, apex obtuse, glabrous, ciliate. *Corolla* yellow; tube 3–3.7 mm long, 0.8–1.1 times as long as lobes; lobes strap-shaped, falcate, 3–4.6 by 0.9–1.1 mm; glabrous outside, pubescent on inside of lobes, glabrous or sparsely pubescent at top of tube inside. *Stamens* inserted at 0.6–0.9 mm from corolla base which is 0.2–0.3 of tube length; anthers 1.3–1.6 by 0.5–0.6 mm. *Disk* annular or 5-crenate, 0.2–0.4 mm long, 0.3–0.6 times as long as ovary. *Ovaries* 0.6–0.7 mm long; style and style head 1–1.2 mm long. *Fruit* narrow dagger-shaped; c. 8.9 by 0.6 cm. *Seeds* not seen. — **Fig. 32.**

Distribution — Solomon Islands; in *Malesia*: Moluccas, New Guinea.

14. *Anodendron wrayii* King & Gamble

Anodendron wrayii King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 489; Ridl., Fl. Malay Penins. 2 (1923) 362; D.J. Middleton, Blumea 41 (1996) 63; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 124. — Type: *Wray 3836* (lecto K, designated by Middleton (1996) op. cit.), Peninsular Malaysia, Perak, Gunong Buleu.

Trachelospermum obtusifolium Ridl., J. Bot. 62 (1924) 298. — Type: *Burkill & Holtum 8898* (lecto K, designated by Middleton (1996) op. cit.; iso SING), Peninsular Malaysia, Pahang, Fraser Hill.

Branchlets glabrous. *Leaves*: petiole 5–12 mm long; blade obovate, 4.2–7 by 2–4.1 cm, 1.7–2.9 times as long as wide, apex rounded or apiculate, base cuneate to obtuse, 10–15 weak pairs of secondary veins, tertiary venation obscure, glabrous above and beneath, glaucous beneath. *Inflorescence* a terminal panicle, glabrous, 6.5–11.8 cm long; pedicels 3.5–11 mm long, bracteoles at base. *Sepals* ovate, 1.6–2.6 by 1–1.8 mm, 1.1–1.6 times as long as wide, apex acute, glabrous, eciliate. *Corolla* yellow-green; tube 4.7–8 mm long, 1.1–1.4 times as long as lobes; lobes falcate, 4–6.8 by 2.6 mm; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at c. 1.1 mm from corolla base which is 0.2 of tube length; anthers c. 3.2 by 1 mm. *Disk* annular, c. 0.5 mm long, 0.6 times as long as ovary. *Ovaries* c. 0.9 mm long; style and style head c. 1.2 mm long. *Fruit* 10–11 by c. 1 cm. *Seeds*: grain 16.5–17 by 5.5–6.5 mm; beak 7.5–11 mm long; coma 5–5.9 cm long.

Distribution — *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In forest from 1200–1600 m.

6. BAHARUIA

Baharuia D.J. Middleton, Blumea 40 (1995) 445; Coode et al., Checklist Pl. Brunei (1996) 26; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 9. — Type species: *Baharuia gracilis* D.J. Middleton.

Climbers or scramblers; producing white latex. *Branches* lenticellate or not. *Leaves* opposite; those of a pair equal in size; petiolate; blade papery, entire; secondary veins few, strongly ascending; hair-filled domatia in the axils of the secondary veins with the midrib. *Inflorescence* a terminal and/or axillary cyme, lax. *Flowers* 5-merous, actinomorphic, small. *Sepals* free, colleters in a row at the base inside. *Corolla*: lobes

dextrorse; mature corolla urceolate to salverform, consisting of a tube and somewhat spreading lobes; lobes narrow, strap-shaped, strongly bent to the right as viewed from inside. *Stamens* completely included within the corolla tube, attached at the insertion of the filament into the anthers in a ring to the style head; anthers with a short filament, fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* 5-dentate or 5-crenate, usually slightly shorter

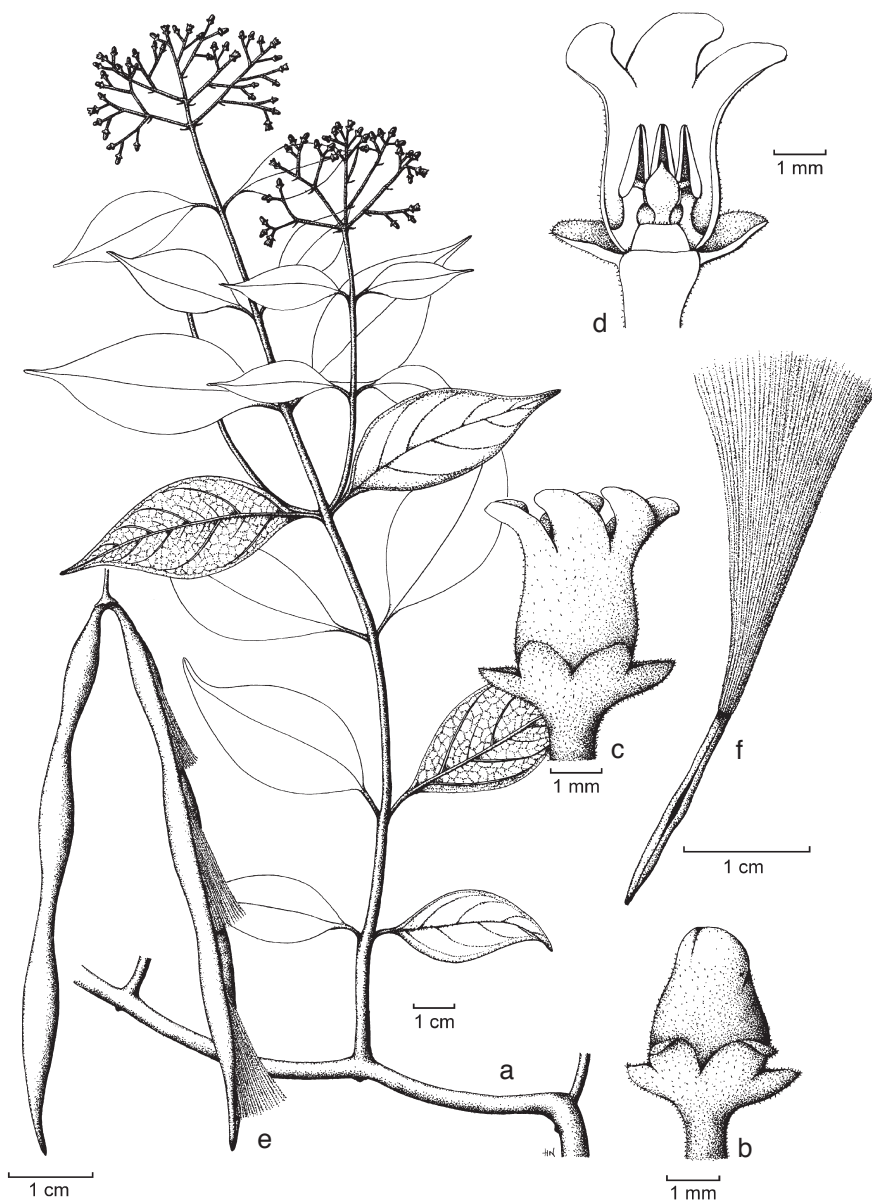


Fig. 33. *Baharuia gracilis* D.J. Middleton. a. Habit; b. flower bud; c, d. open flower; e. fruit; f. seed.

than ovary. Gynoecium 2-carpellate, apocarpous but apically united into a common style, superior, ovoid, pubescent. *Fruit* of 2 parallel or slightly divergent follicles; narrow and torulose; longitudinally dehiscent. *Seeds* linear; glabrous; unbeaked apex bearing a cream-coloured coma.

Distribution — 1 species in Sumatra and Borneo.

Baharua gracilis D.J. Middleton

Baharua gracilis D.J. Middleton, *Blumea* 40 (1995) 445; Coode et al., *Checklist Pl. Brunei* (1996) 26.
— Type: *Wood SAN 4678* (holo L; iso KEP, SING), Borneo, Sabah, Kinabatangan, Bukit Garam.

Branchlets densely brown puberulent or, rarely, glabrous; branches lenticellate or not. *Leaves*: petiole 2–7 mm long; blade papery, ovate, elliptic or weakly obovate, 2.3–13.3 by 0.9–4.7 cm, 2–3.6 times as long as wide, apex acuminate to caudate, base cuneate to rounded, 3–8 pairs of secondary veins, strongly ascending, tertiary venation laxly reticulate; hair-filled domatia in secondary vein axils with the midrib, occasionally also sparsely puberulent on the midrib. *Inflorescence* puberulent, 1.7–9.5 cm long; pedicels 0.9–4.5 mm long. *Sepals* ovate, 0.8–1.3 by 0.6–0.9 mm, 1–2 times as long as wide, apex rounded to acute, puberulent. *Corolla* yellow to orange; tube 1.3–3.1 mm long, 0.9–2 times as long as lobes, puberulent outside, puberulent behind stamens inside; lobes 0.9–2.2 by 0.5–0.9 mm. *Stamens* inserted at 0.2–0.5 mm from corolla base which is 0.1–0.2 of tube length; filaments 0.3–0.7 mm long; anthers 1.2–1.6 by 0.4–0.6 mm, 2.3–4 times as long as wide. *Disk* 0.4–0.8 mm long. *Ovaries* 0.4–0.9 mm long; style and style head 0.7–1.1 mm long. *Fruit* glabrous or very sparsely puberulent; 4–57 cm by 1.8–4 mm. *Seeds* 11.2–19 by 1.1–2 mm; coma 1.7–3 cm long. — **Fig. 33.**

Distribution — *Malesia*: Sumatra, Borneo.

Habitat & Ecology — In evergreen forest or at forest margin to 900 m altitude.

7. BEAUMONTIA

Beaumontia Wall., *Tent. Fl. Napal.* 1 (1824) 14; G. Don, *Gen. Hist.* 4 (1837) 77; A.DC., *Prodr.* 8 (1844) 403; Benth. & Hook.f., *Gen. Pl.* 2 (1876) 721; K. Schum. in Engl. & Prantl, *Nat. Pflanzenfam.* 4, 2 (1895) 177; Pit. in Lecomte, *Fl. Indo-Chine* 3 (1933) 1235; Pichon, *Mém. Mus. Natl. Hist. Nat., sér. B, Bot.* 1 (1950) 61; Backer & Bakh.f., *Fl. Java* 2 (1965) 239; Rudjiman, *Agric. Univ. Wageningen Pap.* 86-5 (1987) 3; D.J. Middleton, *Fl. Thailand* 7 (1999) 100. — Type species: *Beaumontia grandiflora* Wall.

Muantum Pichon, *Bull. Mus. Hist. Nat. (Paris), sér. 2*, 20 (1948) 382. — Type species: *Muantum roseum* (C.E.C. Fisch.) Pichon

Climbers with white latex. *Branches* terete, lenticellate; branchlets tomentose. *Leaves* opposite; with long glands in the axils. *Inflorescence* a terminal or axillary cyme; all axes tomentose; bracts frequently deciduous, large and leafy; flowers large, 5-merous; actinomorphic or slightly zygomorphic. *Sepals* leafy; colleters inside. *Corolla* lobes dextrorse; open corolla infundibuliform with the lower tube shorter than the upper tube. *Stamens* with long filaments, adnate to the style head; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* 5-lobed, surrounding the ovary. Gynoecium 2-carpellate, apocarpous

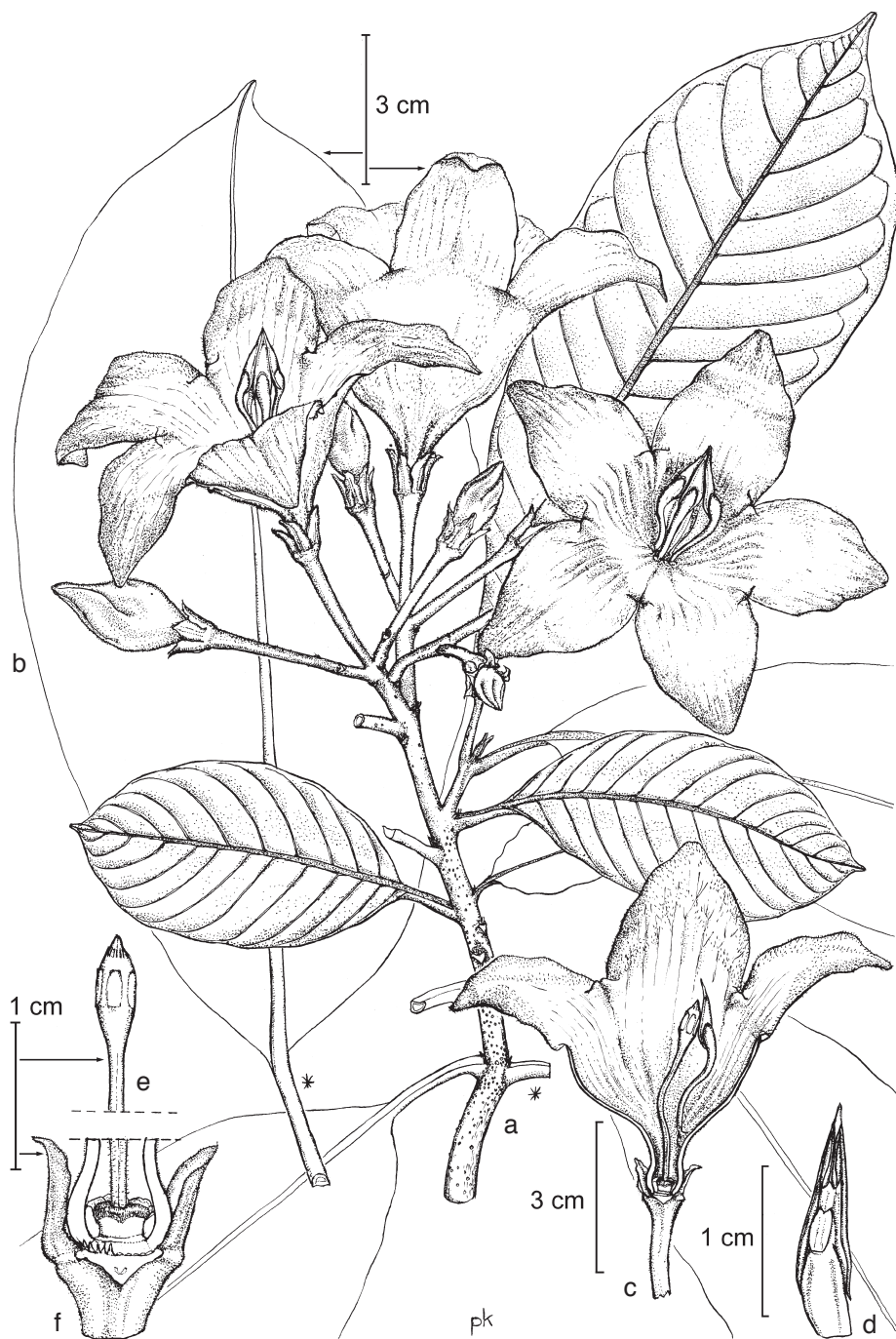


Fig. 34. *Beaumontia multiflora* Teijsm. & Binn. a. Habit; b. outline of fully developed leaf; c. section of flower; d. anther, ventral view; e. pistil head; f. flower base, partly dissected (Leeuwenberg 11893).

but apically united into a common style, ovules numerous; style filiform; style head ellipsoid. *Fruit* an oblong follicle; lenticellate. *Seeds* numerous, unbeaked, with an apical coma.

Distribution — 9 species in India, Nepal, Bhutan and southern China through Indo-China to Bali; in *Malesia* 2 species.

KEY TO THE SPECIES

- 1a. Stamens included; filaments ≥ 30 mm long *B. grandiflora* Wall. [cultivated]
 b. Stamens exerted; filaments < 30 mm long 2
 2a. Sepals 9–20(–30) mm long; lower part of corolla tube 5–10 mm long; filaments inserted at 10–15(–20) mm from corolla base **1. *B. multiflora***
 b. Sepals 24–40(–45) mm long; lower part of corolla tube (10–)15–17.5 mm long; filaments inserted at 20–25 mm from corolla base **2. *B. murtonii***

1. *Beaumontia multiflora* Teijsm. & Binn.

Beaumontia multiflora Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 4 (1853) 395; Miq., Fl. Ned. Ind. 2 (1857) 430; Bakh.f., Blumea 6 (1950) 387; Backer & Bakh.f., Fl. Java 2 (1965) 239; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 27; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 124; D.J. Middleton, Fl. Thailand 7 (1999) 103. — Type: *Teijsmann 14050* (lecto BM, designated by Rudjiman (1987) op. cit.), W Java, Banten.

Beaumontia campanulata K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 177. — Type: Not traced.

Leaves: petiole 1–2 cm long, glabrous or sparsely puberulent; blade papery, elliptic to obovate, 5.5–24.5 by 2–13 cm, 1.5–2.6 times as long as wide, apex acuminate, base cuneate, older leaves sparsely pubescent on underside of veins. *Inflorescence* lax, 10–17 cm long, c. 8-flowered; peduncle 3–10 cm long; pedicels 1.5–4 cm long. *Sepals* leafy, elliptic, 9–20(–30) by 2–6(–10) mm, 2–4.5 times as long as wide, apex acuminate, tomentose. *Corolla* white and pale yellow or green; tube (2–)3–4.6(–5) cm long, lower part of tube 5–10 mm long; lobes 1.7–3 cm long, apex rounded to acuminate; tomentose outside and on lobes inside, inside of tube glabrous. *Stamens* inserted at 1–1.5(–2) cm from corolla base; filaments 1.5–2.7 cm long, glabrous; anthers 10–13 by 1.9–3 mm. *Disk* glabrous or very sparsely pubescent. *Ovaries* densely pubescent, 0.5–2 mm long; style and style head 2.5–3.4 cm long, very sparsely pubescent. *Fruit* a solitary follicle, oblong/ellipsoid, apex rounded, base cordate, 10–26 by 3–7 cm. *Seeds* ellipsoid; flattened; (10–)14–20 by (2–)3.5–7 mm; coma (1.5–)2–5 cm. — **Fig. 34.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Java, Lesser Sunda Islands (Bali).

Habitat & Ecology — In forest to 700 m altitude.

2. *Beaumontia murtonii* Craib

Beaumontia murtonii Craib, Bull. Misc. Inform. Kew 1914 (1914) 282; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1239; Kerr in Craib, Fl. Siam. 2 (1939) 476; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 132; Rudjiman, Agric. Univ. Wageningen Pap. 86-5: 31 (1987); P.T. Li et al., Fl. China

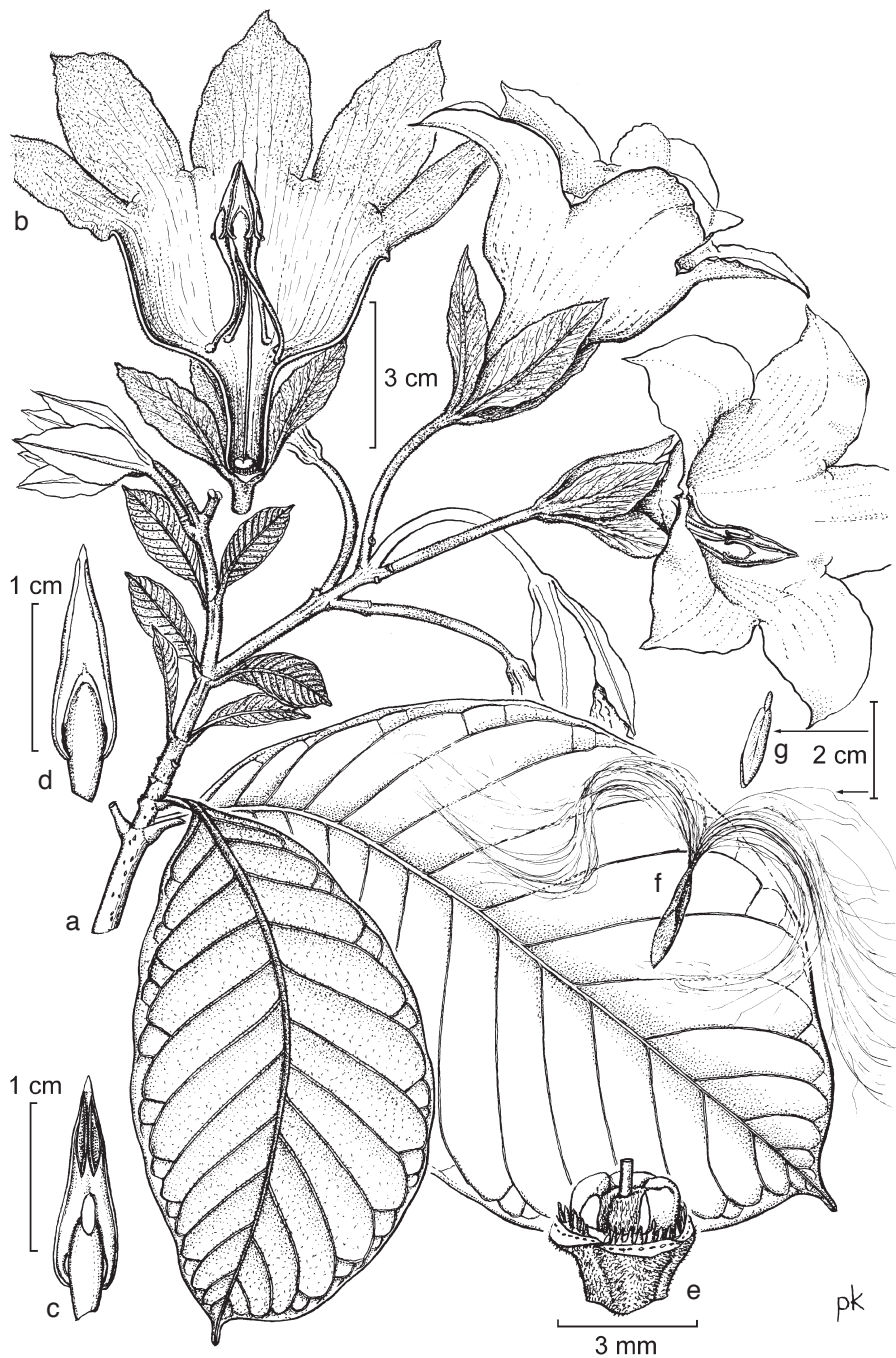


Fig. 35. *Beaumontia murtonii* Craib. a. Flowering branch; b. opened flower; c, d. anther both sides; e. ovary; f. seed; g. embryo (a–e: Kerr 19837; f, g: Collins 1030).

16 (1995) 176; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 124; D.J. Middleton, Fl. Thailand 7 (1999) 103. — Type: *Murton 113* (lecto K, designated by Rudjiman (1987) op. cit.), Thailand, Kow Hoo Wen.

Beaumontia fragrans Pierre [ex L. Planch., Prod. Apocyn. (1894) 325, nom. nud.] ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1236; Lý, Feddes Repert. 97 (1986) 644. — Type: *Pierre 484* (lecto K, designated by Lý (1986) op. cit.; iso P), Vietnam, An Giang, Mt Cam, Chau Doc.

Leaves: petiole 1–2.5(–3) cm long; blade papery, elliptic or obovate, 9–29 by (3.5–) 4.5–14.2(–15) cm, 1.4–2.3 times as long as wide, apex acuminate or apiculate, base obtuse to cuneate, tomentose when young, becoming almost glabrous. *Inflorescence* lax, 11–19.5 cm long, 3–15-flowered; peduncle 2–6(–9) cm long; pedicels 3–5 cm long. *Sepals* leafy, ovate, 2.4–4 by 1.1–2.7 cm, 1–3 times as long as wide, apex acuminate or apiculate. *Corolla* white or yellowish; tube 4–6.5 cm long, lower part of tube (10–)15–17.5 mm long; lobes 1.8–5.6 cm long, apex acute or acuminate; tomentose outside and on lobes and upper corolla tube inside, otherwise glabrous. *Stamens* inserted at 1.8–2.5 cm from corolla base; filaments 2–3.5 cm long, glabrous; anthers 10.7–15 by 2–3 mm, sagittate base 2–3.5 mm long. *Disk* glabrous or very sparsely pubescent. *Ovaries* densely pubescent, 1.4–2.5 mm long; style and style head 3.6–5 cm long, glabrous or sparsely pubescent. *Fruit* 18 by 5 cm, ellipsoid, obtuse at the apex, cordate at the base, glabrous. *Seeds* 11–20 by 4–5 mm; sparsely pubescent or glabrous; obtuse at both ends; coma 3–8 cm long. — **Fig. 35.**

Distribution — Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In evergreen forests or thickets to 1500 m.

8. CARISSA

Carissa L., Mant. Pl. 1 (1767) 7, nom. cons.; R.Br., Prodr. (1810) 468; A.DC., Prodr. 8 (1844) 331; Benth. & Hook.f., Gen. Pl. 2 (1876) 695; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1112; Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 130; Backer & Bakh.f., Fl. Java 2 (1965) 222; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 9; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 9; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 34; Lý, Feddes Repert. 97 (1986) 408; P.T. Li et al., Fl. China 16 (1995) 146; P.I. Forst., Fl. Australia 28 (1996) 107; D.J. Middleton, Fl. Thailand 7 (1999) 10; Leeuwenb. & Van Dilst, Agric. Univ. Wageningen Pap. 2001-1 (2001) 3. — *Carandas* Adans., Fam. Pl. 2 (1763) 171. — Type species: *Carissa carandas* L.

Shrubs, small trees or lianas. *Branches* bearing sharp spines, spines either simple or branched. *Leaves* opposite, those of a pair equal, usually with few secondary veins; colleters in axils few or absent. *Inflorescence* a terminal and/or axillary cyme, usually few-flowered; flowers 5-merous. *Sepals* without colleters inside. *Corolla* lobes dextrorse in bud (or sinistrorse in some African species); mature flower salverform with a narrow tube and spreading lobes. *Stamens* completely included in the corolla tube; filaments short and filiform; anthers ovate to oblong, fertile entire length, free from the style head. *Disk* absent. Gynoecium syncarpous, bilocular, each locule with 2 ovules; style filiform. *Fruit* a fleshy berry; 4-seeded. *Seeds* flattened, ellipsoid.

Distribution — 7 species in Africa, Continental South and Southeast Asia, New Guinea, New Caledonia, Australia; in *Malesia*: 1 species.

KEY TO THE SPECIES

- 1a. At least some leaves oblong and all with rounded apex; with 4–12 pairs of secondary veins all forming similar angles with the midrib *C. carandas* [cultivated]
 b. Leaves circular to narrowly elliptic and acuminate to rounded, then usually apiculate, at apex; one or several basal pairs of curving secondary veins forming a narrower angle with the midrib than the other straighter ones **C. spinarum**

***Carissa spinarum* L.**

Carissa spinarum L., Mant. Pl. 2 (1771) 559; Miq., Fl. Ned. Ind. 2 (1857) 399; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 9; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 10; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 35; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 35; P.T. Li et al., Fl. China 16 (1995) 146; M.F. Watson, Fl. Bhutan 2 (1999) 664; D.J. Middleton, Fl. Thailand 7 (1999) 11; Leeuwenb. & Van Dilst, Agric. Univ. Wageningen Pap. 2001-1 (2001) 35; Kress et al., Checklist Pl. Myanmar (2003) 147. — Type: *Koenig s.n.* (lecto LINN 295.2, designated by Huber (1973) op. cit.), India, sine loc.

Carissa lanceolata R.Br., Prodr. (1810) 468; Hochr., Candollea 5 (1934) 176. — Type: *R. Brown* (lecto BM, designated by P.I. Forster, Austral. Syst. Bot. 5 (1992) 583; iso CANB, K, P, S), Australia, Northern Territory, Sir Edward Pellew Group.

Carissa diffusa Roxb., Fl. Ind. 2 (1824) 524; Miq., Fl. Ned. Ind. 2 (1857) 399. — Type: *Roxburgh s.n.* (lecto BR, designated here; iso G-DC, K-W [as 1678B]), India, Orissa.

Carissa laxiflora Benth., Fl. Australiensis 4 (1869) 305; P.I. Forst., Blumea 35 (1990) 263. — Type: *Macgillivray s.n.* (holo K), Australia, Queensland, Cape York.

Carissa papuana Markgr., Nova Guinea 14, 2 (1926) 278; Bot. Jahrb. Syst. 61 (1927) 173. — Type: *Branderhorst 64* (lecto U, designated by Markgraf (1927) op. cit.; iso K, L), New Guinea, Papua, Okaba.

Carissa cochinchinensis Pierre ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1112; Kerr in Craib, Fl. Siam. 2 (1939) 427; Lý, Feddes Repert. 97 (1986) 409. — Type: *Poilane 9316* (lecto HM, designated by Lý (1986) op. cit.; iso P), Vietnam, Ninh Thuan, Ca Na.

Carissa laotica Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1113. — Type: *Thorel 2213* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 295; iso P), probably Cambodia (but labelled Laos), ‘Stung Streng’ (probably = Stung Treng).

Carissa laotica Pit. var. *ferruginea* Kerr, Bull. Misc. Inform. Kew 1937 (1937) 87; Kerr in Craib, Fl. Siam. 2 (1939) 428. — Type: *Kerr 9118* (lecto BM, designated here; iso K), Thailand, Saraburi, Muak Lek.

Strychnos pungens Gagnep., Notul. Syst. (Paris) 14 (1950) 23, non Solered. (1892). — Type: *Lecomte & Finet 1425* (holo P), Vietnam, de Phanrang à Tourcham.

For further synonymy for names that have not been used in Malesia and Southeast Asia (i.e. Africa, the rest of continental Asia and Australia) see Leeuwenberg & Van Dilst (2001) op. cit.

Shrub or small tree to 5 m tall, or a liana. *Branchlets* glabrous to puberulent; spines simple or branched, sometimes slightly recurved. *Leaves*: petiole 1.5–5 mm long; blade coriaceous, ovate, 1.4–12.2 by 0.8–6 cm, 1.5–2.8 times as long as wide, elliptic, obovate or orbicular, apex weakly retuse to acuminate, apiculate or mucronate, base cuneate to rounded, glabrous to pubescent above and beneath, 2–8 pairs of secondary veins, strongly ascending, tertiary venation obliquely scalariform or reticulate. *Inflorescence* 1.4–3 cm long, terminal and/or axillary; peduncle 0.2–1.8 cm long, glabrous or puberulent; pedicels 2–4.5 mm long. *Flowers* fragrant. *Sepals* ovate to narrowly ovate, 1.5–3 by 0.4–1.5 mm, 2.1–3.8 times as long as wide, apex acute to acuminate;

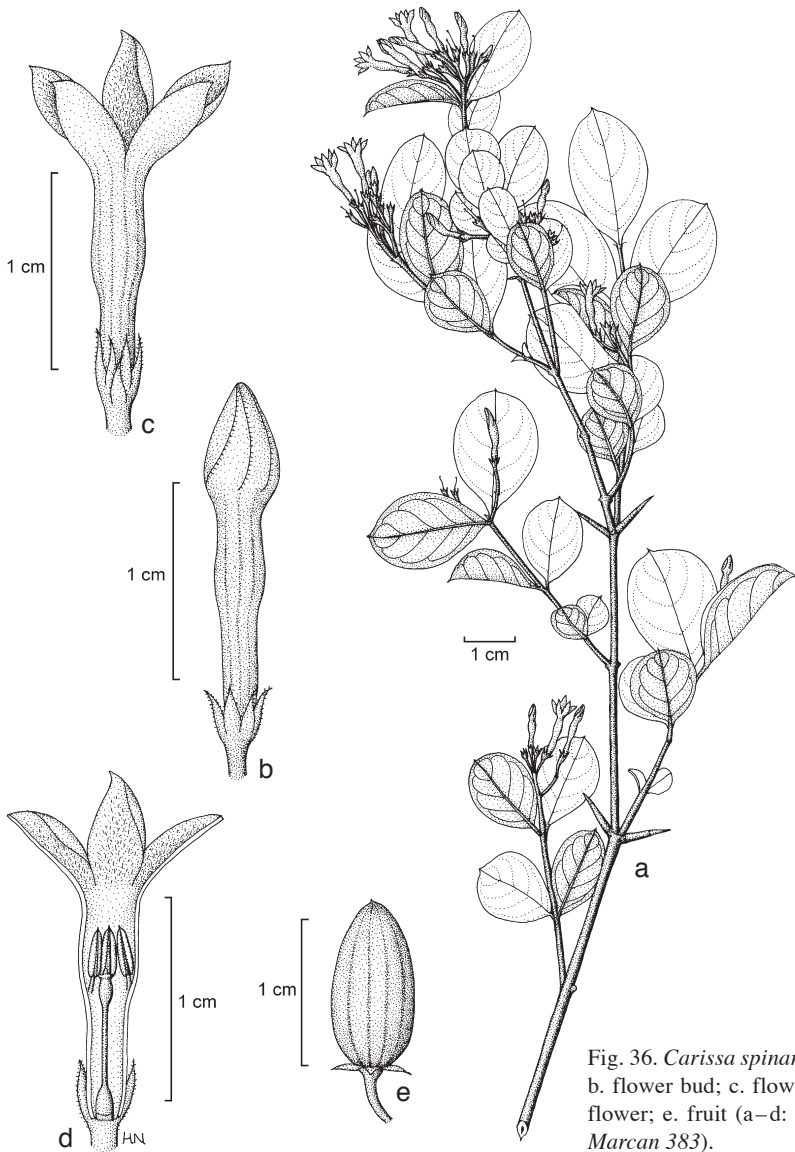


Fig. 36. *Carissa spinarum* L. a. Habit; b. flower bud; c. flower; d. dissected flower; e. fruit (a–d: Kerr 19898; e: Marcan 383).

glabrous, rarely sparsely puberulent, ciliate. *Corolla* white; tube 8–21.5 mm long, 1.4–2.7 times as long as lobes, 3.6–5 times as long as calyx, glabrous or pubescent at top of tube outside, pubescent inside; lobes 2.8–15 by 1.1–2.4 mm, 4.1–6.4 times as long as wide, ovate or oblong, apex acuminate to acute, glabrous to puberulent outside and inside, lobes ciliate. *Stamens* inserted at 0.7–0.8 of corolla tube length from base; filaments 0.2–0.5 mm long; anthers 1–2.5 by 0.3–0.7 mm. *Ovary* 0.5–1.5 mm long, glabrous or weakly papillose; style and style head 3–11.4 mm long. *Fruit* ovoid or subglobose, 0.6–2.5 cm by 4–15 mm; glabrous. — **Fig. 36.**

Distribution — Arabia, Subsaharan Africa, Madagascar, Seychelles, Pakistan, India, southern China and continental Southeast Asia, Australia, New Caledonia; in *Malesia*: Moluccas (Aru Islands), New Guinea, possibly also in Peninsular Malaysia.

Note — This is an extremely widespread and variable species with a very large disjunction between the western and eastern parts of its distribution. It has not yet been collected in Peninsular Malaysia but has been collected in the far south of Thailand so may occur there. The specimens from New Guinea tend to have somewhat smaller flowers and shorter corolla lobes in relation to the corolla tube but these characters are also very variable over short distances in the western part of the range.

9. CARRUTHERSIA

Carruthersia Seem., Fl. Vit. (1866) 155; Benth. & Hook. f., Gen. Pl. 2 (1876) 718; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 174; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 158; D.J. Middleton, Blumea 42 (1997) 490; Harvard Pap. Bot. 8 (2003) 1. — Type species: *Carruthersia scandens* Seem.

Woody climbers, producing white latex. *Branches* terete, lenticellate or not; branchlets terete, puberulent to glabrous. *Leaves* opposite, those of a pair equal, petiolate; bases of petioles usually joined in an inconspicuous ring around the branch, with colleters in a ring on younger nodes. Blade papery to coriaceous, entire, midrib impressed above and prominent beneath; secondary veins anastomosing before margin, tertiary venation scalariform and/or reticulate. *Inflorescence* of axillary and terminal cymes, often forming into a terminal panicle, glabrous or puberulent, lax; bracts small and ovate; flowers 5-merous, actinomorphic, often fragrant. *Sepals* free, entire, often with a thick base, with a row of colleters at the base inside. *Corolla* salverform; tube slightly wider near the base where the anthers are located and widening again slightly just before the top; lobes dextrorse, falcate in mature flower. *Stamens* seemingly free but actually very loosely adnate to style head, inserted near base of corolla tube; filaments filiform; anthers introrse, oblong, base shortly sagittate, apex mucronate, fertile most of length except at very base and apex. *Disk* of 2 separate ovate or oblong lobes alternating with the carpels. Gynoecium 2-carpellate, apocarpous but apically united into a common style, glabrous, ovules many, style head fusiform with a sterile pointed apex. *Fruit* of paired follicles, fusiform to terete, pointed at ends, somewhat laterally flattened, longitudinally dehiscent, many-seeded. *Seeds* elliptic with a coma pointing towards fruit apex, grain slightly elongated at end with coma.

Distribution — 4 species in the Philippines, Solomon Islands, Fiji, Tonga; in *Malesia* 2 species.

KEY TO THE SPECIES

- 1a. Leaves with 11–14 pairs of secondary veins; corolla tube c. 6.3 mm long
 **1. *C. glabra***
- b. Leaves with 5–10 pairs of secondary veins; corolla tube 6.8–14 mm long
 **2. *C. pilosa***

1. *Carruthersia glabra* D.J. Middleton

Carruthersia glabra D.J. Middleton, Harvard Pap. Bot. 8 (2003) 1. — Type: *Sulit PNH 6440* (holo A), Philippines, Samar Province, Mt Calbiga.

Branchlets dark brown, smooth with occasional lenticel, glabrous. *Leaves*: petiole 1.3–2.9 cm long; blade coriaceous, elliptic, 4.1–8.5 by 1.7–3.9 cm, 2–2.8 times as long as wide, apex shortly acuminate, base rounded to acute, 11–14 pairs of secondary veins at 70–80° from midrib, straight and anastomosing near margin and forming a looped intramarginal vein, tertiary venation of weaker veins intercalated between the secondary veins and more or less perpendicular to the midrib, becoming scalariform or netlike towards margin, glabrous above and beneath. *Inflorescence* axillary and terminal, lax, glabrous, 5.5–8.7 cm long; peduncle 2.7–4.2 cm by 1–1.2 mm; bracts and bracteoles small, deltoid, mostly with two small opposite bracteoles on the pedicel (possibly empty bracts) and a single bracteole immediately beneath the calyx; pedicels 6–13.5 mm long (including area below opposite bracteoles). *Sepals* ovate, 2–2.2 by 1.1–1.3 mm, 1.7–1.8 times as long as wide, apex obtuse to rounded, ciliate at apex, otherwise glabrous. *Corolla* whitish; tube 6.3 mm long, 1.4 times as long as lobes; lobes c. 4.4 by 1.9 mm, 2.3 times as long as wide; glabrous outside, densely pubescent around and above the stamens inside. *Stamens* inserted at c. 1.5 mm from corolla base which is 0.24 of tube length; filaments c. 0.3 mm long; anthers c. 1.5 by 0.5 mm. *Disk* irregularly deltoid, c. 0.3 mm long. *Ovaries* c. 0.5 mm long, glabrous; style and style head c. 2 mm long. *Fruit* unknown.

Distribution — *Malesia*: Philippines (Samar).

Habitat & Ecology — Reported only from mid-mountain forest at 300 m altitude.

2. *Carruthersia pilosa* (A.DC.) Fern.-Vill.

Carruthersia pilosa (A.DC.) Fern.-Vill., Novis. App. (1880) 137; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 335; D.J. Middleton, Blumea 42 (1997) 493. — *Kopsia pilosa* A.DC., Prodr. 8 (1844) 352; Miq., Fl. Ned. Ind. 2 (1857) 411. — Type: *Cuming 1783* (lecto G-DC, designated by Middleton (1997) op. cit.; iso BM, CGE, E, FR, K, L, NY, P, W, Z), Philippines, sine loc.

Ellertonia macgregori Merr., Publ. Bur. Sci. Gov. Lab. 35 (1906) 59. — *Carruthersia macgregorii* (Merr.) Merr., Philipp. J. Sci., Bot. 3 (1908) 261; Enum. Philipp. Fl. Pl. 3 (1923) 335; Tsiang, Sunyatsenia 2 (1934) 157. — Type: *Macgregor 285* (lecto K, designated by Middleton (1997) op. cit.; iso K, NY, US), Philippines, Mindoro, Baco River.

Carruthersia hirsuta Elmer, Leaflet Philipp. Bot. 2 (1909) 587. — Type: *Elmer 8899* (lecto E, designated here; iso BM, BO, MO, NY, US, W, Z), Philippines, Luzon, Benguet Province, Baguio.

Carruthersia kindleyi Elmer, Leaflet Philipp. Bot. 4 (1912) 1452. — Type: *Elmer 7833* (lecto K, designated by Middleton (1997) op. cit.; iso A, BO, BP, E, L, MO, NSW, NY, US, W, Z), Philippines, Luzon, Tayabas Province, Lucban.

Carruthersia brassii Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 215. — Type: *Brass 2609* (holo A; iso BISH, BM, BO, BRI, L), Solomon Islands, San Cristoval, Huro River.

Carruthersia mollis Markgr., Gard. Bull. Singapore 22 (1967) 25. — Type: *Whitmore BSIP 2749* (holo BSIP n.v.; iso K, L, SING), Solomon Islands, Santa Isabel, Bogotu, W of Peregá Village.

Branchlets glabrous to densely puberulent and then often interspersed with longer hairs. *Leaves*: petiole 0.6–8.2 cm long; blade papery to subcoriaceous, ovate, 2.3–20.6 by 1.1–13.6 cm, 1.1–3.3 times as long as wide, apex acuminate, base cordate to rounded, 5–10 pairs of secondary veins, glabrous to densely velutinous above and beneath.

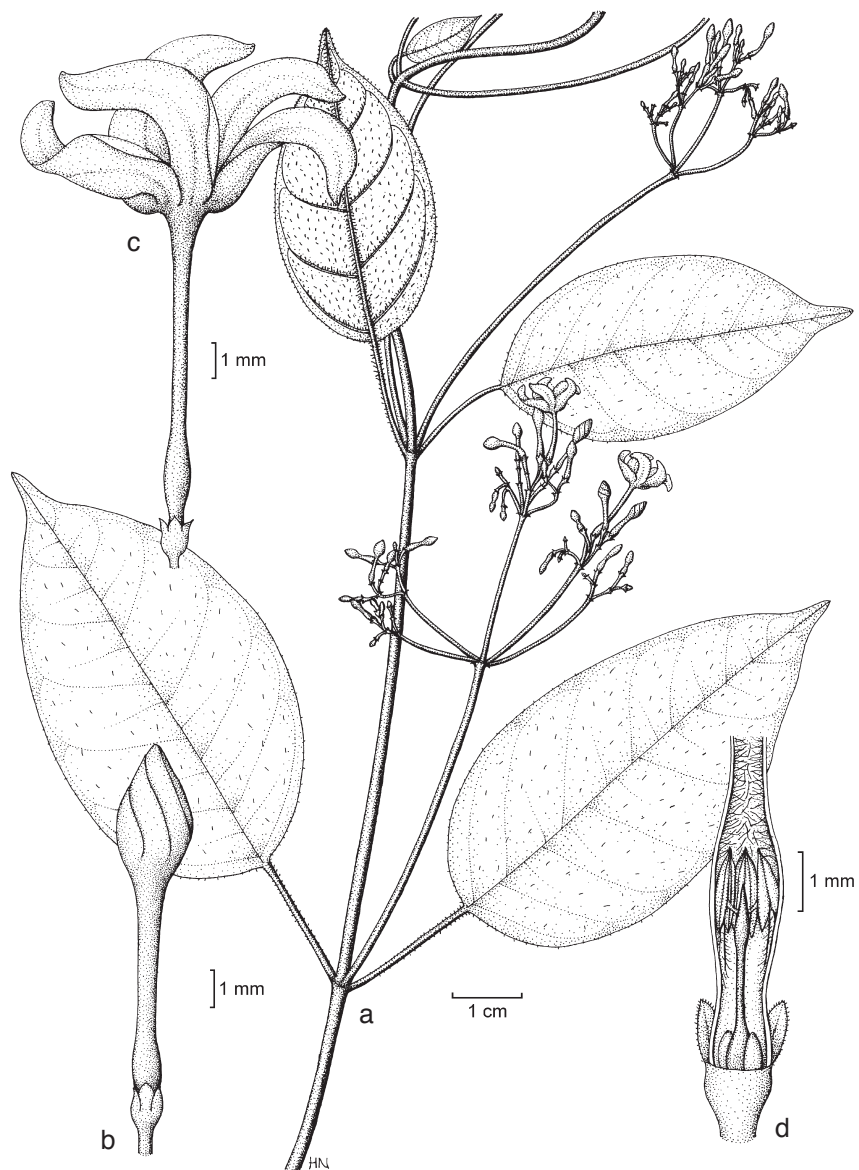


Fig. 37. *Carruthersia pilosa* (A.DC.) Fern.-Vill. a. Habit; b. flower in bud; c. open flower; d. flower dissection (a: Madulid et al. 952; b–d: Craven & Schodde 479).

Inflorescence axillary and terminal, often forming panicles, sometimes somewhat umbelliform, glabrous to velutinous, often with longer hairs interspersed, 3.8–20 cm long; pedicels 1.3–10 mm long. *Sepals* ovate to oblong, 0.6–1.9 by 0.5–1.3 mm, 0.7–2.4 times as long as wide, apex rounded to obtuse, rarely to acute, glabrous to puberulent, ciliate. *Corolla* white to reddish; tube 6.8–14 mm long, 0.9–2.5 times as long as lobes;

lobes 3.2–12.5 by 2–7 mm, 1.5–4.8 times as long as wide; glabrous to puberulent outside, densely pubescent around and above stamens inside. *Stamens* inserted at 1.1–2.5 mm from corolla base which is 0.1–0.2 of tube length; filaments 0.6–1 mm long; anthers 1.4–1.8 by 0.3–0.6 mm, 3–6 times as long as wide. *Disk* ovate to oblong, apex obtuse, flat-topped or slightly bifid, 0.3–0.7 mm long. *Ovaries* 0.3–0.9 mm long; style and style head 1.9–3 mm long. *Fruit* laterally flattened, fusiform, glabrous, 7–13.3 by 1.2–1.7 cm. *Seeds*: grain ruminant; 15–21 by 3.3–4.5 mm; coma 2.8–2.9 cm long.

— **Fig. 37.**

Distribution — Solomon Islands; in *Malesia*: Philippines.

Habitat & Ecology — Grows in primary or secondary forest to 2400 m altitude.

Note — The rather unusual distribution is discussed by Middleton (1997).

10. CERBERA

Cerbera L., Sp. Pl. (1753) 208; A.DC., Prodr. 8 (1844) 352; Benth. & Hook.f., Gen. Pl. 2 (1876) 699; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 158; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 426; Ridl., Fl. Malay Penins. 2 (1923) 338; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1137; Pichon, Notul. Syst. (Paris) 13 (1948) 221; Backer & Bakh.f., Fl. Java 2 (1965) 232; Whitmore, Tree Fl. Malaya 2 (1973) 12; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 17; J.A.R. Anderson, Checklist Trees Sarawak (1980) 148; Lippold, Feddes Repert. 91 (1980) 51; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 26; Corner, Wayside Trees Malaya ed. 3, 1 (1988) 153; P.I. Forst., Austrobaileya 3 (1992) 570; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 53; Coode et al., Checklist Pl. Brunei (1996) 26; Argent et al., Man. non-Dipterocarp Trees C. Kalimantan 1 (1997) 81; PROSEA 5, 3 (1998) 154; D.J. Middleton, Fl. Thailand 7 (1999) 65; Leeuwenb., Agric. Univ. Wageningen Pap. 98-3 (1999) 5; PROSEA 12, 2 (2001) 151; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 23. — *Odollam* Adans., Fam. Pl. 2 (1763) 171. — *Odollamia* Raf., Sylva Tellur. (1838) 162. — Type species: *Cerbera manghas* L.

Tanghinia Thouars, Gen. Nov. Madagasc. (1806) 10. — Type species: *Tanghinia venenifera* (= *Cerbera venenifera* (Poir.) Steud., possibly a synonym of *Cerbera manghas* L.)

Elcana Blanco, Fl. Filip., ed. 2 (1845) 584. — Type species: *Elcana seminuda* Blanco (= *Cerbera manghas* L.).

Shrubs or small trees. *Leaves* spirally arranged, with colleters in the axils; usually drying black. *Inflorescence* of terminal panicles; flowers 5-merous. *Sepals* without colleters inside. *Corolla* lobes sinistrorse; mature corolla salverform, sometimes weakly infundibuliform at top of tube; lobes obovate; corona of short lobes perpendicular to the corolla tube, above and below stamens. *Stamens* completely included in corolla tube; ± sessile; connate to each other by appendages on the top of the anthers, not attached to gynoecium; anthers ovate, fertile entire length except for appendages. *Disk* absent. Gynoecium 2-carpellate, apocarpous but apically united into a common style, glabrous; several ovules per carpel; style filiform. *Fruit* a drupe; often only one carpel developing; exocarp fleshy, mesocarp fibrous, endocarp lignified; one seed per locule. *Seeds* flattened, ellipsoid.

Distribution — A genus of 6 species from Madagascar and the Seychelles to Pitcairn Island and from the Ryukus to Queensland; in *Malesia* 5 species.

Note — Care must be exercised when interpreting the previous literature on *Cerbera* as species have often been confused with each other, especially *C. manghas* and *C. odollam*.

KEY TO THE SPECIES

- 1a. Stamens inserted at the top of the tube with widest part of tube at the throat . . . 2
 b. Stamens not inserted at the top of the tube with widest part of tube distinctly below the throat 3
 2a. Corolla with scales at the throat above the stamens, pubescent inside; sepals 8–21 mm long. **4. C. manghas**
 b. Corolla without scales, glabrous inside; sepals 4–8 mm long **2. C. inflata**
 3a. Stamens inserted near corolla tube base; corolla tube 29–33 mm long; sepals 3–4 mm long. **3. C. laeta**
 b. Stamens inserted around middle of corolla tube; corolla tube 8–25 mm long; sepals 4–19 mm long 4
 4a. Corolla glabrous inside, tube 8–20 mm long **1. C. floribunda**
 b. Corolla puberulent at least in throat inside, tube 13–22 mm long **5. C. odollam**

1. *Cerbera floribunda* K. Schum.

Cerbera floribunda K. Schum. in K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 111; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 505; Markgr., Nova Guinea 14, 2 (1926) 284; P.I. Forst., Austrobaileya 3 (1992) 570; Fl. Australia 28 (1996) 140; PROSEA 5, 3 (1998) 156; Leeuwenb., Agric. Univ. Wageningen Pap. 98-3 (1999) 12; Kessler et al., Blumea, Suppl. 14 (2002) 13. — Type: *Hollrung 849* (lecto K, designated by P.I. Forster (1992) op. cit.; iso BO, L, MEL, P, UPS), Papua New Guinea, West Sepik Province, Augustfluss (= Sepik River).

Cerbera batjanica Teijsm. & Binn. ex Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 247, t. 26. — Type: *Cultivated Bogor Botanic Garden IV A 92* (lecto L [914.116-142], designated by Leeuwenberg (1999) op. cit.).

Cerbera micrantha Kaneh., Bot. Mag. (Tokyo) 45 (1931) 343. — Type: *Kanehira 470* (lecto TI n.v., designated by Leeuwenberg (1999) op. cit.; iso BISH), Palau, Babeldaob.

Tree to 40 m tall, mostly much smaller, to 60 cm dbh, mostly much less. Bark grey to brown. *Leaves*: petiole 2–5 cm long; blade obovate, 7–34 by 1.5–7.9 cm, 3–6 times as long as wide, apex shortly acuminate or apiculate, base attenuate, 8–25 pairs of secondary veins, glabrous. *Inflorescence* terminal, lax, 8–25 cm long, glabrous; peduncle 2–12 cm long; pedicels 5.5–40 mm long. *Sepals* ovate to obovate, 4–14 by 2–8 mm, 1.5–3.5 times as long as wide, apex rounded to acuminate, spreading, mostly deciduous at corolla anthesis. *Corolla* white, sometimes with some pink or red; tube 8–20 mm long, widening around the middle, 3–4 mm wide around stamens, 1–2.5 times as long as calyx, 0.7–1.3 times as long as lobes, glabrous outside and inside; lobes obovate to elliptic, 8–17 by 4–10 mm, 1.5–2.5 times as long as wide, apex rounded to acuminate, glabrous outside and inside. *Stamens* inserted at 5–10 mm from corolla base which is 0.4–0.6 of tube length; anthers 2–2.5 by 1–1.5 mm. *Ovaries* 1–1.5 mm high; style head 3–3.5 mm long. *Fruit* blue or purplish blue, each ellipsoid, 7.5–10.5 by 5–6.5 by 3–4 cm.

Distribution — Western Pacific Islands, Solomon Islands; in *Malesia*: Moluccas, New Guinea.

Habitat & Ecology — In forest, mostly at low altitudes.

Uses — The seeds contain an oil used externally for the treatment of skin ailments. The wood can be used for household items and packaging.

2. *Cerbera inflata* S.T. Blake

Cerbera inflata S.T. Blake, Proc. Roy. Soc. Queensland 70 (1959) 33; P.I. Forst., Austrobaileya 3 (1992) 572; Fl. Australia 28 (1996) 140; Leeuwenb., Agric. Univ. Wageningen Pap. 98-3 (1999) 16. — *Cerbera dilatata* S.T. Blake, Proc. Roy. Soc. Queensland 59 (1948) 161, non Markgr. (1929). — Type: *S.T. Blake 15003* (holo BRI; iso CANB, K), Australia, Queensland, Cook District, near Goldsborough, Upper Mulgrave River.

Tree to 30.5 m tall, mostly smaller, to 60 cm dbh. Bark grey. *Leaves*: petiole 1.5–5 cm long; blade obovate to elliptic, 7–22.5 by 2–8 cm, 3–5 times as long as wide, apex rounded, apiculate or shortly acuminate, base attenuate, 10–30 pairs of secondary veins, glabrous above and beneath. *Inflorescence* terminal, lax, 8–22 cm long, many-flowered; peduncle 2–8 cm long; pedicels 10–30 mm long. *Sepals* ovate to elliptic, 4–8 by 2–7 mm, 1.1–3 times as long as wide, apex rounded to obtuse. *Corolla* white or cream, lobes often suffused pink, throat sometimes greenish; tube 12–30 mm long, widest near the apex, 4–7.5 mm around the stamens, 2–5 times as long as sepals, 2.2–5 times as long as lobes, glabrous outside and inside; lobes ovate, 5–9 by 5–6 mm, 1–1.5 times as long as wide, apex rounded. *Stamens* inserted at 9–16 mm from corolla base which is 0.7–0.8 of tube length; anthers 3–3.5 by 1.2–1.5 mm. *Ovaries* 1.5–2 mm high; style head 2.7–4 mm long. *Fruit* ellipsoid, 4.5–5 by 2.5–4 by 2.3 cm.

Distribution — Queensland; in *Malesia*: New Guinea.

Habitat & Ecology — In forest to 2250 m altitude.

3. *Cerbera laeta* Leeuwenb.

Cerbera laeta Leeuwenb., Agric. Univ. Wageningen Pap. 98-3 (1999) 18. — Type: *Staples 1139* (holo WAG; iso K), from plant cultivated in Hawaii, Oahu, Ho'omaluhia Botanical Garden from seeds collected at Rouna Falls, in forest along road to Varariato National Park, Papua New Guinea.

Tree to 6 m tall. *Leaves*: petiole 2.5–8 cm long; blade oblong to elliptic, 10–28 by 5–9 cm, 2–3.5 times as long as wide, apex apiculate, base cuneate, 8–14 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* 15–25 cm long, lax, many-flowered; peduncle 5–10 cm long; pedicels 3–6 cm long. *Flowers* fragrant. *Sepals* ovate, c. 4 by 3 mm, 1.3 times as long as wide, apex obtuse to rounded, spreading to reflexed. *Corolla* white, with some pink on lobes; tube 29–33 by 6 mm, 7.2–8.2 times as long as sepals, 3.2–4.1 times as long as lobes, glabrous outside, minutely pubescent at top of tube and throat inside, glabrous below; lobes suborbicular, 8–9 by 8–9 mm, c. 1 times as long as wide, apex rounded to retuse, glabrous outside, pubescent at base inside. *Stamens* inserted at 5–7 mm from corolla base which is c. 0.2 of tube length; filaments c. 1 mm long; anthers c. 5 by 2 mm. *Ovaries* 1.5 mm high; style c. 7 mm long; style head c. 3 mm long. *Fruit* blue, each ellipsoid, c. 6 by 3 by 3 cm, rounded at end. — **Fig. 38.**

Distribution — *Malesia*: New Guinea (only known from a cultivated tree in Hawaii from seed collected in Papua New Guinea).

Habitat & Ecology — Unknown.

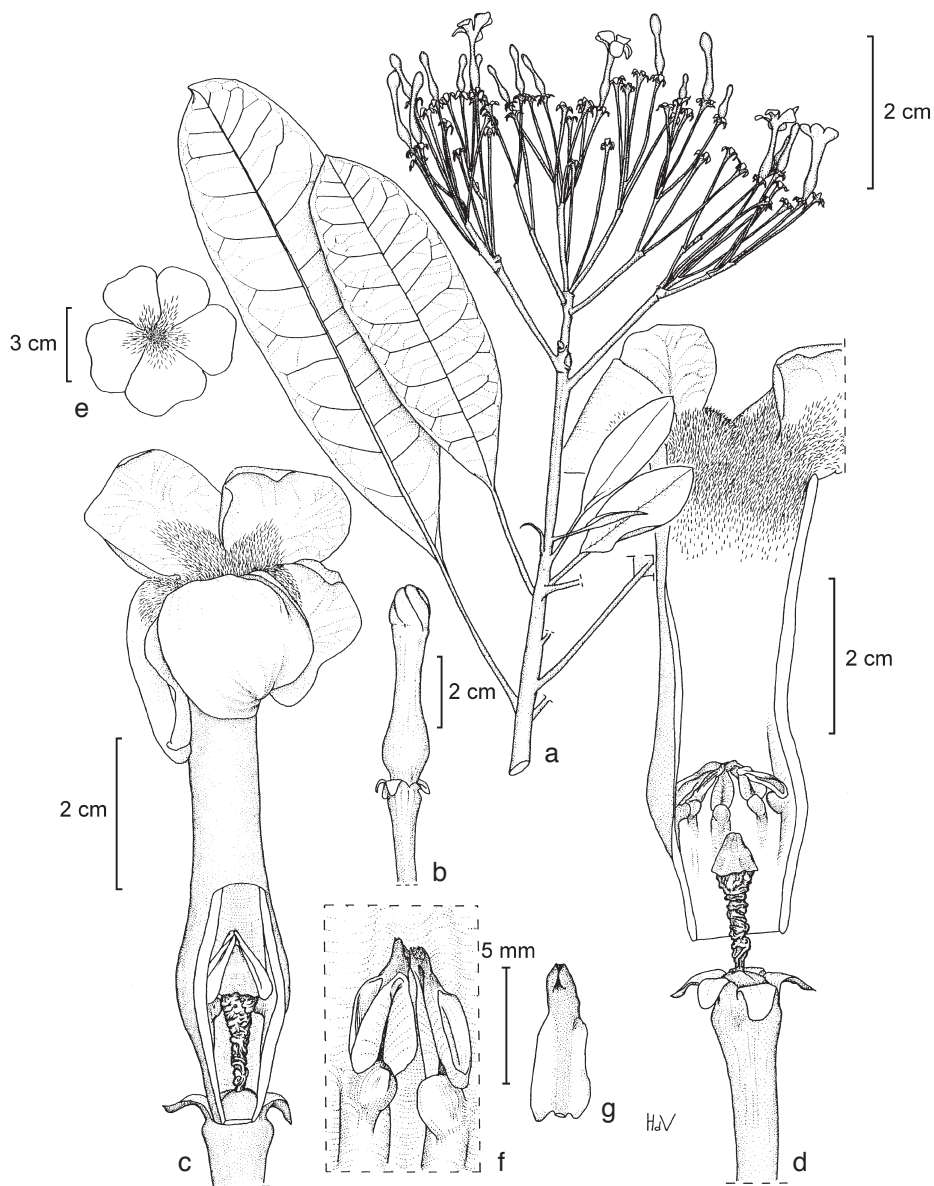


Fig. 38. *Cerbera laeta* Leeuwenb. a. Habit; b. bud; c. flower; d. opened flower; e. flower above; f. stamens; g. anther outside (Staples 1139).

4. *Cerbera manghas* L.

Cerbera manghas L., Sp. Pl. (1753) 208; Blanco, Fl. Filip. (1837) 125; Merr., Bibliogr. Enum. Born. Pl. (1921) 500; Markgr., Nova Guinea 14, 2 (1926) 284; Bot. Jahrb. Syst. 61 (1927) 197; Merr., Contr. Arnold Arbor. 8 (1934) 144; Hochr., Candollea 5 (1934) 179; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 514, p.p.; Kerr in Craib, Fl. Siam. 2 (1939) 435; Corner, Wayside Trees

Malaya (1940) 143; Masam., Enum. Phan. Born. (1942) 619; Bakh.f., Blumea 6 (1950) 386; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 143; F.G. Browne, Forest Trees Sarawak & Brunei (1955) 66; Backer & Bakh.f., Fl. Java 2 (1965) 233; Whitmore, Tree Fl. Malaya 2 (1973) 12; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 33; J.A.R. Anderson, Checklist Trees Sarawak (1980) 148; T.C. Huang, Taiwania 31 (1986) 94; L \acute{y} , Feddes Repert. 97 (1986) 445; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 27; P.I. Forst., Austrobaileya 3 (1992) 575; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 53; P.T. Li et al., Fl. China 16 (1995) 165; Coode et al., Checklist Pl. Brunei (1996) 26; P.I. Forst., Fl. Australia 28 (1996) 142; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 125; PROSEA 5, 3 (1998) 156; M.F. Watson, Fl. Bhutan 2 (1999) 666, p.p.; D.J. Middleton, Fl. Thailand 7 (1999) 67; Leeuwenb., Agric. Univ. Wageningen Pap. 98-3 (1999) 21; Pradhan in Singh et al., Fl. Maharashtra State, Dicot. 2 (2001) 321; PROSEA 12, 2 (2001) 154; Kessler et al., Blumea, Suppl. 14 (2002) 13; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 24. — *Tanghinia manghas* (L.) G. Don, Gen. Hist. 4 (1837) 98. — Type: *Osbeck s.n.* (lecto LINN 298.2, designated by Leeuwenberg in Jarvis, Taxon 41 (1992) 560).

Elcana seminuda Blanco, Fl. Filip., ed. 2 (1845) 584. — Type: Untraced. Neotype: *Merrill Species Blancoanae 318* (neo L, designated by Leeuwenberg (1999) op. cit.; isoneo BM, BO, F, GH, K, NSW, NY, P, W), Philippines, Palawan, Taytay.

Cerbera dollam auct. non p.p. Gaertn.: Hook.f., Fl. Brit. India 3 (1882) 638; King & Gamble; J. Asiat. Soc. Bengal 74, 2 (1907) 427; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1137.

Leeuwenberg, Agric. Wageningen Univ. Pap. 98-3 (1999) 21, recognises several other synonyms typified with specimens outwith Malesia which I have not checked.

Tree or shrub to 20 m tall, to 60 cm dbh. *Branchlets* with very visible leaf scars, glabrous. *Leaves*: petiole 0.9–4.5 cm long, glabrous; blade papery to coriaceous, elliptic to obovate, 5–31 by 1–7 cm, 1.7–7 times as long as wide, apex acuminate, apiculate or, rarely, rounded, base cuneate, glabrous above and beneath, 12–40 pairs of secondary veins anastomosing into an intramarginal nerve, tertiary venation reticulate. *Inflorescence* few- to many-flowered, lax, robust, 5–31 cm long; peduncle 6–15.5 cm long, glabrous; pedicels 3–28 mm long, glabrous. *Flowers* fragrant. *Sepals* linear, narrowly ovate or narrowly obovate, 8–21 by 2–9 mm, 2–5.6 times as long as wide, glabrous. *Corolla* white with a red eye (reported also as pure white); tube 17–43 mm long, narrow, widening near the throat, 2–5.5 mm wide around stamens, 2.1–3.3 times as long as calyx, 1.4–2 times as long as lobes, glabrous outside, pubescent most of length of tube inside; lobes obliquely elliptic, 15–29 by 7.5–18 mm, 1.1–2.5 times as long as wide, glabrous outside and inside. *Stamens* inserted near top of tube with anther apices just beneath corolla throat; anthers 1.3–3 by 1.1–2 mm. *Ovaries* 1.2–2 mm long; style and style head 21–40 mm long. *Fruit* oblong or ellipsoid; reddish when mature; 5–12 by 3–7 cm.

Distribution — From the Seychelles through eastern Asia and Malesia to the Pacific Islands and northern Australia; in *Malesia*: throughout.

Habitat & Ecology — On beaches above the high tide mark or in forest near sea.

Uses — The wood can be used for household items and packaging and makes a good charcoal. It can be used externally against sores and internally as a purgative. The seeds can be made into a fish poison. The seeds also yield an oil that can be used to make candles. Also grown as an ornamental.

Note — *Cerbera manghas* and *C. odollam* have been very frequently confused in much of the earlier literature.

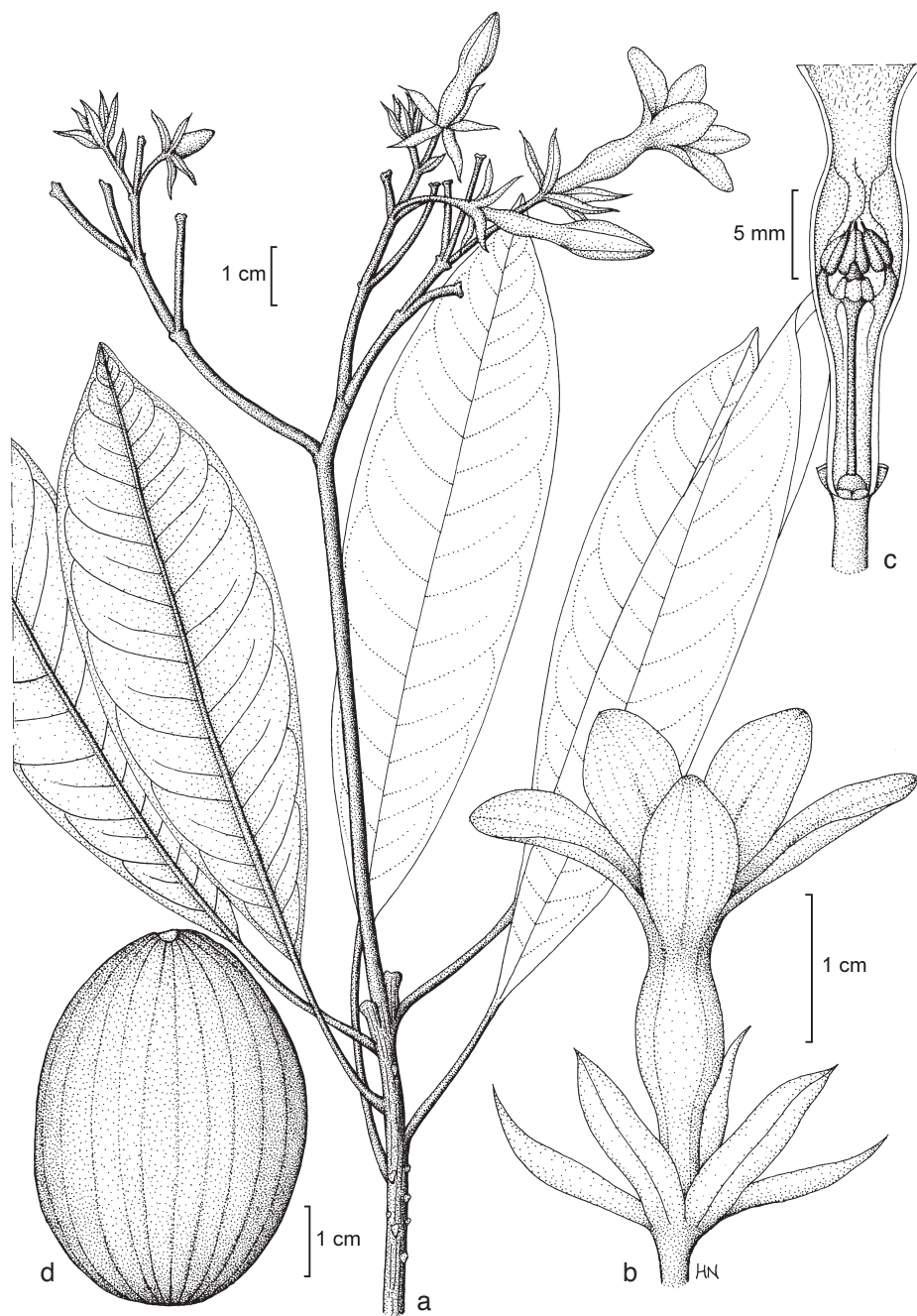


Fig. 39. *Cerbera odollam* Gaertn. a. Habit; b. flower; c. dissected flower; d. fruit (a: Yip 264; b, c: Kerr 19558).

5. *Cerbera odollam* Gaertn.

- Cerbera odollam* Gaertn., Fruct. Sem. Pl. 2 (1791) 193; Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 441; Miq., Fl. Ned. Ind. 2 (1857) 413; Fl. Ned. Ind., Eerste Bijv. (1861) 553; Kurz, Forest Fl. Burma 2 (1877) 171; Hook.f., Fl. Brit. India 3 (1882) 638, p.p.; K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 111; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 427, p.p.; Hallier, Bot. Jahrb. Syst. 49 (1913) 375; Ridl., Fl. Malay Penins. 2 (1923) 339; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1137, p.p.; Hochr., Candollea 5 (1934) 181; Kerr in Craib, Fl. Siam. 2 (1939) 436; Corner, Wayside Trees Malaya (1940) 144; Wayside Trees Malaya ed. 2, 1 (1952) 144; Backer & Bakh.f., Fl. Java 2 (1965) 233; Whitmore, Tree Fl. Malaya 2 (1973) 12; J.A.R. Anderson, Checklist Trees Sarawak (1980) 148; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 53; Lý, Feddes Repert. 97 (1986) 445; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 28; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 36; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 53; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 125; PROSEA 5, 3 (1998) 156; D.J. Middleton, Fl. Thailand 7 (1999) 67; Leeuwenb., Agric. Univ. Wageningen Pap. 98-3 (1999) 34; PROSEA 12, 2 (2001) 154; Kessler et al., Blumea, Suppl. 14 (2002) 13; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 25. — *Tanghinia odollam* (Gaertn.) G. Don, Gen. Hist. 4 (1837) 98. — Type: *Odollam* Rheede, Hortus Malabaricus 1 (1678) pl. 39.
- Cerbera lactaria* Buch.-Ham. ex Spreng., Syst. Veg. 1 (1825) 642; Miq., Fl. Ned. Ind. 2 (1857) 414; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 505; Ridl., Fl. Malay Penins. 2 (1923) 339. — Type: Untraced (listed as a plant from the Moluccas).
- Cerbera dilatata* Markgr., Bot. Jahrb. Syst. 61 (1927) 196. — Type: *Gaudichaud s.n.* (lecto P, designated by Leeuwenberg (1999) op. cit.), Mariana Islands, sine loc.
- Cerbera manghas* auct. non L.: Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 514, p.p.; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 18.

Tree or shrub to 12 m tall, to 20 cm dbh. *Branchlets* with very visible leaf scars, glabrous. *Leaves*: petiole 1.6–3.8 cm long, glabrous; blade papery to coriaceous, obovate, 7.5–26 by 2.4–5.7 cm, 2.5–5 times as long as wide, apex acuminate, base cuneate, glabrous above and beneath, 12–25 pairs of secondary veins anastomosing into an intramarginal nerve, tertiary venation reticulate. *Inflorescence* few- to many-flowered, robust, lax, 8.8–35 cm long, glabrous; peduncle 3–20 cm long; pedicels 1.2–4 cm long. *Sepals* linear, narrowly ovate or narrowly obovate, 8.6–26 by 2.6–5 mm, 2–6 times as long as wide, apex acute or acuminate; glabrous. *Corolla* white with a yellow eye; tube 13–22 mm long, bulging in the middle, 2–4 mm wide, 1–3 times as long as calyx, 0.5–0.9 times as long as lobes, glabrous outside, pubescent in upper half of tube inside; lobes 12–38 by 8–15 mm, 1.4–3 times as long as wide. *Stamens* inserted around the middle of corolla tube at 9.5–12.5 mm from corolla base which is 0.5–0.6 of tube length; anthers 2.2–2.4 by 1.3–1.5 mm. *Ovaries* 1.2–1.7 mm long; style and style head 9.1–12 mm long. *Fruit* spherical to ovoid; green when mature; 4.7–7.7 by 3.7–6.6 cm. — **Fig. 39.**

Distribution — From South India and Sri Lanka to the western Pacific Islands; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines, Sulawesi.

Habitat & Ecology — Mostly riverine at low altitudes.

Uses — Same uses as *C. manghas*. Frequently grown as a roadside tree.

Note — See note under *C. manghas*.

11. CHILOCARPUS

Chilocarpus Blume, *Catalogus* (1823) 22; A.D.C., *Prodr.* 8 (1844) 320; Benth. & Hook.f., *Gen. Pl.* 2 (1876) 691; K. Schum. in Engl. & Prantl, *Nat. Pflanzenfam.* 4, 2 (1895) 131; Pit. in Lecomte, *Fl. Indo-Chine* 3 (1933) 1091; Pichon, *Mém. Mus. Natl. Hist. Nat.* 24 (1948) 154; Backer & Bakh.f., *Fl. Java* 2 (1965) 224; Markgr., *Blumea* 19 (1971) 156; D.J. Middleton, *Fl. Thailand* 7 (1999) 26; Leeuwenb., *Syst. Geogr. Pl.* 72 (2002) 130; D.J. Middleton, *Tree Fl. Sabah & Sarawak* 5 (2004) 8.

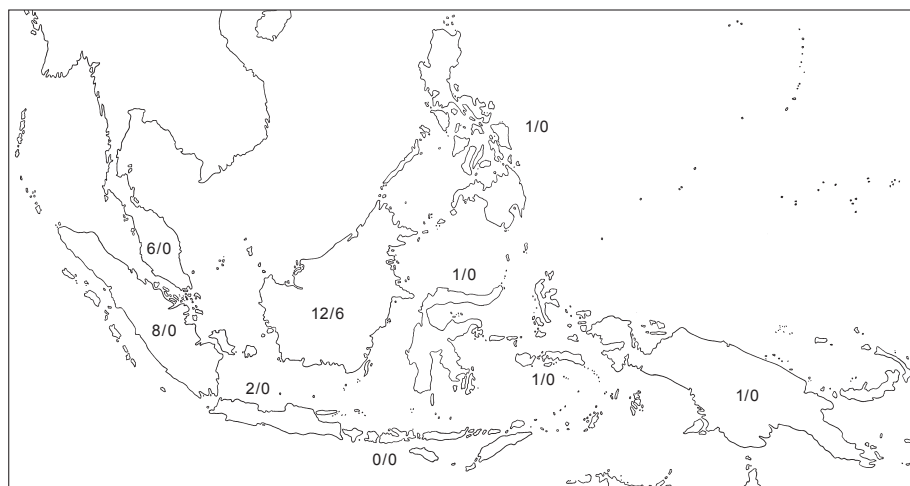
— Type species: *Chilocarpus suaveolens* Blume.

Neokeithia Steenis, *Bull. Jard. Bot. Buitenzorg III*, 17 (1948) 407. — Type species: *Neokeithia conspicua* Steenis (= *Chilocarpus conspicuus* (Steenis) Markgr.)

Climbers with copious white latex. *Leaves* opposite; petiole bases slightly clasping stems forming small intrapetiolar ocrea and connected across the stem forming an interpetiolar ridge; blades with distinct or weakly visible punctae beneath. *Inflorescence* of axillary and/or terminal cymes; flowers 5-merous. *Sepals* usually slightly connate at base, not clasping base of corolla; without colleters inside. *Corolla* lobes sinistrorse, bud drumstick-shaped; mature corolla salverform; lobes falcate. *Stamens* free from the style head, completely included in the corolla tube, inserted around the middle or in lower half of corolla tube; filaments short and narrow; anthers ovate, base cordate, apex acute, fertile entire length. *Disk* absent. *Ovary* syncarpous, unilocular with 2 parietal placentas, glabrous; ovules numerous; style filiform, separated from the ovary by an articulation, style head unspecialised. *Fruit* a berry/capsule, fleshy when young; dehiscent into two parts when mature. *Seeds* with a corky aril; ovoid.

Distribution — 14 species in Southeast Asia and through Malesia to New Guinea. All species in *Malesia*. — **Map 5.**

Notes — 1. Species delimitation in this account is quite different from the recent account by Leeuwenberg, *Syst. Geogr. Pl.* 72 (2002: 127–166) and care should be exercised when comparing the two.



Map 5. Distribution of *Chilocarpus* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

2. A seedling identified as *Chilocarpus obtusifolius* due to its close proximity to a mature adult had much narrower leaves than the adult. This may be true in other species too.

KEY TO THE SPECIES¹

- 1a. Leaf blade puberulent beneath 2
- b. Leaf blade glabrous beneath 4
- 2a. Inflorescence terminal and branched, 9.5–12 cm long; corolla densely pubescent all over outside except at very base **8. C. pubescens**
- b. Inflorescence in axillary cymes, rarely terminal, 1–5.6 cm long; corolla glabrous or sparsely pubescent only in lower half outside 3
- 3a. Leaves glabrous above; inflorescence 3–5.6 cm long; corolla sparsely pubescent in lower half outside **11. C. steenisianus**
- b. Leaves sparsely pubescent above; inflorescence c. 1 cm long; corolla glabrous outside **6. C. hirtus**
- 4a. Corolla tube sparsely puberulent, at least in part, outside 5
- b. Corolla tube glabrous outside 7
- 5a. Branchlets densely pubescent when young, sometimes glabrescent when older; corolla tube sparsely pubescent only in lower half outside . . **11. C. steenisianus**
- b. Branchlets glabrous, even when young; corolla tube sparsely and minutely papillate-pubescent all over or pubescent only in upper half 6
- 6a. Inflorescence mostly longer than subtending leaves; secondary veins on leaves weakly to not visible beneath **1. C. beccarianus**
- b. Inflorescence shorter than subtending leaves; secondary veins on leaves strongly prominent beneath **10. C. sarawakensis**
- 7a. Branchlets minutely puberulent (use a lens!) 8
- b. Branchlets glabrous 9
- 8a. Pedicels without numerous bracteoles; corolla tube 6.8–8.2 mm long **1. C. beccarianus**
- b. Pedicels with numerous bracteoles; corolla tube 4.2–6 mm long **12. C. suaveolens**
- 9a. Inflorescence densely congested in leaf axils, shorter than subtending petiole **9. C. rostratus**
- b. Inflorescence not densely congested, mostly longer than subtending petioles 10
- 10a. Corolla tube < 6 mm long 11
- b. Corolla tube ≥ 6 mm long 15
- 11a. Pedicels with numerous bracteoles **14. C. vernicosus**
- b. Pedicels with 2 or fewer bracteoles 12
- 12a. Leaves mostly with rounded or retuse apices; ultimate inflorescence nodes strongly congested so as to appear umbelliform; fruit globose **7. C. obtusifolius**

1) Fruit characters are very distinctive for several species. However, a key based on fruit characters is not possible as they are unknown for several species. A check through the descriptions should enable identification of specimens with particularly distinctive fruits.

- b. Leaves mostly acute to acuminate, more rarely to rounded; ultimate inflorescence branches not umbelliform; fruit various but not globose 13
- 13a. Leaf blade coriaceous, base decurrent onto petiole; stamens inserted at 0.6–0.7 of length of tube from base; fruit long and torulose, constrictions between bulges around seeds mostly not less than half as wide as bulges around seeds. **13. C. torulosus**
- b. Leaf blade variable but mostly not coriaceous, base rounded to cuneate; stamens inserted at 0.3–0.6 of length of tube from base; fruit ellipsoid, fusiform or strongly moniliform with constrictions between bulges around seeds less than half as wide as bulges around seeds. 14
- 14a. Corolla tube 2.7–4 mm long; fruit ellipsoid or fusiform. — Probably not in Borneo **5. C. denudatus**
- b. Corolla tube 4–4.7 mm long; fruit strongly moniliform. — Borneo **2. C. conspicuus**
- 15a. Pedicels with many bracteoles; stamens inserted at around 0.5 of tube length from base **4. C. decipiens**
- b. Pedicels with 2 bracteoles or fewer; stamens inserted at 0.2–0.4 of tube length from base. 16
- 16a. Inflorescence almost always longer than subtending leaves; secondary veins on leaves weakly to not visible beneath **1. C. beccarianus**
- b. Inflorescence only very rarely longer than subtending leaves; secondary veins on leaves prominent beneath **3. C. costatus**

1. *Chilocarpus beccarianus* Pierre

Chilocarpus beccarianus Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 101; Markgr., Blumea 19 (1971) 163; Coode et al., Checklist Pl. Brunei (1996) 26; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 130. — Type: *Beccari 3280* (lecto P, designated here; iso K), Borneo, Sarawak, Kuching.

Large woody climber to 15 m high. *Branchlets* glabrous, rarely puberulent. *Leaves*: petioles 3–25 mm long; blades elliptic to obovate, 2.5–14.8 by 1.1–5.8 cm, 1.6–3.7 times as long as wide, apex shortly acuminate to obtuse or apiculate, rarely rounded, base rounded to cuneate, glabrous above and beneath, 17–30 pairs of secondary veins, weakly distinguishable above and beneath to obscure beneath, tertiary venation weakly intercalated and parallel, often obscure. *Inflorescence* terminal and axillary in uppermost leaf axils (sometimes these uppermost leaves greatly reduced in size), forming a terminal panicle mostly longer than subtending leaves, occasionally shorter, 3.2–13.7 cm long, lax, puberulent to completely glabrous except occasionally for a few hairs on bracts; peduncle 2–4.6 cm long; pedicels 1.4–2.5 mm long, with 1 or 2 bracteoles, sometimes with some bracts empty giving the appearance of a much longer pedicel with distant opposite bracts. Calyx 1.2–1.5 mm long, lobes 0.5–0.6 by 0.7–0.9 mm, 0.6–0.8 times as long as wide, apex obtuse to rounded, often spreading or slightly reflexed, glabrous or papillate-pubescent, ciliate. *Corolla* yellow or orange; tube 6.8–8.2 mm long, 4.5–6.3 times as long as sepals, 1.6–3 times as long as lobes, glabrous to minutely and sparsely papillate-pubescent outside, pubescent below stamens inside; lobes falcate, 2.3–5 by 1.2–1.8 mm, 1.8–2.8 times as long as wide, apex acute to

acuminate, glabrous to pubescent on part exposed in bud outside, sometimes only with minute papillate hairs, glabrous inside. *Stamens* inserted at 2–3.1 mm from corolla base which is 0.3–0.4 of tube length; filaments 0.7 mm long; anthers 0.9–1.2 by 0.3 mm. *Ovary* 1.1–1.3 mm long; style and style head 1.5–1.6 mm long. *Fruit* fusiform but with one or more slight constrictions, 5.5–10.5 by 1.5–2.7 cm. *Seeds* quite large but no undamaged ones measured.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — In a wide variety of forest types or in open places at an altitude of 30–1310 m.

2. *Chilocarpus conspicuus* (Steenis) Markgr.

Chilocarpus conspicuus (Steenis) Markgr., Blumea 19 (1971) 162; Coode et al., Checklist Pl. Brunei (1996) 26; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 131. — *Neokeithia conspicua* Steenis, Bull. Jard. Bot. Buitenzorg III, 17 (1948) 407. — Type: *Clemens & Clemens 31147* (lecto L, designated by Markgr. (1971) op. cit.; iso A, BM, BO, M, NY, UC), Borneo, Sabah, Mt Kinabalu, Penibukan.

Chilocarpus gracilis Markgr., Mitt. Bot. Staatssamml. München 1 (1950) 27. — Type: *Clemens & Clemens 31651* (holo M; iso A, BM, BO, G, K, L, NY, UC), Borneo, Sabah, Mt Kinabalu, Penibukan.

Large woody climber, reported to 15 m high. *Branchlets* glabrous. *Leaves*: petiole 7–12 mm long, glabrous; blade elliptic, 4.9–12.7 by 1.7–6.5 cm, 2–3.5 times as long as wide, apex acuminate to subcaudate with a blunt tip, base rounded to acute, glabrous above and beneath, 17–32 pairs of secondary veins, weakly prominent above, only weakly visible beneath, often difficult to distinguish from parallel tertiary venation, tertiary venation also reticulate. *Inflorescence* terminal and axillary in the axils of upper leaves, 3.5–7 cm long; peduncle 1.2–2.8 cm long, sparsely and minutely puberulent; pedicels 0.8–2.7 mm long, sparsely and minutely puberulent, bracteoles 1 or absent. Calyx 1–1.2 mm long, lobes ovate, 0.5–0.8 by 0.5–0.9 mm, 0.8–1 times as long as wide, apex obtuse to rounded, glabrous, ciliate. *Corolla* yellow, tinged pink; tube 4–4.7 mm long, 3.6–4.2 times as long as calyx, 1–1.1 times as long as lobes, glabrous outside, pubescent only below stamens inside; lobes narrowly falcate, 3.5–4.2 by 1.3–1.8 mm, 2.3–2.7 times as long as wide, apex acute, glabrous outside and inside. *Stamens* inserted at 2.3–2.5 mm from corolla base which is 0.5–0.6 of tube length; filaments 0.4–0.5 mm long; anthers 0.8–1.1 by 0.4–0.5 mm. *Ovary* 1–1.2 mm high; style and style head 1.5–1.6 mm long. *Fruit* moniliform, total length uncertain due to poor fragmented material, articles 2.4–2.8 by 1.9–2.4 cm, 1.3–1.7 cm between articles. *Seeds* 14–16 by 13–14 mm.

Distribution — *Malesia*: Borneo (Sabah, Sarawak, Brunei).

Habitat & Ecology — In forest at (600–)1200–1500 m.

Note — This species is only known from a few collections from Mt Kinabalu, Brunei and two collections from Sarawak. There are number of species that are very difficult to tell apart in flower and if a specimen does not have the distinctive fruit of this species, as is the case for the known material from Sarawak, the determinations may be due to a mistaken identification for *Chilocarpus denudatus*, which is currently unknown in Borneo, or an as yet undescribed species.

3. *Chilocarpus costatus* Miq.

Chilocarpus costatus Miq., Fl. Ned. Ind. 2 (1857) 393; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 406; Ridl., Fl. Malay Penins. 2 (1923) 326; Kerr in Craib, Fl. Siam. 2 (1939) 425; Markgr., Blumea 19 (1971) 161; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 125; D.J. Middleton, Fl. Thailand 7 (1999) 26; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 133. — Type: *Kajoetanem* HB 988 (lecto L, designated here; iso BO, U), Sumatra, Getah Mantjie.

Chilocarpus diepenhorstii Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 552. — Type: *Diepenhorst* HB 3113 (lecto L, designated here; iso A, BO), Sumatra, Akar Poeloe.

Chilocarpus maingayi Dyer ex Hook.f., Fl. Brit. India 3 (1882) 627. — Type: *Maingay* 2565 (= *Kew Distribution* 1046) (lecto K, designated here; iso K), Peninsula Malaysia, 'Malacca'.

Chilocarpus aurantiacus Ridl., Bull. Misc. Inform. Kew 1926 (1926) 73. — Type: *Kloss* 14500 (lecto K, designated here; iso SING), Sumatra, Mentawi Islands, Siberut.

Chilocarpus cuneifolius Kerr, Bull. Misc. Inform. Kew 1937 (1937) 40; Kerr in Craib, Fl. Siam. 2 (1939) 424. — Type: *Vanpruk* 705 (lecto K, designated here; iso BKF), Thailand, Nakhon Sri Thammarat, Prubua.

Chilocarpus spec. Kerr in Craib, Fl. Siam. 2 (1939) 425.

Chilocarpus costatus Miq. var. *borneensis* Markgr., Blumea 19 (1971) 161. — Type: *Clemens & Clemens* 29827 (holo L; iso A, BM, BO, G, K, NY, UC), Borneo, Sabah, Mt Kinabalu, Tenompok.

Large woody climber to 25 m high. *Branchlets* glabrous. *Leaves*: petiole 7–21 mm long; blade coriaceous, elliptic to obovate, 2.9–23.5 by 0.9–12.5 cm, 1.5–3.8 times as long as wide, apex acuminate to rounded and apiculate, base acute to cuneate, glabrous above and beneath, 11–24 pairs of secondary veins, prominent beneath, with weaker parallel tertiary veins. *Inflorescence* axillary, 2–13 cm long; peduncle 0.3–5.5 cm long, glabrous to puberulent; pedicels 1–4.5 mm long, glabrous to puberulent, bracteoles 0–2. Calyx thick, connate at base, 1–2 mm long, lobes ovate, 0.6–1.4 by 0.6–1.4 mm, 0.7–1.3 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* white, yellow, orange or red; tube 6–21.5 mm long, 5.5–10.5 times as long as calyx, 0.9–2 times as long as lobes, glabrous outside, densely pubescent below stamens inside; lobes 4.5–19 by 1.8–5.4 mm, 1.5–3.9 times as long as wide, apex obtuse to acuminate, glabrous outside and inside. *Stamens* inserted at 2.1–3.8 mm from corolla base which is 0.2–0.4 of tube length; filaments 0.3–0.8 mm long; anthers 1.1–1.4 by 0.3–0.5 mm. *Ovary* 1–2 mm long; style and style head 0.8–2.4 mm long. *Fruit* ellipsoid or globular, glabrous, 2.2–8.9 by 2–4.2 by 2–4 cm. *Seeds* 5.6–8 by 4.5–5.8 by 1.8–5.4 mm, reported on one specimen to be purple.

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

Habitat & Ecology — In forest to 1500 m altitude.

Note — This is a very variable species in both leaf and flower characters. The material of this species cited by Leeuwenberg (2002) for New Guinea is *Melodinus acutiflorus*.

4. *Chilocarpus decipiens* Hook.f.

Chilocarpus decipiens Hook.f., Fl. Brit. India 3 (1882) 627; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 402; Ridl., Fl. Malay Penins. 2 (1923) 327; Markgr., Blumea 19 (1971) 164; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 125; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 138. — Type: *Maingay* 1713 (= *Kew Distribution* 1060) (lecto K, designated by Leeuwenberg (2002) op. cit; iso GH, L), Peninsular Malaysia, sine loc.

Climber to 20 m high. *Branchlets* glabrous. *Leaves*: petiole 4–11 mm long; blade elliptic, more rarely narrowly ovate or oblong, 3.7–11.2 by 1.2–4.2 cm, 1.7–3.9 times as long as wide, apex long acuminate to subcaudate, base cuneate to obtuse, glabrous above and beneath, venation barely visible to obscure, 21–27 pairs of secondary veins, tertiary venation obscure. *Inflorescence* axillary and terminal, lax throughout, 4–11 cm long, peduncle 0.8–3.2 cm long, glabrous; pedicels 2.5–5.5 mm long, glabrous, with several to many bracteoles. *Sepals* 1.2–1.5 mm long, lobes 0.6–0.8 by 0.6–0.8 mm, c. 1 times as long as wide, apex obtuse to rounded, glabrous, ciliate. *Corolla* tube 7–8.7 mm long, 5.8–6.2 times as long as sepals, c. 2.5 times as long as lobes, glabrous outside, pubescent beneath stamens inside; lobes falcate, c. 3 by 1.2 mm, 2.5 times as long as wide, apex rounded, glabrous inside and outside. *Stamens* inserted at c. 4.2 mm from corolla base which is 0.5 of tube length; filaments c. 0.5 mm long; anthers c. 1.2 by 0.3 mm. *Ovary* c. 1.3 mm high; style and style head c. 3 mm long. *Fruit* fusiform or slightly torulose, 3.5–5 by 1.3–1.8 cm. *Seeds* c. 13 by 8.5 mm.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia.

Habitat & Ecology — In forest at low altitude.

Note — A rather poorly known species with inadequate flowering material.

5. *Chilocarpus denudatus* Blume

Chilocarpus denudatus Blume, Bijdr. (1826) 1025; Mus. Bot. 1 (1850) 153; Miq., Fl. Ned. Ind. 2 (1857) 393; Kerr in Craib, Fl. Siam. 2 (1939) 424; Bakh.f., Blumea 6 (1950) 385; Backer & Bakh.f., Fl. Java 2 (1965) 224; Markgr., Blumea 19 (1971) 164; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 37; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 125; D.J. Middleton, Fl. Thailand 7 (1999) 27; Kessler et al., Blumea, Suppl. 14 (2002) 14; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 138. — Type: *Blume s.n.* (lecto L [898.110-10], designated here; iso L [898.110-11], scrap in A), Java.

Hunteria atroviridis G. Don, Gen. Hist. 4 (1837) 105 (as *atrovirens*). — *Hunteria atroviridis* (G. Don) Wall. ex A.DC., Prodr. 8 (1844) 351. — *Chilocarpus atroviridis* (G. Don) Blume, Mus. Bot. 1 (1850) 153; Miq., Fl. Ned. Ind. 2 (1857) 393; Hook.f., Fl. Brit. India 3 (1882) 626; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 400; Ridl., Fl. Malay Penins. 2 (1923) 327. — *Winchia atroviridis* (G. Don) Kurz, Forest Fl. Burma 2 (1877) 170. — Type: *Gomez* in *Wallich 1614* (lecto K-W, designated by Middleton, Taxon 55 (2006) 504; iso G-DC, K), Burma, Tavoy.

Chilocarpus malabaricus Bedd., Icon. Pl. Ind. Orient. 1 (1874) 38, t. 175. — Type: *Beddome 69* (holo K n.v.), India, Malabar, Carcoar, South Canara.

Chilocarpus alyxiifolius Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 102; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1092; Lý, Feddes Repert. 97 (1986) 422. — Type: *Pierre 4420* (lecto P, designated by Lý (1986) op. cit., 1st step, and Middleton, 2nd step, designated here; iso P), Vietnam, Dong Nai, Bao Chang.

Chilocarpus embelioides King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 401; Ridl., Fl. Malay Penins. 2 (1923) 327; Markgr., Blumea 19 (1971) 162. — Type: *Scortechini 711* (untraced), Peninsular Malaysia, Perak, Haram. — Although the type has not been traced it is clear from the description that it is a synonym here.

Chilocarpus minutiflorus King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 405; Ridl., Fl. Malay Penins. 2 (1923) 328; Markgr., Blumea 19 (1971) 164; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 125. — Type: *King’s Collector 7550* (lecto K, designated by Markgraf (1971) op. cit.; iso BM, CGE), Peninsular Malaysia, Perak, Larut.

Chilocarpus leytenensis Elmer, Leafl. Philipp. Bot. 4 (1912) 1453; Markgr., Blumea 19 (1971) 162; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 141. — Type: *Elmer 7359* (lecto A, designated by Leeuwenberg (2002) op. cit.; iso BO, E, G, K, NY), Philippines, Leyte, Palo.

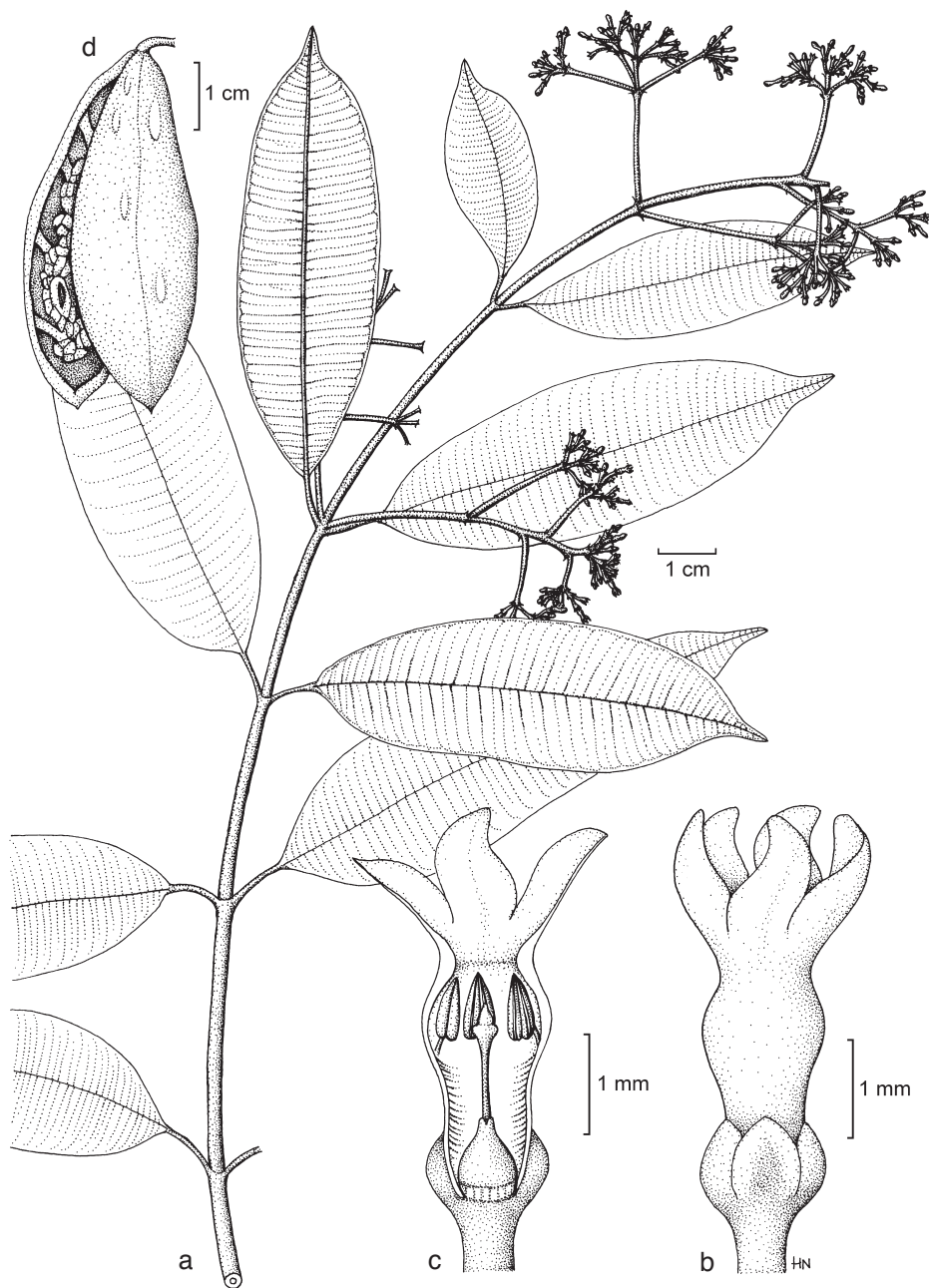


Fig. 40. *Chilocarpus denudatus* Blume. a. Habit; b. flower; c. dissected flower; d. fruit (a–c: Sinclair 7581; d: Kerr 18101).

Alstonia micrantha Ridl., J. Straits Branch Roy. Asiat. Soc. 79 (1918) 95; Fl. Malay Penins. 2 (1923) 347. — Type: *Kloss s.n.* (holo K), Peninsular Malaysia, Selangor, Rantau Panjang.

Chilocarpus amboinensis Markgr., Blumea 19 (1971) 162. — Type: *Kuswata & Soepadmo 293* (holo L; iso A, BM, BO, K, NY, SING), Moluccas, Ambon, Waai, slope of Mt Salahutu.

Large woody climber. *Branchlets* glabrous. *Leaves*: petiole 6–16 mm long; blade elliptic to obovate, rarely almost oblong, 4–17.5 by 1.2–7.3 cm, 1.5–4.7 times as long as wide, apex acuminate or obtuse and apiculate, glabrous above and beneath, base cuneate or decurrent onto petiole, 15–35 pairs of secondary veins, always visible but only sometimes prominent beneath, tertiary venation of weaker interstitial veins. *Inflorescence* axillary and terminal, 1.5–11.5 cm long, ultimate axes shorter but not so contracted as to appear umbelliform; peduncle 0.7–5 cm long, glabrous to minutely puberulent; pedicels 0.5–4.2 mm long, glabrous to minutely puberulent, bracteoles single or absent. Calyx 0.6–1 mm long, lobes 0.5–0.6 by 0.7–0.9 mm, 0.6–0.9 times as long as wide, apex rounded to obtuse, glabrous, ciliate. *Corolla* orange; tube 2.7–4 mm long, 3.1–5.8 times as long as sepals, 0.7–1.4 times as long as lobes, glabrous outside, densely pubescent below stamens; lobes elliptic or narrowly ovate, 2.2–4.5 by 1–1.6 mm, 1.7–4.1 times as long as wide, apex obliquely acute or acuminate, glabrous outside and inside. *Stamens* inserted at 1.4–2.1 mm from corolla base which is 0.3–0.6 of tube length; filaments 0.4–0.5 mm long; anthers 0.7–1.1 by 0.3–0.4 mm. *Ovary* 0.5–1.1 mm high; style and style head 0.8–1.5 mm long. *Fruit* ellipsoid to fusiform, 2.9–7 by 2.1–4.2 cm, apex apiculate. *Seeds* 6–9 by 4.5–8.2 by 2.5–5 mm. — **Fig. 40.**

Distribution — South India, Nicobar Islands, Burma (Tenasserim), Thailand, Cambodia, southern Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo (Anamba Islands), Java, Sulawesi, Moluccas, New Guinea (Papua).

Habitat & Ecology — In forest to 1800 m altitude.

Notes — 1. Leeuwenberg designated *Blume s.n.* (L 898.110-10) as the lectotype but labelled this specimen and another *Blume* specimen both as lectotype and did not state that the lectotypification was being done in his publication. Both specimens were equal candidates for lectotypification. I shall follow Leeuwenberg's choice but under the ICBN the lectotypification is designated here.

2. *Chilocarpus sunainaianus* Yogan. and *C. denudatus* var. *nicobaricus* M. Gangop. & Chakr., both from the Nicobar Islands, have been synonymised under *C. denudatus* by Leeuwenberg (2002). I have not seen the types but this synonymy is likely correct.

3. It is extremely difficult to distinguish *C. denudatus* and *C. torulosus* in flower. The stamens tend to be inserted higher in the tube in *C. torulosus* but this conclusion is based on extremely inadequate mature flowering material of both species. Also the leaves of *C. torulosus* tend to be more coriaceous and it is confined to Borneo where *C. denudatus* is seemingly absent (but see note under *C. conspicuus*). They are easily distinguished in fruit. There is, however, the possibility that some of the immature flowering material from Sulawesi and the Moluccas, where no fruiting material of *C. torulosus* has been found, has been misidentified leading to a misinterpretation of the distributions of the two species. All the specimens from Borneo assigned to this species by Leeuwenberg are a mixture of other species of *Chilocarpus*, mainly *C. beccarianus*, and *Andodendron*. There is one old specimen of *C. denudatus* from a plant cultivated in Bogor that states that it came from Borneo but until wild material in fruit is collected there its presence in Borneo is not clarified.

6. *Chilocarpus hirtus* D.J. Middleton

Chilocarpus hirtus D.J. Middleton, Edinburgh J. Bot. 63 (2006) 202. — Type: *Yii Puan Ching S48375* (holo L; iso K, KEP, MO, SAN), Borneo, Sarawak, 7th Division, Batang Balleh, Sungei Melatai, Nanga Berkakap.

Woody climber to 20 m high. *Branchlets* densely pubescent with long soft brown hairs. *Leaves*: petiole 7–13 mm long, densely pubescent with long soft brown hairs; blade spatulate or obovate, 2.5–7.5 by 1.6–3.4 cm, 1.6–2.2 times as long as wide, apex retuse to rounded or apiculate, base cuneate, pubescent beneath with long soft brown hairs, more sparsely so above but denser on midrib, punctate beneath, 14–17 pairs of secondary veins, prominent beneath, weakly prominent above, tertiary venation parallel to the secondary veins, often anastomosing before the intramarginal vein. *Inflorescence* a short axillary cyme, mostly in both axils of opposite leaves, c. 1 cm long, few-flowered; peduncle up to 2 mm long, densely puberulent; pedicels 1.5–2 mm long, sparsely puberulent to glabrous, bracteoles few at base. Calyx 1.2–1.4 mm long, connate at the base, lobes 0.8–1 by 1.1 mm, 0.7–0.9 times as long as wide, glabrous, ciliate. *Corolla* (immature) orange; tube c. 5 mm long, glabrous outside, pubescent inside below stamens; lobes only known in bud but have an acuminate apex, glabrous inside and outside. *Stamens* inserted at c. 2.1 mm from corolla base; filaments c. 0.5 mm long; anthers c. 1.3 by 0.5 mm. *Ovary* c. 1.3 mm high; style and style head c. 1.6 mm long. *Fruit* unknown.

Distribution — *Malesia*: Sumatra, Borneo.

Habitat & Ecology — In primary forest to 320 m altitude.

7. *Chilocarpus obtusifolius* Merr.

Chilocarpus obtusifolius Merr., Pap. Michigan Acad. Sci. 19 (1934) 188; Markgr., Blumea 19 (1971) 163; Coode et al., Checklist Pl. Brunei (1996) 26; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 125; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 144. — Type: *Bartlett 7349* (holo NY; iso BO, K, L, MICH, SING, US), Sumatra, East Coast, near Aek Kanopan, Kuala.

Chilocarpus obovatus Markgr., Blumea 19 (1971) 161. — Type: *Beccari PB 3266* (holo FI; iso K), Borneo, Sarawak, Gunong Balang, Botang-Lupar.

Chilocarpus kuchingensis Markgr., Blumea 19 (1971) 163. — Type: *Haviland 2299* (holo L; iso BO, GH, K, L, SING), Borneo, Sarawak, near Kuching.

Large woody climber. *Branchlets* glabrous, except in transition to terminal inflorescence. *Leaves*: petiole 9–25 mm long; blade elliptic to obovate or spatulate, 3.5–15.3 by (1.1–)1.6–8 cm, 1.5–3.3(–3.9) times as long as wide, apex retuse, rounded or obtuse, more rarely apiculate or shortly acuminate, base cuneate or decurrent onto petiole, glabrous, 16–28 pairs of secondary veins, these visible but not prominent to completely obscure beneath, mostly with weaker interstitial veins, sometimes completely obscure, anastomosing into an intramarginal vein. *Inflorescence* axillary and usually also terminal, 2–14 cm long, longer or shorter than the subtending leaves, ultimately mostly umbelliform by contraction of terminal nodes; peduncle 0.3–6 cm, puberulent; pedicels 2.2–4 mm, glabrous to sparsely puberulent, bracteoles absent; flowers weakly fragrant. Calyx 1–1.4 mm long, connate at base, lobes 0.7–1 by 0.5–1 mm, 0.8–1.1 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* yellow; tube 3.5–3.6 mm long, c. 0.4 times as long as lobes, glabrous outside, densely pubescent below stamens inside,

slightly constricted in throat; lobes c. 4 by 1.9 mm, 2.1 times as long as wide. *Stamens* inserted at 1.9–2.1 mm from corolla base which is 0.5–0.6 of tube length; filaments 0.3–0.5 mm long; anthers 0.8–0.9 by 0.4 mm. *Ovary* 0.9–1.4 mm high; style and style head 0.5–1 mm long. *Fruit* globose, subglobose or ellipsoid, ripening yellow or orange, 3.2–5 by 2.1–4.5 cm, base and apex rounded. *Seeds* 6.9–8.5 by 6–6.5 by 4.2–5 mm.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

Habitat & Ecology — In peat swamp forest, kerengas forest, primary forest or secondary forest at low altitudes.

Note — Although this species is not uncommon mature flowering material is extremely scarce. A seedling, identified as this species due to its proximity to a putative parent, had narrow narrowly ovate leaves, 5–8 by 0.5–0.7 cm.

8. *Chilocarpus pubescens* D.J. Middleton

Chilocarpus pubescens D.J. Middleton, Edinburgh J. Bot. 63 (2006) 204. — Type: *Ag. Amin SAN 115314* (holo L; iso KEP, SAN), Borneo, Sabah, Beaufort District, Mile 58.

Woody climber. *Branchlets* minutely and densely puberulent, glabrescent with age. *Leaves*: petiole 15–21 mm long, densely puberulent; blade ovate to elliptic, 6–18.9 by 3.8–8.2 cm, 1.5–2.6 times as long as wide, apex short acuminate, base rounded to obtuse, glabrous above, puberulent beneath, more densely so on midrib and veins, punctate beneath, 18–24 pairs of secondary veins, with weaker interstitial veins, anastomosing into an intramarginal vein. *Inflorescence* a terminal panicle, flowers densely clustered, 9.5–14.4 cm long; peduncle 2.5–9.5 cm long, minutely and densely puberulent; pedicels 1.5–2 mm long, minutely and densely puberulent, bracteoles absent. Calyx 1–2.2 mm long, connate at base, lobes c. 0.7–1 by 1–1.7 mm, 0.6–0.7 times as long as wide, apex rounded, densely pubescent. *Corolla* (slightly immature) yellow or purple; tube 8–9 mm long, c. 4.1 times as long as calyx, c. 1.5 times as long as lobes, densely pubescent outside except at very base, pubescent inside only below stamens; lobes falcate, c. 6 by 2.2 mm, apex acuminate, pubescent outside on parts of lobes exposed in bud, glabrous inside. *Stamens* inserted at 2.3–2.7 mm from corolla base which is c. 0.3 of tube length; filaments 0.6–0.8 mm long; anthers 1.2 by 0.4–0.5 mm. *Ovary* 1.3–1.4 mm long; style and style head 1.2–1.7 mm long. *Fruit* narrowly fusiform, c. 9.4 by 1.4 cm (immature).

Distribution — *Malesia*: Borneo (Sabah).

Habitat & Ecology — In swamp forest at low altitude.

Note — Only known from two collections.

9. *Chilocarpus rostratus* Markgr.

Chilocarpus rostratus Markgr., Blumea 19 (1971) 165; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 146. — Type: *Haviland & Hose 3490* (holo K; iso BM, L), Borneo, Sarawak, near Kuching.

Chilocarpus tuberculatus Markgr. ex Leeuwenb., Syst. Geogr. Pl. 72 (2002) 156; Markgr., Blumea 19 (1971) 164, nom. inval.; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 125, nom. nud. — Type: *Bünnemeyer 1136* (holo L; iso BO, K, U), Sumatra, Tanang Talu. — Markgraf did not provide a type so the species was not validly described. The 'lectotype' designation by Leeuwenberg actually had the effect of validating the name by providing a type and a reference back to the Latin description of Markgraf.

Climber, reported to 20 m high. *Branchlets* glabrous. *Leaves*: petiole 5–20 mm long, glabrous; blade elliptic, obovate or spatulate, (2.1–)3.9–16.5 by (0.8–)1.3–6.5 cm, 1.7–4.3 times as long as wide, apex rounded to shortly acuminate or apiculate, base cuneate, glabrous above and beneath, 18–43 pairs of secondary veins (but often difficult to count and distinguish from tertiary venation), these obscure beneath and weakly visible to obscure above, anastomosing into an intramarginal vein, tertiary venation parallel to and not very distinct from secondary veins, or obscure. *Inflorescence* axillary, shorter than to as long as subtending petiole, to 1.6 cm long, flowers densely congested, glabrous; peduncle 0–0.3 cm long; flowers subsessile or pedicels to 1 mm long; bracteoles 1–several. Calyx thin, ovate, 1–1.5 by 1–1.2 mm, 1–1.2 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* yellow, tube 4.5–6.8 mm long, 3.7–6.2 times as long as sepals, 1.1–1.6 times as long as lobes, glabrous outside, pubescent below the stamens inside; lobes falcate, 3.1–5.5 by 1.2–1.9 mm, 2.6–3.3 times as long as wide, apex acute to obtuse, glabrous outside and inside. *Stamens* inserted at 2–3.8 mm from corolla base which is 0.3–0.5 of tube length; filaments 0.5–0.6 mm long; anthers 0.9–1.1 by 0.3–0.4 mm. *Ovary* ovoid, 0.7–1.3 mm high; style and style head 1.3–2.5 mm long. *Fruit* 4.2–9 by 1.9–4.2 cm, orange, smooth to densely tuberculate. *Seeds* 6.5–8.5 by 4.5–5.3 by 3.9–4 mm.

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

Habitat & Ecology — Heath forest, secondary forest, primary forest and mossy forest on a range of soils at 20–1430 m altitude.

Note — *Chilocarpus tuberculatus*, from Peninsular Malaysia and Sumatra, is indistinguishable in flower from *C. rostratus*, from Borneo, but does tend to have more warty fruits. However, this character is also present to a lesser degree in some *C. rostratus* specimens from Borneo. The distinction between the two species is slight and cannot be maintained.

10. *Chilocarpus sarawakensis* D.J. Middleton

Chilocarpus sarawakensis D.J. Middleton, Edinburgh J. Bot. 63 (2006) 204. — Type: *Burt & Martin B.5183* (holo E), Borneo, Sarawak, 5th Division, route from Bakelalan to Gunung Murud, above S. Konap.

Woody climber, reported to 27 m high. *Branchlets* glabrous. *Leaves*: petiole 12–21 mm long; blade elliptic, 7.4–17 by 3.7–8.7 cm, 1.8–2.5 times as long as wide, apex short acuminate, apiculate, obtuse or rounded, base acute to cuneate, glabrous above and beneath, punctate beneath, 19–24 pairs of secondary veins, these strongly prominent beneath, weaker parallel and branched intercalated tertiary veins, all anastomosing into an intramarginal vein. *Inflorescence* axillary, robust, 4.6–8.5 cm long; peduncle 1.6–2.5 cm long, sparsely puberulent; pedicels 1–6 mm long, sparsely puberulent, with 1 or 2 bracteoles. Calyx 1.7–2 mm long, connate at the base, lobes 0.8–1 by 1.2–1.3 mm, 0.6–0.8 times as long as wide, puberulent, apex obtuse. *Corolla* yellow; tube c. 8.4 mm long, 4.2 times as long as sepals, 1.1 times as long as lobes, glabrous outside except at very top of tube, densely pubescent inside beneath stamens; lobes falcate, c. 7.5 by 2.2 mm, 3.4 times as long as wide, apex acute, pubescent on part exposed in

bud outside, glabrous inside. *Stamens* inserted at c. 4 mm from corolla base which is 0.5 of tube length; filaments c. 0.7 mm long; anthers c. 1.3 by 0.6 mm. *Ovary* c. 1.2 mm long; style and style head c. 2.8 mm long. *Fruit* unknown.

Distribution — *Malesia*: Borneo (Sarawak).

Habitat & Ecology — In primary forest at 1020–1340 m altitude.

11. *Chilocarpus steenisianus* Markgr.

Chilocarpus steenisianus Markgr., *Blumea* 19 (1971) 160; Leeuwenb., *Syst. Geogr. Pl.* 72 (2002) 148, p.p. — Type: *Endert 2872* (holo L), Borneo, West Kutai, Lake Ibut.

Large or small woody climber. *Branchlets* densely puberulent; glabrescent when older. *Leaves*: petiole 8–15 mm long, densely puberulent; blade elliptic or oblong, 6.6–26.5 by 2.2–13 cm, 2.1–3.6 times as long as wide, apex acuminate, sometimes obtuse and apiculate, base rounded to acute, 14–27 pairs of secondary veins, very prominent beneath, tertiary venation of weaker interstitial veins and reticulate veins, glabrous above, sparsely to densely pubescent all over beneath, more densely so on midrib, occasionally pubescent only on midrib and secondary veins, very rarely glabrous. *Inflorescence* in the axils of leaves (rarely pseudoterminal), much shorter than the leaves, ultimate branches fairly congested, 3–5.7 cm long; peduncle 1.2–3.7 cm long, sparsely to densely puberulent; pedicels 2.8–3.5 mm long, with 0–2 bracteoles, puberulent. Calyx 1.1–1.2 mm long, lobes 0.7–0.9 by 0.9–1.1 mm, c. 0.8 times as long as wide, apex rounded, glabrous to sparsely puberulent, ciliate. *Corolla* only known in bud, yellowish, sometimes with purple or reddish tinge at base; tube (immature) 6–8 mm long, pubescent outside in the lower half; lobes only known from buds but unfurled lobes with acute apex. *Stamens* inserted at 3.1–3.5 mm from corolla base; filament 0.5–0.7 mm long; anthers 1.1–1.2 by 0.3–0.4 mm. *Ovary* 1.3–1.4 mm long; style and style head 2–2.6 mm long. *Fruit* linear, torulose, 35–40 cm by 7–10 mm.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — In forest at low altitude.

Note — Material determined as this species from Sumatra is here considered to be *C. hirtus*.

12. *Chilocarpus suaveolens* Blume

Chilocarpus suaveolens Blume, *Cat. Gew. Buitenzorg* (1823) 23; *Bijdr.* (1826) 1025; *Mus. Bot.* 1 (1850) 151; *Miq., Fl. Ned. Ind.* 2 (1857) 391; *Hochr., Candollea* 5 (1934) 176; *Bakh.f., Blumea* 6 (1950) 385; *Backer & Bakh.f., Fl. Java* 2 (1965) 224; *Markgr., Blumea* 19 (1971) 164; Leeuwenb., *Syst. Geogr. Pl.* 72 (2002) 151. — Type: *Blume s.n.* (lecto L [898.110-55], designated by Middleton, *Taxon* 55 (2006) 503; probable iso BO, GH, L, MEL, NY, S, U), Java.

Chilocarpus suaveolens Blume var. *cuneatus* Blume, *Mus. Bot.* 1 (1850) 152. — Type: *Korthals s.n.* (holo L [898.110-60]; scrap from holotype in A), Sumatra.

Chilocarpus compositus Blume, *Mus. Bot.* 1 (1850) 152; *Miq., Fl. Ned. Ind.* 2 (1857) 392. — Type: *Blume s.n.* (holo L [898.110-19]), Java.

Chilocarpus densiflorus Blume, *Mus. Bot.* 1 (1850) 152; *Miq., Fl. Ned. Ind.* 2 (1857) 392. — Type: *Korthals s.n.* (lecto L [898.110-29], designated here; iso L, U), Sumatra.

Chilocarpus suaveolens Blume var. *salaccensis* Hochr., *Candollea* 5 (1934) 176. — Type: *Hochreutiner 2547* (holo G; iso L, Z), W Java, Depok near Bogor.

Large woody climber. *Branchlets* sparsely and minutely puberulent at least when young, very rarely glabrous. *Leaves*: petiole 6–15 mm long, glabrous or puberulent; blade elliptic, 3–13.5 by 0.9–6.7 cm, 1.9–4.3 times as long as wide, apex acuminate or obtuse and apiculate, glabrous above and beneath, 12–20 pairs of secondary veins, clearly visible above and beneath, prominent beneath, tertiary venation of weaker intercalated veins and reticulate. *Inflorescence* axillary, 1.3–4 cm long, much shorter than the subtending leaf; peduncles 0–2.1 cm long, sparsely to densely and minutely puberulent; pedicels 1.5–8 mm long, sparsely to densely and minutely puberulent, with several to numerous bracteoles. Calyx 1–1.2 mm long, slightly reflexed, connate at base, lobes 0.5–1 by 0.7–1 mm, 0.7–1 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* yellowish or orange-yellow; tube 4.2–6 mm long, 5–6 times as long as sepals, 1.2–1.6 times as long as lobes, glabrous outside, densely pubescent below stamens inside; lobes 3.2–5.1 by 1.2–1.7 mm, 2.6–3 times as long as wide, apex acuminate, glabrous outside and inside. *Stamens* inserted at 1.5–2.4 mm from corolla base which is 0.3–0.5 of tube length; filament 0.4–0.7 mm long; anthers 0.9–1.2 by 0.3–0.4 mm. *Ovary* 0.9–1.2 mm long; style and style head 1.1–1.9 mm long. *Fruit* dull orange, ovoid, 4.5–9 by 2.4–3.7 cm. *Seeds* 7–10 by 5–7.2 by 4.5–5.7 mm.

Distribution — *Malesia*: Sumatra, Borneo, Java.

Habitat & Ecology — Primary, secondary and scrub forest to 650 m altitude.

Note — The material of this species cited by Leeuwenberg (2002) for New Guinea is *Melodinus acutiflorus* and that for Sulawesi *Chilocarpus denudatus*.

13. *Chilocarpus torulosus* (Boerl.) Markgr.

Chilocarpus torulosus (Boerl.) Markgr., Blumea 19 (1971) 162; Coode et al., Checklist Pl. Brunei (1996) 26; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 153. — *Alyxia torulosa* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 12; Merr., Bibliogr. Enum. Born. Pl. (1921) 499; Masam., Enum. Phan. Born. (1942) 618. — *Neokeithia torulosa* (Boerl.) Steenis, Bull. Jard. Bot. Buitenzorg III, 17 (1948) 408. — Type: *Van Romburgh 54* (holo BO), Borneo, Kalimantan, Kampong Djoedjoe.

Chilocarpus anguineus Stapf, Hooker's Icon. Pl. ser. 4, 10 (1913) t. 2993; Merr., Bibliogr. Enum. Born. Pl. (1921) 497; Masam., Enum. Phan. Born. (1942) 619; Coode et al., Checklist Pl. Brunei (1996) 26. — Type: *Haviland 2060* (holo K (on 2 sheets)), Borneo, Sarawak, Mt Bongo.

Woody climber to over 25 m high. *Branchlets* glabrous. *Leaves*: petiole 6–19 mm long, glabrous; blade coriaceous, elliptic to obovate, 5.1–14.1 by 1.5–5 cm, 2.1–4.1 times as long as wide, apex shortly acuminate with a blunt apex, apiculate, rounded or weakly emarginate, base attenuate onto petiole, glabrous above and beneath, 22–35 pairs of secondary veins, weakly ascending, clearly visible above and beneath, tertiary venation of only slightly weaker intercalated veins. *Inflorescence* axillary and terminal, delicate, ultimately umbelliform by contraction of terminal nodes, 4–7 cm long, axes sparsely and minutely puberulent; peduncle 1–3.7 mm long; pedicels 1.3–3.5 mm, glabrous, with 0 or 1 bracteoles. Calyx 0.7–1.1 mm long, connate at base, lobes ovate, 0.5–0.9 by 0.6–1.1 mm, 0.6–0.9 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* yellow, tube 3.4–3.7 mm long, 3.1–4.9 times as long as sepals, 0.7–0.9 times as long as lobes, constricted above anthers, glabrous outside, densely pubescent below stamens inside; lobes falcate, 3.9–5 by 1.2–1.9 mm, 2.6–3.3 times as long as wide,

apex acute to rounded, glabrous outside and inside. *Stamens* inserted at 2–2.4 mm from corolla base which is 0.6–0.7 of tube length; filaments 0.5–0.6 mm long; anthers 0.9–1 by 0.3–0.4 mm. *Ovary* 1.2–1.4 mm high; style and style head 1.1–1.6 mm long. *Fruit* ripening orange, linear, torulose, often distinctly twisted, 15–45 cm by 6–15 mm wide across dilations, dehiscing longitudinally into two. *Seeds* c. 6–10 by 6 by 4.5 mm.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — In kerengas forest and mixed dipterocarp forest. On white or yellow sandy soil. 0–920 m altitude.

Note — See note under *C. denudatus*.

14. *Chilocarpus vernicosus* Blume

Chilocarpus vernicosus Blume, Mus. Bot. 1 (1850) 152; Miq., Fl. Ned. Ind. 2 (1857) 392; Merr., Bibliogr. Enum. Born. Pl. (1921) 497; Masam., Enum. Phan. Born. (1942) 619; Markgr., Blumea 19 (1971) 161; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; 47 (1997 ['1995']) 125; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 159. — Type: *Korthals s.n.* (lecto L [898.110-65], designated by Leeuwenberg (2002) op. cit.; iso A, BO, L, U), Borneo, Kalimantan.

Chilocarpus globuliferus Blume, Mus. Bot. 1 (1850) 152; Miq., Fl. Ned. Ind. 2 (1857) 392; Merr., Bibliogr. Enum. Born. Pl. (1921) 497; Masam., Enum. Phan. Born. (1942) 619. — Type: *Blume s.n.* (lecto L [898.110-34], designated here), Borneo, Kalimantan.

Chilocarpus enervis Hook.f., Fl. Brit. India 3 (1882) 626; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 7; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 402; Hallier, Bot. Jahrb. Syst. 49 (1913) 371; Merr., Bibliogr. Enum. Born. Pl. (1921) 497; Ridl., Fl. Malay Penins. 2 (1923) 327; Masam., Enum. Phan. Born. (1942) 619. — Type: *Maingay 3063* (= *Kew Distribution 1044*) (lecto K, designated here; iso K), Peninsular Malaysia, Malacca.

Chilocarpus cantleyi King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 403; Ridl., Fl. Malay Penins. 2 (1923) 328. — Type: *Cantley 227* (lecto K, designated by Leeuwenberg (2002) op. cit.), Peninsular Malaysia, Perak.

Chilocarpus nigrescens King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 404; Ridl., Fl. Malay Penins. 2 (1923) 328; Markgr., Blumea 19 (1971) 161; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 125. — Type: *Curtis 1040* (lecto SING n.v., designated by Leeuwenberg (2002) op. cit.; iso K, SING), Peninsular Malaysia, Penang, West Hill, March 1892. — Note that not all specimens of *Curtis 1040* are the same species and another specimen with the same number serves as the type of *Melodinus coriaceus* Oliv.

Woody climber to 20 m high. *Branchlets* glabrous, not lenticellate. *Leaves*: petiole 10–37 mm long; blade elliptic, occasionally almost oblong, 4.6–18.5 by 1.5–7.8 cm, 1.6–3.9 times as long as wide, apex acuminate or apiculate, sometimes rounded, base cuneate, secondary veins 11–30 pairs, with slightly weaker parallel interstitial veins, these sometimes obscure or indistinguishable from secondary veins, more or less straight, anastomosing into an intramarginal vein. *Inflorescence* axillary, paniculate, robust, 2.4–11.7 cm long, shorter than subtending leaves; peduncle 0.7–3.2 cm long, sparsely and minutely puberulent or glabrous; pedicels with many bracteoles, 0.5–2 mm long. Calyx ovate, 1.2–1.6 mm long, lobes 0.8–1.3 by 1–1.4 mm, 0.6–1.2 times as long as wide, apex obtuse to rounded, glabrous, ciliate. *Corolla* orange; tube 4.3–5.7 mm long, 3.3–4.8 times as long as sepals, 0.8–1.4 times as long as lobes, glabrous outside, densely pubescent below stamens inside; lobes 4–5.4 by 1.5–2.1 mm, 2.4–3.3 times as long as wide, falcate, apex acuminate to obtuse. *Stamens* inserted at 2.1–3.3 mm

from corolla base which is 0.4–0.5 of tube length; filaments 0.6–0.8 mm long; anthers 1–1.3 by 0.4–0.5 mm. *Ovary* 1–1.3 mm high, glabrous; style and style head 1.4–2.2 mm long. *Fruit* ellipsoid, often warty, 5.5–8.2 by 3.1–4 by 3.2–3.5 cm, base cuneate, apex apiculate or acuminate. *Seeds* 7–9 by 6–7 by 3.5–4.5 mm.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo.

Habitat & Ecology — In forest at low altitude.

12. CHONEMORPHA

Chonemorpha G. Don, Gen. Hist. 4 (1837) 76, nom. cons.; Benth. & Hook.f., Gen. Pl. 2 (1876) 720; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 177; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1246; Furtado, Gard. Bull. Straits Settlements 9 (1935) 113; Chatterjee, Kew Bull. 1947 (1947) 47; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 33; Seshagiri Rao, J. Indian Bot. Soc. 32 (1953) 34; Backer & Bakh.f., Fl. Java 2 (1965) 238; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 19; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 195; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 56; Lý, Feddes Repert. 97 (1986) 653; D.J. Middleton, Novon 3 (1993) 455; P.T. Li et al., Fl. China 16 (1995) 170; D.J. Middleton, Fl. Thailand 7 (1999) 121; Tree Fl. Sabah & Sarawak 5 (2004) 13. — Type species: *Chonemorpha macrophylla* G. Don (= *Chonemorpha fragrans* (Moon) Alston).

Rhynchospermum A.DC., Prodr. 8 (1844) 431 (as *Rhynchospermum*), non Reinw. — *Rhynchodia* Benth. in Benth. & Hook.f., Gen. Pl. 2 (1876) 719; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 172; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1239; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 32; Backer & Bakh.f., Fl. Java 2 (1965) 237; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 206; Lý, Feddes Repert. 97 (1986) 650. — *Cercocoma* Miq., Fl. Ned. Ind. 2 (1857) 445, non Wall. — Type species: *Rhynchospermum wallichii* A.DC. (= *Chonemorpha verrucosa* (Blume) D.J. Middleton).

Triadenia Miq., Fl. Ned. Ind. 2 (1857) 458, non Spach. — Type species: *Triadenia verrucosa* (Blume) Miq. (= *Chonemorpha verrucosa* (Blume) D.J. Middleton).

Chonemorpha G. Don sect. *Abscalyx* P.T. Li, J. S. China Agric. Coll. 11 (1990) 31. — Type species: *Chonemorpha valvata* Chatterjee (= *Chonemorpha fragrans* (Moon) Alston).

Large woody climbers. *Branchlets* frequently lenticellate; bud scales or bud scale scars present at base of new growth. *Leaves* opposite; colleters present in the axils. *Inflorescence* a terminal panicle; flowers 5-merous. *Sepals* often connate for large part of length; colleters in a row inside. *Corolla* lobes dextrorse and twisted to the left in bud; tube distinctly widening at point of stamen insertion, lobes obovate, slightly asymmetrical; salverform in mature flower. *Stamens* inserted in lower half of corolla tube, completely included in tube; filaments short; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base; adnate to the style head. *Disk* entire, 5-dentate; shorter than the ovaries; glabrous. Gynoecium 2-carpellate, apocarpous but apically united into a common style, often somewhat semi-inferior; ovules numerous; ovaries glabrous. *Fruit* of paired follicles, mostly rather flattened, rarely fused together at the apices. *Seeds* with a long narrowly acuminate end topped with a coma directed towards the fruit apex.

Distribution — About 10 species from India and China to Malesia; in *Malesia* 3 species.

Note — This genus is in need of a comprehensive revision throughout its range.

KEY TO THE SPECIES

- 1a. Corolla tube < 10 mm long; calyx 3–6 mm long **3. C. verrucosa**
 b. Corolla tube > 10 mm long; calyx 5.5–17 mm long 2
 2a. Corolla tube 18–65 mm long, 2.4–7.9 times as long as calyx; calyx colleters glabrous or sparsely pubescent inside. **1. C. fragrans**
 b. Corolla tube 12–23 mm long, 1.1–1.4 times as long as calyx; calyx colleters densely pubescent inside. **2. C. mollis**

1. Chonemorpha fragrans (Moon) Alston

Chonemorpha fragrans (Moon) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11 (1929) 203; Furtado, Gard. Bull. Straits Settlement. 9 (1935) 115; Bakh.f., Blumea 6 (1950) 388; Seshagiri Rao, J. Indian Bot. Soc. 32 (1953) 36; Sleseen, Nova Guinea n.s. 9 (1958) 344; Backer & Bakh.f., Fl. Java 2 (1965) 239; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 19; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 56; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 37; P.T. Li et al., Fl. China 16 (1995) 170; P.I. Forst., Fl. Australia 28 (1996) 145; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 125; M.F. Watson, Fl. Bhutan 2 (1999) 683; D.J. Middleton, Fl. Thailand 7 (1999) 122. — *Echites fragrans* Moon, Cat. Pl. Ceylon (1824) 20. — *Pergularia tomentosa* Dennst., Schlüssel Hortus Malab. 10 (1818) 23, non L. (1767). — *Chonemorpha rheedei* Ridl., Agric. Bull. Straits Fed. Malay States 10 (1911) 146. — Type: Rheede, Hort. Malab. 9 (1689) t. 5, 6.

Chonemorpha grandiflora G. Don, Gen. Hist. 4 (1837) 76. — *Chonemorpha grandiflora* M.R. Almeida & S.M. Almeida, J. Bombay Nat. Hist. Soc. 90 (1994) 427, isonym. — *Echites grandiflora* Roth in Roem. & Schult., Syst. Veg. 4 (1819) 393, non G. Mey (1818). — Type: *Heyne s.n.* (untraced). Neotype: *Savantwadi SMA 2180* (neo BLAT n.v., designated by Almeida & Almeida (1994) op. cit.), India.

Chonemorpha macrophylla G. Don, Gen. Hist. 4 (1837) 76; Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 432; Miq., Fl. Ned. Ind. 2 (1857) 444; Kurz, Forest Fl. Burma 2 (1877) 187; Hook.f., Fl. Brit. India 3 (1882) 661; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 483; Furtado, Gard. Bull. Straits Settlement. 9 (1935) 115; Chatterjee, Kew Bull. 1947 (1947) 49; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 197. — *Echites macrophyllus* Roxb., Fl. Ind. ed. 2, 2 (1832) 13, non Kunth (1819). — Type: *Wallich 1657.2* (lecto K-W, designated by Middleton, Taxon 55 (2006) 503; iso K), India, cultivated in Calcutta Botanic Garden.

Chonemorpha macrophylla G. Don var. *grandis* A.DC., Prodr. 8 (1844) 430. — Type: *Wallich 1658* (lecto G-DC, designated by Middleton, Taxon 55 (2006) 504; iso K, K-W), India, Kamaon.

Cercocoma macrantha Teijsm. & Binn., Cat. Hort. Bot. Bogor. (1866) 126, nom. nud.

Chonemorpha griffithii Hook.f., Fl. Brit. India 3 (1882) 662; Chatterjee, Kew Bull. 1947 (1947) 49; Seshagiri Rao, J. Indian Bot. Soc. 32 (1953) 43; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 204; P.T. Li et al., Fl. China 16 (1995) 171; M.F. Watson, Fl. Bhutan 2 (1999) 683; D.J. Middleton, Fl. Thailand 7 (1999) 122. — Type: *Griffith s.n.* (lecto K, designated by Middleton, Taxon 55 (2006) 503), India.

Chonemorpha grandieriana [Pierre in L. Planch., Prod. Apocyn. (1894) 296, nom. nud.] Pierre ex Spire, Contr. Apocyn. (1905) 72; Spire, Caoutchouc Indo-Chine (1906) 72; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1252; Kerr in Craib, Fl. Siam. 2 (1939) 474; Chatterjee, Kew Bull. 1947 (1947) 49; Lý, Feddes Repert. 97 (1986) 656. — *Beluttakaka grandieriana* Pierre ex L. Planch., Prod. Apocyn. (1894) 297, nom. nud. — Type: *Spire 3* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 295; iso P), Laos, Xieng Khouang, Cua Rao.

Chonemorpha harmandiana Pierre in L. Planch., Prod. Apocyn. (1894) 296, nom. nud. — *Beluttakaka harmandiana* Pierre in L. Planch., Prod. Apocyn. (1894) 296, nom. nud.

Chonemorpha yersinii Spire [Bull. Écon. Indochine 12 (1902) 859, nom. nud.] ex Vernet, Bull. Écon. Indochine 35 (1904) 1197; Chatterjee, Kew Bull. 1947 (1947) 52. — Type: *Vernet s.n.* (holo P), Vietnam, Khanh Hoa, Suoi Giao.

- Chonemorpha elliptica* Merr. & Rolfe, Philipp. J. Sci., Bot. 3 (1908) 121; Chatterjee, Kew Bull. 1947 (1947) 48. — *Tabernaemontana elliptica* Blanco, Fl. Filip. (1837) 115 (as *elliptica*), non Thunb. (1784). — *Chonemorpha blancoi* Merr., Sp. Blancoan. (1918) 312; Seshagiri Rao, J. Indian Bot. Soc. 32 (1953) 42. — Type: *Ramos 1065* (lecto GH, designated by Middleton, Taxon 55 (2006) 503; iso BO, K, NSW, NY, PNH, SING, US), Philippines, Luzon, Rizal Province, Bosoboso.
- Chonemorpha penangensis* Ridl., Agric. Bull. Straits Fed. Malay States 10 (1911) 147; Fl. Malay Penins. 2 (1923) 360; Furtado, Gard. Bull. Straits Settlement. 9 (1935) 116; Chatterjee, Kew Bull. 1947 (1947) 51; Seshagiri Rao, J. Indian Bot. Soc. 32 (1953) 43; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 125. — Type: *Curtis 832* (lecto SING, designated by Middleton, Taxon 55 (2006) 504; iso SING), Peninsular Malaysia, Penang, May 1893.
- Chonemorpha macrantha* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1249; Kerr in Craib, Fl. Siam. 2 (1939) 474; Chatterjee, Kew Bull. 1947 (1947) 49; L y, Feddes Repert. 97 (1986) 656. — Type: *Spire 19* (lecto P, designated by Middleton, Adansonia s r. 3, 27 (2005) 295; iso HM, P), Laos, Xieng Khouang.
- Chonemorpha valvata* Chatterjee, Kew Bull. 1947 (1947) 51; Seshagiri Rao, J. Indian Bot. Soc. 32 (1953) 44; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 204. — Type: *Forrest 7590* (holo K; iso E), China, Yunnan, west of Tengyueh.
- Chonemorpha mollis* auct. non Miq.: Furtado, Gard. Bull. Straits Settlement. 9 (1935) 116, p.p.

Large woody climbers to 20 m high. *Branchlets* sparsely to very densely pubescent or hispid, rarely glabrous; lenticellate. *Leaves*: petiole 0.7–9 cm long, densely pubescent; blade orbicular, elliptic or obovate, 4–38 by 2.8–34.5 cm, 0.9–2.5 times as long as wide, apex rounded, acuminate or apiculate, base cordate to acute, sparsely pubescent and more densely so on venation above, more rarely glabrous or densely pubescent all over above, sparsely to densely pubescent beneath, 7–11 pairs of secondary veins, ascending, anastomosing into a looped intramarginal vein, subscalariform and reticulate. *Inflorescence* terminal, 10–30 cm long; peduncle 1–13 cm long, densely pubescent; pedicels 4–31 mm long, densely pubescent. Calyx of 5 free lobes, or fused into a tube with 5 lobes, these lobes sometimes irregular, entire calyx 5.5–17 mm long, glabrous to densely pubescent outside, free or fused for up to 0.89 of calyx length; lobes 1–10 by 1.5–5 mm, 0.8–6.7 times as long as wide; colleters free or in a partially fused row on the inside base of the calyx, glabrous or very sparsely pubescent on inner surface. *Corolla* white or cream, fragrant; tube 18–65 mm long, 2.4–7.9 times as long as calyx, 0.5–2.5 times as long as lobes, glabrous or sparsely puberulent outside, densely pubescent inside; lobes 21–63 by 11–55 mm, 1.1–2.3 times as long as wide, oblique obovate with a sharp projection on one side, glabrous outside and inside. *Stamens* inserted at 5.2–12.5 mm from corolla base which is 0.2–0.4 of tube length; anthers 7.2–13.2 by 1.2–2.2 mm, 4.3–8.8 times as long as wide. *Disk* of a 5-crenate or 5-dentate ring, 0.6–1.5 mm high, shorter than the ovaries. *Ovaries* 1.5–3.4 mm high, glabrous; style 4.5–12 mm long, glabrous to pubescent in upper parts; style head 2–5 mm long. *Fruit* 17.6–40 by 1–2.3 cm, fusiform, flattened, glabrous to puberulent. *Seeds* 13–35 by 4–7 mm with a beak 4–19 mm long; coma 26–70 mm long.

Distribution — India, Sri Lanka, Nepal, Bhutan, Bangladesh, Burma, southern China, Thailand, Cambodia, Laos, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo (one record from Brunei), Java, Philippines, Sulawesi, Lesser Sunda Islands (incl. East Timor).

Habitat & Ecology — In a wide variety of forest or scrub habitats, including on karst limestone.

Note — *Chonemorpha fragrans* is an extremely variable species with the specimens from Peninsular Malaysia seemingly particularly distinct with the longer calyx tube and correspondingly shorter lobes and the more densely pubescent calyx. In addition the corolla is generally somewhat smaller than usual. However, there are no discontinuities between these specimens and the rest of the material of the species which shows patterns of variation in other parts of its range.

2. *Chonemorpha mollis* Miq.

Chonemorpha mollis Miq., Fl. Ned. Ind. 2 (1857) 444; Fl. Ned. Ind., Eerste Bijv. (1861) 556; Furtado, Gard. Bull. Straits Settle. 9 (1935) 116. — Type: *Horsfield s.n.* (lecto U, designated by Middleton, Taxon 55 (2006) 504; iso CAL n.v., CGE, GH, L (scrap)), Java.

Chonemorpha mollissima Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; Bakh.f., Blumea 6 (1950) 388. — Type: *Collector unknown (Reinwardt?) s.n.* (lecto L [898.110-88], designated here; iso L), Java.

Woody climber. *Branchlets* densely golden pubescent. *Leaves*: petiole 12–55 mm long, sparsely to densely pubescent; blade elliptic to orbicular, 11–19.4 by 6.7–16 cm, 1.2–1.9 times as long as wide, apex rounded, acuminate or apiculate, base rounded to subcordate, densely pubescent or only sparsely so on blade and more densely on venation above, densely pubescent beneath, 8–11 pairs of secondary veins, tertiary venation subscalariform and reticulate. *Inflorescence* terminal, 5–20 cm long; peduncle 2.3–10 cm long, densely pubescent; pedicels 7–12 mm long, densely pubescent. Calyx of a tube and small lobes, 11–14.5 mm long, sparsely to densely pubescent outside, tube 0.71–0.93 of calyx length; lobes 0.9–4.7 by 2–3 mm, 0.5–1.6 times as long as wide, apex acute; colleters inside densely pubescent on the inner surface. *Corolla* tube 12–23 mm long, 1.1–1.4 times as long as calyx, 0.8–1.4 times lobe length, glabrous or sparsely pubescent at top of tube outside, densely pubescent inside; lobes 12–38 by 6–14 mm, 2–2.7 times as long as wide, oblique obovate, glabrous outside and inside. *Stamens* inserted at 5–5.5 mm from corolla base which is 0.3–0.5 of tube length; anthers 5–6.6 by 1.1–1.7 mm, 2.9–6 times as long as wide. *Disk* a 5-crenate ring, 0.7–1.6 mm high. *Ovaries* 1.2 mm high, glabrous; style 5 mm long, glabrous; style head 2 mm long. *Fruit* unknown.

Distribution — *Malesia*: Java.

Habitat & Ecology — Unknown.

Note — This species is known from only a very few old specimens. It is very similar to *C. fragrans* but differs in the very small flowers and the densely pubescent inside to the calyx colleters. Further collections may show that it is merely an extreme variation of *C. fragrans*.

3. *Chonemorpha verrucosa* (Blume) D.J. Middleton

Chonemorpha verrucosa (Blume) D.J. Middleton, Novon 3 (1993) 455; P.T. Li et al., Fl. China 16 (1995) 171; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 125; M.F. Watson, Fl. Bhutan 2 (1999) 682; D.J. Middleton, Fl. Thailand 7 (1999) 123; PROSEA 18 (2000) 122. — *Tabernaemontana verrucosa* Blume, Bijdr. (1826) 1029. — *Triadenia verrucosa* (Blume) Miq., Fl. Ned. Ind. 2 (1857) 459. — *Trachelospermum verrucosum* (Blume) Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400. — *Rhynchodia verrucosa* (Blume) Woodson, Sunyatsenia 3 (1936) 102; Kerr in Craib, Fl. Siam. 2 (1939) 473; Backer & Bakh.f., Fl. Java 2 (1965) 237; Lý, Feddes Repert. 97 (1986) 652. — Type: *Blume 2159* (lecto L [898.112-94], designated by Middleton (1993) op. cit.; iso L), Java.

- Echites rhynchospermus* Wall., Pl. Asiat. Rar. 1 (1830) 43, t. 49. — *Rhynchospermum wallichii* A.DC., Prodr. 8 (1844) 431 (as *Rhynchospermum*). — *Cercocoma wallichii* (A.DC.) Miq., Fl. Ned. Ind. 2 (1857) 445; Kurz, Forest Fl. Burma 2 (1877) 187. — *Rhynchodia wallichii* (Miq.) Benth. ex Hook.f., Fl. Brit. India 3 (1882) 667; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 485; Ridl., Fl. Malay Penins. 2 (1923) 361. — *Rhynchodia rhynchosperma* (Wall.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 173; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 206; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 53. — Type: *Wallich 1665* (holo K-W; iso G-DC, K), Burma, Martaban.
- Rhynchospermum ellipticum* A.DC., Prodr. 8 (1844) 431 (as *Rhynchospermum*). — *Echites ellipticum* Wall. ex G. Don, Gen. Hist. 4 (1837) 75, non Thunb. (1819). — *Echites verticalis* Buch.-Ham. ex A.DC., Prodr. 8 (1844) 431, nom. nud. (in synonymy of *Rhynchospermum ellipticum*). — Type: *Wallich 1666* (lecto G-DC, designated by Middleton, Taxon 55 (2006) 505; iso K-W, NY, P), Bangladesh, Sylhet.
- Rhynchodia capusii* Pierre ex Spire, Contr. Apocyn. (1905) 102; Caoutchouc Indo-Chine (1906) 102. — Type: *Spire 23* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 302; iso E, P), Laos, Xieng Khouang.
- Rhynchodia fragrans* Pierre ex Spire, Contr. Apocyn. (1905) 108; Caoutchouc Indo-Chine (1906) 108. — Type: *Balansa 2097* in *Pierre 6548* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 302; iso P), Vietnam, Hoa Binh, left bank of the Black River, Phuong-lam. — Note that the lectotype of this taxon is a different specimen of the same collection to the lectotype of *Rhynchodia pierrei* Spire.
- Rhynchodia pierrei* Spire, Bull. Soc. Bot. France 52 (1905) 556; Caoutchouc Indo-Chine (1906) 145. — Type: *Balansa 2097* in *Pierre 6548* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 302; iso P), Vietnam, Hoa Binh, left bank of the Black River, Phuong-lam. — Note that the lectotype of this taxon is a different specimen of the same collection to the lectotype of *Rhynchodia fragrans* Pierre ex Spire.
- Chonemorpha elastica* Merr., Philipp. J. Sci., Bot. 4 (1909) 81. — Type: *Hutchinson 12351* (lecto US, designated by Middleton, Taxon 55 (2006) 503), Philippines, Mindanao, Tigbalubu, Dumanguilas Bay.
- Rhynchodia pauciflora* Pit. in Lecomte, Fl. Indo-Chine 2 (1933) 1243; Lý, Feddes Repert. 97 (1986) 652. — *Rhynchodia pierrei* Spire var. *annamensis* Pit., Fl. Indo-Chine 2 (1933) 1241. — Type: *Chevalier 40315* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 302; iso P), Vietnam, Massif du Langbian, Dran.
- Trachelospermum slootenii* Tsiang, Sunyatsenia 4 (1939) 29. — *Rhynchodia slootenii* (Tsiang) Tsiang ex Bakh.f., Blumea 6 (1950) 389; Backer & Bakh.f., Fl. Java 2 (1965) 237. — Type: *Winckel 526B* (holo BO), Java.

Large woody climber. *Branchlets* lenticellate, sparsely pubescent, turning glabrous with age. *Leaves*: petiole 8–26 mm long, sparsely puberulent; blade ovate, elliptic or slightly obovate, 4–20.8 by 2.2–11 cm, 1.7–3.1 times as long as wide, apex acuminate, base obtuse to cuneate, sparsely puberulent on midrib to glabrous above, sparsely puberulent all over beneath, 8–16 pairs of secondary veins, tertiary venation scalariform. *Inflorescence* lax, 4.8–14.5 cm long; peduncle 1.4–5.5 cm long, sparsely puberulent; pedicels 6.5–22 mm long, sparsely pubescent; bracts slightly leafy. Calyx of a tube at the base and erect or spreading lobes; 3–6 mm long, sparsely puberulent to glabrous outside, lobes ciliate, tube 0.13–0.42 of calyx length; lobes 2–5.2 by 1.1–2 mm, 1.1–2.6 times as long as wide; colleters in a row inside, glabrous. *Corolla* white, fragrant; tube 6–8.5 by 1.8–3.6 mm, 1.3–2.1 times as long as calyx, 0.5–0.8 times as long as lobes, glabrous or very sparsely puberulent outside, pubescent around stamens and top of tube inside, densely pubescent in throat; lobes 8.8–16 by 5.6–10.5 mm, 1.4–1.9 times as long as wide, obovate, falcate, glabrous outside, pubescent at base of lobes inside. *Stamens* inserted at 2.6–4 mm from corolla base which is 0.4–0.5 of tube length;

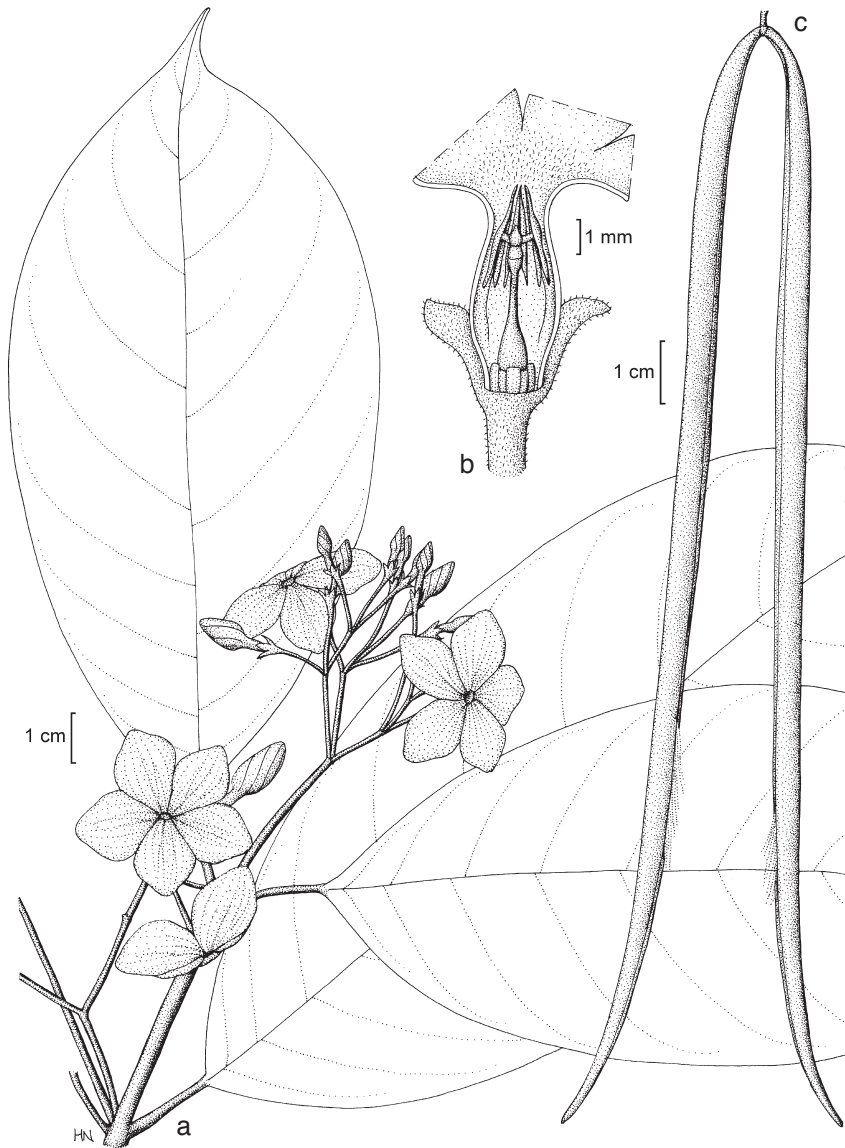


Fig. 41. *Chonemorpha verrucosa* (Blume) D.J. Middleton. a. Habit; b. flower dissection; c. fruit (a, b: Geesink 6713; c: L.202470).

anthers 3.3–4.3 by 0.6–0.7 mm, 4.9–5.7 times as long as wide. *Disk* in a ring, crenate around the margin, 0.8–1 mm high, 0.3–1 times as high as ovaries. *Ovaries* 1–2.5 mm high, glabrous; style 1–2.3 mm long, glabrous; style head 1.5–1.6 mm long. *Fruit* of paired linear follicles, smooth, glabrous to sparsely puberulent, 15.8–44 cm by 6–17 mm. *Seeds*: grain 11–30 by 3–4.8 mm of which rostrate apex 3.2–19 mm long, coma 2.7–7.5 cm long. — **Fig. 41.**

Distribution — India, Bhutan, China, Burma, Cambodia, Laos, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java.

Habitat & Ecology — In a wide variety of forest or scrub habitats to 1000 m altitude.

Uses — Previously exploited for a high quality rubber before the widespread use of *Hevea brasiliensis*.

13. CLEGHORNIA

Cleghornia Wight, Icon. Pl. Ind. Orient. 4 (1848) 5, t. 1310, 1312; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1208; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 86; Z.R. Xu, Agric. Univ. Wageningen Pap. 88-6 (1988) 11, p.p.; D.J. Middleton, Fl. Thailand 7 (1999) 133. — Type species: *Cleghornia acuminata* Wight.

Climber. *Branches* sparsely lenticellate. *Leaves* opposite, those of a pair equal, col-leters in the axils. *Inflorescence* axillary and terminal, forming panicles, usually at least the lower branches of inflorescence alternate, more rarely all branches opposite; flowers 5-merous. *Sepals* with colleters only in sinuses. *Corolla* lobes dextrorse in bud, not twisted in bud; tube cylindrical; lobes erect in bud, ± symmetrical; mature flower salverform or with lobes erect. *Stamens* completely included, inserted near base of corolla tube, subsessile; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base, pubescent on outside at the tip; adnate to the style head. *Disk* of 5 separate fleshy lobes. Gynoecium 2-carpel- late, apocarpous but apically united into a common style, glabrous; ovules numerous; style head without a collar at base. *Fruit* of 2 slender, terete or fusiform, divergent or parallel follicles. *Seeds*: grain narrowly elliptic, somewhat flattened, glabrous except for the apical coma on a short beak.

Distribution — 2 species in Sri Lanka, China, and Southeast Asia; in *Malesia* 1 species.

Note — Some of the Malesian species included in *Cleghornia* in Xu's revision have been removed to *Anodendron* (see Middleton, Blumea 41 (1996) 37–68).

Cleghornia malaccensis (Hook.f.) King & Gamble

Cleghornia malaccensis (Hook.f.) King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 491; Ridl., Fl. Malay Penins. 2 (1923) 363; Z.R. Xu, Agric. Univ. Wageningen Pap. 88-6 (1988) 21; P.T. Li et al., Fl. China 16 (1995) 187; I.M. Turner, Gard. Bull. Singapore 47 (1997 [1995]) 125; D.J. Middleton, Fl. Thailand 7 (1999) 133. — *Baissea malaccensis* Hook.f., Fl. Brit. India 3 (1882) 663. — *Giadotrum malaccense* (Hook.f.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 300. — Type: *Maingay* 3276 (lecto K, designated by Xu (1988) op. cit.; iso K), Peninsular Malaysia.

Cleghornia dongnaiensis Pierre ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1208. — *Giadotrum dongnaiensis* (Pierre ex Pit.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 300; Lý, Feddes Repert. 97 (1986) 671. — Type: *Pierre* 2027 (lecto HM, designated by Lý (1986) op. cit.; iso P), Vietnam, Bien Hoa Province, Baochiang.

Baissea acuminata auct. non (Wight) Benth. ex Hook.f.: Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 172; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 532. — *Cleghornia acuminata* auct. non Wight: P.T. Li, Guihaia 4 (1984) 193.

Large woody climber to 30 m high. *Branches* often with flaking bark, glabrous. *Leaves*: petiole 0.7–1.8 cm long, glabrous; blade papery to subcoriaceous, elliptic to

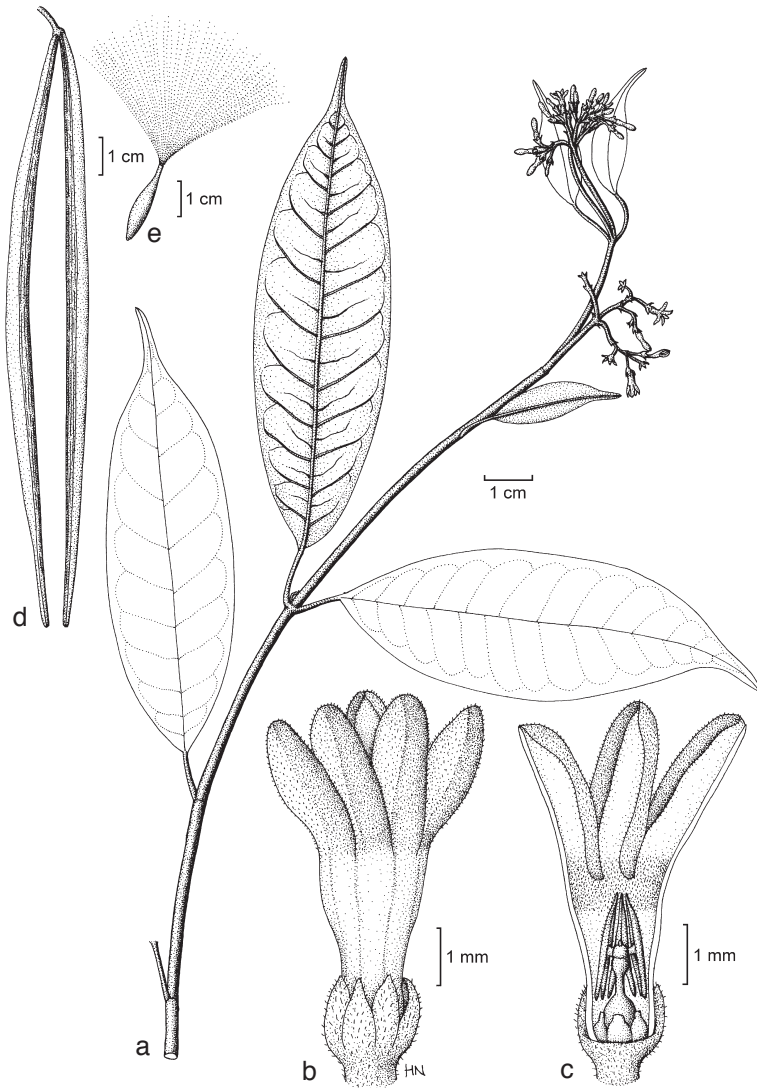


Fig. 42. *Cleghornia malaccensis* (Hook.f.) King & Gamble. a. Habit; b. flower; c. dissected flower; d. fruit; e. seed (a–c: Kerr 20988; d, e: fruit copied from Xu).

oblong, rarely somewhat obovate, 4–13.5 by 1.5–6 cm, 1.9–3.6 times as long as wide, apex abruptly caudate or acuminate, base rounded to cuneate, glabrous above and beneath, 7–15 pairs of secondary veins almost perpendicular to midrib, anastomosing to form a faint intramarginal vein, tertiary venation faint and subparallel to secondary veins or reticulate. *Inflorescence* 4–10 cm long, many-flowered; peduncle 1.8–5.7 cm long, puberulent; pedicels 1–4 mm long, puberulent. *Sepals* ovate, 0.8–1.7 by 0.6–1.2 mm, 1.7–1.9 times as long as wide, apex obtuse; glabrous, ciliate. *Corolla* white or

pale yellow; tube 1.6–3.4 by 1–1.3 mm, 1.6–2.8 times as long as calyx, 0.8–1.7 times as long as lobes, glabrous outside, pubescent in lines between anthers inside; lobes 1.7–3.8 by 0.8–1.2 mm, 2.5–3.2 times as long as wide, oblong, margins usually slightly inrolled, glabrous or sparsely puberulent on lobes outside. *Stamens* inserted at 0.2–0.3 of corolla tube length from base; anthers 1.8–2.8 by 0.5–0.6 mm, puberulent on back at apex and at filamentsinsertion on front. *Disk* 0.6–0.7 mm, lobes notched. *Ovaries* 0.5–0.9 mm long, glabrous; style and style head 1–1.4 mm long. *Fruit* 7–25 by 0.5–1.5 cm, not lenticellate. *Seeds*: grain 24–30 by 3.2–5 mm, plus a beak of 4–7 mm long; coma 3.5–5 cm long. — **Fig. 42.**

Distribution — China, Thailand, Laos, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — Evergreen forest to 1600 m altitude.

14. DYERA

Dyera Hook.f., J. Linn. Soc., Bot. 19 (1882) 293; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 139; Monach., Lloydia 9 (1946) 182; Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 190; Backer & Bakh.f., Fl. Java 2 (1965) 227; D.J. Middleton, Fl. Thailand 7 (1999) 36; PROSEA 18 (2000) 65; D.J. Middleton, Gard. Bull. Singapore 55 (2003) 210; Tree Fl. Sabah & Sarawak 5 (2004) 27. — Type species: *Dyera costulata* (Miq.) Hook.f.

Trees, often growing to enormous size; buttresses absent; white latex in all plant parts. *Branchlets* usually strongly longitudinally ribbed when young, occasionally weakly so. *Leaves* in whorls; petioles relatively long with noticeable intrapetiolar stipules; blade often weakly crenulate at margin; glabrous. *Inflorescence* of umbelliform or paniculate cymes; lax or somewhat congested in upper parts; flowers 5-merous. *Sepals* with colleters inside; connate at base; lobes often of different sizes. *Corolla* lobes sinistrorse; mature corolla platter-shaped; lobes oblong to narrowly ovate, more or less symmetrical, auriculate at the base on both sides; glabrous outside and inside. *Stamens* free from the style head; completely included in the corolla tube; filaments short and narrow; anthers narrowly ovate, base cordate, apex apiculate, sterile at apex, dehiscing laterally. *Disk* annular; inconspicuous; adnate to the ovary. Gynoecium 2-carpellate, apocarpous but apically united into a common style and carpels closely associated and appearing syncarpous, pubescent; many ovules per carpel; style and style head short. *Fruit* of paired, divergent follicles, these heavy and woody, dehiscing at maturity. *Seeds* elliptic, flattened; with a broadly membranous wing.

Distribution — 2 species in western *Malesia* and southern Thailand.

Uses — Both species were previously tapped for making rubber and for the manufacture of chewing gum but this industry has greatly declined. Both also have a soft and easily worked timber but which is not durable. The wood is used for smaller items like pencils, picture frames, carving, toys, furniture parts, packing cases etc.

KEY TO THE SPECIES

- 1a. Trees without pneumatophore roots; leaf blades mostly obtuse to shortly acuminate at apex, only rarely rounded (and then not exclusively so), broadly cuneate to subcordate at base **1. *D. costulata***

- b. Trees with pneumatophore roots; leaf blades emarginate at apex, only rarely with some (but not all) leaves on a plant with rounded or apiculate apices, cuneate and decurrent onto petiole at base **2. D. polyphylla**

1. *Dyera costulata* (Miq.) Hook.f.

Dyera costulata (Miq.) Hook.f., J. Linn. Soc., Bot. 19 (1882) 293; Fl. Brit. India 3 (1882) 644; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 443; Hallier, Bot. Jahrb. Syst. 49 (1913) 372; Merr., Bibliogr. Enum. Born. Pl. (1921) 498; Ridl., Fl. Malay Penins. 2 (1923) 345; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 876; Kerr in Craib, Fl. Siam. 2 (1939) 441; Masam., Enum. Phan. Born. (1942) 619; Monach., Lloydia 9 (1946) 190; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 144; F.G. Browne, Forest Trees Sarawak & Brunei (1955) 60; Backer & Bakh.f., Fl. Java 2 (1965) 227; Smythies, Common Sarawak Trees (1965) 21; Whitmore, Tree Fl. Malaya 2 (1973) 13; Cockburn, Trees Sabah 1 (1976) 19; J.A.R. Anderson, Checklist Trees Sarawak (1980) 148; Whitmore & Tantra, Checklist Sumatra (1986) 19; P.S. Ashton, Man. non-Dipt. Trees Sarawak (1988) 32; Corner, Wayside Trees Malaya ed. 3, 1 (1988) 154; Whitmore & Tantra, Checklist Sulawesi (1989) 14; Whitmore et al., Checklist Kalimantan (1990) 25; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 53; PROSEA 5, 2 (1995) 229; Coode et al., Checklist Pl. Brunei (1996) 26; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; D.J. Middleton in Argent et al., Man. non-Dipterocarp Trees C. Kalimantan 1 (1997) 83; Kochummen, Tree Fl. Pasoh Forest (1997) 151; D.J. Middleton, Fl. Thailand 7, 1 (1999) 36; PROSEA 18 (2000) 65; D.J. Middleton, Gard. Bull. Singapore 55 (2003) 211; Tree Fl. Sabah & Sarawak 5 (2004) 28. — *Alstonia costulata* Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 556. — Type: *Diepenhorst HB1114* (lecto U, designated by Middleton (2003) op. cit.; iso K, L), Sumatra, Priaman.

Alstonia eximia Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 555. — Type: *Teijsmann HB3358* (lecto U, designated by Middleton (2003) op. cit.; iso BO, L), Sumatra, Bangka, near Djebus.

Alstonia grandifolia Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 555; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 442. — Type: *Teijsmann HB4044* (lecto U, designated by Middleton (2003) op. cit.; iso K, L), Sumatra, Palembang.

Dyera laxiflora Hook.f., Fl. Brit. India 3 (1882) 644; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 444; Ridl., Fl. Malay Penins. 2 (1923) 345. — Type: *Cantley 226* (lecto K, designated by Middleton (2003) op. cit.; iso P), Singapore.

Dyera spec. indet. Coode et al., Checklist Pl. Brunei (1996) 27.

Tree to 80 m high, to 300 cm dbh, sometimes with somewhat exposed roots but not with knee-shaped pneumatophores. Bark dark grey, brown or black, smooth with squarish scales; inner bark cream, pale grey or pale reddish; wood cream or white. *Branchlets* 3.5–9 mm wide, glabrous. *Leaves* in whorls of 4–8; stipules 3–6 mm long; petiole 2–6.2 cm long, glabrous; blade coriaceous to papery, obovate, oblong or elliptic, 5.5–42 by 1.8–14 cm, 1.6–4.3 times as long as wide, apex short acuminate to rounded, base subcordate to rounded (sometimes from a narrowed base), rarely cuneate, margin crenulate or weakly crenulate, glabrous above and beneath, glaucous beneath or not, midrib sunken to slightly raised above, 12–24 pairs of secondary veins, at 45–80° from midrib, clearly distinguishable from tertiary venation and prominent or flat above and prominent beneath, tertiary venation reticulate or subscalariform, prominent above and beneath. *Inflorescence* arranged in whorls, 4–18 cm long, glabrous, many-flowered; peduncle 2.5–9.2 cm long; pedicels 1.5–6.5 mm long. *Sepals* ovate or orbicular, 1–3 by 0.8–2 mm, 1–1.5 times as long as wide, apex rounded to acute, ciliate or not, glabrous. *Corolla* white, yellowish green or pinkish yellow; tube 1.1–3 mm long, 0.3–0.6 times

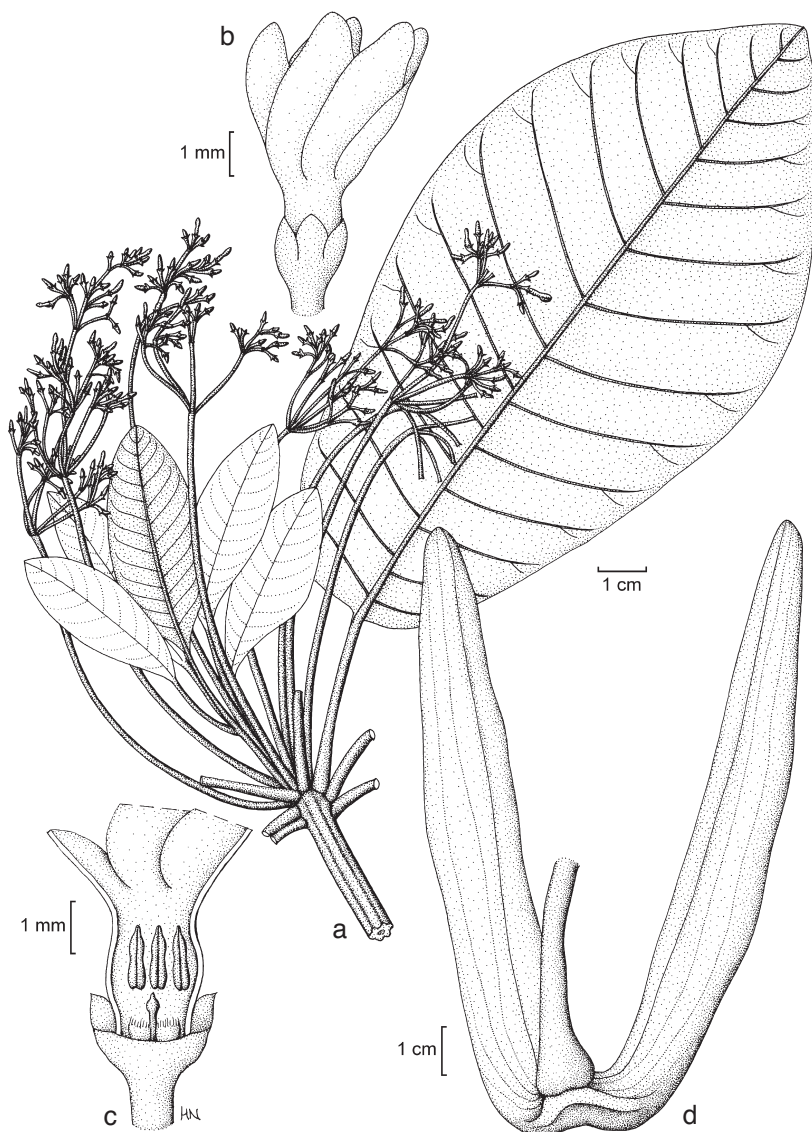


Fig. 43. *Dyera costulata* (Miq.) Hook. f. a. Habit; b. flower; c. dissected flower; d. fruit (a: *Paie S.37571*; d: *Gadoh KLU.1355a*).

as long as lobes, glabrous inside and outside; lobes 3–9 by 1.2–2.3 mm, 1.7–4.4 times as long as wide, glabrous outside and inside. *Stamens* inserted at 0.5–0.6 mm from corolla base which is 0.2–0.36 of tube length; anthers 1.1–1.4 by 0.4–0.5 mm, 2.7–3 times as long as wide, exerted 0–0.88 mm from corolla throat. *Ovaries* 0.3–0.6 mm long; style 0–0.2 mm long; style head 0.5–0.7 mm long. *Fruit* 18–40 by 2.5–4 cm. *Seeds*: grains c. 2.5 by 1.5 cm, c. 5 by 2 cm with wing. — **Fig. 43.**

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

Habitat & Ecology — To 1220 m altitude in a range of evergreen forest types on brown or yellowish soil.

Note — Specimens of *D. costulata* from Sumatra more often have a cuneate leaf base than those from other parts of the range, making it more difficult to distinguish herbarium material of the two species from Sumatra.

2. *Dyera polyphylla* (Miq.) Steenis

Dyera polyphylla (Miq.) Steenis, Blumea 14 (1967) 316; J.A.R. Anderson, Tr. Peat Swamp For. Sarawak (1972) 23; Cockburn, Trees Sabah 1 (1976) 20; J.A.R. Anderson, Checklist Trees Sarawak (1980) 148; P.S. Ashton, Man. non-Dipt. Trees Sarawak (1988) 32; Whitmore et al., Checklist Kalimantan (1990) 25; PROSEA 5, 2 (1995) 230; D.J. Middleton in Argent et al., Man. non-Dipterocarp Trees C. Kalimantan 1 (1997) 83; D.J. Middleton, Gard. Bull. Singapore 55 (2003) 212; Tree Fl. Sabah & Sarawak 5 (2004) 30. — *Alstonia polyphylla* Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 556. — Type: *Teijsmann HB3212* (lecto U, designated by Middleton (2003) op. cit.; iso BO n.v., L), Sumatra, Bangka, near Djebus.

Dyera lowii Hook.f., J. Linn. Soc., Bot. 19 (1882) 293; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 15; Merr., Bibliogr. Enum. Born. Pl. (1921) 498; Masam., Enum. Phan. Born. (1942) 619; Monach., Lloydia 9 (1946) 194; F.G. Browne, Forest Trees Sarawak & Brunei (1955) 63; Smythies, Common Sarawak Trees (1965) 21; Whitmore & Tantra, Checklist Sumatra (1986) 19; Coode et al., Checklist Pl. Brunei (1996) 26. — Type: *Beccari 3570* (lecto K, designated by Middleton (2003) op. cit.; iso FI n.v., G, P), Borneo, Sarawak.

Dyera borneensis Baill., Bull. Mens. Soc. Linn. Paris 1 (1888) 751; Merr., Bibliogr. Enum. Born. Pl. (1921) 498; Masam., Enum. Phan. Born. (1942) 619. — Type: *Beccari 3570* (holo P; iso FI, K), Borneo, Sarawak.

Tree to 60 m tall, dbh to 200 cm; knee-shaped pneumatophore roots present, these chocolate brown and with paler lenticels. Bark chocolate-brown or greyish brown with corky paler lenticels and horizontal ridges; inner bark cream; wood cream. *Branchlets* 11–14 mm wide, glabrous. *Leaves* in whorls of 6–8; stipules 4.5–5 mm long; petiole 2.1–4.5 cm long; blade coriaceous or subcoriaceous, obovate, 4–24 by 2.3–10.7 cm, 1.7–2.9 times as long as wide, apex retuse or, more rarely, rounded, obtuse or apiculate, base cuneate, margin not crenulate or only weakly so, glabrous above and beneath, glaucous beneath, midrib flat or slightly raised above, 17–32 pairs of secondary veins with 3–12 mm spacing, 65–75° from midrib, more or less straight to curved ascending, slightly prominent or flat above, not prominent beneath, tertiary venation reticulate to somewhat scalariform, not prominent above or beneath. *Inflorescence* arranged in whorls, 8.5–14 cm long, glabrous; peduncle 4–11 cm long, sometimes with reduced leaves at apex; pedicels 1.5–3 mm long. *Sepals* ovate to orbicular, apex rounded or obtuse, 1–1.4 by 1–1.4 mm, 0.9–1.2 times as long as wide, not ciliate, glabrous. *Corolla* tube 1–3 mm long, 0.35–1 times as long as lobes, glabrous or slightly pubescent beneath stamens inside, glabrous outside; lobes 1.8–4 by 1–1.7 mm, 1.4–3 times as long as wide, glabrous outside and inside, not ciliate. *Stamens* inserted 0.5–0.6 mm from corolla base which is 0.4–0.43 of tube length; filaments c. 0.3 mm long; anthers 0.8–1.5 by 0.3–0.4 mm, 2.7–3.8 times as long as wide, exerted 0.1–0.8 mm from corolla throat. *Ovaries* 0.5–0.9 mm long; style 0–0.1 mm long; style head c. 0.5 mm long.

Fruit 22–30 by 1.8–4 cm. *Seeds*: grain 1.8–2 by 0.8–1.2 mm, 3.7–4.5 by 1.2–1.5 with wing.

Distribution — *Malesia*: Sumatra, Borneo.

Habitat & Ecology — Known only from peat swamp forest, often in association with *Alstonia pneumatophora* Backer ex Den Berger.

IUCN conservation category — Vulnerable due to habitat loss and over-exploitation (VU A1cd).

Note — *Dyera polyphylla* and *Alstonia pneumatophora* both have pneumatophore roots which can easily be distinguished in the field even when the connection to the parent tree is not obvious by the chocolate-brown bark with corky paler lenticels and horizontal ridges of *D. polyphylla* and the grey bark with non-corky horizontal lenticels of *Alstonia pneumatophora*.

15. ECUA

Ecua D.J. Middleton, *Blumea* 41 (1996) 33. — Type species: *Ecua moluccensis* D.J. Middleton.

Climbers or scramblers. *Branches* lenticellate, becoming corky. *Leaves* opposite; those of a pair equal in size; petiolate, with a ring of glands in the axils and between petiole bases; blade coriaceous, entire, secondary veins ascending towards margins, tertiary venation conspicuous and reticulate, glabrous. *Inflorescence* an axillary elongated cyme, brown puberulent, lax; flowers 5-merous, actinomorphic, small. *Sepals* free, colleters fused together on the inside at the base. *Corolla* lobes weakly dextrorse; mature corolla urceolate, consisting of an inflated tube, thickened throat and small lobes; lobes triangular; pubescent outside, glabrous inside. *Stamens* included within the corolla tube, attached in a ring to the style head; filaments attached near corolla throat, curving downwards and then up again; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and outward curving sagittate appendages at the base. *Disk* of 5 lobes, fused at base. Gynoecium of 2 connate carpels, superior, flat-topped, pubescent; ovules many; style columnar. *Fruit* unknown.

Distribution — 1 species in the Moluccas.

Ecua moluccensis D.J. Middleton

Ecua moluccensis D.J. Middleton, *Blumea* 41 (1996) 34. — Type: *Main & Aden* 706 (holo BO), Moluccas, Morotai, 10 May 1949.

Branches lenticellate or with large corky thickenings; branchlets glabrous. *Leaves*: petiole 1.7–6 cm long; blade coriaceous, elliptic, 11.1–38 by 7.6–20.5 cm, 1.5–1.7 times as long as wide, apex acuminate or apiculate, base rounded to obtuse, 7 or 8 pairs of secondary veins, prominent or not beneath, tertiary venation reticulate, glabrous. *Inflorescence* an elongated cyme, brown puberulent distally, 17–37 cm long; pedicels 6.5–8.5 mm long. *Sepals* ovate, 2.1–2.5 by 2.2–2.5 mm, 1 times as long as wide, apex rounded, puberulent, ciliate. *Corolla* bud ovoid, open corolla urceolate; tube 9.8–10 mm long, 3.9–4.8 times as long as sepals; lobes triangular, 2–2.3 by 1–1.4 mm, apex acute, 0.2 times as long as tube; densely short brown puberulent outside, glabrous inside. *Stamens* inserted at c. 7.4 mm from corolla base which is 0.7 of tube length; filaments

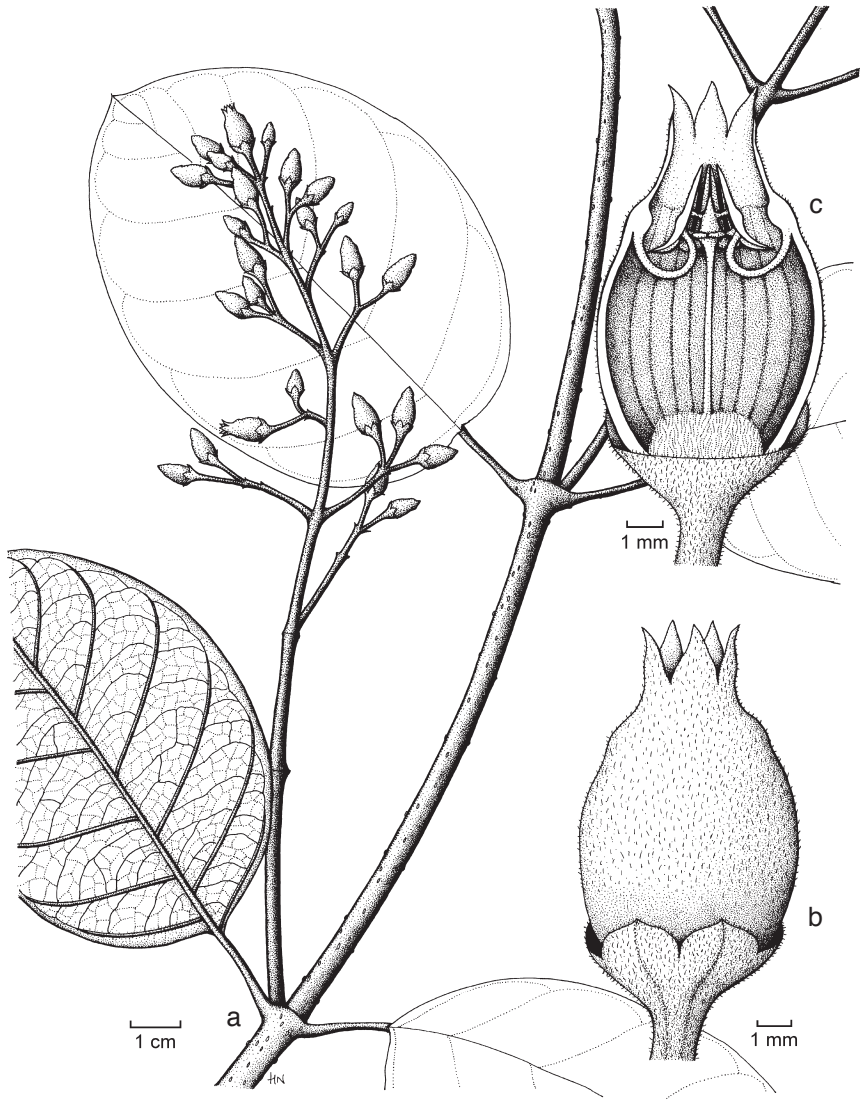


Fig. 44. *Eua moluccensis* D.J. Middleton. a. Habit; b. flower; c. flower dissection (Main & Aden 706, BO).

2.1 mm long, strongly curved; anthers with bases strongly curved outwards, c. 4.5 by 1.5 mm, 3 times as long as wide. *Disk* c. 1.2 mm long, shorter than ovary. *Ovary* c. 1.8 mm long; *style* c. 4.3 mm long; *style head* c. 1.8 mm long. — **Fig. 44.**

Distribution — *Malesia*: Moluccas (Morotai and Halmahera).

Habitat & Ecology — Growing below 100 m in thickets.

Indigenous name — Kore hara (Halmahera).

Note — Only known from two collections.

16. EPIGYNUM

- Epigynum* Wight, Icon. Pl. Ind. Orient. 4 (1848) 4, t. 1308. Benth. & Hook.f., Gen. Pl. 2 (1876) 717; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 178; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 103; D.J. Middleton, Fl. Thailand 7 (1999) 118; Tree Fl. Sabah & Sarawak 5 (2004) 12; Harvard Pap. Bot. 10 (2005) 68. — Type species: *Epigynum griffithianum* Wight.
- Legouixia* Van Heurck & Müll. Arg. in Van Heurck, Observ. Bot. (1871) 145. — Type species: *Legouixia amabilis* Van Heurck & Müll. Arg. (= *Epigynum griffithianum* Wight).
- Nouettea* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 29; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1232. — Type species: *Nouettea cochinchinensis* Pierre (= *Epigynum cochinchinense* (Pierre) D.J. Middleton).
- Trachelospermum* Lem. subg. *Lachnocarpus* C.K. Schneid. in Sarg., Pl. Wilson. 3 (1916) 341. — Type species: *Trachelospermum auritum* C.K. Schneid. (= *Epigynum auritum* (C.K. Schneid.) Tsiang & P.T. Li).
- Argyronerium* Pit. in Lecomte, Fl. Indo-Chine. 3 (1933) 1234. — Type species: *Argyronerium odoratum* Pit.

Large woody climbers with all parts bearing white latex. *Branchlets* weakly lenticellate or not, pubescent at least when young. *Leaves* opposite; glands in axils of petioles; blade ovate, elliptic or obovate, apex with a sharp tip, secondary veins arcuate ascending, anastomosing before margin. *Inflorescence* an umbelliform panicle formed from terminal and axillary cymes; bracts small. *Sepals* with colleters in a row at base inside, only at edges of sepals at base inside or without colleters. *Corolla* in bud a narrow tube, bulging around the anthers, and an ovate head, lobes dextrorse, tomentose to glabrous outside, pubescent or glabrous inside, salverform when open; lobes falcate-obovate, mostly with a sharp projection on one side. *Stamens* inserted in lower half of tube or almost in the middle of tube; filament broad, short; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base, attached at base of style head and attached again at middle of anthers to top of style head. *Disk* of 5 separate lobes or in a ring with a crenate margin; glabrous. Gynoecium of 2 separate semi-inferior carpels united into a common style; ovules numerous; style filiform; style head long cylindrical, with an acuminate apex and a basal collar, collar sometimes very small, 5 ribs between collar and apex. *Fruit* of paired follicles; fusiform or linear, sometimes strongly curled. *Seeds* consisting of a flattened grain and a coma directed towards the fruit apex.

Distribution — 5 species in continental Southeast Asia and western Malesia. In Malesia 3 species.

Note — The species in this genus are somewhat heterogeneous and possibly do not form a monophyletic group.

KEY TO THE SPECIES

- 1a. Leaf blade base rounded to cordate; sepal colleters present; corolla throat glabrous or with few hairs **1. *E. auritum***
- b. Leaf blade base cuneate to obtuse, or rarely rounded; sepal colleters absent; corolla throat densely villous 2

- 2a. 9–14 pairs of secondary veins but always with at least some leaves on the plant with >9 pairs of secondary veins; never with tuft of hairs in secondary vein axils with midrib unless all of blade beneath pubescent; ovary densely to sparsely puberulent **3. E. ridleyi**
- b. 5–9(–11) pairs of secondary veins; often with tuft of hairs in secondary vein axils with midrib or all of blade beneath pubescent; ovary glabrous **2. E. griffithianum**

1. *Epigynum auritum* (C.K. Schneid.) Tsiang & P.T. Li

Epigynum auritum (C.K. Schneid.) Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 397; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 246; P.T. Li et al., Fl. China 16 (1995) 187; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; D.J. Middleton, Fl. Thailand 7 (1999) 118; Harvard Pap. Bot. 10 (2005) 68. — *Trachelospermum auritum* C.K. Schneid. in Sarg., Pl. Wilson. 3 (1916) 341; Woodson, Sunyatsenia 3 (1936) 72. — Type: *Henry 12136* (lecto A, designated by Woodson (1936) op. cit.; iso K, NY), China, Yunnan, Szemao.

Trachelospermum curtisii King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 498; Ridl., Fl. Malay Penins. 2 (1923) 366; Woodson, Sunyatsenia 3 (1936) 73; Kerr in Craib, Fl. Siam. 2 (1939) 473. — *Epigynum lachnocarpum* Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 192. — Type: *Curtis 838* (lecto K, designated by Woodson (1936) op. cit.; iso SING; fragment A), Peninsular Malaysia, Penang, Balick Pulau, May 1886.

Climber, recorded to 16 m high. *Branchlets* sparsely lenticellate or not; sparsely to densely pubescent, often with a combination of shorter and longer crisped hairs. *Leaves*: petiole 5–27 mm long, densely brown pubescent; blade ovate to broadly elliptic or obovate, 4.1–18.5 by 2.2–11 cm, 1.3–2.4 times as long as wide, apex acuminate or apiculate, base rounded to cordate, sparsely pubescent with crisped hairs above and beneath, more densely pubescent on the midrib above and beneath, 7–10 pairs of secondary veins, tertiary venation irregularly scalariform. *Inflorescence* of axillary and terminal dichasial cymes, mostly somewhat umbelliform, lax to somewhat congested, 4–12 cm long, bracts small, mostly deciduous; peduncle 0.4–7.5 cm long, densely tomentose, mostly with a combination of shorter and longer crisped hairs; pedicels 1.5–9 mm long, tomentose. *Sepals* oblong to narrowly ovate, 1.6–3.9 by 0.6–0.9 mm, 2.3–4.8 times as long as wide, apex acute, sparsely to densely pubescent, with colleters on the inner surface at the lower edges of each sepal. *Corolla* white, fragrant; tube 13–21 by 1.8–2.3 mm, 4.6–10.3 times as long as sepals, 1.7–2.3 times as long as lobes, tomentose outside, often more densely so in upper half, sparsely to densely pubescent in upper part of tube above stamens inside, glabrous or with few hairs in throat; lobes 7.2–14 by 4.4–5.5 mm, 1.8–2.5 times as long as wide, obovate, falcate, with a sharp projection on one side, outside densely tomentose on part exposed in bud outside, otherwise glabrous, inside glabrous or with few hairs at base of lobes. *Stamens* inserted at 3.6–5.2 mm from corolla base which is 0.2–0.3 of tube length in rehydrated flowers; filaments 0.8–1 mm long; anthers 4.7–5.4 by 0.6–0.8 mm. *Disk* of 5 separate squarish lobes, apex rounded, 0.7–0.9 mm high. *Ovaries* very slightly semi-inferior, 0.6–1.2 mm high, densely pubescent; style 4–4.4 mm long; style head 2.1–2.5 mm long. *Fruit* of paired pendulous follicles, rather flattened, linear to fusiform, often curved outwards from or inwards to each other towards end, sparsely to densely pubescent, 12.8–33 cm by 7.5–16 mm. *Seeds* 12–23 by 4–16 mm; coma 31–41 mm long.

Distribution — Northeastern India, southern China, Burma, Thailand, Laos; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — It is found in primary and secondary forest, evergreen and deciduous forest and on a wide variety of soil types.

Note — It is the most widespread species in the genus.

2. *Epigynum griffithianum* Wight

Epigynum griffithianum Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1308; Miq., Fl. Ned. Ind. 2 (1857) 459; Kurz, Forest Fl. Burma 2 (1877) 184; Hook.f., Fl. Brit. India 3 (1882) 666; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 126; D.J. Middleton, Fl. Thailand 7 (1999) 121; Harvard Pap. Bot. 10 (2005) 74. — Type: *Griffith s.n.* (lecto K [Herb. Wight], designated by Middleton (2005) op. cit.; iso CGE, K [Herb. Hookerianum]), Burma, Mergui.

Legouixia amabilis Van Heurck & Müll. Arg. in Van Heurck, Observ. Bot. (1871) 146. — Type: *Griffith* 227 (holo AWH n.v.; iso G, P), 'India Orientali'.

Epigynum maingayi Hook.f., Fl. Brit. India 3 (1882) 666; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 501; Ridl., Fl. Malay Penins. 2 (1923) 367; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 126. — Type: *Maingay KD 1088* (lecto K, designated by Middleton (2005) op. cit.; iso GH, K), Peninsular Malaysia, Malacca.

Epigynum perakense King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 500; Ridl., Fl. Malay Penins. 2 (1923) 366; Kerr in Craib, Fl. Siam. 2 (1939) 471. — Type: *King's Collector 1971* (lecto K, designated by Middleton (2005) op. cit.), Peninsular Malaysia, Perak, Larut.

Epigynum curtisii King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 501; Ridl., Fl. Malay Penins. 2 (1923) 367; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 126. — Type: *Curtis 2441* (holo SING; iso K, SING), Peninsular Malaysia, Penang, road to Penara Bukit.

Argyronerium odoratum Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1234. — *Epigynum odoratum* (Pit.) Kerr in Craib, Fl. Siam. 2 (1939) 471. — Type: *Geoffray 484* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 294; iso HN, P), Cambodia, Kampot, Kep.

Climber, reported to 20 m high. *Branchlets* not lenticellate; sparsely to densely brown pubescent, glabrescent with age. *Leaves*: petiole 2–15 mm long, glabrous to densely pubescent; blade elliptic to slightly obovate, 1.7–16.2 by 0.9–7 cm, 1.5–4 times as long as wide, apex acuminate with a sharp tip, rarely apiculate, base cuneate to obtuse, glabrous, with few hairs on midrib or sparsely pubescent all over and more densely on midrib above, pubescent in the secondary vein axils to all over beneath, more rarely with only a few hairs on midrib beneath, 5–9(–11) pairs of secondary veins, tertiary venation laxly reticulate. *Inflorescence* of terminal and axillary umbelliform cymes, 3–6.5 cm long; peduncle 0.2–2.9 cm long, densely brown pubescent; pedicels 1.8–5 mm long, densely brown pubescent. *Sepals* narrowly ovate, 1.2–3 by 0.5–1.2 mm, 1.6–3.1 times as long as wide, apex acute to acuminate, densely brown pubescent, colleters absent inside. *Corolla* white or cream, fragrant; tube slightly twisted or not, 15–27 by 1.7–2.8 mm, 6–11.4 times as long as sepals, 2–4.1 times as long as lobes, densely pubescent outside, glabrous at very base and then densely pubescent towards upper half of tube inside, villous in throat; lobes 4–10 by 3–6 mm, 1.3–2 times as long as wide, falcate with a sharp projection on one side, densely pubescent on part of lobes exposed in bud outside, glabrous inside. *Stamens* inserted at 2.1–3.2 mm from corolla base which is 0.1–0.2 of tube length in rehydrated flowers; filaments 0.7–1 mm long; anthers 3.1–5.1 by 0.6–1 mm. *Disk* a ring with a slightly to strongly crenate margin, 0.5–0.6 mm high.

Ovaries semi-inferior, 0.7–1.2 mm high, glabrous; style 1.9–2.7 mm long; style head 1.5–2.5 mm long. *Fruit* narrowly linear or very slightly torulose, 9.8–33 cm by 3–4 mm, densely to very sparsely pubescent or glabrous. *Seeds* 13.5–31 by 2–2.7 mm; coma 17–34 mm long.

Distribution — Northeastern India, Burma, Thailand, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In primary and secondary forests, and even in plantations, particularly at forest margins.

3. *Epigynum ridleyi* King & Gamble

Epigynum ridleyi King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 502; Ridl., Fl. Malay Penins. 2 (1923) 367; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; D.J. Middleton, Harvard Pap. Bot. 10 (2005) 77. — Type: *Ridley 7567* (holo SING; iso K), Peninsular Malaysia, Selangor, Rawang.

Epigynum forbesii King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 503; Merr., Bibliogr. Enum. Born. Pl. (1921) 501; Masam., Enum. Phan. Born. (1942) 620; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35. — Type: *Forbes 3236* (holo K), Sumatra, near Bijin Telok.

Epigynum borneense Merr., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 27; Masam., Enum. Phan. Born. (1942) 620. — Type: *Ramos 1117* (lecto A, designated by Middleton (2005) op. cit.; iso BO, GH, K, P, US), Borneo, Sabah, Sandakan.

Climber, reported to 8 m high but probably can grow higher. *Branchlets* sparsely lenticellate or not; densely brown pubescent, becoming less densely so with age. *Leaves*: petiole 4–7 mm long, sparsely to densely pubescent; blade elliptic, 2.3–13 by 0.6–5.1 cm, 2.1–6.2 times as long as wide, apex acuminate with a sharp tip, base cuneate to rounded, 9–14 pairs of secondary veins, tertiary venation subperpendicular to midrib and/or laxly reticulate. *Inflorescence* of terminal and axillary umbelliform cymes, 3.8–7 cm long; peduncle 0.3–2.2 cm long, densely brown pubescent; pedicels 1.5–4.7 mm long, densely brown pubescent. *Sepals* narrowly ovate, 2–5 by 0.8–1.9 mm, 1.8–3.8 times as long as wide, apex acuminate, densely brown pubescent, collectors absent inside. *Corolla* white, reported on one specimen as yellow in throat; tube 15.5–38 by 2.2–3 mm, 6.2–12.9 times as long as sepals, 2.2–4.5 times as long as lobes, densely pubescent outside, glabrous at very base and then sparsely to densely pubescent towards upper half of tube inside, villous in throat; lobes 6–14 by 3.3–8.1 mm, 1.6–2.6 times as long as wide, falcate with a sharp projection on one side, densely pubescent on part of lobes exposed in bud outside, glabrous inside. *Stamens* inserted at 2.5–4.2 mm from corolla base which is 0.1–0.2 of tube length in rehydrated flowers; filaments 0.6–1.2 mm long; anthers 5.5–6.5 by 0.8–1 mm. *Disk* a ring with a crenate margin, 0.6–1.1 mm high. *Ovaries* semi-inferior, 0.9–1.3 mm high, sparsely to densely pubescent; style 2.5–3.7 mm long; style head 2–3.1 mm long. *Fruit* linear or slightly torulose, 16.5–30 cm by 3.5–5.5 mm, densely to sparsely pubescent. *Seeds* not seen.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

Habitat & Ecology — It has been collected from dipterocarp forest, swamp forest and in seriously disturbed and logged areas.

17. EUCORYMBIA

Eucorymbia Stapf, Hooker's Icon. Pl. 28 (1903) t. 2764; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 21 (1949) 270; Coode et al., Checklist Pl. Brunei (1996) 27; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 11. — Type species: *Eucorymbia alba* Stapf.

Large woody climbers with white latex. *Branches* terete or weakly angled, lenticellate; branchlets glabrous. *Leaves* opposite, petiolate; secondary veins rather straight, anastomosing into a looped intramarginal vein. *Inflorescence* terminal, cymose, glabrous; flowers 5-merous; actinomorphic. *Sepals* deciduous; colleters in a row at base inside. *Corolla* lobes dextrorse; open corolla salverform; tube narrow at base and widening at stamen insertion; lobes obovate, narrow at base, rounded at apex. *Stamens* sessile; anthers narrowly triangular, apex acute or acuminate, base sagittate, sterile at apex and base; weakly adnate to the style head. *Disk* a ring, 5-lobed. Gynoecium 2-carpellate, apocarpous but apically united into a common style, ovules numerous; style filiform; style head columnar and ribbed, with a basal collar. *Fruit* a pair of follicles, fusiform, slightly flattened, densely lenticellate. *Seeds* elliptic, flattened, without a terminal coma.

Distribution — 1 species from Sumatra, Peninsular Malaysia and Borneo.

Note — The affinities of this genus are not very clear. Endress & Bruyns (Bot. Rev. 66 (2000) 1–56), in their review of the Apocynaceae s.l., placed it in subfamily Apocynoideae, tribe Apocyneae. Amongst the members of this group it is unique in its weak attachment of the stamens to the style head and the lack of a coma on the seeds.

Eucorymbia alba Stapf

Eucorymbia alba Stapf, Hooker's Icon. Pl. 28 (1903) t. 2764; Merr., Bibliogr. Enum. Born. Pl. (1921) 499; Masam., Enum. Phan. Born. (1942) 620; Steenis, Bull. Jard. Bot. Buitenzorg III, 17 (1948) 408; Coode et al., Checklist Pl. Brunei (1996) 27. — Type: *Haviland 2300* (lecto K, designated by Middleton, Taxon 55 (2006) 504; iso BO, L, SAR, SING), Borneo, Sarawak, Kuching.

Branchlets lenticellate, glabrous. *Leaves*: petiole 0.6–2.5 cm long; blade elliptic, obovate or oblong, 4.7–21 by 2.3–10.2 cm, 1.9–3.5 times as long as wide, apex acuminate to rounded or apiculate, base acute to rounded, 12–22 pairs of straight secondary veins at an angle of c. 80°, forming a looped intramarginal vein, tertiary venation of strong intercalated veins and then laxly reticulate, glabrous. *Inflorescence* 9–15 cm long, peduncle 1.7–3.9 cm long, glabrous. *Sepals* ovate, deciduous, 6.4–11 by 2.2–5 mm, 1.5–3 times as long as wide, apex acuminate, glabrous. *Corolla* white; tube 2.5–5.2 cm long; lobes 2–4.4 by 1–4.5 cm; glabrous outside, pubescent in tube above anthers and on the insertion of the stamens to the corolla. *Stamens* inserted at 14–19 mm from corolla base which is 0.4–0.5 of corolla length; anthers pubescent on the back, 9.2–9.8 by 1.6–2 mm. *Disk* c. 0.6 mm high. *Ovaries* c. 1.2 mm long; style 18–21.5 mm long, style head 2.9–3.3 mm long. *Fruit* 15.8–20.6 by 1.7–2.9 cm. *Seeds* 28–56 by 4.6–12 mm.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

18. HOLARRHENA

Holarrhena R.Br., Asclepiadeae (1810) 52; G. Don, Gen. Syst. 4 (1837) 78; A.DC., Prodr. 8 (1844) 413; Benth. & Hook.f., Gen. Pl. 2 (1876) 708; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 137; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1168; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B., Bot 1 (1950) 157; de Kruif, Meded. Landbouwhoogeschool Wageningen 81-2 (1981) 4; M.E. Endress et al., Pl. Syst. Evol. 171 (1990) 157; D.J. Middleton, Fl. Thailand 7 (1999) 73; PROSEA 12, 1 (1999) 296. — Type species: *Holarrhena mitis* (Vahl) R.Br.

Small trees or shrubs. *Branches* pubescent with few lenticels, rarely glabrous. *Leaves* opposite or subopposite; no glands in the axils. *Inflorescence* a terminal or seemingly axillary cyme; many-flowered. *Sepals* often unequal in length, linear to narrowly ovate, pubescent outside, pubescent or glabrous inside; colleters inside few or absent. *Corolla* lobes dextrorse; mature bud club-shaped with head approximately half of total length; open corolla salverform, corolla tube narrow, white or greenish white; pubescent outside and inside. *Stamens* inserted near base of corolla tube, completely included in tube; anthers oblong to narrowly ovate with short, mucronate apex, base rounded, fertile entire length; free from the style head. *Disk* absent. Gynoecium 2-carpellate, apocarpous but apically united into a common style, ovules numerous; glabrous or very sparsely pubescent. *Fruit* of paired follicles; lenticellate, sometimes only sparsely so. *Seeds* linear, unbeaked, grooved, with an apical coma.

Distribution — 4 species from Africa and Asia; in *Malesia* 2 species.

KEY TO THE SPECIES

- 1a. Shrub to 2.5 m; leaves subcoriaceous when dry, apex mostly rounded or emarginate; inflorescence usually terminal; follicles erect at least when young; seeds pubescent **1. *H. curtisii***
- b. Shrub or tree to 15 m; leaves papery when dry, apex mostly acuminate or acute; inflorescence usually appearing axillary; follicles pendulous; seeds glabrous **2. *H. pubescens***

1. *Holarrhena curtisii* King & Gamble

Holarrhena curtisii King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 446; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1171; Kerr in Craib, Fl. Siam. 2 (1939) 450; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 145; M.R. Hend., Malay. Wild Fls., Monocots. (1959) 281; de Kruif, Meded. Landbouwhoogeschool Wageningen 81-2 (1981) 6; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; D.J. Middleton, Fl. Thailand 7 (1999) 73; PROSEA 12, 1 (1999) 298. — Type: *Curtis* 3392 (lecto K, designated by De Kruif (1981) op. cit.; iso SING), Thailand, Trang.

Holarrhena angustata Pierre ex L. Planch., Prod. Apocyn. (1894) 196, nom. nud.

Holarrhena crassifolia Pierre ex L. Planch., Prod. Apocyn. (1894) 196, nom. nud.; Lý, Feddes Repert. 97 (1986) 617.

Holarrhena crassifolia Pierre ex L. Planch. var. *montana* Pierre ex Spire, Caoutchouc Indo-Chine 144 (1906). — Type: *Spire* 123 (not traced).

Holarrhena pulcherrima Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 130; Fl. Malay Penins. 2 (1923) 349. — Type: *Ridley* 14982 (lecto SING, designated by Middleton, Taxon 55 (2006) 504; iso BM), Peninsular Malaysia, Perlis, Kanga. — De Kruif (1981) designated a Kew duplicate of this collection as a lectotype. However, I could not find this specimen so have designated the SING

duplicate as the lectotype. If the Kew specimen can be found in the future then it would supersede the designation of the SING specimen.

Holarrhena densiflora Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 131; Fl. Malay Penins. 2 (1923) 349; Kerr in Craib, Fl. Siam. 2 (1939) 450. — Type: *Cantley 2746* (lecto SING, designated by Middleton, Taxon 55 (2006) 504), Singapore.

Holarrhena latifolia Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 131. — Type: *Keith 19.3.1890*, Thailand, Bangtaphan (type not found).

Holarrhena similis Craib, Bull. Misc. Inform. Kew 1913 (1913) 70; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1172; Lý, Feddes Repert. 97 (1986) 617. — Type: *Kerr 2548* (lecto BM, designated by De Kruif (1981) op. cit.; iso E, K), Thailand, Lamphun, Me Ta.

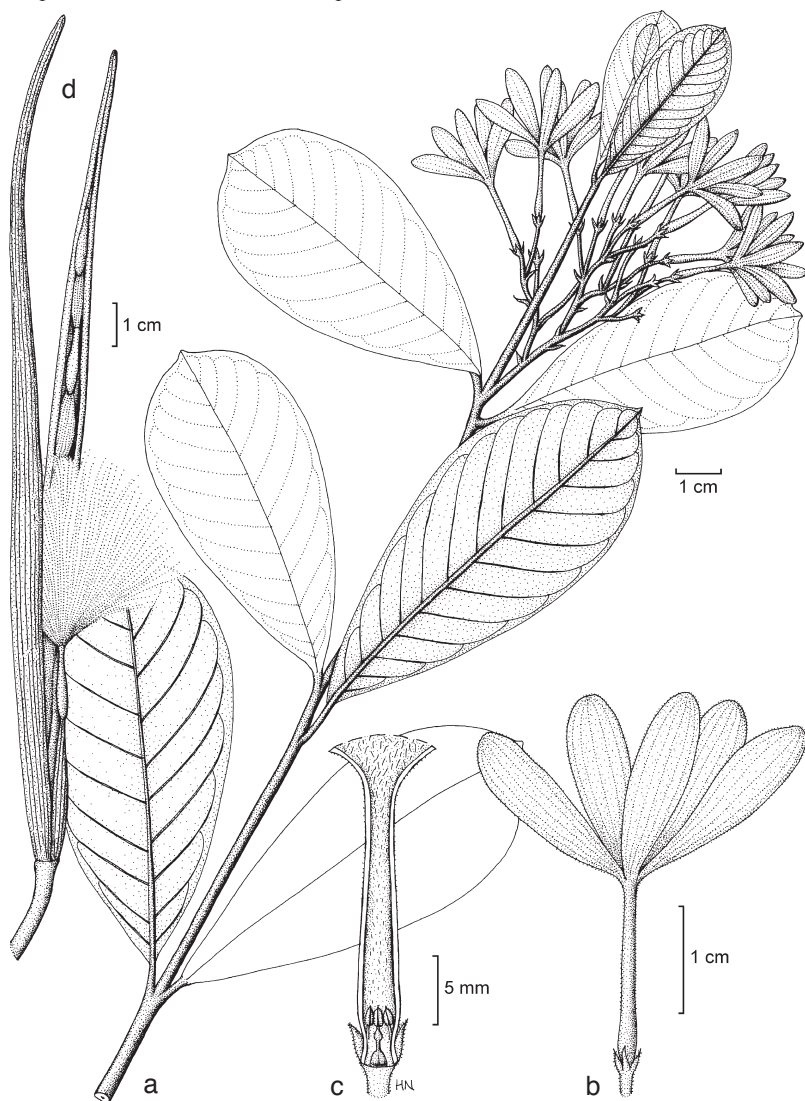


Fig. 45. *Holarrhena curtisii* King & Gamble. a. Habit; b. flower; c. dissected flower; d. fruit (a–c: *Smitinand 46195*; d: *Maxwell 76-197*).

Shrub to 2.5 m. *Branchlets* densely to sparsely pubescent. *Leaves*: petiole 1–4 mm; blade subcoriaceous when dry, obovate or elliptic, 3–12.6 by 1–7.3 cm, 1.5–5 times as long as wide, apex rounded, apiculate or retuse, less often acute or acuminate (especially in Peninsular Thailand), base cuneate, less often rounded or obtuse, first leaves on branch generally much smaller and strongly emarginate; pubescent on both surfaces, rarely almost glabrous. *Inflorescence* a terminal cyme, rarely appearing axillary, 3–12.5 cm long, lax, pubescent. *Sepals* linear, 2.5–7.5 by 0.8–1.2 mm, 3–7.5 times as long as wide, pubescent outside and inside, colleters few or absent near the base. *Corolla* tube 9–22 mm long; lobes (5–)12–23 by 3.8–9 mm, obovate to elliptic, apex rounded. *Stamens* inserted at 1.6–2.4 mm from corolla base; filaments 0.3–1.1 mm long, pubescent at base; anthers 1.3–2.5 by 0.5–0.6 mm. *Ovaries* 0.7–1.1 mm long; style and style head 1.4–2.2 mm. *Fruit* erect, at least when young, 7–30 cm by 1.5–5 mm. *Seeds* pubescent, 8.2–15 by 1.8–2.5 mm, coma 32–66 mm long. — **Fig. 45.**

Distribution — Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — Grows on roadsides, in grasslands and open forests to 400 m, often on sandy soil.

Uses — The bark and roots are used to treat dysentery.

2. *Holarrhena pubescens* (Buch.-Ham.) Wall. ex G. Don

Holarrhena pubescens (Buch.-Ham.) Wall. ex G. Don, Gen. Hist. 4 (1837) 78; A.DC., Prodr. 8 (1844) 413; Miq., Fl. Ned. Ind. 2 (1857) 440; de Kruif, Meded. Landbouwhoogeschool Wageningen 81-2 (1981) 17; P.T. Li et al., Fl. China 16 (1995) 180; D.J. Middleton, Fl. Thailand 7 (1999) 75; M.F. Watson, Fl. Bhutan 2 (1999) 671; Pradhan in Singh et al., Fl. Maharashtra State, Dicot. 2 (2001) 322. — *Echites pubescens* Buch.-Ham., Trans. Linn. Soc. London 13 (1822) 524. — *Holarrhena antidysenterica* Wall. ex A.DC. var. *pubescens* (Buch.-Ham.) Steward & Brandis, Fl. Northw. Centr. Ind. (1874) 326. — Type: *Buchanan-Hamilton s.n.* (lecto BM, designated by De Kruif (1981) op. cit.), Burma, Ava, Canoungaklay.

Echites antidysenterica Roth in Roem. & Schult., Syst. Veg. 4 (1819) 394, non Roxb. ex Fleming (1810). — *Holarrhena antidysenterica* sensu Wall., Numer. List 1672 (1829); A.DC., Prodr. 8 (1844) 413; Kurz, Forest Fl. Burma 2 (1877) 182; Hook.f., Fl. Brit. India 3 (1882) 644; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 445; Ridl., Fl. Malay Penins. 2 (1923) 349; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1169; Kerr in Craib, Fl. Siam. 2 (1939) 448; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 117; T.C. Huang, Taiwan 31 (1986) 97; Lý, Feddes Repert. 97 (1986) 617. — *Chonemorpha antidysenterica* G. Don, Gen. Syst. 4 (1837) 76; Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 439. — Type: *Heyne s.n.* (untraced), 'India orientalis'.

Holarrhena codaga G. Don, Gen. Hist. 4 (1837) 78; Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1297; Kurz, Forest Fl. Burma 2 (1877) 181. — Type: Illustration in Rheede, Hort. Malab. 1 (1678) t. 47.

Holarrhena malaccensis Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1298; Miq., Fl. Ned. Ind. 2 (1857) 441. — Type: *Wight s.n.* (holo K), Peninsular Malaysia, Malacca.

Holarrhena perrottii Spire, Caoutchouc Indo-Chine (1906) 142. — Type: *Spire 120* (not traced, synonym based on Spire's description).

Holarrhena pierrei Spire, Caoutchouc Indo-Chine (1906) 143. — Type: *Spire 122* (not traced, synonym based on Spire's description).

Holarrhena antidysenterica Wall. ex A.DC. var. *macrantha* Kerr in Craib, Fl. Siam. 2 (1939) 449. — Type: *Marcan 951* (lecto K, designated by De Kruif (1981) op. cit.; iso BM), Thailand, Kanchanaburi.

For further non-Malesian synonymy see De Kruif (1981) op. cit.

Shrub or tree to 15 m. *Branchlets* pubescent or occasionally glabrous. *Leaves*: petiole 2–4 mm; blade papery when dry, elliptic, 4.5–27 by 2.4–11.5 cm, 1.2–3.8 times as long as wide, apex acuminate or acute, rarely obtuse or rounded, young leaves may be emarginate, base mostly cuneate, rarely obtuse, pubescent on both surfaces to glabrous, 7–20 pairs of secondary veins, tertiary venation scalariform and reticulate. *Inflorescence* appearing as an axillary cyme, rarely terminal, 3.8–9 cm long, lax, pubescent; bracts mostly deciduous, 1–4 mm long. *Sepals* ovate to linear, 1.8–4.2 by 0.8–1.3 mm, 1.5–4 times as long as wide, pubescent outside, pubescent or glabrous inside; colleters few or absent inside. *Flowers* fragrant. *Corolla* tube 8–14 by 1.6–1.7 mm, 0.6–1.2 times as long as lobes, 2.6–6.4 times as long as calyx; lobes 9–21 by 4–7 mm, 2.3–4.2 times as long as wide, obovate to elliptic, apex rounded. *Stamens* inserted at 2–2.3 mm from corolla base; filaments pubescent at base, 0.3–0.8 mm long; anthers 1.5–1.7 by 0.4–0.6 mm. *Ovaries* 0.6–1.2 mm long; style and style head 1.8–2.5 mm long. *Fruit* pendulous, 18–43 cm by 3–7 mm. *Seeds* glabrous, 13–17 by 1.3–3 mm, coma 23–50 mm long.

Distribution — Eastern and Southern Africa, India, Nepal, Bangladesh, Burma, China, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Possibly Peninsular Malaysia (see note).

Habitat & Ecology — In a wide variety of forest types, particularly in drier forests. Also in open areas and scrub.

Uses — The bark and oil from the seeds is used as a treatment for amoebic dysentery. A decoction of the bark or leaves can also be added to baths for the treatment of scabies. The leaves can be used for the treatment of bronchitis and on boils, ulcers and haemorrhoids. The wood can be used for the manufacture of all manner of small objects.

Notes — 1. There is considerable confusion over the use of the name *H. antidysenterica*. This has been clarified by Panigrahi, *Taxon* 36 (1987) 464–467.

2. It is likely that *H. malaccensis* Wight (= *H. pubescens* Wall. ex G. Don) was described from a cultivated plant grown in Malacca because *H. pubescens* is otherwise unknown from Peninsular Malaysia. This species, however, has been collected in Peninsular Thailand not far north of the border so may be native in Peninsular Malaysia.

19. HUNTERIA

Hunteria Roxb., *Fl. Ind.* 2 (1824) 531; A.DC., *Prodr.* 8 (1844) 349; Benth. & Hook.f., *Gen. Pl.* 2 (1876) 698; K. Schum. in Engl. & Prantl, *Nat. Pflanzenfam.* 4, 2 (1895) 150; Pit. in Lecomte, *Fl. Indo-Chine* 3 (1933) 1129; Pichon, *Mém. Mus. Natl. Hist. Nat.* 24 (1948) 160; H. Huber in Abeyw. (ed.), *Revis. Handb. Fl. Ceylon* 1 (1973) 10; in Dassan. (ed.), *Revis. Handb. Fl. Ceylon* 4 (1983) 37; Markgr., *Blumea* 30 (1984) 169; Omino, *Agric. Univ. Wageningen Pap.* 96-1 (1996) 88; D.J. Middleton, *Fl. Thailand* 7 (1999) 24. — Type species: *Hunteria corymbosa* Roxb. (= *Hunteria zeylanica* (Retz.) Gardner ex Thwaites).

Trees or shrubs. *Leaves* opposite; those of a pair equal; with ochrea in the leaf axils. *Inflorescence* of axillary and/or terminal compound dichasial cymes; lax. *Sepals* with a row of colleters inside. *Corolla* lobes sinistrorse in bud; mature corolla salverform, tube much longer than calyx; lobes oblong or narrowly ovate. *Stamens* free from the style head, completely included in the corolla tube; filaments short and narrow; anthers

ovate, base cordate or rounded, apex obtuse, apiculate, fertile entire length. *Disk* absent. Gynoecium 2-carpellate, apocarpous but apically united into a common style, glabrous; 2 ovules per carpel (in Asia); style filiform. *Fruit* of paired stipitate, ovoid berries; 2-seeded (in Asia).

Distribution — 12 species in Africa and Asia; in *Malesia* 1 species.

Note — This account is partly based on the revision by Omino (1996) and examination of the material from Thailand as there is very little material in *Malesia*.

***Hunteria zeylanica* (Retz.) Gardner ex Thwaites**

Hunteria zeylanica (Retz.) Gardner ex Thwaites, Enum. Pl. Zeyl. (1860) 191; Kerr in Craib, Fl. Siam. 2 (1939) 434; Whitmore, Tree Fl. Malaya 2 (1973) 16; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 10; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 15; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 38; Markgr., Blumea 30 (1984) 169; L y, Feddes Repert. 97 (1986) 443; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 39; P.T. Li et al., Fl. China 16 (1995) 151; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; Omino, Agric. Univ. Wageningen Pap. 96-1 (1996) 122; Kochummen, Tree Fl. Pasoh Forest (1997) 152; D.J. Middleton, Fl. Thailand 7 (1999) 24; PROSEA 12, 3 (2003) 247. — *Cameraria zeylanica* Retz., Observ. Bot. 4 (1786) 24. — *Hunteria corymbosa* Roxb. var. *zeylanica* (Retz.) Hallier f., Jahrb. Hamburg Wiss. Anst. 17, Beih. 3 (1900) 195. — Type: *Koenig s.n.* (lecto LD, designated by Huber (1973) op. cit.; iso BM, C, K-W [in *Wallich 1608*], MO), Sri Lanka.

Hunteria corymbosa Roxb., Fl. Ind. 2 (1824) 531; Fl. Ind. ed. 2, 1 (1832) 695; Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 428; A.D.C., Prodr. 8 (1844) 350; Miq., Fl. Ned. Ind. 2 (1857) 409; Hook.f., Fl. Brit. India 3 (1882) 637; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 13; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 426; Ridl., Fl. Malay Penins. 2 (1923) 335; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1129; Whitmore, Tree Fl. Malaya 2 (1973) 15. — Type: *Hunter s.n.* (holo BM), India, Bengal.

Tabernaemontana salicifolia Wall., Bot. Reg. 15 (1829) t. 1273; A.D.C., Prodr. 8 (1844) 376. — *Hunteria corymbosa* Roxb. var. *salicifolia* (Wall.) Hallier f., Jahrb. Hamburg Wiss. Anst. 17, Beih. 3 (1900) 195. — *Hunteria zeylanica* (Retz.) Gardner ex Thwaites var. *salicifolia* (Wall.) Pichon, Bol. Soc. Brot. s r. 2, 27 (1953) 111; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 10. — Type: *Heyne in Wallich 1580a* (lecto K-W, designated by Omino (1996) op. cit.; iso BM), India.

Hunteria lanceolata Wall. ex A.D.C., Prodr. 8 (1844) 350; Miq., Fl. Ned. Ind. 2 (1857) 410. — *Gynopogon lanceolatum* (Wall. ex A.D.C.) Kurz, Forest Fl. Burma 2 (1877) 177. — Type: *Wallich 1611* (lecto G-DC, designated by Omino (1996) op. cit.; iso K-W).

Hunteria roxburghiana Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1294; Thwaites, Enum. Pl. Zeyl. (1860) 192. — *Hunteria corymbosa* Roxb. var. *roxburghiana* (Wight) Trimen ex Gamble, Fl. Madras 2 (1923) 808. — Type: *Wight 1874* (lecto G, designated by Omino (1996) op. cit.; iso GH, L, M, P, S, W), India, Tamil Nadu, Courtallum.

Hunteria africana K. Schum. in Engl., Pflanzenw. Ost-Afrikas C (1895) 317. — *Hunteria zeylanica* (Retz.) Gardner ex Thwaites var. *africana* (K. Schum.) Pichon, Bol. Soc. Brot. s r. 2, 27 (1953) 112. — Type: Untraced. Neotype: *Faulkner 1626* (neo K, designated by Omino (1996) op. cit.; iso B, BR, FT, P), Tanzania, Tanga Dist., Sawa.

Hunteria legocii Livera, Ann. Roy. Bot. Gard. (Peradeniya) 10 (1926) 140. — Type: *Thwaites C.P. 2518* (holo PDA n.v.; iso G, K, P, W), Sri Lanka, Peradeniya.

Shrub or tree to 1–20 m tall; 2–30 cm dbh; bark pale to dark grey to dark brownish yellow, smooth or rough, shallowly fissured; inner bark cream, yellow or orange; wood hard, dense, whitish to yellow. *Branchlets* lenticellate; glabrous. *Leaves*: petiole 0.7–1.7 cm long; blade coriaceous, oblong or, more rarely, elliptic or obovate, (2–)4.2–

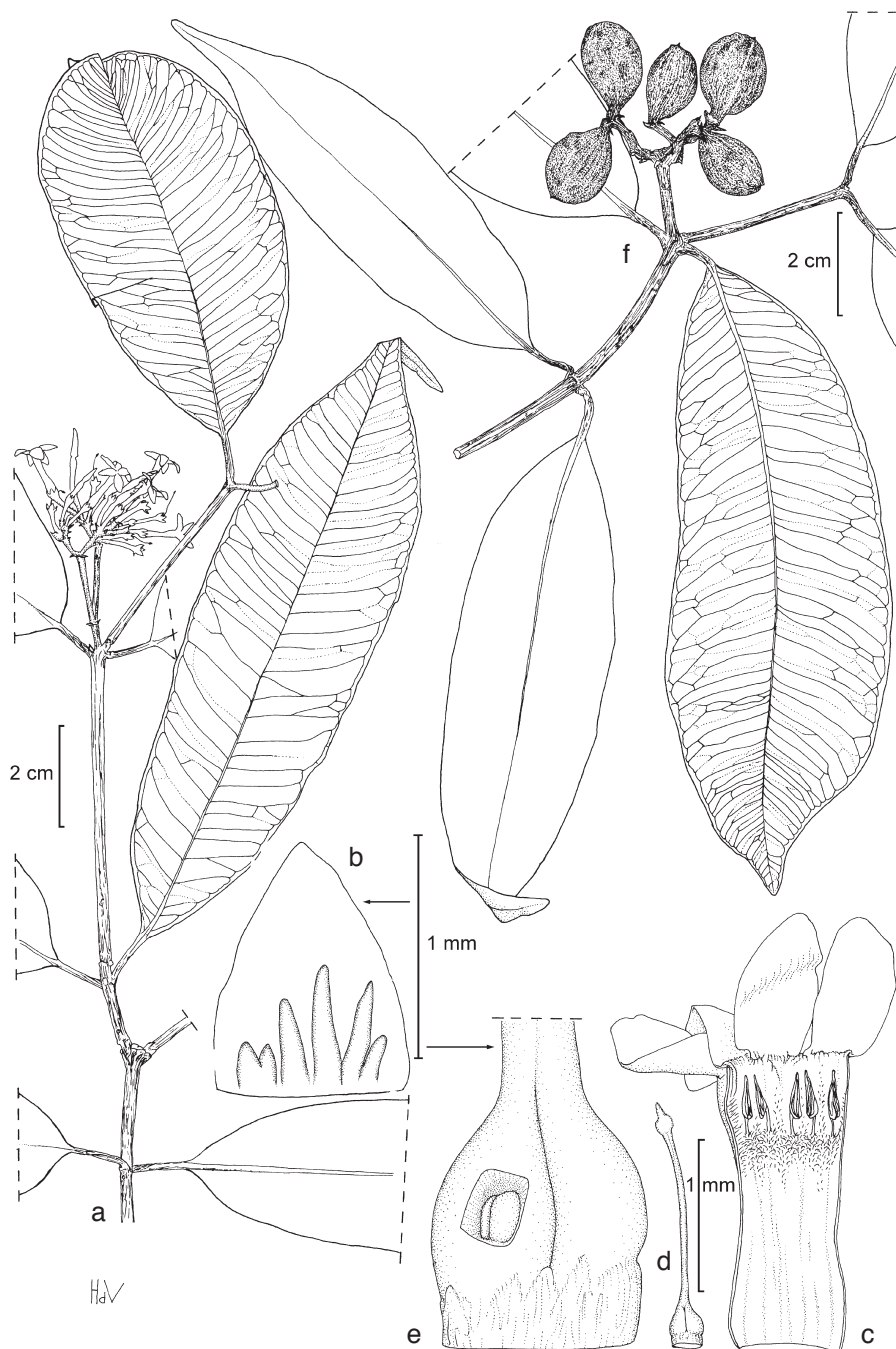


Fig. 46. *Hunteria zeylanica* (Retz.) Gardn. ex Thwaites. a. Habit; b. sepal inside; c. dissected corolla; d. pistil; e. dissected ovary; f. fruiting branch (a: Maxwell 85-675, Thailand, L; b–e: Mycologist Bot. Garden Peradeniya, Sri Lanka 21 Nov. 1921, A; f: Mamol F.D. 22004, Selangor, Malaysia, FHO).

18.7(–20.7) by (0.9–)1.2–6.7 cm, 1.7–5.7 times as long as wide, apex acuminate to caudate, more rarely to rounded, base rounded to cuneate, glabrous above and beneath, 12–30 pairs of secondary veins anastomosing into a distinct intramarginal nerve. *Inflorescence* glabrous, lax, 10–65-flowered, 1.6–7.5 cm long; peduncle (5–)10–40 mm long; pedicels 3.8–10 mm long. *Flowers* fragrant. *Sepals* erect, ovate, 0.9–1.7(–2.5) by 0.5–1(–1.4) mm, apex obtuse to acuminate; glabrous. *Corolla* white to pale yellow; tube 6–10 by 0.8–1.8 mm, 1.1–2.2 times as long as lobes, 3.7–7.7 times as long as calyx; lobes 2.1–5.1(–8.8) by 1.8–3.5 mm long; glabrous outside, pubescent at top of tube inside. *Stamens* inserted at 0.6–0.8 of corolla tube length from base; filaments 0.3–0.9 mm long; anthers 0.7–1.5 by 0.2–0.5 mm. *Ovaries* 0.8–1.8 mm long; style and style head 4–8 mm long. *Fruit* yellow to orange, obovoid to globose, smooth; 1.3–3.4 by 10–15 by 7–9 cm. *Seeds* 10.8–15.2 by 6.8–9.8 mm. — **Fig. 46.**

Distribution — East Africa, India, Sri Lanka, South China, Burma, Thailand, Vietnam, Laos, Cambodia; in *Malesia*: Sumatra, Peninsular Malaysia.

Habitat & Ecology — In the undergrowth of forest at low altitudes.

Uses — The latex is used externally to treat the disease yaws, to reduce boils and skin irritations. The wood is hard and can be used to make knife and axe handles and other smallish items.

20. ICHNOCARPUS

Ichnocarpus R.Br., Asclepiadeae (1810) 50, nom. cons., a preprint of Mem. Wern. Nat. Hist. Soc. 1 (1811) 61; G. Don, Gen. Hist. 4 (1837) 78; A.DC., Prodr. 8 (1844) 434; Benth. & Hook.f., Gen. Pl. 2 (1876) 717; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 178; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1253; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 102; Backer & Bakh.f., Fl. Java 2 (1965) 239; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 27; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 71; D.J. Middleton, Blumea 39 (1994) 74; P.I. Forst., Fl. Australia 28 (1996) 194; Coode et al., Checklist Pl. Brunei (1996) 27; D.J. Middleton, Fl. Thailand 7 (1999) 113; Tree Fl. Sabah & Sarawak 5 (2004) 13. — *Ichnocarpus* R.Br. sect. *Euichnocarpus* Benth. & Hook.f., Gen. Pl. 2 (1876) 717. — Type species: *Ichnocarpus frutescens* (L.) W.T. Aiton.

Quirivelia Poir. in Lam., Encycl. 6 (1804) 42, nom. illeg.

Springia Müll.Arg. in Van Heurck, Observ. Bot. (1871) 142. — Type species: *Springia indica* Müll. Arg. (= *I. frutescens*).

Climbers or trailers, producing white or slightly off-white latex. *Leaves* opposite. *Inflorescence* terminal and/or axillary, often thyrsoid; flowers 5-merous. *Sepals* with or without colleters in the axils. *Corolla* lobes dextrorse in bud, asymmetrical with a slant to the right; tube cylindrical or somewhat inflated, widening at the point of stamen insertion and somewhat constricted at throat; mature corolla salverform. *Stamens* inserted at around the middle of the corolla tube, completely included within the tube, adnate to the style head; filaments short; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* of 5 narrow lobes longer than the ovaries. Gynoecium 2-carpellate, apocarpous but apically united into a common style, pubescent; ovules numerous; style head globular. *Fruit* of paired follicles; linear and narrow; pubescent or glabrous. *Seeds* unbeaked, narrowly ovate or linear, glabrous, with an apical coma.

Distribution — 3 species from India to Australia; in *Malesia* 1 species.

Note — *Micrechites* has been included in *Ichnocarpus* in much of the recent literature. However, recent molecular sequencing research has suggested that the two genera do not form a monophyletic group and, coupled with the previous morphological bases for their separation, there are good reasons to separate the two again.

***Ichnocarpus frutescens* (L.) W.T. Aiton**

- Ichnocarpus frutescens* (L.) W.T. Aiton, Hort. Kew ed. 2, 2 (1811) 69; Spreng., Syst. Veg. 1 (1824) 635; G. Don, Gen. Hist. 4 (1838) 78; Wight, Icon. Pl. Ind. Orient. 2 (1841) 430; A.D.C., Prodr. 8 (1844) 435; Miq., Fl. Ned. Ind. 2 (1857) 448; Fl. Ned. Ind., Eerste Bijv. (1861) 556; Thwaites, Enum. Pl. Zeyl. (1864) 194; Benth., Fl. Australiensis 4 (1869) 315; Kurz, J. Asiat. Soc. Bengal 46 (1877) 256; Forest Fl. Burma 2 (1877) 185; Hook.f., Fl. Brit. India 3 (1882) 669; K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 114; Collett & Hemsl., J. Linn. Soc., Bot. 28 (1890) 86; Trimen, Handb. Fl. Ceylon 3 (1895) 142; F.M. Bailey, Queensl. Fl. 3 (1900) 994; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 507; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 493; Cooke, Fl. Bombay 2 (1908) 142; Craib, Contr. Fl. Siam. (1912) 131; Haines, Bot. Bihar Orissa (1922) 546; Gamble, Fl. Madras (1923) 820; Ridl., Fl. Malay Penins. 2 (1923) 364; Markgr., Bot. Jahrb. Syst. 61 (1927) 207; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1255; Kerr in Craib, Fl. Siam. 2 (1939) 466; Bakh.f., Blumea 6 (1950) 387; Backer & Bakh.f., Fl. Java 2 (1965) 239; R.R. Stewart, Fl. W. Pakistan (1972) 564; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 27; Ramaswamy & Razi, Fl. Bangalore Dist. (1973) 450; C.J. Saldanha & Nicolson, Fl. Hassan Dist. (1976) 435; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 225; Chater, Enum. Flow. Pl. Nepal 3 (1982) 83; Streimann, Pl. Upper Watut Watershed Papua New Guinea (1983) 86; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 71; Lý, Feddes Repert. 97 (1986) 675; Seshagiri Rao, Fl. Goa, Daman, Dadra & Nagarhaveli 2 (1986) 257; N.P. Singh, Fl. Eastern Karnataka 1 (1988) 403; W.R. Elliot & D.L. Jones, Encycl. Austral. Pl. 5 (1990) 413; P.T. Li, J. S. China Agric. Univ. 11 (1990) 32; P.I. Forst., Austral. Syst. Bot. 5 (1992) 536; D.J. Middleton, Blumea 39 (1994) 77; P.I. Forst., Fl. Australia 28 (1996) 194; Coode et al., Checklist Pl. Brunei (1996) 27; I.M. Turner, Gard. Bull. Singapore 47 (1997 [1995]) 126; D.J. Middleton, Fl. Thailand 7 (1999) 113; Kessler et al., Blumea, Suppl. 14 (2002) 14. — *Apocynum frutescens* L., Sp. Pl. (1753) 213; Willd., Sp. Pl. 1 (1798) 1260. — *Echites frutescens* [Wall., Numer. List 1674] Roxb., Fl. Ind. 2 (1832) 12. — *Quirivelia frutescens* (L.) M.R. & S.M. Almeida, J. Bombay Nat. Hist. Soc. 90 (1994) 427; Pradhan in Singh et al., Fl. Maharashtra State, Dicot. 2 (2001) 352. — *Ichnocarpus frutescens* (L.) W.T. Aiton var. *genuina* Kurz, J. Asiat. Soc. Bengal 46 (1877) 256. — *Apocynum crassifolium* Salisb., Prodr. (1796) 149. — Type: Herb. Hermann no. 114, vol. 3, fol. 29 (holo BM; photos BRI, TCD), Sri Lanka.
- Echites malabaricus* Lam., Encycl. 2 (1786) 342; Poir. in Lam., Tabl. Encycl. 2 (1819) 318. — *Periploca palvalli* Dennst., Schlüssel Hortus Malab. (1818) 14, 24, 35. — *Chonemorpha malabarica* (Lam.) G. Don, Gen. Hist. 4 (1837) 76. — Type: Rheede, Hortus Indicus Malabaricus vol. 9, t. 12.
- Gardenia volubilis* Lour., Fl. Cochinch. (1790) 148. — *Ichnocarpus volubilis* (Lour.) Merr., Philipp. J. Sci. 21 (1922) 506; Enum. Philipp. Fl. Pl. 3 (1923) 336; Markgr., Nova Guinea 14, 2 (1926) 288; Merr., Pl. Elmer. Born. (1929) 255; Trans. Amer. Philos. Soc., n.s. 24 (1935) 313; Kerr in Craib, Fl. Siam. 2 (1939) 468; Masam., Enum. Phan. Born. (1942) 620; Backer & Bakh.f., Fl. Java 2 (1965) 240; Lý, Feddes Repert. 97 (1986) 675; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 40. — Type: *Loureiro s.n.* (holo P-LOUR; photo A), Vietnam.
- Quirivelia zeylanica* Poir. in Lam., Encycl. 6 (1804) 42, nom. illeg.
- Tabernaemontana parviflora* Poir. in Lam., Encycl. Suppl. 5 (1817) 276. — Type: *Commerson s.n.* in Herb. Desfontaines (holo FI-W; photo A).
- Echites affinis* Roth in Roem. & Schult., Syst. Veg. 4 (1819) 393. — *Aganosma affinis* (Roem. & Schult.) G. Don, Gen. Hist. 4 (1837) 77. — *Ichnocarpus affinis* (Roem. & Schult.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 179. — *Echites caryophyllatus* Roth in Roem. &

- Schult., Syst. Veg. 4 (1819) 392; Roth, Nov. Pl. Sp. (1821) 133. — Type: *Heyne* (untraced, probably destroyed in B).
- Echites ferrugineus* Horsf. in Roem. & Schult., Syst. Veg. 4 (1819) 796. — Type: Untraced.
- Echites bantamensis* Blume, Bijdr. (1826) 1040; A.DC., Prodr. 8 (1844) 478. — *Chonemorpha bantamensis* (Blume) G. Don, Gen. Hist. 4 (1838) 76. — *Ichnocarpus bantamensis* (Blume) Miq., Fl. Ned. Ind. 2 (1857) 449; Fl. Ned. Ind., Eerste Bijv. (1861) 556; Backer & Bakh.f., Fl. Java 2 (1965) 240. — *Quirivelia bantamensis* (Blume) Williams, Bull. Herb. Boissier, ser. 2, 5 (1905) 949. — Type: *Blume 4514* (lecto L, designated by Middleton (1994) op. cit.; iso U), Java.
- Echites caudatus* Blanco, Fl. Filip. (1837) 106, non L. (1767); Fl. Filip., ed. 2 (1845) 77. — Type: Not preserved. Merrill (1918) has designated *Merrill Species Blancoanae 456* (A, K, L, MO, P) as an illustrative example.
- Ichnocarpus ovatifolius* A.DC., Prodr. 8 (1844) 435; Miq., Fl. Ned. Ind. 2 (1857) 449; Hook.f., Fl. Brit. India 3 (1882) 670; S. Vidal, Revis. Pl. Vasc. Filip. (1886) 186; Koord., Versl. Minahasa (1898) 528; Prain, Bengal Pl. (1903) 680; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 494; Merr., Sp. Blancoan. (1918) 313; Bibliogr. Enum. Born. Pl. (1921) 501; Haines, Bot. Bihar Orissa (1922) 546; Ridl., Fl. Malay Penins. 2 (1923) 364; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1254. — *Ichnocarpus frutescens* (L.) W.T. Aiton var. *ovatifolius* (A.DC.) Deb, Fl. Tripura State 2 (1983) 18. — Type: *Cuming 1809* (lecto BM, designated by Middleton (1994) op. cit.; iso G, K, MO, OXF, TCD, W), Philippines, Manila.
- Ichnocarpus moluccanus* Miq., Fl. Ned. Ind. 2 (1857) 448. — Type: *Zippelius s.n.* (holo L), Lesser Sunda Islands, Timor. This is also the collection on which *Echites trichonemus* Zipp., Linnaea 15 (1841) 324, nom. nud. is based.
- Ichnocarpus dasycalyx* Miq., Fl. Ned. Ind. 2 (1857) 449. — Type: *Horsfield s.n.* (lecto K, designated by Middleton (1994) op. cit.; iso K, L, U), Java.
- Ichnocarpus leptodictyus* F. Muell., Fragm. 6 (1868) 118. — *Ichnocarpus frutescens* (L.) W.T. Aiton var. *leptodictyus* (F. Muell.) Domin, Biblioth. Bot. 89 (1928) 528. — Type: *J. Dallachy s.n.* (lecto MEL, designated by P.I. Forster (1992) op. cit.; iso BO), Australia, Queensland.
- Gardenia sinensis* Lour. ex B.A. Gomes, Mem. Acad. Real. Sci. Lisboa, 2 Cl. Sci. Moraes n.s. 4, 1 (1868) 28. — Type: *Loureiro s.n.* (holo P), Vietnam.
- Springia indica* Müll. Arg. in Van Heurck, Observ. Bot. (1871) 143. — Type: *Griffith 973* (lecto BM, designated by Middleton (1994) op. cit.; iso E), India, Assam.
- Ichnocarpus frutescens* (L.) W.T. Aiton var. *pubescens* Kurz, J. Asiat. Soc. Bengal 46 (1877) 256; Forest Fl. Burma 2 (1877) 185. — Type: Untraced.
- Ichnocarpus frutescens* (L.) W.T. Aiton var. *parvifolia* Hook.f., Fl. Brit. India 3 (1882) 670. — Type: *Wight 1881* (lecto K, designated by Middleton (1994) op. cit.; iso A, BRI, K, L, M, MEL, P, S, W), India, Tamil Nadu, Coimbatore.
- Ichnocarpus navesii* Rolfe, J. Linn. Soc., Bot. 21 (1884) 313, nom. nud.
- Carruthersia daronensis* Elmer, Leaflet Philipp. Bot. 4 (1912) 1450. — Type: *Elmer 11099* (lecto K, designated by Middleton (1994) op. cit.; iso BISH, BO, BP, E, L, Z), Philippines, Mindanao, Davao, Todaya, Mt Apo.
- Toxocarpus makilingensis* Elmer ex Merr., Enum. Philipp. Fl. Pl. 3 (1923) 336, nom. inval. (only in synonymy).
- Ichnocarpus sogerensis* Wernham ex S. Moore, J. Bot. 61, Suppl. (1923) 33. — *Ichnocarpus volubilis* (Lour.) Merr. forma *sogerensis* (Wernham ex S. Moore) Markgr., Nova Guinea 14, 2 (1926) 288. — *Ichnocarpus frutescens* (L.) W.T. Aiton forma *sogerensis* (Wernham ex S. Moore) Markgr., Bot. Jahrb. Syst. 61 (1927) 207. — Type: *Forbes 944* (holo BM; iso K; photo & fragment A), Papua New Guinea, Sogere.
- Ichnocarpus frutescens* (L.) W.T. Aiton forma *pubescens* Markgr., Bot. Jahrb. Syst. 61 (1927) 208; Tsiang, Sunyatsenia 3 (1936) 156; Streimann, Pl. Upper Watut Watershed Papua New Guinea (1983) 86; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 227. — Type: *Schlechter 12771* (untraced, probably destroyed in B).
- Micrechites sinensis* Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 11 (1931) 215. — Type: *S.S. Sin & Whang 730* (untraced).

Ichnocarpus microcalyx Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1254; Kerr in Craib, Fl. Siam. 2 (1939) 467. — Type: *Pierre 4469* (holo P), Thailand, Phetchaburi.

Ichnocarpus oxypetalus Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1256. — Type: *Poilane 119* (lecto P, designated by Middleton (1994) op. cit.; iso A, P), Vietnam, Phan-ri, Song-long-song.

Climber or trailing shrub to 20 m high. *Branchlets* glabrous, puberulent only around nodes, puberulent all over or shortly tomentose, frequently becoming glabrous and sparsely lenticellate with age. *Leaves*: petiole 4.5–29 mm long, glabrous, puberulent or tomentose; blade papery or subcoriaceous, elliptic or ovate, rarely obovate, 1.3–15 by

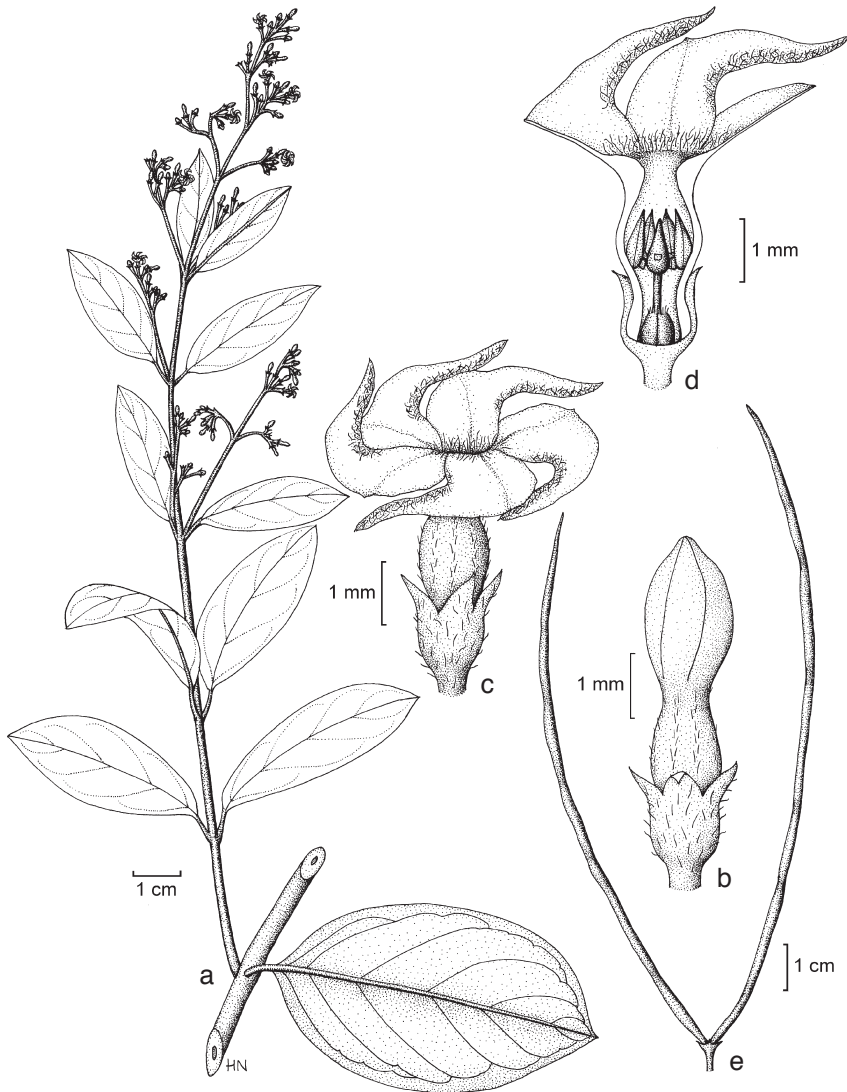


Fig. 47. *Ichnocarpus frutescens* (L.) W.T. Aiton. a. Habit; b. flower bud; c. flower; d. dissected flower; e. fruit (*Put 3120*).

0.4–8.5 cm, 1.3–4.4 times as long as wide, apex usually short acuminate, more rarely acute or obtuse, base cuneate to rounded, puberulent only on midrib beneath, sparsely to densely tomentose all over beneath and sparsely so above or glabrous, 4–8 pairs of secondary veins. *Inflorescence* axillary and terminal, 0.8–17 cm long, peduncle and pedicels puberulent or short tomentose, more rarely glabrous; bracts ovate, deciduous; pedicels 1–5 mm long. *Sepals* ovate, thickened at base, usually spreading, 0.6–2.4 by 0.3–1.1 mm, 1.1–3.7 times as long as wide, apex acute or, more rarely, acuminate or obtuse, puberulent or almost glabrous; colleterers few or absent. *Corolla* white or yellow, sometimes with a darker centre; tube 2–4 by 1–1.4 mm, 1.5–3.4 times as long as calyx, 0.5–1 times as long as lobes, outside glabrous to densely puberulent, glabrous or pubescent inside in upper part of tube; lobes 2.6–6.2 by 0.9–1.3 mm, 3.3–6.1 times as long as wide, ciliate, outside glabrous or puberulent on that part exposed in bud, villous at tube throat. *Stamens* inserted 0.9–1.7 mm from base which is 0.4–0.7 of tube length; filaments 0.2–0.5 mm long; anthers elliptic, 0.9–1.7 by 0.3–0.5 mm, apex mucronate, base short sagittate. *Disk* lobes narrow, separate, 0.5–1 mm long, 1–2.2 times as long as ovary, slightly bulging on top. *Ovaries* 0.3–0.7 mm long, pubescent; style 0.4–1.7 mm long; style head 0.7–1.8 mm long with a globular base. *Fruit* tomentose, sometimes becoming glabrous, 0.5–17.1 cm by 1–5 mm. *Seeds* elliptic or linear, 7–26 by 0.8–2 mm; coma fawn, cream or white, 1.8–3.8 cm long. — **Fig. 47.**

Distribution — Pakistan, India (including Nicobar Islands), Sri Lanka, Nepal, Bhutan, Bangladesh, Burma, southern China, Thailand, Vietnam, Laos, Cambodia, Australia; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines, Sulawesi, Lesser Sunda Islands, Moluccas, New Guinea.

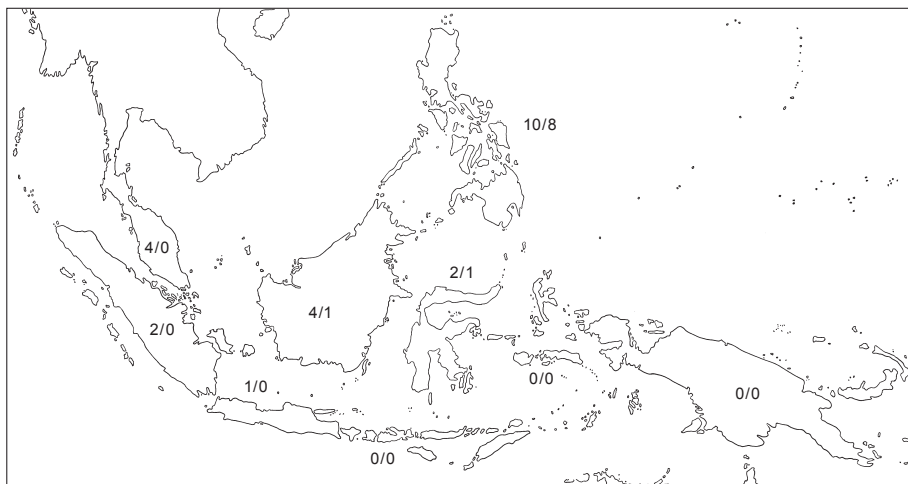
Habitat & Ecology — This species grows in a wide variety of habitats, most often in moist to dry evergreen or deciduous forest but also sometimes in thorn scrub or as a ground cover creeper in open areas.

21. KIBATALIA

Kibatalia G. Don, Gen. Hist. 4 (1837) 86; Woodson, Philipp. J. Sci. 60 (1936) 209; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B., Bot. 1 (1950) 70; Backer & Bakh.f., Fl. Java 2 (1965) 238; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 36; Biotrop Special Publ. 51 (1993) 53; P.T. Li et al., Fl. China 16 (1995) 179; Latiff et al., Gard. Bull. Singapore 48 (1996) 198; D.J. Middleton, Fl. Thailand 7 (1999) 90; PROSEA 12, 2 (2001) 322; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 31. — *Hasseltia* Blume, Bijdr. 15 (1826) 1045, non Kunth (1825). — *Kickxia* Blume, Rumphia 4 (1848) 25, non Dumort. (1827); A.DC., Prodr. 8 (1844) 408 (as *Kixia*); Benth. & Hook.f., Gen. Pl. 2 (1876) 721; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 161. — Type species: *Kibatalia arborea* (Blume) G. Don.

Paravallaris Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 31; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1179; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 133. — Type species: *Paravallaris macrophylla* Pierre (= *Kibatalia macrophylla* (Pierre ex Hua) Woodson).

Trees or large shrubs with copious white latex from all parts. *Branches* sparsely lenticellate, often transversely fissured. *Leaves* opposite; midrib prominent beneath; glands in the axils present or absent. *Inflorescence* with a very short peduncle and appearing as a fascicle; flowers 5-merous and often distinctly 5-angled. *Sepals* ovate; colleterers inside. *Corolla* tube often widening at point of stamen insertion; lobes dextrorse; mature corolla salverform. *Stamens* sessile or subsessile, adnate to the style head; anthers



Map 6. Distribution of *Kibatalia* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* not as high as the ovary, 5-lobed, glabrous. Gynoecium 2-carpellate, apocarpous but apically united into a common style; ovules numerous; style filiform; style head conical or ovoid. *Fruit* of paired follicles, narrowly ellipsoid or cylindrical, lenticellate or not. *Seeds* consisting of seed grain and a long beak directed towards base of fruit and with a coma along the beak; hairs of coma directed down towards seed grain.

Distribution — 15 species in Southeast Asia and Malesia; in *Malesia* 14 species.

— **Map 6.**

Uses — The wood of all species can be used for medium-heavy construction work but as the trees are generally not very large are more often used for household items. The latex is used medicinally against stomach disorders or worms. The flowers can be cooked and eaten.

Note — A number of species are poorly known and have not been collected since near the beginning of the 19th century and may well be extinct. The only non-Malesian species, *K. macrophylla*, has not been collected in Malesia but is known from Peninsular Thailand.

KEY TO THE SPECIES

- 1a. Stamens partially to almost completely exerted 2
- b. Stamens completely included in corolla tube 7
- 2a. Corolla tube 5–14 mm long; upper part absent or up to 2 mm long 3
- b. Corolla tube 23–37 mm long; upper part 5–9(–10) mm long 6
- 3a. Corolla tube 9–14 mm long; leaves 8–20 by 2–7.5 cm; secondary veins (6–)7–14 on each side 4

- b. Corolla tube 5–8(–9) mm long; leaves 3.5–14 by 0.8–6 cm; secondary veins 5–8 on each side 5
- 4a. Corolla mouth glabrous or glabrate; inflorescences 1–7-flowered, tertiary venation largely obscure **6. *K. laurifolia***
- b. Corolla mouth densely pubescent; inflorescences 8–25-flowered, tertiary venation easily visible, \pm perpendicular to midrib and oblique to secondary veins. **13. *K. villosa***
- 5a. Corolla lobes glabrous at the apices; leaves 3–8.1 times as long as wide **5. *K. gitingensis***
- b. Corolla lobes pubescent all over; leaves 2.1–4.8 times as long as wide **9. *K. maingayi***
- 6a. Corolla tube 23–26 mm long; lobes 15–20 mm long; leaves obtuse or acute at the apex; ovary glabrous or only very sparsely puberulent **4. *K. elmeri***
- b. Corolla tube 34–37 mm long; lobes 25–33 mm long; leaves acuminate with obtuse point at the apex; ovary pubescent **10. *K. merrilliana***
- 7a. Corolla lobes 3–4 mm wide, 7.5–10 times as long as wide; lower part of the corolla tube 4–5 mm long; calyx without colleters **12. *K. stenopetala***
- b. Corolla lobes (5–)7–22 mm wide, 1.5–5 times as long as wide¹; lower part of the corolla tube 5–19 mm long; calyx with colleters. 8
- 8a. Stamens inserted 6–8 mm from corolla base; lower part of the tube 5–8 mm long; inflorescences 1- or 2-flowered 9
- b. Stamens inserted 15–19 mm from corolla base; lower part of the tube 7–17(–18) mm long; inflorescences 1–12-flowered 10
- 9a. Leaves 1.5–2.2 times as long as wide; corolla tube 18–23 mm long; colleters in the calyx 5–15 **11. *K. puberula***
- b. Leaves 2.7–4.2 times as long as wide; corolla tube 25–33 mm long; colleters in the calyx 50–60. **14. *K. wigmanii***
- 10a. Anther apex 1–1.5 mm from throat; upper part of the tube densely pubescent inside **8. *K. macgregori***
- b. Anther apex 3–30 mm from throat; upper part of the tube glabrous or sparsely pubescent inside 11
- 11a. Leaves \leq 2.5 times as long as wide, 8–13 cm wide **1. *K. arborea***
- b. Leaves $>$ 2.5 times as long as wide, 1–6.5 cm wide 12
- 12a. Leaves \leq 11 cm long; corolla tube 11–31 mm long; lobes 1.1–4 times as long as the tube; anther apex 4–6 mm from throat **2. *K. blancoi***
- b. Leaves 9–20 cm long; corolla tube (20–)33–37 mm long¹; lobes 0.5–0.9 times as long as the tube; anther apex (3–)9–11 mm from throat¹ 13
- 13a. Leaves 3–6.1 times as long as wide, acuminate or caudate at the apex; leaf axils with colleters; sepals 2–3.8 times as long as wide; pedicels c. 5 mm long **3. *K. borneensis***
- b. Leaves 2.6–2.8 times as long as wide, acute at the apex; leaf axils without colleters; sepals 0.8–1.7 times as long as wide; pedicels 30 mm long **7. *K. longifolia***

1) Not properly known in *K. longifolia*.

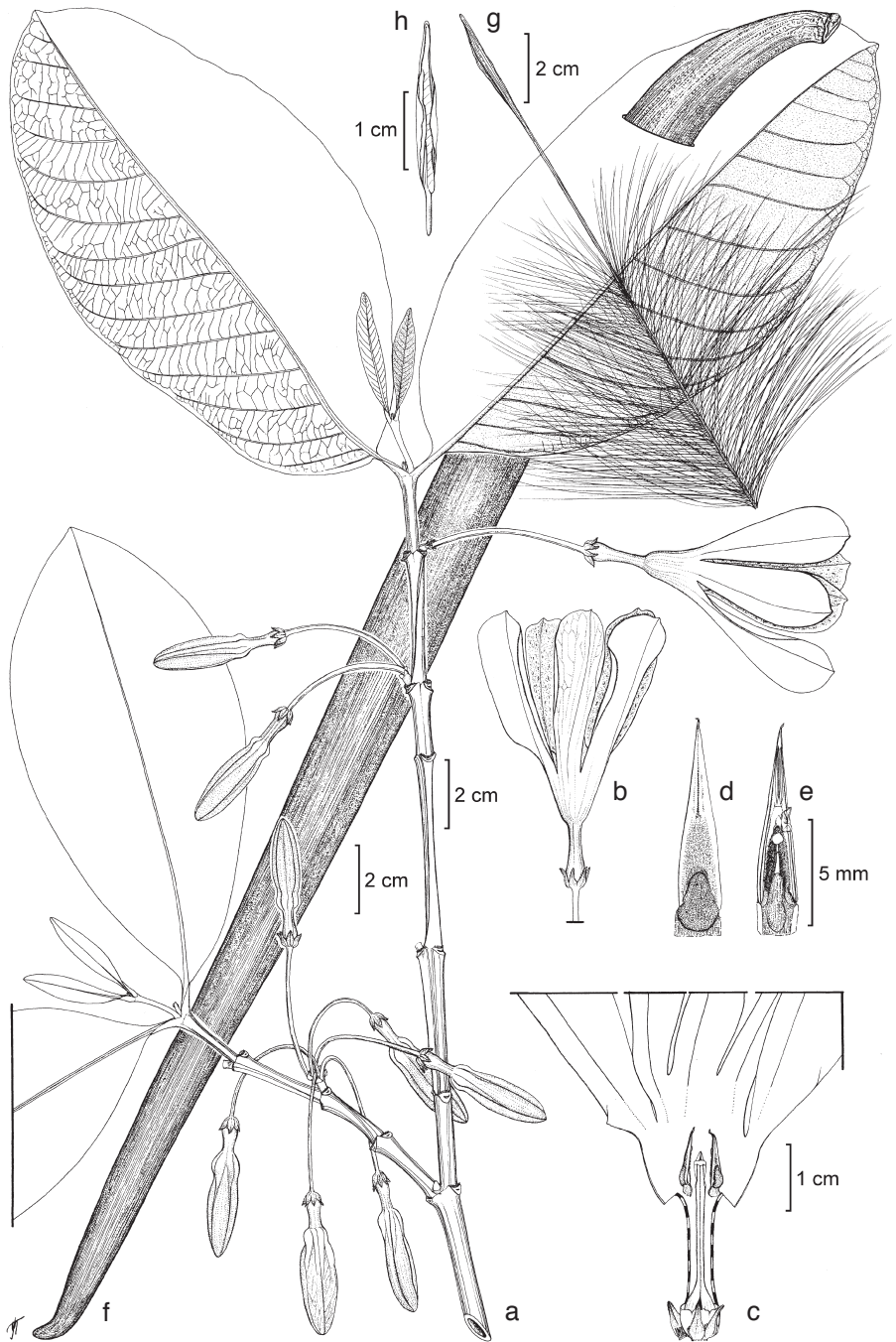


Fig. 48. *Kibatalia arborea* (Blume) G. Don. a. Habit; b. flower; c. flower dissection; d. anther, dorsal view; e. anther, ventral view; f. fruit; g. seed; h. embryo (a: Sargent 20-10-1903; b–e: Blume s.n., L 898.110-294; f, g: Koorders 2026; h: Whitmore FRI.13406).

1. *Kibatalia arborea* (Blume) G. Don

Kibatalia arborea (Blume) G. Don, Gen. Hist. 4 (1837) 86; Blume, Rumphia 4 (1849) 26; Woodson, Philipp. J. Sci. 60 (1936) 226; Kerr in Craib, Fl. Siam. 2 (1939) 456; Backer & Bakh.f., Fl. Java 2 (1965) 238; Whitmore, Tree Fl. Malaya 2 (1973) 18; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 43; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; D.J. Middleton, Fl. Thailand 7 (1999) 91; PROSEA 12, 2 (2001) 323; Kessler et al., Blumea, Suppl. 14 (2002) 14; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 31. — *Hasseltia arborea* Blume, Bijdr. (1826) 1046. — *Kickxia arborea* (Blume) Blume, Rumphia 4 (1849) 26 (as *Kixia*); A.DC., Prodr. 8 (1844) 408; Miq., Fl. Ned. Ind. 2 (1845) 435; Walp., Ann. Bot. 3 (1852) 39; Villar, Nov. Phil. (1880) 132; Koord. & Valetton, Bijdr. Boomsoort. Java 1 (1894) 110; L. Planch., Prod. Med. (1894) 298; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 161; Koord., Meded. Lands Plantentuin 19 (1898) 529; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; Stapf, Bull. Misc. Inform. Kew 1905 (1905) 50; Koord., Exkurs.-Fl. Java 3 (1912) 77; Koord.-Schum., Syst. Verz. 1, fam. 247 (1913) 181; Koord., Atlas Baumart. Java (1918) f. 639, 640; Kerr in Craib, Fl. Siam. 2 (1939) 456. — Type: *Blume s.n.* (lecto L [898.110-294], designated by Rudjiman (1987) op. cit.; possible iso BO), Java Barat, Bogor, Cihampea.

Tabernaemontana ovalis Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 554. — Type: *Unknown HB2213* (lecto L, designated by Rudjiman (1987) op. cit.; iso BO, U), Sumatra.

Tree to 45(–65) m tall; trunk straight, to 100 cm dbh, with short buttresses; outer bark grey, grey-brown or black, inner bark white, light orange or greenish, softwood white or pale yellow. *Branches* transversely fissured; lenticellate; glabrous or locally pubescent. *Leaves*: petiole 5–14(–30) mm long; blade coriaceous or papery, elliptic, less often obovate, 10.5–26(–35) by 4.6–13 cm, 1.7–2.5 times as long as wide, apex acute, acuminate or obtuse, base rounded to cuneate, sparsely puberulent beneath, 11–18 pairs of secondary veins, tertiary venation clearly visible, domatia absent. *Inflorescence* 8–10 cm long, 1- or 2-flowered; peduncles 2–5 mm long; pedicels 30–50 mm long. *Sepals* 4–7 by 2–3 mm, apex obtuse to acuminate, glabrous outside, colleters inside. *Corolla* white or creamy; tube 17–45 mm long, lower part 9–15 mm long, upper part 12–25(–40) mm, glabrous; lobes elliptic or narrowly obovate, 22–40 by 10–18 mm, 2.2–3.2 times as long as wide, glabrous or pubescent inside and outside. *Stamens* not exerted from corolla tube, inserted at 7–19 mm from the corolla base; anthers 6–7 by 1–2 mm. *Disk* cup-shaped, 2–3 mm high, obscurely 5-lobed. *Ovaries* 2.5–4 mm high, glabrous; style 1–1.9 cm long; style head 1–3 mm long. *Fruit* pendulous, 25–85 by 1–2.5 cm. *Seeds*: grains 28–35 by 2–3.5 mm, beak glabrous for c. 5 cm with a coma for 3–8 cm; coma hairs 2–10 cm long. — **Fig. 48.**

Distribution — Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Phillipines (Palawan), Sulawesi.

Habitat & Ecology — Lowland forest, often on river banks, to 500 m.

2. *Kibatalia blancoi* (Rolfe) Merr.

Kibatalia blancoi (Rolfe) Merr., Philipp. J. Sci. 17 (1920) 309; Enum. Philipp. Fl. Pl. 3 (1923) 334; Woodson, Philipp. J. Sci. 60 (1936) 221; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 47; Biotrop Special Publ. 51 (1993) 55; PROSEA 12, 2 (2001) 324. — *Kickxia blancoi* Rolfe, J. Linn. Soc., Bot. 21 (1884) 313; Stapf, Bull. Misc. Inform. Kew 1905 (1905) 52. — Type: Illustration in Fern.-Vill., Nov. App. (1880) pl. 428bis under the incorrect name of *Kixia arborea* (lectotypified here).

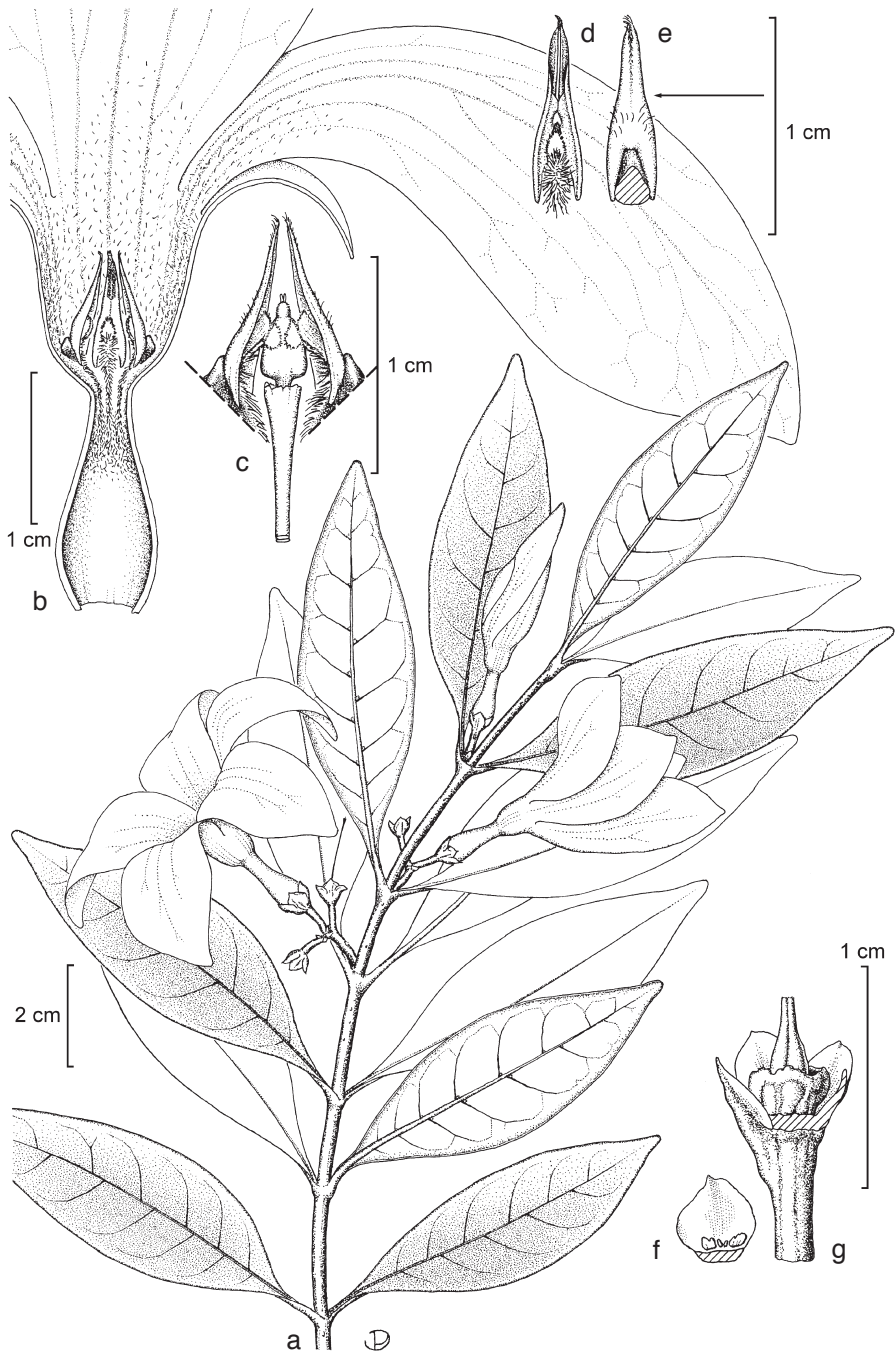


Fig. 49. *Kibatalia blancoi* (Rolfe) Merr. a. Habit; b. section of flower; c. apex of gynoecium and anthers lateral view; d. anther ventral view; e. anther dorsal view; f. sepal inside with colletes; g. part of calyx with disk and ovary (a, f, g: *Sulit PNH.6876*; b–e: *Mabesa FB.25726*).

Kickxia merrittii Merr., Philipp. J. Sci., Bot. 4 (1909) 315. — *Kibatalia merrittii* (Merr.) Woodson, Philipp. J. Sci. 60 (1936) 220. — Type: *Merritt 11488* (lecto K, designated by Rudjiman (1987) op. cit.; iso US), Philippines, Mondoro.

Kixia arborea auct. non (Blume) G. Don: Fern.-Vill., Nov. App. (1880) 132.

Tree to 20 m tall; trunk 13–40 cm dbh. *Leaves*: petiole 4–10 mm long; blade coriaceous, narrowly elliptic, 6–11 by 1–4 cm, 2.6–6 times as long as wide, apex bluntly acute to acuminate, rarely shortly caudate, cuneate at the base, 5–12 pairs of secondary veins, tertiary venation reticulate, domatia with or without tufts of hairs. *Inflorescence* 4.5–10 cm long, 1–4-flowered; peduncle 0–7 mm long; pedicels 8–20 mm long, glabrous. *Sepals* ovate, 2–5 by 2–4 mm, 1–1.6 times as long as wide, apex acute to obtuse, glabrous, colleter inside. *Corolla* white; tube 11–31 mm long, lower part 6–19 mm long, upper part 5–10(–15) mm long, glabrous outside, glabrous or sparsely pubescent inside; lobes narrowly elliptic, 30–51 by 10–22 mm, 1.5–4 times as long as wide, apex acute, glabrous or sparsely pubescent inside and outside. *Stamens* not exerted from corolla tube, inserted at 7–21 mm from corolla base; anthers c. 6 by 2 mm. *Disk* cup-shaped, 1.5–3 mm high. *Ovaries* 2–4 mm high, glabrous; style 12–22 mm long; style head 3 mm long. *Fruit* wider towards the apex, 7.7–12.5 by 1–2.2 cm. — **Fig. 49.**

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Mountains or volcanic areas.

Note — Very close to *K. elmeri*. Rolfe published this species with a very short but adequate description taken from Blanco, Fl. Filip. (1837) 114, who did not provide a name, and by reference back to an analysed drawing. This latter is the illustration which is typified above in the absence of any cited specimens. The *Lobb* specimen cited by Rudjiman as the type is not part of the original material.

3. *Kibatalia borneensis* (Stapf) Merr.

Kibatalia borneensis (Stapf) Merr., Philipp. J. Sci. 17 (1920) 309; Woodson, Philipp. J. Sci. 60 (1936) 220; J.A.R. Anderson, Tr. Peat Swamp For. Sarawak (1972) 24; Checklist Trees Sarawak (1980) 149; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 50; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 33; Whitmore et al., Checklist Kalimantan (1990) 26; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 33. — *Kickxia borneensis* Stapf, Hooker's Icon. Pl. 27 (1901) t. 2693; Bull. Misc. Inform. Kew 1905 (1905) 53; Merr., Bibliogr. Enum. Born. Pl. (1921) 501; Masam., Enum. Phan. Born. (1942) 620. — Type: *Lobb s.n.* (holo K), Sarawak.

Small tree or shrub to 4 m tall; trunk to 5 cm dbh; bark dark brown. *Leaves*: petiole 5–20 mm long; blade coriaceous, elliptic, oblong or slightly obovate, 9–20 by 2.4–6 cm, 3–6.1 times as long as wide, apex acuminate to caudate, base cuneate, 8–11(–15) pairs of secondary veins, tertiary venation mostly obscure, domatia present, rarely absent. *Inflorescence* 5–8 cm long, 1- or 2-flowered, glabrous; peduncle c. 2 mm long; pedicels c. 5 mm long. *Sepals* narrowly ovate, 4–7.5 by 2–2.5 mm, 2–3.8 times as long as wide, apex acuminate, colleter inside. *Corolla* white; tube (20–)30–37 mm long, lower part (11–)15–18 mm long, upper part (8–)15–20 mm long, glabrous outside, pubescent inside; lobes narrowly elliptic, (15–)30–36 by (5–)8–9 mm, 3.7–4.2 times as long as wide, glabrous inside and outside or with few hairs at base inside. *Stamens* not exerted from corolla tube, inserted at 19–22 mm from corolla base; anthers 5–5.5 by 1–1.5 mm. *Disk* ring-shaped, 0.5 mm high, obscurely 5-lobed. *Ovaries* 2–4 mm

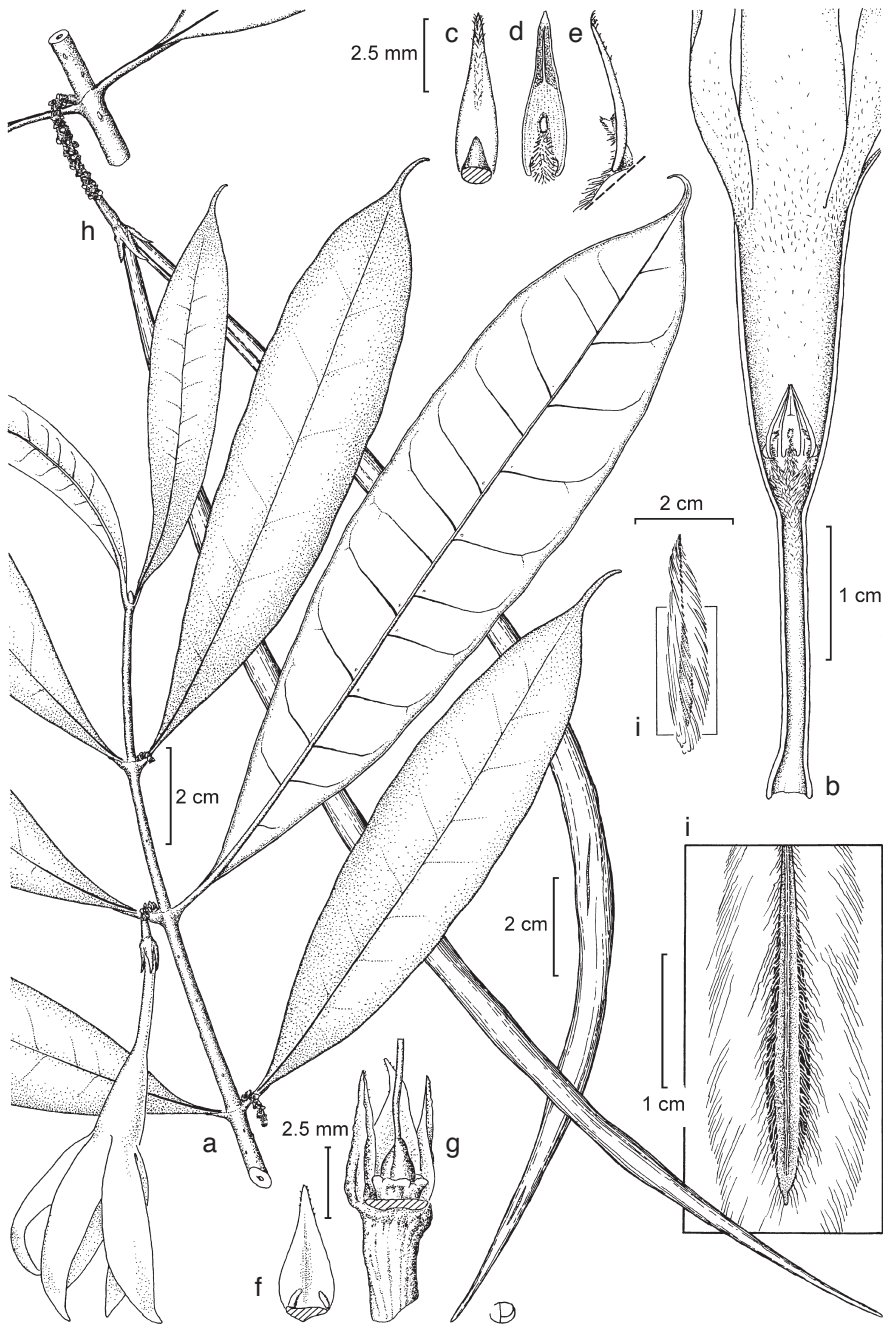


Fig. 50. *Kibatalia borneensis* (Stapf) Merr. a. Habit; b. section of flower; c. anther, dorsal view; d. anther, ventral view; e. anther, lateral view; f. sepal inside with colleters; g. part of calyx with disk and ovary; h. seed; i. enlarged part of seed (a: *Bujang S.20865*; b–g: *Native collector 46*; h, i: *Tahir 12251*).

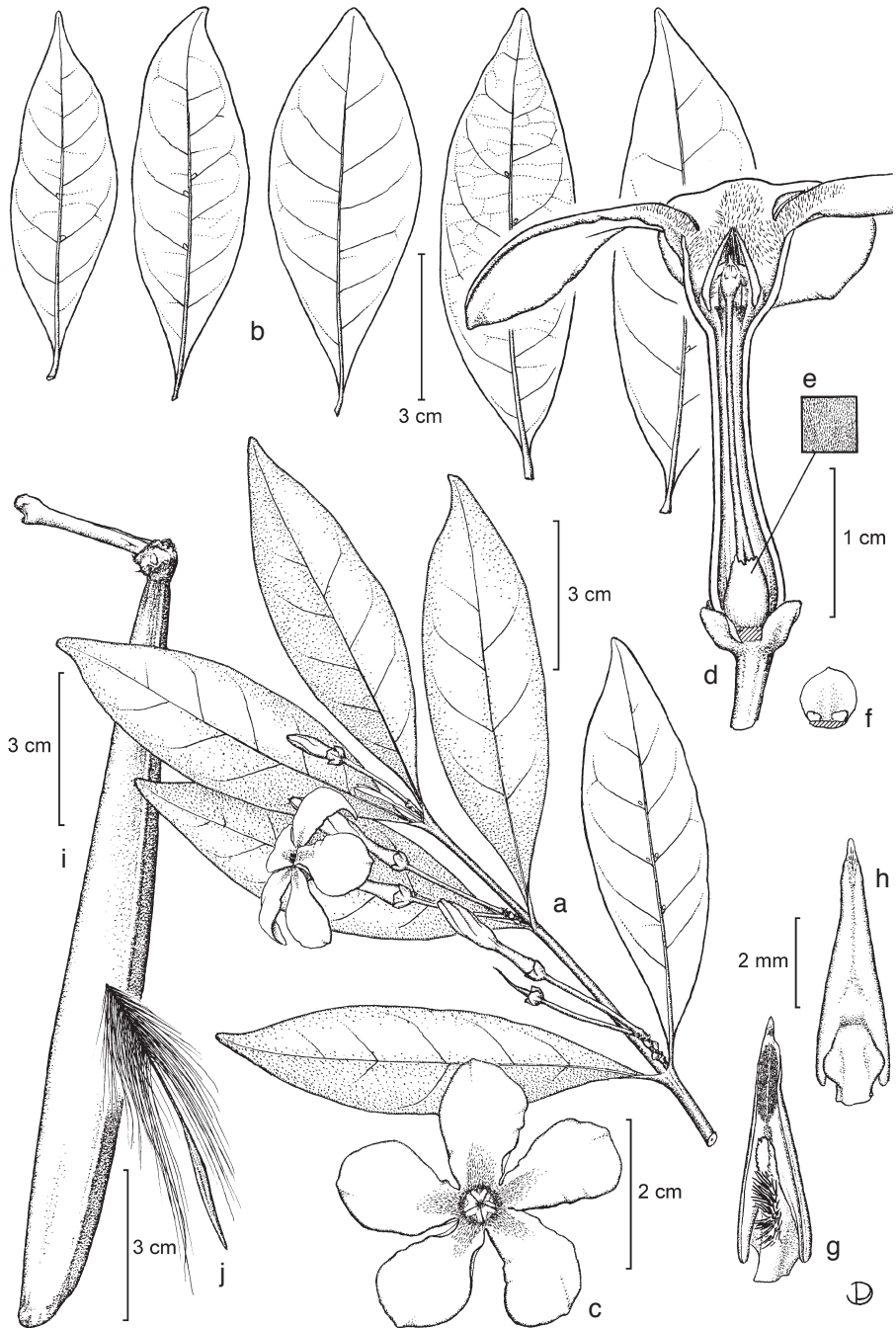


Fig. 51. *Kibatalia elmeri* Woodson. a. Flowering branch; b. leaves beneath; c. flower: above; d. flower dissection; e. part of disk; f. sepal with colleters; g, h. stamen both sides; i. fruit; j. seed (a–h: *Elmer 15934*; i, j: *Elmer 15270*).

high, glabrous; style 18 mm long; style head 1–2 mm long. *Fruit* 10–30 by 0.4–0.6 cm. *Seeds* with coma hairs throughout length; grains 18–20 by 2–3 mm; beak 3–11 mm long; coma hairs 15–30 mm long. — **Fig. 50.**

Distribution — *Malesia*: Borneo (Sarawak).

Habitat & Ecology — Swamp or heath forest at low altitude.

IUCN conservation category — Endangered due to habitat loss (EN A1c).

4. *Kibatalia elmeri* Woodson

Kibatalia elmeri Woodson, Philipp. J. Sci. 60 (1936) 223; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 53; Biotrop Special Publ. 51 (1993) 58. — *Kibatalia fragrans* Elmer, Leaflet. Philipp. Bot. 10 (1939) 3694. — Type: *Elmer 15934* (holo MO; iso A, BM, BO, C, F, G, K, L, NY, P, PNH, U, US, W, Z), Philippines, Luzon, Irosin.

Tree to 15 m tall. *Leaves*: petiole 4–6 mm long; blade elliptic, 6–10.5 by 2–3.5 cm, 2.7–3.8 times as long as wide, apex obtuse, sometimes acute, base cuneate, glabrous, 5–7 pairs of secondary veins, tertiary venation obscure; domatia present, without tufts of hairs. *Inflorescence* lax, 6.7–7.5 cm long, 1–6-flowered, glabrous; peduncles 4–5 mm long; pedicels 20–25 mm long. *Sepals* ovate, 2–4.5 by 2–3.5 mm, 1–1.5 times as long as wide, apex acute to obtuse, glabrous or puberulent at tips. *Corolla* tube 23–26 mm long, lower part 17–20 mm long, upper part 5–6 mm long, glabrous outside, glabrous or sparsely pubescent inside; lobes 15–20 by 10–14 mm, 0.5–0.8 times as long as wide, glabrous outside, pubescent inside near the base. *Stamens* slightly exerted, inserted at 19–22 mm from corolla base; anthers 5–6.5 by 1.5–2 mm. *Ovaries* 4–5 mm high, glabrous or sparsely pubescent; style 14–19 mm long; style head 2 mm long. *Disk* cup-shaped, 4–5 mm high. *Fruit* 10–15.5 by 1–1.5 cm. *Seeds*: grain 20–27 by 2 mm; beak 35–45 mm long; coma hairs 10–50 mm long. — **Fig. 51.**

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Mountain forest.

IUCN conservation category — Vulnerable due to acute restriction in area (VU D2).

Note — Very close to *K. blancoi*.

5. *Kibatalia gitingensis* (Elmer) Woodson

Kibatalia gitingensis (Elmer) Woodson, Philipp. J. Sci. 60 (1936) 216; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 57; Biotrop Special Publ. 51 (1993) 61; PROSEA 12, 2 (2001) 324. — *Kickxia gitingensis* Elmer, Leaflet. Philipp. Bot. 4 (1912) 1455. — *Vallaris gitingensis* (Elmer) Merr., Philipp. J. Sci., Bot. 10 (1915) 70. — Type: *Elmer 12203* (lecto K, designated by Rudjiman (1987) op. cit.; iso BM, BO, E, F, G, K, L, MO, NY, US, W, Z), Philippines, Sibuyan, Mt Giting-Giting.

Vallaris angustifolia Merr., Philipp. J. Sci., Bot. 7 (1912) 335. — Type: *Curran FB 10507* (lecto K, designated by Rudjiman (1987) op. cit.), Philippines, Luzon, Sorsogon.

Tree to 30 m tall; trunk 5–55 cm dbh with short spreading buttresses; bark blackish or dark brown, inner bark white, sapwood pale yellow to white. *Leaves*: petiole 3–10 mm long; blade papery to subcoriaceous, narrowly elliptic, 4–10 by 0.8–4 cm, 3–8.1 times as long as wide, apex acuminate to subcaudate, base cuneate or decurrent onto the petiole, glabrous, 5–8 obscure pairs of secondary veins, tertiary venation obscure; with

or without domatia, if present obscure. *Inflorescence* 2.5–3 cm long, 4–24-flowered; peduncle 1–2 mm long; pedicels 8–12 mm long. *Sepals* ovate, 1–2.5 by 1–1.5 mm, apex acute, glabrous outside. *Corolla* white; tube 5.3–8 mm long, lower part 4–6.5 mm long, upper part 1–1.5 mm long, glabrous inside and outside or with some hairs at top of tube outside; lobes narrowly elliptic, 8–12 by 3–7 mm, 1.3–3 times as long as wide, pubescent to glabrous outside, sparsely to densely pubescent inside, glabrous at lobe apices. *Stamens* slightly exerted, inserted at 5–7 mm from corolla base; anthers 2–2.3 by 0.5–0.8 mm. *Disk* cup-shaped, 0.5–1 mm high, 5-lobed. *Ovaries* 1–1.5 mm high, puberulent; style 5.5–7 mm long; style head 0.7–1 mm long. *Fruit*: sometimes only one fully developed, 8–25 by 0.2–0.4 cm. *Seeds*: grains 22–25 by 2–3 mm, glabrous; beak glabrous for 5–10 mm with a coma for 20–30 mm; coma hairs 10–60 mm long.

— **Fig. 52.**

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Hill forest to 525 m.

IUCN conservation category — Vulnerable due to habitat loss and over-exploitation (VU A1c, B1+2c).

6. *Kibatalia laurifolia* (Ridl.) Woodson

Kibatalia laurifolia (Ridl.) Woodson, Philipp. J. Sci. 60 (1936) 212; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 60; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; D.J. Middleton, Fl. Thailand 7 (1999) 91. — *Trachelospermum laurifolium* Ridl., J. Fed. Malay States Mus. 5 (1915) 163. — *Paravallaris laurifolia* (Ridl.) Kerr in Craib, Fl. Siam. 2 (1939) 455. — Type: *Robinson 5764* (lecto K, designated by Rudjiman (1987) op. cit.; iso K, P), Thailand, Ko Pennan.

Paravallaris microphylla Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1181; L.Y. Feddes Repert. 97 (1986) 629. — *Kibatalia microphylla* (Pit.) Woodson, Philipp. J. Sci. 60 (1936) 214. — Type: *Poilane 47* (lecto P, designated by Rudjiman (1987) op. cit, 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 301, 2nd step; iso A, HM, MO, NY, P), Vietnam, Khanh Hoa, Hoa Tan.

Kibatalia macrophylla auct. non (Pierre) Woodson: Latiff et al., Gard. Bull. Singapore 48 (1996) 197.

Shrub or tree to 20 m tall; trunk to 19 cm dbh; bark smooth. *Leaves*: petiole 2–6 mm long; blade coriaceous to papery, narrowly elliptic or narrowly ovate, 8–19 by 2–6 cm, 1.8–5.7 times as long as wide, apex acuminate or subcaudate, base cuneate, glabrous, (6–)7–14 pairs of secondary veins, tertiary venation obscure; with or without domatia, if present consisting of pits. *Inflorescence* 1.8–3 cm long, glabrous, 1–7-flowered; peduncle 0–5 mm long; pedicels 5–20 mm long. *Sepals* 1.5–3 by 1–3 mm, apex rounded to acute, glabrous. *Corolla* white or pale yellow; tube 9–13 mm long, lower part 8–11 mm long, upper part 1–2 mm long, mostly glabrous, occasionally pubescent outside, at the top, and inside; lobes narrowly elliptic, 8–16 by 3–8 mm, 1.6–3 times as long as wide, sparsely to densely pubescent inside and outside. *Stamens* exerted, inserted at 10–12 mm from corolla base; anthers 2.5–3.5 by 0.5–1 mm. *Disk* ring-shaped, 0.7–1 mm high, obscurely 5-lobed. *Ovaries* 1.7–2 mm high; style 7–11 mm long; style head 1–2 mm long. *Fruit* 6.5–18.5 by 0.5–1 cm. *Seeds*: grains 15–23 by 1.5–3 mm; beak glabrous for 5–10 mm, bearing a coma for 10–20 mm; coma hairs 30–50 mm long.

— **Fig. 53.**

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

Habitat & Ecology — Forests to 500 m.

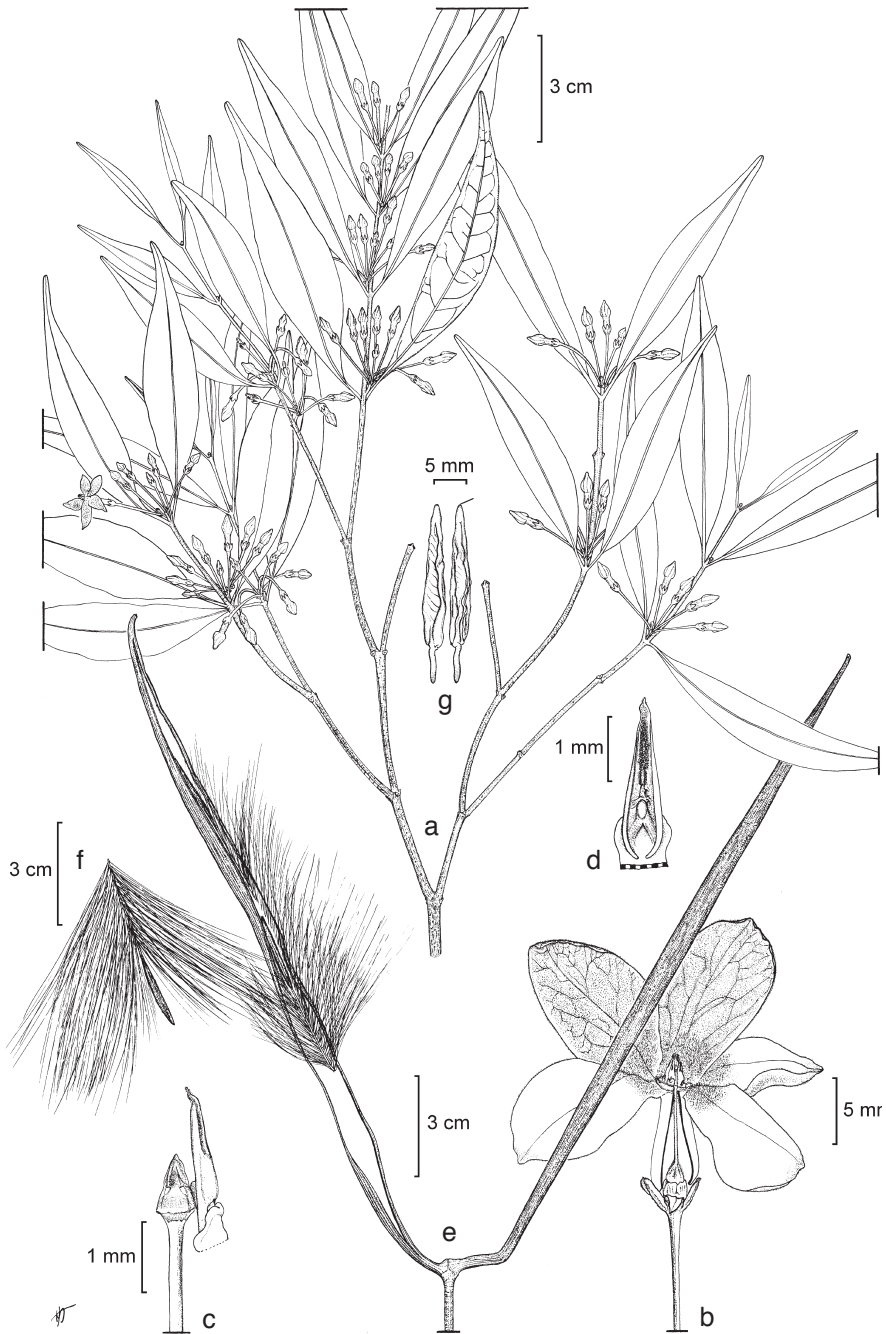


Fig. 52. *Kibatalia gütingensis* (Elmer) Woodson. a. Habit; b. flower dissection; c. part of pistil and anther lateral view; d. anther, ventral view; e. fruit; f. seed; g. embryo (a: Wenzel 652; b–d: *Duldulao* 25565; e, f: *Ramos BS* 19537; g: *Elmer* 15391).

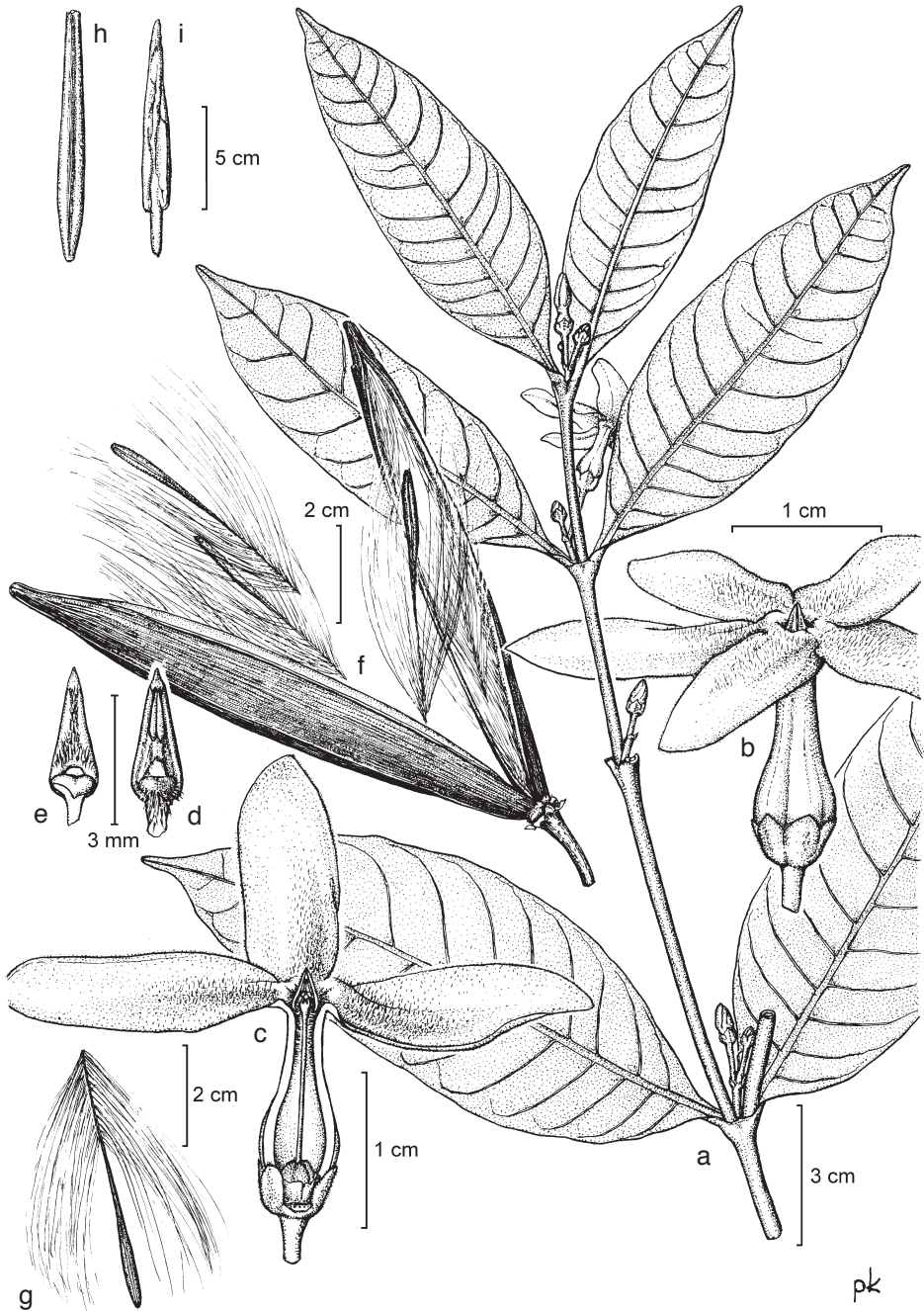


Fig. 53. *Kibatalia laurifolia* (Ridl.) Woodson. a. Flowering branch; b. flower; c. flower dissection; d, e. anther both sides; f. opened fruit; g. seed; h. detail of seed; i. embryo (a, f, g: *Clemens 4344*; b–e: *Leeuwenberg 12166*; h, i: *Kerr 18229*).

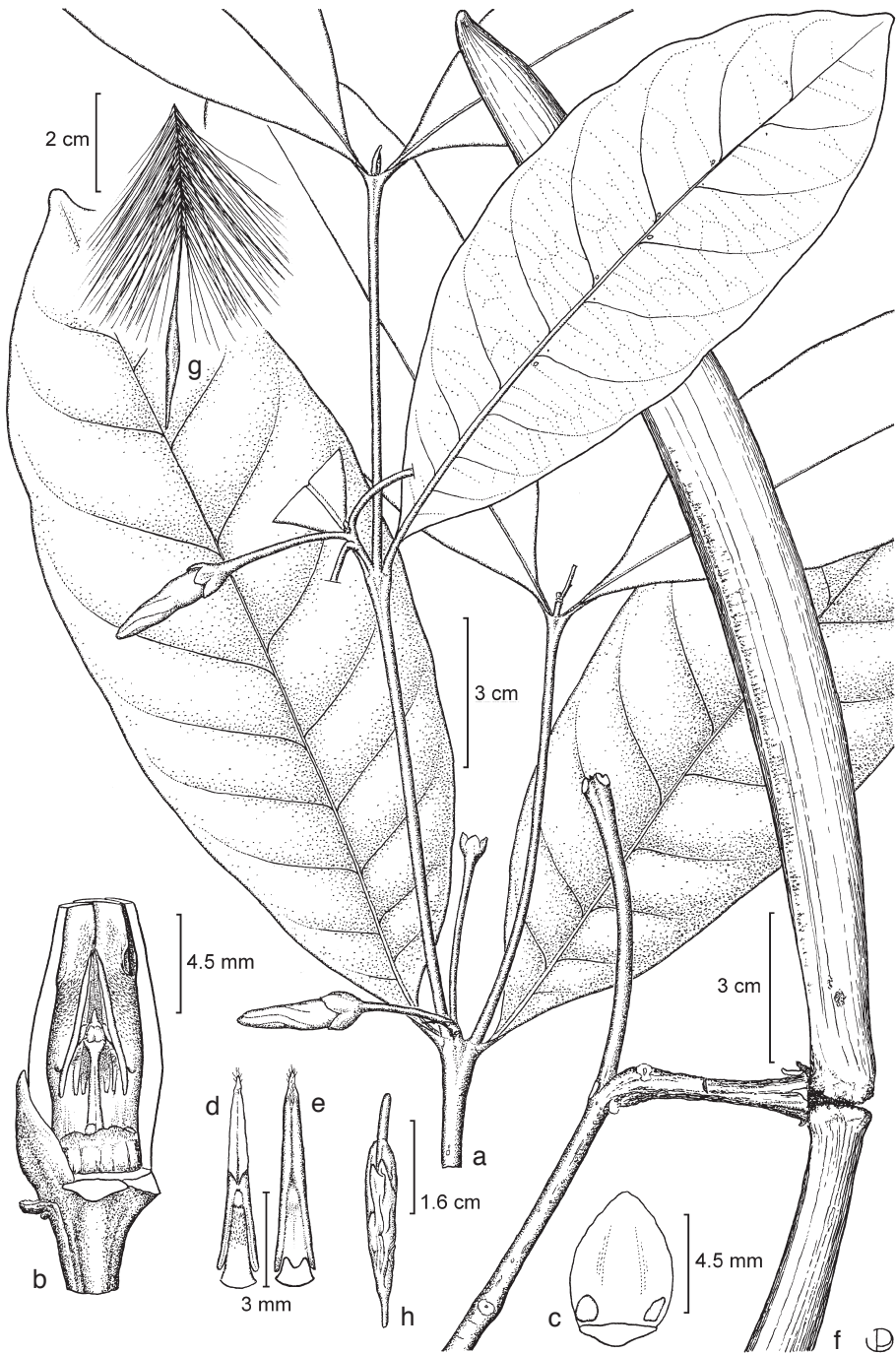


Fig. 54. *Kibatalia longifolia* Merr. a. Flowering branch; b. part of bud; c. sepal with colleters; d, e. stamens; f. fruit; g. seed; h. embryo (De Mesa 118).

7. *Kibatalia longifolia* Merr.

Kibatalia longifolia Merr., Philipp. J. Sci. 17 (1920) 307; Enum. Philipp. Fl. Pl. 3 (1923) 335 (as *oblongifolia*); Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 64; Biotrop Special Publ. 51 (1993) 64. — Type: *De Mesa 118* in *FB 27534* (lecto A, designated by Rudjiman (1987) op. cit.), Philippines, Mindanao, Davao, Balutakay, Santa Cruz.

Tree to 16 m tall; trunk to 34 cm dbh. *Leaves*: petiole 6–7 mm long; blade elliptic or subovate, 16–17.5 by 6–6.5 cm, 2.6–2.8 times as long as wide, apex acute, base cuneate, glabrous, 8 or 9 pairs of secondary veins, tertiary venation obscure. *Inflorescence* c. 10 cm long, 1–3-flowered; peduncle 3–5 mm long; pedicels c. 30 mm long. *Sepals* 4–7 by 4–5 mm, apex rounded to acute, glabrous, colleters inside. *Corolla* white; tube c. 26 mm long, lower part c. 16 mm long, upper part c. 10 mm long, glabrous or sparsely pubescent outside, puberulent inside; lobes c. 40 mm long, outside sparsely pubescent or glabrous, inside puberulent [only known from immature flowers, lengths taken from Merrill's notes]. *Stamens* probably not exerted from corolla tube. *Disk* c. 5 mm high. *Ovaries* 6 mm high. *Fruit* 17–21.5 by 1.5–1.8 cm. *Seeds*: grain 20–30 by 2–3 mm; beak glabrous for 10–15 mm, bearing a coma for 40–50 mm; coma hairs 20–50 mm long. — **Fig. 54.**

Distribution — *Malesia*: Philippines (Mindanao)

Habitat & Ecology — At 40 m altitude, probably in forest.

IUCN conservation category — Critically endangered due to severely restricted and declining area (CR B1+2c)

Note — A very poorly known species.

8. *Kibatalia macgregori* (Elmer) Woodson

Kibatalia macgregori (Elmer) Woodson, Philipp. J. Sci. 60 (1936) 224; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 67; Biotrop Special Publ. 51 (1993) 67. — *Kickxia macgregori* Elmer, Leaflet Philipp. Bot. 4 (1912) 1457. — Type: *Elmer 12373* (lecto K, designated by Rudjiman (1987) op. cit.; iso A, BM, BO, BP, E, F, G, L, MICH, MO, NY, W, Z), Philippines, Sibuyan, Magalanes.

Shrub or tree to 20 m tall; trunk to 27 cm dbh; bark rough or smooth, blackish, inner bark pale brown; wood yellowish white, bitter. *Leaves*: petiole 5–7 mm long; blade subcoriaceous to papery, narrowly ovate to elliptic, 8–17.6 by 2–4.7 cm, 3.5–4.7 times as long as wide, apex acuminate or acute, rarely subcaudate, base cuneate, glabrous, 10–13 pairs of secondary veins, tertiary venation obscure; domatia many especially either side of midrib, with or without hairs. *Inflorescence* lax, 5.5–7 cm long, glabrous, 1–3-flowered; peduncle 2–3 mm long; pedicels 10–26 mm long. *Sepals* 2–5 by 2–4.2 mm, 1–1.2 times as long as wide, apex acute to acuminate, glabrous, colleters inside. *Corolla* white; tube 17–22 mm long, lower part 13–15 mm long, upper part 5–7 mm long, glabrous outside, densely pubescent inside except at base; lobes narrowly elliptic, 27–60 by 7–21 mm, 2–3.8 times as long as wide, glabrous outside, glabrous or sparsely pubescent inside. *Stamens* not exerted from corolla tube, inserted at 18–20 mm from corolla base; anthers 4–4.5 by 1 mm. *Disk* cup-shaped, 2–2.5 mm high. *Ovaries* 2–3 mm high; style 12–15 mm long; style head c. 2 mm long. *Fruit* unknown. — **Fig. 55.**

Distribution — *Malesia*: Philippines.



Fig. 55. *Kibatalia macgregori* (Elmer) Woodson. a. Flowering branch; b. leaf beneath; c. opening bud; d. longitudinal section of flower; e. sepal with colleters; f, g. stamen both sides (Elmer 12373).

Habitat & Ecology — High altitude in forest.

IUCN conservation category — Vulnerable due to acute restriction in area (VU D2).

9. *Kibatalia maingayi* (Hook.f.) Woodson

Kibatalia maingayi (Hook.f.) Woodson, Philipp. J. Sci. 60 (1936) 213; Whitmore, Tree Fl. Malaya 2 (1973) 18; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; Whitmore & Tantra, Checklist Sumatra (1986) 19; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 69; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 36; Whitmore et al., Checklist Kalimantan (1990) 26; Rudjiman, Biotrop Special Publ. 51 (1993) 67; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; Kochummen, Tree Fl. Pasoh Forest (1997) 152; D.J. Middleton, Fl. Thailand 7 (1999) 92; Tree Fl. Sabah & Sarawak 5 (2004) 34. — *Vallisneria maingayi* Hook.f., Fl. Brit. India 3 (1882) 651; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 461; Merr., Bibliogr. Enum. Born. Pl. (1921) 502; Ridl., Fl. Malay Penins. 3 (1923) 351; Masam., Enum. Phan. Born. (1942) 625. — *Paravallisneria maingayi* (Hook.f.) Kerr in Craib, Fl. Siam. 2 (1939) 456. — Type: *Maingay 2948* (= *KD 1084*) (lecto K, designated by Rudjiman (1987) op. cit.; iso K, L), Peninsular Malaysia, Malacca.

Holarrhena daronensis Elmer, Leaflet Philipp. Bot. 4 (1912) 1455. — *Vallisneria daronensis* (Elmer) Merr., Philipp. J. Sci., Bot. 10 (1915) 70. — *Kibatalia daronensis* (Elmer) Woodson, Philipp. J. Sci. 60 (1936) 218. — Type: *Elmer 11912* (lecto K, designated by Rudjiman (1987) op. cit.; iso A, BISH, BM, BO, BP, E, L, MO, NY, P, US, W), Philippines, Mindanao, Davao.

Tree to 40 m tall; trunk to 120 cm dbh, sometimes with buttresses; bark rough or smooth, pale brown, dark grey or whitish, inner bark pale yellow, less often brown. *Leaves*: petiole 2–10 mm long; blade coriaceous, narrowly to broadly elliptic, 3.5–14 by 1–6 cm, 2.1–4.8 times as long as wide, apex acuminate or subcaudate, base cuneate or decurrent onto petiole, glabrous, 4–7 pairs of secondary veins, tertiary venation obscure; with or without domatia, if present with or without hairs. *Inflorescence* 1.5–3 cm long, 4–25-flowered; peduncle 1–3 mm long; pedicels 7–12(–15) mm long. *Sepals* 1.5–3 by 1–2 mm, apex acute or acuminate, glabrous or, rarely, pubescent. *Corolla* white or pale yellow; tube 5–8(–9) mm long, no obvious upper tube, minutely puberulent outside and inside; lobes obovate or ovate, rarely elliptic, 6–13 by 3–7 mm, 1.4–2.3 times as long as wide, minutely puberulent outside and inside. *Stamens* exerted, inserted at 5–8 mm from corolla base; anthers 2–2.5(–3) by 0.5–1 mm. *Disk* ring- to cup-shaped, 0.5–1.5 mm high, 5-lobed. *Ovaries* 1–2 mm high; style 3–7 mm long; style head 1 mm long. *Fruit* 8–50 by 0.4–0.6 cm. *Seeds*: grain 20–35 by 1.5–3 mm; beak glabrous for 5–10 mm, bearing a coma for up to 65 mm; coma hairs 10–80 mm long. — **Fig. 56.**

Distribution — Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Philippines (Mindanao).

Habitat & Ecology — Evergreen lowland or montane forest.

10. *Kibatalia merrilliana* Woodson

Kibatalia merrilliana Woodson, Philipp. J. Sci. 60 (1936) 225; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 74; Biotrop Special Publ. 51 (1993) 72. — Type: *Wenzel 330* (holo US; iso A, BM, F, G, GH, L), Philippines, Leyte.

Tree to 7 m tall; trunk to 12 cm dbh. *Leaves*: petiole 2–5 mm long; blade coriaceous, elliptic, 7.5–13.5 by 2.5–4.5 cm, 2.5–3.4 times as long as wide, apex acuminate with

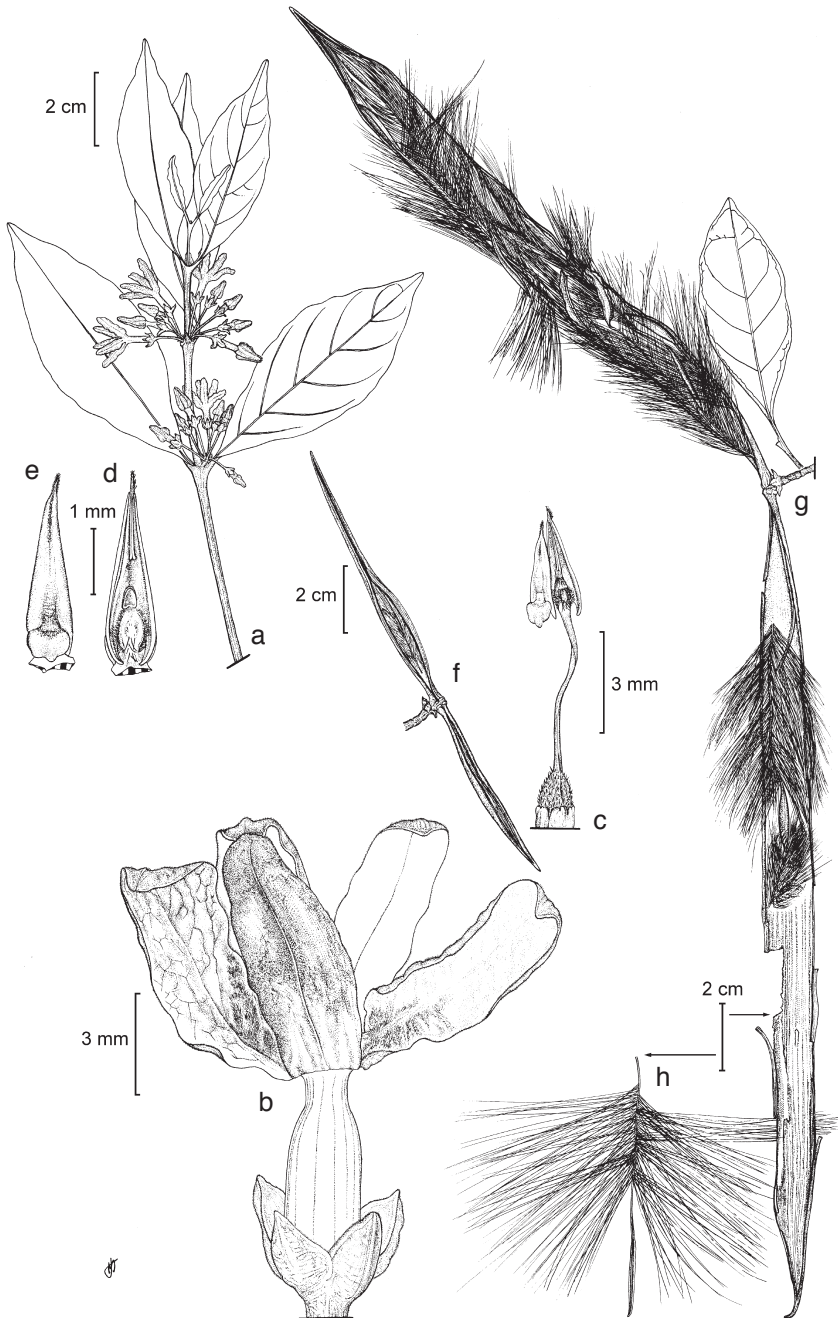


Fig. 56. *Kibatalia maingayi* (Hook.f.) Woodson. a. Habit; b. flower; c. gynoecium and stamens inside and dorsal view; d. stamen, ventral view; e. stamen, dorsal view; f. fruit. small size; g. mature fruit; h. seed (a: *Kostermans & Anta 1096*; b–e: *Kostermans 7167*; f, g: *Dachlan 2 in bb 9898*; h: *Kostermans 6698*).

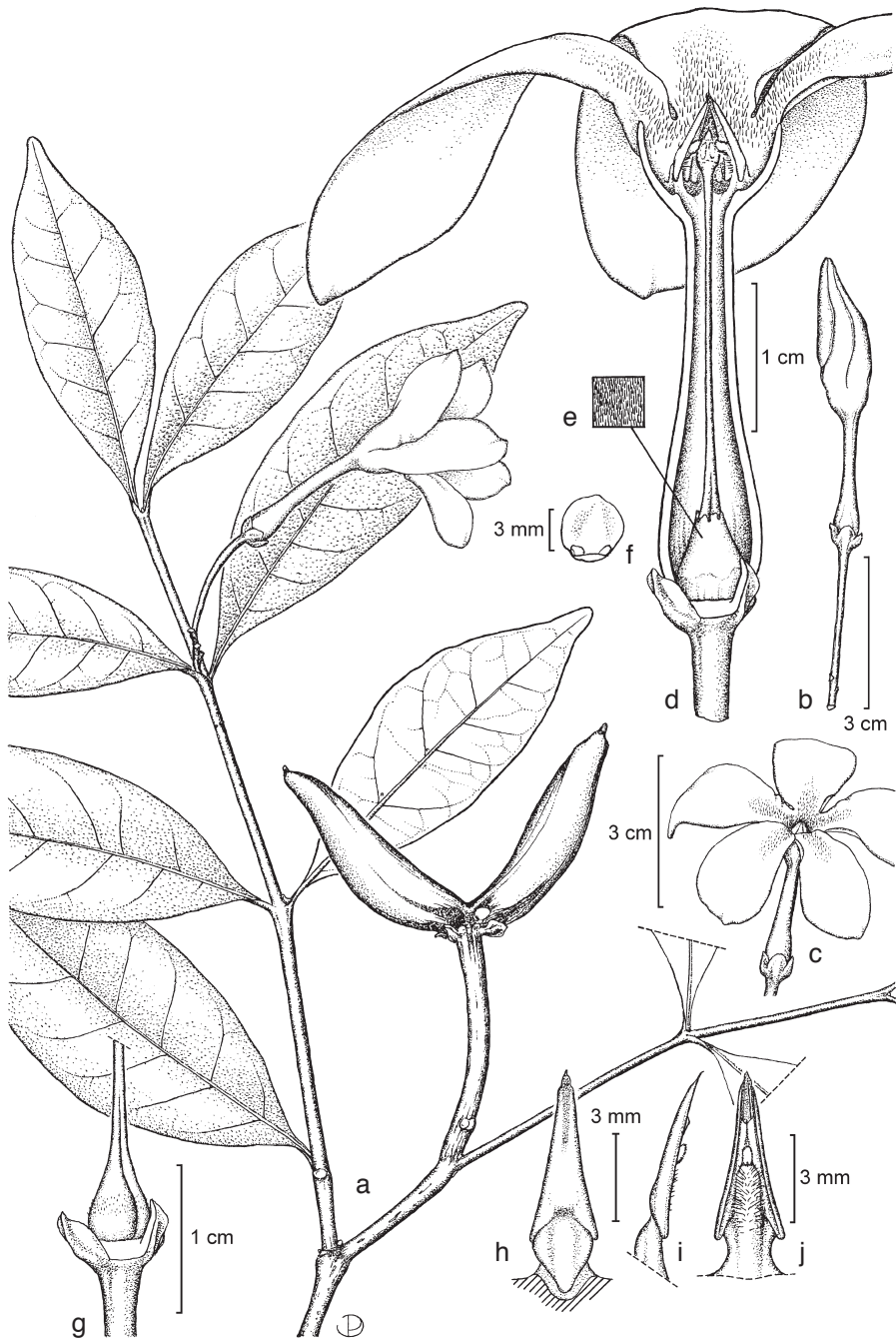


Fig. 57. *Kibatalia merrilliana* Woodson. a. Branch with flower and young fruit; b. flower bud; c. flower; d. flower dissection; e. part of disk; f. sepal with colletes; g. part of calyx with ovary (disk removed); h–j. stamen, three sides (a–c: Sulit & Conese PNH.6241; d–j: Wenzel 330).

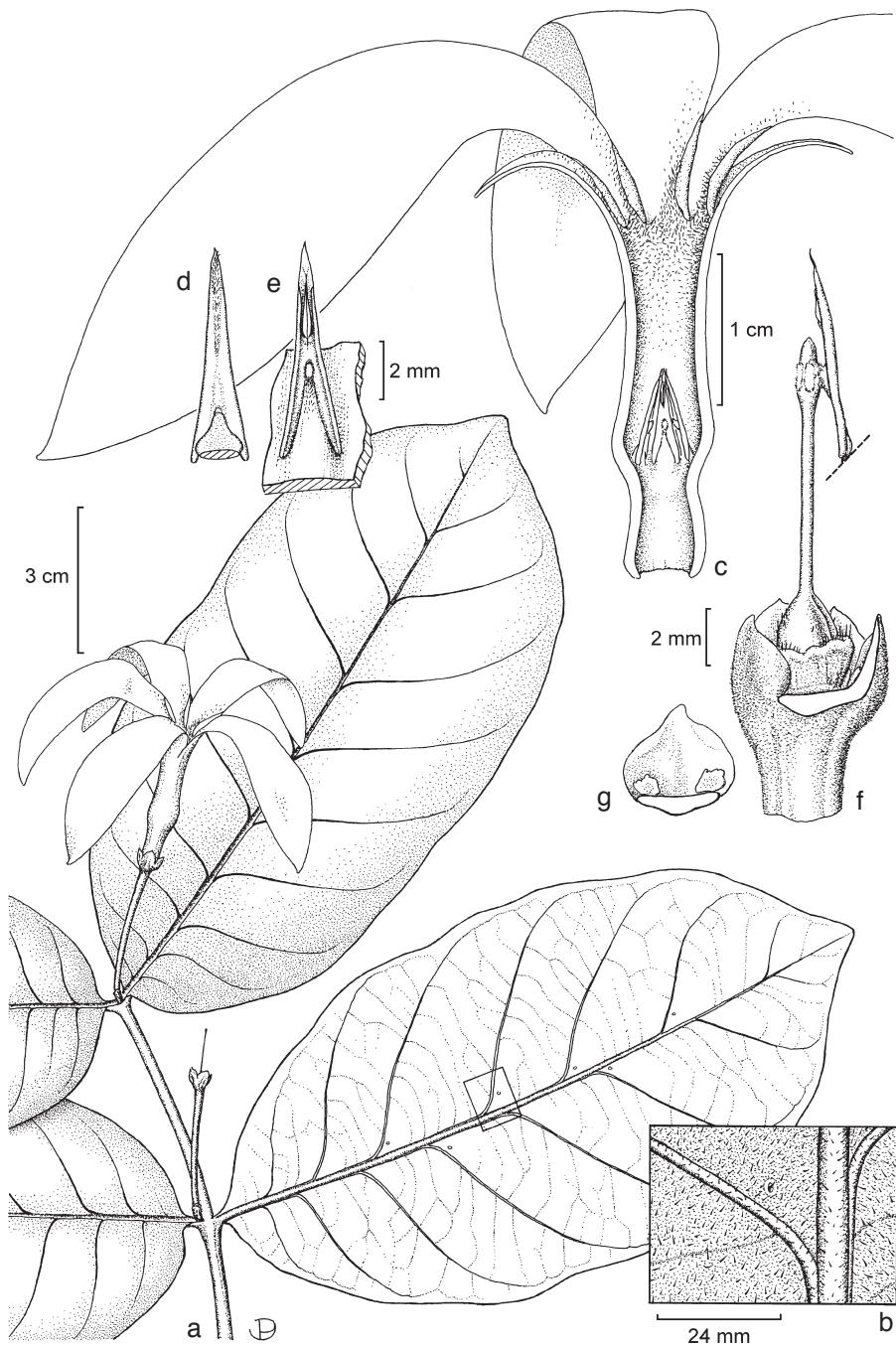


Fig. 58. *Kibatalia puberula* Merr. a. Flowering branch; b. leaf beneath (detail with domatium); c. longitudinal section of corolla; d, e. stamen both sides; f. calyx with pistil and one stamen; g. sepal with colleters (*Sulit PNH.6293*).

blunt apex, base cuneate, glabrous, 6–8 pairs of secondary veins, tertiary venation obscure; domatia present. *Inflorescence* lax, 9–9.5 cm long, 1- or 2-flowered; peduncle 4–5 mm long; pedicels 20–25 mm long. *Sepals* 3–5 by 2–5 mm, apex acute to rounded, glabrous. *Corolla* white; tube 34–37 mm long, lower part 27–28 mm long, upper part 7–9 mm long, glabrous outside and inside; lobes obovate, 25–33 by 12–23 mm, 1.3–2 times as long as wide, glabrous inside and outside except sparsely pubescent at top and base of lobes. *Stamens* exerted, inserted at 29–30 mm from corolla base; anthers 6–7 by 1.5–2 mm. *Disk* urceolate c. 8 mm high, 5-lobed. *Ovaries* c. 7 mm high, pubescent; style c. 20 mm long; style head c. 3 mm long. Only immature fruits known. — **Fig. 57.**

Distribution — *Malesia*: Philippines (Samar, Leyte).

IUCN conservation category — Vulnerable due to acute restriction in area (VU D2).

11. *Kibatalia puberula* Merr.

Kibatalia puberula Merr., Philipp. J. Sci. 30 (1926) 423; Woodson, Philipp. J. Sci. 60 (1936) 223; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 77; Biotrop Special Publ. 51 (1993) 75. — Type: *McGregor BS 43767* (lecto UC, designated by Rudjiman (1987) op. cit.; iso NY), Philippines, Samar.

Tree to 10 m tall; trunk to 20 cm dbh; bark pale grey or pale brown. *Leaves*: petiole 3–5 mm long; blade papery to coriaceous, elliptic, less often ovate or obovate, 11–18 by 5.5–9.6 cm, 1.5–2.2 times as long as wide, apex acuminate or acute, base rounded or cuneate, glabrous above, sparsely puberulent beneath, 7–12 pairs of secondary veins, tertiary venation obscure; domatia present. *Inflorescence* mostly of solitary flowers, 9.5–10 cm long; peduncle 2–5 mm long; pedicels 20–30 mm long; glabrous or sparsely puberulent. *Sepals* 2–4 by 2–4 mm, apex acute or acuminate, pubescent, colleter inside. *Corolla* white; tube 18–23 mm long, lower part 6–6.5 mm long, upper part 12–17 mm long; lobes narrowly elliptic, (33–)40–48.5 by 9–13 mm, 3.5–5 times as long as wide, outside puberulent or glabrous on lobes, inside pubescent up to base of lobes or all over. *Stamens* not exerted from corolla tube, inserted at (6–)7.5–8 mm from corolla base; anthers 6.5 by 1.5–2 mm. *Disk* ring- to cup-shaped, c. 2 mm high. *Ovaries* 3–3.5 mm high; style 5.5–9.5 mm long; style head 1–2 mm long. *Fruit* unknown. — **Fig. 58.**

Distribution — *Malesia*: Philippines (Samar).

Habitat & Ecology — Dipterocarp forests or river banks, 100–250 m altitude.

IUCN conservation category — Endangered due to restricted and declining area (EN B1+2c).

12. *Kibatalia stenopetala* Merr.

Kibatalia stenopetala Merr., Philipp. J. Sci. 17 (1920) 308; Woodson, Philipp. J. Sci. 60 (1936) 219; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 80; Biotrop Special Publ. 51 (1993) 75. — Type: *Ramos & Pascasio 34691* (lecto A, designated by Rudjiman (1987) op. cit.; iso BM, BO, K, L, P, US), Philippines, Mindanao.

Kibatalia luzonensis Woodson, Philipp. J. Sci. 60 (1936) 218. — Type: *Rivera & Duyag 75041* (lecto UC, designated here), Philippines, Luzon.

Tree to 10 m tall. *Leaves*: petiole 2–12 mm long; blade papery to coriaceous, elliptic to narrowly elliptic, 3.6–10 by 1.5–4.3 cm, 1.6–4.7 times as long as wide, apex obtuse

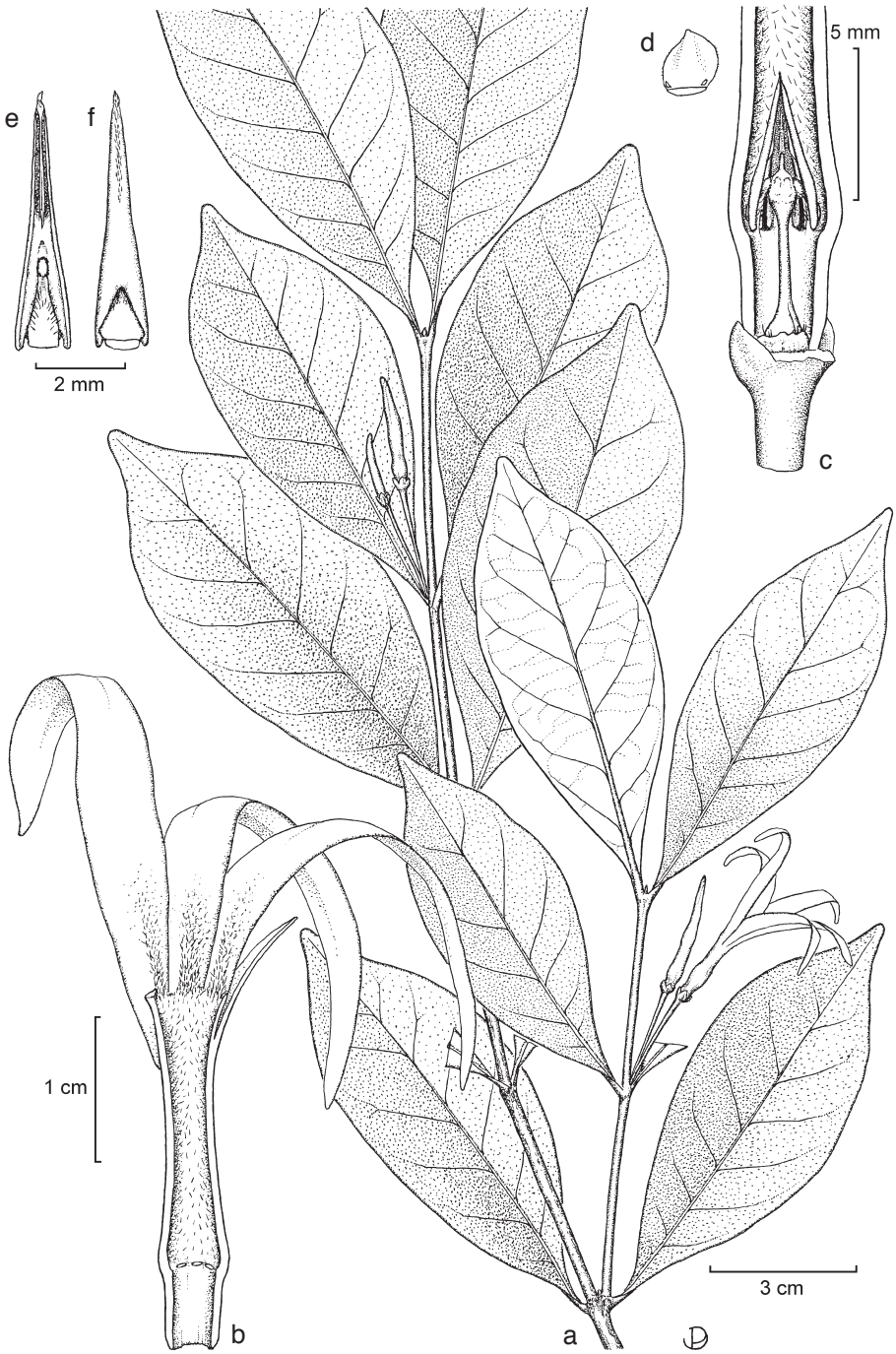


Fig. 59. *Kibatalia stenopetala* Merr. a. Flowering branch; b. part of corolla without stamens; c. flower base dissected; d. sepal with colleters; e, f. stamen both sides (Ramos & Pascasio BS.34691).

to acuminate with a blunt apex, base cuneate or decurrent onto petiole, glabrous, 5–8 pairs of secondary veins, tertiary venation obscure; domatia present or absent. *Inflorescence* 1–4-flowered, 4.5–7 cm long; peduncle 0–3 mm long; pedicels 9–25 mm long. *Sepals* 1.5–2 by 1.5 mm, apex acute, glabrous, colleters absent inside. *Corolla* white; tube 10–16 mm long, lower part 4–5 mm long, upper part 5–12 mm long, outside very minutely and sparsely puberulent, inside pubescent at top of tube; lobes narrowly elliptic, 25–33 by 3–4 mm, 7.5–10 times as long as wide, outside very minutely and sparsely puberulent, inside glabrous except at base of lobes. *Stamens* not exerted from corolla tube, inserted at 4–5 mm from corolla base; anthers 4.7–6 by 1–1.1 mm. *Disk* ring-shaped, 5-crenate, 0.8–1 mm high, sparsely puberulent. *Ovaries* 1.2–2 mm high, sparsely puberulent; style c. 3 mm long; style head c. 2 mm long. *Fruit* apex acuminate, 8.4–9.3 cm by 6.5–7.5 mm. *Seeds*: grain 17–18 by 2.8–3.1 mm; beak glabrous for 3.5–3.9 mm, bearing a coma for 15–17 mm; coma hairs 19–31 mm long. — **Fig. 59.**

Distribution — *Malesia*: Philippines (Mindanao, Dinagat, Luzon).

Habitat & Ecology — Low altitude forests.

IUCN conservation category — Endangered due to restricted and declining area (EN B1+2c).

13. *Kibatalia villosa* Rudjiman

Kibatalia villosa Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 82; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 34. — Type: *Rudjiman* 266 (holo BO; iso BO, L, WAG), Borneo, Kalimantan Selatan, Barito Kuala, Bambang.

Tree to 30 m tall; trunk to 70 cm dbh; bark grey, rough or smooth, inner bark brown, sapwood pale yellow. *Leaves*: petiole 5–15 mm long; blade coriaceous, elliptic to narrowly elliptic, 8–20 by 3.6–7.5 cm, 1.2–3 times as long as wide, apex acute to acuminate, less often obtuse or caudate, base cuneate, glabrous, 8–12 pairs of secondary veins, tertiary venation perpendicular to midrib and oblique to secondary veins; domatia consisting of pits. *Inflorescence* congested, 8–25-flowered, 2.5–4 cm long; peduncle 1–5 mm long; pedicels 10–14 mm long; glabrous or sparsely puberulent near base. *Sepals* 1.7–4.5 by 1.5–2 mm, 1.2–2 times as long as wide, apex acute, glabrous or sparsely puberulent. *Corolla* white or yellowish green; tube 9–14 mm long, lower part 8–12 mm long, upper part 0–2 mm long; lobes elliptic or narrowly elliptic, 7–17.5 by 4.5–7.5 mm, 0.9–2.7 times as long as wide, outside glabrous, inside glabrous at base, pubescent at top of tube and inside of lobes. *Stamens* exerted, inserted at 10–12 mm from corolla base; anthers 3 by 1–1.5 mm. *Disk* ring- to cup-shaped, 1–2 mm high. *Ovaries* 2–3 mm high; style 8–11 mm long; style head 1.5–2 mm long. *Fruit* 18.5–29 by 0.7–0.9 cm. *Seeds*: grain c. 24 by 0.8 mm; beak glabrous for c. 10 mm, bearing a coma for c. 38 mm; coma hairs c. 35 mm long. — **Fig. 60.**

Distribution — *Malesia*: Peninsular Malaysia, Borneo.

Habitat & Ecology — Swamp or montane forest, often on limestone to 1200 m.

IUCN conservation category — Vulnerable due to fragmented and declining area (VU B1+2c).

Note — This species has often been confused with *K. borneensis* when in fruit, even in the protologue.

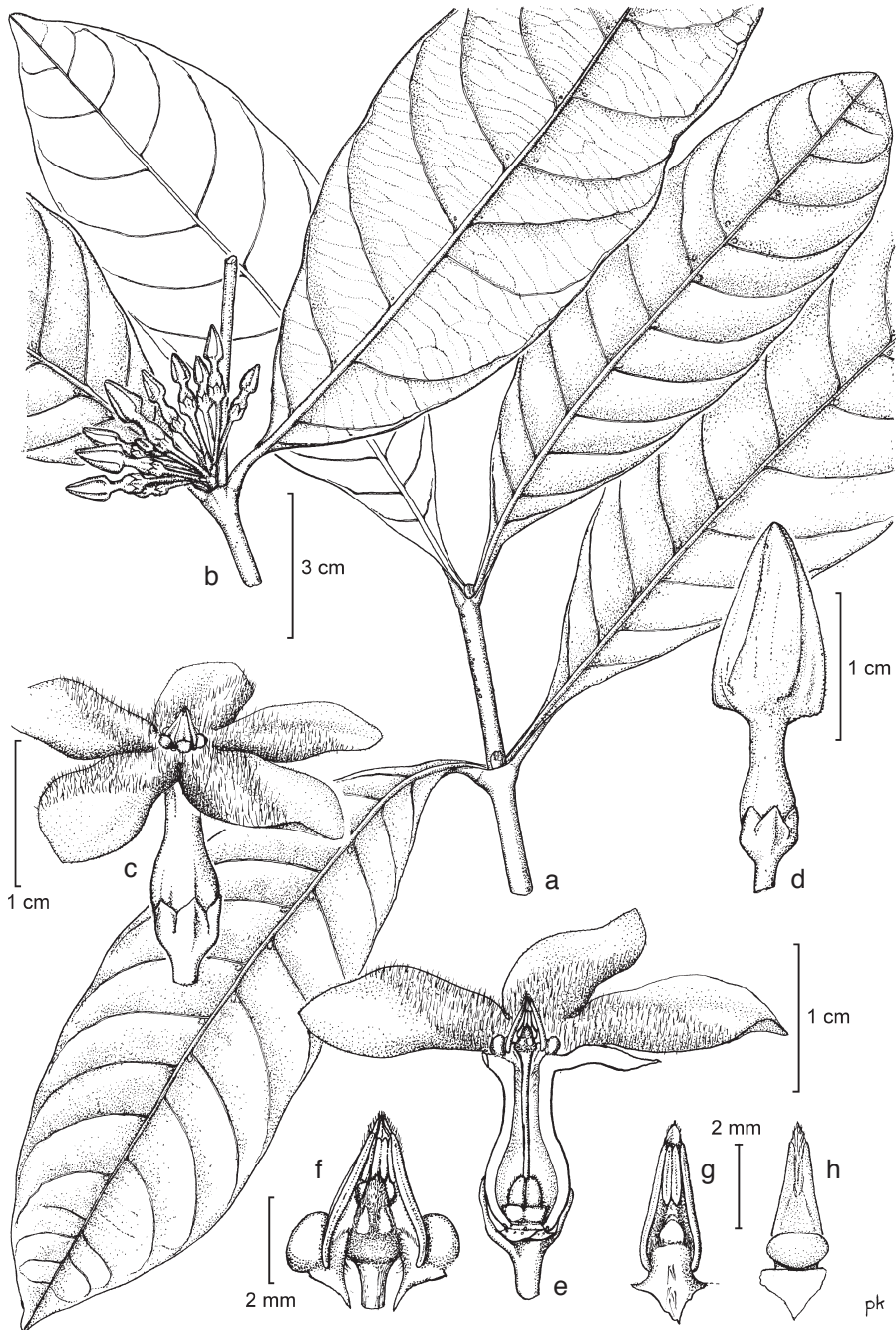


Fig. 60. *Kibatalia villosa* Rudjiman. a. Branchlet; b. flowering branchlet; c. flower; d. flower bud; e. section of flower; f. apex of gynoecium and anther lateral view; g. anther, ventral view; h. anther, dorsal view (a, c–h: Rudjiman 266; b: Haviland 3050).

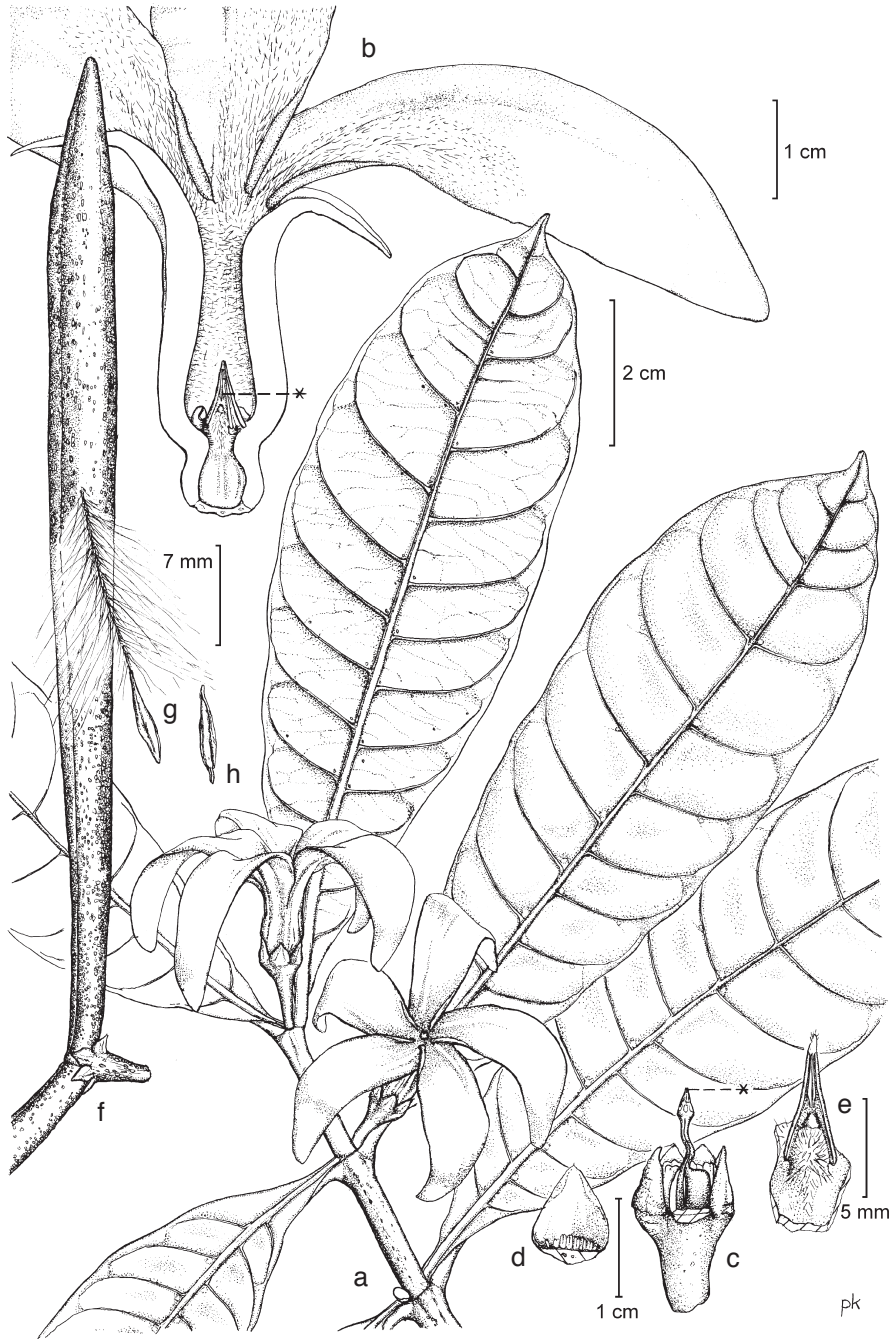


Fig. 61. *Kibatalia wigmanii* (Koord.) Merr. a. Habit; b. section of flower; c. part of calyx opened out and pistil; d. a single sepal inside; e. anther, ventral view; f. fruit; g. seed; h. embryo (a–e: *Leeuwenberg 11864*; f–h: *Koorders 160456*).

14. *Kibatalia wigmanii* (Koord.) Merr.

Kibatalia wigmanii (Koord.) Merr., Philipp. J. Sci. 17 (1920) 310; Woodson, Philipp. J. Sci. 60 (1936) 226; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 86; Whitmore & Tantra, Checklist Sulawesi (1989) 14; Kessler et al., Blumea, Suppl. 14 (2002) 14. — *Kickxia wigmanii* Koord., Meded. Lands Plantentuin 19 (1898) 528; Stapf, Bull. Misc. Inform. Kew 1905 (1905) 51. — *Kickxia vaele-tonii* Koord., Meded. Lands Plantentuin 19 (1898) 67, nom. illeg. — Type: *Koorders 16045* (lecto L., designated by Rudjiman (1987) op. cit.; iso BO, K, P), North Celebes.

Tree to 25 m tall; trunk to 45 cm dbh; bark grey, blackish or dark brown. *Leaves*: petiole 5–10 mm long; blade coriaceous, narrowly obovate or narrowly elliptic, 12.5–33.5 by 4.5–8 cm, 2.7–4.2 times as long as wide, apex acute, acuminate or caudate with a sharp point, base cuneate, 10–16 pairs of secondary veins, tertiary venation conspicuous; domatia present. *Inflorescence* 1- or 2-flowered, 7.5–9 cm long; peduncle 5–10 mm long; pedicels 15–20 mm long. *Sepals* 5.5–8 by 4–5 mm, apex acute, glabrous, colleters inside. *Corolla* yellow or creamy; tube (25–)28–33 mm long, lower part 5–8 mm long, upper part 20–25 mm long; lobes narrowly elliptic, (30–)55–60 by (7–)15–20 mm, 3.2–3.6 times as long as wide, outside glabrous except puberulent at top of tube, inside pubescent. *Stamens* not exerted from corolla tube, inserted at 6–7 mm from corolla base; anthers 5–6 by 1.5–2 mm. *Disk* cup-shaped, 3–3.3 mm high, 5-lobed. *Ovaries* 3–3.3 mm high; style 8–8.5 mm long; style head 2–3.5 mm long. *Fruit* 23–31.5 by 1–2 cm. *Seeds*: grain 17–30 by 3–4 mm; beak glabrous for 5–20 mm, bearing a coma for 25–70 mm; coma hairs 25–70 mm long. — **Fig. 61.**

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — Forests to 500 m altitude.

IUCN conservation category — Vulnerable due to acute restriction in area (VU D2).

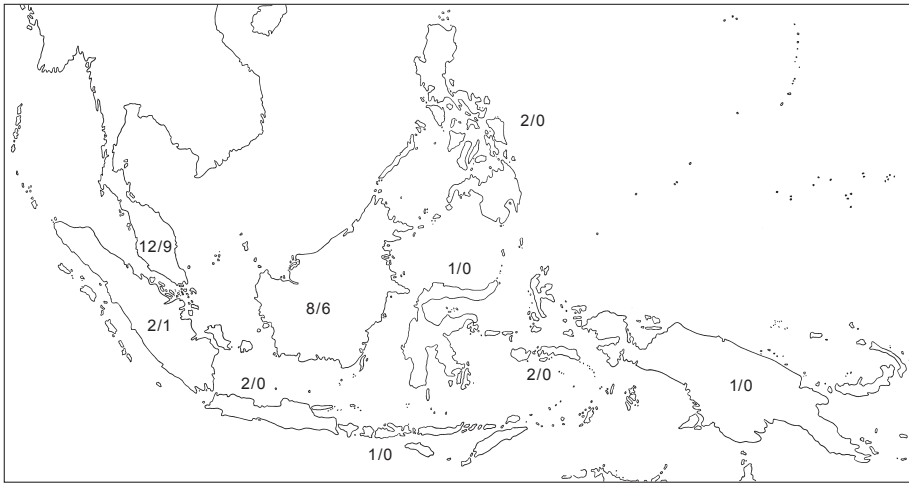
22. KOPSIA

Kopsia Blume, Catalogus (1823) 12, nom. cons.; G. Don, Gen. Hist. 4 (1837) 100; A.DC., Prodr. 8 (1844) 351; Benth. & Hook.f., Gen. Pl. 2 (1876) 701; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1132; Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 171; Backer & Bakh.f., Fl. Java 2 (1965) 232; D.J. Middleton, Fl. Thailand 7 (1999) 60; Harvard Pap. Bot. 89 (2004) 92; Tree Fl. Sabah & Sarawak 5 (2004) 35. — Type species: *Kopsia arborea* Blume.

Calpicarpum G. Don, Gen. Hist. 4 (1837) 100. — Type species: *Calpicarpum roxburghii* G. Don, nom. illeg.

Kentrochrosia K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1900) 506. — Type species: *Kentrochrosia monocarpa* K. Schum. & Lauterb.

Shrubs or small trees, buttresses absent. *Branchlets* terete to winged; glabrous or more rarely pubescent; lenticellate or not. *Leaves* opposite; mostly petiolate, rarely sessile, bases mostly clasping the terminal bud when young and the stem when older; blade mostly subcoriaceous to coriaceous, rarely papery, more or less equal in size, entire; colleters present in the axils. *Inflorescence* terminal; basically dichasial, more rarely trichasial, but often with elongated branches that do not further branch so as to appear somewhat cincinnate; pedunculate or not; glabrous to densely pubescent; bracts and bracteoles small; flowers 5-merous. *Sepals* erect; without colleters inside; with a gland on the outside just below the apex. *Corolla* actinomorphic; lobes dextrorse; salverform with a narrow tube, slightly wider around the stamens, and spreading lobes.



Map 7. Distribution of *Kopsia* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

Stamens inserted around the middle of the tube to near the tube throat, very rarely near base, not exserted from throat; filaments straight, short, thin; anthers ovate, fertile for most of the length; free from style head. *Disk* of 2 lobes alternating with the 2 free carpels. Gynoecium 2-carpellate, apocarpous but united into a common style, glabrous or pubescent; style filiform, glabrous; style head with a collar at the base, otherwise short and cylindrical. Ovules 2 in each carpel although only ever one develops. *Fruit* of paired drupes, more rarely solitary, ellipsoid to falcate, flattened to various degrees (hardly at all in *K. arborea*), usually with spur-like appendages facing inwards towards each other, rarely absent. *Seeds* curved, broader at one end, other end acuminate.

Distribution — 23 species from southern China and Burma to northern Australia and Vanuatu; in *Malesia* 19 species. — **Map 7.**

KEY TO THE SPECIES

- 1a. Stamens inserted very clearly around the middle or in lower half of corolla tube, ≤ 0.6 of corolla tube length 2
- b. Stamens inserted in upper half of corolla tube, > 0.6 of corolla tube length 4
- 2a. Sepals acute, rarely obtuse but never rounded **12. *K. profunda***
- b. Sepals rounded 3
- 3a. Inflorescence robust, glabrous to densely pubescent; branchlets glabrous to densely pubescent, terete to very weakly angled. — Peninsular Malaysia **10. *K. macrophylla***
- b. Inflorescence delicate, glabrous; branchlets glabrous, weakly angled to strongly winged. — Borneo **11. *K. pauciflora* var. *mitrephora***
- 4a. Corolla tube ≤ 20 mm long 5
- b. Corolla tube > 20 mm long 10

- 5a. Branchlets sparsely to densely puberulent, glabrescent when older; petiole sparsely to densely pubescent; sepals densely puberulent 6
- b. Branchlets glabrous; petiole glabrous; sepals glabrous to sparsely puberulent 7
- 6a. Secondary veins 24–32 pairs; corolla lobes < 7 times as long as wide
. **6. *K. grandifolia***
- b. Secondary veins 16–19 pairs; corolla lobes > 8 times as long as wide
. **17. *K. sumatrana***
- 7a. Inflorescence lax with clear internodes, sparsely to densely puberulent; pedicels 2.1–5 mm long 8
- b. Inflorescence with flowers clustered along short or elongated branches, glabrous or puberulent only in upper parts; pedicels 1–2 mm long 9
- 8a. Petiole 4–7 mm long; pedicels 2.1–3.5 mm long; corolla throat pubescent, corolla lobes 9.5–12.3 mm long; disk pubescent; ovary densely pubescent
. **7. *K. griffithii***
- b. Petiole 1–2 mm long; pedicels 4.5–5 mm long; corolla throat glabrous, corolla lobes 11.5–15 mm long; disk glabrous; ovary glabrous **18. *K. tenuis***
- 9a. Leaf apex caudate, secondary veins clearly discernable from tertiary venation, curved ascending; corolla white, lobes 1–1.5 mm wide. **9. *K. larutensis***
- b. Leaf apex short acuminate, secondary veins not clearly discernable from tertiary venation, straight; corolla red, lobes 2.2–2.3 mm wide. **8. *K. lapidilecta***
- 10a. Leaves sessile 11
- b. Leaves petiolate 12
- 11a. Corolla white and tinged pink or pink with a red eye; anther apex < 2 mm from corolla throat **19. *K. teoi***
- b. Corolla completely white or white with a yellow eye, rarely pinkish white; anther apex > 2 mm from corolla throat **11. *K. pauciflora***
- 12a. Disk pubescent; inflorescence lax with distinct internodes **7. *K. griffithii***
- b. Disk glabrous; inflorescence variable 13
- 13a. Petioles delicate, 6–17 mm long, usually around 15% of total leaf length; inflorescence axes < 1 mm wide **3. *K. deverrei***
- b. Petioles robust, 3–12.5 mm long, less than 15% of total leaf length; inflorescence axes > 1 mm wide or rarely less but then corollas not white with a red eye 14
- 14a. Anther apex 5.2–5.8 mm from corolla throat; inflorescence > 10 cm long, densely puberulent **2. *K. dasyrachis***
- b. Anther apex 0.1–5 mm from corolla throat; inflorescence length variable but mostly < 10 cm long, puberulent or not. 15
- 15a. Inflorescence with bracts as large as the sepals and flowers clustered at inflorescence branch ends; sepals mostly acute, more rarely obtuse; fruit without a spur or angle **1. *K. arborea***
- b. Inflorescence with bracts somewhat obscure or smaller than sepals, if as large as sepals then flowers not clustered at inflorescence branch ends; sepals obtuse to rounded; fruit with a spur or angle on one side 16
- 16a. Ovaries glabrous or with just a few isolated hairs 17
- b. Ovaries clearly pubescent 19

- 17a. Leaves with long caudate apex; secondary veins at 40–60° from midrib. — Borneo **13. *K. rajangensis***
 b. Leaves acuminate; secondary veins at (45–)60–75° from midrib. — Not in Borneo 18
- 18a. Stamen bulge slightly below top of corolla tube; flowers white or pinkish but not white with a strongly contrasted pink or red ‘eye’. — Southern Thailand, Peninsular Malaysia **14. *K. rosea***
 b. Stamen bulge at top of corolla tube; flowers white with a strongly contrasted pink or red ‘eye’. — Philippines, Eastern Malesia, Western Pacific Islands **4. *K. flavida***
- 19a. Inflorescence robust and lax with distinct internodes all through inflorescence **16. *K. sleesiana***
 b. Inflorescence robust or delicate with flowers congested, if lax then at least with ultimate branches congested 20
- 20a. Inflorescence without elongated branches; corolla pale to dark pink or white with a red or pink ‘eye’ 21
 b. Inflorescence with elongated branches but with the flowers congested along these; corolla white or white with a yellow ‘eye’, very rarely with a pink tinge but then only ever one flower on an inflorescence branch open at a time 23
- 21a. Branchlets pubescent; native in Burma but widely cultivated . . . **5. *K. fruticosa***
 b. Branchlets glabrous; wild 22
- 22a. Peduncle to 1 cm long; fruit with a large deltoid or very slightly hooked projection on one side. — Philippines, Eastern Malesia, Western Pacific Islands **4. *K. flavida***
 b. Peduncle mostly > 1 cm long, very rarely under 1 cm; fruit with only a slight angle on one side. — Peninsular Malaysia **15. *K. singaporensis***
- 23a. Secondary veins at (55–)60–80° from midrib; anther apex 2.4–5 mm from corolla throat **11. *K. pauciflora***
 b. Secondary veins at 40–60° from midrib; anther apex 1.1–2 mm from corolla throat **13. *K. rajangensis***

1. *Kopsia arborea* Blume

Kopsia arborea Blume, Catalogus (1823) 13; G. Don, Gen. Syst. 4 (1837) 100; A.DC., Prodr. 8 (1844) 352; Miq., Fl. Ned. Ind. 2 (1857) 410; Markgr., Bot. Jahrb. Syst. 61 (1927) 195; Sleesen, Fl. Mal. Misc. Rec. 1 (1959) 9; Backer & Bakh.f., Fl. Java 2 (1965) 232; Markgr., Blumea 20 (1973) 419; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; P.S. Ashton, Man. non-Dipt. Trees Sarawak (1988) 37; Goel & M.P. Sharma, Higher Pl. Ind. Subcont. 1 (1990) 8; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 41; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 149; P.I. Forst., Fl. Australia 28 (1996) 134; D.J. Middleton, Fl. Thailand 7 (1999) 61; Beaman et al., Pl. Mt. Kinabalu 4 (2001) 108; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 97; Tree Fl. Sabah & Sarawak 5 (2004) 37. — Type: *Blume s.n.* (lecto L [898.110-313], designated by Sleesen (1959) op. cit.; iso L [898.110-305]; possible isotype NY), W Java, Mt Salak.

Kopsia longiflora Merr., Publ. Bur. Sci. Gov. Lab. 29 (1905) 47; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 158. — Type: *Borden 611* (holo PNH†; lecto US, designated by Middleton (2004) op. cit.; iso BM, BO, F, K, NY, SING; probable unnumbered isotype UC), Philippines, Luzon, Bataan Province, Lamao River.

- Kopsia scortechinii* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 431; Ridl., Fl. Malay Penins. 2 (1923) 337; Sleesen, Fl. Mal. Misc. Rec. 1 (1959) 12; Whitmore, Tree Fl. Malaya 2 (1972) 20; Markgr., Blumea 20 (1973) 421; Goel & Sharma, Higher Pl. Ind. Subcont. 1 (1990) 7; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 41; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 161; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 127. — Type: *Scortechini 1878* (lecto SING, designated by Sleesen (1959) op. cit.; iso CAL), Peninsular Malaysia, Perak, Bujang Malacca.
- Kopsia laxinervia* Merr., Philipp. J. Sci., Bot. 13 (1918) 55; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 158. — Type: *Fénix 28232* (lecto A, designated by Middleton (2004) op. cit.; iso BO, K, NY, P, US), Philippines, Luzon, Apayao.
- Kopsia lancibracteolata* Merr., Philipp. J. Sci. 23 (1923) 262; Tsiang, Sunyatsenia 2 (1934) 111; Lý, Feddes Repert. 97 (1986) 440; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 156. — Type: *McClure 9183* (lecto K, designated by Sévenet et al. (1994) op. cit.; iso A, BM, ECON, MO, P, PNH, UC), China, Hainan, near Ka La.
- Kopsia jasminiflora* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1136; Kerr in Craib, Fl. Siam. 2 (1939) 438; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 156. — Type: *Dussaud 114* (holo P; iso P), Laos, sine loc.
- Kopsia pitardii* Merr., Contr. Arnold Arbor. 8 (1934) 141; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 161. — *Kopsia cochinchinensis* auct. non Kuntze: Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1134; Lý, Feddes Repert. 97 (1986) 440; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 151. — Type: *J.B.L. Pierre 32* (lecto P, designated by Sévenet et al. (1994) op. cit.; iso A, B, BR, F, HM n.v., K, L, MICH, MO, NY, P, SING, US), Vietnam, Dong Nai, Mt Dinh.
- Kopsia pruniformis* Rechb.f. & Zoll. ex Bakh.f., Blumea 6 (1950) 391; Backer & Bakh.f., Fl. Java 2 (1965) 232; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 161. — Type: *Zollinger 3832* (holo L; iso K, L, NY, P), E Java, Rogodjampi.
- Kopsia officinalis* Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 356; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 160. — Type: *Ting 54* (holo CANT; photographs A, P), China, Yun-Ching-Hung, Yunnan (= Junjinghong).
- Kopsia flavida* auct. non Blume: Corner, Wayside Trees Malaya ed. 2, 1 (1952) 145.

Tree to 14 m tall, to 30 cm dbh. Bark grey; inner bark pale brown. *Branchlets* glabrous or sparsely puberulent when young, sparsely lenticellate or not. *Leaves*: petiole 3–10 mm long, glabrous; blade subcoriaceous to coriaceous, elliptic, 4.5–30.5 by 1.4–12 cm, 1.9–5.7 times as long as wide, apex caudate to acuminate with a blunt tip, base acute or cuneate, glabrous above and beneath, secondary veins 9–18 pairs with 4–13 mm spacing, 60–65° from midrib. *Inflorescence* dichasial, 4.8–15.3 cm long with axes 2–12.5 cm long and branches 1.2–2.7 mm wide, glabrous to sparsely puberulent; peduncle 0.7–8.1 cm by 2.1–2.7 mm, glabrous or puberulent in upper parts; pedicels 0–5 mm long, glabrous to densely puberulent. *Sepals* ovate, narrowly ovate or oblong, 1.8–6.3 by 0.6–1.9 mm, 1–3.7 times as long as wide, apex obtuse to acute, ciliate, glabrous to sparsely puberulent outside, glabrous or puberulent on upper half inside. *Corolla* completely white; tube 20.5–35 by 1.6–2.2 mm, 1.3–2.7 times as long as lobes, 5.4–13.6 times as long as calyx, glabrous to sparsely pubescent around stamens and slightly beneath inside, glabrous or sparsely puberulent at top of tube outside; lobes 7–21.5 by 3.4–6.5 mm, 1.6–4.4 times as long as wide, elliptic or oblong, apex rounded to obtuse, ciliate or ciliate only at lobe base, inside glabrous or sparsely pubescent in upper quarter, outside glabrous. *Stamens* inserted 18–32.3 mm from corolla base which is 0.8–0.9 of corolla tube length in rehydrated flowers; anthers 1.2–1.7 by 0.5–0.8 mm, apex 0.1–1.4 mm from corolla throat; filaments 0.8–1.2 mm long. *Disk* 0.7–2.1 mm long, 1.1–1.9 times as long as ovaries, glabrous, oblong, hourglass-shaped, or awl-

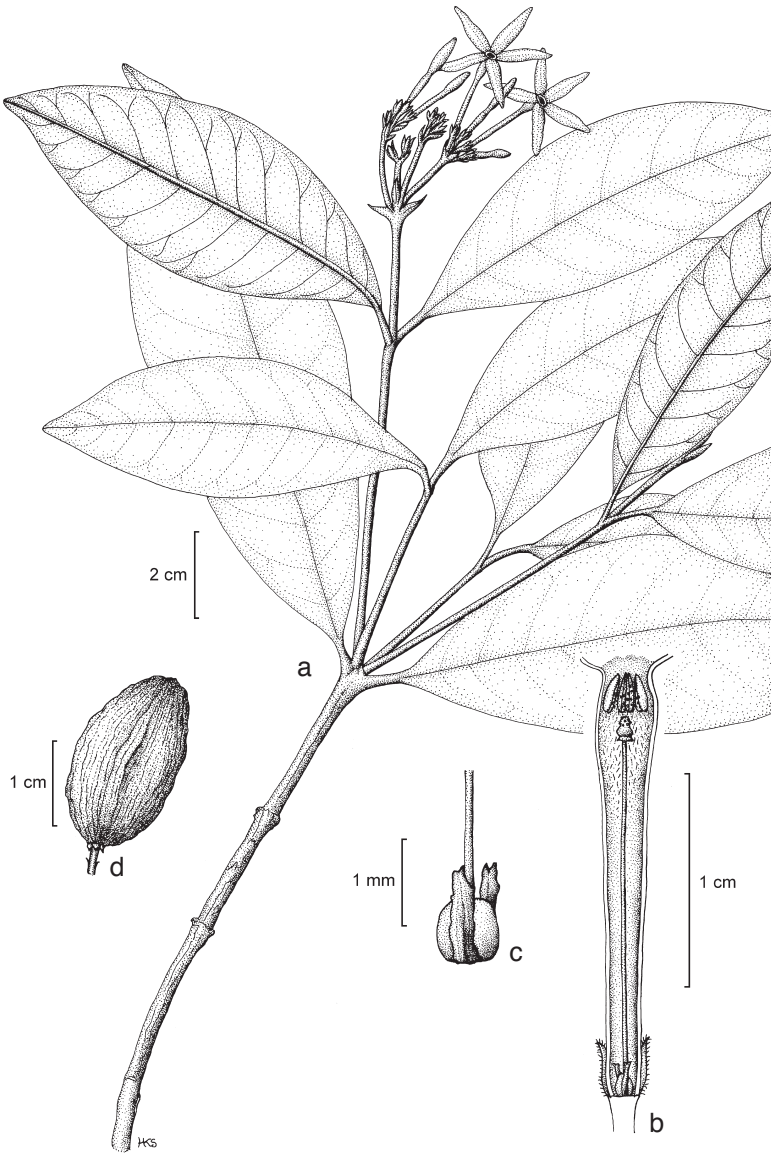


Fig. 62. *Kopsia arborea* Blume. a. Habit; b. flower dissection; c. ovaries, disk and base of style; d. fruit (a–c: Hu 11985; d: Kostermans 7673).

shaped, apex shape variable and often quite complex ranging from simply acuminate to rounded to horizontally V-shaped and flat on top or horizontally V-shaped and retuse on top. *Ovaries* 0.9–1.2 mm high, glabrous to sparsely pubescent all over; style 18–25 mm long; style head 0.8–1.1 mm long. *Fruit* oblique ellipsoid or subglobose, blue-black, 14–42.4 by 5.5–15.5 by 8–22 mm, only one carpel developing, spur absent, glabrous. — **Fig. 62.**

Distribution — India (Andaman and Nicobar Islands), southern China, Thailand, Vietnam, Queensland; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines, Sulawesi, Lesser Sunda Islands.

Habitat & Ecology — Grows in a range of forest types as an understorey tree and at forest margins on a wide range of soil types from sea level to 1500 m altitude.

2. *Kopsia dasyrachis* Ridl.

Kopsia dasyrachis Ridl., Bull. Misc. Inform. Kew 1934 (1934) 123; Masam., Enum. Phan. Born. (1942) 620; Slesesen, Fl. Mal. Misc. Rec. 1 (1959) 8; Markgr., Blumea 20 (1973) 424; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 151; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 100; Tree Fl. Sabah & Sarawak 5 (2004) 37. — Type: *Arsat 1211* (holo K; iso K; photo A), Borneo, Sabah, Lukan.

Tree to 10 m tall, to 46 cm dbh. Bark grey or yellow, smooth; inner bark white. *Branchlets* glabrous, sparsely lenticellate, weakly winged. *Leaves*: petiole 5–7 mm long, glabrous; blade subcoriaceous to coriaceous, mostly drying reddish brown, elliptic, 6.5–24.5 by 2–10.2 cm, 2.1–3.3 times as long as wide, apex long acuminate with a blunt tip, base acute to cuneate, glabrous above and beneath, secondary veins 9–16 pairs with 6–18 mm spacing, 65–70° from midrib. *Inflorescence* with dichasial branching followed by cincinnate branches, 10.7–20 cm long with axes 7–16 cm long and branches 2–2.3 mm wide, densely puberulent; peduncle 2.7–9.3 cm by 1.9–2.3 mm, puberulent; pedicels c. 1.2 mm long, densely puberulent, subtending bracts persistent. *Sepals* oblong, 2.3–3.7 by 1.4–2.2 mm, 1.6–1.75 times as long as wide, apex rounded to obtuse, ciliate, densely puberulent outside, glabrous inside. *Corolla* completely white; tube 22–35 by 1.4 mm, 1.1–1.4 times as long as lobes, 5.9–13.5 times as long as calyx, pubescent around and beneath stamens and in throat, glabrous or sparsely puberulent at top of tube outside; lobes 16–28 by 6.2–7 mm, 2.6–4 times as long as wide, elliptic, apex rounded, ciliate only at lobe base, glabrous outside and inside. *Stamens* inserted 19–21 mm from corolla base which is c. 0.7 of corolla tube length in rehydrated flowers; anthers 1.9–2.6 by 0.5–0.6 mm, 3.8–4.6 times as long as wide, apex 5.2–5.8 mm from corolla throat; filaments 0.8–0.9 mm long, pubescent. *Disk* 1.1–1.5 mm long, 0.9–1.7 times as long as ovaries, glabrous, awl-shaped, narrowly deltoid or narrowly ovate, apex acuminate. *Ovaries* 0.9–1.5 mm high, densely pubescent on top or densely pubescent all over; style 17–20 mm long; style head 1.1–1.4 mm long. *Fruit* sparsely puberulent, with a blunt hooked spur, 12–17 by 5.4–6 by 7–10 mm, spur 3.5–6 mm long. — **Fig. 63.**

Distribution — *Malesia*: Borneo (Sabah).

Habitat & Ecology — In a variety of evergreen forest types often on sandy soils from 0–900 m altitude.

3. *Kopsia deverrei* L. Allorge

Kopsia deverrei L. Allorge, Phytologia 59 (1986) 93; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 151; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 103. — Type: *Deverre 25* (holo P; iso P), Peninsular Malaysia, Johor, 87 km milestone from Mersing to Johore Bahru.

Tree to 10 m tall. *Branchlets* glabrous, sparsely lenticellate or not, terete or weakly angled. *Leaves*: petiole 6–17 mm long, glabrous; blade papery or subcoriaceous,

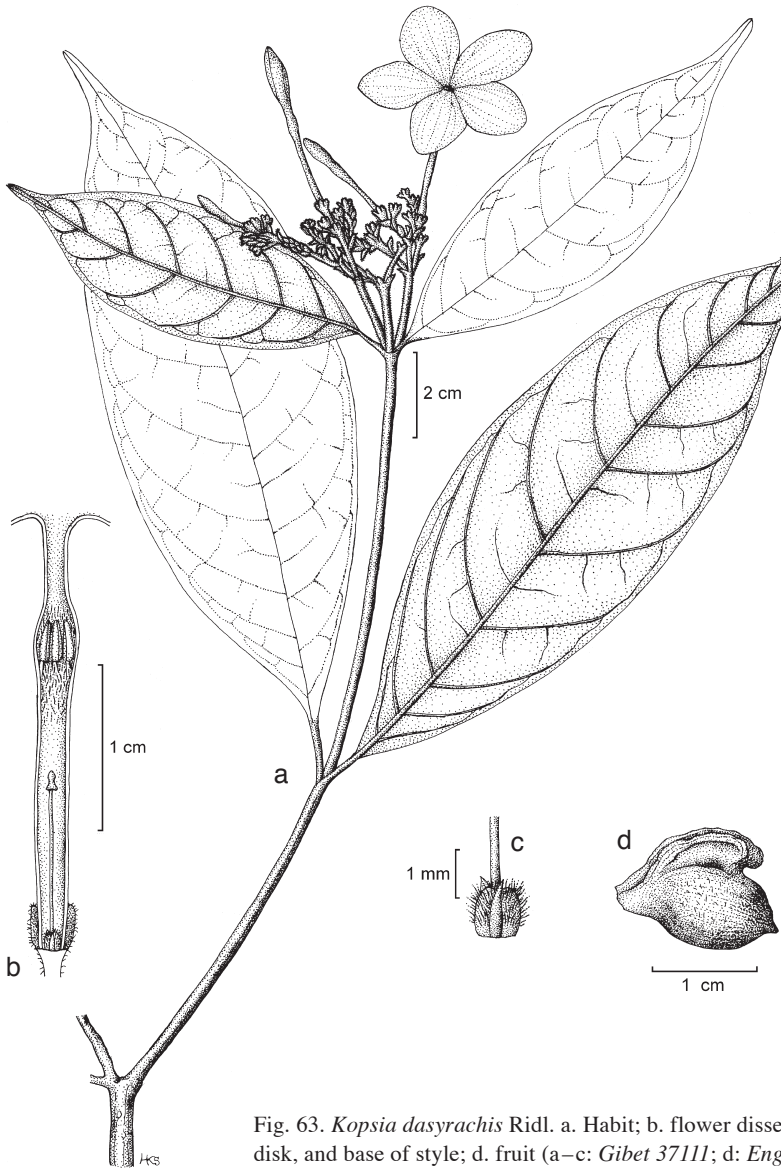


Fig. 63. *Kopsia dasyrachis* Ridl. a. Habit; b. flower dissection; c. ovaries, disk, and base of style; d. fruit (a–c: *Gibet 37111*; d: *Enggoh 10435*).

elliptic, 4.6–14.5 by 1.1–5.5 cm, 2.1–3.8 times as long as wide, apex caudate or short to long acuminate with a blunt tip, base acute or cuneate, glabrous above and beneath, secondary veins 7–11 pairs with 3–15 mm spacing, $45\text{--}60^\circ$ from midrib. *Inflorescence* dichasial, 4.5–4.8 cm long with axes 0.9–2.4 cm long and branches 0.8–0.9 mm wide, glabrous; peduncle 0.2–2.6 cm by 0.9–1.4 mm, glabrous; pedicels 1–3.5 mm long, glabrous or sparsely puberulent; subtending bracts persistent; bracts present on pedicel. *Sepals* ovate, 1.6–1.7 by 1.4 mm, 1.1–1.2 times as long as wide, apex rounded to

obtuse, ciliate, glabrous outside and inside. *Corolla* white with a red 'eye'; tube 27–37 by 2 mm, 1.5–2.1 times as long as lobes, 15.9–23.1 times as long as calyx, pubescent in upper part of tube above, around and slightly below the stamens, throat pubescent, glabrous outside; lobes 13–24 by 4.5–4.8 mm, 2.7–5.3 times as long as wide, elliptic or oblong, apex rounded, ciliate, pubescent at very base of lobes, glabrous outside. *Stamens* inserted 22–32 mm from corolla base which is c. 0.9 of corolla tube length in rehydrated flowers; anthers 1.3–1.5 by 0.6 mm, 2.2–2.5 times as long as wide, 0.8–1.4 mm from corolla throat; filaments c. 0.8 mm long, pubescent. *Disk* 1–1.1 mm long, 1.1–1.2 times as long as ovaries, glabrous, awl-shaped, apex acute or acuminate. *Ovaries* c. 0.9 mm high, densely pubescent on top; style 21.5–31 mm long; style head 0.8–0.9 mm long. *Fruit* unknown.

Distribution — *Malesia*: Peninsular Malaysia (Johor).

Habitat & Ecology — From 150–305 m altitude.

4. *Kopsia flavida* Blume

Kopsia flavida Blume, *Rhumpia* 4 (1849) 28; Miq., *Fl. Ned. Ind.* 2 (1857) 411; Merr., *Philipp. J. Sci.* 29 (1926) 412; Sleesen, *Fl. Mal. Misc. Rec.* 1 (1959) 10; Markgr., *Blumea* 20 (1973) 423; Sévenet et al., *J. Ethno-pharmacol.* 41 (1994) 151; D.J. Middleton, *Harvard Pap. Bot.* 9 (2004) 104. — Type: *Zippelius s.n.* (lecto L [898.110-336], designated by Sleesen (1959) op. cit.; iso L [898.110-334, 898.110-335]), New Guinea, sine loc. [but likely to be Papua].

Calpicarpum albiflorum Teijsm. & Binn., *Tijdschr. Ned.-Indië* 25 (1863) 402. — *Kopsia albiflora* (Teijsm. & Binn.) Boerl., *Handl. Fl. Ned. Ind.* 2 (1899) 395; Sévenet et al., *J. Ethno-pharmacol.* 41 (1994) 149. — *Kopsia fruticosa* (Roxb.) A.DC. var. *albiflora* (Teijsm. & Binn.) King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 431. — Type: *Teijsmann HB5035* (lecto BO, designated by Sévenet et al. (1994) op. cit.; iso L), Moluccas, Ceram.

Calpicarpum ornatum W. Bull., *Retail List* 199 (1884) 12; J. Fraser & Hemsl., *Johns. Gard. Dict.* new ed. (1917) 156; Mabb., *Taxon* 34 (1985) 456. — No illustration or specimen has been found that could be type material. However, from the description and its provenance it is clearly *K. flavida*.

Kentrochrosia monocarpa Lauterb. & K. Schum., *Fl. Schutzgeb. Südsee* (1900) 506; Markgr., *Nova Guinea* 14, 2 (1926) 283; *Bot. Jahrb. Syst.* 61 (1927) 195; Merr. & L.M. Perry, *Philipp. J. Sci.* 76 (1941) 20. — Type: *Lauterbach 2180* (holo B⁺; lecto: illustration in Lauterb., *Fl. Schutzgeb. Südsee* (1900) t. xviii), Papua New Guinea, Oertzen Mts.

Kopsia grandiflora Merr., *Philipp. J. Sci.* 20 (1922) 435; Sévenet et al., *J. Ethno-pharmacol.* 41 (1994) 154. — Type: *Ramos & Edaño 33691* (lecto US, designated by Middleton (2004) op. cit.; iso A, K, P, US), Philippines, Luzon, Camarines sur Province, Paracale.

Kopsia triangularis Quisumb. & Merr., *Philipp. J. Sci.* 37 (1928) 191; Sévenet et al., *J. Ethno-pharmacol.* 41 (1994) 165. — *Kentrochrosia triangularis* (Quisumb. & Merr.) Merr. & L.M. Perry, *Philipp. J. Sci.* 76 (1941) 21. — Type: *Wenzel 2648* (holo UC; iso A, BO, BR, G, M, MO, Z), Philippines, Mindanao, Surigao.

Kopsia carolinensis Kaneh., *Bot. Mag. (Tokyo)* 45 (1931) 344; Merr. & L.M. Perry, *Philipp. J. Sci.* 76 (1941) 20; Sévenet et al., *J. Ethno-pharmacol.* 41 (1994) 150. — *Kentrochrosia carolinensis* (Kaneh.) Kaneh. & Hatus., *Bot. Mag. (Tokyo)* 53 (1939) 190; Merr. & L.M. Perry, *Philipp. J. Sci.* 76 (1941) 20. — Type: *Kanehira 502* (holo FU; iso NY), Palau Island, Babeldayob, Aimiyou.

Tree to 9.15 m tall, to 27.5 cm dbh. Bark ashy-brown, brown or grey, smooth; inner bark straw coloured. *Branchlets* glabrous, sparsely lenticellate or not. *Leaves*: petiole 3–10 mm long, glabrous; blade subcoriaceous to coriaceous, elliptic, 4.5–25 by 1.9–8.9 cm, 1.7–4.9 times as long as wide, apex acuminate with a blunt tip, base

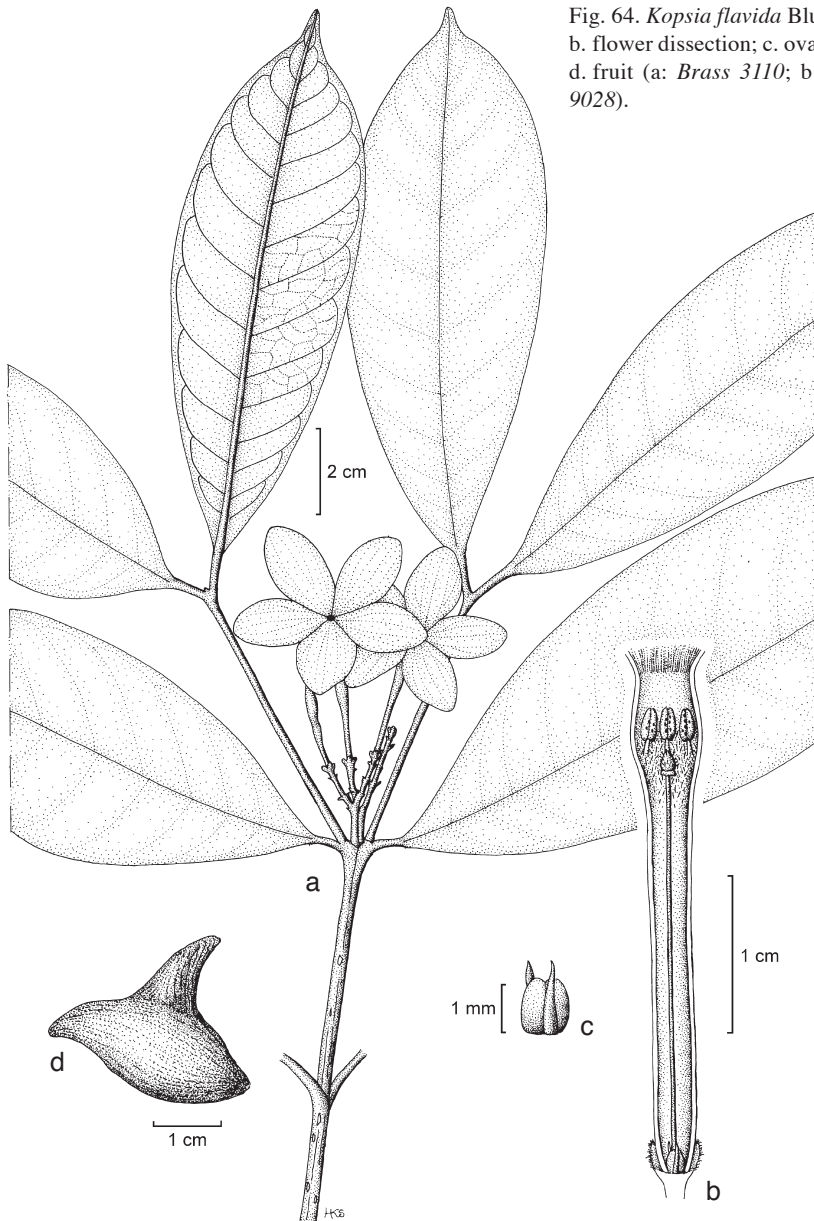


Fig. 64. *Kopsia flavida* Blume. a. Habit; b. flower dissection; c. ovaries and disk; d. fruit (a: Brass 3110; b–d: Takeuchi 9028).

acute or cuneate, glabrous above and beneath, secondary veins 8–24 pairs with 3–15 mm spacing, $60\text{--}75^\circ$ from midrib. *Inflorescence* dichasial or cincinnate, 6–6.5 cm long with axes 1–3.5 cm long and branches 1.2–2.2 mm wide, glabrous or puberulent in upper parts; peduncle 0.2–1 cm by 1.2–2.2 mm, glabrous; pedicels 1.5–3.5 mm long, glabrous or sparsely puberulent, subtending bracts persistent, bracts present on pedicel. *Sepals* ovate or oblong, 1.6–3 by 0.9–2.4 mm, 1.1–2.2 times as long as wide,

apex rounded to acute, ciliate, glabrous outside and inside. *Corolla* white with a red 'eye' or pale pink with a darker pink 'eye'; tube 26–38(–49) by 2.2–3 mm, 1.2–1.8 times as long as lobes, 11.7–16.3 times as long as calyx, pubescent around and beneath stamens and in throat, rarely glabrous, glabrous outside; lobes 16–31 by 6.1–12.5 mm, 1.3–3.5 times as long as wide, elliptic or obovate, apex rounded to obtuse, ciliate or not, glabrous outside and inside. *Stamens* inserted 23–40 mm from corolla base which is 0.8–0.9 of corolla tube length in rehydrated flowers; anthers 1.5–2.6 by 0.5–0.8 mm, 3–3.7 times as long as wide, apex 0.9–2.5 mm from corolla throat; filaments 0.7–1.1 mm long, pubescent. *Disk* 1.2–1.9 mm long, 0.9–1.4 times as long as ovaries, glabrous, oblong, awl-shaped, narrowly deltoid or narrowly ovate, apex acute to acuminate. *Ovaries* 1.2–1.5 mm high, glabrous or, rarely, very sparsely pubescent on top; style 23–38 mm long; style head 1–1.4 mm long. *Fruit* with a sharp deltoid spur, 27–35 by 10–14 by 3–5.5 mm, spur 8–13 mm long, glabrous. — **Fig. 64.**

Distribution — Micronesia, Solomon Islands, Vanuatu; in *Malesia*: Philippines, Moluccas, New Guinea.

Habitat & Ecology — In a wide range of forest types from swamp forest to lowland evergreen forest on limestone, ultrabasic, and poorly drained to well-drained soils from 0–270 m altitude. Also cultivated.

5. *Kopsia fruticosa* (Roxb.) A.DC.

Kopsia fruticosa (Roxb.) A.DC., Prodr. 8 (1844) 352; Hook.f., Fl. Brit. India 3 (1882) 639; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 395; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 430; Merr., Bibliogr. Enum. Born. Pl. (1921) 500; Ridl., Fl. Malay Penins. 2 (1923) 338; Tsiang, Sunyatsenia 2 (1934) 110; Masam., Enum. Phan. Born. (1942) 621; Bakh.f., Blumea 6 (1950) 390; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 146; Slessen, Fl. Mal. Misc. Rec. 1 (1959) 15; Backer & Bakh.f., Fl. Java 2 (1965) 232; Markgr., Blumea 20 (1973) 422; Ly, Feddes Repert. 97 (1986) 440; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 154; Coode et al., Checklist Pl. Brunei (1996) 27; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 127; D.J. Middleton, Fl. Thailand 7 (1999) 61; Harvard Pap. Bot. 9 (2004) 107. — *Cerbera fruticosa* Roxb. in Ker Gawl., Bot. Reg. (1819) t. 391; Roxb., Fl. Ind. 2 (1824) 526; Fl. Ind. ed. 2, 1 (1832) 691. — *Calpicarpum roxburghii* G. Don, Gen. Hist. 4 (1837) 100; Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 431; Miq., Fl. Ned. Ind. 2 (1857) 412. — *Kopsia roxburghii* Wehmer, Pflanzenst. (1911) 625; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 161. — Type: Roxburgh Flora Indica illustration in Kew, number 2200.

Kopsia vincaeflora Blume, Bijdr. (1826) 1030; A.DC., Prodr. 8 (1844) 352; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 165. — Type: *Blume s.n.* (lecto L [898.110-342], designated by Sévenet et al. (1994) op. cit.); Java, sine loc.

Tree to 6 m tall. Bark mostly greyish. *Branchlets* sparsely to densely puberulent, glabrescent when older, not lenticellate, weakly angled. *Leaves*: petiole 5–12 mm long, glabrous; blade subcoriaceous or coriaceous, elliptic, 5.4–22 by 2.5–10.2 cm, 1.7–3.5 times as long as wide, apex short to long acuminate with blunt tip, base obtuse to cuneate, glabrous above and beneath, secondary veins 8–17 pairs with 4–21 mm spacing, 50–70° from midrib. *Inflorescence* dichasial, 4.9–9.5 cm long with axes 1.1–5.5 cm long and branches 1.1–1.9 mm wide, sparsely to densely puberulent; peduncle 0.3–4 cm by 1.9–2.9 mm, puberulent at least in upper parts; pedicels 1.4–5 mm long, sparsely to densely puberulent; subtending bracts persistent; bracts present on pedicel. *Sepals* ovate or oblong, 1.7–2.5 by 1.2–2.2 mm, 1–1.7 times as long as wide, apex emarginate

to obtuse, ciliate, glabrous to densely puberulent, glabrous or puberulent on upper half inside. *Corolla* mostly white or pale pink at the base of the tube and becoming pinker higher up, lobes whitish pink to pink with a darker pink to almost red throat, more rarely whole corolla only pale pinkish; tube 25–37 by 1.8–3.2 mm, 1.5–2.5 times as long as lobes, 11.6–21.2 times as long as calyx, pubescent around stamens and slightly beneath inside, throat pubescent, glabrous outside; lobes 10–33 by 5.5–16 mm, 1.6–2.4 times as long as wide, elliptic, apex rounded, ciliate or ciliate only at lobe base, glabrous outside and inside. *Stamens* inserted 20–33.5 mm from corolla base which is 0.8–0.9 of corolla tube length in rehydrated flowers; anthers 1.9–2.5 by 0.5–0.8 mm, 2.9–3.8 times as long as wide, 1.4–2.4 mm from corolla throat; filaments 0.6–0.9 mm long, pubescent. *Disk* 1–1.7 mm long, 0.7–1.3 times as long as ovaries, glabrous, oblong or awl-shaped, apex acute, acuminate or irregularly toothed and acuminate. *Ovaries* 1.2–1.6 mm high, densely pubescent; style 20.5–32 mm long; style head 1.1–1.5 mm long. *Fruit* falcate with a blunt hooked spur, c. 17 by 5 by 7 mm, spur c. 3 mm long, densely puberulent.

Distribution — Burma (Tenasserim), also widely cultivated. The original description suggests the plant comes from Pegu but no collections have been seen from that far north.

Habitat & Ecology — Widely cultivated in Malesia and frequently naturalised.

Note — This species has quite a complex nomenclatural history and typification (see Middleton 2004).

6. *Kopsia grandifolia* D.J. Middleton

Kopsia grandifolia D.J. Middleton, Harvard Pap. Bot. 9 (2004) 109. — Type: *Burkill 4230* (holo A; iso K, L, SAR, SING), Peninsular Malaysia, Johor, Sungai Mupar, off 32nd mile Johor Bahru-Mersing road.

Tree to 3 m tall. *Branchlets* sparsely puberulent, sparsely lenticellate or not, terete or weakly angled. *Leaves*: petiole 7–11 mm long, sparsely to densely pubescent; blade papery or subcoriaceous, broadly elliptic or elliptic, 19–29.5 by 6.1–12.1 cm, 2.4–3.5 times as long as wide, apex caudate, rarely to short acuminate with a blunt tip, base obtuse to cuneate, glabrous or puberulent on midrib above, puberulent on midrib and sometimes on major veins beneath, at least when young, secondary veins 24–32 pairs with 3–15 mm spacing, 65–80° from midrib. *Inflorescence* dichasial, with or without longer unbranched branches, 3.2–8 cm long with axes 1.7–6.5 cm long and branches 1.5–1.9 mm wide, sparsely to densely puberulent; peduncle 0.7–1 cm long, puberulent, pedicels c. 3 mm long, densely puberulent; subtending bracts persistent; bracts present on pedicel. *Sepals* ovate, 1.6 by 1.5–2.2 mm, 0.7–1.1 times as long as wide, apex rounded, ciliate, densely puberulent, glabrous inside. *Corolla* buds purple, yellow when open; tube 15.5–18 mm long, c. 1.8 times as long as lobes, c. 9.7 times as long as calyx, densely pubescent only beneath stamens and becoming less so further down in upper half, throat glabrous, glabrous outside; lobes 10–12 by 1.6–2.3 mm, 4.9–6.7 times as long as wide, linear to oblong, apex rounded to acute, ciliate or not, glabrous outside and inside. *Stamens* inserted at c. 15 mm from corolla base which is c. 0.8 of corolla tube length in the rehydrated flower, anthers 2.6–2.7 by 0.6 mm, 4.3–4.5 times as long as wide, apex 0.4–1.1 mm from corolla throat. *Disk* 1–1.1 mm long,

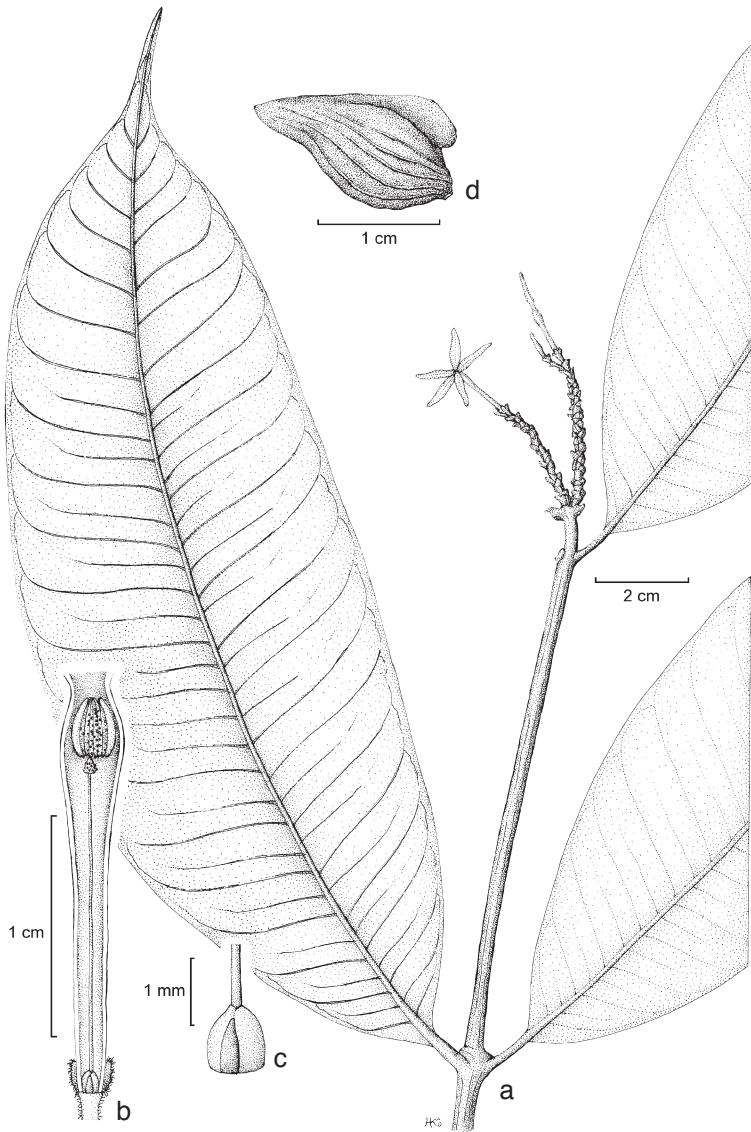


Fig. 65. *Kopsia grandifolia* D.J. Middleton. a. Habit; b. flower dissection; c. ovaries, disk, and base of style; d. fruit (a–c: Burkill HMB.4230; d: David 265).

c. 0.8 times as long as ovaries, glabrous, awl-shaped or deltoid, apex acuminate. *Ovaries* 0.8–0.9 mm high, glabrous; style 1.5–15 mm long (see note 1); style head 0.9–1.1 mm long. *Fruit* falcate with a blunt hooked spur in the lower part of the fruit, 18.5–19 by 9.5–10 by 4 mm, hook c. 2 mm long, sparsely puberulent. — **Fig. 65.**

Distribution — *Malesia*: Peninsular Malaysia and probably the Anambas Islands (see note 2).

Habitat & Ecology — In forest to 60 m altitude.

Notes — 1. *David 265* has an extremely short style, shorter than any other observed in the genus. The type collection of the species, *Burkill HMB4230*, has a style which places the style head at the same level as the stamens as is the case in all the other species. Because there are so few specimens of this species I am unsure whether the short style of *David 265* is just an aberrant character or whether it has some pollination function.

2. *Henderson 20395* from the Anambas Islands is a paratype of *K. lapidilecta*, the type of which is from the Natuna Islands. It is a rather poor specimen without a corolla. However, it does have leaves like *K. grandifolia*, pubescent when young, the remnants of the inflorescence are pubescent, and a comment on the label notes that the now missing corolla lobes are narrow. *Kopsia lapidilecta* also has rather narrow corolla lobes but has glabrous leaves and a glabrous inflorescence.

7. *Kopsia griffithii* King & Gamble

Kopsia griffithii King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 432; Ridl., Fl. Malay Penins. 2 (1923) 337; Sleesen, Fl. Mal. Misc. Rec. 1 (1959) 12; Whitmore, Tree Fl. Malaya 2 (1972) 19; Markgr., Blumea 20 (1973) 421; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 154; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 111. — Type: *Griffith s.n.* (lecto CAL, designated by Sévenet et al. (1994) op. cit.; iso BO, K, L, M), Peninsular Malaysia, Malacca, sine loc.

Kopsia griffithii King & Gamble var. *paucinervia* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 432; Ridl., Fl. Malay Penins. 2 (1923) 337. — Type: *King’s Collector 10707* (lecto UC, designated by Middleton (2004) op. cit.; iso BO), Peninsular Malaysia, Perak, sine loc.

KEY TO THE VARIETIES

- 1a. Pedicels glabrous; corolla tube > 30 mm long, lobes > 19 mm long **a. var. *griffithii***
- 1b. Pedicels densely pubescent; corolla tube < 25 mm long, lobes < 15 mm long. **b. var. *pubescens***

a. var. *griffithii*

Tree to 5 m tall, to 24 cm dbh. Bark ashy-brown or grey. *Branchlets* glabrous, not lenticellate or sparsely lenticellate. *Leaves*: petiole 3–10 mm long, glabrous; blade papery to subcoriaceous, elliptic to oblong, 5.7–20 by 1.6–8 cm, 2–5.3 times as long as wide, apex caudate or long acuminate with a blunt tip, base acute or cuneate, glabrous above and beneath, secondary veins 9–28 pairs with 1–10 mm spacing, 45–80° from midrib. *Inflorescence* dichasial, lax, 5–12 cm long of which the axes are 1.2–7 cm long and branches 0.7–1 mm wide, glabrous; peduncle 0.5–6 cm by 0.9–1.5 mm, glabrous; pedicels 1–3.5 mm long, glabrous, subtending bracts persistent, bracts present or absent on pedicel. *Sepals* ovate or oblong, 1.4–1.8 by 0.7–1.4 mm, 1.1–2.1 times as long as wide, apex rounded to acute, ciliate, glabrous outside and inside. *Corolla* completely white or white with yellow ‘eye’; tube 31–40 by 1.6–2.4 mm, 1.6–2.2 times as long as lobes, 19.4–26 times as long as calyx, pubescent around and beneath stamens and in

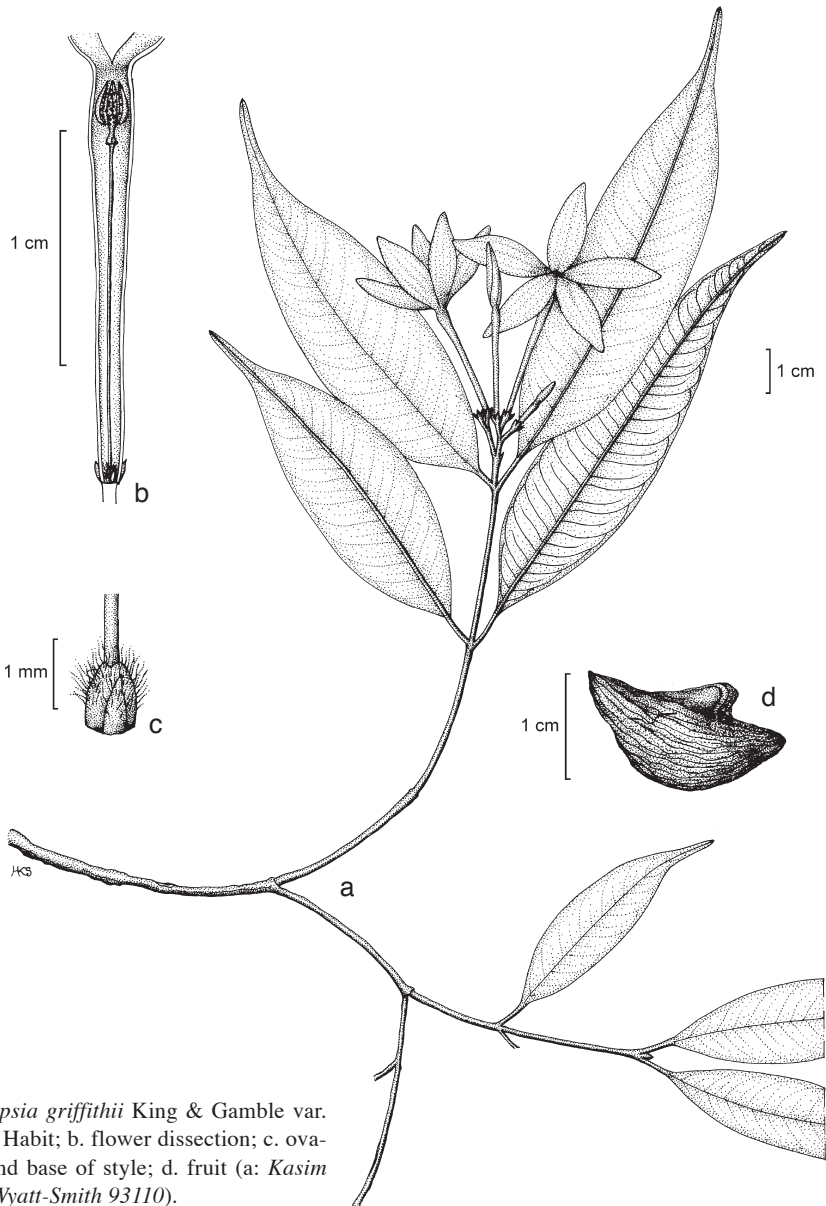


Fig. 66. *Kopsia griffithii* King & Gamble var. *griffithii*. a. Habit; b. flower dissection; c. ovaries, disk and base of style; d. fruit (a: *Kasim 590*; b–d: *Wyatt-Smith 93110*).

throat, glabrous outside; lobes 16–23 by 4.5–7 mm, 2.5–4.6 times as long as wide, elliptic, apex obtuse or acute, ciliate or not, glabrous outside and inside. *Stamens* inserted 26.5–35 mm from corolla base which is 0.8–0.9 of corolla tube length in rehydrated flowers; anthers 2–2.3 by 0.5–0.7 mm, 3.3–4.6 times as long as wide, apex 1.7–2.6 mm from corolla throat; filaments 0.7–1 mm long, pubescent. *Disk* 0.8–1.4 mm long, 0.8–1.2 times as long as ovaries, pubescent, awl-shaped, apex acute. *Ovaries* 0.8–1.4

mm high, densely pubescent on top or densely pubescent all over; style 26–32 mm long; style head 0.8–1.2 mm long. *Fruit* falcate with a small spur, 19–21 by 7–8 by 3 mm, spur 3–4 mm long; sparsely puberulent. — **Fig. 66.**

Distribution — *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In primary or secondary forest to 800 m altitude.

b. var. pubescens D.J. Middleton

Kopsia griffithii King & Gamble var. *pubescens* D.J. Middleton, Harvard Pap. Bot. 9 (2004) 114.
— Type: *Lake & Kelsall s.n.* (holo SING), Peninsular Malaysia, Johor, Sungai Hula Sembong, 30 October 1892.

Height unknown. *Branchlets* glabrous, not lenticellate, weakly angled. *Leaves*: petiole 4–7 mm long, glabrous; blade coriaceous, elliptic, 11.3–17 by 3.9–7.2 cm, 2.6–3.3 times as long as wide, apex long acuminate to caudate with a blunt tip, base acute, glabrous above and beneath, secondary veins 18–23 pairs with 5–14 mm spacing, 60–70° from midrib. *Inflorescence* dichasial, 11–13 cm long with axes 9.3–10 cm long and branches 1–1.9 mm wide, densely puberulent; peduncle c. 5 cm by c. 2.5 mm, puberulent in upper parts; pedicels 2.1–3.5 mm long, densely puberulent; subtending bracts persistent; bracts absent on pedicel. *Sepals* ovate, 1.6–2 by 1–1.2 mm, 1.6–1.7 times as long as wide, apex acute, ciliate, sparsely puberulent outside, glabrous inside. *Corolla* white with a yellow ‘eye’; tube 18–21.5 by 1.6–2.5 mm, 1.7–1.9 times as long as lobes, 9–13.4 times as long as calyx, pubescent around stamens and slightly beneath inside, throat pubescent, glabrous outside; lobes 9.5–12.3 by 2.5–3.5 mm, 3.6–3.8 times as long as wide, elliptic, apex obtuse, not ciliate, glabrous outside and inside. *Stamens* inserted at 17.5–18 mm from corolla base which is 0.9 of corolla tube length in the rehydrated flower; anthers 1.4–1.5 by 0.3–0.4 mm, 3.5–5 times as long as wide, apex 0.6–0.9 mm from corolla throat. *Disk* 0.6–0.9 mm long, 0.7–0.8 times as long as ovaries, pubescent, awl-shaped, apex acute. *Ovaries* 0.9–1.1 mm high, densely pubescent all over; style 16–16.5 mm long; style head 8–1 mm long. *Fruit* unknown.

Distribution — *Malesia*: Peninsular Malaysia (Johor, Pahang).

Habitat & Ecology — Not recorded.

Note — This species was described based on only one rather unsatisfactory collection. It is now known from two collections with the collection from Pahang, *Kam K643* (L), a much better specimen than the type.

8. *Kopsia lapidilecta* Sleesen

Kopsia lapidilecta [Sleesen, Fl. Mal. Misc. Rec. 1 (1959) 13, no Latin description] Sleesen, Blumea 10 (1960) 137; Markgr., Blumea 20 (1973) 423; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 156; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 116. — Type: *Van Steenis 1384* (holo L; iso B, BO), Natuna Islands, Gunung Ranai.

Habit unknown. *Branchlets* glabrous, densely lenticellate, terete. *Leaves*: petiole 3–8 mm long, glabrous; blade coriaceous, elliptic, 6–17.2 by 3–6.6 cm, 1.9–2.7 times as long as wide, apex short acuminate with a blunt tip, base obtuse, glabrous above and beneath, secondary veins 21–33 pairs with 2–6 mm spacing, 75–85° from midrib.

Inflorescence with few elongate branches, 3.5–9 cm long with axes 1–8 cm long and branches 2.3 mm wide, glabrous; peduncle 0.2–0.5 cm by 2 mm, glabrous; pedicels 1.3–2 mm long, glabrous; subtending bracts persistent; bracts present or absent on pedicels. *Sepals* ovate, 1.7–2 by 1.4–1.5 mm, 1.2–1.3 times as long as wide, apex rounded, ciliate, otherwise glabrous outside and inside. *Corolla* bright red; tube 15–17 by 1.6–1.7 mm, 1.3–1.5 times as long as lobes, 7.5–10 times as long as calyx, densely pubescent beneath stamens and becoming less so further down, throat glabrous, glabrous outside; lobes 11–11.5 by 2.2–2.3 mm, 4.8–5.2 times as long as wide, narrowly oblong, apex obtuse, not ciliate, glabrous outside and inside. *Stamens* inserted 16.7–17 mm from corolla base which is c. 0.8 of corolla tube length in rehydrated flowers; anthers 2.2–2.4 by 0.5–0.6 mm, 4–4.4 times as long as wide, apex c. 0.9 mm from corolla throat; filaments c. 1 mm long, glabrous. *Disk* c. 1.4 mm long, 1.4–1.6 times as long as ovaries, glabrous, awl-shaped, apex acute. *Ovaries* 0.9–1 mm high, glabrous; style c. 16 mm long; style head c. 0.7 mm long. *Fruit* not seen (see note).

Distribution — *Malesia*: Natuna Islands.

Habitat & Ecology — Recorded from 200 m altitude.

Note — In an accompanying illustration to the original description a fruit is illustrated. However, none of the original material now extant has any sign of a fruit on it. The illustration shows a falcate fruit with only a small projection on one side.

9. *Kopsia larutensis* King & Gamble

Kopsia larutensis King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 432; Ridl., Fl. Malay Penins. 2 (1923) 337; Sleesen, Fl. Mal. Misc. Rec. 1 (1959) 13; Whitmore, Tree Fl. Malaya 2 (1972) 19; Markgr., Blumea 20 (1973) 423; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 157; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 117. — Type: *Wray 2736* (lecto CAL, designated by Markgraf (1973) op. cit., 1st step, and Middleton (2004) op. cit., 2nd step; iso CAL, SING), Peninsular Malaysia, Perak, Larut.

Tree to 1.8 m tall. *Branchlets* glabrous, not lenticellate, weakly angled. *Leaves*: petiole 5–12 mm long, glabrous; blade subcoriaceous to coriaceous, elliptic or oblong, 7.5–21 by 2.8–8.7 cm, 2–4.1 times as long as wide, apex caudate or more rarely long acuminate, in both cases with a blunt tip, base acute to cuneate, glabrous above and beneath, secondary veins 11–27 pairs with 4–11 mm spacing, 55–80° from midrib. *Inflorescence* often many times branched near the base with short thick branches that appear very crowded, 1.7–6 cm long with axes 0.4–5.2 cm long and branches 0.7–2 mm wide, glabrous or puberulent in upper parts; peduncle 0.3–5 cm by 2.2 mm, glabrous; pedicels 1–1.5 mm long, glabrous or sparsely puberulent; subtending bracts persistent; bracts present on pedicel. *Sepals* ovate, 1.3–2.1 by 1.2–1.8 mm, 1.1–1.5 times as long as wide, apex rounded, ciliate, glabrous or sparsely puberulent outside, glabrous inside. *Corolla* completely white; tube 7–10.5 by 1.1–1.3 mm, 1.3–1.4 times as long as lobes, 3.3–6.5 times as long as calyx, pubescent in lower half of tube but not at base, throat glabrous, glabrous outside; lobes 5–10 by 1–1.5 mm, 3.7–6.7 times as long as wide, linear, apex acute, not ciliate, glabrous outside and inside. *Stamens* inserted c. 6.5 mm from corolla base which is c. 0.8 of corolla tube length in rehydrated flowers; anthers c. 1.4 by 0.4 mm, c. 3.5 times as long as wide, apex c. 0.3 mm from corolla throat,

filaments 0.5 mm long, glabrous. *Disk* 0.7–1.1 mm long, 0.7–1 times as long as ovaries, glabrous, awl-shaped, apex acute. *Ovaries* 0.9–1.1 mm high, glabrous or very sparsely pubescent on top; style c. 5 mm long; style head c. 0.7 mm long. *Fruit* with a blunt hooked spur, 10–12 by 4–7.5 by 8–9 mm, spur c. 4 mm long, sparsely puberulent.

Distribution — *Malesia*: Peninsular Malaysia (Perak).

Habitat & Ecology — Understorey shrub in lowland forest to 200 m altitude.

Note — This is a very characteristic species with inflorescences that are branched near the base followed by crowded short cincinnate branches and small flowers and narrow corolla lobes.

10. *Kopsia macrophylla* Hook. f.

Kopsia macrophylla Hook. f., Fl. Brit. India 3 (1882) 639; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 434; Ridl., Fl. Malay Penins. 2 (1923) 338; Slessen, Fl. Mal. Misc. Rec. 1 (1959) 7; Whitmore, Tree Fl. Malaya 2 (1972) 19; Markgr., Blumea 20 (1973) 423; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 159; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 127; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 118. — Type: *Lobb s.n.* (holo K; iso BM), Singapore.

Kopsia ridleyana King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 433; Ridl., Fl. Malay Penins. 2 (1923) 338; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 161. — Type: *Ridley 10093* (lecto K, designated by Middleton, Taxon 55 (2006) 504; iso SING), Peninsular Malaysia, Negri Sembilan, Tinggi.

Tree to 6.1 m tall. *Branchlets* glabrous to densely puberulent, sparsely lenticellate or not, terete to weakly angled. *Leaves*: petiole 3–8 mm long, glabrous to densely pubescent; blade papery or subcoriaceous, elliptic to obovate, 7.5–24.5 by 1.6–9.2 cm, 2.2–4.6 times as long as wide, apex caudate or short to long acuminate with a blunt tip, base acute or cuneate, glabrous to puberulent on midrib and major veins beneath, secondary veins 8–23 pairs with 3.3–15 mm spacing, 50–65° from midrib. *Inflorescence* dichasial, mostly also with cincinnate branches, 3.2–11 cm long with axes 0.8–7.3 cm long and branches 1.2–2.5 mm wide, glabrous to densely puberulent; peduncle 0.3–2.7 cm by 1.4–2.8 mm, glabrous to puberulent; pedicels 1–1.5 mm long, glabrous to densely puberulent; subtending bracts persistent; bracts present on pedicel. *Sepals* ovate or oblong, 1.7–2.5 by 1.6–1.7 mm, 1–1.6 times as long as wide, apex rounded, margin ciliate, glabrous to densely puberulent, glabrous inside. *Corolla* completely white or white with a yellow 'eye'; tube 22–32 by 1.4–1.9 mm, 1.5–1.8 times as long as lobes, 8.8–16 times as long as calyx, pubescent around stamens and slightly beneath inside or pubescent around and beneath stamens and in throat, glabrous inbetween, throat pubescent, sometimes so shortly so as to appear papillose, glabrous outside; lobes 13–21 by 5.3–12.5 mm, 1.2–2.5 times as long as wide, elliptic or broadly elliptic, apex rounded, ciliate or not, glabrous outside and inside. *Stamens* 8.5–12 mm from corolla base which is 0.3–0.5 of corolla tube length in rehydrated flowers; anthers 2.3–2.4 by 0.4–0.7 mm, 3.4–5.1 times as long as wide, apex 9.7–12.5 mm from corolla throat; filaments 0.6 mm long. *Disk* 0.6–1.3 mm long, 0.6–1.1 times as long as ovaries, glabrous, awl-shaped, apex acute to obtuse. *Ovaries* 0.8–1.2 mm high, sparsely to densely pubescent on top; style 8.5–9.6 mm long; style head c. 1 mm long. *Fruit* with a blunt hooked spur from about the middle of the fruit, 15–18 by 8–8.5 mm, spur c. 4 mm long, glabrous or sparsely puberulent.

Distribution — *Malesia*: Peninsular Malaysia, Singapore.

Habitat & Ecology — Recorded from 100–150 m altitude.

11. *Kopsia pauciflora* Hook.f.

Kopsia pauciflora Hook.f., Fl. Brit. India 3 (1882) 639; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 431; Ridl., Fl. Malay Penins. 2 (1923) 337; Slesesen, Fl. Mal. Misc. Rec. 1 (1959) 14; Whitmore, Tree Fl. Malaya 2 (1972) 19; Markgr., Blumea 20 (1973) 422; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; P.S. Ashton, Man. non-Dipt. Trees Sarawak (1988) 38; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 160; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Fl. Thailand 7 (1999) 64; Harvard Pap. Bot. 9 (2004) 120; Tree Fl. Sabah & Sarawak 5 (2004) 39. — Type: *Maingay KD1056* (holo K; iso K, L (scrap); photo in A), Peninsular Malaysia, Malacca, Mt Ophir.

Kopsia spec. Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 130.

Kopsia parvifolia Merr., Philipp. J. Sci. 29 (1926) 412; Masam., Enum. Phan. Born. (1942) 621; Slesesen, Fl. Mal. Misc. Rec. 1 (1959) 8; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 160; Beaman et al., Pl. Mt. Kinabalu 4 (2001) 108. — Type: *Castro & Melegrito 1456* (holo UC; iso A, BM, BO, K), Borneo, Sabah, Banguay Island [= Pulau Banggi].

Kopsia caudata Merr., Univ. Calif. Publ. Bot. 15 (1929) 254; Masam., Enum. Phan. Born. (1942) 620; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 150; Coode et al., Checklist Pl. Brunei (1996) 27. — Type: *Elmer 20130* (lecto UC, designated by Middleton (2004) op. cit.; iso A, BISH, BM, BO, BR, F, G, K, M, MICH, NY, P, SING, Z), Borneo, Sabah, Sandakan.

Kopsia caudata Merr. var. *glabra* Merr., Univ. Calif. Publ. Bot. 15 (1929) 255; Masam., Enum. Phan. Born. (1942) 620; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 151. — Type: *Elmer 20615* (lecto UC, designated by Middleton (2004) op. cit.; iso A, B, BISH, BM, BO, BR, BRI, F, G, GH, K, M, MICH, MO, NY, P, SING, US, Z), Borneo, Sabah, Tawao.

Kopsia alba Ridl. ex M.R. Hend., Gard. Bull. Straits Settlem. 5 (1930) 78; Kerr in Craib, Fl. Siam. 2 (1939) 437, p.p.; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 149; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127. — Type: *Nur in Henderson 18948* (lecto K, designated by Sévenet et al. (1994) op. cit.; iso BO, SING, UC), Peninsular Malaysia, Pahang, Pulau Tioman, Ayer Surin.

Kopsia lancifolia Markgr., Blumea 20 (1973) 425; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 156. — Type: *Nooteboom 1089* (holo L; iso B, BISH, CANB, SAN, US), Borneo, Sabah, Mendulong.

Kopsia macrophylla auct. non Hook.f.: Beaman et al., Pl. Mt. Kinabalu 4 (2001) 108.

KEY TO THE VARIETIES

- 1a. Corolla tube 15–28.5 mm long; stamens inserted at 3.5–15.5 mm from the base of corolla tube, anthers at 6.5–19 mm from corolla throat **b. var. mitrephora**
 b. Corolla tube 25–44 mm long; stamens inserted at 22–33 mm from the base of corolla tube, anthers at 2.4–5 mm from corolla throat **a. var. pauciflora**

a. var. pauciflora

Tree to 10 m tall, to 15 cm dbh. Bark grey, olive-brown or white, smooth; inner bark pale brown, straw coloured or white. *Branchlets* glabrous to sparsely puberulent, lenticellate or not, angled, weakly winged or markedly winged. *Leaves*: petiole 0–10 mm long, glabrous; blade subcoriaceous to coriaceous, elliptic, 5–25.5 by 1.1–9.5 cm, 1.8–6.1 times as long as wide, apex caudate or short to long acuminate with a blunt tip, base rounded to cuneate, glabrous or puberulent on midrib above, glabrous

or puberulent beneath, secondary veins 7–24 pairs with 2–19 mm spacing, 55–80° from midrib. *Inflorescence* dichasial or with cincinnate branches, 3.5–14 cm long with axes 0.5–10 cm long and branches 0.3–3.1 mm wide, glabrous to densely puberulent; peduncle 0–1.8 cm by 1.2–3.2 mm, glabrous to densely puberulent; pedicels 0.5–2.5 mm long, glabrous to densely puberulent; subtending bracts persistent; bracts present on pedicel. *Sepals* ovate or oblong, 1.5–2.9 by 1–3.2 mm, 0.8–2 times as long as wide, apex rounded, ciliate, glabrous to densely puberulent outside, glabrous or puberulent on upper half inside. *Corolla* completely white, white with yellow ‘eye’, white and green or, rarely, pinkish white; tube 25–44 by 1.6–2.8 mm, 1.2–2.4 times as long as lobes, 10.9–19.5 times as long as calyx, pubescent around stamens and slightly beneath inside, throat pubescent, glabrous or sparsely puberulent at top of tube outside; lobes 11.5–33 by 4.6–19 mm, 1.7–4.1 times as long as wide, elliptic or obovate, apex rounded, ciliate or not, glabrous outside and inside. *Stamens* 22–33 mm from corolla base which is 0.7–0.9 of corolla tube length in rehydrated flowers; anthers 1.8–2.8 by 0.4–0.8 mm, 2.6–5.6 times as long as wide, apex 2.4–5 mm from corolla throat; filaments 0.5–0.8 mm long, glabrous or pubescent. *Disk* 0.9–1.9 mm long, 0.8–1.9 times as long as ovaries, glabrous, awl-shaped or deltoid, apex acute, acuminate or irregularly toothed. *Ovaries* 0.9–1.5 mm high, sparsely to densely pubescent, or mostly glabrous with a few hairs; style 20–31.5 mm long; style head 1–1.3 mm long. *Fruit* falcate with a blunt hooked spur from about the middle of the fruit, 13.5–17 by 4.5–6 by 6–9 mm, hook 3–5 mm long, sparsely puberulent.

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

Habitat & Ecology — In a wide variety of forest types on a wide variety of soil types from sea level to 1500 m altitude.

Note — Only one collection is known from Java, *Backer 17199*. Although it is not indicated on the label this collection may have only been a cultivated plant and the species may not be native to Java.

b. var. *mitrephora* (Sleesen) D.J. Middleton

Kopsia pauciflora Hook.f. var. *mitrephora* (Sleesen) D.J. Middleton, Gard. Bull. Singapore 55 (2003) 66; Tree Fl. Sabah & Sarawak 5 (2004) 40. — *Kopsia mitrephora* Sleesen, Blumea 10 (1960) 136; Sleesen, Fl. Mal. Misc. Rec. 1 (1959) 7; Whitmore, Tree Fl. Malaya 2 (1972) 19; Markgr., Blumea 20 (1973) 424; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 159; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 123. — Type: *Wood SAN16118* (holo L; iso BRI, SING), Borneo, Sabah, Lahad Datu District, Path between Sungei Sabahan and Sungei Dok.

Tree to 3 m tall. *Branchlets* glabrous, sparsely lenticellate or not, weakly angled to markedly winged. *Leaves*: petiole 2–7 mm long, glabrous; blade subcoriaceous or coriaceous, elliptic or oblong, 5–24 by 1.5–7.5 cm, 2.4–5.1 times as long as wide, apex long acuminate with a blunt tip, base acute to cuneate, glabrous above and beneath, secondary veins 13–22 pairs with 3–14 mm spacing, 65–75° from midrib. *Inflorescence* dichasial, 4.3–6.5 cm long with axes 0.9–3.4 cm long and branches 0.8–1.9 mm wide, glabrous, peduncle 0.2–0.8 cm by 0.8–2 mm, glabrous, pedicels 0.7–2.5 mm long, glabrous or sparsely puberulent; subtending bracts persistent; bracts present on pedicel. *Sepals* ovate or oblong, 1.3–2.5 by 1.1–1.6 mm, 1.25–1.8 times as long

as wide, apex rounded, ciliate or not, glabrous outside and inside. *Corolla* completely white or white with a yellow 'eye', tube 15–28.5 by 1.1–1.5 mm, 0.8–2 times as long as lobes, 10.7–13.6 times as long as calyx, pubescent around stamens and slightly beneath inside, throat pubescent, glabrous outside; lobes 9–28 by 3.5–11.5 mm, 2–3.1 times as long as wide, elliptic, apex rounded to obtuse, ciliate or not, glabrous outside and inside. *Stamens* inserted 3.5–15.5 mm from corolla base which is 0.1–0.6 of corolla tube length in rehydrated flowers; anthers 1.7–2.3 by 0.4–0.6 mm, 3.4–5.5 times as long as wide, apex 6.5–19 mm from corolla throat, filaments 0.5–0.8 mm long, pubescent. *Disk* 0.7–1.4 mm long, 0.7–1.6 times as long as ovaries, glabrous, awl-shaped, apex acute to acuminate. *Ovaries* 0.5–1.2 mm high, sparsely to densely pubescent; style 2.5–12.5 mm long; style head 0.8–1.3 mm long. *Fruit* falcate with a small blunt hooked spur on one side, 12–18 by 2.5–4.5 by 6–7.5 mm, hook 3–5 mm long, sparsely puberulent.

Distribution — *Malesia*: Borneo (Sabah).

Habitat & Ecology — In primary forest.

12. *Kopsia profunda* Markgr.

Kopsia profunda Markgr., Blumea 20 (1973) 424; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 161; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 124. — Type: *Sinclair 39917* (holo L; iso B, E, K, SING, US), Peninsular Malaysia, Terengganu, Belara Forest Reserve.

Kopsia terengganensis L. Allorge & Wiart, Acta Bot. Gallica 142 (1996) 434; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127. — Type: *Wuart & Teo KL 4432* (holo P; iso KEP, P), Peninsular Malaysia, Terengganu, Dungun.

Tree to 3 m tall. Bark grey. *Branchlets* glabrous, sparsely to densely lenticellate or not. *Leaves*: petiole 2–12 mm long, glabrous; blade papery, elliptic or oblong, 5.2–22 by 1.4–6.8 cm, 3.1–4.4 times as long as wide, apex caudate to long acuminate with a blunt tip, base cuneate, glabrous above and beneath, secondary veins 12–20 pairs with 2.5–18 mm spacing, 50–70° from midrib. *Inflorescence* dichasial or cincinnate, 3.5–14 cm long with axes 1.7–12 cm long and branches 0.9–1.5 mm wide, glabrous; peduncle 0.8–5.4 cm by 1–1.8 mm, glabrous; pedicels 1.2–3.5 mm long, glabrous or sparsely puberulent, subtending bracts deciduous, bracts present on pedicel. *Sepals* ovate, 1–2.1 by 1–1.4 mm, 0.8–1.5 times as long as wide, apex obtuse to acute, ciliate, glabrous outside, glabrous or puberulent at tips inside. *Corolla* completely white or white with a yellow 'eye'; tube 20–26 by 1.1–6.1 mm, 1.3–1.8 times as long as lobes, 10.2–21 times as long as calyx, pubescent in upper part of tube above or around and slightly below the stamens, pubescent in throat, glabrous outside; lobes 11.5–20 by 3.8–8 mm, 1.8–3.7 times as long as wide, elliptic, apex obtuse to acute, ciliate or not, glabrous outside and inside. *Stamens* inserted 6–9.1 mm from corolla base which is 0.3–0.4 of corolla tube length in rehydrated flowers; anthers 1.7–2.5 by 0.4–0.6 mm, 3.8–5 times as long as wide, apex 1.1–10.7 mm from corolla throat; filaments 0.6–1 mm long, pubescent. *Disk* 0.7–1.1 mm long, 0.8–1.1 times as long as ovaries, glabrous, awl-shaped, apex acute. *Ovaries* 0.8–1.1 mm high, densely long pubescent on top or densely pubescent all over; style 4.9–7.3 mm long; style head 0.9–1.5 mm long. *Fruit* (immature) falcate with a small or blunt hooked spur, sparsely puberulent (see note).

Distribution — *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In lowland evergreen forest from 230–330 m altitude.

Note — Sketches on specimens suggest the fruit is about 2 cm long but the only actual fruit on any of the specimens is small and immature so measurements have not been given in the description above.

13. *Kopsia rajangensis* D.J. Middleton

Kopsia rajangensis D.J. Middleton, Gard. Bull. Singapore 55 (2003) 65; Harvard Pap. Bot. 9 (2004) 125; Tree Fl. Sabah & Sarawak 5 (2004) 41. — Type: *Clemens & Clemens 21221* (holo MO; iso A, BM, BO, NY, SAR), Borneo, Sarawak, Kapit, Upper Rejang River.

Kopsia spec. Sleesen, Fl. Mal. Misc. Rec. 1 (1959) 15.

Kopsia arborea auct. non Blume: Markgr., Blumea 20 (1973) 419, p.p.

Kopsia larutensis auct. non King & Gamble: J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; P.S. Ashton, Man. non-Dipt. Trees Sarawak (1988) 38.

Small tree or shrub, to 4.6 m tall. *Branchlets* glabrous, not or sparsely lenticellate, terete. *Leaves*: petiole 4–9 mm long, glabrous; blade papery to subcoriaceous, elliptic or oblong, 13.4–32 by 3.8–9.6 cm, 2.6–4.3 times as long as wide, apex caudate, base obtuse to cuneate, glabrous above and beneath, secondary veins 9–25 pairs with 6–25 mm spacing, 40–60° from midrib. *Inflorescence* dichasial and then with cincinnate branches, 4–15 cm long with axes 1.4–20 cm long and branches 1.4–2.1 mm wide, glabrous to densely puberulent; peduncle 0.2–7.6 cm by 1.7–3.7 mm; pedicels c. 4 mm long; subtending bracts persistent. *Sepals* ovate, 1.5–1.7 by 1.1–1.4 mm, 1.2–1.4 times as long as wide, apex rounded, ciliate, otherwise glabrous outside and inside. *Corolla* white; tube 21.5–26.5 by c. 2.3 mm, pubescent around stamens and slightly beneath inside, throat pubescent, glabrous outside, 1.8–2 times as long as lobes, 12.6–16.7 times as long as calyx; lobes 11–15 by 2.7–4.7 mm, 3–4.5 times as long as wide, elliptic or oblong, apex obtuse or acute, not ciliate, glabrous outside and inside. *Stamens* 17–21 mm from corolla base which is c. 0.8 of corolla tube length in rehydrated flowers; anthers 1.7–2 by 0.6–0.8 mm, 2.5–2.8 times as long as wide, apex 1.1–2 mm from corolla throat; filaments c. 0.7 mm long. *Disk* c. 0.9 mm high, c. 1 times as long as ovaries, glabrous, awl-shaped, apex acute. *Ovaries* c. 0.9 mm high, glabrous to densely pubescent; style c. 20 mm long; style head c. 0.8 mm long. *Fruit* falcate with small blunt projection near the base, 15–16 by 4 by 6.5–7 mm; projection 3–4 mm long.

Distribution — *Malesia*: Borneo (Sarawak).

Habitat & Ecology — In primary or disturbed forest to 300 m altitude.

14. *Kopsia rosea* D.J. Middleton

Kopsia rosea D.J. Middleton, Harvard Pap. Bot. 9 (2004) 126. — Type: *Soejarto, Santisuk, Taylor & Nantasan 5945* (holo A; iso F, L, MO, NY), Thailand, Krabi, Ao Luk, Thanbok Khorani National Park.

Kopsia alba auct. non Ridl. ex M.R. Hend.: Kerr in Craib, Fl. Siam. 2 (1939) 437, p.p.

Kopsia fruticosa auct. non (Roxb.) A.DC.: D.J. Middleton, Fl. Thailand 7 (1999) 61, p.p.

Kopsia macrophylla auct. non Hook.f.: D.J. Middleton, Fl. Thailand 7 (1999) 63.

Tree to 10 m tall. *Branchlets* glabrous, lenticellate or not, terete or weakly angled. *Leaves*: petiole 3–12.5 mm long, glabrous; blade coriaceous, elliptic, 4.7–27.5 by

2.3–11 cm, 1.9–3.2 times as long as wide, apex short acuminate with a blunt tip, base acute or cuneate, glabrous above and beneath, secondary veins 8–20 pairs with 6.5–18 mm spacing, 60–70° from midrib. *Inflorescence* dichasial, often with robust cincinnate branches, 5–12.5 cm long with axes 1–9.5 cm long and branches 1.4–2.9 mm wide, glabrous to densely puberulent; peduncle 0.4–4.5 cm by 1.3–3 mm, glabrous or puberulent; pedicels 0–6.5 mm long, glabrous to densely puberulent; subtending bracts persistent; bracts present on pedicel. *Sepals* oblong, 1.5–3.5 by 1.4–2.2 mm, 1.1–1.6 times as long as wide, apex rounded, ciliate, glabrous to densely puberulent outside, glabrous inside. *Corolla* white, pale pink with darker pink ‘eye’, or white with a pink tinge; tube 24–45 by 2–2.7 mm, 1.1–1.5 times as long as lobes, 8.3–16 times as long as calyx, pubescent in upper part of tube above, around and slightly below the stamens, throat pubescent, glabrous or sparsely puberulent at top of tube outside; lobes 15–31 by 9.5–16.5 mm, 1.8–1.9 times as long as wide, obovate, apex rounded, not ciliate, glabrous outside and inside. *Stamens* 22.4–35 mm from corolla base which is c. 0.8 of corolla tube length in rehydrated flowers; anthers 2.2–2.6 by 0.6–0.8 mm, 2.9–4 times as long as wide, apex 2.2–4 mm from corolla throat; filaments 0.7–1.1 mm long, glabrous. *Disk* 0.8–2 mm long, 0.7–1.4 times as long as ovaries, glabrous, narrowly ovate, apex acuminate. *Ovaries* 1.2–2.5 mm high, glabrous or with just one or two hairs; style c. 22.5 mm long; style head c. 1.2 mm long. *Fruit* falcate with a blunt hooked spur from around the middle of the fruit, 15–18 by 4.5–5.5 by 8–9 mm, spur 2.5–4.5 mm long, sparsely puberulent.

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

Habitat & Ecology — In forest to 300 m altitude. Recorded from limestone.

15. *Kopsia singapurensis* Ridl.

Kopsia singapurensis Ridl., Fl. Malay Penins. 2 (1923) 336; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 146; Slesesen, Fl. Mal. Misc. Rec. 1 (1959) 11; Whitmore, Tree Fl. Malaya 2 (1972) 19; Markgr., Blumea 20 (1973) 421; I.M. Turner, Gard. Bull. Singapore 45 (1993) 35; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 161; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 127. — Type: *Ridley s.n.* (lecto K, designated by Middleton (2004) op. cit.), Singapore, Chan Chu Kang.

Kopsia fruticosa (Roxb.) A.DC. var. *albiflora* (Teijsm. & Binn.) King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 431, p.p., not including the type.

Tree to 12 m tall, to 24 cm dbh. *Branchlets* glabrous, sparsely lenticellate or not, weakly angled. *Leaves*: petiole 5–12 mm long, glabrous; blade subcoriaceous to coriaceous, elliptic, 6.1–19.5 by 2.7–11.4 cm, 1.4–2.8 times as long as wide, apex short acuminate with blunt or sharp tip, base acute or cuneate, glabrous above and beneath, secondary veins 7–15 pairs with 4–16 mm spacing, 45–80° from midrib. *Inflorescence* dichasial, mostly many-flowered, 3.5–12.5 cm long with axes (0.5–)1.2–11.5 cm long and branches 1.2–1.8 mm wide, glabrous or puberulent in upper parts; peduncle (0.2–) 1–7.5 cm by 1.4–1.8 mm, glabrous or puberulent; pedicels 1–5.3 mm long, glabrous to densely puberulent, subtending bracts persistent, bracts present or absent on pedicel. *Sepals* ovate or oblong, 2–4 by 1.4–3.4 mm, 1–1.8 times as long as wide, apex rounded or obtuse, ciliate, glabrous to densely puberulent outside, glabrous inside. *Corolla* white with red ‘eye’; tube 32–36 by 1.8–2.9 mm, 1.4–2.1 times as long as lobes, 8.75–16.5

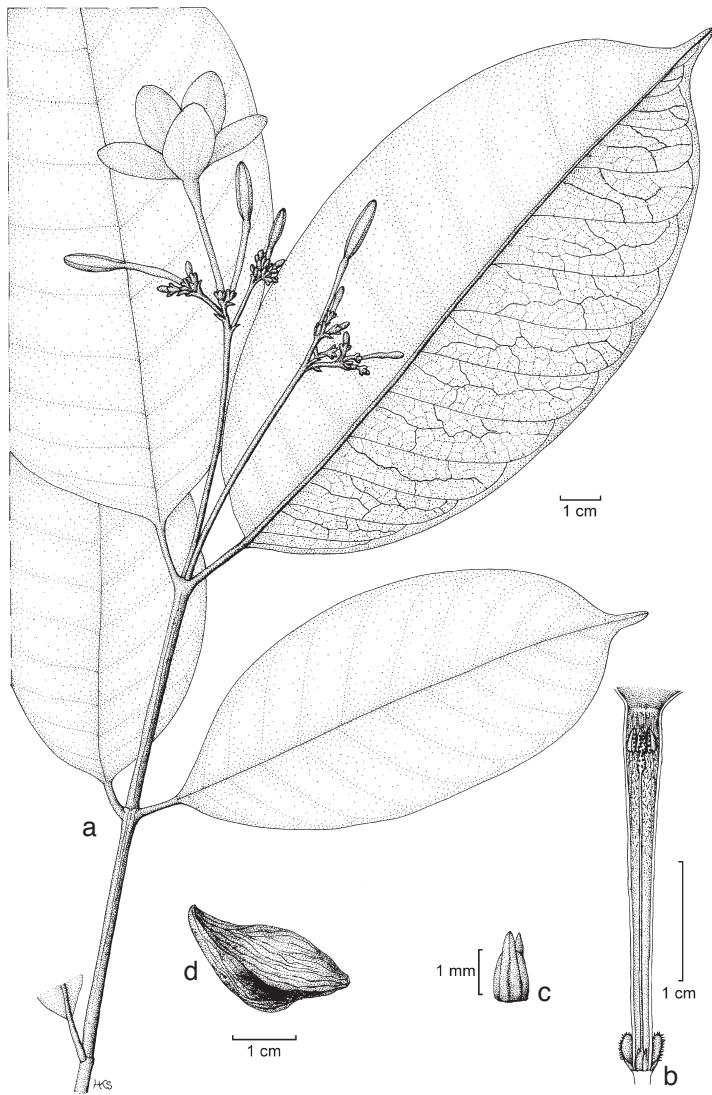


Fig. 67. *Kopsia singapurensis* Ridl. a. Habit; b. flower dissection; c. ovaries and disk; d. fruit (a–c: Shah MS.1226; d: David 263).

times as long as calyx, pubescent inside above, around and slightly below the stamens, throat pubescent, glabrous or rarely sparsely puberulent at top of tube outside; lobes 15–24 by 6.5–12 mm, 2–3.1 times as long as wide, elliptic or oblong, apex rounded to obtuse, ciliate, glabrous or, rarely, sparsely pubescent in upper quarter outside, glabrous or puberulent at base inside. *Stamens* inserted 23.5–34 mm from corolla base which is 0.8–0.9 of corolla tube length in rehydrated flowers; anthers 1.7–2.1 by 0.7–0.8 mm, 2.4–3 times as long as wide, apex 1.2–2.2 mm from corolla throat; filaments 0.2–1

mm long, pubescent. *Disk* 1.1–1.8 mm long, 0.6–1.1 times as long as ovaries, glabrous, oblong or awl-shaped, apex acute to acuminate. *Ovaries* 1.6–1.9 mm high, sparsely to densely pubescent on top; style 27–30 mm long; style head 1.1–1.2 mm long. *Fruit* oblique ellipsoid with either a simple angle or a spur on one side, 26–33 by 6–7 by 11.5–14 mm, angle/spur 2.5–3 mm long, glabrous. — **Fig. 67.**

Distribution — *Malesia*: Peninsular Malaysia, Singapore.

Habitat & Ecology — In lowland evergreen forest, swamp forest or on river banks to 600 m altitude.

16. *Kopsia sleeseniana* Markgr.

Kopsia sleeseniana Markgr., *Blumea* 20 (1973) 421; Sévenet et al., *J. Ethno-pharmacol.* 41 (1994) 161; D.J. Middleton, *Harvard Pap. Bot.* 9 (2004) 130; *Tree Fl. Sabah & Sarawak* 5 (2004) 36. — Type: *Haviland 3046* (holo SING; iso K, L, SAR), Borneo, Sarawak, Bintulu.

Kopsia spec. Sleesen, *Fl. Mal. Misc. Rec.* 1 (1959) 15; P.S. Ashton, *Man. non-Dipt. Trees Sarawak* (1988) 39.

Small tree reported at 2 m tall. *Branchlets* glabrous, not lenticellate, terete or weakly angled. *Leaves*: petiole 7–12 mm long, glabrous; blade papery to subcoriaceous, elliptic or oblong, 8.5–21.5 by 3.6–7.8 cm, 2.2–5 times as long as wide, apex caudate or long acuminate with a blunt tip, base rounded to cuneate, glabrous above and beneath, secondary veins 23–43 pairs with 2–9 mm spacing, 70° from midrib. *Inflorescence* dichasial, lax, robust, higher order branching is not opposite but alternate, 6–10.2 cm long with axes 2.2–7.5 cm long and branches 1.6–2.2 mm wide, glabrous; peduncle 0.6–4.5 cm by 1.4–2.2 mm, glabrous; pedicels 2.8–5.2 mm long, glabrous; subtending bracts persistent; bracts absent on pedicel. *Sepals* ovate, 1.3–1.6 by 1–1.6 mm, 1–1.3 times as long as wide, apex rounded or obtuse, ciliate, glabrous outside and inside. *Corolla* completely white; tube 26.5–32 by 1.9–2.6 mm, 1.6–2.1 times as long as lobes, 18.7–20.4 times as long as calyx, pubescent around stamens and slightly beneath inside, throat pubescent, glabrous outside; lobes 13.2–20 by 3.3–6 mm, 3.3–4 times as long as wide, narrowly elliptic or oblong, apex obtuse, not ciliate, glabrous outside and inside. *Stamens* inserted c. 22 mm from corolla base which is c. 0.8 of corolla tube length in rehydrated flowers; anthers c. 2.4 by 0.8 mm, c. 3 times as long as wide, apex 1.1 mm from corolla throat; filaments c. 0.9 mm long, pubescent. *Disk* c. 0.8 mm long, c. 0.7 times as long as ovaries, glabrous, awl-shaped, apex acuminate. *Ovaries* c. 1.2 mm high, densely pubescent on top; style c. 19.4 mm long; style head c. 0.9 mm long. *Fruit* flattened oblique ellipsoid with a blunt hooked spur, c. 16–17 by 7 by 4 mm, densely puberulent.

Distribution — *Malesia*: Borneo (Sarawak)

Habitat & Ecology — Lowland mixed dipterocarp forest and beach forest to 80 m altitude.

IUCN conservation category — Vulnerable due to acute restriction in area (VU D2).

17. *Kopsia sumatrana* D.J. Middleton

Kopsia sumatrana D.J. Middleton, *Harvard Pap. Bot.* 9 (2004) 131. — Type: *Burley, Tukirin et al. 1886* (holo A; iso L), Sumatra, Riau Province, Bukit Karampal, 5 km W of Talanglakat on Rengat-Jambi road.

Tree reported to 2 m tall, 2 cm dbh. *Branchlets* densely puberulent becoming glabrescent with age, not lenticellate, weakly angled. *Leaves*: petiole 4–7.5 mm long, densely pubescent; blade papery, elliptic, oblong or ovate, 11.5–26 by 2.7–5.5 cm, 3.5–5.4 times as long as wide, apex acuminate with blunt tip, base obtuse to cuneate, puberulent on midrib only or sparsely puberulent on midrib and major veins above, puberulent on midrib and major veins beneath, secondary veins 16–19 pairs with 3–13 mm spacing, c. 60° from midrib. *Inflorescence* cincinnate, 5–7.2 cm long with axes 3.4–5.5 cm long and branches 1.4–1.7 mm wide, densely puberulent; peduncle 0–5 cm by 2.6 mm, puberulent; pedicels 1–2 mm long, densely puberulent, subtending bracts persistent, bracts present on pedicel. *Sepals* ovate, c. 1.4 by 1.4 mm, c. 1 times as long as wide,

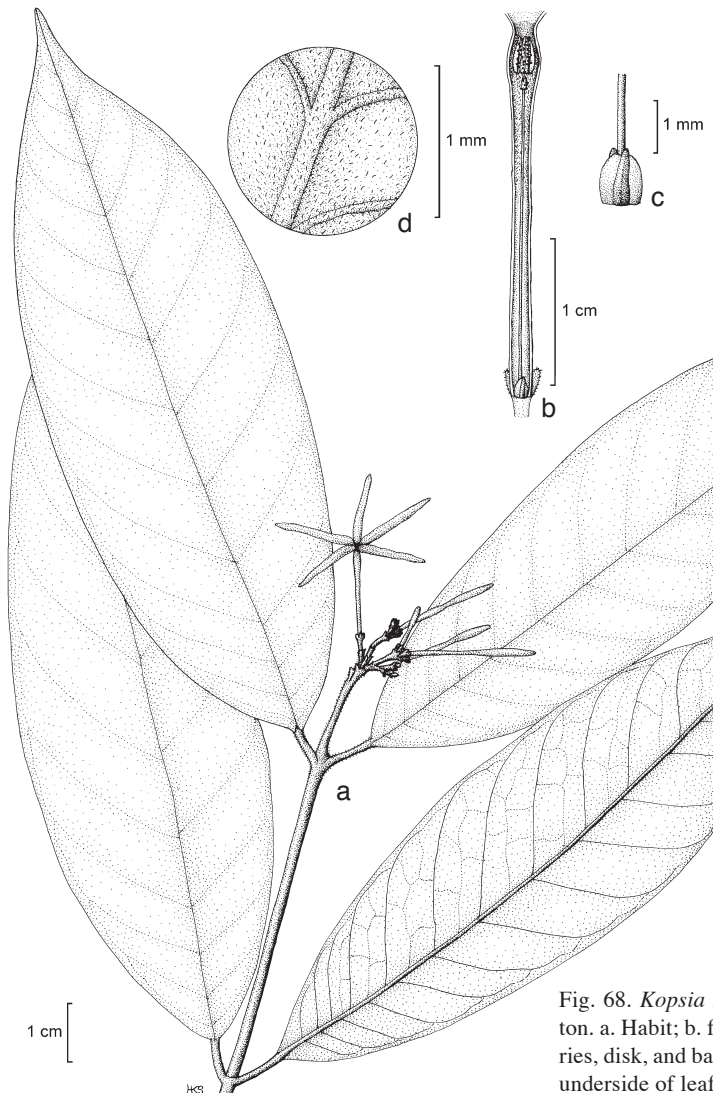


Fig. 68. *Kopsia sumatrana* D.J. Middleton. a. Habit; b. flower dissection; c. ovaries, disk, and base of style; d. close up of underside of leaf (Turkirin et al. 1820).

apex rounded, ciliate, densely puberulent outside, glabrous inside. *Corolla* yellowish; tube c. 19.5 mm long in dried flowers, c. 1 mm wide, c. 1.4 times as long as lobes, c. 13.9 times as long as calyx, pubescent in upper part of tube above, around and slightly below the stamens inside, throat glabrous, sparsely puberulent at top of tube outside; lobes c. 14 by 1.7 mm, c. 8.2 times as long as wide, linear, obtuse, not ciliate, glabrous outside and inside. *Stamens* inserted c. 19.5 mm from corolla base which is c. 0.8 of corolla tube length in rehydrated flowers; anthers c. 2.5 by 0.5 mm, c. 5 times as long as wide, apex c. 1.9 mm from corolla throat; filaments c. 0.7 mm long, pubescent. *Disk* 0.9 mm long, c. 0.7 times as long as ovaries, glabrous, awl-shaped or narrowly deltoid, apex acute to obtuse. *Ovaries* c. 1.3 mm high, glabrous or sparsely pubescent on top; style c. 18 mm long; style head c. 0.8 mm long. — **Fig. 68.**

Distribution — *Malesia*: Sumatra.

Habitat & Ecology — Recorded from ridge forest at 100 m altitude.

18. *Kopsia tenuis* Leenh. & Steenis

Kopsia tenuis Leenh. & Steenis, *Blumea* 10 (1960) 138; Slessen, *Fl. Mal. Misc. Rec.* 1 (1959) 11, nom. nud.; Markgr., *Blumea* 20 (1973) 424; J.A.R. Anderson, *Checklist Trees Sarawak* (1980) 149; P.S. Ashton, *Man. non-Dipt. Trees Sarawak* (1988) 39; Sévenet et al., *J. Ethno-pharmacol.* 41 (1994) 162; D.J. Middleton, *Harvard Pap. Bot.* 9 (2004) 133; *Tree Fl. Sabah & Sarawak* 5 (2004) 41. — Type: *Ridley s.n.* (holo K; photo in A), Borneo, Sarawak, Mattang.

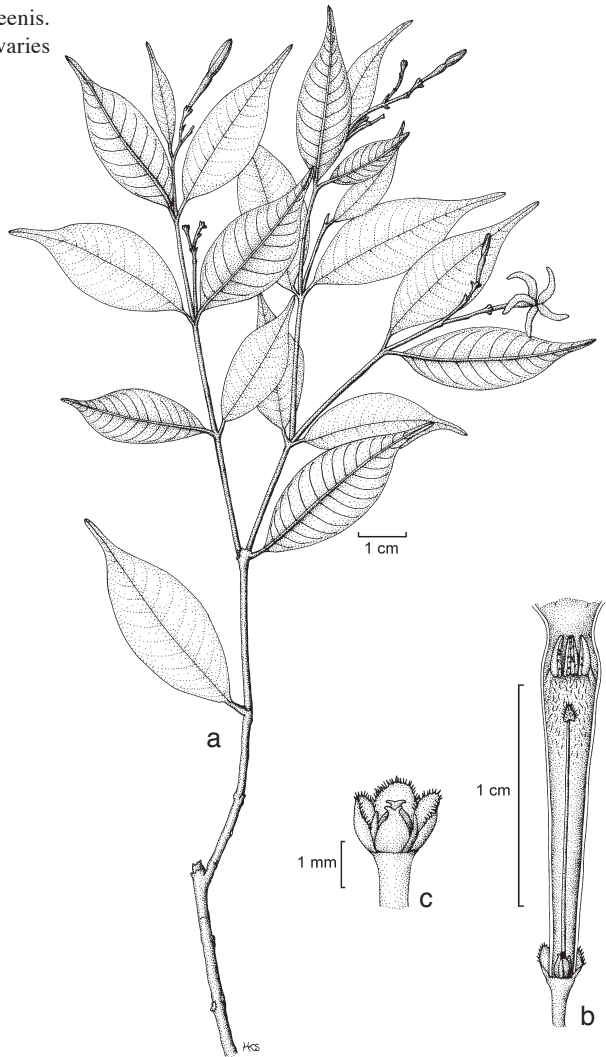
Tree or shrub to 6 m tall, to 15 cm dbh. Bark brown, slightly flaky. *Branchlets* glabrous, sparsely lenticellate or not, terete. *Leaves*: petiole 1–2 mm long, glabrous; blade papery, elliptic, oblong or ovate, 3.2–13.7 by 1.2–4.5 cm, 2.2–4.6 times as long as wide, apex caudate, base acute to cuneate, glabrous above and beneath, secondary veins 16–30 pairs with 1–3 mm spacing, 70–80° from midrib. *Inflorescence* delicate, lax, dichasial or flowers solitary, 3.7–17 cm long with axes 1.1–15 cm long and branches 0.5–5 mm wide, sparsely puberulent; peduncle 0.2–2.2 cm by 0.4–5 mm, puberulent, pedicels 4.5–5 mm long, glabrous or sparsely puberulent, subtending bracts persistent, bracts normally 2 on pedicel. *Sepals* ovate, 1 by 0.9–1 mm, 1–1.1 times as long as wide, rounded, ciliate, glabrous. *Corolla* completely white or yellowish; tube 16–17 by 1.8 mm, 1.1–1.4 times as long as lobes, 16–17 times as long as calyx, pubescent around stamens and slightly beneath inside, throat glabrous or with a few sparse hairs, glabrous outside; lobes 11.5–15 by 2.4–3 mm, 3.8–6.25 times as long as wide, narrowly elliptic or oblong, apex obtuse, not ciliate, glabrous outside and inside. *Stamens* inserted c. 14 mm from corolla base which is c. 0.8 of corolla tube length in rehydrated flowers; anthers c. 2 by 0.4 mm, c. 5 times as long as wide, apex c. 2 mm from corolla throat; filaments c. 0.4 mm long, pubescent. *Disk* c. 0.6 mm long, c. 0.7 times as long as ovaries, glabrous, awl-shaped, apex obtuse. *Ovaries* c. 0.9 mm high, glabrous; style c. 13 mm long; style head c. 0.9 mm long. *Fruit* flattened oblique ellipsoid with a blunt hooked spur, 12.5–15 by 5.6–7.3 by 3–3.4 mm, spur 3–4 mm long, sparsely puberulent. — **Fig. 69.**

Distribution — *Malesia*: Borneo (Sarawak).

Habitat & Ecology — Recorded from mixed dipterocarp forest on sandy clay soils from 20–735 m altitude.

IUCN conservation category — Vulnerable due to acute restriction in area (VU D2).

Fig. 69. *Kopsia tenuis* Leenh. & Steenis.
 a. Habit; b. flower dissection; c. ovaries
 and disk (James et al. S.34459).



19. *Kopsia teoi* L. Allorge

Kopsia teoi L. Allorge, Acta Bot. Gallica 140 (1993) 97; Sévenet et al., J. Ethno-pharmacol. 41 (1994) 162; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 127; D.J. Middleton, Harvard Pap. Bot. 9 (2004) 133. — Type: *Teo & Remy KL 3976* (holo P; iso KEP, KLU n.v.), Peninsular Malaysia, Johor, Keluang.

Tree to 4 m tall. *Branchlets* glabrous, sparsely lenticellate or not, terete. *Leaves* sessile; blade subcoriaceous or coriaceous, elliptic, 6–20.5 by 2.1–8.1 cm, 1.4–3.2 times as long as wide, apex short acuminate with a blunt tip, base rounded to acute, glabrous above and beneath, secondary veins 11–15 pairs with 5–18 mm spacing, 50–70° from midrib. *Inflorescence* dichasial, 5.6–6.3 cm long with axes 0.3–1.7 cm long and branches 0.7–1.3 mm wide, glabrous; peduncle 0–1.2 cm by 1.4–1.7 mm, glabrous;

pedicels 1.2–2.5 mm long, glabrous; subtending bracts persistent; bracts several on each pedicel. *Sepals* ovate, 1.6–2.9 by 1.3–2 mm, 1.1–1.5 times as long as wide, apex rounded to acute, ciliate, glabrous outside, puberulent at tips inside. *Corolla* white with a pink tinge or pink with a red ‘eye’; tube 34–41 by 2.7–2.8 mm, 1.6–2.3 times as long as lobes, 14.1–25.6 times as long as calyx, pubescent in upper part of tube above, around and slightly below the stamens, throat pubescent, glabrous outside; lobes 18–25 by 8–14 mm, 1.3–2.2 times as long as wide, elliptic or broadly elliptic, apex rounded or obtuse, not ciliate, glabrous outside and inside. *Stamens* inserted 35–37.5 mm from corolla base which is c. 0.9 of corolla tube length in rehydrated flowers; anthers 1.7–1.9 by 0.5 mm, 3.4–3.8 times as long as wide, 1.8–1.9 mm from corolla throat; filaments 0.9–1.4 mm long, glabrous. *Disk* c. 1.2 mm long, c. 1.5 times as long as ovaries, glabrous, awl-shaped, apex acute. *Ovaries* c. 0.8 mm high, glabrous or sparsely pubescent on top; style 34–37.5 mm long; style head 0.9–1.1 mm long. *Fruit* unknown.

Distribution — *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In lowland dipterocarp forest to 200 m altitude.

23. LEPINIA

Lepinia Decne., Ann. Sci. Nat., Bot. sér. 3, 12 (1849) 194, t. 9; Lorence & W.L. Wagner, Allertonia 7 (1997) 256. — Type species: *Lepinia taitensis* Decne.

Small trees or shrubs with white latex which may turn blue when exposed. *Branchlets* glabrous; not lenticellate. *Leaves* alternate; petiolate; blade subcoriaceous, entire, secondary venation almost perpendicular to the midrib and closely spaced; with colleters in the axils which produce a sticky exudate. *Inflorescence* terminal but appearing leaf-opposed; cymose; flowers 5-merous. Calyx without colleters inside. *Corolla* lobes sinistrorse; mature corolla salverform; lobes ovate, slightly falcate. *Stamens* inserted in the upper half of the corolla tube, completely included in the tube; filaments short; anthers free from style head, fertile for their entire length. *Disk* small and annular. Gynoecium 3–5-carpellate, congenitally syncarpous at base, then with an apocarpous section, and then apically postgenitally syncarpous; each carpel with 2 ovules, only one of which may develop; style filiform. *Fruit* pendulous, the apocarpous parts of the gynoecium fused together at the base and elongating to form thin stalks of each fruiting carpel, these carpels also remaining fused at the apices to form a star-like structure, the whole forming an open-sided basket-like effect; the fruiting carpels eventually drying and disintegrating to release the seeds. *Seeds* solitary in each carpel, simple.

Distribution — 4 species from New Guinea eastwards but only know from a few islands across the Pacific; in *Malesia* 1 species.

Lepinia solomonensis Hemsl.

Lepinia solomonensis Hemsl., Hooker’s Icon. Pl. 28 (1905) t. 2703; P.I. Forst., Austrobaileya 3 (1992) 757; Lorence & W.L. Wagner, Allertonia 7 (1997) 257. — Type: *R.B. Comins 132* (lecto K, designated by P.I. Forster (1992) op. cit.; iso BRI), Solomon Islands, San Cristobal.

Tree to 12 m tall. Bark grey, rough. *Leaves*: petiole 11–35 mm long; blade elliptic, obovate or oblong, 6.1–21.5 by 2.1–7.5 cm, 2–4.5 times as long as wide, apex abruptly

caudate with a blunt tip, base cuneate to decurrent onto petiole, secondary veins very faint or obscure, numerous, closely parallel, almost indistinguishable from parallel tertiary venation, straight intramarginal vein c. 1 mm from margin, glabrous above and beneath. *Inflorescence* with a peduncle and two short branches, to 27 cm long. *Sepals* ovate, 1–1.3 by 1.1–1.8 mm, apex rounded to obtuse, glabrous, ciliate. *Corolla* white; tube 15–16 mm long; lobes c. 10 mm long. *Stamens* inserted around the middle of corolla tube. *Pistil* of 4 carpels of which 2–4 reach maturity; ovaries glabrous. *Fruit* with 2–4 parts, sometimes other carpels not developing but still joined in the basket structure, fruit stalks 8.2–18 cm long, fruits 3.8–6 cm by 5–8 mm, cylindrical and tapering at stalk end. — **Fig. 70.**

Distribution — Solomon Islands; in *Malesia*: New Guinea (Papua (Sarmi Province)) and Papua New Guinea, Milne Bay Province, Bougainville.

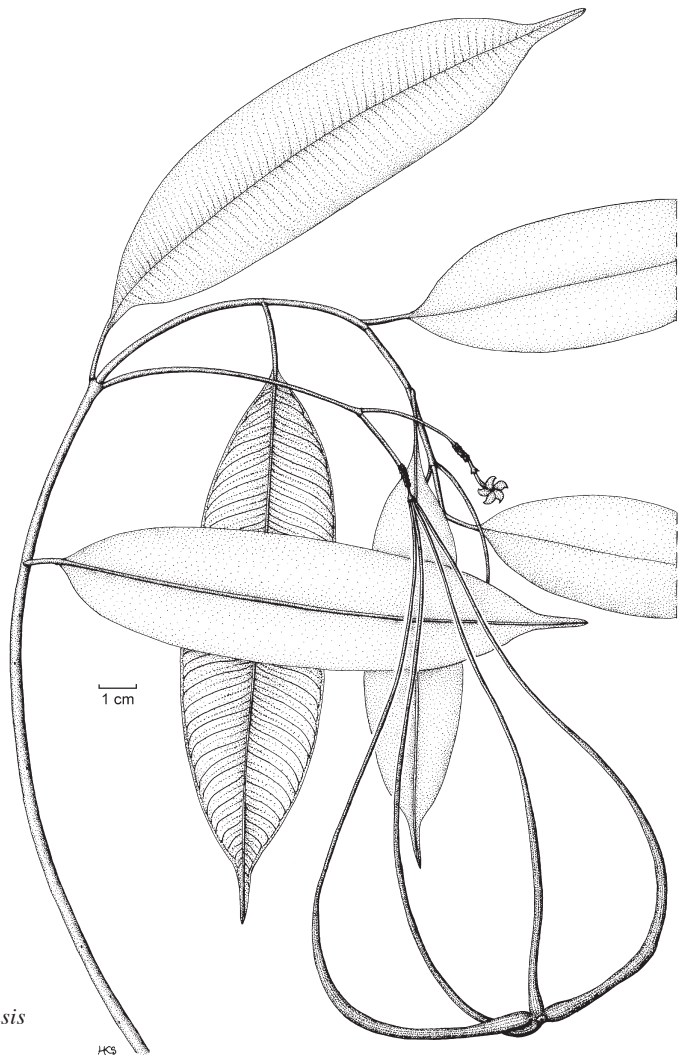


Fig. 70. *Lepinia solomonensis*
Hemsl. Habit.

Habitat & Ecology — In forest to 760 m altitude.

Note — The material from Malesia is very scanty and this description includes dimensions of plants from the Solomon Islands. Almost all the material known of this species is in fruit.

24. LEPINIOPSIS

Lepiniopsis Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 251; Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 168; Markgr., Blumea 30 (1984) 170. — Type species: *Lepiniopsis ternatensis* Valetton.

Trees, mostly without buttresses or with very small buttresses. *Leaves* spirally arranged, petiolate; colleters in axil and in an arc around half the stem; secondary veins straight, closely parallel. *Inflorescence* axillary or pseudoterminal, dichotomous or trichotomous, pedunculate, mostly with 2 or 3 second order long branches and then 2 or 3 densely congested short cincinnate branches, occasionally with 1 more or fewer orders of branching, fallen flowers leaving prominent scars, bracts absent in mature inflorescence; flowers 5-merous. *Sepals* without colleters in the axils. *Corolla* lobes sinistrorse, in bud tube narrow, head globose, apex rounded to acute; mature corolla salverform; tube narrow, widening slightly around the stamens; lobes falcate, auriculate at base, apex acuminate. *Stamens* not adnate to the style head. *Ovary* 3–5-locular, syncarpous. *Fruit* syncarpous, indehiscent, with a thin fibrous mesocarp and thin endocarp, 1–5-seeded. *Seeds* long and narrow, one per locule, longitudinally lined, endosperm hard.

Distribution — 2 species in Malesia and the western Pacific; in *Malesia* 1 species.

Note — Valetton published the genus description under the name *Lepinionopsis* but the species description under *Lepiniopsis ternatensis*. It is clear from the labels on the specimens and his intention to compare it to the genus *Lepinia* that *Lepinionopsis* was a spelling error which should be corrected.

Lepiniopsis ternatensis Valetton

Lepiniopsis ternatensis Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 252, t. 28; Markgr., Bot. Jahrb. Syst. 61 (1927) 172; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 496; Markgr., Blumea 30 (1984) 171; PROSEA 19 (1999) 178; Kessler et al., Blumea, Suppl. 14 (2002) 14. — Type: *Teijsmann in Kurz 5601* (lecto BO, designated here; iso BO), Moluccas, Ternate (see note).

Lepiniopsis philippinensis Elmer, Leaflet Philipp. Bot. 4 (1912) 1458. — Type: *Elmer 12378* (lecto GH, designated by Middleton, Taxon 55 (2006) 504; iso BISH, BO, L, NY, P, US), Philippines, Sibuyan Island, Magellanes, Mt Giting-Giting.

Tree to 36 m tall, to 46 cm dbh; buttresses absent or up to 0.3 m high, spreading for 0.3 m, 7 cm thick; copious white latex present in trunk and branches although also reported as absent from trunk. Bark grey, yellowish grey, grey-brown or brown, smooth or vertically finely fissured or pustular; wood yellowish or pale ochre. *Branchlets* glabrous, not lenticellate. *Leaves*: petiole 9–30 mm long, glabrous; blade subcoriaceous, elliptic, oblong or slightly obovate, 3.7–30 by 1.5–10 cm, 1.8–4.8 times as long as wide, apex short to long acuminate with a blunt tip, base cuneate, 39–60 pairs of secondary veins, fairly straight, anastomosing into an intramarginal vein close to margin, mostly

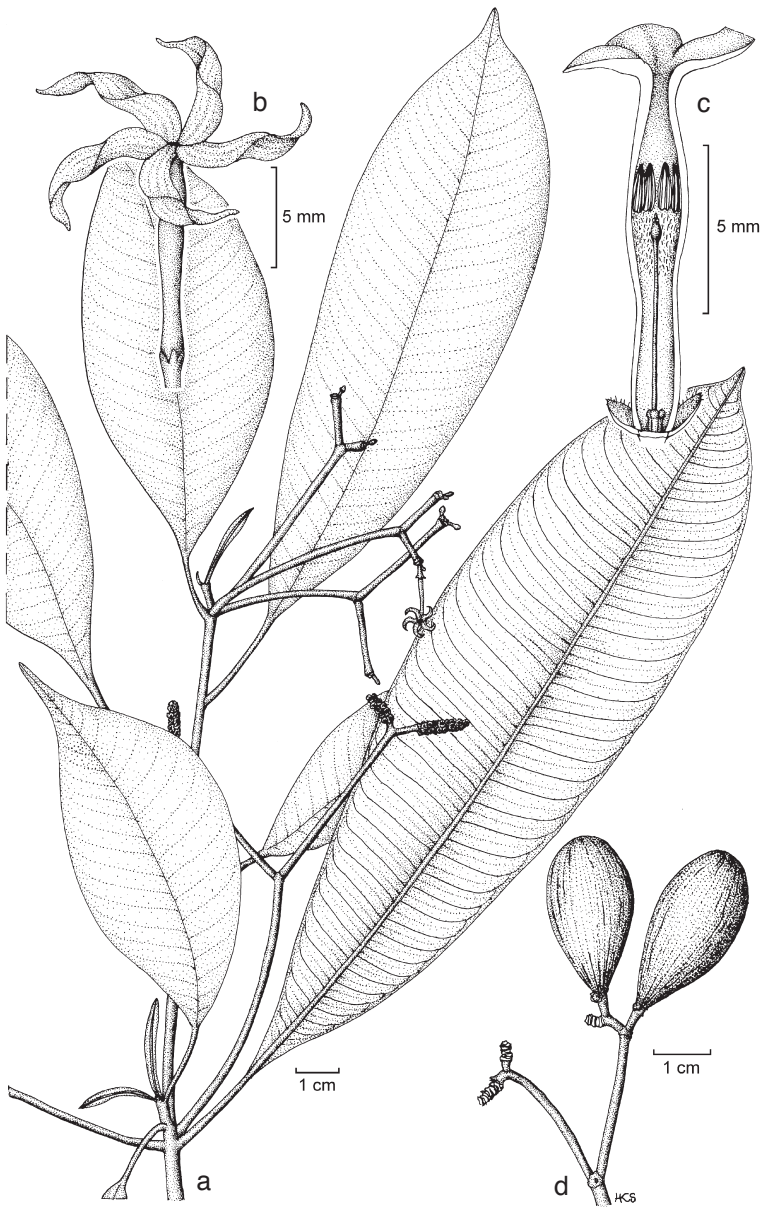


Fig. 71. *Lepiniopsis ternatensis* Valeton. a. Habit; b. flower; c. flower dissection; d. fruit.

somewhat obscure (and hard to accurately count), tertiary venation obscure or weakly parallel to secondary veins. *Inflorescence* 1.5–24 cm long; peduncle 0–5.5 cm long, glabrous; pedicels 0–11 mm long, flowers mostly sessile, glabrous. *Sepals* ovate, 0.9–1.8 by 1.1–1.4 mm, 0.7–1 times as long as wide, apex rounded, glabrous, not ciliate. *Corolla* white or tube pinkish brown to orange with pale yellow or pale green lobes;

tube 6.5–13 by 0.9–1.6 mm, 6.7–8.5 times as long as sepals, 1.1–1.7 times as long as lobes, glabrous outside, densely pubescent below stamens inside; lobes 4–7 by 1.5–2.5 mm, 2.6–3.8 times as long as wide, narrowly falcate, apex acuminate, glabrous outside and inside. *Stamens* inserted at 4.7–7 mm from corolla base which is 0.5–0.7 of tube length; filament 0.5–0.7 mm long; anthers 1.6–1.7 by 0.4–0.5 mm, 3.2–4.2 times as long as wide. *Ovary* 0.7–0.9 mm high, glabrous; style 3.4–5.5 mm long; style head 0.5–0.8 mm long. *Fruit* red or black, 2.1–7 by 0.9–1.9 cm, ellipsoid, often somewhat curved. *Seeds* 17–21 by 4–7 by 4.5–5 mm. — **Fig. 71.**

Distribution — *Malesia*: Philippines, Sulawesi, Moluccas, New Guinea.

Habitat & Ecology — In a wide variety of forest types to 300 m altitude.

Uses — The roots are fragrant and used to perfume clothes and skin.

Note — Markgraf (1984) suggested that a specimen cultivated in Bogor and collected by Teijsmann, housed in Leiden, is the holotype of this species. However, it is clear from the protologue that a specimen labelled as *Kurz 5601* is the type material and the only specimens I have found of this are in Bogor.

25. LEUCONOTIS

Leuconotis Jack, Trans. Linn. Soc. London 14 (1823) 121; A.DC., Prodr. 8 (1844) 331; Benth. & Hook.f., Gen. Pl. 2 (1876) 691; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 123; Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 156; D.J. Middleton, Fl. Thailand 7 (1999) 13; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 112; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 7. — Type species: *Leuconotis anceps* Jack.

Climbers, sometimes forming large lianas. *Leaves* opposite; distinctly petiolate; blade usually with distantly spaced secondary veins, punctate beneath; glands absent in the axils. *Inflorescence* a cyme; axillary and/or terminal; flowers 4-merous. *Sepals* 4, outer and inner pair sometimes slightly different sizes, with many small colleters at base inside. *Corolla* lobes sinistrorse; open corolla salverform. *Stamens* completely included in the tube, free from the style head; filaments short, filiform; anthers narrowly ovate, rounded at the base, fertile entire length. *Disk* absent. *Ovary* syncarpous, bilocular, with 2 or 3 ovules in each cell; style short; style head globose. *Fruit* a berry, pulpy inside. *Seeds* simple, with a membranous testa.

Distribution — 4 species in southern Thailand, Sumatra, Peninsular Malaysia and Borneo.

Habitat & Ecology — All species are confined to areas with everwet forest and only get as far north as this forest type occurs in the extreme south of Thailand.

Note — Several species were described by Boerlage, Bull. Inst. Bot. Buitenzorg 5 (1900) 7–9, which Leeuwenberg (2003) has placed in synonymy of existing species of *Leuconotis*. Leeuwenberg noted that he had not seen the types which he presumed were in BO. I have not been able to find these types in BO and given that many of Boerlage's other species, for which we do still have types, were described in the wrong genera it is perhaps risky to assign these *Leuconotis* species and I have included them only in a list of insufficiently known taxa at the end of this flora account.

KEY TO THE SPECIES

- 1a. Sepals more than 2 times as long as wide; leaves often densely pubescent beneath 2
 b. Sepals less than 2 times as long as wide; leaves glabrous or puberulent only on midrib beneath 3
 2a. Leaves densely dark pubescent beneath; ovary pubescent; fruit pear-shaped with a long narrow neck **2. *L. bullata***
 b. Leaves sparsely to densely pale pubescent beneath; ovary glabrous; fruit ovoid to slightly pear-shaped with a very short neck **3. *L. eugeniifolia***
 3a. Corolla tube densely pubescent at base inside; secondary veins 2–5 pairs
 **4. *L. griffithii***
 b. Corolla tube glabrous at base inside; secondary veins 5–10 pairs . . . **1. *L. anceps***

1. *Leuconotis anceps* Jack

Leuconotis anceps Jack, Trans. Linn. Soc. London 14 (1823) 121; Miq., Fl. Ned. Ind. 2 (1857) 397; Stapf, Trans. Linn. Soc. London, Bot. 4 (1894) 206; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 7; Burkill, J. Straits Branch Roy. Asiat. Soc. 73 (1916) 258; Merr., Bibliogr. Enum. Born. Pl. (1921) 494; Masam., Enum. Phan. Born. (1942) 621; Markgr., Blumea 19 (1971) 155; Coode et al., Checklist Pl. Brunei (1996) 27; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 113, p.p. — Type: Untraced. Neotype: *Rahmat si Toroës 3292* (neo L., designated by Middleton, Taxon 55 (2006) 504; isoneo A, BISH, MICH, S, UC, US), Sumatra.

Willughbeia borneensis Merr., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 28; Masam., Enum. Phan. Born. (1942) 626. — Type: *Ramos 1442* (lecto K, designated by Middleton, Taxon 55 (2006) 505; iso A, P; photo A), Borneo, Sabah, Sandakan and vicinity.

Leuconotis floribunda Leeuwenb., Syst. Geogr. Pl. 72 (2002) 122. — Type: *Wood & Wyatt-Smith SAN A.4520* (holo L; iso A, SING), Borneo, Sabah, Tuaran District, 11 miles E of Tamparuli on path to Dallas.

Woody climber growing up to more than 30 m high, with copious white latex. *Branchlets* glabrous to densely minutely puberulent; sparsely to densely lenticellate. *Leaves*: petiole 11–22 mm long, glabrous or minutely puberulent; blade elliptic, 6.3–17.2 by 1.7–5.3 cm, 2.5–4.4 times as long as wide, apex mostly acuminate, rarely to rounded, base cuneate to rounded, glabrous or sparsely puberulent on midrib and on margin above, glabrous or puberulent on midrib beneath, 5–10 pairs of secondary veins at 70–90° from midrib, usually ascending towards intramarginal vein, sometimes somewhat obscure, anastomosing into an intramarginal vein, tertiary venation obscure. *Inflorescence* 2.4–11 cm long; peduncle 0.6–7.2 cm long, sparsely to densely minutely puberulent; pedicels 3.7–5 mm long, sparsely to densely minutely puberulent. *Sepals* ovate, 1.7–2.5 by 1.2–2.1 mm, 1–1.4 times as long as wide, apex obtuse to rounded, glabrous or with few hairs at top, ciliate. *Corolla* yellow or orange; tube 4.2–9 by 1.2–1.4 mm, glabrous outside and inside; lobes 3–4 by 3.2–3.6 mm, c. 0.8 times as long as wide, obliquely suborbicular, apex rounded, minutely puberulent outside and inside, more rarely glabrous. *Stamens* inserted at 3.5–3.8 mm from corolla base which is 0.4 of tube length; filament c. 1 mm long; anthers 2.4–3.2 by 0.6–0.8 mm, tip of anthers at corolla throat or further down tube. *Ovary* 0.8–1.2 mm high; style 1.4–1.5 mm long; style head 0.8–1 mm long. *Fruit* to 6.7 cm long, 4 cm circumference (see

note 2), ellipsoid or wider near base, frequently strongly wrinkled when immature, 1- or 2-seeded. *Seeds* to 5.7 by 3.3 by 2.7 cm.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

Habitat & Ecology — In evergreen forest to 900 m altitude.

Notes — 1. The limits of this species as defined here are quite different from Leeuwenberg (2002). I have removed many of the specimens he included in *L. anceps* to *L. griffithii* and thereby expanded the concept of the species which he called *L. elastica*, here treated as a synonym of *L. griffithii*. The two species are most easily distinguished by the indumentum on the inside of the corolla tube which is glabrous in *L. anceps* and densely pubescent at the base in *L. griffithii*. In addition, *L. anceps* tends to have more delicate inflorescences and more secondary veins whilst *L. griffithii* tends to have more robust and shorter inflorescences and fewer secondary veins, most clearly seen in the specimens previously referred to *L. elastica* with as few as 2 pairs of secondary veins.

2. Further studies are necessary to understand the fruits of this species. Many of the specimens bear strongly wrinkled and slightly angled 1- or 2-seeded fruits which are apiculate on top. A handful of specimens bear a much larger 1-seeded smooth round-ended fruit. It could be that these larger fruits are merely the mature form and the wrinkled fruits immature. There are no other appreciable differences between the specimens.

3. Almost no flowers of this species are open on the available specimens suggesting either that the open flowers are extremely ephemeral or that they are night flowering when botanists are generally not about their business.

4. The specimens included by Leeuwenberg (2002) in *L. anceps* from Laos and Vietnam are rather *Bousignonia mekongensis* Pierre.

2. *Leuconotis bullata* Leeuwenb.

Leuconotis bullata Leeuwenb., Syst. Geogr. Pl. 72 (2002) 117. — Type: Amin & Francis SAN 116297 (holo L; iso K, SAN), Borneo, Sabah, Ranau District, Gana-Gana.

Woody climber to 8 m high. *Branchlets* densely brown pubescent. *Leaves*: petiole 10–25 mm long; blade elliptic to oblong, 6.2–17.5 by 2.7–6.6 cm, 1.8–3 times as long as wide, apex acuminate to caudate with a blunt tip, base obtuse to rounded or truncate, densely pubescent on midrib and sparsely so on secondary veins above, densely dark pubescent beneath, more so on midrib and veins, 12–18 pairs of secondary veins, 70–80° from midrib, slightly ascending, anastomosing into an intramarginal vein, tertiary venation reticulate. *Inflorescence* 3.2–4.6 cm long; peduncle 0.8–2.4 cm long, densely pubescent; pedicels 5–8 mm long, densely pubescent. *Sepals* 3.2–4 by 1–1.3 mm, 2.5–4 times as long as wide, densely pubescent. *Corolla* white or yellow; tube c. 10.5 mm long, pubescent around top of tube outside, glabrous inside; lobes c. 5.1 by 4.7 mm, 1.1 times as long as wide, obliquely orbicular, apex rounded, densely pubescent inside and outside. *Stamens* inserted c. 6.7 mm from corolla base which is 0.6 of tube length; filament c. 1.2 mm long; anthers c. 4.7 by 0.9 mm, tips at corolla throat. *Ovary* c. 2.2 mm high, pubescent; style c. 2 mm long; style head c. 1.1 mm long. *Fruit* pear-shaped, to 4.5 by 2.9 cm (but probably not completely mature), densely brown pubescent.

Distribution — *Malesia*: Borneo (Sabah).

Habitat & Ecology — Evergreen forest at low altitude.

Notes — 1. Leeuwenberg described *L. bullata* on the basis of it having bullate leaves, more densely hairy leaves beneath and sepals only up to twice as long as wide. It is extremely close to *L. eugeniifolia* and the characters of the bullate leaves and sepals do not serve to distinguish it. I have seen no sepals less than twice as long as wide as suggested by Leeuwenberg. However, the very dense dark coloured indumentum contrasts to the much paler indumentum in *L. eugeniifolia* and the ovary is pubescent as opposed to the glabrous ovary of *L. eugeniifolia*.

2. No open flowers have been seen of this species, the approximate corolla dimensions given above were based on what I take to be mature buds.

3. *Leuconotis eugeniifolia* (Wall. ex G. Don) A.DC.

Leuconotis eugeniifolia (Wall. ex G. Don) A.DC., Prodr. 8 (1844) 331; Miq., Fl. Ned. Ind. 2 (1857) 397; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 7; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 407; Hallier, Bot. Jahrb. Syst. 49 (1913) 372; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Ridl., Fl. Malay Penins. 2 (1923) 329; Masam., Enum. Phan. Born. (1942) 621; Markgr., Blumea 19 (1971) 155; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 127; Coode et al., Checklist Pl. Brunei (1996) 27; PROSEA 18 (2000) 127; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 119. — *Melodinus eugeniifolius* Wall. ex G. Don, Gen. Hist. 4 (1837) 101. — Type: *Wallich 1616* (lecto BM, designated by Middleton, Taxon 55 (2006) 505; iso E, G-DC, K-W, NY, P), Peninsular Malaysia, Penang.

Leuconotis cuspidata Blume, Mus. Bot. 1 (1849) 112; Miq., Fl. Ned. Ind. 2 (1857) 398; Fl. Ned. Ind., Erste Bijv. (1861) 552. — Type: *Korthals s.n.* (holo L [898.110-379]), Sumatra.

Woody climber to 15 m high. *Branchlets* sparsely lenticellate, sparsely to densely pubescent. *Leaves*: petiole 8–17 mm long, sparsely to densely pubescent; blade elliptic to oblong, 3–13.6 by 0.8–5.2 cm, 2.1–4 times as long as wide, apex acuminate to caudate, base cuneate to rounded, sparsely to densely pubescent on midrib above, sparsely to densely pubescent beneath, rarely only on midrib beneath, 8–16 pairs of secondary veins, 80–90° from midrib anastomosing into a slightly looped intramarginal vein inset from margin, tertiary venation reticulate. *Inflorescence* axillary, 1.8–4 cm long; peduncle 0.4–2 cm long, densely pubescent; pedicels 2–9 mm long, densely pubescent. *Sepals* 2.5–7.5 by 0.7–1.2 mm, 2.1–8.1 times as long as wide, narrowly ovate to linear, often of markedly different lengths in a single flower, apex acute to acuminate. *Corolla* yellow; tube 9–11 by 1.6–2.4 mm, 1.6–3.3 times as long as sepals, 2–3.7 times as long as lobes, glabrous or pubescent around top of tube outside, glabrous or with very few minute hairs at base inside; lobes 3–3.2 by 3.2 mm, 0.9–1 times as long as wide, obliquely suborbicular, apex rounded, densely pubescent outside and inside. *Stamens* inserted at 6.4–6.7 mm from corolla base which is 0.6 of tube length; anthers 3.4–3.5 by 0.7–1 mm, tips at corolla throat. *Ovary* 2 mm long, glabrous; style 2.5 mm long; style head 0.9 mm long. *Fruit* to 3.8 by 2.3 cm (possibly immature), ovoid, more rarely slightly pear-shaped, often 5-angled and strongly wrinkled, glabrous or very sparsely puberulent.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo.

Habitat & Ecology — In evergreen forest to 800 m altitude.

Uses — Previously exploited for a high quality rubber before the widespread use of *Hevea brasiliensis*. The fruit is edible. The latex is also used externally to treat the disease yaws.

Note — See note under *L. bullata*.

4. *Leuconotis griffithii* Hook. f.

Leuconotis griffithii Hook. f., Fl. Brit. India 3 (1882) 628; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 409; Ridl., Fl. Malay Penins. 2 (1923) 329; Markgr., Blumea 19 (1971) 156; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; 47 (1997 [‘1995’]) 127; D.J. Middleton, Fl. Thailand 7 (1999) 14; PROSEA 18 (2000) 127. — Type: *Maingay KD.1051* (lecto K, designated by Leeuwenberg (2002) op. cit.; iso L), Peninsular Malaysia, sine loc.

Leuconotis maingayi Dyer ex Hook. f., Fl. Brit. India 3 (1882) 628; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 408; Ridl., Fl. Malay Penins. 2 (1923) 329; Masam., Enum. Phan. Born. (1942) 621; Markgr., Blumea 19 (1971) 156; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; 47 (1997 [‘1995’]) 128. — Type: *Maingay KD.935* (holo K), Singapore.

Leuconotis elastica Becc., For. Borneo (1902) 562; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 621; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 117. — *Leuconotis subavenis* Boerl. var. *elastica* (Becc.) Markgr., Blumea 19 (1971) 156. — Type: *Beccari 899* (lecto FI n.v., designated here; photo of specimen in protologue), Borneo, Sarawak, Kuching.

Leuconotis griffithii Hook. f. var. *sumatrana* Markgr., Blumea 19 (1971) 156. — Type: *Meijer 4384* (holo L), C Sumatra, W Indragiri, Taluk region, Hutan Pulau Lawas.

Leuconotis anceps auct. non Jack: Leeuwenb., Syst. Geogr. Pl. 72 (2002) 113, p.p.

Large woody climber to 15 m high. *Branchlets* lenticellate, glabrous to minutely puberulent. *Leaves*: petiole 20–32 mm long, often slightly swollen at base and opposite bases forming a ridge across the stem, glabrous; blade coriaceous, elliptic, 4.5–19 by 2.3–8.6 cm, 1.4–3.1 times as long as wide, apex acuminate to rounded, base cuneate to rounded or truncate, glabrous above and beneath, rarely sparsely puberulent on midrib beneath, 2–5 pairs of secondary veins, 70–90° from midrib, straight, widely spaced, anastomosing into an intramarginal vein, tertiary venation faint and parallel to secondary veins. *Inflorescence* short, congested, 2.2–4 cm long; peduncle 0.2–1 cm long, minutely puberulent; pedicels c. 1 mm long, glabrous to densely puberulent. *Sepals* ovate, 2.4–3.7 by 1.8–3 mm, 1.2–1.8 times as long as wide, apex acute to rounded, glabrous at base, minutely puberulent at apex, ciliate. *Corolla* yellow-orange; tube 8.5–11.2 by 2.1–2.8 mm, 2.4–3.8 times as long as sepals, 2.1–4.5 times as long as lobes, glabrous outside, densely minutely puberulent at base inside becoming sparser higher up tube; lobes 2–5.5 by 3–7 mm, 0.7–1.1 times as long as wide, obliquely sub-orbicular, apex rounded, glabrous or sparsely to densely minutely puberulent outside, glabrous or minutely puberulent inside in upper part. *Stamens* inserted at 5–7.4 mm from corolla base which is c. 0.6 of tube length; anthers 3.2–3.6 by 0.5–1.2 mm, apex at corolla throat. *Ovary* 1.2–2 mm high, glabrous; style 1.7–2 mm long; style head 0.5–0.9 mm long. *Fruit* globose to ovoid, 3–4.6 by 2.4–3 cm, smooth. — **Fig. 72.**

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

Habitat & Ecology — In evergreen forest, mostly at lower altitudes.

Uses — Previously exploited for a high quality rubber before the widespread use of *Hevea brasiliensis*.

Notes — 1. The limits of this species in relation to *L. anceps* are not entirely clear because most of the available flowering material is rather poor. Further work is necessary.

2. I have placed *L. subavenis* in the list of insufficiently known taxa as a type cannot be found and the description given by Boerlage is not diagnostic enough to be certain of its identity. Leeuwenberg placed it in synonymy of *L. anceps* but from the number of secondary veins given in the description it would appear more likely to belong here.

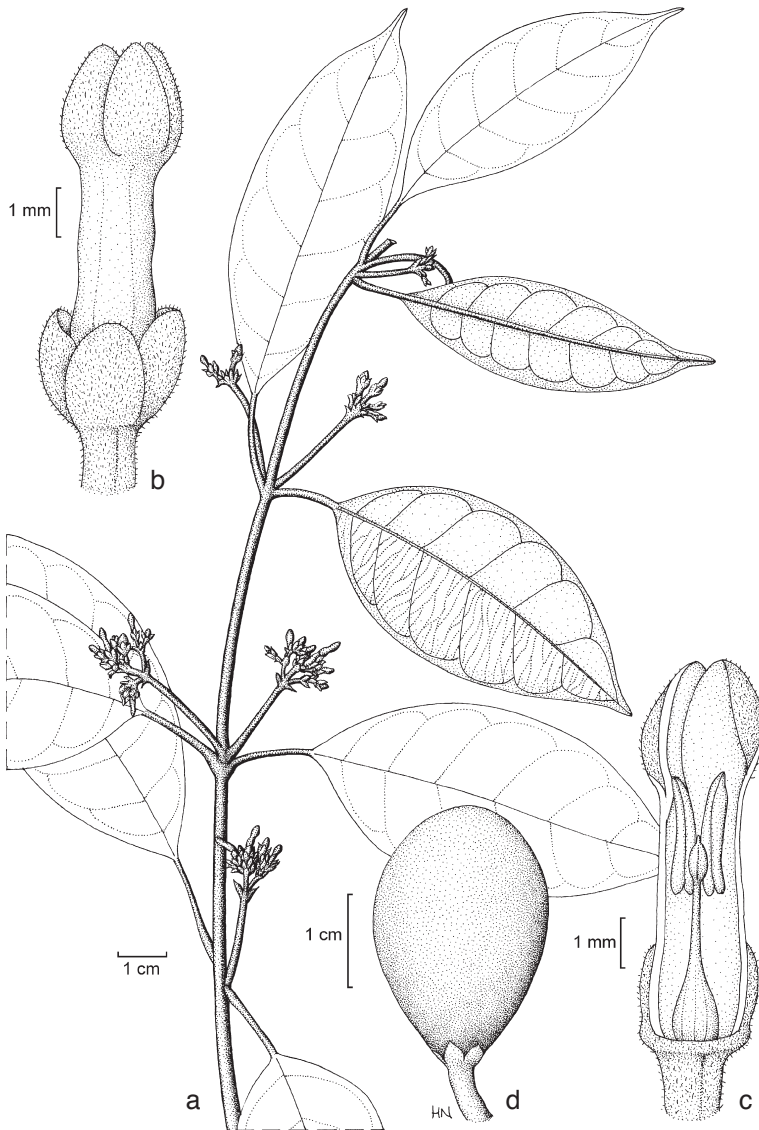


Fig. 72. *Leuconotis griffithii* Hook. f. a. Habit; b. flower; c. dissected flower; d. fruit (a–c: Stone 15601; d: T. & P. KL 3475).

26. MELODINUS

- Melodinus* J.R. Forst. & G. Forst., Char. Gen. Pl. (1776) 37; A.DC., Prodr. 8 (1844) 329; Benth. & Hook.f., Gen. Pl. 2 (1876) 694; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 123; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1100; Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 125; Backer & Bakh.f., Fl. Java 2 (1965) 221; Markgr., Blumea 19 (1971) 150; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 17; Lý, Feddes Repert. 97 (1986) 410; P.T. Li et al., Fl. China 16 (1995) 147; P.I. Forst., Fl. Australia 28 (1996) 111; D.J. Middleton, Fl. Thailand 7 (1999) 14; Leeuwenb., Syst. Geogr. Pl. 73 (2003) 4; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 11. — Type species: *Melodinus scandens* J.R. Forst. & G. Forst.
- Oncinus* Lour., Fl. Cochinch. (1790) 151. — Type species: *Oncinus cochinchinensis* Lour. (= *Melodinus cochinchinensis* (Lour.) Merr.).
- Echaltium* Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 472. — Type species: *Echaltium piscidium* Wight (= *Melodinus cochinchinensis* (Lour.) Merr.).
- Bicorona* A.DC., Prodr. 8 (1844) 330. — *Melodinus* J.R. Forst. & G. Forst. sect. *Bicorona* (A.DC.) Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 128. — Type species: *Bicorona phylliraeoides* (Labill.) A.DC. (= *Melodinus phylliraeoides* Labill.).
- Lycimnia* Hance in Walp., Ann. Bot. Syst. 3 (1852) 20. — Type species: *Lycimnia suaveolens* (Hance) Champ. ex Benth. (= *Melodinus cochinchinensis* (Lour.) Merr.).
- Melodinus* J.R. Forst. & G. Forst. sect. *Dichostemma* F. Muell., Trans. & Proc. Philos. Inst. Victoria 2 (1857) 71. — Type species: *Melodinus acutiflorus* F. Muell.
- Melodinus* J.R. Forst. & G. Forst. sect. *Pleurocephalus* K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 123. — Type species: *Melodinus acutiflorus* F. Muell.
- Neowollastonia* Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 110. — Type species: *Neowollastonia tabernaemontanooides* Wernham (= *Melodinus forbesii* Fawc.).
- Clitandropsis* S. Moore, J. Bot. 61, Suppl. (1923) 31. — *Melodinus* J.R. Forst. & G. Forst. sect. *Clitandropsis* (S. Moore) Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 129. — Type species: *Clitandropsis papuana* S. Moore (= *Melodinus australis* (F. Muell.) Pierre).
- Pseudowillughbeia* Markgr., Bot. Jahrb. Syst. 61 (1927) 174. — Type species: *Pseudowillughbeia gracilis* Markgr. (= *Melodinus australis* (F. Muell.) Pierre).
- Trichostomanthemum* Domin, Biblioth. Bot. 89 (1928) 520. — *Melodinus* J.R. Forst. & G. Forst. sect. *Trichostomanthemum* (Domin) Pichon, Notul. Syst. (Paris) 14 (1951) 87. — Type species: *Trichostomanthemum bacellianum* (F. Muell.) Domin (= *Melodinus acutiflorus* F. Muell.).
- Melodinus* J.R. Forst. & G. Forst. sect. *Orthodinus* Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 129. — Type species: *Melodinus cambodiensis* Pierre.
- Melodinus* J.R. Forst. & G. Forst. sect. *Fimbricorona* Boiteau, Adansonia sér. 2, 15 (1976) 398. — Type species: *Melodinus aeneus* Baill.

Climbers, mostly large woody lianas. *Leaves* opposite; venation often raised, veins anastomosing before margin forming an intramarginal nerve; usually with the base of the petioles meeting across the stem; few glands in the axils or absent. *Inflorescence* a cyme; axillary and/or terminal, often forming a terminal panicle; flowers 5-merous. *Sepals* of free lobes, without colleters inside. *Corolla* lobes sinistrorse; open corolla infundibuliform or salverform; with a corona at the mouth of the corolla. *Stamens* free from style head, completely included in tube; anthers narrowly elliptic or narrowly ovate, base very short bluntly sagittate, fertile entire length; filaments short, filiform. *Disk* absent. *Ovary* syncarpous, bilocular, with numerous ovules, glabrous; style slender. *Fruit* a hard-walled solitary berry. *Seeds* ellipsoid, flattened; surface patterned.

Distribution — Approximately 25 species from the Himalayas and southern China through Southeast Asia and throughout Malesia to Australia, New Caledonia, Vanuatu and Fiji; in *Malesia* 9 species.

Note — The corolla lobes are frequently strongly asymmetrical with a projection to the right as viewed from the outside. Dimensions for lobe length and width below include this projection in the figure given for the corolla width except in *M. densestriatus* where the projection appears as almost a caudate apex on the corolla lobe so it is included in the corolla length. In the key below the projection should always be included in the corolla width when calculating a corolla lobe ratio and this character is not used to key out *M. densestriatus*.

KEY TO THE SPECIES

- 1a. Inflorescence terminal, sometimes also axillary to form a terminal panicle 2
- b. Inflorescence axillary 6
- 2a. Corolla tube mostly glabrous or with few hairs outside **9. *M. philippinensis***
- b. Corolla tube densely pubescent outside 3
- 3a. Corona lobes fused at base forming a tube in the corolla throat; stamens inserted at 0.4–0.6 of tube length **3. *M. cochinchinensis***
- b. Corona lobes free or only slightly fused in pairs, not in a ring; stamens inserted at 0.2–0.3 of tube length 4
- 4a. Corolla lobes 0.6–1 times as long as wide (see note above) **6. *M. forbesii***
- b. Corolla lobes 1.6–4.4 times as long as wide (see note above) 5
- 5a. Sepals rounded **4. *M. cumingii***
- b. Sepals obtuse to acute **7. *M. fusiformis***
- 6a. Secondary veins 40–60 pairs, almost perpendicular to midrib; corolla lobes with a squarish basal portion and a long caudate apex **5. *M. densestriatus***
- b. Secondary veins 8–28 pairs, mostly not almost perpendicular to midrib; corolla lobes narrowly elliptic or strongly falcate with a projection to the side 7
- 7a. Corolla lobes narrowly elliptic, 3.2–6.1 times as long as wide (see note above) **1. *M. acutiflorus***
- b. Corolla lobes strongly falcate with a projection to one side, 0.6–0.8 times as long as wide (see note above) 8
- 8a. Corolla lobes 1.5–2 mm wide (measuring the projection as part of the width), apex of projection mostly fimbriate; tube 2.8–5.5 mm long, sparsely to densely pubescent around stamens inside; bud head about as long as wide with an obtuse apex. — Western Malesia **8. *M. orientalis***
- b. Corolla lobes 2.7–3.8 mm wide (measuring the projection as part of the width), apex of projection mostly not fimbriate; tube 5.2–12 mm long, glabrous or sparsely pubescent around stamens inside; bud head longer than wide with an acute apex. — New Guinea **2. *M. australis***

1. *Melodinus acutiflorus* F. Muell.

Melodinus acutiflorus F. Muell., Trans. & Proc. Philos. Inst. Victoria 2 (1857) 71; P.I. Forst., Fl. Australia 28 (1996) 112; Leeuwenb., Syst. Geogr. Pl. 73 (2003) 8. — Type: *Hill 27* (holo MEL n.v.; iso K), Australia, Brisbane River.

Clitandropsis acutus Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 15 (1940) 130. — *Melodinus acutus* (Markgr.) Markgr., Blumea 19 (1971) 154. — Type: *Carr 14364* (lecto L, designated by Markgraff (1971) op. cit.; iso A, K, NY, SING), Papua New Guinea, Boridi.

Clitandropsis clemensiae Merr. & L.M. Perry, J. Arnold Arbor. 29 (1948) 163. — Type: *Clemens 41192* (holo A; iso E, MICH, UC, US), Papua New Guinea, Morobe Province, Wantaal.

Chilocarpus costatus auct. non Miq.: Leeuwenb., Syst. Geogr. Pl. 72 (2002) 133, p.p. (material cited for New Guinea).

Chilocarpus suaveolens auct. non Blume: Leeuwenb., Syst. Geogr. Pl. 72 (2002) 151, p.p. (material cited for New Guinea).

Leeuwenberg, Syst. Geogr. Pl. 73 (2003) 8, has synonymised a number of additional Australian species under *M. acutiflorus* which I have not studied.

Woody climber to 10 m high. *Branchlets* densely pubescent to glabrous. *Leaves*: petiole 4–8 mm long, glabrous, bases meeting across stems to form a slight interpetiolar ridge; blade narrowly elliptic, 4–13.4 by 1.2–5.3 cm, 2.2–6.1 times as long as wide, apex acuminate, base cuneate, glabrous to sparsely pubescent all over above, glabrous to densely pubescent all over beneath, 13–19 pairs of secondary veins, ascending and anastomosing near margin, tertiary venation obscure. *Inflorescence* axillary, 2–4.1 cm long, few-flowered, densely pubescent to glabrous throughout; peduncle 0.2–0.4 cm long; pedicels 2.5–5 mm long. *Sepals* ovate, 2.5–3.7 by 1.2–1.7 mm, 1.5–2.5 times as long as wide, apex acuminate, densely pubescent to glabrous. *Corolla* creamy yellow; bud head narrowly ovate, apex acute; tube 8.5–15 mm long, 3.3–4 times as long as sepals, 0.8–1.1 times as long as lobes, glabrous or sparsely puberulent around top of tube outside, densely pubescent in a band either side of stamens and with a few hairs in top of tube inside; lobes narrowly elliptic, 8–15 by 1.8–2.5 mm, 3.2–6.1 times as long as wide, apex acuminate, glabrous outside and inside; corona of irregularly fimbriate lobes in sinuses, 1.5–2.5 mm long, glabrous. *Stamens* inserted at 4.5–5.3 mm from corolla base which is 0.4 of tube length; filaments 0.5–1 mm long; anthers 2.4–2.5 by 0.5–0.6 mm. *Ovary* 1.3–1.5 mm high; style 2.2–2.5 mm long; style head 2.1–2.5 mm long. *Fruit* subglobose; 3–5 cm wide.

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

Habitat & Ecology — In forest or at forest edge at 450–2700 m altitude.

Note — This species is particularly variable in the degree of pubescence on all parts.

2. *Melodinus australis* (F. Muell.) Pierre

Melodinus australis (F. Muell.) Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 103; P.I. Forst., Fl. Australia 28 (1996) 111. — *Chilocarpus australis* F. Muell., Fragm. 2 (1860) 90. — *Rhytyleucoma chilocarpoides* F. Muell., Fragm. 2 (1860) 90, nom. illeg. — *Melodinus chilocarpoides* F. Muell., Fragm. 6 (1868) 118, nom. illeg. — Type: *Beckler s.n.* (lecto MEL, designated here; iso BRI, K, M), Australia, Clarence River, near Grafton.

Clitandropsis papuana S. Moore, J. Bot. 61, Suppl. (1923) 31. — Type: *Forbes 485* (holo BM; iso MEL), Papua New Guinea, Sogeri.

Pseudowillughbeia gracilis Markgr., Bot. Jahrb. Syst. 61 (1927) 174. — *Melodinus gracilis* (Markgr.) Markgr., Blumea 19 (1971) 153. — Type: *Schlechter 20306* (holo B†; lecto L, designated by Leeuwenberg (2003) op. cit.; iso A, BM, C, G, K), Papua New Guinea, Toricelli Mts.

Clitandropsis grandiflorus Markgr., Brittonia 2 (1936) 140. — *Melodinus grandiflorus* (Markgr.) Markgr., Blumea 19 (1971) 154. — Type: *Brass 4912* (holo NY; iso A, BO), Papua New Guinea, Central Division, Mt Tafa.

Clitandropsis crassifolia Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 494. — Type: *Kanehira & Hatusima 13749* (holo TI), New Guinea, Papua, Anggi, Arfak Mts.

Melodinus novoguineensis (Wernham) Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 129; Markgr., Blumea 19 (1971) 154. — *Willughbeia novoguineensis* Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 108. — *Clitandropsis novoguineensis* (Wernham) S. Moore ex Markgr., Nova Guinea 14, 2 (1926) 279; Markgr., Bot. Jahrb. Syst. 61 (1927) 174; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 493. — Type: *Kloss s.n.* (holo BM untraced), New Guinea, Papua, Utakwa River.
Melodinus orientalis auct. non Blume: Leeuwenb., Syst. Geogr. Pl. 73 (2003) 42, p.p.

Large woody climber. *Branchlets* glabrous. *Leaves*: petiole 2–8 mm long, glabrous; blade elliptic, 2.5–17 by 0.7–6.9 cm, 1.3–5 times as long as wide, apex acute to shortly acuminate with a blunt apex, base cuneate to obtuse, glabrous above and beneath, 10–28 pairs of secondary veins, ascending and anastomosing near margin, tertiary venation mostly obscure. *Inflorescence* 1.5–3 cm long, glabrous throughout; peduncle 0–0.2 cm long; pedicels 2.5–4 mm long. *Sepals* ovate, 1.6–2.4 by 0.8–1.6 mm, 1.1–2.1 times as long as wide, apex obtuse to rounded, glabrous, ciliate. *Corolla* white, cream or yellow; tube 5.2–12 mm long, 2.2–4.7 times as long as sepals, 2.4–4.5 times as long as lobes, glabrous outside, glabrous or sparsely pubescent around stamens inside; lobes strongly falcate with a sharp projection or slightly fimbriate projection to one side, 1.5–3.1 by 2.7–3.8 mm (counting the projection as part of the width), 0.6–0.8 times as long as wide, glabrous inside and outside; corona of 5 free triangular or simple lobes at sinuses, more rarely these bifid to base which then appears as 10 lobes, 0.5–1.1 mm long. *Stamens* inserted at 1.5–2.5 mm from corolla base which is 0.3 of tube length; filaments 0.6–1 mm long; anthers 1.3–1.7 by 0.4–0.5 mm. *Ovary* 1–1.5 mm high; style 1.1–1.5 mm long; style head 1–1.5 mm long. *Fruit* ellipsoid, 5–9 by 2.2–4.5 cm, orange or red when mature.

Distribution — Solomon Islands, Vanuatu, Australia; in *Malesia*: New Guinea.

Habitat & Ecology — In forest or at forest margins at 150–2600 m altitude.

Note — The description is for the species as it is found in Malesia, the Australian material often has somewhat smaller flowers. This species differs from *M. orientalis* in the characters given in the key and, in addition, in the position of the stamens in the corolla tube and in the shape of the fruit.

3. *Melodinus cochinchinensis* (Lour.) Merr.

Melodinus cochinchinensis (Lour.) Merr., Trans. Amer. Philos. Soc., n.s. 24 (1935) 315; Lý, Feddes Repert. 97 (1986) 418; P.T. Li et al., Fl. China 16 (1995) 149; D.J. Middleton, Fl. Thailand 7 (1999) 16; Leeuwenb., Syst. Geogr. Pl. 73 (2003) 21. — *Oncinus cochinchinensis* Lour., Fl. Cochinch. (1790) 123. — Type: Untraced. Neotype: *Clemens & Clemens 3427* (neo P, designated by Leeuwenberg (2003) op. cit.; isoneo K, MO, NY), Vietnam, Thua Thien-Huê, Truoi, S of Huê.

Melodinus tournieri [Pierre ex Spire, Bull. Écon. Indochine 12 (1902) 859, nom. nud.] Pierre ex Spire, Contr. Apocyn. (1905) 114; Caoutchouc Indo-Chine (1906) 114; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1102; Lý, Feddes Repert. 97 (1986) 418. — Type: *Spire 9* (holo P), Vietnam, Nghe An, Song Ca.

Melodinus jumellei [Pierre ex Spire, Bull. Écon. Indochine 12 (1902) 859, nom. nud.; Spire, Contr. Apocyn. (1905) 121, nom. nud.; Caoutchouc Indo-Chine (1906) 121, nom. nud.] Pierre ex Pit. in Lecomte, Fl. Indo-Chine 3 (1905) 1110. — Type: *Jumelle s.n.* (holo P), Vietnam, sine loc.

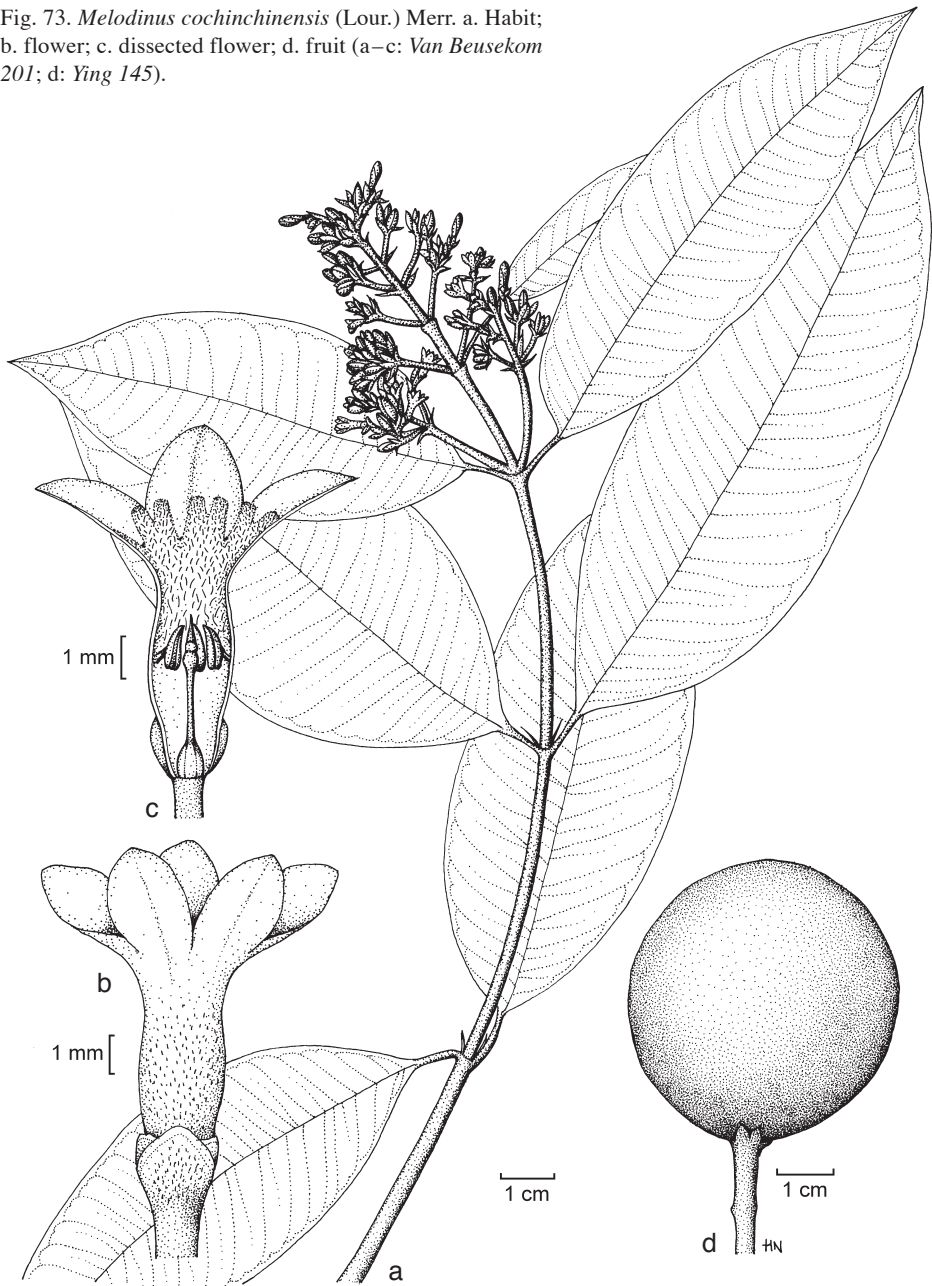
Melodinus oblongus Pierre ex Spire, Contr. Apocyn. (1905) 121; Caoutchouc Indo-Chine 121 (1906); Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1110; Kerr in Craib, Fl. Siam. 2 (1939) 427; Lý, Feddes Repert. 97 (1986) 418. — Type: *Spire 51* (lecto HM, designated by Lý (1986), 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 298, 2nd step; iso HM, P), Laos, Xieng Khouang.

- Melodinus guignardii* Pierre ex Spire, Contr. Apocyn. (1905) 122; Caoutchouc Indo-Chine (1906) 122; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1111. — Type: *Spire 32* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 298; iso P), Laos, Khammouane.
- Melodinus henryi* Craib, Bull. Misc. Inform. Kew 1911 (1911) 411; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1111; Kerr in Craib, Fl. Siam. 2 (1939) 426. — Type: *Henry 11944A* (lecto E, designated by Leeuwenberg (2003) op. cit.; iso A, K, MO), China, Yunnan, N Szemao.
- Melodinus minutiflorus* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1105; Lý, Feddes Repert. 97 (1986) 413. — Type: *Poilane 7783* (lecto P, designated by Leeuwenberg (2003) op. cit.; iso HM, K, P), Quang Nam-Da Nang, Col des Nuages, near Tourane.
- Melodinus myrtifolius* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1106; Lý, Feddes Repert. 97 (1986) 413. — Type: *Poilane 8212* (lecto HM, designated by Lý (1986) op. cit.; iso HN, P), Vietnam, Khanh Hoa, km 26 from Nhatrang to Ninh Hoa.
- Melodinus annamensis* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1107; Lý, Feddes Repert. 97 (1986) 418. — Type: *Poilane 10247* (lecto P, designated by Lý (1986) op. cit.; iso K, P), Vietnam, Quang Tri, Dent du Tigre.
- Melodinus tonkinensis* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1107; Lý, Feddes Repert. 97 (1986) 418. — Type: *Bon 4150* (lecto P, designated by Lý (1986) op. cit.; iso P), Vietnam, Ninh Thai, Muou Lang.
- Melodinus silvaticus* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1108. — Type: *Poilane 7131* (lecto HM, designated by Lý (1986) op. cit.; iso HM, K, P), Vietnam, Quang Nam-Da Nang, Ba Na.
- Melodinus crassipetalus* Kerr, Bull. Misc. Inform. Kew 1937 (1937) 40; Kerr in Craib, Fl. Siam. 2 (1939) 426. — Type: *Kerr 12756* (lecto BM, designated by Middleton, Taxon 55 (2006) 505; iso ABD, K), Thailand, Surat Thani, Khao Tao.
- Melodinus locii* Lý, Feddes Repert. 92 (1981) 619; 97 (1986) 418. — Type: *Loc P.2569* (holo HN), Vietnam, Ha Son Binh, Lac Thuy, Phu Lao.
- Melodinus monogynus* auct. non Roxb.: Hook.f., Fl. Brit. India 3 (1882) 629, p.p.: King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 411; Ridl., Fl. Malay Penins. 2 (1923) 330; Markgr., Blumea 19 (1971) 152; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 128.

Climber to 28 m high. *Branchlets* glabrous, puberulent around nodes or, rarely, puberulent all over when young. *Leaves* opposite or in whorls of 3 or 4, often with all permutations on a single branch; petiole 5–17 mm long, glabrous to densely puberulent; blade coriaceous, ovate, elliptic or oblong, 3.7–22 by 0.8–7.8 cm, 1.8–5 times as long as wide, apex acuminate, base rounded to cuneate, glabrous above and beneath, 10–23 pairs of secondary veins, slightly raised above, anastomosing into an intramarginal vein, tertiary venation running parallel to secondary veins to reticulate. *Inflorescence* axillary and terminal forming a panicle, 3–15 cm long; peduncle 0.4–2.5 cm long, glabrous to puberulent; pedicels 2–8 mm long, puberulent. *Sepals* ovate, 1.5–3 by 1.4–2.5 mm, 1–1.6 times as long as wide, apex obtuse to rounded, puberulent or glabrous, ciliate. *Corolla* white or yellow; bud head ovoid, apex acute to obtuse; tube 4.1–12.3 by 1.8–2.8 mm, 1.7–2.2 times as long as lobes, 1.9–6.2 times as long as calyx, puberulent outside, densely pubescent inside; lobes 2.1–6 by 1.5–3.6 mm, 1.2–2.2 times as long as wide, strongly falcate to dolabriform; corona in a ring, slightly to deeply 10-lobed, 1.1–4 mm high, pubescent. *Stamens* inserted at 2.4–6 mm from base which is 0.4–0.6 of tube length; anthers 1.4–1.7 by 0.4–0.6 mm. *Ovary* 0.9–1.4 mm long; style 0.9–1.9 mm long; style head 1.2–1.9 mm long. *Fruit* globose to ellipsoid or ovoid, 3.5–10 by 2.7–5.4 cm. *Seeds* 11–17 by 7–11 by 2–4 mm. — **Fig. 73.**

Distribution — China, Burma, Thailand, Laos, Vietnam; in *Malesia*: Peninsular Malaysia.

Fig. 73. *Melodinus cochinchinensis* (Lour.) Merr. a. Habit; b. flower; c. dissected flower; d. fruit (a–c: Van Beusekom 201; d: Ying 145).



Habitat & Ecology — Throughout its large range it is found in a wide variety of habitats to 1500 m altitude. Its habitat preferences in Peninsular Malaysia are not recorded.

Note — This is a very variable species which requires more research.

4. *Melodinus cumingii* A.DC.

Melodinus cumingii A.DC., Prodr. 8 (1844) 330; Markgr., Blumea 19 (1971) 152; Leeuwenb., Syst. Geogr. Pl. 73 (2003) 27. — Type: *Cuming 1831* (lecto NY, designated here; iso BM, C, K, MO, P), Philippines, Luzon, Manila.

Melodinus apoensis Elmer, Leaflet Philipp. Bot. 4 (1912) 1459. — *Melodinus cumingii* A.DC. var. *apoensis* (Elmer) Markgr., Blumea 19 (1971) 152. — Type: *Elmer 10793* (lecto L, designated by Leeuwenberg (2003) op. cit.; iso A, BISH, BM, E, G, GH, K, L, MO, NY, P, US, Z), Philippines, Mindanao, Davao, Todaya, Mt Apo.

Large woody climber. *Branchlets* sparsely to densely pubescent. *Leaves*: petiole 7–11 mm long, pubescent; blade ovate, 7.6–25 by 1.4–8 cm, 2.1–5.6 times as long as wide, apex acuminate, base rounded, glabrous to sparsely pubescent above and beneath, 13–24 pairs of secondary veins, ascending, not particularly distinct from the reticulate tertiary venation. *Inflorescence* a terminal panicle, 2–8 cm long, densely pubescent throughout, many-flowered; peduncle 1.6–2.5 cm long; pedicels 1–6 mm long. *Sepals* orbicular, 2.8–5 by 2.3–3.5 mm, 1–2 times as long as wide, apex rounded, densely pubescent, ciliate. *Corolla* white; bud head ellipsoid, apex acute to obtuse; tube 13–18 mm long, 3.5–4.7 times as long as sepals, 1.1–1.9 times as long as lobes, densely pubescent outside, densely pubescent inside except at very base, pubescent in throat; lobes axe-shaped, projection short, 8.5–16 by 5.3–7.5 mm, 1.7–2.1 times as long as wide, pubescent outside on part exposed in bud, glabrous inside; corona of 10 free lobes, paired in each sinus, pubescent at base, otherwise glabrous, 2–3.3 mm long. *Stamens* inserted at c. 2.8 mm from corolla base which is 0.2 of tube length; anthers c. 2.5 by 0.6 mm. *Ovary* c. 1.2 mm high; style c. 1.3 mm long; style head c. 1.8 mm long. *Fruit* ovoid, c. 5.7 by 4 cm across.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Unknown.

5. *Melodinus densestriatus* Markgr.

Melodinus densestriatus Markgr., Blumea 19 (1971) 152. — Type: *Carr 15540* (holo SING; iso A, BM, K, L, NY), Papua New Guinea, Isuarava.

Melodinus baueri auct. non Endl.: Leeuwenb., Syst. Geogr. Pl. 73 (2003) 19, p.p. (material cited for New Guinea).

Large woody climber into forest canopy. *Branchlets* puberulent to glabrous. *Leaves*: petiole 5–14 mm long, glabrous to puberulent; blade elliptic, 4–13.5 by 2.2–4.5 cm, 1.7–3.6 times as long as wide, apex acuminate, base cuneate, glabrous above, sparsely and minutely puberulent on midrib beneath, 40–60 pairs of secondary veins, 85–90° from midrib, barely distinguishable from weaker intercalated anastomosing tertiary venation, anastomosing to form an intramarginal vein close to margin. *Inflorescence* axillary, 3–4 cm long; peduncle 0.9–1.6 cm long, densely puberulent; pedicels 1.2–3.8 mm long, densely puberulent. *Sepals* ovate, 1.3 by 1.2–1.3 mm, 1–1.1 times as long as wide, apex obtuse to rounded, puberulent ciliate. *Corolla* creamy yellow or orange-yellow; bud head ovoid, apex obtuse; tube 5.6–6.6 mm long, 4.3–5.1 times as long as sepals, densely puberulent outside, sparsely pubescent only around stamens inside; lobes 5 by 1.5 mm, with a basal squarish portion and a long caudate projection (lobe

length includes this projection), very sparsely puberulent to glabrous outside, glabrous inside; corona of broad calluses in throat, c. 0.5 mm long, glabrous. *Stamens* inserted at 2.2–2.4 mm from corolla base which is 0.3–0.4 of tube length; filaments 0.5 mm long; anthers 1.2–1.3 by 0.4–0.5 mm. *Ovary* 1.1–1.3 mm high; style 0.8–1 mm long; style head 0.9 mm long.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Lower montane forest at 800–900 m altitude.

Note — This species differs from *M. baueri*, into which it has previously been synonymised, in the dense pubescence on the outside of the corolla tube and the globose corolla bud head. In *M. baueri*, which is endemic to Norfolk Island, the corolla is glabrous and the bud head is ovate. Specimens from Borneo previously attributed to *M. baueri* are *Willughbeia angustifolia*.

6. *Melodinus forbesii* Fawc.

Melodinus forbesii Fawc. in H.O. Forbes, Naturalist's Wanderings E. Archipel. (1885) 510; Markgr., Blumea 19 (1971) 152; P.I. Forst., Fl. Australia 28 (1996) 112; Leeuwenb., Syst. Geogr. Pl. 73 (2003) 31. — Type: *Forbes 3708* (lecto BM, designated by Middleton, Taxon 55 (2006) 505; iso A, CAL n.v., L), Lesser Sunda Islands, Timor, sine loc.

Melodinus monogynus Roxb. var. *minor* Hallier f., Jahrb. Hamburg Wiss. Anst. 17, Beih. 3 (1900) 165. — Type: *Forbes 3708* (holo B⁺; lecto BM, designated here; iso A, CAL), Lesser Sunda Islands, Timor, sine loc. — Note: this is the same collection as the type of *M. forbesii*.

Melodinus landolphoides Lauterb. & K. Schum. in K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 500; Markgr., Nova Guinea 14, 2 (1926) 278; Bot. Jahrb. Syst. 61 (1927) 172; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 496. — Type: *Lauterbach 2614* (holo B⁺), Papua New Guinea, Ramu River.

Newollastonia tabernaemontanoides Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 110. — Type: *Kloss s.n.* (holo BM), New Guinea, Papua, Mt Carstensz.

Large woody climber into forest canopy. *Branchlets* glabrous. *Leaves* opposite; petiole 5–8 mm long, glabrous or minutely papillose-puberulent, bases meeting across stems to form a slight interpetiolar ridge; blade ovate, oblong or elliptic, often remarkably different shapes on the same branch, (3.1–)5.3–21 by (2.4–)2.7–8.7 cm, 1.1–4.7 times as long as wide, apex acuminate with a blunt apex, or very rarely obtuse or rounded (but on the same plant where leaves have acuminate apices), base rounded to cuneate, glabrous above, glabrous to minutely papillose-puberulent on midrib beneath, 15–28 pairs of secondary veins, straight to weakly ascending, anastomosing into a weakly looped intramarginal vein, tertiary venation reticulate. *Inflorescence* a robust terminal panicle, occasionally also axillary, 4–12 cm long, many-flowered; flowers fragrant; peduncle 0–4 cm long, minutely and sparsely puberulent; pedicels 1.2–8 mm long, densely puberulent. *Sepals* oblong, 2.1–3.6 by 1.7–2.8 mm, 1–1.8 times as long as wide, apex rounded, glabrous or puberulent at base, ciliate. *Corolla* white or white with a yellowish throat; bud head ovoid, apex acute to obtuse; tube 8–21 mm long, 3.8–6.5 times as long as sepals, 1.3–2.9 times as long as lobes, minutely and densely pubescent outside, densely pubescent inside from just below stamens to over half way up tube but glabrous at top of tube and in throat; lobes axe-shaped, projection rounded to acute, 3.5–13 by 4.7–13.5 mm, 0.6–1 times as long as wide, pubescent on part of

lobes exposed in bud outside, glabrous inside; corona of 10 free lobes, paired in each sinus, glabrous, 1.5–2.5 mm long. *Stamens* inserted at 3–5.3 mm from corolla base which is 0.2–0.3 of tube length; filament 1–1.8 mm long; anthers 1.6–2.6 by 0.5–0.6 mm. *Ovary* 1.5–2 mm high; style 1.2–2.5 mm long; style head 1.6–2.5 mm long. *Fruit* globose, 6–7 cm across, green or brown. *Seeds* 7.3–8 by 5–5.2 by 2.1–2.4 mm.

Distribution — *Malesia*: Lesser Sunda Islands, Moluccas, New Guinea.

Habitat & Ecology — In forest at 0–1200 m altitude.

7. *Melodinus fusiformis* Champ. ex Benth.

Melodinus fusiformis Champ. ex Benth., Hooker's J. Bot. Kew Gard. Misc. 4 (1852) 332; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 29; P.T. Li et al., Fl. China 16 (1995) 150; Leeuwenb., Syst. Geogr. Pl. 73 (2003) 36, p.p.

Melodinus hemsleyanus Diels, Bot. Jahrb. Syst. 29 (1900) 539; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 27. — Type: *Bock & Von Rosthorn 511* (lecto A, designated by Leeuwenberg (2003) op. cit.), China, Nanchuan, Kungchiaping.

Melodinus seguinii H. Lév., Feddes Repert. Spec. Nov. Regni Veg. 2 (1906) 114. — Type: *Seguin & Bodinier 2390* (holo E; photo A), China, Guizhou.

Melodinus flavus H. Lév., Feddes Repert. Spec. Nov. Regni Veg. 11 (1913) 548. — Type: *Cavalerie 3412* (holo E; photo A), China, Guizhou, Lofou.

Melodinus edulis H. Lév., Feddes Repert. Spec. Nov. Regni Veg. 11 (1913) 549. — Type: *Cavalerie 3802* (lecto E, designated here; iso A), China, Guizhou, Ganchouen.

Melodinus esquirolii H. Lév., Feddes Repert. Spec. Nov. Regni Veg. 11 (1913) 549. — Type: *Esquiroil 886* (holo E; photo A), China, Guizhou, Cheten.

Trachelospermum esquirolii H. Lév., Fl. Kouy-Tcheou (1914) 32. — Type: *Esquiroil 750* (holo E; iso A), China, Guizhou, Tcheou-tchou.

Melodinus lanceolatus Merr., Philipp. J. Sci. 27 (1925) 52; Markgr., Blumea 19 (1971) 152. — Type: *Loher 15057* (lecto UC, designated by Leeuwenberg (2003) op. cit.; iso K, M), Philippines, Luzon, Rizal Province.

Melodinus morsei Tsiang, Sunyatsenia 6 (1941) 110, t. 19; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 27. — Type: *Morse 171* (holo IBSC n.v.; iso A, K, NY, US), China, Guangxi, Lungchow.

Melodinus brachyphyllus Merr., J. Arnold Arbor. 23 (1942) 191; Lý, Feddes Repert. 97 (1986) 413. — Type: *Petelot 2438* (holo A; iso HN, US), Vietnam, Lang Son, between Dong Mo and Thanh Moi.

Melodinus yunnanensis Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 355; Fl. Reipubl. Popularis Sin. 63 (1977) 20. — Type: *Tsai 53311* (holo IBSC n.v.; iso A), China, Yunnan, Kien-shuei Hsien.

Woody climber. *Branchlets* glabrous to densely pubescent. *Leaves* opposite; petiole 3.5–9 mm long, glabrous to densely pubescent; blade ovate, 6.3–20.5 by 1.3–10 cm, 1.6–6 times as long as wide, apex acuminate, base obtuse, glabrous to sparsely pubescent above and then more densely so on midrib, glabrous to densely pubescent all over beneath and then more densely so on venation, 9–19 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* terminal, 4–5 cm long; pedicels 3.2–13 mm long, densely pubescent. *Sepals* ovate, 2–4.2 by 1.3–2.4 mm, 1.3–1.9 times as long as wide, apex obtuse to acute, glabrous to densely pubescent, ciliate. *Corolla* white, sometimes with a yellow 'eye'; tube 10–16 mm long, 0.8–1.9 times as long as lobes, 4.4–7 times as long as calyx, short pubescent throughout or only in upper half outside; lobes 6.4–18 by 3.3–11.5 mm, 1.6–4.4 times as long as wide, asymmetrically obovate, apex rounded,

pubescent all over or pubescent only at very base outside, pubescent inside; corona lobes free, 2–4 mm long, puberulent. *Stamens* inserted at 0.2–0.3 of corolla tube length from base; anthers 1.5–2.1 by 0.3–0.7 mm. *Ovary* 1.4–1.5 mm high; style 1.7–4 mm long; style head 1.4–2.2 mm long. *Fruit* fusiform to subglobose, 4–10 by 2.5–5 cm.

Distribution — China, Vietnam, Laos; in *Malesia*: Philippines.

Habitat & Ecology — In forest or scrub to 2000 m altitude.

8. *Melodinus orientalis* Blume

Melodinus orientalis Blume, Bijdr. (1826) 1026; Mus. Bot. 1 (1850) 155; Miq., Fl. Ned. Ind. 2 (1857) 395; Fl. Ned. Ind., Eerste Bijv. (1861) 552; Hook. f., Fl. Brit. India 3 (1882) 629; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 412; Ridl., Fl. Malay Penins. 2 (1923) 330; Bakh.f., Blumea 6 (1950) 384; Backer & Bakh.f., Fl. Java 2 (1965) 222; Markgr., Blumea 19 (1971) 154; Coode et al., Checklist Pl. Brunei (1996) 27; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 128; D.J. Middleton, Fl. Thailand 7 (1999) 18; PROSEA 18 (2000) 129; Kessler et al., Blumea, Suppl. 14 (2002) 14; Leeuwenb., Syst. Geogr. Pl. 73 (2003) 42, p.p. — Type: *Blume s.n.* (lecto L [898.111-15], designated here), Java, sine loc.

Alyxia coriacea Wall. in Roxb., Fl. Ind. 2 (1824) 541, non *Melodinus coriaceus* Oliv. — *Hunteria coriacea* Wall. ex G. Don, Gen. Hist. 4 (1837) 105; Miq., Fl. Ned. Ind. 2 (1857) 410. — *Pulassarium coriaceum* (Wall.) Kuntze, Revis. Gen. Pl. 2 (1891) 417. — *Gynopogon coriaceus* (Wall.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 151. — Type: *Wallich 1610* (lecto K-W, designated by Leeuwenberg (2003) op. cit.; iso BM, G, K), Peninsular Malaysia, Penang.

Hunteria cuspidata Wall. ex A.DC., Prodr. 8 (1844) 350. — *Alyxia cuspidata* Wall. ex A.DC., Prodr. 8 (1844) 351, nom. illeg. — *Chilocarpus cuspidatus* Benth. & Hook. f., Gen. Pl. 2 (1876) 698, nom. illeg. — Type: *Wallich 1609* (lecto G-DC, designated by Middleton, Taxon 55 (2006) 504; iso BR, C, E, G, K, K-W, MEL, NY, P, W), Peninsular Malaysia, Penang.

Willughbeia umbrosa Blume, Mus. Bot. 1 (1850) 154; Miq., Fl. Ned. Ind. 2 (1857) 390. — *Ancylodadus umbrosus* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 412. — Type: *Blume s.n.* (holo L [898.112-437]), Java, sine loc.

Melodinus fasciculatus Blume, Mus. Bot. 1 (1850) 155; Miq., Fl. Ned. Ind. 2 (1857) 396; Merr., Bibliogr. Enum. Born. Pl. (1921) 494; Masam., Enum. Phan. Born. (1942) 622. — Type: *Korthals s.n.* (lecto L [898.110-407], designated by Leeuwenberg (2003) op. cit.), Borneo, Kalimantan, sine loc.

Melodinus laevigatus Blume, Mus. Bot. 1 (1850) 155; Miq., Fl. Ned. Ind. 2 (1857) 396; Bakh.f., Blumea 6 (1950) 384. — Type: *Blume s.n.* (lecto L [890.110-414], designated by Leeuwenberg (2003) op. cit.), Java, sine loc.

Melodinus laxiflorus Blume, Mus. Bot. 1 (1850) 155; Miq., Fl. Ned. Ind. 2 (1857) 396. — Type: *Blume s.n.* (lecto L [898.110-417], designated here), Java, sine loc.

Melodinus micranthus Hook. f., Fl. Brit. India 3 (1882) 629; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 413; Ridl., Fl. Malay Penins. 2 (1923) 331; Markgr., Blumea 19 (1971) 154; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; 47 (1997 [‘1995’]) 128. — Type: *Maingay KD.1090* (lecto K, designated by Middleton, Taxon 55 (2006) 505; iso L), Singapore.

Melodinus coriaceus Oliv., Hooker’s Icon. Pl. 18 (1888) 1758; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 414; Ridl., Fl. Malay Penins. 2 (1923) 331; Markgr., Blumea 19 (1971) 153; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 128; Leeuwenb., Syst. Geogr. Pl. 72 (2002) 27. — Type: *Curtis 1040* (lecto K, designated by Middleton, Taxon 55 (2006) 505; iso SING; possible iso K), Peninsular Malaysia, Penang, Oct. 1886. — Note that not all specimens of *Curtis 1040* are the same species and another specimen with the same number serves as the type of *Chilocarpus nigrescens* King & Gamble.

Alyxia macrocarpa Koord., Meded. Lands Plantentuin 19 (1898) 622. — Type: *Koorders 16073* (holo BO; iso L, fragment A), Celebes, Minahassa, Menado.

- Melodinus citriformis* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 413; Ridl., Fl. Malay Penins. 2 (1923) 331. — Type: *King's Collector 6525* (lecto K, designated here; iso CAL n.v., K), Peninsular Malaysia, Perak, near Larut.
- Melodinus perakensis* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 413; Ridl., Fl. Malay Penins. 2 (1923) 331; Markgr., Blumea 19 (1971) 153. — Type: *King's Collector 7031* (lecto K, designated here), Peninsular Malaysia, Perak.
- Willughbeia luzoniensis* Merr., Philipp. J. Sci., Bot. 4 (1909) 320. — *Melodinus luzoniensis* (Merr.) Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 129; Markgr., Blumea 19 (1971) 153. — Type: *Curran For. Bur. 12277* (lecto US, designated by Middleton, Taxon 55 (2006) 505), Philippines, Luzon, Camarines, Caramoan.
- Chilocarpus globosus* Elmer, Leaflet Philipp. Bot. 4 (1912) 1454. — *Melodinus globosus* (Elmer) Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 129. — Type: *Elmer 12229* (lecto L, designated by Leeuwenberg (2003) op. cit.; iso BM, BO, E, G, MO, NY, US, Z), Philippines, Sibuyan Island, Magellanes, Mt Giting-Giting.
- Willughbeia pauciflora* Merr., Philipp. J. Sci., Bot. 3 (1913) 387. — Type: *Wenzel 100* (lecto BM, designated by Leeuwenberg (2003) op. cit.; iso G, MO, US), Philippines, Leyte.
- Willughbeia ellipticifolia* Quisumb. & Merr., Philipp. J. Sci. 37 (1928) 194. — *Melodinus ellipticifolius* (Quisumb. & Merr.) Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 128; Markgr., Blumea 19 (1971) 153. — Type: *Wenzel 2605* (lecto UC, designated here; iso BR, G, GH, K, MO, Z), Philippines, Mindanao, Surigao.
- Melodinus lancifolius* Ridl., Bull. Misc. Inform. Kew 1934 (1934) 123; Masam., Enum. Phan. Born. (1942) 622; Markgr., Blumea 19 (1971) 153; Coode et al., Checklist Pl. Brunei (1996) 27. — Type: *Fraser 70* (holo K), Borneo, Sabah, Kudat.
- Melodinus kopsifolius* Markgr., Blumea 19 (1971) 153. — Type: *Wright S.25267* (holo L; iso A, BO, K, SAR, SING), Borneo, Sarawak, 5th Division, Lawas District, Ulu Sg. Kapulu, Bukit Bugoh.

Woody climber to 5 m high. *Branchlets* glabrous or minutely papillose-puberulent. *Leaves*: petiole 6–17 mm long, glabrous; blade elliptic to oblong or slightly obovate, 3.7–23.5 by 1.5–9.1 cm, 1.7–4.4 times as long as wide, apex shortly acuminate, rarely to rounded, base cuneate to obtuse, glabrous above and beneath, 8–26 pairs of secondary veins, slightly ascending, tertiary venation subperpendicular to midrib and oblique to secondary veins, and also reticulate. *Inflorescence* 1.3–3.1 cm long, several-flowered; peduncle 0–0.5 cm long, glabrous; pedicels 0.5–5 mm long, glabrous to minutely papillose-puberulent. *Sepals* ovate, often somewhat fused at base, 0.7–1.3 by 0.7–1.1, 0.7–1.3 times as long as wide, apex obtuse, glabrous, ciliate. *Corolla* tube 2.8–5.5 mm long, 2.8–4.7 times as long as calyx, 2.4–4 times as long as lobes, glabrous to minutely puberulent outside, sparsely to densely pubescent around stamens inside; lobes falcate with a fimbriate projection to one side, 0.7–2.7 by 1.5–2 mm (measuring the projection as part of the width), 0.5–0.8 times as long as wide, glabrous inside and outside; corona of 10 flattened triangular lobes free to base, 0.4–0.8 mm long, glabrous. *Stamens* inserted at 1.7–2.9 mm from corolla base which is c. 0.5 of tube length; filaments c. 0.4 mm long; anthers 0.9–1.6 by 0.3–0.6 mm. *Ovary* 1–1.4 mm high; style 0.7–1.1 mm long; style head 0.5–1 mm long. *Fruit* globose or subglobose, 3.3–7.4 by 3.3–7.5 cm. *Seeds* 9–15 by 4–7 by 3 mm.

Distribution — Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines, Sulawesi, Lesser Sunda Islands (Bali).

Habitat & Ecology — In forest mainly at higher altitudes.

Uses — Yields a poor quality rubber which is said to be highly poisonous. The bark yields a short fibre.

Note — *Melodinus coriaceus* Oliv. is not a new combination based on *Alyxia coriacea* Wall. Therefore, a combination in *Melodinus* is not available for the oldest epithet in this species, *Alyxia coriacea* Wall.

9. *Melodinus philippinensis* A.DC.

Melodinus philippinensis A.DC., Prodr. 8 (1844) 330; Miq., Fl. Ned. Ind. 2 (1857) 397; Markgr., Blumea 19 (1971) 152; Leeuwenb., Syst. Geogr. Pl. 73 (2003) 48. — Type: *Cuming 1574* (lecto E, designated here; iso A, BM, C, G, G-DC, K L, M, MO, NY, P), Philippines, Mindoro.

Leaves: petiole 4–10 mm long, glabrous; blade oblong to narrowly ovate, 4.3–11 by 1–3.5 cm, 2.3–4.3 times as long as wide, apex obtuse to rounded, base cuneate to obtuse, glabrous above and beneath, 8–20 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* 2.6–5 cm long, rather few-flowered; peduncle 0.4–1.6 cm long, sparsely and minutely puberulent; pedicels 3.8–4.6 mm long, sparsely to densely minutely puberulent. *Sepals* ovate, 2.2–3.1 by 1.5–2.2 mm, 1.4–1.5 times as long as wide, apex obtuse to rounded. *Corolla* tube 10.7–11.8 mm long, 3.4–4.4 times as long as calyx, 1.6–1.8 times as long as lobes, outside densely minutely puberulent at base and more sparsely so higher up, inside densely pubescent; lobes elliptic, 5.8–8.8 by 4.3–4.7 mm, 1.2–1.9 times as long as wide, apex rounded, glabrous outside and inside, ciliate; corona of free lobes, densely pubescent. *Stamens* inserted at c. 2.7 mm from corolla base which is c. 0.25 of tube length; filaments c. 1.2 mm long; anthers c. 1.7 by 0.5 mm. *Ovary* 1.3 mm high; style 1.1 mm long; style head 1.5 mm long. *Fruit* unknown.

Distribution — *Malesia*: Philippines.

Note — Only known from the type.

27. MICRECHITES

Micrechites Miq., Fl. Ned. Ind. 2 (1857) 457; Benth. & Hook.f., Gen. Pl. 2 (1876) 714; Hook.f., Fl. Brit. India 3 (1882) 670 (as *Microchites*); K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 163; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1257; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 34; Backer & Bakh.f., Fl. Java 2 (1965) 234. — Type species: *Micrechites polyanthus* (Blume) Miq.

Otopetalum Miq., Fl. Ned. Ind. 2 (1857) 400. — Type species: *Otopetalum micranthum* Miq. (= *M. serpyllifolia*).

Lamechites Markgr., Nova Guinea 14, 2 (1926) 290. — Type species: *Lamechites schlechteri* Markgr. (= *M. rhombifolius*).

Ichnocarpus auct. non R.Br.: P.I. Forst., Austral. Syst. Bot. 5 (1992) 535, p.p.; D.J. Middleton, Blumea 39 (1994) 74, p.p.; P.I. Forst., Fl. Australia 28 (1996) 194, p.p.; Coode et al., Checklist Pl. Brunei (1996) 27, p.p.; D.J. Middleton, Fl. Thailand 7 (1999) 113, p.p.

Climbers; stems sometimes with corky protuberances. *Leaves* opposite; those of a pair equal. *Inflorescence* terminal and/or axillary, often thyrsoid; flowers 5-merous. *Sepals* with or without colleters in the axils. *Corolla* lobes dextrorse in bud, asymmetrical with a slant to the right; tube cylindrical or somewhat inflated, widening at the point of stamen insertion and somewhat constricted at throat; mature corolla salverform. *Stamens* inserted at around the middle of the corolla tube, completely included within

the tube, adnate to the style head; filaments short; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* of 5 lobes or in a ring, shorter than the ovaries. Gynoecium 2-carpellate, apocarpous but apically united into a common style, pubescent (in Malesia); ovules numerous; style head cup-shaped. *Fruit* of paired follicles; linear and narrow; pubescent or glabrous. *Seeds* not beaked; narrowly ovate or linear; glabrous; with an apical coma.

Distribution — 10 species from the Himalayas to New Guinea; in *Malesia* 8 species.

Note — Many species of *Micrechites* show a marked distinction between younger and older growth form with much smaller leaves in the younger forms. They may, however, still flower even in this form.

KEY TO THE SPECIES

- 1a. Inflorescence thyrsoid 2
- b. Inflorescence a loose or congested panicle 4
- 2a. Head of corolla in bud narrower than tube; corolla lobes < 0.6 times as long as tube **7. *M. serpyllifolius***
- b. Head of corolla in bud as wide as or wider than tube, if narrower only slightly so and then flat-topped; corolla lobes > 0.7 times tube length 3
- 3a. Head of corolla bud wider than tube, rounded; stamens included or exerted in mature flower. — Eastern Malesia **6. *M. rhombifolius***
- b. Head of corolla bud not noticeably wider than tube, ± flat-topped; stamens included. — Western Malesia **5. *M. polyanthus***
- 4a. Corolla lobes ≤ 0.6 times as long as tube; corolla bud head mostly narrower than tube 5
- b. Corolla lobes > 0.6 by tube length; corolla bud head mostly as wide as or wider than tube, sometimes narrower 6
- 5a. Inflorescence pubescent; corolla tube > 2 mm long **7. *M. serpyllifolius***
- b. Inflorescence glabrous; corolla tube ≤ 2 mm long **2. *M. glabrus***
- 6a. Head of corolla bud wider than tube, rounded; stamens included or exerted in mature flower **6. *M. rhombifolius***
- b. Head of corolla bud not noticeably wider than tube; stamens included 7
- 7a. Corolla tube glabrous outside 8
- b. Corolla tube pubescent outside 9
- 8a. Young branchlets puberulent; corolla tube > 2 mm long **1. *M. archboldianus***
- b. Young branchlets glabrous; corolla tube ≤ 2 mm long **2. *M. glabrus***
- 9a. Corolla tube 5.7–6.6 mm long **3. *M. grandiflorus***
- b. Corolla tube 1.4–4 mm long 10
- 10a. Inflorescence a loose panicle, not robust; bracts deciduous
- **4. *M. novoguineensis***
- b. Inflorescence congested, robust; bracts usually persistent **8. *M. warianus***

1. *Micrechites archboldianus* Merr. & L.M. Perry

Micrechites archboldianus Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 214. — *Ichnocarpus archboldianus* (Merr. & L.M. Perry) P.I. Forst., Austral. Syst. Bot. 5 (1992) 541; D.J. Middleton, Blumea 39 (1994) 76. — Type: *Brass 13401* (holo A; iso BM, BO, BRI, L, LAE), New Guinea, Papua, 4 km SW of Bernhard Camp, Idenburg River.

Climber. *Branches* puberulent when young, becoming glabrous. *Leaves*: petiole 1–1.5 cm long; blade ovate, elliptic or obovate, 1.8–3.1 times as long as wide, 8.4–16 by 2.5–9 cm, apex long acuminate, base rounded to cuneate; glabrous or sparsely puberulent on midrib beneath; 7–11 pairs of secondary veins. *Inflorescence* of axillary and terminal panicles, 7.5–17 cm long; peduncle glabrous or sparsely puberulent; pedicels sparsely puberulent, 1.1–1.5 mm long. *Sepals* ovate, 1.1–1.5 times as long as wide, 0.9–1.5 by 0.8–1.1 mm, apex obtuse to rounded, very sparsely puberulent or glabrous, ciliate; no colleters seen. *Corolla* yellow with red lobes; in bud the tube is cylindrical with head about the same width; tube 2.8–3.4 by 1.9–2 mm, 2.9–4.7 times as long as calyx, 1–1.3 times as long as lobes, glabrous outside, with a thick row of hairs at the throat; lobes 2.3–3.1 by 0.9–1.1 mm, 2.4–3.2 times as long as wide, glabrous. *Stamens* inserted 1.2–1.3 mm from base, 0.3–0.4 of tube length; filament 0.5–0.7 mm long, with projections or swellings at the sides; anthers 3.2–4 times as long as wide, 1.2–1.6 by 0.3–0.5 mm; narrow triangular, apex acuminate, base sagittate; included in the corolla tube. *Disk* of 5 oblong lobes, slightly narrower at the top, 0.8–1 times as long as the ovary, 0.7–1 mm long. *Ovaries* 0.7–1 mm long, pubescent; style 0.8–0.9 mm long; style head 0.6–0.9 mm long with a cup-shaped base. *Fruit* (immature) fusiform, warty lenticellate, 3.7–8.9 cm by 4.5–6 mm.

Distribution — *Malesia*: New Guinea (Papua).

Habitat & Ecology — Primary forest at 450–850 m altitude.

2. *Micrechites glabrus* D.J. Middleton

Micrechites glabrus D.J. Middleton, Harvard Pap. Bot. 9 (2005) 383. — Type: *De Wilde, Postar & Tajudin SAN 143957* (holo SAN; iso K, L, SING), Borneo, Sabah, Pinangah District, Imbak River, Camp 1.

Liana to 10 m high with white latex. *Branchlets* not lenticellate, glabrous. *Leaves*: petiole 7–11 mm long, glabrous; blade obovate, 3–6.1 by 1.5–3.4 cm, 1.6–2.6 times as long as wide, apex abruptly acuminate with a blunt tip, base narrowly cuneate, glabrous above and beneath, 7–9 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* pendant, terminal and axillary forming terminal panicles, fairly delicate, 5.5–17 cm long, many-flowered; peduncle 0.6–3.2 cm long, glabrous; pedicels 1.5–2.5 mm long, glabrous. *Sepals* ovate, c. 0.8 by 0.8 mm, 1 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* yellow; in bud tube slightly inflated with globose bud head slightly smaller to same width; tube 1.8–2 by 1.3 mm, 2.2–2.5 times as long as calyx, 1.2–1.7 times as long as lobes, glabrous outside, pubescent in upper part of tube and around stamens inside, densely pubescent in throat; lobes 1.2–1.5 by 0.8–0.9 mm, 1.5–1.7 times as long as wide, 0.6–0.8 times as long as tube, falcate, apex acute, glabrous outside and inside except at very base of lobes inside. *Stamens* inserted at 0.9 mm from corolla base which is c. 0.4 of tube length; anthers 0.7 by 0.3 mm, 2.3 times

as long as wide, triangular in outline. *Disk* a ring, 5-crenate, 0.5 mm high, 0.8 times as long as ovaries. Gynoecium consisting of two free carpels which unite into a common style; ovaries 0.6 mm high, sparsely pubescent; style 0.3 mm long; style head 0.5 mm long. *Fruit* unknown.

Distribution — *Malesia*: Borneo (Sabah).

Habitat & Ecology — Edge of damp forest at 200 m altitude.

Note — Only known from the type collection.

3. *Microchites grandiflorus* (D.J. Middleton) D.J. Middleton

Microchites grandiflorus (D.J. Middleton) D.J. Middleton, *Taxon* 55 (2006) 503. — *Ichnocarpus grandiflorus* D.J. Middleton, *Blumea* 39 (1994) 80. — Type: *Brass* 28217 (holo L; iso A, BO, K, PNH, S, US), Papua New Guinea, Sudest Island, Rambuso.

Climbing shrub. *Branches* densely tomentose with longer hispid hairs. *Leaves*: petiole 1.6–2.6 cm long, tomentose; blade ovate, 9.1–14.1 by 5.5–8.7 cm, 1.3–1.7 times as long as wide, apex acuminate, base obtuse; subcoriaceous; densely tomentose beneath, becoming glabrous above; 10–13 pairs of secondary veins. *Inflorescence* terminal and axillary forming a panicle, 7.1–12 cm long; tomentose with longer hispid hairs; pedicels 2–2.6 mm long. *Sepals* ovate, 1.9 times as long as wide, 3 by 1.6 mm, apex obtuse, densely tomentose; no colleters seen. *Corolla* yellow; in bud tube cylindrical with head about the same width; tube 5.7–6.6 mm long, outside densely pubescent, pubescent in throat and inside; lobes 0.8 times as long as the tube, 4.6–5 mm long, densely pubescent on part of lobes exposed in bud. *Stamens* inserted at c. 2.1 mm from base, c. 0.3 of tube length; filaments 0.9 mm long, with projections from the side; anthers 5.6 times as long as wide, 3.9 by 0.7 mm, narrow triangular, apex acuminate, base sagittate; included in the corolla tube. *Disk* of 5 oblong lobes; 0.6 times as long as the ovary, 0.6 mm long. *Ovaries* 1 mm long, pubescent; style 1.8 mm long; style head 1 mm long, base cup-shaped. *Fruit* unknown.

Distribution — *Malesia*: New Guinea.

Note — This species is undoubtedly closely related to *M. novoguineensis* from which it is easily distinguished by its very much larger flowers. It is so far known only from the type collection.

4. *Microchites novoguineensis* K. Schum.

Microchites novoguineensis K. Schum. in K. Schum. & Lauterb., *Nachtr. Fl. Schutzgeb. Südsee* (1905) 350. — *Ichnocarpus novoguineensis* (K. Schum.) D.J. Middleton, *Blumea* 39 (1994) 82. — *Papuechites novoguineensis* (K. Schum.) Markgr., *Bot. Jahrb. Syst.* 61 (1927) 210. — Type: *Schlechter* 14609 (untraced, probably destroyed in B). Neotype: *Schlechter* 16928 (neo A, designated by Middleton (2005) op. cit.; iso BM, BRI, G, L, MO), Papua New Guinea, Madang Province, Djamu River.

Ichnocarpus xanthogalax Schltr., *Kautschukexp. Kaiser Wilhelmsland* (1911) 126. — Type: Untraced.

Climber. *Branches* tomentose with longer hispid hairs, often becoming glabrous. *Leaves*: petiole 0.5–2 cm long; blade ovate to elliptic, 1.3–3.3 times as long as wide, 3.7–12.6 by 1.7–8.7 cm, apex acuminate, rarely to obtuse, base obtuse to weakly cordate; tomentose above and beneath, tomentose beneath and glabrous above or, rarely,

glabrous on both surfaces; 7–15 pairs of secondary veins. *Inflorescence* of terminal and axillary panicles, 3.4–14.7 cm long; peduncle tomentose; pedicels tomentose, 0.8–4.5 mm long. *Sepals* ovate, 1.1–2.2 times as long as wide, 0.9–1.8 by 0.5–1.2 mm, apex obtuse or rounded, sparsely to densely tomentose or puberulent. *Corolla* pink; in bud the tube is cylindrical and the head about the same width; tube 1.4–4 by 2.1–2.4 mm, 2.5–3.3 times as long as calyx, 0.7–1.4 times as long as lobes, outside densely pubescent, rarely sparsely so, pubescent to glabrous in throat and inside tube; lobes 2–3.8 by 0.8–1.3 mm, 1.6–5.4 times as long as wide, outside pubescent on parts exposed in bud. *Stamens* inserted at 0.7–1.7 mm from base, 0.3–0.4 of tube length; filaments with projections at the sides; anthers 3–4.3 times as long as wide, 1.2–1.7 by 0.3–0.5 mm; narrow triangular, apex acuminate, base sagittate; included in corolla tube. *Disk* of 5 elliptic or oblong lobes; 0.6–1.1 times as long as ovary, 0.3–1 mm long. *Ovaries* 0.5–1.2 mm long, pubescent; style 0.7–1.1 mm long; style head 0.5–1.2 mm long with a cup-shaped base. *Fruit* fusiform; weakly tomentose, 3.2–4.7 by 1.3–1.8 cm. *Seeds* 8–9 by 3.7–4.4 mm; coma brownish, 1–2 cm long.

Distribution — *Malesia*: Papua New Guinea.

Habitat & Ecology — In forest to 1000 m altitude.

Note — The specimen cited by P.I. Forster (1992) as being a taxon of uncertain status (*Henty NGF 16964*) belongs to this species.

5. *Micrechites polyanthus* (Blume) Miq.

Micrechites polyanthus (Blume) Miq., Fl. Ned. Ind. 2 (1857) 457; Hook.f., Fl. Brit. India 3 (1882) 671; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 504; Tsiang, Sunyatsenia 2 (1934) 126; Backer & Bakh.f., Fl. Java 2 (1965) 234; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 194; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 46. — *Tabernaemontana polyantha* Blume, Bijdr. (1826) 1029. — *Ichnocarpus polyanthus* (Blume) P.I. Forst., Austral. Syst. Bot. 5 (1992) 544; D.J. Middleton, Blumea 39 (1994) 82; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; D.J. Middleton, Fl. Thailand 7 (1999) 116. — Type: *Blume s.n.* (lecto L [898.111-50], designated by P.I. Forster (1992) op. cit.; iso L, NY, P), Java.

Ichnocarpus pubiflorus Hook.f., Fl. Brit. India 3 (1882) 670. — *Micrechites pubiflorus* (Hook.f.) Kerr in Craib, Fl. Siam. 2 (1939) 462. — Type: *Griffith s.n.* (lecto K, designated by Middleton (1994) op. cit.; CGE, M, P), India, Meghalaya, Khasia Hills.

Micrechites ellipticus Hook.f., Fl. Brit. India 3 (1882) 671; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 505. — Type: *Hooker & Thomson s.n.* (lecto K, designated by Middleton (1994) op. cit.; BM, G, GH, L, TCD), India, Meghalaya, Khasia Hills.

Micrechites baillonii Pierre, Rev. Cultures Colon. 11 (1902) 229; Spire, Contr. Apocyn. (1905) 48; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1260. — *Ichnocarpus baillonii* (Pierre) Lý, Feddes Repert. 97 (1986) 675. — Type: *Balansa 2084* (lecto P, designated by Lý (1986) op. cit.; iso G, K, P), Vietnam, Hanoi, Mont Bavi.

Micrechites ellipticus Hook.f. var. *scortechinii* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 505. — *Micrechites scortechinii* (King & Gamble) Ridl., J. Straits Branch Roy. Asiat. Soc. 79 (1918) 95; Fl. Malay Penins. 2 (1923) 368. — Type: *Scortechini s.n.* (holo K), Peninsular Malaysia, Perak.

Micrechites radicans Markgr., Bot. Jahrb. Syst. 61 (1927) 205. — *Ichnocarpus radicans* Wall., Numer. List. 1676 (1829), nom. nud. — Type: *Wallich 1676* (lecto K-W, designated by Middleton (1994) op. cit.; iso K), India.

Micrechites ferrugineus Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1260; Lý, Feddes Repert. 97 (1986) 673. — Type: *Poillane 1894* (lecto HM, designated by Lý (1986) op. cit.; iso P), Laos, Samneua Province, Muong-pun.

Micrechites lachnocarpus Tsiang, Bull. Fan Mem. Inst. Biol. Bot. 9 (1939) 22; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 189; Lý, Feddes Repert. 97 (1986) 673. — Type: *Wang 79164* (holo IBSC; iso A), China, Yunnan, Che-li, Jah-Leei.

Micrechites rehderianus Tsiang, Bull. Fan Mem. Inst. Biol. Bot. 9 (1939) 23; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 194. — Type: *Tsang 22409* (holo SYS n.v.; iso A).

Ichnocarpus himalaicus T. Yamaz., J. Jap. Bot. 46, 2 (1971) 49; Chater, Enum. Flow. Pl. Nepal 3 (1982) 83. — Type: *Hara et al. 10196* (holo TI; iso BM, TI), Nepal, Ghatte-Khebang.

Micrechites malipoensis Tsiang & P.T. Li var. *parvifolius* Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 383. — Type: *Feng 22691* (holo KUN), China, Yunnan, Ma-Li-Po.

Branches glabrous or puberulent, becoming glabrous. *Leaves*: petiole glabrous or, rarely, with a few small hairs, 0.3–2.1 cm long; blade elliptic, rarely obovate, 1.6–4.2 times as long as wide, 0.9–17.2 by 0.2–6.1 cm, apex sharp acuminate to caudate, rarely to rounded, base cuneate, rarely to rounded; coriaceous; mostly glabrous, sometimes very sparsely puberulent on midrib beneath or all over beneath; 6–21 pairs of secondary veins. *Inflorescence* axillary and terminal, 1–16.5 cm long; peduncle glabrous to tomentose; pedicels glabrous to tomentose, 1–3.5 mm long. *Sepals* ovate to oblong, 1.1–3 times as long as wide, 1–3.4 by 0.7–1.5 mm, apex acute to rounded, glabrous to tomentose; colleters present. *Corolla* yellow or white; in bud the tube is cylindrical and the head not much wider, not very constricted at throat; tube 2–4.6 by 1.2–2.7 mm, 0.6–1.4 times as long as lobes, 1.6–3.3 times as long as calyx, outside glabrous or, rarely, very sparsely puberulent, inside pubescent; lobes 2–7.2 by 0.7–1.7 mm, 2.7–3.6 times as long as wide, outside glabrous, densely pubescent in tube throat. *Stamens* inserted 0.7–1.6 mm from base, 0.2–0.5 of tube length; anthers subsessile, 3.5–9 times as long as wide, 1.5–2.9 by 0.2–0.6 mm, narrowly triangular, apex acuminate, base sagittate; included in the corolla tube. *Disk* entire with 5 thick lobes; 0.2–0.5 times as long as the ovary, 0.2–0.5 mm long. *Ovaries* 0.6–1.4 mm long, pubescent; style 0.3–1.3 mm long, glabrous or pubescent; style head 0.5–1.3 mm long with a cup-shaped base. *Fruit* villous to glabrous, 10–27 cm by 2.3–7 mm. *Seeds* 1.9–2.5 cm by 2.1–5 mm; coma 2.3–3.2 cm long.

Distribution — India, Nepal, Bhutan, Burma, southern China, Thailand, Vietnam, Laos; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java.

Note — This species is extremely variable particularly in leaf shape and size and in indumentum.

6. *Micrechites rhombifolius* Markgr.

Micrechites rhombifolius Markgr., Bot. Jahrb. Syst. 61 (1927) 206. — *Ichnocarpus rhombifolius* (Markgr.) D.J. Middleton, Blumea 39 (1994) 84; P.I. Forst., Fl. Australia 28 (1996) 196; Kessler et al., Blumea, Suppl. 14 (2002) 14. — Type: *Ledermann 10411* (lecto L, designated by P.I. Forster (1992) op. cit.), Papua New Guinea, West Sepik Province.

Lamechites schlechteri Markgr., Nova Guinea 14, 2 (1926) 290, t. 32; Bot. Jahrb. Syst. 61 (1927) 212. — Type: *Schlechter 17266* (lecto A, designated by Middleton (1994) op. cit.; iso BM, BRI, G, K, L, S, US), Papua New Guinea, Madang Prov., Minjem Tor.

Micrechites rhombifolius Markgr. var. *lanceolatus* Markgr., Bot. Jahrb. Syst. 61 (1927) 206. — Type: *Ledermann 7200* (lecto L, designated by Middleton (1994) op. cit.; iso SING), Papua New Guinea, West Sepik Province.

Ichnocarpus salomonensis C.T. White, J. Arnold Arbor. 31 (1950) 112. — Type: Walker & White BSIP 117 (lecto BRI, designated by P.I. Forster (1992) op. cit.; iso A, CANB, K, L), Solomon Islands, Malaita, near Heho River.

Ichnocarpus serpyllifolius auct. non (Blume) P.I. Forst.: P.I. Forst., Austral. Syst. Bot. 5 (1992) 539, p.p.

Climber to 40 m. *Branchlets* puberulent or, rarely, tomentose, usually becoming glabrous with age. *Leaves*: petiole glabrous or puberulent, 0.4–2.5 cm long, blade orbicular, obovate or elliptic, 1.1–3.6 times as long as wide, (1.2–)1.6–11 by 0.6–6.2 cm, apex rounded to short blunt acuminate, base cuneate, rarely obtuse; coriaceous; tomentose, puberulent or glabrous above and beneath; 5–13 pairs of secondary veins. *Inflorescence* axillary and terminal, 1–13 cm long; peduncle puberulent to densely pale tomentose; pedicels pale tomentose, 1–6 mm long. *Sepals* oblong, obtuse to rounded, 0.7–1.8 times as long as wide, 0.7–4.3 by 0.9–2.4 mm; tomentose; many colleters. *Corolla* cream; in bud tube narrow with a large rounded head; tube 2.4–7.5 by 1.3–1.7 mm, 2.3–2.6 times as long as calyx, 0.6–1 times as long as lobes, outside glabrous or pubescent, densely pubescent at tube throat; lobes 2.5–7.5 by 1–1.3 mm, 3.8–4.7 times as long as wide, outside glabrous or puberulent on part exposed in bud, inside pubescent at base and in throat. *Stamens* inserted 1.7–3 mm from base, 0.4–0.7 of tube length; anthers subsessile, 3.7–8.3 times as long as wide, 2–2.7 by 0.3–0.6 mm, narrow triangular, apex acuminate, base sagittate; included or exerted. *Disk* entire, 5-lobed, 0.2–0.6 times as long as ovary, 0.3–0.7 mm long. *Ovaries* 0.7–1.2 mm long, pubescent; style head 0.7–1.3 mm long with a cup-shaped base. *Fruit* glabrous to tomentose, 8.4–30 cm by 2.8–20 mm. *Seeds* linear; 2 cm by 1.4 mm; coma fawn, 2.9–3 cm long.

Distribution — Solomon Islands, Australia (Queensland); in *Malesia*: Sulawesi, Moluccas, New Guinea (including New Britain and Bougainville).

Note — The scant Sulawesi material appears to belong to both *M. serpyllifolius* and *M. rhombifolius* although in this case it then becomes difficult to assign the immature material to one or the other.

7. *Micrechites serpyllifolius* (Blume) Kosterm.

Micrechites serpyllifolius (Blume) Kosterm., Reinwardtia 5 (1960) 246. — *Ficus serpyllifolia* Blume, Bijdr. 1 (1825) 443. — *Ichnocarpus serpyllifolius* (Blume) P.I. Forst., Austral. Syst. Bot. 5 (1992) 539; D.J. Middleton, Blumea 39 (1994) 85; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; D.J. Middleton, Fl. Thailand 7 (1999) 117; PROSEA 18 (2000) 127; Kessler et al., Blumea, Suppl. 14 (2002) 14. — Type: *Blume s.n.* (lecto L [908.188-2695], designated by P.I. Forster (1992) op. cit., 1st step, and Middleton (1994) op. cit., 2nd step; iso BO, L), Java.

Otopetalum micranthum Miq., Fl. Ned. Ind. 2 (1857) 400. — *Micrechites micranthum* (Miq.) Hallier f., Jahrb. Hamburg Wiss. Anst. 17, Beih. 3 (1900) 156; Bakh.f., Blumea 6 (1950) 389; Backer & Bakh.f., Fl. Java 2 (1965) 234. — Type: *Unknown collector 53765* (holo U), Java.

Ecdysanthera schrieckii Van Heurck & Müll. Arg. in Van Heurck, Observ. Bot. (1871) 191. — *Micrechites schrieckii* (Van Heurck & Müll. Arg.) Rolfe, J. Bot. 23 (1885) 214; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 332; Tsiang, Sunyatsenia 2 (1934) 126. — Type: *Cuming 910* (holo AWH; iso A, BM, CGE, E, G, K, L, M, MEL, MO, P, W), Philippines, Luzon.

Trachelospermum philippinense Elmer, Leafl. Philipp. Bot. 2 (1908) 488. — Type: *Elmer 9135* (lecto K, designated by Middleton (1994) op. cit.; iso A, BO, E, G, MO, NY, W, Z), Philippines, Luzon, Tabayas Prov., Lucban.

Micrechites furcatus Ridl., J. Straits Branch Roy. Asiat. Soc. 79 (1918) 95; Fl. Malay Penins. 2 (1923) 368; Burkill & M.R. Hend., Gard. Bull. Straits Settlem. 3 (1925) 397. — Type: *King’s collector*

8859 (lecto K, designated by Middleton (1994) op. cit.; iso BM, K), Peninsular Malaysia, Perak, Bernam River.

Microchites brachypetalus Ridl., J. Straits Branch Roy. Asiat. Soc. 79 (1918) 96; Fl. Malay Penins. 2 (1923) 368. — Type: *Curtis 850* (lecto K, designated by Middleton (1994) op. cit.; iso BM, SING), Peninsular Malaysia, Penang, Penaru Bukit.

Microchites tenuifolius Ridl., J. Straits Branch Roy. Asiat. Soc. 79 (1918) 96; Fl. Malay Penins. 2 (1923) 369. — Type: *Maingay 3394* (holo K), Peninsular Malaysia.

Microchites polyanthus auct. non Miq.: King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 504.

Branchlets sparsely villous, puberulent or glabrous, becoming glabrous with age; often sparsely lenticellate. *Leaves*: petiole glabrous or puberulent, (0.4–)0.6–1.6 cm long; blade orbicular, elliptic or obovate, 1.1–3.3 times as long as wide, (0.6–)3–11.5 by (0.3–)1–5.6 cm, apex usually short blunt acuminate, sometimes obtuse or rounded, base cuneate to rounded; coriaceous, rarely subcoriaceous; very sparsely puberulent on midrib beneath, sparsely puberulent all over beneath, completely glabrous or, rarely, sparsely villous beneath; 5–16 pairs of secondary veins. *Inflorescence* axillary and terminal; 1.2–12 cm long; peduncle tomentose or puberulent, rarely glabrous; pedicels tomentose or puberulent, 0.4–2.1 mm long. *Sepals* ovate, 0.7–2 times as long as wide, 0.8–1.5 by 0.6–1.1 mm, apex obtuse to rounded, tomentose or puberulent; colleters few or many. *Corolla* cream; in bud tube somewhat inflated and with a small narrow head; tube 2.1–5 by 1.2–1.5 mm, 2.5–3.6 times as long as calyx, 1.7–3.3 times as long as lobes, outside glabrous or rarely puberulent, pubescent inside in upper part of tube; lobes 0.7–2.1 by 0.7–0.9 mm, 1.1–1.8 times as long as wide, outside glabrous or rarely puberulent, densely pubescent in tube throat. *Stamens* inserted 1.2–2.3 mm from base which is 0.4–0.6 of tube length; anthers sessile, 3.6–5.3 times as long as wide, 1.3–2.5 by 0.3–0.7 mm, narrow triangular, apex acuminate, base sagittate; included in the corolla tube or very slightly exerted. *Disk* entire, broadly 5-lobed, 0.2–0.5 times as long as ovary, 0.2–0.5 mm long. *Ovaries* 0.6–1.2 mm long, pubescent; style 0.5–1.2 mm long; style head 0.6–1 mm long with a cup-shaped base. *Fruit* glabrous; 1.8–7.2 cm by 2.5–5.6 mm. *Seeds* linear; 1.2–2.9 cm by 1.3–2.3 mm; coma fawn, 1.8–4.6 cm long.

Distribution — Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines, Sulawesi.

Habitat & Ecology — Climber in forest to 1300 m altitude.

Uses — Previously yielded a non-commercial rubber before the widespread use of *Hevea brasiliensis*.

8. *Microchites warianus* (Schltr.) D.J. Middleton

Microchites warianus (Schltr.) D.J. Middleton, Taxon 55 (2006) 503. — *Parameria wariana* Schltr., Kautschukexp. Kaiser Wilhelmsland (1911) 127. — *Papuechites warianus* (Schltr.) Markgr., Bot. Jahrb. Syst. 61 (1927) 210. — *Ichnocarpus warianus* (Schltr.) D.J. Middleton, Blumea 39 (1994) 86. — Type: *Schlechter 17474* (lecto K, designated by Middleton (1994) op. cit.; iso G), Papua New Guinea, Morobe Prov., Goromia.

Branches glabrous to tomentose. *Leaves*: petiole 5–16 mm long; blade elliptic to ovate, 1.2–4 times as long as wide, 3–12.2 by 1.2–6.1 cm, apex acuminate, base acute to rounded; coriaceous, sparsely puberulent on midrib beneath, 8–11 pairs of secondary

veins. *Inflorescence* terminal and axillary panicles, rather congested; 5.5–10 cm long; densely tomentose; pedicels 1–2.5 mm long. *Sepals* ovate, 1.1–1.7 times as long as wide, 1.6–2.2 by 1.2–1.7 mm, apex obtuse to rounded, tomentose; no colleters seen. *Corolla* cream coloured or pinkish; in bud with cylindrical tube and head about same width; tube 2.4–3.4 mm long, outside pubescent, pubescent in throat and pubescent inside; lobes 0.7–0.9 times as long as the tube, 2–2.8 mm long, pubescent on parts exposed in bud. *Stamens* inserted at 1.6–1.9 mm from base, 0.4–0.5 of tube length; filament 0.3–0.5 mm long with projections from the side; anthers 3.7–5.7 times as long as wide, 1.5–1.7 by 0.3–0.4 mm; narrow triangular, apex acuminate, base sagittate; included in the corolla tube. *Disk* of 5 elliptic or oblong lobes joined at base, 0.6–1 times as long as ovary, 0.6–0.9 mm long. *Ovaries* 0.8–1 mm long, pubescent; style 1–1.4 mm long; style head 0.7–1 mm long, base cup-shaped. *Fruit* (immature) terete and densely tomentose.

Distribution — *Malesia*: Papua New Guinea.

Habitat & Ecology — Climber in forest at 100–600 m altitude.

Note — The specimen cited by P.I. Forster (1992) as being a taxon of uncertain status (*Clemens 1504a*) belongs to this species.

28. OCHROSIA

(Hendrian)

- Ochrosia* Juss., Gen. Pl. (1789) 144; A.DC., Prodr. (1844) 356; Seem., Fl. Vit. (1865) 158; F. Muell., Fragm. 7 (1871) 130; Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 225; Markgr., Bot. Jahrb. Syst. 61 (1927) 189; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1130; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 205; Backer & Bakh.f., Fl. Java 2 (1965) 231; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 17; Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 47; D.J. Middleton, Fl. Thailand 7 (1999) 64; PROSEA 12, 2 (2001) 386; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 42; Hendrian, Blumea 49 (2004) 104. — *Ochrosia* Juss. sect. *Lactaria* F. Muell., Fragm. 7 (1871) 130; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 206. — *Ochrosia* Juss. subg. *Lactaria* (F. Muell.) Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 225. — *Ochrosia* sensu Fosberg & Sachet, Micronesica 8 (1972) 47; 10 (1974) 254; Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 23; Markgr., Blumea 25 (1979) 233; Boiteau & L. Allorge, Fl. Nouv. Caledonie 10 (1981) 47. — Type species: *Ochrosia maculata* Jacq. (= *Ochrosia borbonica* J.F. Gmel., nom.nud.).
- Neiosperma* Raf., Sylva Telur. (1838) 162; Fosberg & Sachet, Micronesica 8 (1972) 48 (as *Neiosperma*); 10 (1974) 254, 255 (as *Neiosperma*); Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 28; Markgr., Blumea 25 (1979) 241; Boiteau & L. Allorge, Fl. Nouv. Caledonie 10 (1981) 64; P.I. Forst., Austrobaileya 4 (1993) 14; M.E. Endress & Bruyns, Bot. Rev. 66 (2000) 34. — Type species: *Neiosperma muricata* Raf. (= *N. oppositifolia* (Lam.) Fosberg & Sachet = *Ochrosia oppositifolia* (Lam.) K. Schum.), designated by Markgraf (1979).
- Lactaria* Rumph. ex Raf., Sylva Telur. (1838) 162, nom.illeg.; Koidz., Bot. Mag. (Tokyo) 37 (1923) 48 (excluding *L. borbonica* J.F. Gmel. = *Ochrosia borbonica* J.F. Gmel.). — Type species: *Lactaria salubris* Rumph. ex Raf. (= *Ochrosia oppositifolia* (Lam.) K. Schum.).
- Pseudochrosia* Blume, Mus. Bot. 1 (1850) 158; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 156. — Type: *Pseudochrosia glomerata* Blume (= *Ochrosia glomerata* (Blume) F. Muell.).
- Ochrosia* Juss. sect. *Echinocaryon* F. Muell., Fragm. 7 (1871) 130; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 209. — *Ochrosia* Juss. subg. *Echinocaryon* Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 225. — Type species: *Ochrosia kilneri* F. Muell.

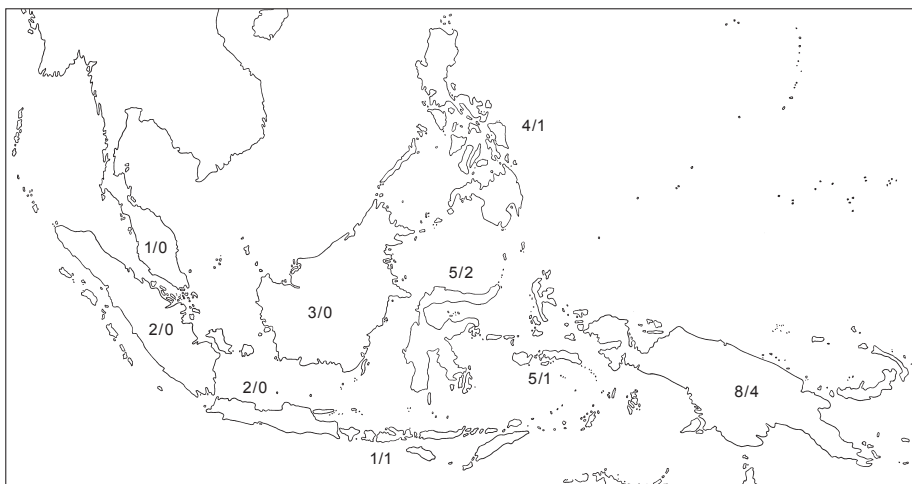
Bleekeria Hassk. emend. Koidz., Bot. Mag. (Tokyo) 37 (1923) 51. — Type: *Bleekeria kalokarpa* Hassk. (= *Ochrosia elliptica* Labill.).

Excavatia Markgr., Bot. Jahrb. Syst. 61 (1927) 194; Bernice P. Bishop Mus. Bull. 141 (1936) 127. — Lectotype: *Excavatia littoralis* (Merr.) Markgr. (= *Ochrosia ackeringae* (Teijsm. & Binn.) Miq.), designated by Leeuwenberg (1988).

Ochrosia Juss. sect. *Phragmochrosia* Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 211. — Type: *Ochrosia apoensis* Elmer.

Trees or shrubs with white latex. *Branchlets* terete, subangular or angular, glabrous, not lenticellate. *Leaves* in whorls of 2–4(–6), papyraceous to coriaceous when dried, glabrous. *Inflorescence* terminal and axillary cymes, in whorls or solitary, loose or congested, glabrous, often with bracts; peduncle sometimes winged (in Malesia occurs only in 2 species). *Flowers* sometimes fragrant, small, pedicellate; pedicels bracteolate. *Sepals* ovate, or suborbicular to orbicular, without colleters inside, connate at base. *Corolla* salverform, villose inside, glabrous outside; lobes elliptic, obovate, narrowly elliptic or narrowly ovate, dextrorse, glabrous. *Stamens* included, free from each other and gynoecium; filaments filiform, short. Gynoecium of 2 carpels (which are usually distinctly separated); disk absent or of 2 lobes, small; style filiform, split or not at base. *Fruit* usually apocarpous, rarely hemisyncarpous or syncarpous, drupaceous, smooth to verrucose, or with fine irregular ridges when dried, green and turning yellow, orange, red or purple when ripe; mericarps ellipsoid, obovoid, ovoid or subglobose, rarely (not in Malesian species) discoid or boat-shaped, round in transverse section or dorsiventrally compressed, sometimes with lateral and/or apical ridges, or with lateral and/or apical wing (not in Malesian species); endocarps split into diverging fibres, or consisting of thick and massive tissue, surrounding 2 lateral cavities. *Seeds* 1–3 on each placenta, with a wing-like structure along the margin.

Distribution — About 40 species, of which 13 species in *Malesia*. The majority of species are in the Pacific Islands. Spread from the Mascarene Islands and Seychelles in



Map 8. Distribution of *Ochrosia* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

the west and throughout South Asia, Indochina, Malesia, northern Australia, and Pacific Islands as far east as the Marquesas and Hawaiian Islands. — **Map 8.**

For a discussion of the generic and sectional delimitation and keys for the species within the sections see Hendrian (2004).

KEY TO THE SECTIONS

- 1a. Fruits apocarpous; mericarps verrucose to smooth, or with fine irregular ridges when dried, more or less round in transverse section, not compressed; endocarps split into diverging fibres, lateral cavities absent Sect. **Echinocaryon**
- b. Fruits apocarpous, rarely hemisyncarpous, or syncarpous; mericarps often smooth when dried, often dorsiventrally compressed or biconvex in transverse section; endocarps not split into diverging fibres, hard, thick, massive surrounding 2 lateral cavities Sect. **Ochrosia**

Species 1, 6, 9, 12 and 13 are in section *Ochrosia*, species 2, 3, 5, 7, 8, 10 and 11 are in section *Echinocaryon*, and the section of species 4 is unknown. For descriptions of the sections and keys to the species within each section see Hendrian (2004). The key below is for all species in the genus.

KEY TO THE SPECIES

- 1a. Secondary veins arcuate ascending, not more than 20 pairs, not joining, not forming a submarginal vein 2
- b. Secondary veins straight to rather arcuate ascending, 10 to more than 40 pairs, joining, forming a submarginal vein 3
- 2a. Leaves in whorls of 2–4; blades papyraceous. Inflorescence 4–9 cm long. Sepals ovate; stamens inserted at 0.7–0.8 of the length of the corolla tube **7. O. ficifolia**
- b. Leaves in whorls of 4–6(–7); blades coriaceous. Inflorescence 9.5–18.5 cm long; sepals suborbicular to orbicular; stamens inserted at 0.2 of the length of the corolla tube **4. O. basistamina**
- 3a. Leaf blades width 1–1.7 cm, ratio 4.2–7.1. Fruits syncarpous. . **12. O. syncarpa**
- b. Leaf blades width 2.1–18 cm, ratio 1–5.8. Fruits apocarpous or hemisyncarpous 4
- 4a. Leaf blades papyraceous when dried. Peduncle winged 5
- b. Leaf blades coriaceous or papyraceous when dried. Peduncle not winged (unknown in *O. tenimberensis*). 6
- 5a. Leaf apex acute or acuminate; peduncle 3.5–6 cm long; corolla tube 3.9–4 mm long; mericarps less than 1.5 cm long **9. O. minima**
- b. Leaf apex cuspidate; peduncle 0.6–3.3 cm long; corolla tube 13 mm long; mericarps up to 4.6 cm long **6. O. coccinea**
- 6a. Calyx ciliolate at margin; fruits hemisyncarpous **1. O. ackeringae**
- b. Calyx not ciliolate at margin (unknown in *O. tenimberensis* and *O. sciadophylla*); fruits apocarpous 7
- 7a. Mericarps smooth when dried; endocarps massive, hard, surrounding 2 lateral cavities **13. O. tenimberensis**

- b. Mericarps verrucose to remotely so, or with fine irregular ridges when dried; endocarps loosely fibrous; lateral cavities absent 8
- 8a. Secondary veins frequently anastomosing around the submarginal vein; submarginal vein angled, 0.3–1 cm inside from the margin; fibres of the endocarps hard and thick; seeds 3 at either placenta **5. *O. citrodora***
- b. Secondary veins infrequently anastomosing around the submarginal vein; submarginal vein not angled, close to the margin; fibres of the endocarps rather slender and thin (except for *O. oppositifolia*, which are slender and thin or hard and thick); seeds 1 or 2 at either placenta 9
- 9a. Secondary veins less than 17 pairs. Mericarps length 2.8–4.7 cm 10
- b. Secondary veins 20 to more than 40 pairs. Mericarps length 4.1–8.5 cm 11
- 10a. Leaf apex acute to abruptly acuminate, or sometimes rounded; peduncle 1–3 cm long; corolla tube 6 mm long; sepals ovate, apex rounded, thick; mericarps apiculate at apex **2. *O. acuminata***
- b. Leaf apex gradually acuminate to cuspidate; peduncle 0.2–1 cm long; corolla tube 7.5–8 mm long; sepals orbicular, apex blunt, thin; mericarps acuminate at apex **3. *O. apoensis***
- 11a. Secondary veins arcuate ascending, 20–22 pairs; flowers 10–12 in each inflorescence; seeds 1 at either placenta **11. *O. sciadophylla***
- b. Secondary veins straight to rather arcuate ascending near the margin, 21 to more than 40 pairs; flowers more than 30 in each inflorescence; seeds 1 or 2 at either placenta 12
- 12a. Leaf blades ratio 2.1–5.8; secondary veins 0.1–0.7 cm spaced; corolla tube 3 mm long; stamens inserted at 1 mm below the mouth; seeds always 2 at either placenta **8. *O. glomerata***
- b. Leaf blades ratio 1–3; secondary veins 0.2–1.5 cm spaced; corolla tube 5.3–7 mm long; stamens inserted at 2–2.5 mm below the mouth; seeds often 1 at either placenta (or rarely with a small second one) **10. *O. oppositifolia***

1. *Ochrosia ackeringae* (Teijsm. & Binn.) Miq.

Ochrosia ackeringae (Teijsm. & Binn.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 138; F. Muell., Fragm. 7 (1871) 131; Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 229; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 208; Bakh.f., Blumea 6 (1950) 386; Backer & Bakh.f., Fl. Java 2 (1965) 232; Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 23; Markgr., Blumea 25 (1979) 238; PROSEA 2 (1991) 349; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 43; Hendrian, Blumea 49 (2004) 117. — *Lactaria ackeringae* Teijsm. & Binn., Tijdschr. Ned.-Indië 29 (1867) 249. — *Bleekeria ackeringae* (Teijsm. & Binn.) Koidz., Bot. Mag. (Tokyo) 37 (1923) 52. — Type: *Ackeringa s.n.* (holo L), Sumatra, Bangka.

Ochrosia ackeringae (Teijsm. & Binn.) Miq. var. *angustifolia* Baker f., Monogr. Christmas Isl. (1900) 182. — Type: Not located.

Ochrosia littoralis Merr., Philipp. J. Sci., Bot. 4 (1909) 315; Enum. Philipp. Fl. Pl. (1923) 330; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 208. — *Bleekeria littoralis* (Merr.) Koidz., Bot. Mag. (Tokyo) 37 (1923) 52. — *Excavatia littoralis* (Merr.) Markgr., Bot. Jahrb. Syst. 61 (1927) 194. — Type: *Curran & Merrit FB 7754* (holo PNH⁺), Philippines, Luzon, Batangas, Malabrigo.

Lactaria calocarpa auct. non Hassk.: Miq., Fl. Ned. Ind. 2 (1857) 415 (as *calocarpa*); Fl. Ned. Ind., Erste Bijv. (1861) 553.

Shrub or tree, 3–10 m high. *Branchlets* usually angular to subangular upwards, 2–4 mm diameter. *Leaves* in whorls of 2 or 3, coriaceous or papyraceous when dried; blades obovate, elliptic or narrowly so, 5.5–20 by 2.5–4.4 cm, ratio 2.1–4.6, base decurrent onto petiole, or cuneate, margin entire, apex usually acuminate, sometimes acute or cuspidate, very rarely shallowly retuse, rounded or truncate; secondary veins more than 35 pairs, at an angle of 75–85° from midrib, straight to rather arcuate ascending near the margin, not reaching the margin, joining, forming a submarginal vein. *Inflorescence* 2.5–10.7 cm long, terminal and axillary cymes, in whorls of 2 or 3; peduncle 1–6.9 cm long. *Flowers* fragrant, 8–20 on each inflorescence. *Sepals* ovate to broadly so, margin ciliate, apex rounded, middle part of the lower half thick, ciliate outside, smooth inside. *Corolla* white, villose inside, rather dense, forming a belt of 2 mm wide just below the insertion of stamens; tube 12.5 mm long, tube-calyx ratio 5.4–6.6, tube-lobes ratio 1. *Stamens* inserted at 3 mm below the mouth, 0.8 of the length of the corolla tube; filaments 0.5 mm long. *Pistil* 9 mm long; ovary ovoid, gradually narrowed at apex towards base of style; style 6.5 mm long, split at base. *Fruit* hemisyncarpous, V-shaped; mericarps united at base for 0.5–2.2(–3.2) cm, unequal in size, sometimes only one carpel developing; each mericarp ellipsoid or narrowly so, sometimes narrowly obovoid, base narrowed or rounded, apex acute or acuminate, acumen short and minute; endocarps massive, hard, surrounding 2 lateral spongy cavities of 0.3–0.4 cm diameter. *Seeds* 2 or 3 at either placenta.

Distribution — Australia, Solomon Islands; in *Malesia*: Sumatra, Borneo (Sabah), Java, Philippines (Luzon, Palawan, Samar, Babuyan, Mindanao), Sulawesi, Moluccas, Papua New Guinea.

Habitat & Ecology — Primary forests behind the beach, upper basin, along riverbanks or open areas. On sandy soil, or shallow phosphatised limestone scree and brown clay loam. Altitude 0–300 m (mostly found at very low altitudes).

Uses — The seeds are said to be edible either raw or cooked.

Note — Uniquely characterised by its hemisyncarpous fruits.

2. *Ochrosia acuminata* Trimen ex Valetton

Ochrosia acuminata Trimen ex Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 231, pl. xxii; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 209; Hendrian, Blumea 49 (2004) 108. — *Neisosperma acuminata* (Trimen ex Valetton) Fosberg & Sachet, Adansonia sér. 2, 17 (1977) 28. — *Neisosperma acuminata* (Trimen ex Valetton) Fosberg & Sachet var. *acuminata* Markgr., Blumea 25 (1979) 244. — *Lactaria acuminata* (Trimen ex Valetton) Koidz., Bot. Mag. (Tokyo) 37 (1923) 51. — Type: *Teysmann s.n.* (lecto L, designated by Markgraf (1979) op. cit.), North Celebes, Menado.

Tree, (8–)15–30 m high. *Leaves* in whorls of 3 or 4, coriaceous when dried; blades usually obovate, 5.7–16(–23) by 2.7–6.6 cm, ratio 1.7–2.9(–3.3), base cuneate, margin entire to undulate, apex acute or abruptly acuminate, sometimes rounded; secondary veins 10–14 pairs. *Inflorescence* 2.2–6 cm long, axillary cymes, in whorls of 2 or 3, loose; peduncle 1–3 cm long. *Flowers* 10–15(–25) on each inflorescence. *Sepals* ovate, apex rounded, thick. *Corolla* greenish cream or pale yellow, villose inside, rather dense, forming a belt of 1.5 mm wide just below the insertion of stamens; tube 6 mm long, tube-calyx ratio 3–3.5, tube-lobes ratio 0.9. *Stamens* inserted at 3 mm below the mouth,

0.5 of the length of the corolla tube; filaments 0.8 mm long. *Pistil* 4.7 mm long; ovary ovoid, gradually narrowed at apex towards base of style; style 3 mm long, not split at base. *Fruit* composed of 2 separate mericarps; mericarps ellipsoid, base rounded, apex gradually apiculate, acumen 0.4–1 cm long, straight or rather curled, with distinct lateral ridges, remotely verrucose or with fine irregular ridges when dried; endocarps split into fibres penetrating the mesocarps; fibres rather thin and slender, not forming hard thick pointed ends. *Seeds* 1 at either placenta.

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — Found in disturbed primary forests, open secondary forests or open areas such as roadsides. On clayey or sandy soil. Altitude 0–1500 m.

3. *Ochrosia apoensis* Elmer

Ochrosia apoensis Elmer, Leafl. Philipp. Bot. 4 (1912) 1461; Merr., Enum. Philipp. Fl. Pl. (1923) 329; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 211; Hendrian, Blumea 49 (2004) 109. — *Neisosperma apoensis* (Elmer) Fosberg & Sachet, Adansonia sér. 2, 17 (1977) 28. — *Neisosperma acuminata* (Trimen ex Valetton) Fosberg & Sachet var. *apoense* (Elmer) Markgr., Blumea 25 (1979) 244. — Type: *Elmer 10478* (lecto L, designated by Hendrian (2004) op. cit.; iso A, NY), Philippines, Mindanao, Davao, Todaya-Mt Apo.

Tree, 10–21 m high. *Leaves* in whorls of 3 or 4, coriaceous when dried; blades obovate to narrowly so, 7–14 by 2.2–4.2 cm, ratio 2.7–4.7, base cuneate, margin entire to undulate, apex gradually acuminate to cuspidate; secondary veins 13–16 pairs. *Inflorescence* 1.5–3.5 cm long, axillary cymes, in whorls of 2 or 3, loose; peduncle 0.2–1 cm long. *Flowers* 7–10 on each inflorescence. *Sepals* suborbicular to orbicular, apex blunt, thin, rather transparent. *Corolla* white, villose inside, rather dense, forming a belt of 1.5 mm wide just below the insertion of stamens; tube 7.5–8 mm long, tube-calyx ratio 4–4.2, tube-lobes ratio 1.3–1.5. *Stamens* inserted at 3.5 mm below the mouth, 0.5 of the length of the corolla tube; filaments 0.5 mm long. *Pistil* 5 mm long; ovary ovoid, gradually narrowed at apex towards base of style; style 3.4 mm long, not split at base. *Fruit* composed of 2 separate mericarps; mericarps ellipsoid, base rounded, apex acuminate, acumen short, less than 0.5 cm long, straight or rather curled, with distinct lateral ridges, remotely verrucose or with fine irregular ridges when dried; endocarps split into fibres penetrating the mesocarps; fibres rather thin and slender, not forming hard thick pointed ends. *Seeds* 1 at either placenta.

Distribution — *Malesia*: Philippines (Mindanao, Luzon).

Habitat & Ecology — Forest slopes. Altitude 810–970 m.

4. *Ochrosia basistamina* Hendrian

Ochrosia basistamina Hendrian, Blumea 49 (2004) 121. — Type: *Boschbouwproefstation (FRI bb) 408* (holo L; iso A, K), South Celebes, Malili.

Branchlets subangular to angular, thick, 8–10 mm diam., sulcate when dried, smooth, not lenticellate, glabrous, with conspicuous leaf scars. *Leaves* in whorls of 4–6(–7), coriaceous to thickly so when dried, long petiolate; petiole 2–5.5 cm long, glabrous; blades usually narrowly obovate, sometimes obovate or elliptic, 14–29 by 5.5–10.1 cm,

ratio 2–3.1, base cuneate, margin entire, sometimes rather undulate, apex abruptly acuminate, rarely rounded; secondary veins conspicuous, rather prominent, 12–19 pairs, 0.5–2.1 cm spaced, at an angle of 50–80(–90)° from midrib, arcuate ascending, not reaching the margin, rarely joining, not forming a submarginal vein; tertiary veins not prominent, conspicuous on abaxial side only, reticulate. *Inflorescence* 9.5–18.5 cm long, terminal and axillary cymes, in whorls of 2–5, congested, glabrous; peduncle 6.5–12.5 cm long, glabrous. *Flowers* more than 30 on each inflorescence, fairly long pedicellate; pedicels 3 mm long, glabrous. *Sepals* suborbicular to orbicular, 2.1 by 2.1 mm, ratio 1, margin entire to undulate, apex blunt, rather thin except at the middle-basal part, rather rough outside, smooth inside, glabrous, connate at base for 0.6 mm. *Corolla* in mature buds narrowly ellipsoid, 20 by 2–2.5 mm, ratio 8–10, of which the lobes form a rounded apex, glabrous outside, villose inside, sparse, forming a belt of 3 mm wide just around the insertion of stamens; tube cylindrical, 10 mm long, tube-calyx ratio 4.8, tube-lobes ratio 0.8, straight; lobes narrowly elliptic, 12–12.5 by 3 mm, ratio 4–4.2, margin entire, apex rounded, glabrous, auriculate on the left side at base. *Stamens* inserted at 8 mm below the mouth, 0.2 of the length of the corolla tube; anthers ovate to narrowly so, 1.5 by 0.5 mm, sagittate at base, apex acute, yellowish when dried; filaments filiform, 1 mm long. *Ovary* ovoid, widening at base, apex rounded and abruptly narrowed at base of style, 1 by 1 mm, of 2 distinctly separated carpels. Style filiform, 3.7 mm long, style-ovary ratio 3.7, not split at base.

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — Altitude 200 m.

Note — Specimens with fruits are not available. Therefore, the position of this species at the sectional level is still unknown. It is characterised by the absence of a submarginal vein, its suborbicular to orbicular sepals and the insertion of stamens near the base (only 0.2 of the length of the corolla tube).

5. *Ochrosia citrodora* Lauterb. & K. Schum.

Ochrosia citrodora Lauterb. & K. Schum. in K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 504; Markgr., Bot. Jahrb. Syst. 61 (1927) 190; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 211 (as *citriodora*); Hendrian, Blumea 49 (2004) 110. — *Neisosperma citrodora* (Lauterb. & K. Schum.) Fosberg & Sachet, Adansonia sér. 2, 17 (1977) 29; Markgr., Blumea 25 (1979) 245. — Type: *Lauterbach 1073* (lecto WRS�, designated by Markgraf (1979) op. cit.), Papua New Guinea, Madang, Gogol.

Paralstonia clusiacea auct. non Baill.: Markgr., Nova Guinea 14, 2 (1926) 283. — The specimen mentioned (*Gjellerup 116*) is clearly *O. citrodora*.

Treelet or tree, 2–25 m high. *Leaves* in whorls of 2 or 3, coriaceous or papyraceous when dried; blades obovate, elliptic or narrowly so, 9.5–29.5 by 3.1–8.3 cm, ratio 1.9–3.8, base cuneate, margin entire, rarely undulate, apex acuminate or cuspidate; secondary veins usually inconspicuous, 15–32 pairs, straight to rather arcuate ascending near the margin, not reaching the margin, joining, forming a submarginal vein, much anastomosing around the submarginal vein; submarginal vein usually angled, 0.3–1 cm inside from the margin. *Inflorescence* 4–10.5 cm long, terminal and axillary cymes, in whorls of 2 or 3, loose; peduncle 2.5–8 cm long. *Flowers* 5–17(–30) on each inflorescence. *Sepals* ovate, apex rounded, thick except along the margin,

rough outside, smooth inside. *Corolla* white, creamy white, yellowish white or greenish white, villose inside, rather dense, forming a belt of 1.5–2 mm wide just below the insertion of stamens; tube 11–12 mm long, tube-calyx ratio 3.4–5.2, tube-lobes ratio 0.9–1.2. *Stamens* inserted at 3.5–4 mm from the mouth, 0.6–0.7 of the length of the corolla tube; filaments 0.5 mm long. *Pistil* 4.3–7.1 mm long; ovary subglobose, apex rounded and abruptly narrowed at base of style; style 3–5.1 mm long, split at base. *Fruit* composed of 2 separate mericarps; mericarps ellipsoid, base cuneate or rounded, apex acute, remotely verrucose when dried; endocarps split into fibres penetrating the mesocarps; fibres hard and thick, usually forming hard thick pointed ends. *Seeds* 3 at either placenta.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In primary and secondary lowland rain forests, gully forests, riversides or swampy areas. On clay, stony soil or copper-rich soil. Altitude 0–850 m.

Note — Characterised by its secondary veins, which are frequently anastomosing around the submarginal vein, and its angled submarginal vein, which is situated 3–10 mm inside from the margin.

6. *Ochrosia coccinea* (Teijsm. & Binn.) Miq.

Ochrosia coccinea (Teijsm. & Binn.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 138; F. Muell., Fragm. 7 (1871) 131; Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 230; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 208; Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 25; Markgr., Blumea 25 (1979) 239; Hendrian, Blumea 49 (2004) 118. — *Lactaria coccinea* Teijsm. & Binn., Tijdschr. Ned.-Indië 29 (1867) 249. — *Bleekeria coccinea* (Teijsm. & Binn.) Koidz., Bot. Mag. (Tokyo) 37 (1923) 52. — *Excavatia coccinea* (Teijsm. & Binn.) Markgr., Bot. Jahrb. Syst 61 (1927) 195. — Type: *Teijsmann s.n.* (lecto FI, designated by Markgraf (1979) op. cit.), Moluccas, Ceram.

Shrub or tree, 2–10 m high. *Branchlets* 2–2.5 mm diam., the topmost branchlets rarely winged; wing occurs longitudinally on opposite sides along the length of the branchlets, leaf-like. *Leaves* in whorls of 2–4, papyraceous when dried; blades obovate, sometimes elliptic, to narrowly so, 7–13.3 by 2.5–5.3 cm, ratio 1.7–3.8, base cuneate, margin entire to undulate, apex cuspidate; secondary veins 25–38 pairs, not reaching the margin, joining, forming a submarginal vein. *Inflorescence* 3.5–5.5 cm long, axillary cymes, solitary or in whorls of 2 or 3; peduncle 0.6–2(–3.3) cm long, winged; wing occurs longitudinally on opposite sides along the length of the peduncle, leaf-like, asymmetric. *Sepals* ovate, margin entire, apex rounded, rather thin. *Corolla* yellow or white, villose inside, rather dense, forming a belt of 2 mm wide just below the insertion of stamens; tube 13 mm long, tube-calyx ratio 6.5, tube-lobes ratio 1.6. *Stamens* inserted at 4 mm below the mouth, 0.7 of the length of the corolla tube; filaments 0.8 mm long. *Pistil* 8.5 mm long; ovary ovoid, gradually narrowed at apex towards base of style; style 6.5 mm long, split at base. *Fruit* apocarpous, composed of 2 separate mericarps; mericarps boat-shape, strongly dorsiventrally compressed, base long cuneate, apex rounded and sometimes abruptly acuminate, acumen tiny, with distinct apical and lateral ridges, longitudinally shallowly grooved along the middle on both dorsal and ventral surfaces; endocarps massive, thick, hard, surrounding 2 spongy cavities of about 0.5–0.9 cm diameter. *Seeds* 2 at either placenta.

Distribution — *Malesia*: Moluccas, New Guinea.

Habitat & Ecology — Primary and secondary rain forests. On clayey soil. Altitude 0–1000 m.

Note — Characterised by its papyraceous and cuspidate leaves.

7. *Ochrosia ficifolia* (S. Moore) Markgr.

Ochrosia ficifolia (S. Moore) Markgr., Bot. Jahrb. Syst. 61 (1927) 190; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 211; Hendrian, Blumea 49 (2004) 111. — *Alstonia ficifolia* S. Moore, J. Bot. 61, Suppl. (1923) 32. — *Neisosperma ficifolia* (S. Moore) Fosberg & Sachet in Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 29; Markgr., Blumea 25 (1979) 244. — Type: *Forbes 74* (holo BM; iso L), Papua New Guinea, Central, Sogeri.

Ochrosia rudis Markgr., Bot. Jahrb. Syst. 61 (1927) 189; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 211. — *Neisosperma rudis* (Markgr.) Fosberg & Sachet in Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 31. — Type: *Beccari 715* (lecto FI, designated here; photo in L), Papua New Guinea, Andai.

Treelet or tree, 3–30 m high. *Leaves* in whorls of 2–4, papyraceous when dried, sometimes thickly so; petiole 1–4 cm long; blades obovate or narrowly so, 10.5–26 by 4.6–10 cm, ratio 1.9–3.9, base cuneate to long cuneate, margin entire, apex acuminate to cuspidate, rarely acute; secondary veins 7–12 pairs, strongly arcuate ascending, not reaching the margin, not joining, not forming a submarginal vein. *Inflorescence* 4–9 cm long, axillary cymes, in whorls of 2, not much branched, congested; peduncle 3–7 cm long. *Flowers* 20–25 on each inflorescence. *Sepals* ovate, apex rounded, thick except along the margin, rough outside, smooth inside. *Corolla* white, cream, yellow, villous inside, rather dense, forming a belt of 2–2.5 mm wide just below the insertion of stamens; tube 11–14.3 mm long, tube-calyx ratio 4.8–5.1, tube-lobes ratio 0.8–0.9. *Stamens* inserted at 3.5–4 mm below the mouth, 0.7–0.8 of the length of the corolla tube; filaments 0.3 mm long. *Pistil* 8.8–9 mm long; ovary subglobose, apex rounded and abruptly narrowed at base of style; style 7–9 mm long, split at base. *Fruit* composed of 2 separate mericarps; mericarps narrowly ellipsoid to narrowly obovoid, base rounded, apex acuminate, acumen short, remotely verrucose or with fine irregular ridges when dried; endocarps split into fibres penetrating the mesocarps; fibres hard and thick, usually forming hard thick pointed ends. *Seeds* 3 at either placenta.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Mostly in primary lowland forests. Also found in monsoon forests, swampy forests, floodplain forests or dry gullies on margin of seasonally arid grassland. On clayey, sandy, stony or gravely clayey soil. Altitude 2–800(–2100) m.

Note — The species usually occurs in the lowland forests, but it also has been collected from montane forest in Yaibos, Western Highland, Papua New Guinea, at an altitude of 2100 m. It is uniquely characterised by its few and strongly arcuate ascending secondary veins which do not form a submarginal vein.

8. *Ochrosia glomerata* (Blume) Valetton

Ochrosia glomerata (Blume) Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 233; Markgr., Bot. Jahrb. Syst. 61 (1927) 191; Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 213; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 209; H. St. John, Pacific Trop. Bot. Gard. (1973) 280; D.J. Middleton,

Tree Fl. Sabah & Sarawak 5 (2004) 43; Hendrian, Blumea 49 (2004) 112. — *Pseudochrosia glomerata* Blume, Mus. Bot. 1 (1850) 158; Miq., Fl. Ned. Ind. 2 (1857) 415; K. Schum., Bot. Jahrb. Syst. 9 (1888) 214; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 156. — *Neisosperma glomerata* (Blume) Fosberg & Sachet in Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 29; Markgr., Blumea 25 (1979) 246. — *Lactaria glomerata* (Blume) Koidz., Bot. Mag. (Tokyo) 37 (1923) 51. — Type: *Zippelius s.n.* (holo L), New Guinea, Papua.

Tree, 4–30 m high. *Leaves* in whorls of (2 or) 3 or 4, coriaceous when dried; petiole 0.6–5.3 cm long; blades obovate, elliptic, or narrowly so, 5.4–26 by 2.1–8 cm, ratio 2.1–5.8, base decurrent onto petiole, margin entire to slightly undulate, apex usually acuminate, sometimes acute or very rarely shallowly retuse; secondary veins 28–45 pairs, straight to rather arcuate ascending near the margin, not reaching the margin, joining, forming a submarginal vein. *Inflorescence* 1.5–18 cm long, terminal and axillary cymes, in whorls of 2–4, sometimes solitary, congested; peduncle 1–8 cm long. *Flowers* fragrant, more than 30 on each inflorescence. *Sepals* ovate, unequal in size, apex acute, thick except along the margin, rough outside, smooth inside. *Corolla* white, villous inside, rather dense, forming a belt of 1.5 mm wide just below the mouth; tube 3 mm long, tube-calyx ratio 1.5–2, tube-lobes ratio 0.4. *Stamens* inserted at 1 mm below the mouth, 0.7 of the length of the corolla tube; filaments 0.4 mm long. *Pistil* 2.5 mm long; ovary subglobose, of 2 distinctly separated carpels, apex rounded and abruptly narrowed at base of style; style 1 mm long, not split at base. *Fruit* composed of 2 separate mericarps; mericarps ovoid, ellipsoid or subglobose, base rounded to blunt, apex apiculate, acumen often strongly curled, verrucose when dried; endocarps split into fibres penetrating the mesocarps; fibres rather thin and slender, not forming hard thick pointed ends. *Seeds* 2 at either placenta.

Distribution — Solomon Islands; in *Malesia*: Borneo, Philippines, Sulawesi, Moluccas, New Guinea.

Habitat & Ecology — In primary and secondary rain forests, closed broadleaved rain forests, riversides, beach forests, swampy areas, disturbed forests or open areas. Also found in forests dominated by *Dipterocarpus* species, dry forests with *Casuarina* species or open forests with rattans and climbing bamboos. On red lateritic clay over ultra basic rocks, clay loam, stony soil or black soil. Altitude 2–900 m.

Note — This species is characterised by its short corolla tube and verrucose fruits (when dried), which make it most similar to *O. oppositifolia*. The shape and size of the leaf blades is very variable.

9. *Ochrosia minima* (Markgr.) Fosberg & Boiteau

Ochrosia minima (Markgr.) Fosberg & Boiteau in Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 27; Markgr., Blumea 25 (1979) 240; P.I. Forst., Austrobaileya 4 (1993) 15; Hendrian, Blumea 49 (2004) 119. — *Excavatia minima* Markgr. in Merr. & L.M. Perry, J. Arnold Arbor. 21 (1940) 199. — *Bleekeria minima* (Markgr.) Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 214. — Type: *Brass 8512* (holo B⁺; lecto A, designated by Markgraf (1979) op. cit.; iso BO, BRI, L), Papua New Guinea, Tarara, Wasi Kussa River.

Shrub, 5 m high. *Branchlets* thin, slender, 1–1.5 mm diameter. *Leaves* in whorls of 2 or 3, papyraceous when dried; blades obovate, 5.5–10 by 3–4.4 cm, ratio 1.8–2.8, base decurrent onto petiole, margin entire, apex acute or acuminate; secondary veins 20–24

pairs, straight to rather arcuate ascending near the margin, not reaching the margin, joining, forming a submarginal vein; tertiary veins not prominent. *Inflorescence* terminal cymes; peduncle 3.5–6 cm long, winged; wing very narrow, 1–1.5 mm wide, occurs on opposite sides along the length of peduncle, leaf-like. *Sepals* ovate, margin entire, apex rounded, erect, thick except along the margin, rough outside, smooth inside. *Corolla* villous inside, rather dense, forming a belt of 1 mm wide just around the insertion of stamens; tube 3.9–4 mm long, tube-calyx ratio 2–2.2, tube-lobes ratio 1.2–1.3. *Stamens* inserted at 2 mm below the mouth, 0.5 of the length of the corolla tube; filaments 0.4–0.5 mm long. *Pistil* 3.1 mm long; ovary subglobose, gradually narrowed at apex towards base of style; style 1.4 mm long, thick, split at base. *Fruit* apocarpous, composed of 2 separate small mericarps; mericarps ellipsoid, 1.2–1.4 by 0.6–1 cm, apiculate at the apex, acumen very short; endocarps massive, hard, surrounding 2 lateral spongy cavities which are occupying the whole space at either side of the seed chamber.

Distribution — Australia (Queensland); in *Malesia*: Papua New Guinea.

Habitat & Ecology — In rain forests or notophyll vine forests on white sandy soil. Altitude 120 m.

Note — Uniquely characterised by its small mericarps.

10. *Ochrosia oppositifolia* (Lam.) K. Schum.

Ochrosia oppositifolia (Lam.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 156; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 504; Merr., Enum. Philipp. Fl. Pl. (1923) 330; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1570; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 211; Guillaumin, Fl. Anal. Synop. Nouv. Cal. (1948) 293; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 147; Backer & Bakh.f., Fl. Java 2 (1965) 232; Boiteau, L. Allorge & Sévenet, Adansonia sér. 2, 12 (1972) 629; H. St. John, Pacific Trop. Bot. Gard. (1973) 280; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 17; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 52; Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 51; D.J. Middleton, Fl. Thailand 7 (1999) 65; PROSEA 12, 2 (2001) 389; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 45; Hendrian, Blumea 49 (2004) 113. — *Cerbera oppositifolia* Lam., Encycl. 1 (1783) 62. — *Neisosperma oppositifolia* (Lam.) Fosberg & Sachet, Micronesica 8 (1972) 48 (as *Neisosperma*); Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 30; Markgr., Blumea 25 (1979) 243; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; Boiteau & L. Allorge, Fl. Nouv. Calédonie 10 (1981) 66; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 40; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 46; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; 47 (1997 [‘1995’]) 128. — *Lactaria oppositifolia* (Lam.) Kuntze, Revis. Gen. Pl. 2 (1891) 415. — *Calpicarpum oppositifolium* (Lam.) Boiteau in Boiteau et al., Adansonia sér. 2, 14 (1974) 495; Boiteau, L. Allorge & Sévenet, Adansonia sér. 2, 15 (1975) 153, nom. illeg. — *Cerbera salutaris* Lour., Fl. Cochinch. 1 (1790) 136; Spreng., Syst. Veg. 2 (1825) 642, superfl. name. — *Lactaria salubris* Rumph. ex Raf., Sylva Telur. (1838) 162; Hassk. & de Vriese, Ned. Kruidk. Arch. 4 (1856) 9; Miq., Fl. Ned. Ind. 2 (1857) 415; Fl. Ned. Ind., Eerste Bijv. (1861) 553; Koidz., Bot. Mag. (Tokyo) 37 (1923) 51, superfl. name. — *Ochrosia salubris* (Raf.) Blume, Mus. Bot. 1 (1850) 158; Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 137; Valetton, Ann. Jard. Bot. Buitenzorg 12 (1895) 226, superfl. name. — *Bleekeria salubris* (Raf.) Hassk., Retzia (1855) 41, superfl. name. — *Calpicarpum lamarkii* G. Don, Gen. Hist. 4 (1838) 100, nom. illeg. — *Kopsia lamarkii* B.D. Jacks., Index Kew. 2 (1895) 12, misapplied name. — Type: Rumphius, Herb. Amboin. 2 (1741) 255, t. 84.

Cerbera platyspermos Gaertn., Fruct. Sem. Pl. (1791) 193. — *Ochrosia platyspermos* (Gaertn.) A. DC., Prodr. 8 (1844) 356. — *Ochrosion platyspermum* (Gaertn.) St.-Lag., Ann. Soc. Bot. Lyon 7 (1880) 131, nom. nud. — Type: Illustration in Gaertner (1791) op. cit. 193, t. 124.

Neisosperma muricata Raf., *Sylva Telur.* (1838) 162, nom. illeg.

Ochrosia cowleyi F.M. Bailey, *Queensland Agric. J.* 1 (1897) 299; *Queensl. Fl.* 3 (1900) 982, t. 91/92, f. 5.

Paralstonia platyphylla Merr. ex E.E. Schneid., *Bull. Bur. Forest. Philipp. Islands* 14 (1916) 204, nom. nud.

Ochrosia elliptica auct. non Labill.: K. Schum. & Hollrung, *Fl. Kais. Wilh. Land* (1889) 112.

Ochrosia borbonica auct. non J.F. Gmel.: Trimen, *Fl. Ceylon* (1895) 129, pl. lx; King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 428; Ridl., *Fl. Malay Penins.* 2 (1923) 340.

Ochrosia parviflora auct. non (G. Forst.) Hensl.: Markgr.: *Nova Guinea* 14, 2 (1926) 283; *Bot. Jahrb. Syst.* 61 (1927) 191.

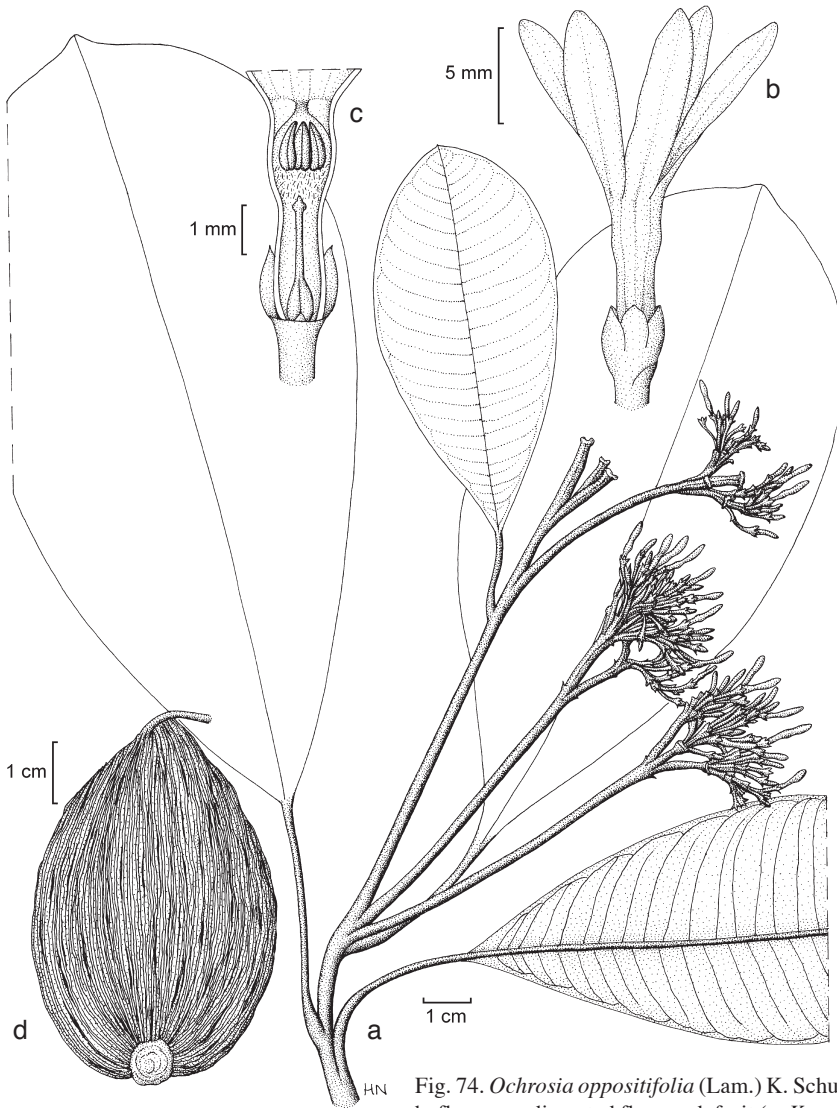


Fig. 74. *Ochrosia oppositifolia* (Lam.) K. Schum. a. Habit; b. flower; c. dissected flower; d. fruit (a: Kerr 12671; b, c: Sinclair 10702; d: De Vogel 1386).

Tree, 2.5–45(–60) m high. *Leaves* in whorls of 3 or 4 (or 5), coriaceous or papery when dried; petiole 1.5–6.6 cm long, glabrous; blades usually obovate, very rarely elliptic, 6.5–36 by 3.4–18 cm, ratio 1–3, base decurrent onto petiole, margin entire, apex often rounded or acuminate, sometimes retuse, shallowly retuse or truncate; secondary veins 21–42 pairs, straight to rather arcuate ascending, not reaching the margin, joining, forming a distinct submarginal vein which is close to the margin. *Inflorescence* 2–17 cm long, terminal and axillary cymes, in whorls of 2–4, congested; peduncle 1–10.5 cm long. *Flowers* more than 30 on each inflorescence. *Sepals* ovate, apex rounded, thick except along the margin. *Corolla* white, creamy white or yellowish white, villose inside, rather dense, forming a belt of 1.5–2 mm wide just below the insertion of stamens; tube 5.3–7 mm long, tube-calyx ratio 2.5–3.5, tube-lobes ratio 0.5–0.7. *Stamens* inserted at 2–2.5 mm below the mouth, 0.5–0.7 of the length of the corolla tube; filaments 0.5–0.6 mm long. *Pistil* 2.5–3.5 mm long; ovary subglobose, apex rounded and abruptly narrowed at base of style; style 1–1.9 mm long, not split at base. *Fruit* composed of 2 separate mericarps; mericarps ovoid to ellipsoid, sometimes subglobose, apex apiculate, acumen strongly curled, sometimes acuminate; endocarps split into fibres penetrating the mesocarps; fibres hard and thick or rather thin and slender, forming hard thick pointed ends or not. *Seeds* often 1 at either placenta, rarely with a small second one. — **Fig. 74.**

Distribution — Seychelles, Sri Lanka, India (Andaman Islands), Thailand, throughout the Pacific; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines, Sulawesi, Moluccas, New Guinea.

Habitat & Ecology — Rain forests by seashore, beach vegetation, disturbed primary forests on deep coral sand, edge of mangrove swamps or open areas. On coral sand and gravel. Altitude 0–200 m.

Note — This species is characterised by its large leaf blades and short corolla tubes.

11. *Ochrosia sciadophylla* Markgr.

Ochrosia sciadophylla Markgr., Gard. Bull. Singapore 22 (1967) 26; Hendrian, Blumea 49 (2004) 115. — *Neisosperma sciadophylla* (Markgr.) Fosberg & Sachet in Fosberg, Boiteau & Sachet, Adansonia sér. 2, 17 (1977) 31; Markgr., Blumea 25 (1979) 246. — Type: *Whitmore's collectors BSIP 3700* (holo BSIP n.v.; iso L), Solomon Islands, New Georgia Islands, Vaimbu.

Tree, 9–36 m high. *Leaves* in whorls of 4, coriaceous or thinly so when dried; blades narrowly elliptic, 18.1–24 by 4.8–5.7 cm, ratio 3.2–4.5, base cuneate, margin entire or slightly undulate, apex usually acuminate, sometimes acute; secondary veins 20–22 pairs, arcuate ascending, not reaching the margin, joining, forming a submarginal vein which is close to the margin. *Inflorescence* 3–6.5 cm long, terminal and axillary cymes, in whorls of 3 or 4, loose; peduncle 0.7–4.5 cm long. *Flowers* fragrant, 10–12 on each inflorescence. *Corolla* white or sometimes yellowish white. *Fruit* composed of 2 separate mericarps; mericarps ovoid, base rounded, apex usually apiculate, acumen 0.5–0.8 cm long, usually strongly curled at the apical part, verrucose when dried; endocarps split into fibres penetrating the mesocarps; fibres rather thin and slender, not forming hard thick pointed ends. *Seeds* 1 at either placenta.

Distribution — Solomon Islands; in *Malesia*: New Guinea.

Habitat & Ecology — In primary and secondary lowland rain forests. On volcanic rock. Altitude 9–170 m.

12. *Ochrosia syncarpa* Markgr.

Ochrosia syncarpa Markgr., Blumea 25 (1979) 237; Hendrian, Blumea 49 (2004) 120. — Type: *Kostermans 22012* (holo L; iso A, BO), Lesser Sunda Islands, Flores.

Shrub, 6 m high. *Branchlets* terete, thin. *Leaves* in whorls of 3, papyraceous when dried; blades narrowly elliptic to narrowly obovate, 5–8.3 by 1–1.7 cm, ratio 4.2–7.1, base decurrent onto petiole, margin entire, apex acute; secondary veins straight, 18–30 pairs, not reaching the margin, joining, forming a submarginal vein. *Inflorescence* 2–3.4 cm long, terminal and axillary cymes, solitary or in whorls of 2 or 3, loose; peduncle 1–2.1 cm long, thin, slender. *Sepals* ovate, unequal in size, margin ciliolate, apex rounded, thick at the middle-basal part, thin along the margin, ciliolate outside. *Corolla* white, villose inside, rather dense, forming a belt of 1.5 mm wide just below the insertion of stamens; tube 10 mm long, tube-calyx ratio 5–5.6, tube-lobes ratio 1.4. *Stamens* inserted at 2–2.5 mm below the mouth, 0.7–0.8 of the length of the corolla tube; filaments 0.5 mm long. *Pistil* 5.6 mm long; ovary ovoid, gradually narrowed at apex towards base of style; style 4.1–6 mm long, split at base. *Fruit* syncarpous, ovoid, base rounded, apex acute; endocarps massive, hard, surrounding 4 spongy cavities of about 0.3 cm diameter. *Seeds* 2 at either placenta.

Distribution — *Malesia*: Lesser Sunda Islands.

Habitat & Ecology — Dry places. Altitude 0–700 m.

Note — Uniquely characterised by its syncarpous fruits.

13. *Ochrosia tenimberensis* Markgr.

Ochrosia tenimberensis Markgr., Blumea 25 (1979) 239; Hendrian, Blumea 49 (2004) 121. — Type: *Pleyte 72* (holo L; iso A), Moluccas, Tanimbar Islands, Jamdena, Saumlaki.

Shrub, 3–10 m high. *Leaves* usually in whorls of 4, rarely in whorls of 3 or 5, coriaceous when dried; blades elliptic to narrowly so, 8.5–19.5 by 3.3–6.3 cm, ratio 2.1–3.3, base decurrent onto petiole, margin entire sometimes rather undulate, apex gradually acuminate or acute; secondary veins 27–42 pairs, usually straight, not reaching the margin, joining, forming a submarginal vein. *Flowers* white or yellowish white. *Fruit* apocarpous, composed of 2 separate mericarps; mericarps obovoid to ellipsoid, base narrowed, apex apiculate, acumen 3 mm long; endocarps massive, hard, whitish, surrounding 2 spongy cavities of about 0.5 cm diameter. *Seeds* 3 at either placenta

Distribution — *Malesia*: Moluccas.

Habitat & Ecology — Coastal forests or open areas at low altitude.

29. PAPUECHITES

Papuechites Markgr., Nova Guinea 14, 2 (1926) 288; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B., Bot. 1 (1950) 94; D.J. Middleton, Blumea 40 (1995) 440. — Type species: *Papuechites aambe* (Warb.) Markgr.

Woody climbers, producing latex. *Branches* terete. *Leaves* opposite, those of a pair equal, petiolate; blade subcoriaceous. *Inflorescence* thyrsoid, terminal and axillary from upper axils; flowers 5-merous, actinomorphic. *Sepal* lobes free; with colleters only in the sinuses. *Corolla* consisting of a lower tube and slightly wider upper tube and then spreading lobes; lobes dextrorse, broad at base becoming narrower, falcate, infolded in bud; head of bud rounded; small corona lobes in throat alternating with the corolla lobes and often slightly notched at apex. *Stamens* included in the corolla tube, inserted at point where corolla widens, adnate at middle of anther to base of the apical part of the style head and again at base of anther to base of style head; filament short and narrow; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate blunt appendages at the base. *Disk* of 5 free lobes. Gynoecium 2-carpellate, apocarpous but apically united into a common style, superior, ovoid, pubescent; style and style head short, head with a basal ring and no collar and a pointed apical part; ovules many. *Fruit* of 2 divergent follicles; broad at base, tapering to the end; with 2 ridges lengthways. *Seeds* flat, elliptic; with a long apical beak bearing a coma.

Distribution — 1 species in New Guinea and Ceram.

***Papuechites aambe* (Warb.) Markgr.**

Papuechites aambe (Warb.) Markgr., Nova Guinea 14, 2 (1926) 288; Bot. Jahrb. Syst. 61 (1927) 209; Tsiang, Sunyatsenia 2 (1934) 126; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 496; D.J. Middleton, Blumea 40 (1995) 440; PROSEA 12, 3 (2003) 323. — *Strophanthus aambe* Warb., Bot. Jahrb. Syst. 13 (1891) 407. — *Anodendron aambe* (Warb.) Warb., Bot. Jahrb. Syst. 13 (1891) 454; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 507. — Type: *Warburg 21307* (untraced, probably destroyed in B). Neotype: *Hartley TGH 11841* (neo L, designated by Middleton (1995) op. cit.; iso A, BRI, G, K, LAE).

Ichnocarpus bertieroides Wernham ex S. Moore, J. Bot. 61, Suppl. (1923) 33. — Type: *Forbes 859* (holo BM; iso A, K, L, MEL).

Anodendron paniculatum auct. non A.DC.: P.I. Forst., Kew Bull. 48 (1993) 139, p.p.

Branchlets glabrous, sparsely puberulent or tomentose; rarely lenticellate. *Leaves*: petiole 0.5–1.7 cm long; blade elliptic or weakly obovate, 3.7–13.7 by 1.2–6.4 cm, 1.7–3.9 times as long as wide, apex acuminate, base cuneate to obtuse, 6–12 pairs of secondary veins, gradually ascending, tertiary venation loosely reticulate; glabrous, sparsely puberulent on midrib beneath or puberulent all over beneath; punctate beneath. *Inflorescence* 6–25 cm long; sparsely to densely tomentose; pedicels 3–9 mm long. *Sepals* ovate, 1.2–2.1 by 1.2–1.8 mm, 1–1.4 times as long as wide, apex rounded, sparsely puberulent. *Corolla* pink or red; tube 2.3–4.7 mm long, 0.8–1.1 times as long as lobes, glabrous outside and inside except on inside face of filaments; lobes 2.7–5 by 1.1–2.1 mm, 1.8–3.8 times as long as wide; corona lobes 0.3–0.7 mm long. *Stamens* inserted at 1.3–2 mm from the base of the tube, which is 0.3–0.5 of tube length; filaments 0.3–1 mm long; anthers 1.5–2.7 by 0.6–0.9 mm, 2.1–3.9 times as long as wide. *Disk* 0.8–2.1 mm long, 0.6–1 times as long as ovary. *Ovaries* 0.9–1.4 mm long; style 0.8–2.1 mm long; style head 0.7–1 mm long. *Fruit* 4.8–7.3 by 1.2–2 cm, glabrous, occasionally weakly lenticellate. *Seeds* 10.3–11.7 by 2.3–3.4 mm; beak 1.3–1.6 cm long, coma hairs 2.9–3.8 cm long.

Distribution — *Malesia*: Moluccas (Aru, Ambon), New Guinea.

Habitat & Ecology — In forest to 1300 m altitude.

Uses — The latex may be applied to sores.

30. PARAMERIA

Parameria Benth. in Benth. & Hook.f., Gen. Pl. 2 (1876) 715; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 162; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1200; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 102; Backer & Bakh.f., Fl. Java 2 (1965) 233; Coode et al., Checklist Pl. Brunei (1996) 28; D.J. Middleton, Blumea 41 (1996) 74; Fl. Thailand 7 (1999) 150; PROSEA 12, 1 (2001) 402; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 8. — Type species: *Parameria glandulifera* (Wall. ex G. Don) Benth. ex Kurz (= *Parameria laevigata* (Juss.) Moldenke).

Parameriopsis Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 299; Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 85. — Type species: *Parameriopsis polyneura* (Hook.f.) Pichon (= *Parameria polyneura* Hook.f.).

Climbers, producing white latex. *Branches* lenticellate or not; branchlets puberulent to glabrous. *Leaves* opposite, those of a pair equal, very rarely in whorls of 3; petiolate, with glands in axils; papery to subcoriaceous, entire. *Inflorescence* of terminal and/or axillary cymes often forming a panicle. *Flowers* 5-merous, actinomorphic. *Sepal* lobes free; colleter inside. *Corolla* lobes sinistrorse, consisting of a narrow tube and a globose head or whole bud ovoid; open corolla salverform to campanulate; lobes falcate, broad and rounded or oblong and acute to obtuse. *Stamens* completely included within the corolla tube, attached in a ring to the style head; filament short; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* 5-crenate to 5 completely separate lobes. Gynoecium 2-carpellate, apocarpous but apically united into a common style, superior, ovoid, densely puberulent on top; ovules numerous; style glabrous, very short; style head ovoid with a projection on top. *Fruit* of paired follicles; long, narrow and strongly to weakly torulose; longitudinally dehiscent. *Seeds* hirsute; ellipsoid, flattened; with a coma pointing towards the end of the fruit.

Distribution — 3 species from India and southern China to western Malesia.

KEY TO THE SPECIES

- 1a. Corolla bud densely pubescent all over; anther apex acute or shortly acuminate; fruit weakly torulose **3. *P. polyneura***
- b. Corolla bud glabrous, pubescent only on tube or pubescent on tube and only very sparsely on head; anther apex long acuminate; fruit strongly and distantly torulose 2
- 2a. Leaves puberulent only in nerve axil domatia or glabrous; inflorescence axis delicate; fruit glabrous **2. *P. laevigata***
- b. Leaves puberulent all over beneath especially on venation; inflorescence axis robust; fruit pubescent **1. *P. densiflora***

1. *Parameria densiflora* Oliv.

Parameria densiflora Oliv., Hooker's Icon. Pl. 16 (1886) t. 1520; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 480; Ridl., Fl. Malay Penins. 2 (1923) 359; D.J. Middleton, Blumea 41 (1996) 75; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 128. — Type: *Curtis 158* (lecto K, designated by Middleton (1996) op. cit.; iso K, P, SING, US, W), Peninsular Malaysia, Penang, Government Hill.

Branchlets densely brown pubescent. *Leaves*: petiole 4.5–7 mm long; blade subcoriaceous, obovate, 5.5–17.9 by 2.8–7.2 cm, 1.6–3.4 times as long as wide, apex acuminate, base rounded to acute, 5–8 pairs of secondary veins, curved ascending, tertiary venation lax, puberulent all over beneath, especially on the midrib and veins. *Inflorescence* a dense terminal panicle, densely brown puberulent, 2.6–9.8 cm long; pedicels 2.1–4.8 mm long. *Sepals* ovate, 0.8–1.2 by 0.5–0.8 mm, 1.1–1.7 times as long as wide, apex acuminate to obtuse, puberulent. *Corolla* lobes sinistrorse; bud drumstick-shaped, open corolla salverform; tube 2.2–2.9 mm long; lobes falcate to the left, 3.5–5.9 by 1.7–3.1 mm, 1.7–2.1 times as long as wide, 1.5–2.5 times as long as tube, apex rounded; densely pubescent on tube outside, sparsely pubescent or glabrous on parts of lobes exposed in bud, glabrous inside. *Stamens* inserted at 0.2–0.3 mm from corolla base which is 0.1–0.2 of tube length; filaments 0.4–0.5 mm long; anthers 0.8–1.5 by 0.2–0.3 mm, 4–5 times as long as wide. *Disk* 5-dentate, 0.2–0.3 mm long. *Ovaries* 0.4–0.5 mm long; style and style head 0.8–1 mm long. *Fruit* distantly torulose, sparsely puberulent, 20–35 cm by 4–8 mm. *Seeds*: grain 10–11 by 1.9–2.5 mm; coma 2–2.5 cm long.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia.

Habitat & Ecology — Not recorded.

2. *Parameria laevigata* (Juss.) Moldenke

Parameria laevigata (Juss.) Moldenke, Revista Sudamer. Bot. 6 (1940) 176; Bakh.f., Blumea 6 (1950) 387; Backer & Bakh.f., Fl. Java 2 (1965) 234; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 166; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 523; Lý, Feddes Repert. 97 (1986) 671; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 48; D.J. Middleton, Blumea 41 (1996) 76; Coode et al., Checklist Pl. Brunei (1996) 28; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 128; D.J. Middleton, Fl. Thailand 7 (1999) 151; PROSEA 12, 2 (2001) 402. — *Aegiphila laevigata* Juss., Ann. Mus. Hist. Nat. Paris 7 (1806) 76. — Type: *De Jussieu Herbarium, Catalogue Number 5037* (holo P), sine loc.

Echites densiflorus Blume, Bijdr. (1826) 1040; A.DC., Prodr. 8 (1844) 478. — *Chonemorpha densiflora* (Blume) G. Don, Gen. Hist. 4 (1837) 76. — *Ecdysanthera densiflora* (Blume) Miq., Fl. Ned. Ind. 2 (1857) 452; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 398. — Type: *Blume s.n.* (lecto U, designated by Middleton (1996) op. cit.; iso BO, L, U), Java.

Parsonsia barbata Blume, Bijdr. (1826) 1042. — *Ecdysanthera barbata* (Blume) Miq., Fl. Ned. Ind. 2 (1857) 451. — *Parameria barbata* (Blume) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 162; Koord.-Schum., Syst. Verz. 1 (1912) 179; Merr., Bibliogr. Enum. Born. Pl. (1921) 500; Enum. Philipp. Fl. Pl. 3 (1923) 331; Tsiang, Sunyatsenia 2 (1934) 115; Bull. Fan Mem. Inst. Biol. Bot. 9 (1939) 19; Kerr in Craib, Fl. Siam. 2 (1939) 464; Masam., Enum. Phan. Born. (1942) 623. — Type: *Horsfield s.n.* (lecto L, designated by Middleton (1996) op. cit.; iso CGE, K), Java, Kuripan.

Echites glanduliferus Wall. ex G. Don, Gen. Hist. 4 (1837) 75. — *Ecdysanthera glandulifera* (Wall. ex G. Don) A.DC., Prodr. 8 (1844) 443; Miq., Fl. Ned. Ind. 2 (1857) 452. — *Parameria glandulifera*

- (Wall. ex G. Don) Benth. ex Kurz, J. Asiat. Soc. Bengal 46 (1877) 255; Forest Fl. Burma 2 (1877) 189; Hook.f., Fl. Brit. India 3 (1882) 660; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 16; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; Spire, Bull. Écon. Indochine 12 (1902) 859; Contr. Apocyn. (1905) 40; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 478; Ridl., Fl. Malay Penins. 2 (1923) 358; C.E. Parkinson, Forest Fl. Andaman Isl. (1923) 207; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36. — Type: *Wallich 1659* (lecto K-W, designated by Middleton (1996) op. cit.; iso BM, CGE, E, G, G-DC, K, K-W, M, W), Burma, Martaban.
- Ecdysanthera griffithii* Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1307; Miq., Fl. Ned. Ind. 2 (1857) 452. — Type: *Griffith s.n.* (lecto CGE, designated by Middleton (1996) op. cit.; iso BM, CGE, K), Peninsular Malaysia.
- Echites torosus* Llanos, Fragm. Pl. Philipp. (1851) 59, non Jacq. (1760). — Type: Untraced. Neotype: *Merrill Species Blancoanae 140* (neo US, designated by Middleton (1996) op. cit.; iso A, BM, BO, K, L, MO, P, W), Philippines, Luzon, Rizal, Antipolo.
- Ecdysanthera barbata* (Blume) Miq. var. *angustior* Miq., Fl. Ned. Ind. 2 (1857) 452. — *Parameria angustior* (Miq.) Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399. — Type: *Korthals s.n.* (holo U), Java.
- Parameria philippinensis* Radlk., Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 14 (1884) 518; Spire, Bull. Écon. Indochine 12 (1902) 859. — *Parameria glandulifera* (Wall. ex G. Don) Benth. ex Kurz var. *philippinensis* (Radlk.) Stapf, Trans. Linn. Soc. London, Bot. 4 (1894) 207. — Type: *Cuming 1126* (lecto M, designated by Middleton (1996) op. cit.; iso AWH, BM, C, CGE, E, FR, G, K, L, MEL, MO, NY, P, UPS, W), Philippines, Luzon.
- Parameria vulneraria* Radlk., Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 14 (1884) 519; Spire, Bull. Écon. Indochine 12 (1902) 859. — Type: *Rothdauscher 1025* (lecto M, designated by Middleton (1996) op. cit.), Philippines, Cebu. Epitype: *Rothdauscher 1029* (M, designated by Middleton (1996) op. cit.), Philippines, Cebu. — The original material now consists of nothing more than branchlets. Radlkofer himself labelled *Rothdauscher 1029* as *Parameria vulneraria* and it was also collected in Cebu so can be taken as an epitype of this species.
- Parameria pierrei* Baill., Hist. Pl. 10 (1888) 167, nom. nud. — *Ecdysanthera glandulifera* (Wall. ex G. Don) A.D.C. var. *pierrei* F. Heim in Spire, Contr. Apocyn. (1905) 40, nom. illeg. (in synonymy of *Parameria glandulifera*). — *Parameria glandulifera* (Wall. ex G. Don) Benth. ex Kurz var. *pierrei* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1201. — *Parameria barbata* (Blume) K. Schum. var. *pierrei* (Pit.) Kerr in Craib, Fl. Siam. 2 (1939) 464. — Type: *Pierre 1458*, p.p. (lecto K, designated by Middleton (1996) op. cit.; iso A, BR, K, NY, P), Cambodia, Kampot, Cam Chay. — There are a number of different collections under the same number. The type collection is from Kampot in Cambodia.
- Parameria glandulifera* (Wall. ex G. Don) Benth. ex Kurz var. *poilanei* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1203. — Type: *Poilane 2197* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 301; iso HM), Laos, Xieng Khouang, entre Ban-ban et Xieng Khouang.

Branches often lenticellate; branchlets glabrous to densely and minutely puberulent. *Leaves*: petiole 1–4 mm long; blade papery, elliptic to obovate, 1.5–15 by 0.7–6.3 cm, 1.6–4.1 times as long as wide, apex acute to caudate, most commonly acuminate, base obtuse to cuneate, 3–6 pairs of secondary veins, curved ascending, tertiary venation lax and obscure, puberulent in domatia in nerve axes with midrib or, rarely, glabrous. *Inflorescence* of axillary and/or terminal cymes often forming a panicle, glabrous to densely and minutely puberulent, 2–16 cm long; pedicels 1.2–7.5 mm long. *Sepals* ovate, 0.5–1.3 by 0.4–0.9 mm, 1–2 times as long as wide, apex obtuse to acuminate, puberulent, rarely glabrous, continuous row of colleters at base inside. *Corolla* white, pink or red; bud drumstick-shaped, open corolla salverform; tube 1.2–2.5 by 1–1.2 mm, 3–4.3 times as long as calyx, 0.4–1.1 times as long as lobes; lobes falcate, apex rounded, 1.7–4 by 1–2.7 mm, 1–1.8 times as long as wide; glabrous to puberulent on tube outside, glabrous inside. *Stamens* inserted at c. 0.2 mm from corolla base which is

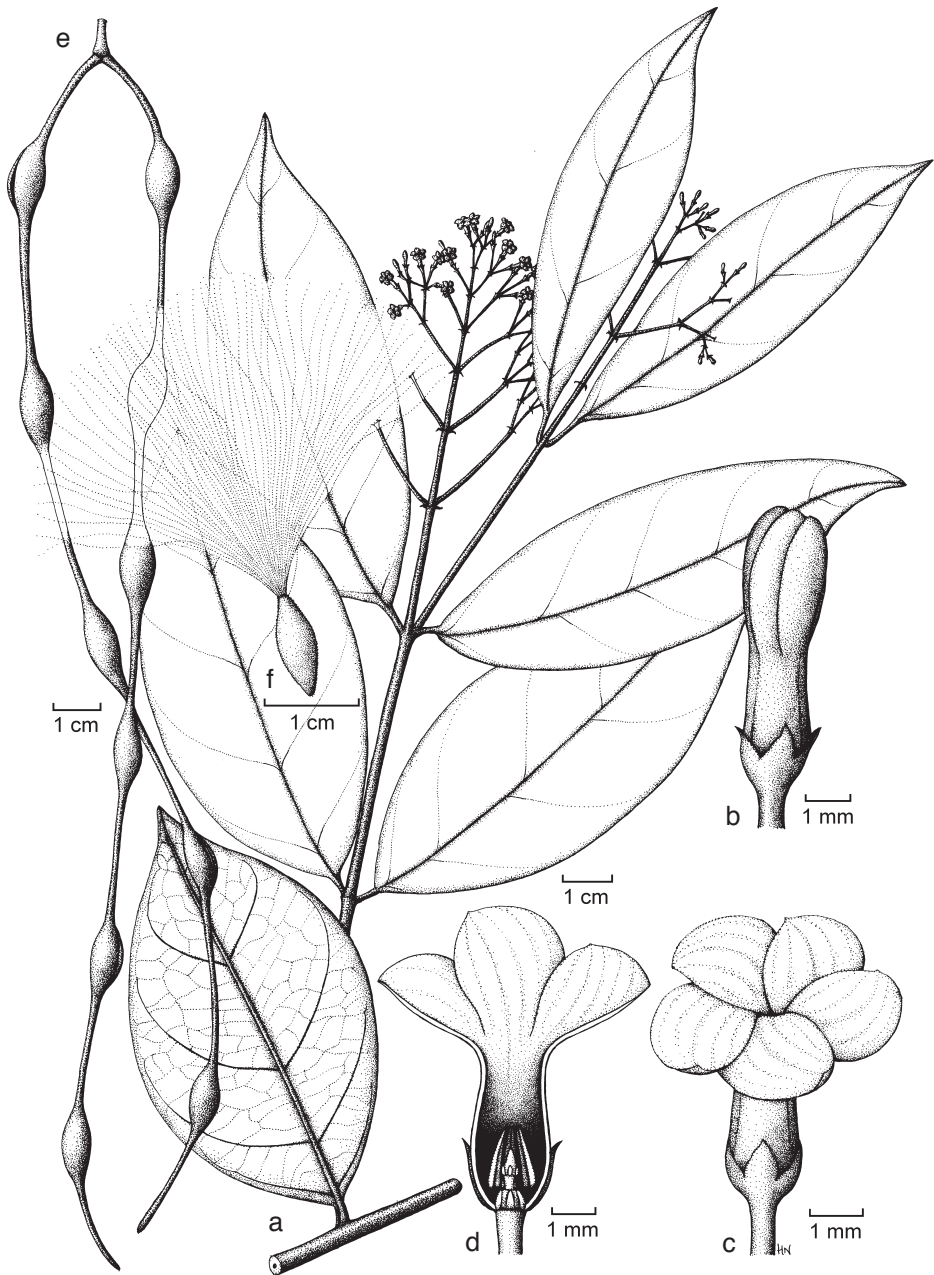


Fig. 75. *Parameria laevigata* (Juss.) Moldenke. a. Habit; b. flower in bud; c. open flower; d. flower dissection; e. fruit; f. seed (a–d: Van Beusekom & Santisuk 3220; e, f: Weber 1540).

0.1 of tube length; filaments 0.2–0.5 mm long; anthers 0.8–1.4 by 0.3–0.4 mm. *Disk* 5-dentate to 5 separate lobes, 0.2–0.3 mm long. *Ovaries* 0.3–0.6 mm long, 1.5–2 times as long as disk; style and style head 0.6–1.2 mm long. *Fruit* distantly torulose, glabrous, 12–32 by 0.4–0.7 cm. *Seeds*: grain 5.7–12 by 1.1–4 mm; coma 1.7–3.2 cm long. — **Fig. 75.**

Distribution — India (Andaman Islands), Burma, China, Thailand, Laos, Vietnam, Cambodia; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines, Sulawesi, western Lesser Sunda Islands.

Habitat & Ecology — In a wide variety of primary and secondary forests and thickets to 1500 m.

Uses — A wide variety of medicinal uses including for use after childbirth, on wounds and as a general tonic.

3. *Parameria polyneura* Hook. f.

Parameria polyneura Hook. f., Fl. Brit. India 3 (1882) 660; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399; Bull. Inst. Bot. Buitenzorg 5 (1900) 16; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 479; Merr., Bibliogr. Enum. Born. Pl. (1921) 500; Ridl., Fl. Malay Penins. 2 (1923) 359; Burkill & M.R. Hend., Gard. Bull. Straits Settlements 3 (1925) 396; Tsiang, Sunyatsenia 2 (1934) 116; Kerr in Craib, Fl. Siam. 2 (1939) 465; Masam., Enum. Phan. Born. (1942) 623; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; D.J. Middleton, Blumea 41 (1996) 80; Coode et al., Checklist Pl. Brunei (1996) 28; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 128; D.J. Middleton, Fl. Thailand 7 (1999) 153. — *Parameriopsis polyneura* (Hook. f.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 300. — Type: *Griffith s.n.* (lecto K, designated by Middleton (1996) op. cit.; iso AAU, BO, BR, CGE, GH, K, L, M, P), Peninsular Malaysia.

Parameria griffithii Pierre, Rev. Cultures Colon. 11 (1902) 229, nom. illeg.

Branches lenticellate or not; branchlets glabrous to puberulent. *Leaves*: petiole 3–9 mm long; blade subcoriaceous, elliptic, obovate or oblong, 3–12.8 by 1.1–6.2 cm, 1.8–3.1 times as long as wide, apex acuminate to acute, base cuneate to obtuse, 4–9 pairs of secondary veins, tertiary venation conspicuous, puberulent in domatia in nerve axes with midrib. *Inflorescence* terminal and/or axillary often forming panicles, densely short puberulent, 5.5–12.4 cm long; pedicels 2–4.8 mm long. *Sepals* ovate, 0.8–1.6 by 0.6–1 mm, 1.1–2 times as long as wide, apex acute to obtuse, densely puberulent, colleters only at edges of sepals at base inside. *Corolla* white and pinkish; bud ovoid, open corolla salverform to campanulate; tube 1–1.8 mm long, 0.3–0.6 times as long as lobes; lobes oblong, falcate, 2.6–4.7 by 1–1.6 mm, 2.4–4.3 times as long as wide; densely puberulent on tube and on parts exposed in bud outside, sparsely puberulent in tube inside. *Stamens* inserted at 0.3–0.4 mm from corolla base which is 0.2 of tube length; filaments 0.3–0.7 mm long; anthers 1–1.4 by 0.2–0.5 mm. *Disk* 5-crenate or 5-dentate, 0.5 mm long. *Ovaries* 0.3–0.5 mm long; style and style head 1–1.3 mm long. *Fruit* weakly torulose, sparsely lenticellate, 37–90 by 0.4–0.5 cm. *Seeds*: grain 14.5–22 by 2.6–3 mm; coma 3–4.1 cm long. — **Fig. 76.**

Distribution — Southern Burma, Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo.

Habitat & Ecology — In forest to 800 m.

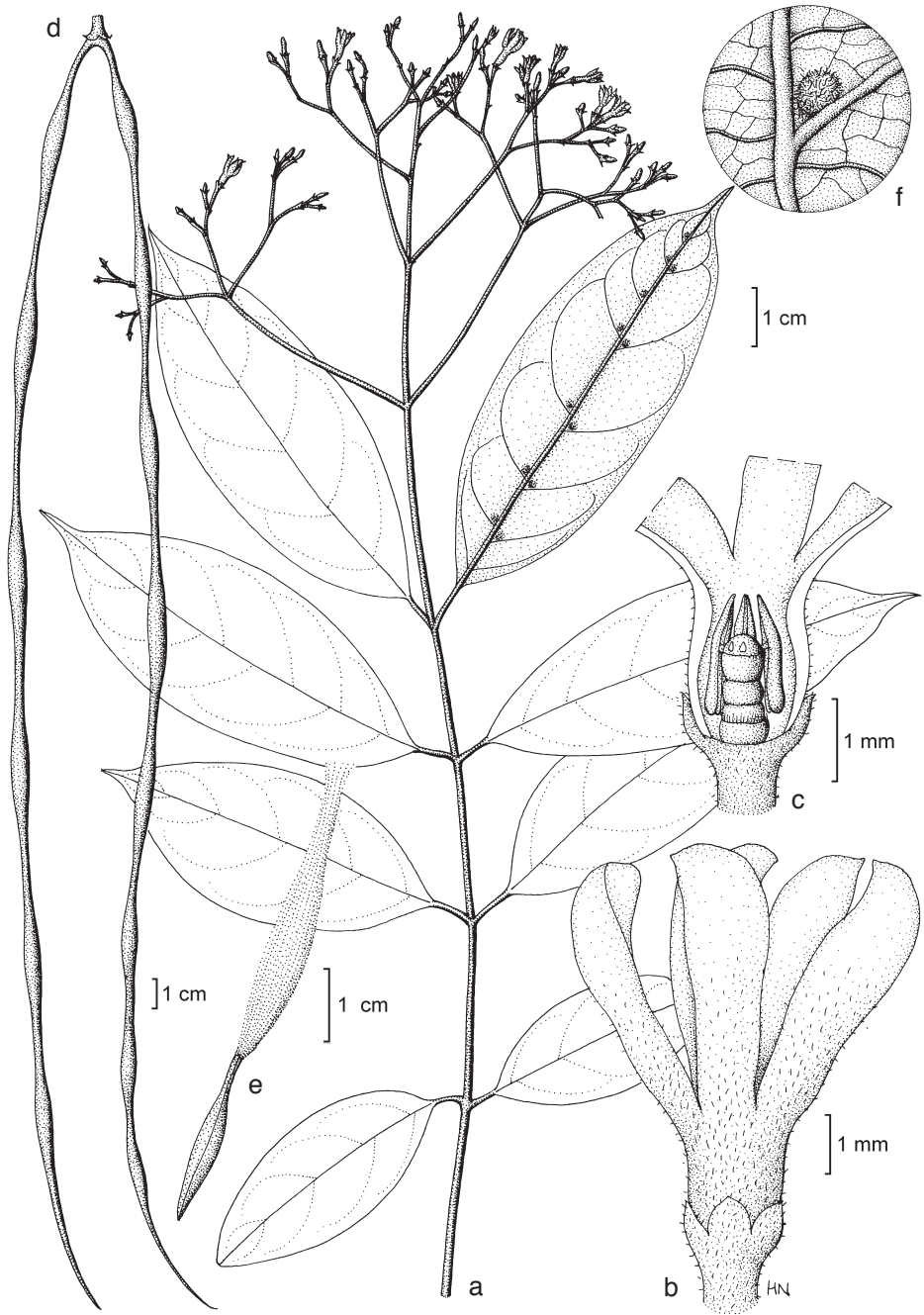


Fig. 76. *Parameria polyneura* Hook.f. a. Habit; b. flower; c. dissected flower; d. fruit; e. seed; f. leaf domatia (a: De Wilde & De Wilde-Duyfjes 12110; b, c: De Wilde & De Wilde-Duyfjes 16542; d: De Vriese s.n.).

31. PARSONSIA

Parsonsia R.Br., Prodr. (1810) 465, nom. cons.; Asclepiadeae (1810) 53; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1172; Backer & Bakh.f., Fl. Java 2 (1965) 242; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 20; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 57; Coode et al., Checklist Pl. Brunei (1996) 28; J.B. Williams, Fl. Australia 28 (1996) 154; D.J. Middleton, Blumea 42 (1997) 193; Fl. Thailand 7 (1999) 135; Tree Fl. Sabah & Sarawak 5 (2004) 12. — Type species: *Parsonsia capsularis* (G. Forst.) R.Br.

Lyonsia R.Br., Prodr. (1810) 466; Asclepiadeae (1810) 55. — Type species: *Lyonsia straminea* R.Br. (= *Parsonsia straminea* (R.Br.) F. Muell.).

Helygia Blume, Bijdr. (1826) 1043. — *Heligme* Miq., Fl. Ned. Ind. 2 (1857) 429, sphalm. — Type species: *Helygia javanica* Blume (= *Parsonsia alboflavescens* (Dennst.) Mabb.).

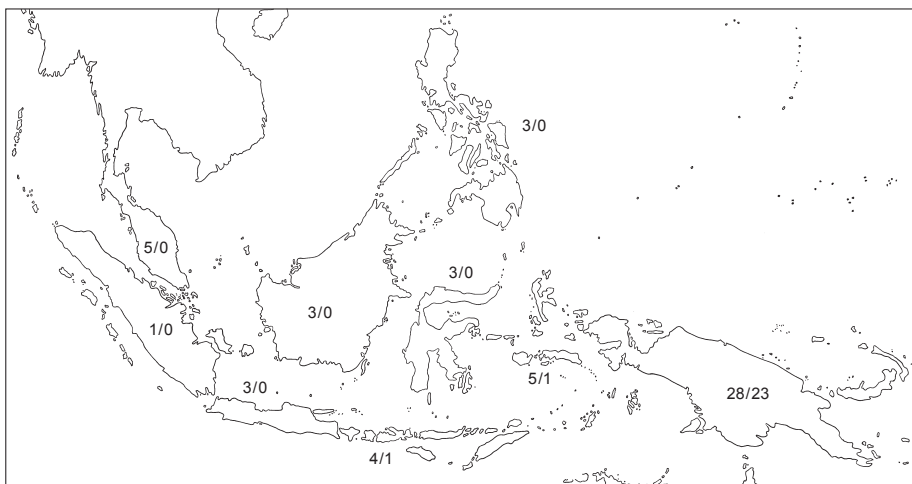
Cudicia Buch.-Ham. (ex G. Don, Gen. Hist. 4 (1837) 80, nom. illeg. (in syn.)) ex Dillwyn, Index Hort. Malab. (1839) 41. — Type species: *Cudicia trichotoma* Buch.-Ham. ex Dillwyn (= *Parsonsia alboflavescens* (Dennst.) Mabb.).

Chaetosus Benth., London J. Bot. 2 (1843) 226. — Type species: *Chaetosus volubilis* Benth. (= *Parsonsia alboflavescens* (Dennst.) Mabb.).

Delphyodon K. Schum., Bot. Jahrb. Syst. 24, Beibl. 59 (1898) 31. — Type species: *Delphyodon oliganthus* K. Schum. (= *Parsonsia oligantha* (K. Schum.) D.J. Middleton).

Grisseea Bakh.f. (in Backer, Bekn. Fl. Java, Afl. 7, Fam. 172 (1948) 49, nom. inval. (no Latin description)), Blumea 6 (1950) 392; Backer & Bakh.f., Fl. Java 2 (1965) 242. — Type species: *Grisseea apiculata* Bakh.f. (= *Parsonsia apiculata* (Bakh.f.) D.J. Middleton).

Climbing shrubs; bark variable. *Branches* with or without lenticels; branchlets glabrous, puberulent or tomentose. *Leaves* opposite or in whorls of 3 or more, equal in size at a node, entire; colleters in the axils and frequently in a ring around the stem. *Inflorescence* axillary or terminal, corymbose, pedunculate and several times branched or with flowers clustered at inflorescence ends, few- to many-flowered; bracts small, linear or ovate; flowers 5-merous. *Sepals* connate at the very base, erect or reflexed, ovate to linear, with colleters inside. *Corolla* actinomorphic; lobes dextrorse, often so



Map 9. Distribution of *Parsonsia* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

very slightly overlapping as to appear valvate; tube cylindrical or somewhat inflated; lobes reflexed, spreading or erect; outside and inside pubescent or glabrous. *Stamens* exerted, inserted anywhere on the corolla tube from the base to near the throat, adnate to the style head; filaments straight, bent or strongly twisted, most often pubescent; anthers usually narrowly triangular, sometimes oblong, fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* of 5 lobes, sometimes fused into an annular ring, often with complex development of teeth at the apex. Gynoecium of 2 connate carpels, often 4-toothed at apex, glabrous. Style narrow; style head ovoid. Ovules many. *Fruit* of 1 follicle clearly composed of 2 locules; linear to fusiform. *Seeds* roughly triangular in cross section, long and narrow, bearing a coma at the end towards the apex of the fruit.

Distribution — Approximately 82 species from India and Sri Lanka to China, southwards through Indochina and Malesia to the western Pacific Islands, Australia and New Zealand; in *Malesia* 27 species. — **Map 9.**

KEY TO THE SPECIES

- 1a. Leaves in whorls of 3 or more **7. *P. curvisepala***
- b. Leaves opposite 2
- 2a. Leaves densely pubescent all over beneath 3
- b. Leaves glabrous or only pubescent on midrib and secondary veins beneath . . 14
- 3a. Corolla tube \geq 10 mm long **10. *P. grandiflora***
- b. Corolla tube $<$ 8 mm long 4
- 4a. Corolla tube pubescent in throat 5
- b. Corolla tube glabrous in throat **15. *P. novoguineensis***
- 5a. Corolla campanulate **26. *P. velutina***
- b. Corolla subcylindrical, salverform, rotate or urceolate 6
- 6a. Hairs on corolla tube dense rufous brown 8
- b. Hairs on corolla tube very short and cream coloured or pale fawn, or corolla tube glabrous outside. 7
- 7a. Corolla tube glabrous outside, lobes 3.9–5.6 times as long as tube, strongly reflexed when mature. — Lesser Sunda Islands **23. *P. sundensis***
- b. Corolla tube puberulent or glabrous outside, lobes 0.7–2.2 times as long as tube, erect or spreading when mature. — Widespread **1. *P. alboflavescens***
- 8a. Tips of corolla lobes glabrous outside; flowers densely clustered at inflorescence ends **8. *P. densiflora***
- b. Tips of corolla lobes pubescent outside; flowers laxly arranged or clustered . . 9
- 9a. Corolla tube \geq 5.4 mm long. — Not in New Guinea **5. *P. celebica***
- b. Corolla tube $<$ 6 mm long. — Those $>$ 3 mm long only in New Guinea 10
- 10a. Corolla tube somewhat inflated, wider than head in bud; anthers with large boss on the back **22. *P. schoddei***
- b. Corolla tube not inflated, narrower or same width as head in bud; no large boss on anthers 11
- 11a. Hairs on inflorescence spreading. 12
- b. Hairs on inflorescence appressed. 13

- 12a. Leaf base cuneate to obtuse **7. *P. curvisepala***
 b. Leaf base cordate **12. *P. lata***
- 13a. Inflorescence 14–20 cm long; mature corolla tube c. 2 mm wide **3. *P. appressa***
 b. Inflorescence 3.5–13 cm long; mature corolla tube 3–4 mm wide
 **27. *P. warensis***
- 14a. Stamens sessile or with very short filaments. — New Guinea 15
 b. Stamens with well-developed filaments. — Widespread 17
- 15a. Leaves without prominent venation; disk lobes free **21. *P. sanguinea***
 b. Leaves with prominent venation above; disk lobes fused 16
- 16a. Corolla pinkish or reddish, with a rounded or apiculate head in bud; fruit spiny
 **16. *P. oligantha***
 b. Corolla yellow, with an acuminate head in bud; fruit smooth **9. *P. flavescens***
- 17a. Filaments twisted around the style **1. *P. alboflavescens***
 b. Filaments straight or, if bent, not twisted around the style 18
- 18a. Flowers hour-glass-shaped; corolla tube > 7 mm long. **6. *P. constricta***
 b. Flowers not hour-glass-shaped; corolla tube < 6 mm long. 19
- 19a. Flowers fleshy, corolla lobes strongly overlapping in bud; sepal lobes rounded to
 obtuse **19. *P. philippinensis***
 b. Flowers not fleshy, corolla lobes only slightly overlapping or appearing valvate
 in bud; sepals acuminate to obtuse 20
- 20a. Anthers exerted completely beyond mouth of corolla tube; lobes 2.4–5.6 times
 as long as tube 21
 b. Anthers partially included in corolla tube or located at mouth of corolla tube; lobes
 0.4–3.1 times as long as corolla tube 22
- 21a. Inflorescence delicate, with flowers clustered at inflorescence branch ends forming
 rounded heads; fruits fusiform, ≤ 12 cm long. — Lesser Sunda Islands
 **23. *P. sundensis***
 b. Inflorescence more robust, flowers not forming rounded heads; fruits linear, ≥ 15
 cm long. — Moluccas, New Guinea **4. *P. buruensis***
- 22a. Filaments with large projections on the sides; dried leaves usually somewhat
 glaucous beneath **20. *P. rubra***
 b. Filaments without large projections on the sides; dried leaves not glaucous . . 23
- 23a. Corolla bearded in throat with brown hairs, usually densely brown pubescent
 outside, rarely glabrous 24
 b. Corolla glabrous or pale-coloured pubescent in throat and glabrous, brown papil-
 lose or shortly puberulent outside 27
- 24a. Sepals erect or only slightly spreading at apex; corolla tube 4.2–5.4 mm long. .
 **27. *P. warensis***
 b. Sepals strongly reflexed; corolla tube 1.9–4.5 mm long 25
- 25a. Leaf base cuneate, rarely to obtuse; leaves 1.8–4.8 times as long as wide
 **7. *P. curvisepala***
 b. Leaf base cordate to rounded; leaves 1.1–2 times as long as wide 26
- 26a. Inflorescence 2.7–6.7 cm long; corolla tube 1.9–2.2 mm long. — Java to Flores
 **2. *P. apiculata***
 b. Inflorescence 7–18.5 cm long; corolla tube 2.9–3.2 mm long. — Bismarck
 Archipelago **17. *P. pedunculata***

- 27a. Corolla with downward pointing hairs in throat 30
 b. Corolla glabrous or with upward pointing hairs in throat 28
- 28a. Buds ovoid in shape; often papillose outside; disk entire . . . **18. P. penangiana**
 b. Buds cylindrical or club-shaped; not papillose outside; disk usually of 5 separate lobes 29
- 29a. Inflorescence 3–21 cm long, flowers not forming a dense rounded cluster at ends **1. P. alboflavescens**
 b. Inflorescence 1.1–4 cm long, flowers forming a dense rounded cluster at ends **24. P. tenuiflora**
- 30a. Open corolla campanulate or subcampanulate 31
 b. Open corolla salverform or with narrow tube and erect lobes 34
- 31a. Tertiary venation densely reticulate 32
 b. Tertiary venation largely obscure, occasionally slightly prominent 33
- 32a. Corolla lobes 1.8–3.1 times as long as tube **13. P. longiloba**
 b. Corolla lobes 0.7–1.3 times as long as tube **11. P. hebetica**
- 33a. Inflorescence pubescent all over; corolla tube 1.3–2 mm long; leaves 1–5.1 cm long **25. P. vaccinioides**
 b. Inflorescence pubescent only in upper parts; corolla tube 2–3.4 mm long; leaves 2.1–10.8 cm long **14. P. marginata**
- 34a. Corolla tube much narrower than corolla bud head **24. P. tenuiflora**
 b. Corolla tube wider than to more or less same width as corolla bud head 35
- 35a. Tertiary venation densely reticulate; leaves usually drying dull ochre above **11. P. hebetica**
 b. Tertiary venation obscure or only laxly reticulate; leaves not drying dull ochre above **21. P. sanguinea**

1. *Parsonsia alboflavescens* (Dennst.) Mabb.

Parsonsia alboflavescens (Dennst.) Mabb., Taxon 26 (1977) 532; P.I. Forst., Austrobaileya 3 (1992) 759; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 49; J.B. Williams in P.I. Forst. & J.B. Williams, Fl. Australia 28 (1996) 188; Coode et al., Checklist Pl. Brunei (1996) 28; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 128; D.J. Middleton, Blumea 42 (1997) 196; Fl. Thailand 7 (1999) 136; Pradhan in Singh et al., Fl. Maharashtra State, Dicot. 2 (2001) 323; Kessler et al., Blumea, Suppl. 14 (2002) 14. — *Periploca alboflavescens* Dennst., Schlüssel Hortus Malab. (1818) 12, 23, 35. — *Echites laevigatus* Moon, Cat. Pl. Ceylon (1824) 20. — *Parsonsia laevigata* (Moon) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11 (1929) 203; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 20; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 58; T.C. Huang, Taiwania 31 (1986) 99. — *Cudicia gyandra* Buch.-Ham. ex Dillwyn, Index Hort. Malab. (1839) 41. — Type: Illustration in Rheede, Hort. Mal. 9 (1689) t. 9.

Apocynum vincifolium Burm.f., Fl. Ind. (1768) 71. — Type: *Garcin* in *Herb. Burman* (holo G), nom. rej.
Helygia javanica Blume, Bijdr. (1826) 1043. — *Heligme javanica* Miq., Fl. Ned. Ind. 2 (1857) 429. sphalm. — *Parsonsia javanica* (Blume) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 184. — Type: *Blume s.n.* (lecto L [898.111-191], designated by Middleton (1997) op. cit.; iso BO), Java.

Parsonsia acuminata Wall., Numer. List 1634 (1829), nom. nud. — Based on: *Wallich 1634* (K-W).

Parsonsia pauciflora Wall., Numer. List 1635 (1829), nom. nud. — Based on: *Wallich 1635* (K-W).

Echites spiralis Blanco, Fl. Filip. (1837) 110. — *Parsonsia confusa* Merr., Philipp. J. Sci. (1-W), Suppl. (1906) 118. — Type: Untraced. Neotype: *Merrill Species Blancoanae 1014* (neo A, designated by

- Middleton (1997) op. cit.; iso BM, BO, GH, K, L, MO, NY, P, US, W), Philippines, Luzon, Bataan Province, Lamao.
- Parsonsia oblonga* Wall. ex G. Don, Gen. Hist. 4 (1837) 80; Miq., Fl. Ned. Ind. 2 (1857) 428; Bakh.f., Blumea 6 (1950) 392; Backer & Bakh.f., Fl. Java 2 (1965) 242. — Type: *Wallich 1632* (lecto K-W [as 1632.2]), designated by Middleton (1997) op. cit.; iso G-DC), Burma, Rangoon.
- Parsonsia spiralis* Wall. ex G. Don, Gen. Hist. 4 (1837) 80; D. Vidal, Sin. Gen. Pl. Leños. Filip. (1883) t. 66; K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 114; Warb., Bot. Jahrb. Syst. 13 (1890) 406; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 508; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 456; Hallier, Bot. Jahrb. Syst. 49 (1913) 375; Merr., Bibliogr. Enum. Born. Pl. (1921) 502; Ridl., Fl. Malay Penins. 2 (1923) 350; Markgr., Bot. Jahrb. Syst. 61 (1927) 217; Masam., Enum. Phan. Born. (1942) 623; Bakh.f., Blumea 6 (1950) 391; Backer & Bakh.f., Fl. Java 2 (1965) 242. — *Heligme spiralis* (Wall. ex G. Don) Thwaites, Enum. Pl. Zeyl. (1860) 193. — Type: *Wallich 1631* (lecto K-W, designated by Middleton (1997) op. cit.; iso G-DC, K), Bangladesh, Sylhet.
- Parsonsia helicandra* Hook. & Arn., Bot. Beechey Voy. (1837) 197; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 498; Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 216; M.R. Hend., Malay. Wild Fls., Monocots. (1959) 280; Peekel, Fl. Bismarck Archip. (1984) 451; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36. — Type: Untraced. — Merrill, Brittonia 1 (1933) 237 says the type is in GL, now housed at E, but I have been unable to find this specimen.
- Cudicia trichotoma* Buch.-Ham. ex Dillwyn, Index Hort. Malab. (1839) 41. — *Heligme rheedei* Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1303, nom. illeg.; Náves in Blanco, Fl. Filip., ed. 3, Atlas 2 (c. 1880) t. 310; Miq., Fl. Ned. Ind. 2 (1857) 430. — *Parsonsia rheedei* Fern.-Vill., Novis. App. (1880) 130, nom. illeg. — Type: Illustration in Rheede, Hort. Mal. 9 (1689) t. 10.
- Chaetosus volubilis* Benth., London J. Bot. 2 (1843) 226; Miq., Fl. Ned. Ind. 2 (1857) 400; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 392. — Type: *Hinds 1841* (holo K), Papua New Guinea.
- Parsonsia cumingiana* A.DC., Prodr. 8 (1844) 402; Miq., Fl. Ned. Ind. 2 (1857) 428; Merr., Fl. Manila (1912) 374; Bibliogr. Enum. Born. Pl. (1921) 502; Masam., Enum. Phan. Born. (1942) 623. — Type: *Cuming 1490* (lecto G-DC, designated by Middleton (1997) op. cit.; iso K, P, W), Philippines, Luzon, Manila.
- Aganosma concanensis* Hook., Hooker's Icon. Pl. 5 (1851) t. 841. — Type: *Dalzell s.n.* (lecto K, designated by Middleton (1997) op. cit.; iso K), India, Bombay.
- Heligme korthalsiana* Miq., Fl. Ned. Ind. 2 (1857) 429. — *Parsonsia korthalsiana* (Miq.) Boerl., Handl. Fl. Ned. Ind. 2, 2 (1899) 397; Bakh.f., Blumea 6 (1950) 391; Backer & Bakh.f., Fl. Java 2 (1965) 242. — Type: *Korthals s.n.* (lecto L [898.111-175]), designated by Middleton (1997) op. cit.; iso A [fragment]), Sumatra.
- Heligme minahassae* Teijsm. & Binn., Tijdschr. Ned.-Indië 25 (1863) 404. — *Parsonsia minahassae* (Teijsm. & Binn.) Koord., Meded. Lands Plantentuin 19 (1898) 531. — Type: *Binnendyck s.n.* (lecto BO, designated by Middleton (1997) op. cit.; iso K), Celebes.
- Heligme rheedei* Wight var. *macrocarpa* Teijsm. & Binn., Cat. Hort. Bot. Bogor. (1866) 127, nom. nud.
- Lyonsia viridiflora* F.M. Bailey, Queensland Agric. J. 3 (1898) 156. — Type: *F.M. Bailey s.n.* (holo BRI; iso K), Papua New Guinea, Chad's Bay.
- Parsonsia kunstleri* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 457; Ridl., Fl. Malay Penins. 2 (1923) 350; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 51; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 128. — Type: *King's Collector 1824* (lecto K, designated by Middleton (1997) op. cit.), Peninsular Malaysia, Perak, Larut.
- Parsonsia oblancifolia* Merr., Philipp. J. Sci., Bot. 7 (1912) 335. — Type: *Ramos 4723* (lecto K, designated by Middleton (1997) op. cit.), Philippines, Luzon, Zambales Province, Candelaria.
- Parsonsia magnifolia* Elmer, Leafl. Philipp. Bot. 8 (1919) 3071. — Type: *Elmer 17867* (lecto NY, designated by Middleton (1997) op. cit.), Philippines, Luzon, Laguna, Mt Makiling.
- Lyonsia sumatrana* Ridl., Bull. Misc. Inform. Kew 1925 (1925) 84. — Type: *Brooks 7100* (lecto K, designated by Middleton (1997) op. cit.), Sumatra, Bengkulu, Lubok Tandai.

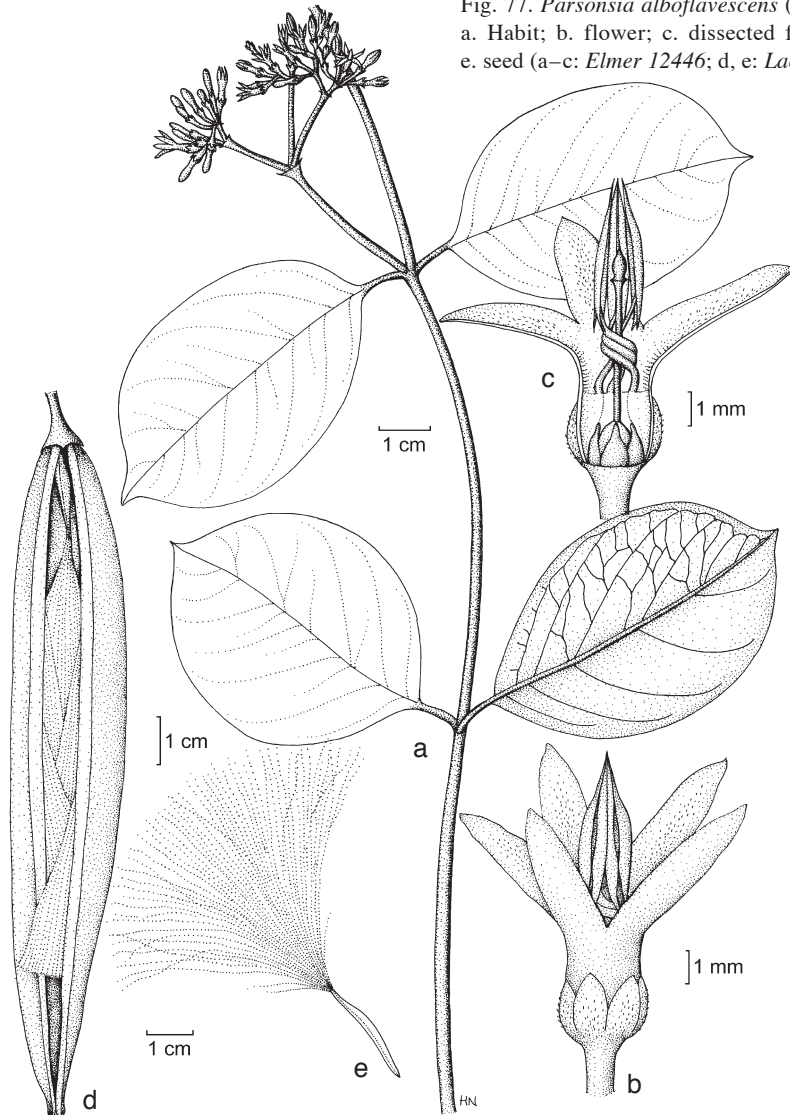
Parsonsia oblongifolia Merr., Philipp. J. Sci. 27 (1925) 50. — Type: *Loher 13477* (holo PNH†; lecto M, designated by Middleton (1997) op. cit.), Philippines, Luzon, Rizal, Paningtingan. — This is tentatively placed in synonymy here as the surviving material is sterile.

Parsonsia longipedunculata Merr., Pl. Elmer. Born. (1929) 255; Masam., Enum. Phan. Born. (1942) 623. — Type: *Elmer 20552* (lecto K, designated by Middleton (1997) op. cit.; iso L, M, SING), Peninsular Malaysia, Sabah, Tawau.

Parsonsia aterinervia [Elmer ex Merr., Enum. Philipp. Fl. Pl. 3 (1923) 338, in obs.] Elmer ex Merr., Leaflet Philipp. Bot. 10 (1939) 3695. — Type: *Elmer 15707* (untraced), Philippines, Luzon, Sorsogon, Irosin, Mt Bulusan. — This species is synonymised on the basis of Elmer's description.

Parsonsia panniculata Pichon, Notul. Syst. (Paris), ed. Humbert 14 (1950) 16; Backer & Bakh.f., Fl. Java 2 (1965) 242. — Type: *Zollinger 537* (holo P), Java.

Fig. 77. *Parsonsia alboflavescens* (Dennst.) Mabb.
a. Habit; b. flower; c. dissected flower; d. fruit;
e. seed (a–c: *Elmer 12446*; d, e: *Lace 5079*).



Branches lenticellate or not; branchlets glabrous or sparsely to densely minutely puberulent. *Leaves* opposite; petiole 0.7–4.7 cm long, glabrous or sparsely puberulent; blade papery to thickly coriaceous when dried, elliptic, ovate or, rarely, obovate or oblong, 3.5–23 by 0.8–21 cm, 1.2–4.4 times as long as wide, apex acuminate, rarely to obtuse, base cuneate to cordate, glabrous or sparsely to extensively puberulent beneath, 5–10 pairs of secondary veins, ascending, tertiary venation laxly reticulate to scalariform, rarely obscure. *Inflorescence* of axillary and, more rarely, terminal cymes, 3–21 cm long; sparsely to densely shortly pale puberulent; peduncles 1.2–13.5 cm long; pedicels 2.2–8.5 mm long. *Sepals* ovate, sometimes somewhat saccate at base of each lobe, 1.2–2.8 by 0.9–2.1 mm, 1–2.2 times as long as wide, apex acute to obtuse, glabrous to puberulent outside. *Corolla* yellowish to greenish, occasionally with some red inside; bud cylindrical or wider around the middle with a rounded to acute head, lobes slightly overlapping, open corolla with erect to only slightly spreading lobes; tube 1.6–4.5 mm long, 1.1–2.7 times as long as sepals, 0.5–1.4 times as long as lobes; lobes oblong to narrowly triangular, 2.1–5.8 by 0.7–1.5 mm, apex rounded to acute; glabrous to shortly puberulent outside and glabrous, puberulent in throat or sparsely puberulent down tube inside. *Stamens* inserted at 0.9–2.5 mm from corolla base which is 0.2–0.7 of tube length; filaments most commonly strongly twisted around the style, more rarely less strongly twisted to straight, 1.1–4.3 mm long; anthers 2.6–4.2 by 0.5–0.8 mm, 4.3–8 times as long as wide. *Disk* of 5 separate lobes, ovate to triangular, apex rounded to acute or irregularly toothed, 0.5–1.2 mm long. *Ovary* 0.7–1.5 mm long; style 1.5–4.6 mm long; style head 0.7–1.3 mm long. *Fruit* linear to fusiform, apex tapered, thin walled, smooth, glabrous to sparsely puberulent; 5.2–21 by 0.7–1.4 cm. *Seeds*: grain 9.5–24 by 1.2–3 mm; coma 1.8–4.6 cm long. — **Fig. 77.**

Distribution — From southern China and Taiwan to India and Sri Lanka and eastwards to Indochina, northern Australia and the Solomon Islands; in *Malesia*: throughout Malesia.

Habitat & Ecology — This species grows in a wide variety of habitats from beaches to swampy ground or dried-up mangroves to secondary or primary forest. It occurs up to 1500 m but has most frequently been collected in coastal vegetation.

Note — This species has the widest variation of any species in the genus. There are a number of indistinct groups discussed in Middleton, *Blumea* 42 (1996).

2. *Parsonsia apiculata* (Bakh.f.) D.J. Middleton

Parsonsia apiculata (Bakh.f.) D.J. Middleton, *Blumea* 42 (1997) 200. — *Grisseea apiculata* Bakh.f. (in Backer, *Bekn. Fl. Java, Afl. 7, Fam. 172* (1948) 49, nom. inval. (no Latin description)), *Blumea* 6 (1950) 392; Backer & Bakh.f., *Fl. Java 2* (1965) 243. — Type: *Dorgelo 2022* (holo BO, untraced; lecto L, designated by Middleton (1997) op. cit.; iso L), E Java, Surabaya, Grisee village.

Branches lenticellate; branchlets sparsely tomentose. *Leaves* opposite; petiole 1–2.9 cm long; blade papery, elliptic to ovate, 4.5–12 by 2.3–7.5 cm, 1.4–2 times as long as wide, apex acuminate, base rounded, sparsely puberulent on midrib above, sparsely puberulent all over beneath, 5–7 pairs of secondary veins, slightly ascending, tertiary venation laxly reticulate to scalariform, sometimes somewhat obscure. *Inflorescence* of congested axillary and terminal cymes, 2.7–6.7 cm long; covered in dense spreading

hairs; peduncles 1.6–4.1 cm long; pedicels 1.6–2.2 mm long. *Sepals* linear, reflexed, 1.3–2 by 0.6–1 mm, 1.6–3.3 times as long as wide, apex acuminate to acute, brown velutinous. *Corolla* yellow; bud cylindrical, apiculate, lobes only slightly overlapping, open corolla salverform or with erect lobes; tube 1.9–2.2 mm long, 1–2.5 times as long as calyx, 0.9–1.3 times as long as lobes; lobes triangular, 1.5–2.2 by 0.9–1 mm, apex acuminate; brown velutinous all over or on lobes and upper 2/3 of tube outside, densely pubescent in throat and upper half of tube inside. *Stamens* inserted at 0.4–0.7 mm from corolla base which is 0.2–0.3 of tube length; filaments slightly curved, puberulent, c. 0.5 mm long; anthers oblong, tails rounded, flattened, 1.9–2.1 by 0.4 mm, 4.8–5.3 times as long as wide. *Disk* of 5 separate lobes, oblong, bifid or 3-dentate on top, c. 0.7 mm long. *Ovary* 0.6–0.7 mm long; style c. 0.7 mm long; style head c. 0.5 mm long. *Fruit* unknown.

Distribution — *Malesia*: Java, Lesser Sunda Islands (Flores). It may also be found in the islands between but no specimens have been seen.

Habitat & Ecology — The only information available is that one specimen was collected at 400 m.

Note — This species appears to be close to *P. lata* from which it is distinguished by its smaller, more condensed inflorescences.

3. *Parsonsia appressa* D.J. Middleton

Parsonsia appressa D.J. Middleton, *Blumea* 42 (1997) 203. — Type: *Craven & Schodde 880* (holo L; iso A, CANB, L), Papua New Guinea, Gulf province, near Malalaua.

Branchlets tomentose. *Leaves* opposite; petiole 1.3–2.8 cm long; blade subcoriaceous to coriaceous, ovate to elliptic, 4.7–15.2 by 3.1–12.1 cm, 1.2–1.6 times as long as wide, apex acuminate, base cordate, densely brown velutinous beneath, more sparsely so above, 6–9 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* of axillary and terminal cymes forming a large panicle, 12–20 cm long; appressed brown velutinous; peduncles 6–7.5 cm long; pedicels 2.3–4.5 mm long. *Sepals* ovate, 1.7–2.8 by 0.9–1.3 mm, 1.8–2.2 times as long as wide, apex acute, appressed velutinous. *Corolla* cream coloured; buds cylindrical with an acuminate head, lobes slightly overlapping, open corolla salverform; tube 3–4 mm long, 1.4–2.1 times as long as sepals, 1.4–2 times as long as lobes; lobes triangular, 1.9–2.6 by 1.1 mm, acuminate, papillose inside; velutinous outside on upper 2/3, bearded in throat and in 5 rows down tube inside. *Stamens* inserted at c. 2 mm from corolla base which is 0.4–0.5 of tube length; filaments straight or slightly curved, c. 0.7 mm long, pubescent; anthers narrowly triangular, tails narrow, 2.2–2.4 by 0.5–0.6 mm, 3.7–4.8 times as long as wide. *Disk* of 5 separate oblong lobes, 3 notched at apex, 1.5–1.8 mm long. *Ovary* c. 0.6 mm long; style 2.2–2.6 mm long; style head c. 0.7 mm long. *Fruit* unknown. — **Fig. 78.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Recorded, only twice, from swamp forest near sea level.

Note — Close to *P. lata* and *P. pedunculata*. It differs from the former in its appressed hairs and generally larger and looser panicles and from the latter in its larger flowers, erect sepals and more densely pubescent leaves.

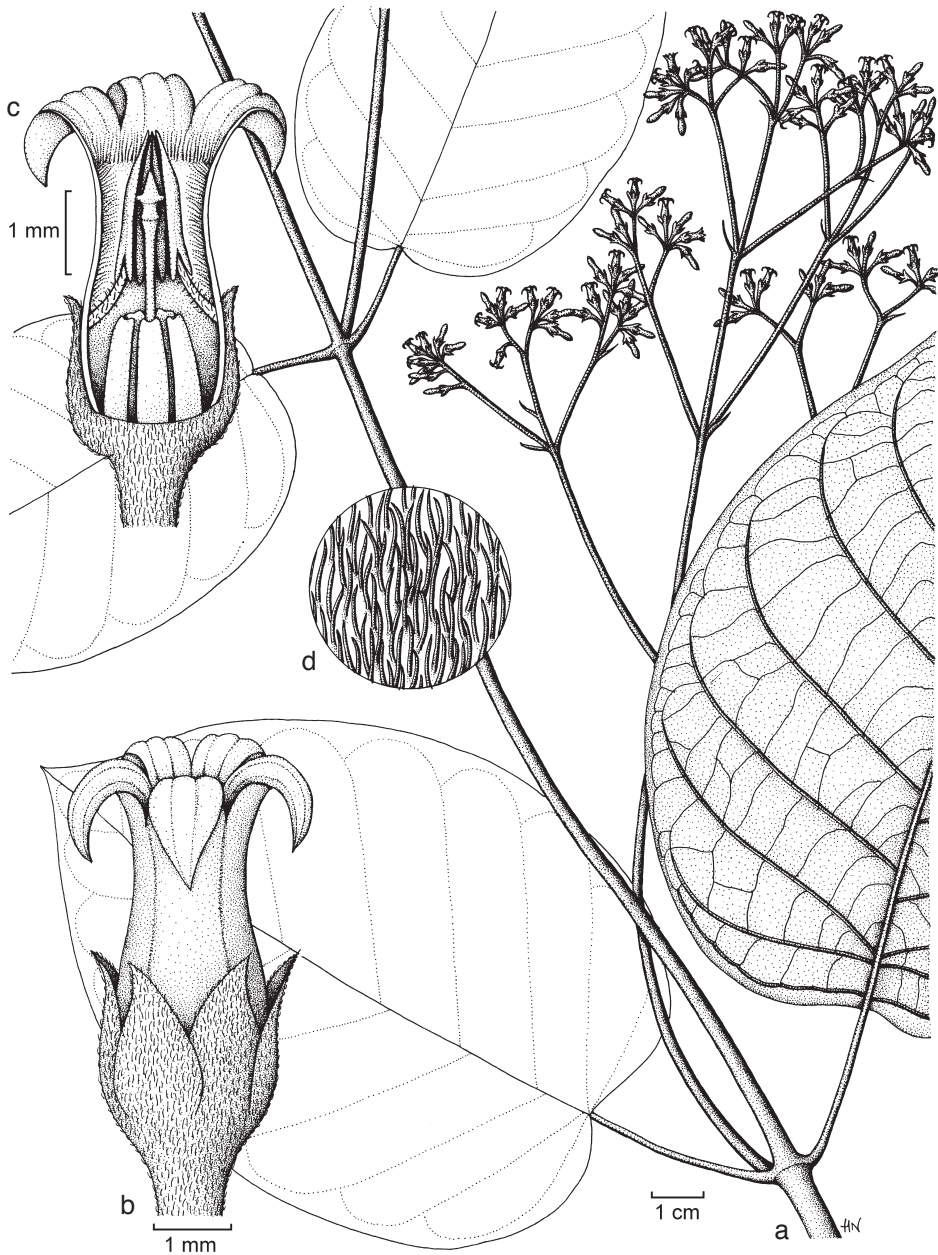


Fig. 78. *Parsonsia appressa* D.J. Middleton. a. Habit; b. flower; c. flower dissection; d. close up of appressed hairs on stems and leaves (Craven & Schodde 880, L).

4. *Parsonsia buruensis* (Teijsm. & Binn.) Boerl.

Parsonsia buruensis (Teijsm. & Binn.) Boerl., Handl. Fl. Ned. Ind. 2, 2 (1899) 397; Markgr., Bot. Jahrb. Syst. 61 (1927) 218; D.J. Middleton, Blumea 42 (1997) 204. — *Heligme buruensis* Teijsm. & Binn., Tijdschr. Ned.-Indië 25 (1863) 405. — Type: *Binnendyck s.n.* (lecto BO, designated by Middleton (1997) op. cit.; iso BO; L photo), Moluccas, Buru.

Branchlets glabrous to sparsely and minutely puberulent. *Leaves* opposite; petiole 1.5–4.8 cm long, glabrous or with a few hairs; blade papery to subcoriaceous, ovate to elliptic, 6.8–24 by 2.4–12 cm, 1.7–3.1 times as long as wide, apex acuminate, base rounded to cuneate, glabrous, 6–8 pairs of secondary veins, ascending, tertiary venation densely reticulate. *Inflorescence* axillary and terminal usually forming a large terminal panicle, 8–9.4 cm long; shortly brown puberulent; peduncle 3.5–4.8 cm long; pedicels 2.8–5 mm long. *Sepals* ovate, apex acute, rarely acuminate, 1.1–1.8 by 0.6–1.1 mm, 1.5–2.3 times as long as wide, brown puberulent outside. *Corolla* white to greenish white; buds narrow cylindrical, apex acuminate, very slightly overlapping; open corolla with long strongly reflexed lobes; tube 1.1–1.9 mm long, 0.8–1.5 times as long as sepals; lobes linear, 4–5.2 by 0.5–0.8 mm, 2.4–3.9 times as long as tube; glabrous to sparsely puberulent outside, densely pubescent at base of lobes and top of tube inside. *Stamens* inserted at 0.7–0.9 mm from corolla base which is 0.4–0.5 of tube length; filaments straight, connate, pubescent, 3.5–3.8 mm long; anthers oblong with incurving tails, 3–3.2 by 0.6 mm, 5–5.3 times as long as wide, exerted completely beyond mouth of corolla. *Disk* of 5 separate lobes, oblong to elliptic, acuminate to apiculate, 1.3–1.7 mm long. *Ovary* 0.7–0.9 mm long; style 3.7–4.2 mm long; style head 0.6–0.7 mm long. *Fruit* linear, apex acute to obtuse, thick walled; minutely puberulent; 15–26.5 by 1–1.3 cm. *Seeds*: grain 16.8–18.6 by 2.8 mm; coma 5.5–6.2 cm long.

Distribution — *Malesia*: Moluccas, New Guinea.

Habitat & Ecology — This species has been collected from 0–1500 m in primary and secondary forest and in savannah.

Note — This species was described from a plant grown in the Botanic Gardens in Bogor but was allegedly originally collected in Buru, hence the name. In the sterile state it is easily confused with *P. rubra*.

5. *Parsonsia celebica* (Oliv.) Sleesen

Parsonsia celebica (Oliv.) Sleesen, Nova Guinea n.s. 9 (1958) 341; D.J. Middleton, Blumea 42 (1997) 205; Kessler et al., Blumea, Suppl. 14 (2002) 14. — *Lyonsia celebica* Oliv., J. Linn. Soc., Bot. 15 (1876) 99. — Type: *Riedel s.n.* (lecto K, designated by Middleton (1997) op. cit.; iso BO), Celebes, Gorontalo.

Branchlets densely short tomentose. *Leaves* opposite; petiole 1.9–3.5 cm long; blade papery to subcoriaceous, ovate, elliptic or obovate, 6.2–23.2 by 3.8–18 cm, 1.1–1.8 times as long as wide, apex acuminate, base rounded to cordate, brown velutinous beneath, sparser above, 5–8 pairs of secondary veins, ascending, tertiary venation laxly reticulate. *Inflorescence* of axillary cymes, 3.3–15 cm long; densely brown appressed velutinous; peduncles 1.6–7.5 cm long; pedicels 1.5–7 mm long. *Sepals* narrow ovate, erect to reflexed at apex, 1.8–2.9 by 1–1.4 mm, 1.7–2.9 times as long as wide, apex acute to acuminate, densely brown appressed velutinous. *Corolla* brownish violet

and white; buds cylindrical with an acuminate head, lobes slightly overlapping; tube 5.4–7.5 mm long, 2.2–3.3 times as long as sepals, 2–3.3 times as long as lobes; lobes triangular, apex acute, papillate inside, 2–3.5 by 1–1.2 mm; densely brown velutinous on lobes and upper half of tube outside, bearded in throat, densely pubescent in 5 rows down tube inside. *Stamens* inserted at 3.2–4.8 mm from corolla base which is 0.4–0.5 of tube length; filaments straight or slightly curved, 0.5–1.2 mm long, pubescent;

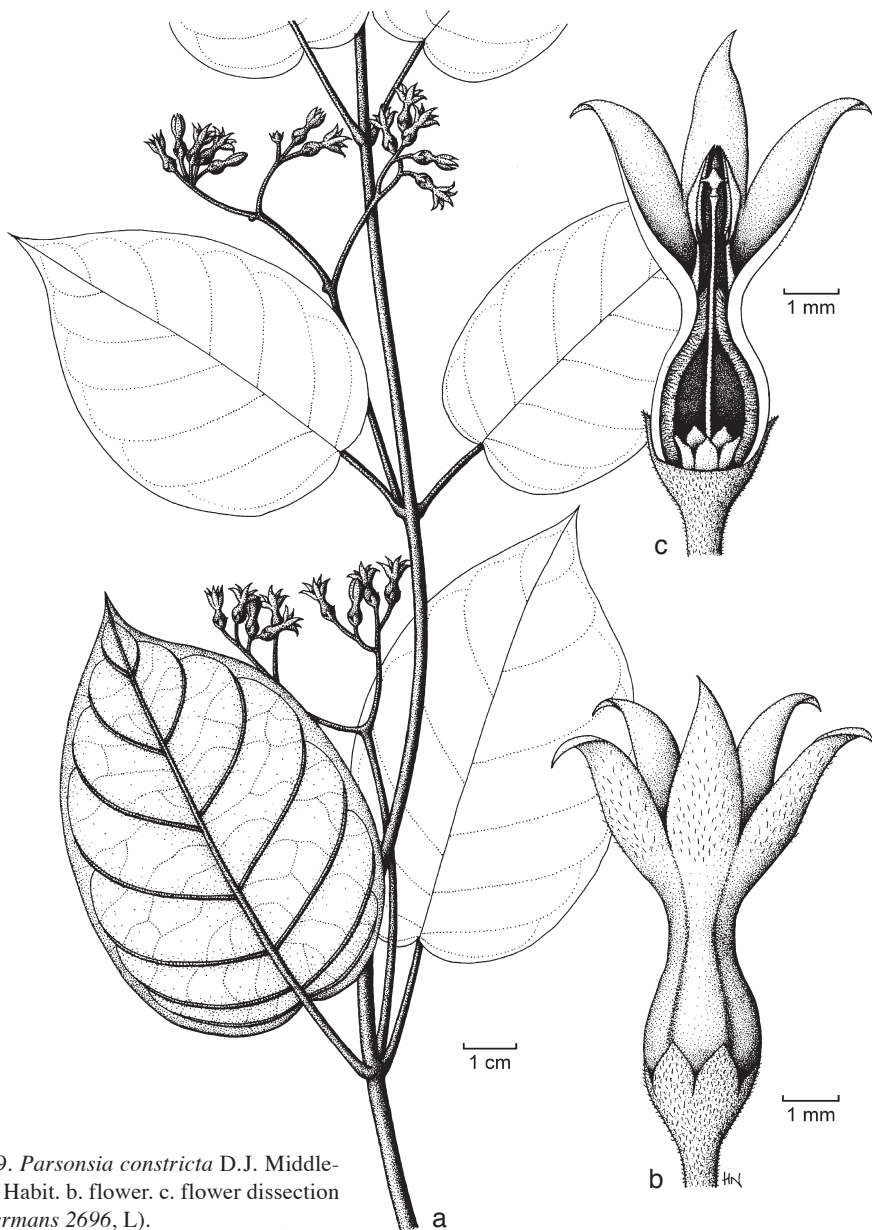


Fig. 79. *Parsonsia constricta* D.J. Middleton. a. Habit. b. flower. c. flower dissection (Kostermans 2696, L).

anthers narrowly triangular with broad flat tails, 3.1–3.4 by 0.6–0.7 mm, 4.4–5.7 times as long as wide. *Disk* of 5 separate lobes, oblong, notched or flat at top, 1.7–2.2 mm long. *Ovary* 0.6–0.7 mm long; style 3.4–4.5 mm long; style head 1–1.3 mm long. *Fruit* fusiform, brown pubescent, 9–13.5 by 1.7–3 cm. *Seeds*: grain 13–15 by 2.1–2.6 mm; coma 1.4–3.3 cm long.

Distribution — *Malesia*: Peninsular Malaysia, Borneo, Sulawesi.

Habitat & Ecology — This species has been collected in primary and secondary forest, sometimes on limestone, up to 1200 m.

6. *Parsonia constricta* D.J. Middleton

Parsonia constricta D.J. Middleton, *Blumea* 42 (1997) 207. — Type: *Kostermans 2696* (holo L.; iso BO), New Guinea, Papua, Momi, south of Manokwari.

Branchlets tomentose, becoming sparsely so with age. *Leaves* opposite; petiole 1.8–2.2 cm long; blade subcoriaceous, ovate, 6.7–10.3 by 3.6–7.4 cm, 1.4–1.9 times as long as wide, apex acuminate, base cordate, brown pubescent on midrib and secondary veins above and beneath, otherwise glabrous, 6 or 7 pairs of secondary veins, ascending, prominent beneath, tertiary venation reticulate. *Inflorescence* of axillary cymes, 8.5–10.6 cm long; brown velutinous; peduncles 4.5–6.5 cm long; pedicels 3.5–4.7 mm long. *Sepals* ovate, 2.5–2.7 by 1.2–1.5 mm, 1–1.1 times as long as wide, apex acute, densely brown appressed velutinous. *Corolla* bright yellow, buds strongly constricted in middle, lobes slightly overlapping, open corolla strongly constricted in the middle with erect lobes; tube 7.1–7.6 mm long, 3.6–4.2 times as long as sepals, c. 2 times as long as lobes; lobes ovate, 4.5–4.7 by 2.4 mm, apex acuminate; sparsely pubescent on lobes and upper part of tube outside, densely pubescent below anthers and glabrous in upper part inside. *Stamens* inserted at c. 6.2 mm from corolla base which is c. 0.7 of tube length; filaments straight, pubescent, c. 1.3 mm long; anthers with narrow tails, c. 4.3 by 0.8 mm, c. 5.4 times as long as wide. *Disk* lobes fused at base, oblong, flat topped, c. 1.9 mm long. *Ovary* c. 1 mm long; style c. 7.3 mm long; style head c. 1.1 mm long. *Fruit* unknown. — **Fig. 79.**

Distribution — *Malesia*: New Guinea (Vogelkop Peninsula).

Habitat & Ecology — In dense forest at low altitude.

Note — Known from only one collection.

7. *Parsonia curvisepala* K. Schum.

Parsonia curvisepala K. Schum., *Bot. Jahrb. Syst.* 9 (1888) 215; K. Schum. & Hollrung, *Fl. Kais. Wilh. Land* (1889) 114; K. Schum. & Lauterb., *Fl. Schutzgeb. Südsee* (1901) 508; Markgr., *Nova Guinea* 14, 2 (1926) 289; *Bot. Jahrb. Syst.* 61 (1927) 219; Merr. & L.M. Perry, *J. Arnold Arbor.* 24 (1943) 215; D.J. Middleton, *Blumea* 42 (1997) 207. — Type: *Hollrung 96* (lecto K, designated by Middleton (1997) op. cit.), Papua New Guinea.

Parsonia verticillata K. Schum. in K. Schum. & Lauterb., *Nachtr. Fl. Schutzgeb. Südsee* (1905) 351. — Type: *Nyman 856* (untraced). — Although no type material of this species has been seen it is clear from the description that it is a synonym of *P. curvisepala*.

Parsonia stenocarpa King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 458; Ridl., *Fl. Malay Penins.* 2 (1923) 351; I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 128. — Type: *Wray 3263* (lecto K, designated by Middleton (1997) op. cit.; iso SING), Peninsular Malaysia, Perak.

Aganosma apoensis Elmer, Leafl. Philipp. Bot. 4 (1912) 1445. — *Parsonsia apoensis* (Elmer) Merr., Philipp. J. Sci., Bot. 9 (1914) 384. — Type: *Elmer 10540* (lecto K, designated by Middleton (1997) op. cit.; iso A, BISH, BM, BO, E, G, GH, L, MO, NY, P, U, US, W, WRSL, Z), Philippines, Mindanao, Davao, Todaya. — Elmer published two collections in his original description, *Elmer 11719* and *Elmer 12540*. This latter is undoubtedly a publication error for *Elmer 10540*.

Lyonsia mollissima Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 109. — *Parsonsia mollissima* (Wernham) Markgr., Bot. Jahrb. Syst. 61 (1927) 220; Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 216. — Type: *C.B. Kloss s.n.* (Dec. 1912–Jan. 1913) (lecto BM, designated by Middleton (1997) op. cit.), New Guinea, Papua, Utakwa River to Mt Carstensz.

Parsonsia cyathocalyx Markgr., Bot. Jahrb. Syst. 61 (1927) 220. — Type: *Ledermann 13037* (untraced, probably destroyed in B). Neotype: *Ledermann 12585* (neo L, designated by Middleton (1997) op. cit.), Papua New Guinea, Sepik. — The neotype is the only one of Markgraf's paratypes which could be traced.

Parsonsia urdanetensis Elmer ex Merr. (Enum. Philipp. Fl. Pl. 3 (1923) 338, nom. nud.), Leafl. Philipp. Bot. 10 (1939) 3696, nom. inval. (no Latin description). — Based on: *Elmer 13836* (A, BM, BO, GH, K, MO, NA, NY, US, W), Philippines, Mindanao, Agusan Province, Mt Urdaneta.

Parsonsia dallmannensis Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 498. — Type: *Kaneh. & Hatus. 12065* (lecto TI n.v., designated by Middleton (1997) op. cit.; iso A, BO), New Guinea, Papua, Dalman, Nabire.

Branchlets short to long brown tomentose. *Leaves* in whorls of 3 or 4, more rarely opposite; petiole 0.5–2.6 cm long; blade papery to subcoriaceous, elliptic to obovate, 1.5–13.5 by 0.6–5.8 cm, 1.8–4.8 times as long as wide, apex acuminate to rounded, sometimes apiculate, base cuneate to obtuse, densely brown velutinous above and beneath to pubescent only on midrib, 4–8 pairs of secondary veins, tertiary venation reticulate, sometimes prominent beneath. *Inflorescence* of axillary cymes, frequently umbelliform with the flowers clustered at the ends, 2–10.5 cm long; densely brown velutinous; peduncles 0.9–7.5 cm long; pedicels 2–6.1 mm long. *Sepals* linear, strongly reflexed, more rarely erect and/or broader obovate, 2–4.5 by 0.5–1.4(–2.2) mm, (1.7–) 1.9–7 times as long as wide, tomentose. *Corolla* yellowish, buds cylindrical, head acute to acuminate, lobes slightly overlapping, open corolla salverform; tube 2.1–4.5 mm long, 0.8–1.8 times as long as sepals, 1–2.5 times as long as lobes; lobes triangular, apex acute to acuminate, 1.3–2.6 by 0.6–1.2 mm; sparsely to densely brown pubescent or, rarely, glabrous outside, pubescent in upper tube inside. *Stamens* inserted at 0.5–0.8 mm from corolla base which is 0.1–0.2 of tube length; filaments straight, narrow, pubescent, 1.1–2 mm long; anthers narrowly triangular, tails squared, flattened, 2.4–3.5 by 0.5–0.6 mm, 4.8–7 times as long as wide. *Disk* of 5 separate lobes, elliptic, acute to notched at apex, 0.7–1.1 mm long. *Ovary* 0.7–1 mm long; style 1.1–2.1 mm long; style head 0.6–1 mm long. *Fruit* linear, minutely puberulent; 2.2–39 cm by 3.2–5.3 mm. *Seeds*: grain 7–17 by 0.4–2 mm; coma yellowish, 1.3–4.7 cm long.

Distribution — Solomon Islands; in *Malesia*: Peninsular Malaysia, Philippines, Sulawesi, New Guinea.

Habitat & Ecology — This species has been collected from low altitude to 1800 m in primary and secondary lowland forest and in lower montane forest, sometimes on limestone.

Note — This species is second only to *P. alboflavescens* in its variability and geographic distribution.

8. *Parsonsia densiflora* D.J. Middleton

Parsonsia densiflora D.J. Middleton, *Blumea* 42 (1997) 211. — Type: *Womersley NGF 11028* (holo L; iso A, BO, BRI, CANB, K, L, SING), Papua New Guinea, Morobe District, Edie Creek above Wau.

Branchlets densely brown velutinous. *Leaves* opposite; petiole 0.6–1.7 cm long; blade subcoriaceous, elliptic to oblong, 4.7–10.5 by 1.4–4.3 cm, 2.4–3 times as long

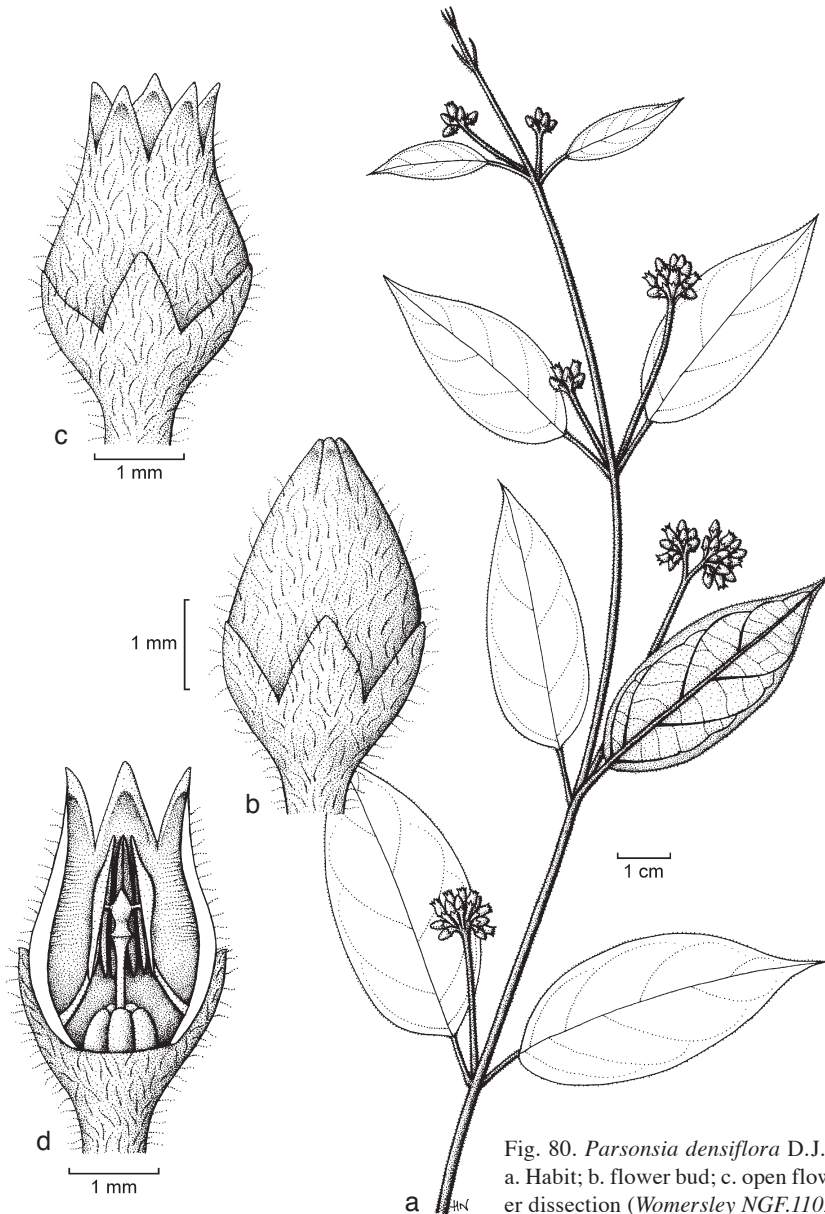


Fig. 80. *Parsonsia densiflora* D.J. Middleton. a. Habit; b. flower bud; c. open flower; d. flower dissection (*Womersley NGF.11028*, L).

as wide, apex acuminate, base obtuse to rounded, densely brown velutinous beneath, slightly less densely so above, 4 or 5 pairs of secondary veins, arcuate ascending, tertiary venation reticulate. *Inflorescence* of axillary cymes with flowers clustered at tips, 3.2–4.8 cm long; velutinous; peduncles 2.2–4.7 cm long; pedicels 2.3–3.5 mm long. *Sepals* ovate, 1.6–2.8 by 0.9–1.6 mm, 1.4–2.2 times as long as wide, apex acuminate, densely brown velutinous. *Corolla* cream coloured or yellowish green, buds ovoid, apex acuminate, lobes slightly overlapping, open corolla with erect lobes; tube 1.6–2.2 mm long, 0.7–1 times as long as sepals, 1.2–2 times as long as lobes; lobes triangular, apex acuminate, 1–1.5 by 0.7 mm; densely pubescent on tube and base of lobes outside with glabrous lobe tips, densely pubescent on inside of lobes and in throat. *Stamens* inserted at c. 0.7 mm from corolla base which is c. 0.2 of tube length; filament curved, pubescent, 0.8–1 mm long; anthers with broad tails, c. 2.7 by 0.5 mm, c. 5.4 times as long as wide. *Disk* of 5 separate lobes, thick, flat topped, 0.5–0.7 mm long. *Ovary* 0.5–0.7 mm; style c. 1.3 mm long; style head c. 0.8 mm long. *Fruit* unknown. — **Fig. 80.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Collected on road banks at 1500–1890 m altitude.

9. *Parsonsia flavescens* Merr. & L.M. Perry

Parsonsia flavescens Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 216; D.J. Middleton, Blumea 42 (1997) 212. — Type: *Brass 11647* (holo A; iso BM, BO, BRI, K; L photo), New Guinea, Papua, Baliem River.

Branches lenticellate or not; branchlets glabrous to minutely and sparsely puberulent. *Leaves* opposite; petiole 3–12 mm long; blade coriaceous, ovate to broad elliptic, 2.3–9 by 1.3–5.5 cm, 1.3–4.1 times as long as wide, apex acuminate, base rounded, glabrous, sometimes with few hairs on petiole, 5–8 pairs of secondary veins, not particularly distinct from tertiary venation, tertiary venation prominent above. *Inflorescence* of axillary cymes, 2–4 cm long, minutely and sparsely puberulent; peduncles 0.6–2 cm long; petiole 3–5.8 mm long. *Sepals* ovate, imbricate, 1.7–2.1 by 0.8–1.2 mm, 1.4–2.3 times as long as wide, apex acute to obtuse, glabrous except for ciliate margin. *Corolla* yellow, buds with an acuminate head, lobes clearly overlapping, open corolla salverform; tube 2.9–4.1 mm long, 1.4–2.3 times as long as sepals, 1–1.4 times as long as lobes; lobes ovate to oblong, apex rounded to obtuse, 2.2–3.3 by 1.5–1.8 mm; glabrous outside, densely pubescent at top of tube and behind anthers inside. *Stamens* inserted at 1.9–2.2 mm from corolla base which is 0.5–0.6 of tube length; filaments geniculate, 0.2–0.4 mm long; anthers narrowly triangular, tails narrow, 3.5–4.1 by 0.6–0.7 mm, 5–6.8 times as long as wide. *Disk* annular, surrounding ovary, 5-crenate, 0.8–1 mm long. *Ovary* 0.6–0.7 mm long; style 2–3.1 mm long; style head 0.9–1.1 mm long. *Fruit* (immature) fusiform, smooth.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest, 1600–2350 m altitude.

10. *Parsonsia grandiflora* D.J. Middleton

Parsonsia grandiflora D.J. Middleton, Blumea 42 (1997) 213. — Type: *De Vogel 3650* (holo L; iso BO, CANB, K, MO), Moluccas, Bacan Island, Gunung Sibela near Waiaua.

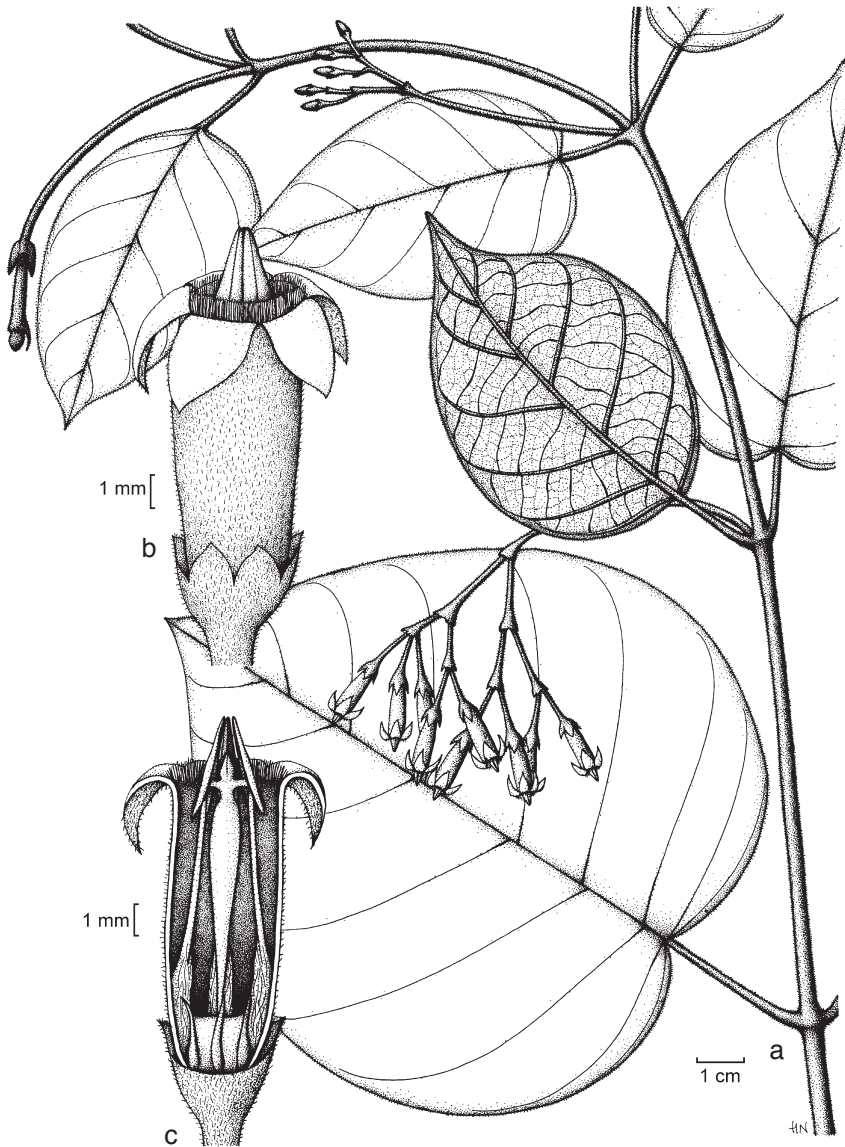


Fig. 81. *Parsonsia grandiflora* D.J. Middleton. a. Habit; b. flower; c. flower dissection (*De Vogel* 3650, L, CANB).

Branchlets densely velutinous. *Leaves* opposite; blade subcoriaceous, ovate to elliptic, 8–17.5 by 4.6–14 cm, 1.6–2 times as long as wide, apex acuminate, base rounded to obtuse, tertiary venation laxly reticulate; brown velutinous above and beneath, 7 or 8 pairs of secondary veins, ascending, prominent beneath. *Inflorescence* of axillary cymes, 6.5–8 cm long; densely brown velutinous; peduncles 4–4.3 cm long; pedicels 7.8–8.2 mm long. *Sepals* ovate, 2.5–2.7 by 1.2–1.5 mm, 1.8–2.1 times as long as wide,

apex acute, densely brown velutinous. *Corolla* yellow, buds cylindrical, apex acute, lobes slightly overlapping, open corolla cylindrical with lobes strongly reflexed; tube 10–10.5 mm long, 3.7–4.2 times as long as sepals, 2–2.5 times as long as lobes; lobes ovate, 4.5–4.7 by 2.5 mm; brown pubescent outside except at base of tube, sparsely pubescent all over inside and bearded at throat. *Stamens* inserted at c. 2.5 mm from corolla base which is c. 0.3 of tube length; filaments straight, sparsely shortly pubescent, c. 3.5 mm long; anthers narrowly triangular, tails narrow, with a boss on the back at the base, c. 5 by 1.1 mm, c. 4.5 times as long as wide. *Disk* of 5 fused lobes, each lobe with 3 small teeth, 3 mm long. *Ovary* c. 0.7 mm long; style c. 6.6 mm long; style head c. 2 mm long. *Fruit* unknown. — **Fig. 81.**

Distribution — *Malesia*: Moluccas (Bacan Island).

Habitat & Ecology — Collected only once in dense primary forest at 1000 m.

Note — This species is characterised by its very large flowers, the largest for the genus in *Malesia*

11. *Parsonsia hebetica* Markgr.

Parsonsia hebetica Markgr., Bot. Jahrb. Syst. 61 (1927) 215; D.J. Middleton, Blumea 42 (1997) 215.

— Type: *Schlechter 19770* (lecto K, designated by Middleton (1997) op. cit.), Papua New Guinea, sine loc.

Branchlets glabrous to puberulent. *Leaves* opposite; petiole 1.4–3.6 cm long; blade coriaceous to subcoriaceous, elliptic, 4.9–13.3 by 1.5–6.6 cm, 2.1–3.2 times as long as wide, apex caudate to acuminate, base obtuse, glabrous to minutely and sparsely puberulent, 7–10 pairs of secondary veins, ascending, tertiary venation reticulate and often dark. *Inflorescence* of axillary and terminal cymes, 4.2–6.2 cm long, brown pubescent; peduncle 2–3.5 cm long; pedicels 3.3–5 mm long. *Sepals* ovate, 0.9–1.3 by 0.6–0.8 mm, 1.3–1.8 times as long as wide, apex acuminate to acute, puberulent. *Corolla* yellowish or purplish, buds with slightly wider head, lobes slightly overlapping, open corolla with erect to spreading lobes; tube 3–4.4 mm long, 3–3.3 times as long as sepals, 0.8–1.4 times as long as lobes; lobes linear, 3.2–3.5 by 0.6–0.7 mm; sparsely puberulent outside, densely puberulent in throat with downward pointing hairs. *Stamens* inserted at 0.7 mm from corolla base which is 0.2–0.3 of tube length; filaments straight, puberulent, 1.7–2.7 mm long; anthers narrowly triangular, tails curving into each other, 2.9–3.6 by 0.6 mm, 4.8–6 times as long as wide. *Disk* of 5 separate lobes, triangular, apex acuminate, 0.7–1.1 mm long. *Ovary* 0.7–1 mm long; style 2.1–3.1 mm long; style head 0.8–1 mm long. *Fruit* linear, puberulent, 6.9–12.9 cm by 2.8–3.2 mm. *Seeds*: grain 4.5–4.6 by 0.9–1 mm, coma 11.5–12 mm long.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest or scrub from 1200–2100 m.

12. *Parsonsia lata* Markgr.

Parsonsia lata Markgr., Bot. Jahrb. Syst. 61 (1927) 221; Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943)

216; Sleesen, Nova Guinea n.s. 9 (1958) 341; D.J. Middleton, Blumea 42 (1997) 215. — *Lyonsia mollis* Warb., Bot. Jahrb. Syst. 13 (1891) 406; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 508. — Type: *Warburg 21301* (untraced, probably destroyed in B). Neotype: *Ledermann 10095* (neo L, designated by Middleton (1997) op. cit.), Papua New Guinea, Sepik, Lordberg.

Branchlets densely brown velutinous. *Leaves* opposite; petiole 1.7–6.5 cm long; blade papery to coriaceous, ovate, rarely elliptic or obovate, 7–26 by 3.6–19.3 cm, 1.2–1.9 times as long as wide, apex acuminate, base cordate, densely velutinous above and beneath, 6–9 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* of axillary and, sometimes, terminal cymes, 6.8–19.5 cm long, densely velutinous; peduncles 2.7–13.5 cm long; pedicels 1.5–4 mm long. *Sepals* ovate, 1.7–3.9 by 0.8–1.5 mm, 1.4–3.8 times as long as wide, apex acute to obtuse, erect to reflexed, densely velutinous. *Corolla* cream or yellowish, buds cylindrical with an acuminate head, lobes slightly overlapping, open corolla salverform; tube 2.8–5.7 mm long, 1–2.4 times as long as sepals, 1.1–2.5 times as long as lobes; lobes triangular, 1.8–3 by 0.9–1.2 mm, apex acuminate, papillose inside; pubescent outside on tube and lobes, bearded in throat and in 5 rows down tube. *Stamens* inserted at 1.5–2.9 mm from corolla base which is 0.4–0.5 of tube length; filaments straight to curved, 0.5–0.7 mm long; anthers narrowly triangular, tails squared, 2.2–3 by 0.4–0.6 mm, 4.2–6 times as long as wide. *Disk* of 5 separate lobes, oblong, apex notched or 3-dentate, 0.9–2 mm long. *Ovary* 0.6–0.8 mm long; 1.7–3 mm long; style head 0.7–1 mm long. *Fruit* broad fusiform, densely brown pubescent; 7.8–12 by 1.5–2.3 cm. *Seeds*: grain 11.3–13 by 1.9–2.4 mm, coma 3–3.9 cm long.

Distribution — Solomon Islands; in *Malesia*: New Guinea.

Habitat & Ecology — This species has been collected in primary and secondary forest and in scrub from low altitude to 1600 m.

Note — *Parsonsia lata* is closely related to *P. pedunculata* and *P. appressa* from which it can be distinguished by the spreading hairs on the leaves.

13. *Parsonsia longiloba* D.J. Middleton

Parsonsia longiloba D.J. Middleton, Blumea 42 (1997) 217. — Type: *Frodin UPNG 4165* (holo K; iso A), Papua New Guinea, New Ireland, near Lemkamin Aid Post, Lelat Plateau.

Branchlets glabrous. *Leaves* opposite; petiole 1.4–2.1 cm long; blade subcoriaceous, elliptic, 5.2–9.4 by 1.6–3 cm, 2.8–3.4 times as long as wide, apex acuminate, base obtuse, glabrous, 7 or 8 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* of axillary cymes, c. 10 cm long; covered with appressed brown hairs; peduncle c. 5.3 cm long; pedicels 4–4.5 mm long. *Sepals* ovate, 1.2–1.7 by 0.7–1.2 mm, 1.4–1.7 times as long as wide, apex acuminate, puberulent. *Corolla* cream coloured, buds cylindrical, lobes slightly overlapping, open corolla subcampanulate; tube 1.3–2.2 mm long, 1.1–1.3 times as long as sepals, 0.3–0.6 times as long as lobes; lobes linear, c. 4 by 1.3 mm; sparsely puberulent outside, sparsely puberulent at base of lobes and in throat, pointing downwards, inside. *Stamens* inserted at c. 1.6 mm from corolla base which is c. 0.6 of tube length; filaments straight, c. 2 mm long; anthers narrowly triangular, tails curved inwards, c. 2.9 by 0.6 mm, c. 4.8 times as long as wide. *Disk* of 5 separate lobes, triangular, c. 1 mm long. *Ovary* c. 0.7 mm long; style c. 2.6 mm long; style head c. 0.9 mm long. *Fruit* unknown.

Distribution — *Malesia*: New Guinea (New Ireland).

Habitat & Ecology — Known only from disturbed forest at 1000 m.

Note — This species is close to *P. hebetica* from which it differs in its very long corolla lobes compared to the length of the corolla tube.

14. *Parsonsia marginata* Markgr.

Parsonsia marginata Markgr., Bot. Jahrb. Syst. 61 (1927) 215; D.J. Middleton, Blumea 42 (1997) 217. — Type: *Schlechter 20105* (untraced, probably destroyed in B). Neotype: *Ledermann 9329* (neo L, designated by Middleton (1997) op. cit.), Papua New Guinea, Sepik.

Parsonsia laevis Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 498, non (A. Gray) Markgr. — Type: *Kaneh. & Hatus. 12710* (lecto TI n.v., designated by Middleton (1997) op. cit.; iso BO), New Guinea, Papua, Boemi, 40 km inland of Nabire.

Branchlets glabrous, rarely with the occasional minute hair. *Leaves* opposite; petiole 0.7–1.5 cm long, glabrous or with few hairs; blade coriaceous, elliptic with a slightly inrolled margin, 2.1–10.8 by 0.8–4.1 cm, 2–3.7 times as long as wide, apex acuminate, base obtuse to weakly cordate, glabrous or with few hairs on midrib beneath, 4–9 pairs of secondary veins, ascending, tertiary venation of an intramarginal nerve and then reticulate. *Inflorescence* of robust axillary cymes, 1.9–4.6 cm long; sparsely puberulent on upper parts; peduncles 0.8–1.7 cm long; pedicels 3–5.5 mm long. *Sepals* ovate, connate at base, 1.1–1.8 by 0.8–1.2 mm, 1.2–1.6 times as long as wide, apex acuminate to obtuse, sparsely puberulent. *Corolla* buds with acuminate head, lobes slightly overlapping, open corolla subcampanulate, lobes erect; tube 2–3.4 mm long, 1.6–3.1 times as long as sepals, 0.6–1 times as long as lobes; lobes narrowly triangular, 2.5–3.9 by 1.1–1.5 mm; puberulent outside, especially on upper tube and lobes, pubescent in throat and top of tube with downward pointing hairs. *Stamens* inserted at 0.7–0.9 mm from corolla base which is c. 0.3 of tube length; filaments straight, connate, puberulent, 1.6–3.1 mm long; anthers with incurving tails, 2.6–3.6 by 0.5–0.7 mm, 3.7–6.2 times as long as wide. *Disk* of 5 separate lobes, oblong to narrowly triangular, apex rounded to acuminate, 0.6–1 mm long. *Ovary* 0.9–1.1 mm long; style 1.5–3.3 mm long; style head 0.6–0.8 mm long. *Fruit* unknown.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest, 300–1750 m altitude.

15. *Parsonsia novoguineensis* D.J. Middleton

Parsonsia novoguineensis D.J. Middleton, Blumea 42 (1997) 218. — Type: *Schodde & Craven 4637* (holo L; iso BRI, K), Papua New Guinea, Gulf, hill on SW junction of Kapau and Tauri Rivers.

Branchlets brown tomentose. *Leaves* opposite; petiole 0.7–3.2 cm long; blade papery to coriaceous, ovate, 3.9–14.3 by 1.9–7.8 cm, 1.5–2.1 times as long as wide, apex acuminate, base cordate, densely brown velutinous beneath, more sparsely so above, 5–8 pairs of secondary veins, ascending, tertiary venation laxly reticulate. *Inflorescence* of axillary umbelliform cymes, 2.5–8.5 cm long; appressed brown velutinous; peduncles 1.2–6 cm long; pedicels 2–4.7 mm long. *Sepals* ovate, 1.6–2.2 by 1–1.2 mm, 1.5–2 times as long as wide, apex acuminate, densely brown velutinous. *Corolla* yellow, buds slightly constricted around the middle, lobes overlapping slightly, open corolla with reflexed lobes; tube 4.5–7 mm long, 2.3–3.7 times as long as sepals, 2.5–5 times as long as lobes; lobes triangular, 1.5–1.9 by 0.9–1.1 mm, apex acute to acuminate; sparsely pubescent on tube above constriction and on lobes outside, glabrous in throat, sparsely pubescent below anthers inside. *Stamens* inserted at 2–3.2 mm from corolla base which is 0.4–0.5 of tube length; filaments narrow, straight, pubescent, 1.5–2 mm

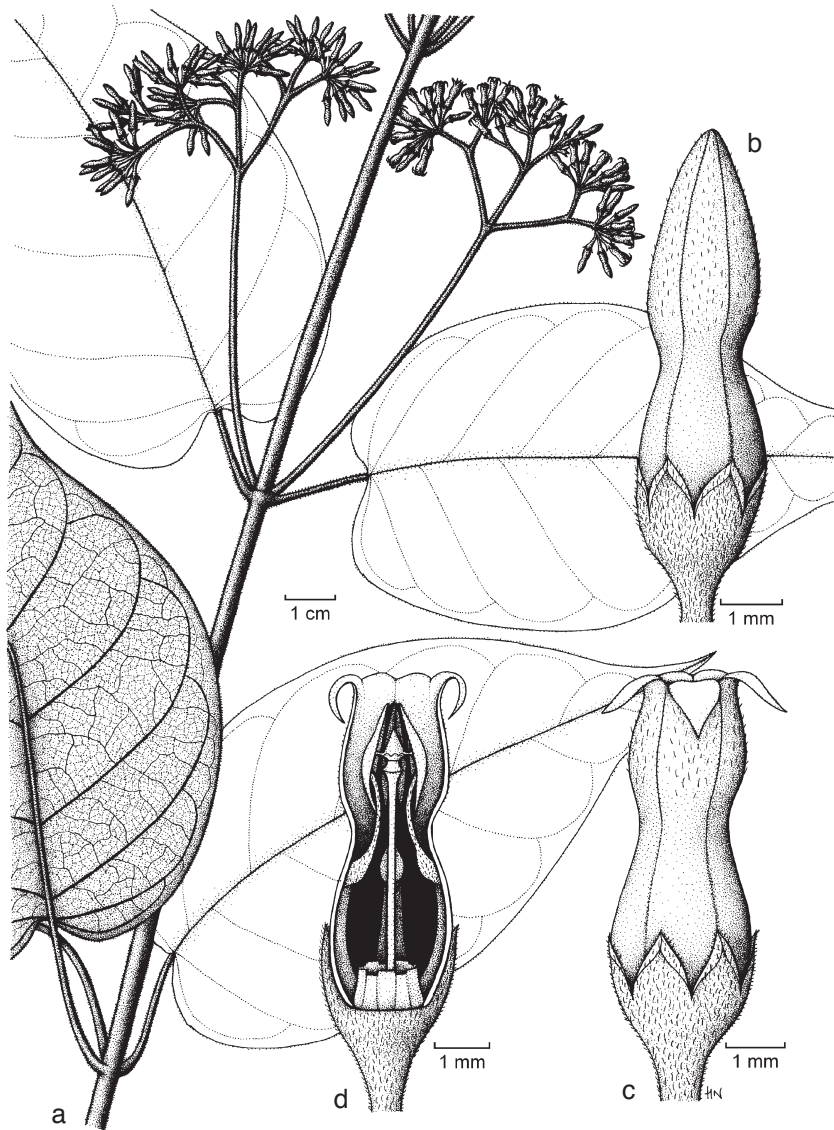


Fig. 82. *Parsonsia novoguineensis* D.J. Middleton. a. Habit; b. flower bud; c. open flower; d. flower dissection (Schodde & Craven 4637, L).

long; anthers narrowly triangular, with narrow tails, 2.8–3.1 by 0.6 mm, 4.7–5.2 times as long as wide. *Disk* either of 5 separate lobes or with lobes partly fused at base, flat, acuminate and/or notched at apex, 1.4–1.5 mm long. *Ovary* 0.7–1 mm long; style 2.9–4 mm long; style head 0.8–1 mm long. *Fruit* unknown. — **Fig. 82.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest to 250 m altitude.

16. *Parsonsia oligantha* (K. Schum.) D.J. Middleton

Parsonsia oligantha (K. Schum.) D.J. Middleton, *Blumea* 42 (1997) 220. — *Delphyodon oliganthus* K. Schum., *Bot. Jahrb. Syst.* 24, *Beibl.* 59 (1898) 31; K. Schum. & Lauterb., *Fl. Schutzgeb. Südsee* (1901) 507; *Markgr.*, *Nova Guinea* 14, 2 (1926) 287; *Bot. Jahrb. Syst.* 61 (1927) 213. — Type: *Lauterbach 772* (untraced, probably destroyed in B). Neotype: *Hartley 10001* (neo CANB, designated by Middleton (1997) op. cit.; iso A, BRI, K, L), Papua New Guinea, Morobe province, Oomsis Creek, c. 18 miles W of Lae.

Neuburgia musculiformis auct. non Miq.: F.M. Bailey, *Queensland Agric. J.* 3 (1898) 202.

Branchlets glabrous. *Leaves*: petiole 3.5–24 mm long, glabrous or with few hairs; blade subcoriaceous, elliptic, 3.6–14.1 by 1.8–6.3 cm, 1.2–5.2 times as long as wide, apex acuminate, base acute to rounded, glabrous, 6–12 pairs of secondary veins, slightly ascending, tertiary venation reticulate and somewhat prominent above. *Inflorescence* a lax axillary cyme, 4–11 cm long, minutely puberulent on upper parts; pedicels 4.2–8.5 mm long. *Sepals* ovate, 2.1–4 by 1.2–2.9 mm, 1.2–1.9 times as long as wide, apex obtuse to acuminate, sparsely shortly puberulent outside. *Corolla* pink, sometimes to reddish or purplish, in bud with a rounded, rarely apiculate, head, lobes clearly overlapping; tube 3.4–5.2 mm long, 1.1–2.2 times as long as sepals, 0.5–0.9 times as long as lobes; lobes ovate to oblong, 2.4–4 by 1.8–3 mm, apex obtuse; glabrous outside, densely puberulent in upper part of the tube and on the front of filaments. *Stamens* inserted at 2.7 mm from corolla base which is 0.5 of tube length; filaments slightly curved, 0.2–0.5 mm long; anthers 3.4–4.3 by 0.7–0.8 mm, 4.8–5.4 times as long as wide. *Disk* annular, 5-dentate, enclosing ovary, 1.2–1.7 mm long. *Ovary* 1–1.7 mm long; style 2.2–3 mm long; style head 1.2–1.5 mm long. *Fruit* fusiform, with long irregular spine-like outgrowths of the fruit wall; 6.2–11 by 1.8–2.9 cm. *Seeds*: grain 8.7–15.2 by 2–4 mm; coma 1.8–3.4 mm long.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — From sea level to over 900 m in a range of forest types.

Note — This species is closest to *P. flavescens* from which it differs in the rounder head of the corolla bud and the spines on the fruit. It has been reported as being used as a treatment for diarrhoea.

17. *Parsonsia pedunculata* (Warb.) Markgr.

Parsonsia pedunculata (Warb.) Markgr., *Bot. Jahrb. Syst.* 61 (1927) 221; Peekel, *Fl. Bismarck Arch.* (1984) 451; D.J. Middleton, *Blumea* 42 (1997) 222. — *Lyonsia pedunculata* Warb., *Bot. Jahrb. Syst.* 13 (1891) 406; K. Schum. & Lauterb., *Fl. Schutzgeb. Südsee* (1901) 508. — Type: *Warburg 21300* (untraced, probably destroyed in B). Neotype: *Peekel 8* (neo BO, designated by Middleton (1997) op. cit.), Papua New Guinea, New Ireland.

Branchlets tomentose. *Leaves* opposite; petiole 1.6–3 cm long; blade ovate, 6.5–13.5 by 3.6–11.2 cm, 1.1–1.8 times as long as wide, apex acuminate, base cordate, sparsely puberulent on midrib and secondary veins, 4–9 pairs of secondary veins, tertiary venation laxly reticulate. *Inflorescence* of lax axillary cymes, 7–18.5 cm long; brown appressed velutinous; peduncles 2.8–8 cm long; pedicels 1.7–4.5 mm long. *Sepals* narrow ovate, reflexed, 1.9–2.9 by 1–1.3 mm, 1.7–2.4 times as long as wide, apex acuminate, appressed velutinous. *Corolla* cream coloured to yellow, buds with an acuminate head,

lobes slightly overlapping, open corolla salverform with reflexed lobes; tube 2.9–3.2 mm long, 1–1.5 times as long as sepals, 1.4–2.5 times as long as lobes; lobes triangular, 1.3–2.1 by 0.8–0.9 mm, apex acuminate; pubescent on upper tube and lobes outside, bearded in throat, pubescent in 5 rows down tube inside. *Stamens* inserted at 1.8 mm from corolla base which is 0.5 of tube length; filaments curved, puberulent, 0.5–0.7 mm long; anthers narrowly triangular, tails broad, flattened, 2.1–2.3 by 0.4 mm, 5.3–5.8 times as long as wide. *Disk* of 5 separate lobes, oblong, flat topped or notched, 1–1.2 mm long. *Ovary* c. 0.9 mm long; style 1.7–1.9 mm long; style head 0.6–0.7 mm long. *Fruit* (immature) linear, sparsely pubescent.

Distribution — *Malesia*: New Guinea (Bismarck Archipelago).

Habitat & Ecology — In forest at low altitude.

Note — This species is close to *P. lata* from which it differs in its less pubescent leaves, more delicate inflorescence and thinner, less pubescent fruit.

18. *Parsonsia penangiana* King & Gamble

Parsonsia penangiana King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 458; Ridl., Fl. Malay Penins. 2 (1923) 351; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 128; D.J. Middleton, Blumea 42 (1997) 222; Fl. Thailand 7 (1999) 138. — *Artia penangiana* (King & Gamble) Pichon, Notul. Syst. (Paris), ed. Humbert 14 (1950) 19. — *Parsonsia alboflavescens* (Dennst.) Mabb. var. *penangiana* (King & Gamble) M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 50. — Type: *Curtis s.n.* (lecto K, designated by Middleton (1997) op. cit.), Peninsular Malaysia, Penang.

Branchlets sparsely puberulent to glabrous. *Leaves* opposite; petiole 1.6–4 cm long; blade papery to coriaceous, ovate to elliptic, 9–18.2 by 4.2–8.6 cm, 1.7–2.2 times as long as wide, apex acuminate, base rounded, glabrous or sparsely puberulent beneath, 6 or 7 pairs of secondary veins. *Inflorescence* an axillary cyme, 6.8–8 cm long, puberulent on upper parts; pedicels 6–9.6 mm long. *Sepals* ovate, 1.5–2.4 by 1.1–1.5 mm, 1.3–1.7 times as long as wide, apex acute to acuminate, puberulent. *Corolla* white, greenish or yellowish, buds ovoid, lobes slightly overlapping, open corolla campanulate; tube 2.7–3.8 mm long, 1.6–1.8 times as long as sepals, 1.4–2 times as long as lobes; lobes ovate, 3.6–3.8 mm long, apex acute; puberulent and papillose on lobes outside, densely long pubescent inside. *Stamens* inserted at c. 1.8 mm from corolla base which is c. 0.5 of tube length; filaments strongly bent, 3.5–4 mm long; anthers narrowly triangular with incurving tails, 4.9–5 by 0.9–1 mm, 5–5.4 times as long as wide. *Disk* annular, 5-crenate, 1.1–1.4 mm long. *Ovary* 1–1.1 mm long; style c. 2.8 mm long; style head c. 0.7 mm long. *Fruit* linear, 14.7–15.1 cm by 8–9 mm. *Seeds* 11.2–14.2 by 1.9–2.2 mm; coma 2.1–4.5 cm long.

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

Habitat & Ecology — In evergreen forest.

Note — It is closely related to *P. alboflavescens* but easily distinguished by its ovoid buds which are usually somewhat papillose outside.

19. *Parsonsia philippinensis* Merr.

Parsonsia philippinensis Merr., Philipp. J. Sci. 17 (1920) 310; D.J. Middleton, Blumea 42 (1997) 223; Fl. Thailand 7 (1999) 138. — Type: *Ramos & Pascasio 34585* (lecto K, designated by Middleton (1997) op. cit.; iso P, US), Philippines, Mindanao, Surigao.

Parsonsia siamensis Kerr, Kew Bull. (1937) 89; Kerr in Craib, Fl. Siam. 2 (1939) 453. — Type: *Kerr 18496* (lecto K, designated by Middleton (1997) op. cit.; iso A, ABD, BK, E, K, L, TCD), Thailand, Phangnga, Khao Katekwam.

Parsonsia paniculiformis Bakh.f. in Backer, Bekn. Fl. Java, Afl. 7, Fam. 172 (1948) 47, nom. illeg. (no Latin description) based on *Bakhuizen van den Brink 1103* (BO, L), W Java, Cibodas.

Branchlets minutely puberulent. *Leaves* opposite; petiole 0.7–2.5 cm long; blade papery to coriaceous, elliptic, 3.9–15.7 by 0.9–7.9 cm, 2–4.1 times as long as wide, apex acuminate, base rounded to cuneate, sparsely puberulent on petiole and often also on midrib beneath, 5–8 pairs of secondary veins, ascending, tertiary venation obscure or laxly reticulate. *Inflorescence* of axillary and, often, terminal cymes, robust, 3.3–10 cm long; puberulent; peduncles 1.1–3.3 cm long; pedicels 3–4.5 mm long. *Sepals* ovate to oblong, 1.6–2.7 by 1.3–1.7 mm, 1–2.1 times as long as wide, apex rounded to obtuse, puberulent. *Corolla* white to reddish, fleshy, buds cylindrical, head rounded, lobes strongly dextrorse, open corolla with erect lobes; tube 2.8–3.7 mm long, 1.3–2.3 times as long as sepals, 0.9–1.4 times as long as wide; lobes oblong, 2.5–4.2 by 0.9–1.1 mm, apex rounded to obtuse; glabrous to puberulent outside, glabrous inside except on filaments. *Stamens* inserted at 0.9–2.1 mm from corolla base which is 0.2–0.6 of tube length; filaments strongly twisted but not wound around style, puberulent, 1.8–3.5 mm long; anthers narrowly triangular, tails broad to narrow, 3–3.9 by 0.5–0.7 mm, 4.9–7.2 times as long as wide. *Disk* of 5 separate lobes, occasionally fused at base, oblong to narrowly triangular, apex acute, flat-topped or notched, 0.6–1 mm long. *Ovary* 0.8–1.6 mm long; style 2.1–3.6 mm long; style head 0.7–1.2 mm long. *Fruit* fusiform, thick-walled, glabrous, 8–13.3 by 1–1.4 cm. *Seeds* not seen.

Distribution — Thailand; in *Malesia*: Peninsular Malaysia, Borneo, Java, southern Philippines.

Habitat & Ecology — In forest, frequently reported as growing on limestone, altitude to 1500 m.

Note — This species can be distinguished from *P. alboflavescens* by the fleshy flowers and the large overlap of the corolla lobes in *P. philippinensis*.

20. *Parsonsia rubra* Kaneh. & Hatus.

Parsonsia rubra Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 500; Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 217; D.J. Middleton, Blumea 42 (1997) 225. — Type: *Kanehira & Hatusima 12220* (lecto TI n.v., designated by Middleton (1997) op. cit.; iso A, BO), New Guinea, Papua, Dalman, 45 km inland of Nabire.

Branchlets sparsely puberulent. *Leaves* opposite; petiole 1.2–3.5 cm long; blade coriaceous to subcoriaceous, elliptic, 7.1–15 by 1.8–8.7 cm, 1.7–4.2 times as long as wide, apex acuminate, base cordate to acute, glabrous or sparsely and minutely puberulent beneath, usually glaucous, 7–10 pairs of secondary veins, ascending, tertiary venation densely reticulate. *Inflorescence* of axillary and/or pseudoterminal cymes, 5.5–13 cm long; puberulent; peduncles 3.4–8 cm long; pedicels 4–7 mm long. *Sepals* ovate, 1–1.9 by 0.7–1.6 mm, 0.9–1.9 times as long as wide, apex acuminate to obtuse, sparsely puberulent. *Corolla* red, buds cylindrical with a slightly wider head, lobes slightly overlapping, open corolla with erect lobes; tube 1.8–3.8 mm long, 1.2–3.5

times as long as sepals, 0.4–0.9 times as long as lobes; lobes narrowly triangular, 3.8–6.5 by 0.9–1.8 mm; glabrous to sparsely puberulent outside, densely pubescent in throat with downward pointing hairs. *Stamens* inserted at 0.8–1.3 mm from corolla base which is 0.2–0.4 of tube length; filaments straight, pubescent, with 2 large projections on either side, 2.3–4.7 mm long; anthers with incurving tails, 3–4.4 by 0.5–0.8 mm, 4.8–6 times as long as wide. *Disk* oblong to narrowly triangular, occasionally fused at base, apex acute to rounded, 0.9–1.5 mm long. *Ovary* 0.8–1.4 mm long; style 2.3–4.9 mm long; style head 0.9–1.4 mm long. *Fruit* linear, glabrous, 9.5–14.2 cm by 8–9 mm. *Seeds*: grain 11–11.5 by 2.4–2.6 mm; coma 2.4–2.5 cm long.

Distribution — *Malesia*: Moluccas (Halmahera, Ceram), New Guinea.

Habitat & Ecology — In forest to 1400 m altitude.

Note — This species is easily distinguished from all others by the large projections on the sides of the filament. Sterile specimens are easily mistaken for the more common *P. buruensis* although they are not particularly closely related. Distinguishing them can be difficult but *P. rubra* tends to have thicker, more glaucous leaves.

21. *Parsonsia sanguinea* (Wernham) Markgr.

Parsonsia sanguinea (Wernham) Markgr., Bot. Jahrb. Syst. 61 (1927) 215; D.J. Middleton, Blumea 42 (1997) 226. — *Lyonsia sanguinea* Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 109. — Type: *Kloss s.n.* (holo BM), New Guinea, Papua, Utakwa River to Mt Carstensz.

Lyonsia wollastonii Wernham, Trans. Linn. Soc. London, Bot. 9 (1916) 109. — *Parsonsia wollastonii* (Wernham) Markgr., Bot. Jahrb. Syst. 61 (1927) 216. — Type: *Kloss s.n.* (lecto BM, designated by Middleton (1997) op. cit.), New Guinea, Papua, Utakwa River to Mt Carstensz.

KEY TO THE VARIETIES

- 1a. Inflorescence ≤ 5 cm long 2
- b. Inflorescence > 5 cm long 3
- 2a. Leaves narrow ovate to linear, apex long acuminate to caudate, 2.5–19 times as long as wide. — Milne Bay District **d. var. cruttwellii**
- b. Leaves elliptic to oblong, apex shortly acuminate, 1.7–2.7(–3.8) times as long as wide. — Papua. **e. var. millikenii**
- 3a. Corolla tube wider than head in bud; leaves broad ovate or elliptic 4
- b. Corolla tube more or less same width as head in bud; leaves variable 5
- 4a. Stamens inserted at or above middle of corolla tube; filaments 0.6–0.7 mm long; corolla tube 2.7–3.2 mm long **a. var. sanguinea**
- b. Stamens inserted below middle of corolla tube; filaments 1.5–2.4 mm long; corolla tube 1.9–2.7 mm long **b. var. albiflora**
- 5a. Flowers densely clustered at inflorescence tips **g. var. vinkii**
- b. Flowers not densely clustered at inflorescence tips 6
- 6a. Anther base of broad inward curving tails; leaves elliptic to obovate, 2.7–5.3 times as long as wide. **f. var. sepikensis**
- b. Anther base of long, thin outward curving tails; leaves usually narrowly linear or elliptic, 2.3–18 times as long as wide **c. var. brassii**

a. var. *sanguinea*

Branchlets glabrous to very sparsely puberulent. *Leaves* opposite; petiole 1.1–2.2 cm long; blade subcoriaceous, margin inrolled, elliptic, 3.9–10 by 2.2–4 cm, 2.5–3.2 times as long as wide, apex acuminate, base cuneate to obtuse, 6–9 pairs of secondary veins, not particularly distinct from tertiary venation, tertiary venation laxly reticulate; glabrous. *Inflorescence* of axillary cymes, 8.5–10 cm long; sparsely puberulent on upper parts; peduncles 4–6.2 cm long; pedicels 4–4.5 mm long. *Sepals* ovate, 1–1.3 by 0.6–0.7 mm, 1.4–2.2 times as long as wide, apex acuminate, sparsely puberulent. *Corolla* mauve, buds narrowly ovoid, lobes slightly overlapping, open corolla with erect lobes; tube 2.7–3.2 mm long, 2.3–2.9 times as long as sepals, 1–1.3 times as long as lobes; lobes oblong, 2.5–2.9 by 0.8–1.1 mm, apex acute to obtuse; glabrous to very sparsely puberulent outside, pubescent in throat to stamen insertion with downward pointing hairs. *Stamens* inserted at 1.9–2.3 mm from corolla base which is 0.5–0.7 of tube length; filament curved, pubescent, 0.6–0.7 mm long; anthers with spreading tails, 2.8–3.8 by 0.6–0.7 mm, 4.7–5.4 times as long as wide. *Disk* of 5 separate lobes, oblong, apex abruptly acuminate, 0.9–1.2 mm long. *Ovary* 0.7–1.1 mm long; style 2.3–2.5 mm long; style head 1.1–1.2 mm long. *Fruit* unknown.

Distribution — *Malesia*: New Guinea (only known from Utakwa River to Mt Carsenz in Papua).

b. var. *albiflora* (Gibbs) D.J. Middleton

Parsonsia sanguinea (Wernham) Markgr. var. *albiflora* (Gibbs) D.J. Middleton, *Blumea* 42 (1997) 229. — *Lyonsia albiflora* Gibbs, *Fl. Arfak Mts.* (1917) 177. — Type: *Gibbs 5532* (holo BM), New Guinea, Papua, Arfak Mts, Anggi.

Branchlets glabrous or very sparsely puberulent when young. *Leaves* opposite; petiole 5–14 mm long; blade papery to coriaceous, elliptic, with an inrolled margin, 2.1–7.1 by 0.8–3.1 cm, 1.8–3.2 times as long as wide, apex acuminate, base rounded to obtuse, glabrous or with a few hairs on the petiole, 4–7 pairs of secondary veins, tertiary venation obscure. *Inflorescence* of lax axillary cymes, 5.5–14.7 cm long; sparsely puberulent especially on the upper parts; peduncles 2–6.7 cm long; pedicels 3.6–6.3 mm long. *Sepals* ovate, 0.9–1.2 by 0.6–1 mm, 1–1.8 times as long as wide, apex acute, obtuse or abruptly acuminate, sparsely puberulent. *Corolla* whitish or purplish, buds with tube wider than head, lobes slightly overlapping, open corolla salverform; tube 1.9–2.7 mm long, 1.7–2.7 times as long as sepals, 0.7–1 times as long as lobes; lobes oblong, 2.5–3.1 by 0.7–0.8 mm, apex acute to acuminate; sparsely puberulent outside, pubescent at base of lobes and throat with hairs pointing downwards inside. *Stamens* inserted at 0.5–0.7 mm from corolla base which is 0.2–0.3 of tube length; filaments straight to geniculate, pubescent, 1.5–2.4 mm long; anthers narrowly triangular, tails obtuse to rounded, 2.4–3.6 by 0.4–0.6 mm, 4–9 times as long as wide. *Disk* of 5 separate lobes, oblong to triangular, apex acuminate to caudate, 1–1.1 mm long. *Ovary* 0.8–1.1 mm long; style 1.8–2.4 mm long; style head 0.9–1 mm long. *Fruit* linear, very sparsely puberulent, c. 6.5 cm by c. 4 mm. *Seeds* not seen.

Distribution — *Malesia*: New Guinea (Vogelkop Peninsula).

Habitat & Ecology — In forest, 1700–2500 m altitude.

c. var. brassii (Markgr.) D.J. Middleton

Parsonsia sanguinea (Wernham) Markgr. var. *brassii* (Markgr.) D.J. Middleton, *Blumea* 42 (1997) 228. — *Parsonsia brassii* Markgr., *Brittonia* 2 (1936) 139. — Type: *Brass* 4921 (holo NY; iso BM, BO, BRI, GH, K, US), Papua New Guinea, Central: Mt Tafa.

Parsonsia elegans Gilli, *Ann. Naturhist. Mus. Wien* 83 (1980) 420. — Type: *Gilli* 474 (holo W), Papua New Guinea, W of Laiagam.

Branchlets glabrous to sparsely puberulent. *Leaves* opposite; petiole 0.2–1.5 mm long; blade papery to coriaceous, linear or, more rarely, elliptic or ovate, sometimes somewhat constricted near the base, 1.6–8.6 by 0.2–3.2 cm, 2.3–18 times as long as wide, apex acuminate to caudate, base cuneate to rounded, glabrous or with few hairs on petiole and leaf margin, 7–12 pairs of secondary veins, tertiary venation obscure. *Inflorescence* of delicate, axillary cymes, 3.5–14 cm long; sparsely puberulent especially on upper parts; peduncles 1.4–7.1 cm long; pedicels 3.5–8.5 mm long. *Sepals* ovate, 0.8–1.5 by 0.7–1 mm, 0.9–2.1 times as long as wide, apex acuminate, glabrous to sparsely puberulent. *Corolla* yellowish to reddish, buds cylindrical, lobes slightly overlapping, open corolla salverform; tube 2.1–4.5 mm long, 1.4–4.1 times as long as sepals, 0.7–1.4 times as long as lobes; lobes linear, 3–4.5 by 0.7–1.3 mm; sparsely shortly puberulent outside, pubescent in throat and top of tube inside with downward pointing hairs. *Stamens* inserted at 0.9–2.1 mm from corolla base which is 0.2–0.5 of tube length; filaments straight, coherent to each other, pubescent, 2.8–4 mm long; anthers narrowly triangular, tails pointed to obtuse, 3.6–4.8 by 0.6–0.7 mm, 5.4–7.2 times as long as wide. *Disk* of 5 separate lobes, oblong to triangular, apex acuminate, 0.7–1.1 mm long. *Ovary* 0.9–1.5 mm long; style 3.5–5.2 mm long; style head 0.9–1.2 mm long. *Fruit* linear, thin-walled, very sparsely puberulent to glabrous, 3.3–6 cm by 4–6 mm. *Seeds*: grain 4.9–5.5 by 1–1.3 mm, coma 1–1.3 cm long.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest, scrub or roadside, 1600–3000 m altitude.

d. var. cruttwellii D.J. Middleton

Parsonsia sanguinea (Wernham) Markgr. var. *cruttwellii* D.J. Middleton, *Blumea* 42 (1997) 230. — Type: *Cruttwell* 894 (holo K), Papua New Guinea, Milne Bay, Mt Mon.

Branchlets glabrous to sparsely puberulent. *Leaves* opposite; petiole 0.4–1.4 mm long, glabrous or sparsely puberulent; blade papery to coriaceous, narrow ovate to linear, 2.8–9.1 by 0.5–2.9 cm, 2.5–19 times as long as wide, apex acuminate to caudate, base rounded to obtuse, glabrous or sparsely puberulent midrib beneath, 5–8 pairs of secondary veins, forming into an intramarginal nerve, tertiary venation obscure or laxly reticulate. *Inflorescence* of short axillary cymes, 1.5–5 cm long; sparsely brown puberulent; peduncles 0.6–2.9 cm long; pedicels 3.7–10 mm long. *Sepals* ovate, 1.2–1.6 by 0.7–1.1 mm, 1.2–2 times as long as wide, apex acuminate to acute, sparsely puberulent. *Corolla* pink or lilac, buds with tube slightly wider than head, lobes slightly overlapping, open corolla salverform or with erect lobes; tube 2–3.9 mm long; 1.7–2.8 times as long as sepals, 1–2.5 times as long as lobes; lobes narrowly triangular, 1.6–2.8 by 0.7–0.9 mm; sparsely puberulent to glabrous outside, pubescent in throat with downward pointing hairs inside. *Stamens* inserted at 0.6–0.8 mm from corolla base which is

0.2–0.3 of tube length; filaments straight, pubescent, 1.6–2.3 mm long; anthers with broad tails curved in towards each other, 2.6–3.4 by 0.5–0.6 mm, 5.2–5.7 times as long as wide. *Disk* of 5 separate lobes, oblong to narrowly triangular, 0.8–1 mm long. *Ovary* 0.7–1 mm long; style 1.8–2.4 mm long; style head 0.7–1 mm long. *Fruit* unknown.

Distribution — *Malesia*: Papua New Guinea (Milne Bay Province).

Habitat & Ecology — Collected at 1600–1850 m altitude.

e. var. millikenii D.J. Middleton

Parsonsia sanguinea (Wernham) Markgr. var. *millikenii* D.J. Middleton, *Blumea* 42 (1997) 230. — Type: *Milliken 1361* (holo A; iso BO, K), New Guinea, Papua, Snow Mts region, East of Baliem Valley, Kab. Jayawijaya, Kec. Kurima.

Branchlets with only the occasional small hair. *Leaves* opposite; petiole 0.8–1.4 cm long; blade coriaceous, elliptic to oblong, 2.3–8.5 by 0.8–3.7 cm, 1.7–2.7(–3.8) times as long as wide, apex acuminate, base rounded to obtuse, glabrous, 7–9 pairs of secondary veins, tertiary venation obscure. *Inflorescence* of delicate axillary cymes, 2.2–3.5 cm long; glabrous; peduncles 1.1–2.5 cm long; pedicels 5–7.7 mm long. *Sepals* ovate, 1.1–1.3 by 0.8–0.9 mm, 1.2–1.4 times as long as wide, apex acuminate, glabrous. *Corolla* white to pale green with mauve lobes, buds ovoid, lobes slightly overlapping, open corolla salverform; tube 2.2–3.2 mm long, 1.7–2.9 times as long as sepals, 0.8–1.7 times as long as lobes; lobes elliptic, 2–2.8 by 1–1.1 mm; glabrous outside, densely pubescent in throat with downward pointing hairs. *Stamens* inserted at c. 0.5 mm from corolla base which is c. 0.2 of tube length; filaments straight, pubescent, c. 2.5 mm long; anthers with rounded tails, c. 3.7 by 0.5 mm, c. 7.4 times as long as wide. *Disk* of 5 separate lobes, oblong, apex acuminate, c. 1 mm long. *Ovary* c. 1 mm long; style c. 2.6 mm long; style head c. 0.7 mm long. *Fruit* unknown.

Distribution — *Malesia*: New Guinea (Snow Mts of Papua).

Habitat & Ecology — Collected in forest at 1700–3100 m altitude.

f. var. sepikensis D.J. Middleton

Parsonsia sanguinea (Wernham) Markgr. var. *sepikensis* D.J. Middleton, *Blumea* 42 (1997) 233. — Type: *Veldkamp 6745* (holo L; iso BISH, CANB), Papua New Guinea, West Sepik, Star Mts, Fologonom.

Branchlets sparsely puberulent. *Leaves* opposite; petiole 0.6–1.4 cm long, sparsely puberulent; blade subcoriaceous to coriaceous, elliptic to obovate, 3.1–9.1 by 0.7–3.1 cm, 2.7–5.3 times as long as wide, apex acuminate to caudate, base cuneate to abruptly rounded, glabrous, 5–9 pairs of secondary veins, tertiary venation largely obscure. *Inflorescence* of axillary cymes, 6.1–16 cm long; puberulent, denser on upper parts; peduncles 2.7–10 cm long; pedicels 4.5–9 mm long. *Sepals* ovate, 1.2–1.5 by 0.8–0.9 mm, 1.3–1.9 times as long as wide, apex acuminate to acute, sparsely puberulent. *Corolla* reddish to purplish with a white or yellowish tube, buds cylindrical, lobes slightly overlapping, open corolla with erect lobes; tube 3–5 mm long, 2.1–3.3 times as long as sepals, 1–1.7 times as long as lobes; lobes narrowly triangular, 2.8–3.2 by 0.9–1 mm, apex acute; puberulent outside, sometimes sparsely so, densely pubescent in throat and

top of tube inside. *Stamens* inserted at 0.7–0.8 mm from corolla base which is 0.1–0.3 of tube length; filaments straight, pubescent, 1.7–2.1 mm long; anthers with broadish tails curved in towards each other, 3.5–4.1 by 0.5 mm, 7–8.2 times as long as wide. *Disk* of 5 separate lobes, narrowly triangular, apex acuminate, 0.8–1 mm long. *Ovary* 0.8–1 mm long; style 2.2–3.1 mm long; style head 0.8–0.9 mm long. *Fruit* unknown.

Distribution — *Malesia*: New Guinea (West Sepik Province of Papua New Guinea).

Habitat & Ecology — In forest, 2200–2300 m altitude.

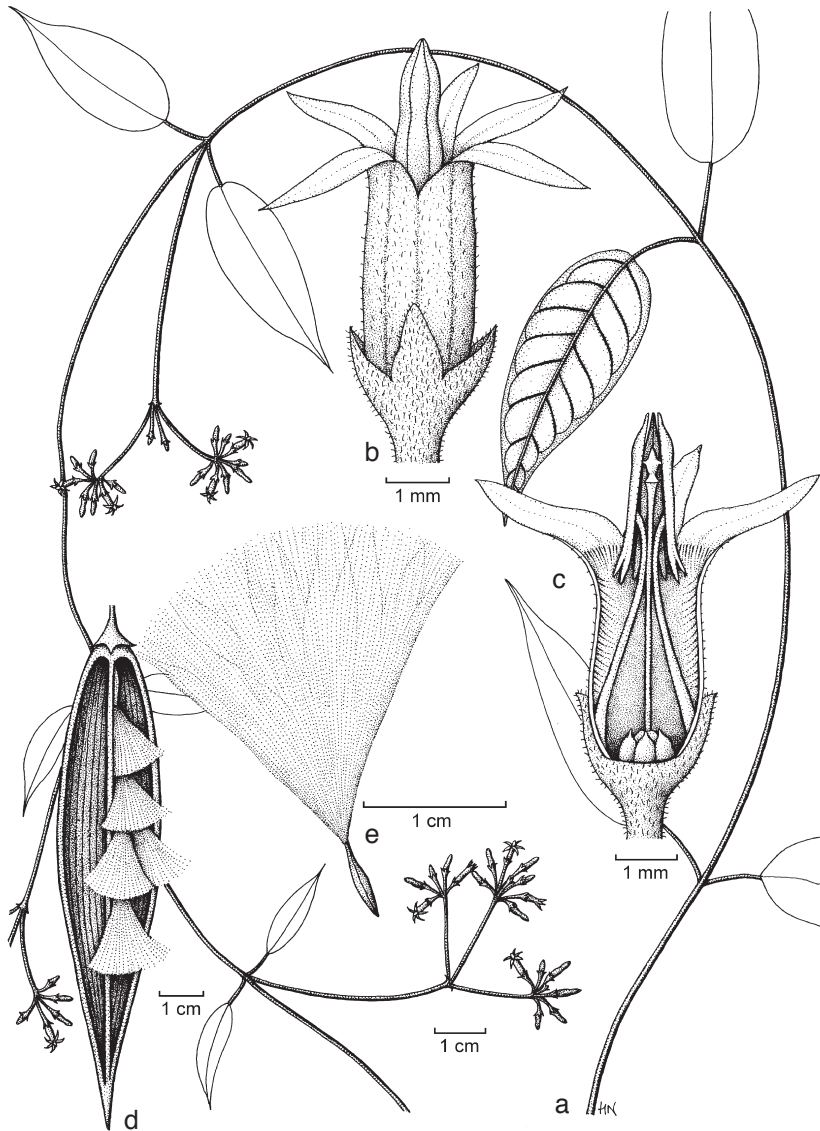


Fig. 83. *Parsonsia sanguinea* (Wernham) Markgr. var. *vinkii* D.J. Middleton. a. Habit; b. flower; c. flower dissection; d. fruit; e. seed (*Vink 17474*, L).

g. var. vinkii D.J. Middleton

Parsonsia sanguinea (Wernham) Markgr. var. *vinkii* D.J. Middleton, Blumea 42 (1997) 231. — Type: *Vink 17474* (holo L; iso A, BISH, CANB, K, P), Papua New Guinea, Southern Highlands, Tari, Lei River, SE foot of Mt Ambua.

Branchlets glabrous or with the occasional hair. *Leaves* opposite; petiole 0.8–1.4 cm long, glabrous or with few hairs; blade papery to subcoriaceous, elliptic to narrowly ovate, 2.9–7.8 by 0.8–3.6 cm, 2.2–4.4 times as long as wide, apex acuminate, base rounded to obtuse, glabrous, 6–8 pairs of secondary veins, tertiary venation largely obscure or laxly reticulate. *Inflorescence* of axillary cymes with flowers clustered at ends, 10–17 cm long; brown puberulent; peduncles 7.5–10.5 cm long; pedicels 3.5–5 mm long. *Sepals* ovate, 1.3–1.7 by 0.7–0.9 mm, 1.4–2.3 times as long as wide, apex acuminate, brown puberulent. *Corolla* pinkish or lilac, buds cylindrical, lobes slightly overlapping, open corolla salverform; tube 2.6–4.4 mm long, 1.5–2.9 times as long as sepals, 0.7–1.7 times as long as lobes; lobes linear, 2.8–3.6 by 0.6–0.8 mm; pubescent on tube and lobes outside, pubescent on base of lobes, throat and top of tube inside with downward pointing hairs. *Stamens* inserted at 1.7–2.5 mm from corolla base which is 0.3–0.7 of tube length; filaments straight, glabrous or shortly pubescent, 1.6–3.7 mm long; anthers with narrow curved tails, 3.6–4.3 by 0.5–0.6 mm, 6–8.6 times as long as wide. *Disk* of 5 separate lobes, narrowly triangular, apex acuminate, sometimes slightly 3-dentate, 0.7–1 mm long. *Ovary* 0.8–1 mm long; style 3.8–5.2 mm long; style head 0.7–1 mm long. *Fruit* linear, thin-walled, glabrous, 6.3–7.7 cm by 6.3–6.7 mm. *Seeds*: grain 7–7.5 by 1.5–1.6 mm; 13.3–17 mm long. — **Fig. 83.**

Distribution — *Malesia*: New Guinea (Southern Highlands Province of Papua New Guinea).

Habitat & Ecology — In submontane forest, 2200–2800 m altitude.

22. Parsonsia schoddei D.J. Middleton

Parsonsia schoddei D.J. Middleton, Blumea 42 (1997) 233. — Type: *Schodde 2515* (holo L; iso A, BO, BRI, CANB, K), Papua New Guinea, Central Province, near Karema, Brown River.

Branchlets sparsely to densely brown velutinous. *Leaves* opposite; petiole 0.8–4.8 cm long; blade subcoriaceous, ovate to elliptic, margin inrolled or not, 4.3–17 by 2.1–10.3 cm, 1.5–2.4 times as long as wide, apex acuminate, base cordate to obtuse, densely brown velutinous, 6–8 pairs of secondary veins, prominent beneath, tertiary venation reticulate. *Inflorescence* of condensed axillary cymes, 1.4–3.8 cm long; densely pubescent; peduncles 0.5–2.3 cm long; pedicels 1.4–4.3 mm long. *Sepals* ovate, 1.4–2.1 by 1.1–1.5 mm, 1–1.6 times as long as wide, apex acuminate, densely velutinous. *Corolla* whitish to greenish, buds with a wider tube than acute head, lobes slightly overlapping, open corolla with erect or inflexed corolla lobes; tube 2.5–3.8 mm long, 1.4–2.1 times as long as sepals, 1.1–1.7 times as long as lobes; lobes triangular, 2–2.6 by 1.2 mm; densely pubescent on upper tube and lobes outside, densely pubescent in throat and in upper half of tube. *Stamens* inserted at 1.6–1.8 mm from corolla base which is 0.4–0.5 of tube length; filaments straight, pubescent, 1.1–1.4 mm long; anthers flattened at base, squared, with a boss on the back at the top, 2.8–3.4 by 0.7 mm, 4–4.9 times as

long as wide. *Disk* of 5 separate lobes, oblong, flat topped or notched, c. 0.7 mm long. *Ovary* 0.7–1 mm long; style 2–2.6 mm long; style head 1–1.1 mm long. *Fruit* linear, sparsely pubescent, 11.6–16.2 cm by 6.5–8.5 mm. *Seeds*: grain 10.1–12.1 by 1.4–1.8 mm, coma 2.2–2.6 cm long. — **Fig. 84.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Known from secondary growth and plantation at low altitude.

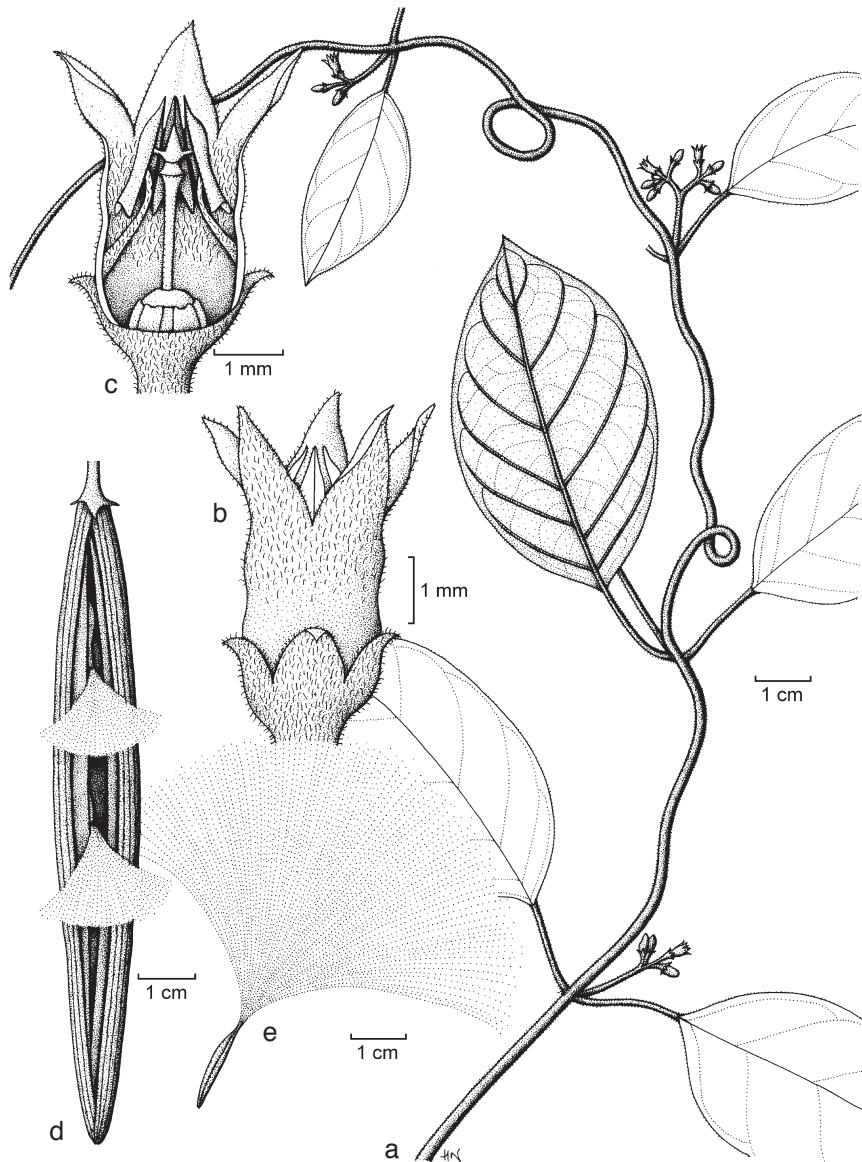


Fig. 84. *Parsonsia schoddei* D.J. Middleton. a. Habit; b. flower; c. flower dissection; d. fruit; e. seed (*Schodde 2801*, CANB).

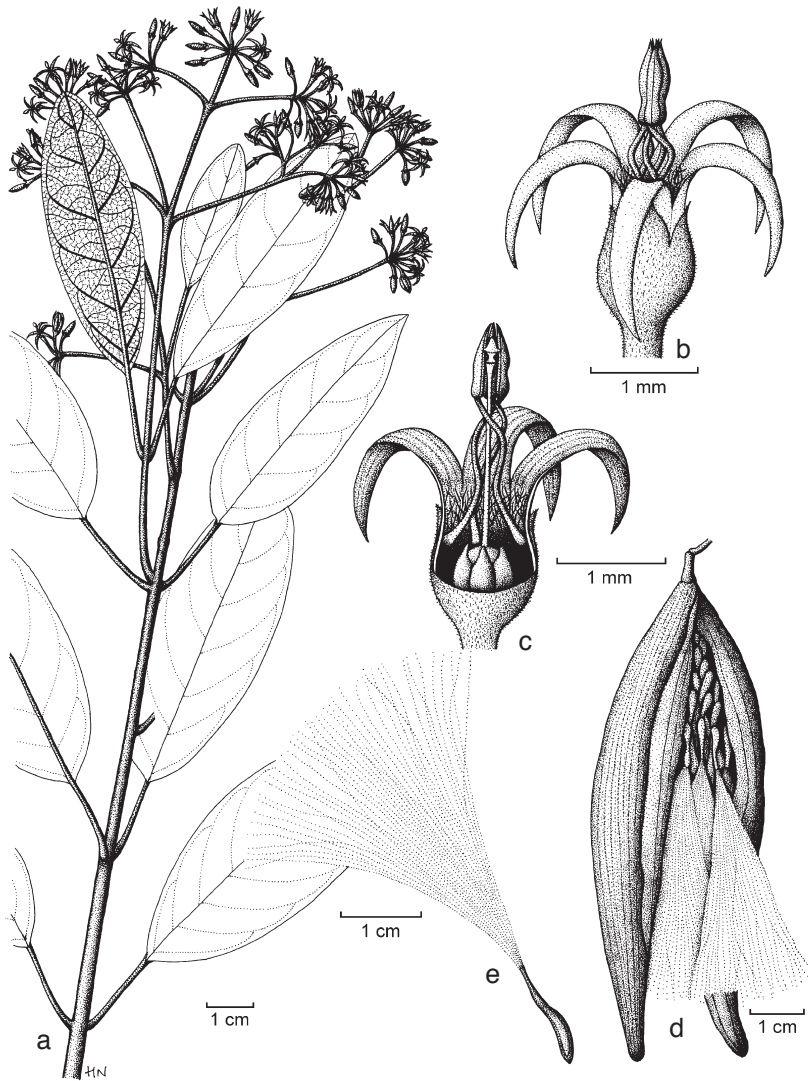


Fig. 85. *Parsonsia sundensis* D.J. Middleton. a. Habit; b. flower; c. flower dissection; d. fruit; e. seed (a–c: Schmutz 1979, L; d: Kostermans 18836, L).

23. *Parsonsia sundensis* D.J. Middleton

Parsonsia sundensis D.J. Middleton, *Blumea* 42 (1997) 235. — Type: *Van Steenis 18306* (holo A; iso BM, BO, CANB, L), East Timor, Mt Perdido.

Branchlets puberulent when very young, becoming rapidly glabrous. *Leaves* opposite; petiole 0.9–2.4 cm long; blade subcoriaceous to coriaceous, elliptic, oblong or obovate, 3.1–9.6 by 0.8–3.7 cm, 2.3–6.4 times as long as wide, apex acuminate or rounded apiculate, base cuneate to obtuse, minutely puberulent beneath when young,

more sparsely so above, 5–9 pairs of secondary veins, strongly ascending, tertiary venation densely reticulate, leaves drying dull ochre colour beneath. *Inflorescence* of axillary and terminal cymes forming a panicle, flowers clustered at ends, 5–10 cm long; brown pubescent; peduncles 1.7–3.5 cm long; pedicels 4–5.5 mm long. *Sepals* ovate, 0.9–1.6 by 0.6–1 mm, 1.2–2.3 times as long as wide, apex acute to acuminate, brown puberulent. *Corolla* white or creamy, buds long and narrow, lobes slightly overlapping, open corolla with strongly reflexed lobes; tube 0.9–1.3 mm long, 0.6–1 times as long as sepals, 0.2–0.3 times as long as lobes; lobes linear, 4.2–6.2 by 0.6–0.8 mm; glabrous to sparsely puberulent on top of lobes outside, densely pubescent at base of lobes and top of tube inside. *Stamens* inserted at 0.6–0.8 mm from corolla base which is 0.7–0.9 of tube length; filaments somewhat twisted, connate, pubescent, 3.5–4.5 mm long; anthers narrowly triangular with incurved tails, 2.5–2.8 by 0.6 mm, 4.2–4.7 times as long as wide, exerted completely beyond mouth of corolla. *Disk* of 5 lobes fused at base, acuminate to acute, 0.8–1 mm long. *Ovary* 0.5–0.7 mm long; style 4–5.1 mm long; style head 0.7–1 mm long. *Fruit* fusiform, minutely and sparsely puberulent, 7.1–12 by 1.2–1.7 cm. *Seeds*: grain 10–14 by 2.2–3.2 mm, coma 2.8–3.7 cm long. — **Fig. 85.**

Distribution — *Malesia*: Lesser Sunda Islands (Flores, Sumbawa, East Timor).

Habitat & Ecology — In forest or more open areas to 1700 m altitude.

24. *Parsonsia tenuiflora* D.J. Middleton

Parsonsia tenuiflora D.J. Middleton, *Blumea* 42 (1997) 237. — Type: *Kostermans & Soegeng 631* (holo L; iso BO, K, L), New Guinea, Papua, Baliem valley, near Wellesey.

Branches corky lenticellate; branchlets glabrous to sparsely puberulent. *Leaves* opposite; petiole 0.4–1.3 cm long, glabrous to sparsely puberulent; blade subcoriaceous to coriaceous, ovate to elliptic, 1.4–7.9 by 0.6–4 cm, 1.6–4.1 times as long as wide, apex acuminate, base rounded to weakly cordate, glabrous to sparsely puberulent on midrib and secondary veins, 4–11 pairs of secondary veins, tertiary venation obscure or laxly reticulate. *Inflorescence* of axillary cymes with flowers clustered at ends, 1.1–4 cm long; puberulent; peduncles 0.3–3 cm long; pedicels 1.2–3 mm long. *Sepals* ovate, 0.9–1.4 by 0.4–0.8 mm, 1.4–2.4 times as long as wide, apex acute to acuminate, sparsely puberulent. *Corolla* greenish, yellowish or white, buds with narrow tube and wider head, lobes slightly overlapping, open corolla with reflexed lobes; tube 1.7–2.5 mm long, 1.4–2.5 times as long as sepals, 0.6–1 times as long as lobes; lobes narrowly elliptic, 2.3–3.8 by 0.6–0.7 mm; glabrous or with occasional hairs outside, pubescent with downward pointing hairs in throat and top of tube or, rarely, glabrous inside. *Stamens* inserted at 1.2–1.9 mm from corolla base which is 0.5–0.7 of tube length; filaments narrow, straight, pubescent, connate, 1.3–1.9 mm long; anthers with narrow incurved tails, 2.6–3 by 0.4–0.5 mm, 5.4–6.8 times as long as wide. *Disk* of 5 separate lobes, triangular, apex acute, 0.7–1.2 mm long. *Ovary* 0.6–1.1 mm long; style 3–3.2 mm long; style head 0.5–0.8 mm long. *Fruit* unknown. — **Fig. 86.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In open areas, 1750–2500 m altitude.

Note — *Parsonsia tenuiflora* is close to *P. hebetica* and *P. sanguinea* from which it is distinguished by its shorter, more delicate inflorescences and very narrow corolla tubes.

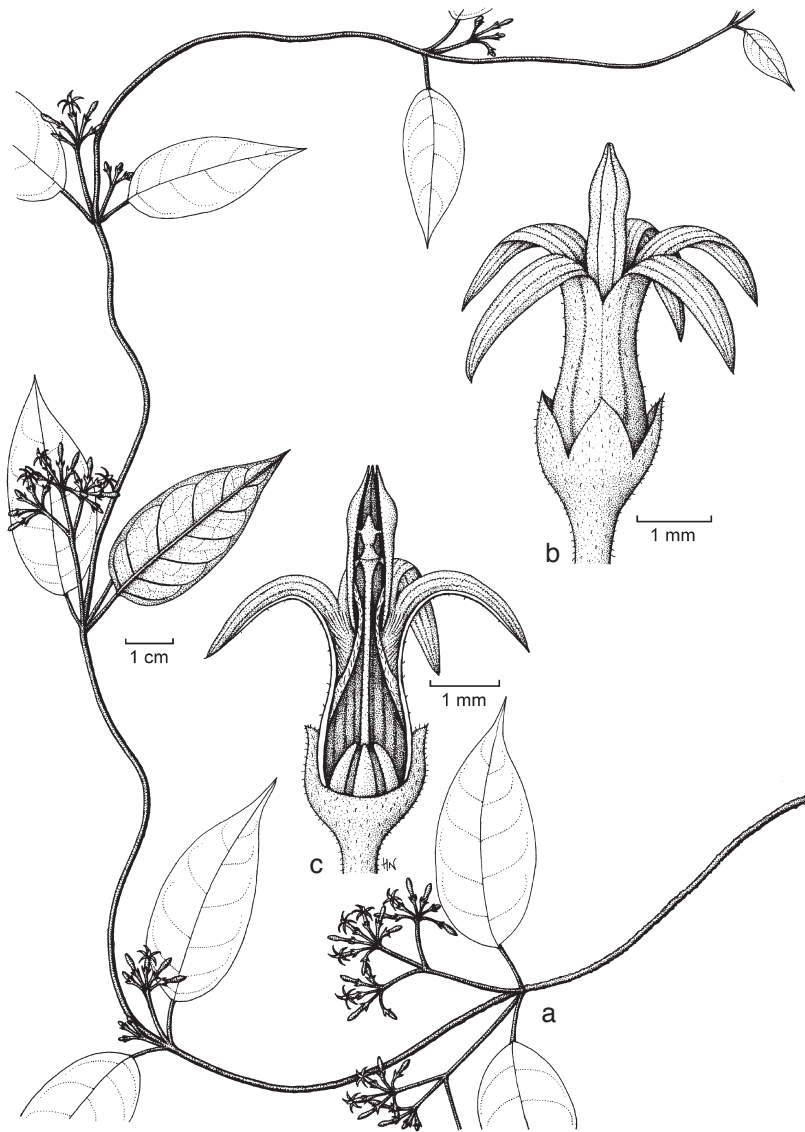


Fig. 86. *Parsonsia tenuiflora* D.J. Middleton. a. Habit; b. flower; c. flower dissection (Kostermans & Soegeng 631, L).

25. *Parsonsia vaccinioides* (Markgr.) Markgr.

Parsonsia vaccinioides (Markgr.) Markgr., Bot. Jahrb. Syst. 61 (1927) 216; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 502; D.J. Middleton, Blumea 42 (1997) 239; Utteridge in R.J. Johns et al., Alp. Subalp. Fl. Mount Jaya (2006) 190. — *Lyonsia vaccinioides* Markgr., Nova Guinea 14, 2 (1926) 290; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 502. — Type: *Gjellerup 1207* (lecto U, designated by Middleton (1997) op. cit.; iso BO, L), New Guinea, Papua, Anggi Gita.

Branchlets glabrous to sparsely puberulent. *Leaves* opposite; petiole 2–10 mm long, puberulent; blade ovate, margin inrolled, 1–5.1 by 0.5–2.4 cm, 1.4–3.6 times as long as wide, apex acuminate, base rounded, sometimes puberulent on midrib beneath, 3–6 pairs of secondary veins, tertiary venation obscure. *Inflorescence* of axillary cymes, flowers clustered, 1.5–3 cm long, short brown pubescent; peduncles 0.8–2.1 cm long; pedicels 2.1–4 mm long. *Sepals* ovate, 1–1.4 by 0.5–0.9 mm, 1.3–2.2 times as long as wide, apex acuminate to obtuse, puberulent. *Corolla* purplish brown to cream, buds ovoid, apex acute, lobes slightly overlapping, open corolla campanulate to subcampanulate; tube 1.3–2 mm long, 1.2–1.8 times as long as sepals, 0.4–0.8 times as long as lobes; lobes triangular to linear, 2.1–3.2 by 0.9–1.3 mm; sparsely and shortly pubescent outside, pubescent in throat with downward pointing hairs. *Stamens* inserted at 0.5–0.7 mm from corolla base which is 0.4–0.5 of tube length; filaments straight or curved, somewhat wider at base, 0.9–1.9 mm long; anthers oblong, tails curved in towards each other, 2.4–3.2 by 0.5–0.6 mm, 4.7–6.4 times as long as wide. *Disk* of 5 separate lobes, oblong, apex acuminate, 0.9–1.2 mm long. *Ovary* 0.4–1 mm long; style 1.5–2.3 mm long; style head 0.5–0.9 mm long. *Fruit* linear, minutely and very sparsely puberulent, 7–10.8 cm long. *Seeds*: grain 5–6.5 by 1.5–2 mm; coma 0.7–1.6 cm long.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In open forest or forest margin, 2000–3250 m altitude.

Note — This species is easily recognised by the small, ovate leaves with an inrolled margin and the short, clustered, few-flowered inflorescences.

26. *Parsonsia velutina* R.Br.

Parsonsia velutina R.Br., Prodr. (1810) 466; J.B. Williams, Fl. Australia 28 (1996) 181; D.J. Middleton, Blumea 42 (1997) 240. — Type: *Brown 2864* (holo BM), Australia.

Parsonsia quinquebullata Sleesen, Nova Guinea n.s. 9 (1958) 342. — Type: *Brass 6280* (holo L; iso A, BM, BO, BRI), Papua New Guinea, Western division, Daru Island.

Branchlets sparsely brown tomentose. *Leaves* opposite; petiole 1.1–3.5 cm long; blade papery to subcoriaceous, ovate to elliptic, 5–12.7 by 2.7–7.8 cm, 1.3–2.2 times as long as wide, apex acuminate, base rounded to cordate, velutinous beneath, pubescent on midrib to all over above, 5–9 pairs of secondary veins, strongly ascending, tertiary venation reticulate. *Inflorescence* of axillary cymes, flowers clustered at tips, 3.6–14 cm long; brown appressed velutinous; peduncles 2.2–11.3 cm long; pedicels 1.7–2.5 mm long. *Sepals* linear, reflexed, 2–3 by 0.6–1 mm, 2–4.8 times as long as wide, appressed brown velutinous. *Corolla* yellowish green, buds ovoid, lobes slightly overlapping, open corolla campanulate; tube 1.5–2.3 mm long, 0.6–0.9 times as long as sepals, 0.9–1.3 times as long as lobes; lobes triangular, 1.4–2.4 by 1.1–1.3 mm, apex acute; pubescent on lobes except on margin and upper part of tube outside, bearded in throat and in 5 rows down tube inside. *Stamens* inserted at 0.4–0.6 mm from corolla base which is 0.2–0.3 of tube length; anthers oblong, tails acute to obtuse, 1.5–2.6 by 0.5–0.6 mm, 3–4.8 times as long as wide. *Disk* of 5 separate lobes, oblong, each lobe deeply bifid and then each half bifid or 3-dentate again, 0.8–1 mm long. *Ovary* 0.8–0.9 mm long; style 1.1–1.4 mm long; style head 0.7–0.8 mm long. *Fruit* linear, densely brown pubescent, 8.2–15 by 0.5–1 cm. *Seeds*: grain 8.8–14.3 by 1.6–2.4 mm; coma 2.3–3.4 cm long.

Distribution — Australia; in *Malesia*: Lesser Sunda Islands (Timor), Moluccas (Kai Islands, Tanimbar Island, Babar), New Guinea.

Habitat & Ecology — In a wide range of primary, secondary, plantation and mangrove forests, generally reasonably dry, to 130 m altitude.

27. *Parsonsia warenaensis* Kaneh. & Hatus.

Parsonsia warenaensis Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 502; D.J. Middleton, Blumea 42 (1997) 241. — Type: *Kanehira & Hatusima 13125* (lecto TI, designated by Middleton (1997) op. cit.), New Guinea, Papua, Waren, Momi.

Parsonsia langiana auct. non F. Muell.: Markgr., Bot. Jahrb. Syst. 61 (1927) 219.

Branchlets densely to sparsely brown tomentose, rarely glabrous. *Leaves* opposite; petiole 0.8–2.7 cm long; blade papery to coriaceous, ovate to elliptic, 3.1–23 by 1.5–15.5 cm, 1.7–2.7 times as long as wide, apex acuminate, base cordate to rounded, sparsely pubescent on midrib only to densely brown pubescent above and beneath, 5–8 pairs of secondary veins, tertiary venation reticulate or scalariform. *Inflorescence* of lax axillary cymes, 3.5–13 cm long; brown velutinous; peduncles 1.8–8.6 cm long; pedicels 4–14 mm long. *Sepals* ovate, 2.2–3.1 by 1.1–1.9 mm, 1.2–2.4 times as long as wide, apex acute to acuminate, brown velutinous. *Corolla* yellowish green with orangish tube, buds ovoid, lobes slightly overlapping, open corolla salverform or with erect lobes; tube 4.2–5.4 mm long, 1.6–2.1 times as long as sepals, 1.7–5 times as long as lobes; lobes triangular, 1.2–2.7 by 1.2–1.5 mm, apex acuminate; densely pubescent on upper part of tube and lobes outside, pubescent in throat and tube inside. *Stamens* inserted at 2–2.8 mm from corolla base which is 0.5–0.6 of tube length; filaments curved or straight, pubescent, 1–1.1 mm long; anthers narrowly triangular, tails narrow, 2.9–3.1 by 0.6–0.8 mm, 3.9–5.2 times as long as wide. *Disk* of 5 separate lobes or fused at base, rounded or notched at apex, 1.6–1.9 mm long. *Ovary* 0.7–0.9 mm long; style 3–3.4 mm long; style head 0.9–1.3 mm long. *Fruit* fusiform, glabrous or sparsely pubescent, 7.8–13.7 by 1.3–2 cm. *Seeds*: grain 10–14 by 1.5–3 mm, coma 1.5–4.1 cm long.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — In forest to 1600 m altitude.

Note — The specimens from higher altitude tend to be the ones with the much more densely pubescent branchlets and leaves.

32. POTTSIA

Pottisia Hook. & Arn., Bot. Beechey Voy. (1837) 198; Benth. & Hook.f., Gen. Pl. 2 (1876) 712; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 186; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1176; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 56; Backer & Bakh.f., Fl. Java 2 (1965) 243; D.J. Middleton, Fl. Thailand 7 (1999) 139. — Type species: *Pottisia cantonensis* Hook. & Arn. (= *Pottisia laxiflora* (Blume) Kuntze).

Euthodon Griff., Notul. Pl. Asiat. 4 (1854) 84. — Type species: *Euthodon paniculata* Griff. (= *Pottisia laxiflora* (Blume) Kuntze).

Teysmannia Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 193. — *Parapottisia* Miq., Fl. Ned. Ind. 2 (1857) 1080. — Type species: *Teysmannia laxiflora* (Blume) Miq. (= *Pottisia laxiflora* (Blume) Kuntze).

Climber. *Leaves* opposite; those of a pair equal; no glands in the axils. *Inflorescence* a large, many-flowered, terminal panicle; flowers 5-merous. *Sepals* with a row of col-leters inside. *Corolla* lobes dextrorse; mature flower salverform; tube cylindrical, lobes narrowly ovate. *Stamens* inserted at corolla mouth, completely exerted from tube, adnate at the attachment of the filament to the anthers and by the thecae to the style head; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* of 5 narrow lobes, connate at the base, or of a dentate ring. Gynoecium 2-carpellate, apocarpous but apically united into a common style; ovules numerous; style inflated in centre (in Malesia). *Fruit* of paired narrow follicles; often spiral; glabrous. *Seeds* narrow elliptic; with an apical coma.

Distribution — 3 species in Eastern and Southeastern Asia; in *Malesia* 1 species.

***Pottsia laxiflora* (Blume) Kuntze**

Pottsia laxiflora (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 416; Kerr in Craib, Fl. Siam. 2 (1939) 453; Backer & Bakh.f., Fl. Java 2 (1965) 243; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 137; Lý, Feddes Repert. 97 (1986) 644; P.T. Li et al., Fl. China 16 (1995) 173; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 128; D.J. Middleton, Fl. Thailand 7 (1999) 139. — *Vallaris laxiflora* Blume, Bijdr. (1826) 1043. — *Teysmannia laxiflora* (Blume) Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 194; Fl. Ned. Ind. 2 (1857) 455. — Type: *Blume 2159* (lecto L, designated here; iso L), Java.

Pottsia cantonensis Hook. & Arn., Bot. Beechey Voy. (1837) 199; Miq., Fl. Ned. Ind. 2 (1857) 450; Kurz, Forest Fl. Burma 2 (1877) 190; Hook.f., Fl. Brit. India 3 (1882) 652; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 462; Ridl., Fl. Malay Penins. 2 (1923) 352; Burkill & M.R. Hend., Gard. Bull. Straits Settlements 3 (1925) 396; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1176. — Type: *Millet s.n.* (holo K), China, Canton.

Pottsia hookeriana Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1306bis. — *Teysmannia hookeriana* (Wight) Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 194; Fl. Ned. Ind. 2 (1857) 456. — Type: *Griffith s.n.* (holo K; iso K), Burma, Mergui.

Euthodon paniculata Griff., Notul. Pl. Asiat. 4 (1854) 84. — Type: Illustration 458, part 2, of the accompanying *Icones*.

Pottsia inodora Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1178. — Type: *Poilane 10727* (lecto P, designated by Lý (1986) op. cit., 1st step, and Middleton, *Adansonia* sér. 3, 27 (2005) 301, 2nd step; iso P), Vietnam, Quang Tri, Lang Khoai.

Parsonsia ovata Wall. ex G. Don, Gen. Hist. 4 (1837) 80. — *Pottsia ovata* (Wall. ex G. Don) A.DC., Prodr. 8 (1844) 442. — Type: *Wallich 1630* (lecto K-W (as *Wallich 1630.I*), designated by Middleton, *Taxon* 55 (2006) 505; iso CGE, P), Bangladesh, Sylhet.

Climber to 25 m high. *Branches* shortly tomentose to glabrous. *Leaves*: petiole 1–3.5 cm long; blade papery to subcoriaceous, ovate to elliptic, 3.3–14 by 1.3–8 cm, 1.5–2.6 times as long as wide, apex acuminate, base rounded to cordate, usually puberulent in secondary vein axils beneath and often on midrib above and beneath, 4–7 pairs of secondary veins, ascending, not reaching margin, tertiary venation subscalariform and reticulate. *Inflorescence* 10–30 cm long; peduncle 0.4–10.5 cm long, glabrous to tomentose; pedicels 5–10 mm long, glabrous to tomentose. *Sepals* ovate, 0.7–1.6 by 0.7–1.1 mm, 1–1.5 times as long as wide, apex acute to acuminate, puberulent to glabrous, ciliate. *Corolla* pink; tube 3.5–7 by 1.6–2.4 mm, 0.8–2 times as long as lobes, 3–4.2 times as long as calyx, glabrous or, rarely, with 5 small pubescent patches at top of tube outside, inside pubescent on and below the filaments; lobes 2–5.5 by 1.5–2.7

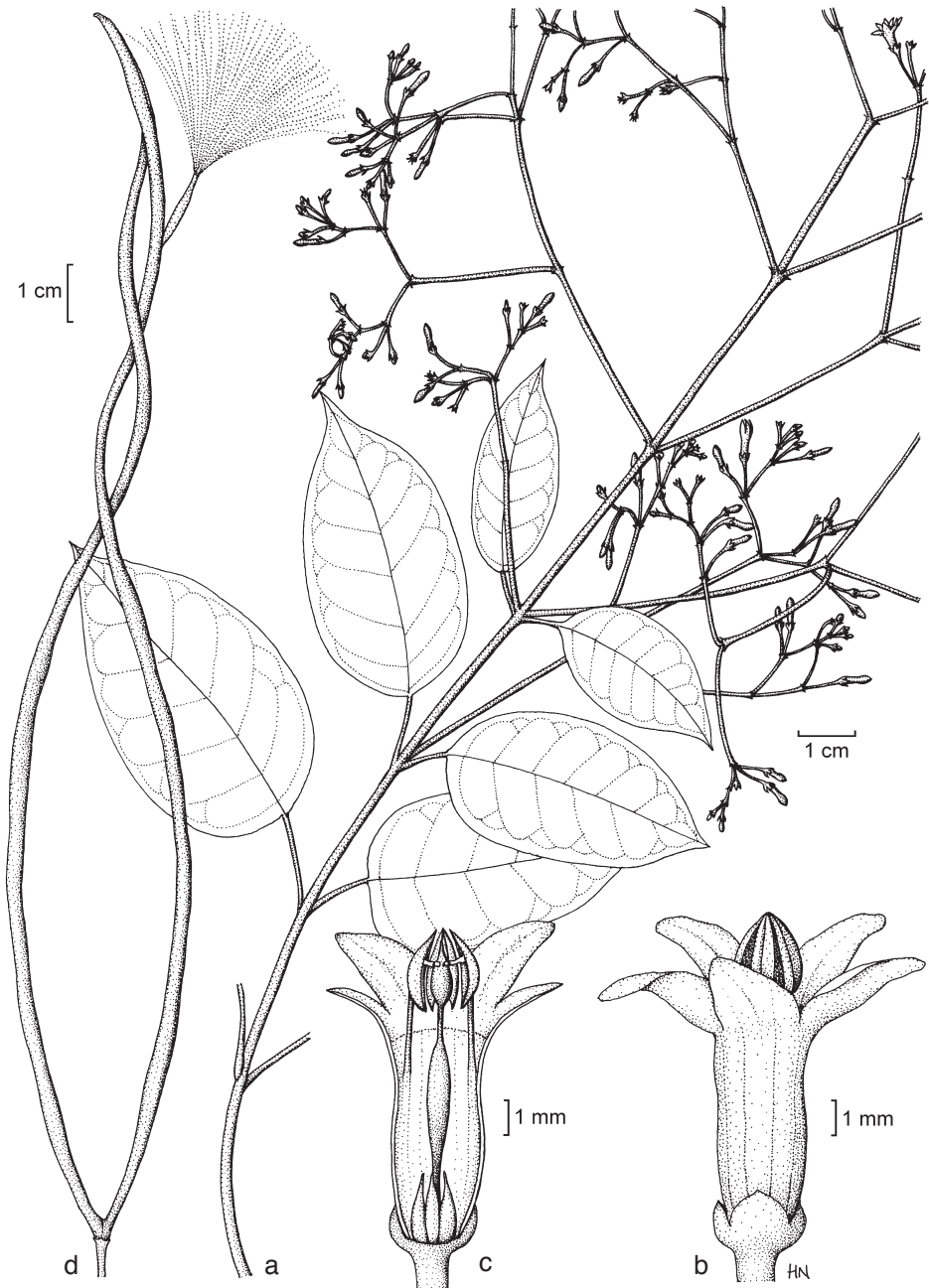


Fig. 87. *Pottsia laxiflora* (Blume) Kuntze. a. Habit; b. flower; c. flower dissection; d. fruit (a–c: Van Beusekom 1024; d, e: Tsang 27185).

mm, 1.3–2 times as long as wide, ovate, apex acute, glabrous outside and inside. *Stamen* filaments 0.7–1.5 mm long; anthers 2–2.7 by 0.7–1 mm. *Disk* of 5 narrow lobes fused together at the base, acuminate at the apex and clasped around and longer than the ovary, 1.5–2 mm long. *Ovaries* 0.6–1.1 mm long, pubescent; style and style head 4.5–6.6 mm long, style inflated for most of its length, narrower at base and top. *Fruit* 26–39 cm by 2.3–3 mm; often somewhat spiral. *Seeds* 16–23.5 by 2–2.7 mm; coma 2.6–3.3 cm long. — **Fig. 87.**

Distribution — India, Bangladesh, China, Thailand, Cambodia, Laos, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Java, Lesser Sunda Islands (Bali).

Habitat & Ecology — In evergreen forest to 1000 m.

33. RAUVOLFIA

(Hendrian & D.J. Middleton)

Rauvolfia L., Sp. Pl. 1 (1753) 208; A.DC., Prodr. 8 (1844) 336; Benth. & Hook.f., Gen. Pl. 2 (1876) 697; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 153; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1114; Pichon, Bull. Soc. Bot. France 94 (1947) 31; Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 162; Backer & Bakh.f., Fl. Java 2 (1965) 230; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 15; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 46; H. Huber in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 47; Markgr., Blumea 30 (1984) 157; Lý, Feddes Repert. 97 (1986) 423; P.T. Li et al., Fl. China 16 (1995) 157; PROSEA 12, 1 (1999) 424; Hendrian & D.J. Middleton, Blumea 44 (1999) 450; D.J. Middleton, Fl. Thailand 7 (1999) 50; Tree Fl. Sabah & Sarawak 5 (2004) 46. — Type species: *Rauvolfia tetraphylla* L.

Ophioxylon L., Sp. Pl. 2 (1753) 1043. — Type species: *Ophioxylon serpentinum* L. (= *Rauvolfia serpentina* (L.) Benth. ex Kurz).

Dissolena Lour., Fl. Cochinch. (1790) 137. — Type species: *Dissolena verticillata* Lour. (= *Rauvolfia verticillata* (Lour.) Baill.).

Cyrtosiphonia Miq., Fl. Ned. Ind. 2 (1857) 401. — Type species: *Cyrtosiphonia sumatrana* (Jack) Miq., designated by Van Dilst & Leeuwenberg 1991 (= *Rauvolfia sumatrana* Jack).

Heurckia Müll.Arg., Flora 53 (1870) 168. — Type species: *Heurckia semperflorens* Müll.Arg. (= *Rauvolfia semperflorens* (Müll.Arg.) Schltr.).

Shrubs, trees or sometimes rhizomatous under-shrubs, with white latex; branches lenticellate. *Leaves* mostly in whorls of 3–7, often confined to the apices of the branchlets, sometimes opposite on the lower nodes, glabrous, petiole varies considerably in length; lamina membranous to coriaceous. *Inflorescence* terminal, sometimes seemingly lateral, lax or congested, a few- to many-flowered cyme, glabrous or pubescent; flowers 5-merous. *Sepals* without colleters. *Corolla* hypocrateriform, infundibuliform, urceolate or campanulate; tube glabrous outside, variably hairy inside; lobes sinistrorse. *Stamens* free from the style head, included or exserted; filaments short and narrow, glabrous or pubescent; anthers fertile for the entire length. *Disk* annular or cupular, entire, undulate, crenate or sometimes serrate, glabrous. Gynoecium 2-carpellate, apocarpous but apically united into a common style, to syncarpous, glabrous; style filiform, glabrous to pubescent; style head cylindrical with a membranous collar at the base and a stigmoid bi-apiculate apex. *Fruit* of apocarpous or partly to completely syncarpous drupes, often only 1 carpel developing, each carpel contains a single seed. *Seeds* laterally compressed, obliquely ovoid or ellipsoid.

Distribution — A pantropical genus of c. 60 species; in *Malesia* 9 species.

KEY TO THE SPECIES

- 1a. Sepals ≥ 2 times as long as wide; corolla tube ≥ 9 mm long; anthers obtuse to acute; leaves with or without submarginal veins 2
- b. Sepals ≤ 1.5 times as long as wide; corolla tube < 6 mm long; anthers cuspidate; leaves with submarginal veins 4
- 2a. First branch of inflorescence less than 0.3 cm long; flowers clustered; carpels connate at base; mericarps subglobose or ovoid, connate at base . . . **7. R. serpentina**
- b. First branch of inflorescence more than 0.5 cm long; inflorescence lax; carpels free from each other; mericarps globose or ellipsoid, free from each other 3
- 3a. Leaf blade thinly papyraceous; inflorescences in whorls of 2 or 3, with fewer than 10 flowers; fruits subglobose to globose, red when mature **3. R. kamarora**
- b. Leaf blade papyraceous; inflorescences in whorls of 3 or 4, with 8—more than 35 flowers; fruits ovoid, whitish purple when mature **9. R. verticillata**
- 4a. Leaf blade papyraceous or thinly so; inflorescence with fewer than 8 flowers . . 5
- b. Leaf blade subcoriaceous to coriaceous; inflorescence usually with more than 25 flowers 6
- 5a. Inflorescence branches usually with many bracteoles; corolla tube ≤ 4 mm long; fruits obversely trapezoid, with 2 acute apices **6. R. rostrata**
- b. Inflorescence branches with few bracteoles or absent; corolla tube > 5 mm long; fruits ovoid, with 1 rounded apex **5. R. oligantha**
- 6a. Corolla tube 2–2.4 mm long; disk serrate; petiole and midrib yellowish when dried. **1. R. amsoniifolia**
- b. Corolla tube 2.6–4.9 mm long; disk crenate; petiole and midrib not yellowish when dried. 7
- 7a. Corolla tube 2.4–3.4 times as long as the calyx; fruits globose or subglobose, apex of mericarps rounded to cleft (when cleft, distance between apices ≤ 0.3 of fruit length) **8. R. sumatrana**
- b. Corolla tube 1.5–2.2 times as long as the calyx; fruits obversely trapezoid, apex of mericarps widely split into 2 acute apices, distance between apices > 0.3 of fruit length 8
- 8a. Disk less than 0.45 times as long as the ovary. — Moluccas, New Guinea **4. R. moluccana**
- b. Disk more than 0.6 times as long as the ovary. — Sumatra, Java, Lesser Sunda Islands **2. R. javanica**

1. Rauvolfia amsoniifolia A.DC.

Rauvolfia amsoniifolia A.DC., Prodr. 8 (1844) 338; Hemsl., Bot. Chall. Exp. 3 (1885) 163; Warb., Bot. Jahrb. Syst. 13 (1891) 404; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 393; Merr., For. Bur. Bull. 1 (1903) 49; Enum. Philipp. Fl. Pl. 3 (1923) 329; Markgr., Nova Guinea 14, 2 (1926) 283; K. Heyne, Nutt. Pl. Ned.-Ind., ed. 2 (1927) 1285; Markgr., Bot. Jahrb. Syst. 61 (1927) 188; Quisumb., Med. Pl. Philipp. (1951) 736; Markgr., Blumea 30 (1984) 162; Whitmore & Tantra, Checklist Sulawesi (1989) 15; Whitmore et al., Checklist Bali, Nusa Tenggara Timor (1989) 13; PROSEA 12, 1 (1999) 429; Hendrian & D.J. Middleton, Blumea 44 (1999) 451. — *Cyrtosiphonia amsoniifolia* (A.DC.) Miq., Fl. Ned. Ind. 2 (1857) 402. — Type: *Cuming 1249* (lecto G, designated by Markgraf (1984) op. cit.; iso BM, FR, G-DC, K, L, P), Philippines, Luzon, Cagayan.

Shrub or tree 1.5–7(–20) m high. *Branches* sparsely lenticellate; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 0.5–1.5 cm long, glabrous; blade subcoriaceous, elliptic, 5.5–12.5(–21.5) by 1–3.6 cm, 3–9.7 times as long as wide, apex acute, rarely acuminate, base cuneate to slightly decurrent, glabrous above and beneath; secondary veins (14–)21–27(–31) pairs, 0.1–0.3(–0.6) mm spaced, more or less straight, 45–65° from midrib. *Inflorescence* 3–9.5 cm long, in whorls of 2–4(–6), congested, 32–more than 35-flowered; peduncle 2.3–5 cm long, glabrous; pedicels 1–2.5(–5) mm long, glabrous. *Sepals* broadly ovate, 1.1–1.3 by 0.9–1.4 mm, 0.9–1.3 times as long as wide, apex obtuse to rounded. *Corolla* glabrous outside, villose from just around the mouth downwards for 1–1.2 mm, 3 mm long in the mature bud, and forming a subglobose head of 1 by 1.5 mm, usually indistinct from the tube; tube cylindrical, 2–2.4 mm long, 1.6–1.9 times as long as calyx, 1.4–1.8 times as long as lobes; lobes broadly and obliquely ovate, 1.1–1.5 by 1.2–1.5 mm, 0.9–1.1 times as long as wide, apex rounded, sometimes slightly retuse. *Stamens* inserted at 1.9–2.1 mm from base, c. 0.9 of the length of the corolla tube; filaments 0.5 mm long; anthers 1–1.1 by 0.2–0.3 mm, 3.3–5 times as long as wide. *Disk* cup-shaped, 0.7–1 mm high, 0.7–0.8 times as long as ovary, serrate. Gynoecium mostly glabrous; ovary syncarpous, c. 1 mm long; style 1–1.3 mm long; style head 0.6–0.8 mm long, puberulous. *Fruit* bluish black when mature, syncarpous or partly so, broadly ovoid, subglobose or trapezoid, often cleft at the apex, 7–9.2 by 7–10.2 mm, 0.8–1.1 times as long as wide, connate for 0.6–0.9 of fruit length when cleft, distance between apices 2–7.5 mm, apices acute, base thickened, sometimes only 1 carpel developing, glabrous. *Seeds* 3–5.5 by 2–2.7 mm.

Distribution — *Malesia*: Philippines, Sulawesi, eastern Lesser Sunda Islands and Moluccas.

Habitat & Ecology — In open areas, scrub or secondary forests. Sometimes also found at the edge of coconut plantations. On rocky soil. Altitude mostly from 0–500 m. It also occurs at an altitude of 2500 m on Mt Badyang in primary forest, East Mindoro, Philippines.

Uses — It is used for the treatment of stomach problems, as a laxative and febrifuge and in childbirth.

2. *Rauvolfia javanica* Koord. & Valetton

Rauvolfia javanica Koord. & Valetton, Bijdr. Boomsoort. Java 1 (1894) 91; Koord., Meded. Lands Plantentuin 11 (1894) 81; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 393; Koord.-Schum., Syst. Verz. 1 (1912) 174; Koord., Exkurs.-Fl. Java 3 (1912) 74; Fl. Tjibodas 3, 3 (1918) 57; Rendle, J. Bot. 63, Suppl. (1925) 67; K. Heyne, Nutt. Pl. Ned.-Ind., ed. 2 (1927) 1285; Backer & Bakh.f., Fl. Java 2 (1965) 231; Markgr., Blumea 30 (1984) 164; Whitmore & Tantra, Checklist Sumatra (1986) 20; Whitmore et al., Checklist Bali, Nusa Tenggara Timor (1989) 14; PROSEA 12, 1 (1999) 429; Hendrian & D.J. Middleton, Blumea 44 (1999) 453. — Type: *Koorders 151* (lecto L, designated by Hendrian & Middleton (1999) op. cit.; iso A, BO), Java, Cibodas.

Tree 3–15 m high. *Branches* lenticellate, often strongly angled; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 0.4–1.8 cm long, glabrous; blades 6.5–21 by 1.4–4.9 cm, 2.6–5.3 times as long as wide, coriaceous, sometimes subcoriaceous, elliptic to obovate, apex acute to acuminate, base slightly decurrent, glabrous above and beneath; secondary veins (10–)19–26 pairs, 0.3–1 cm spaced, straight to rather arcuate ascend-

ing, forming an angle of 50–85° with the midrib, forming a submarginal vein. *Inflorescence* 3–11.5 cm long, in whorls of 3 or 4, usually on the top of a short and robust (leafy) twig, 24–more than 35-flowered; peduncle 2.5–7.5 cm long, often robust, glabrous; pedicels 0.15–0.4 cm long, glabrous. *Sepals* ovate or subtriangular, 1.6–1.9 by 1.6–1.8 mm, 0.9–1.2 times as long as wide, apex obtuse to rounded, glabrous. *Corolla* white, 3.2–4.5 mm long in the mature bud and forming a broadly ovoid head of 1–1.8 by 1.8–2 mm, with an obtuse to rounded apex, usually indistinct from the tube, glabrous outside, villose from just around the mouth downwards for 1.5 mm; tube 3.1–4.2 mm long, 1.8–2.2 times as long as calyx, 1.8–2.1 times as long as lobes; lobes ovate, 1.7–2 by 1.5–2.1 mm, 0.9–1.1 times as long as wide, apex obtuse. *Stamens* inserted at 1.6–3 mm from the base, 0.6–0.9 of the length of the corolla tube; filaments 0.5–0.6 mm long; anthers 9–17 by 2–4 mm, 3.7–5 times as long as wide. *Disk* cup-shaped, 1.2–1.8 mm high, 0.6–0.8 times as long as ovary, crenate. *Pistil* mostly glabrous; ovary of 2 carpels which are fused at the base, 1.1–1.4 mm high; style filiform, 1.3–1.8 mm long; style head 0.7–1 mm long. *Fruit* black or purplish black when mature, obversely trapezoid, 7–11 by 8.5–15 mm, 0.7–1 times as long as wide; mericarps connate for 0.6–0.85 of their length, apices widely spreading, acute, distance between apices 6.5–13 mm, very narrow but thickened at the base, glabrous, sometimes only 1 carpel developing. *Seeds* 5–8.5 by 1.8–2.7 mm.

Distribution — *Malesia*: Sumatra, Java, Lesser Sunda Islands.

Habitat & Ecology — In very moist and old forests. Altitude 30–1400 m.

Uses — Crushed leaves are used externally for the treatment of wounds.

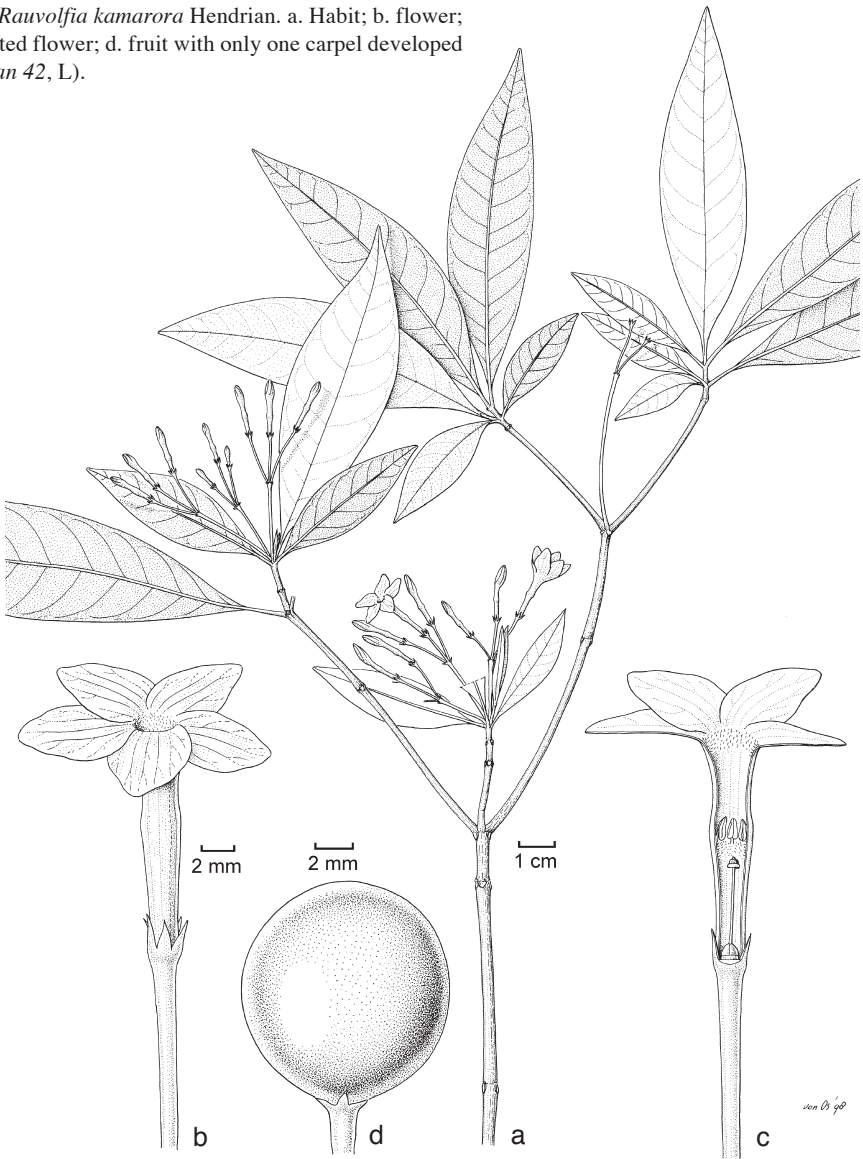
3. *Rauvolfia kamarora* Hendrian

Rauvolfia kamarora Hendrian, Blumea 44 (1999) 454; Kessler et al., Blumea, Suppl. 14 (2002) 15.

— Type: *Hendrian 42* (holo L; iso A, BM, BO, K), Central Sulawesi, Lore Lindu National Park, Kamarora.

Shrub 1.5–2 m high. *Branches* lenticellate; branchlets glabrous. *Leaves* usually in whorls of 3, rarely 4; petiole 0.3–1 cm long, glabrous; blade thin, narrowly elliptic or narrowly obovate, 8–25 by 1.6–4.1 cm, 3.5–7.6 times as long as wide, apex acuminate to cuspidate, base decurrent or slightly so, glabrous above and beneath; secondary veins 8–11(–12) pairs, 0.3–2 cm spaced, arcuate ascending, forming an angle of 45–85° with the midrib. *Inflorescence* 3–7 cm long, usually in whorls of 2 or 3, rarely solitary, lax, 2–9-flowered; peduncle 1.8–4.5 cm long, often delicate, glabrous; pedicels 1–1.8 cm long, glabrous. *Sepals* ovate or subtriangular 1.7–3.1 by 0.8–1 mm, 2–3.7 times as long as wide, apex obtuse to acute, glabrous. *Corolla* pure white, 15–17 mm long in mature bud and forming an ovoid head of 2–2.2 by 5–5.1 mm, glabrous outside, villose from just around the mouth downwards for 3 mm; tube 10–13 mm long, 4.5–5.9 times as long as calyx, 1.7–2.2 times as long as lobes, slightly twisted; lobes obliquely ovate, 4–4.5 by 5.9–6.2 mm, 1.3–1.5 times as long as wide, rounded. *Stamens* inserted at 6–8 mm from the base, 0.6–0.7 of the length of the corolla tube; filaments 0.7–0.9 mm long; anthers 1.2–1.5 by 0.3–0.5 mm, 2.8–4.3 times as long as wide. *Disk* cup-shaped, 0.6–0.8 by 0.7–0.8 mm, 0.3–0.4 times as long as ovary, undulate. *Pistil* glabrous; ovary ovoid, 1.5–1.7 mm high, consisting of 2 carpels which are free from each other; style

Fig. 88. *Rauvolfia kamarora* Hendrian. a. Habit; b. flower; c. dissected flower; d. fruit with only one carpel developed (Hendrian 42, L).



filiform, 4–4.3 mm long; style head 0.5–0.9 mm long. *Fruit* red when mature, usually of paired mericarps free from each other, with a very short stalk, sometimes only 1 carpel developing, subglobose to globose, 11–13 by 10–11 mm, 1.1–1.3 times as long as wide, apex rounded; endocarp rugose, rather hard. *Seeds* 1, obliquely ovoid, 8–10 by 3–4 mm, 2–3.3 times as long as wide, acute at both ends, glabrous. — **Fig. 88.**

Distribution — *Malesia*: Sulawesi.

Habitat & Ecology — In relatively open areas, light woods and secondary forests. Altitude 500–700 m.

4. *Rauvolfia moluccana* Markgr.

Rauvolfia moluccana Markgr., Blumea 30 (1984) 163; Whitmore et al., Checklist Maluku (1989) 14; Hendrian & D.J. Middleton, Blumea 44 (1999) 456. — Type: *Sayers NGF 21949* (holo L), Papua New Guinea, New Britain, Kandrian, Pirilongi.

Tree 3–15 m high. *Branches* lenticellate; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 2–4.3 cm long, glabrous; blade coriaceous to subcoriaceous, elliptic to narrowly elliptic, 9.5–20.5 by 4.4–9.5 cm, 1.8–3.5 times as long as wide, apex acuminate, base cuneate to slightly decurrent, glabrous above and beneath; secondary veins 15–23 pairs, 0.4–1.4 cm spaced, straight to rather arcuate-ascending, forming an angle of 75–90° with the midrib, forming a submarginal vein. *Inflorescence* 6–16.5 cm long, usually in whorls of 3 or 4, rarely solitary, usually on the top of a short and robust (leafy) twig, more than 35-flowered, glabrous; peduncle 4.6–11.3 by 0.15–0.25 cm, glabrous; pedicels 0.2–0.5 cm long, glabrous. *Sepals* broadly ovate, 1.5–1.8 by 1.6–1.7 mm, 0.95–1.05 times as long as wide, apex rounded, glabrous. *Corolla* white, glabrous outside, villose in a belt from just around the mouth downwards for 1.5 mm; tube 2.6–2.7 mm long, 1.5–1.7 times as long as calyx, 1.6–1.7 times as long as lobes; lobes broadly ovate, 1.6 by 1.7 mm, 0.94 times as long as wide, apex obtuse. *Stamens* inserted at c. 2.4 mm from the base, 0.9 of the length of the corolla tube; filaments 0.4–0.6 mm long; anthers 10–17 by 3–4 mm, 3.3–4.25 times as long as wide. *Disk* cup-shaped, very short, 1–1.2 by 0.3–0.5 mm, 0.27–0.42 times as long as ovary, crenate. *Pistil* mostly glabrous; ovary of 2 carpels which are subglobose, 1.1–1.4 mm long; style filiform, 1.3–1.8 mm long; style head 0.8–1 mm long. *Fruit* black or purplish black when mature, obversely trapezoid, 8.8–11.2 by 9–14 mm, 0.8–1.1 times as long as wide, mericarps connate for 0.65–0.95 of their length, apices widely spreading, acute, distance between apices 6–13.5 mm, sometimes trapezoid, truncate or shallowly cleft at apex, glabrous, sometimes only 1 carpel developing. *Seeds* 1 in each endocarp, ovoid or narrowly ovoid, 5–7.2 by 1.5–2.5 mm, 2.5–3.5 times as long as wide, apex acute or obtuse, glabrous.

Distribution — *Malesia*: Moluccas, New Guinea.

Habitat & Ecology — In secondary and primary forests. On sandy soil or limestone mixed with gravel and stones. Altitude 2–900 m.

5. *Rauvolfia oligantha* Hendrian

Rauvolfia oligantha Hendrian, Blumea 44 (1999) 457. — Type: *Koorders 38049* (holo BO; iso L), Central Java.

Shrub 2–5 m high. *Branchlets* slightly lenticellate. *Leaves* in whorls of 3 or opposite; petiole 0.4–2 cm long, glabrous; blade elliptic, 5–16 by 2.6–5.7 cm, 1.5–3.1 times as long as wide, apex acuminate, very rarely obtuse, base cuneate or abruptly decurrent, glabrous above and beneath; secondary veins 8–17 pairs, 0.3–1.1 mm spaced, straight, rather arcuate-ascending near the margin, forming an angle of 75–90° with the midrib, forming a submarginal vein. *Inflorescence* 3–4 cm long, terminal, lax, 5–8-flowered; peduncle c. 2.3 cm long, glabrous; pedicels 0.3–0.4 cm long, glabrous. *Sepals* ovate, 1.5–1.6 by 1–1.1 mm, 1.45–1.5 times as long as wide, apex acute to acuminate,

glabrous. *Corolla* 6 mm long in mature bud, forming a broadly ovoid head of 1.1 by 2 mm with obtuse apex, glabrous outside, with a villose belt inside from just around the mouth downwards to the insertion of the stamens; tube 5.1–5.3 mm long, 3.3–3.4 times as long as calyx, 3.9–4.1 times as long as lobes; lobes ovate, c. 1.3 by 1.2 mm, c. 1.1 times as long as wide, apex obtuse to rounded, entire. *Stamens* inserted at c. 5 mm from base, c. 0.9 of the length of the corolla tube; filaments c. 0.5 mm long; anthers c. 1.4 by 0.5 mm, 2.8 times as long as wide. *Disk* cup-shaped, 1.2 by 1 mm, c. 0.65 times as

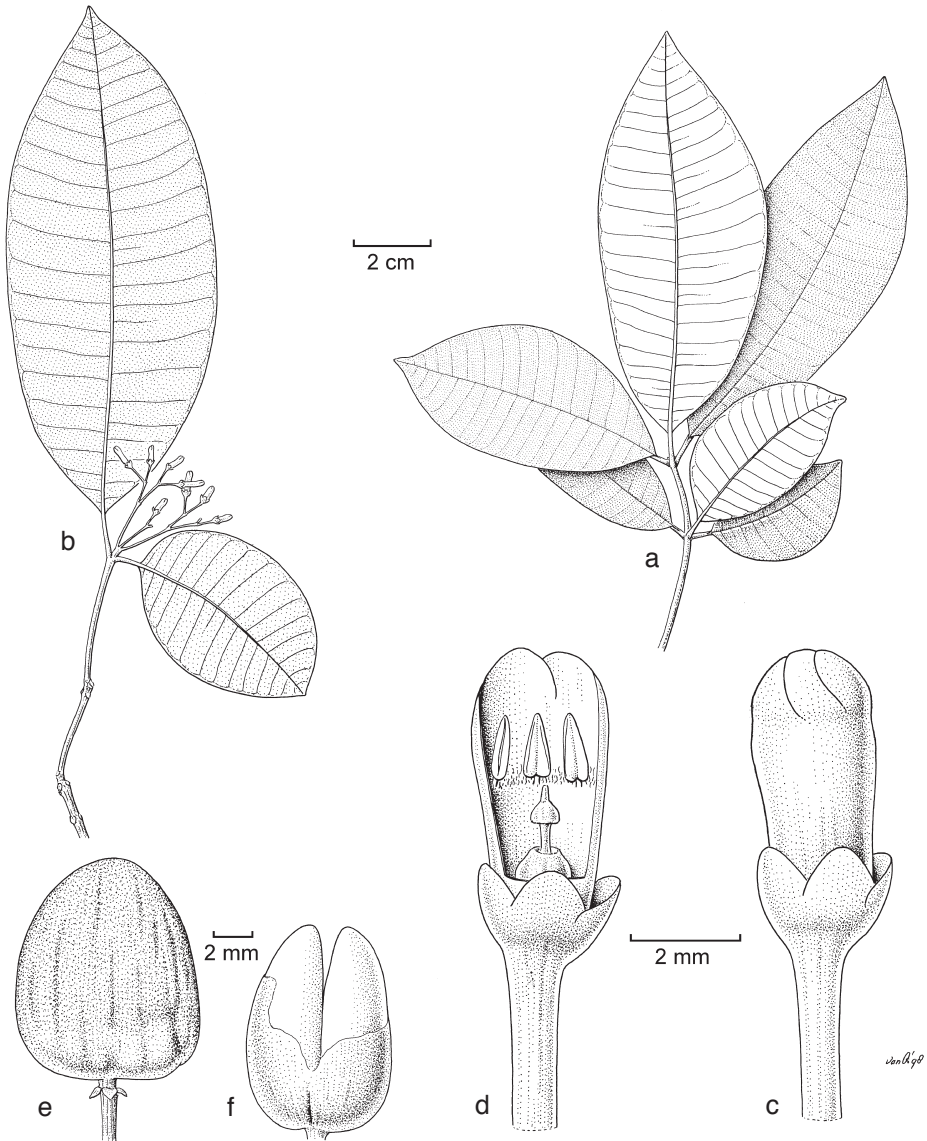


Fig. 89. *Rauvolfia oligantha* Hendrian. a. Habit; b. habit with inflorescence; c. flower bud; d. dissected flower; e. fruit; f. fruit showing paired endocarps (a–d Koorders 38397; e, f: Koorders 38049, BO).

long as ovary, crenate. *Pistil* mostly glabrous; ovary syncarpous, ovoid, 1.5 mm long, glabrous; style filiform, 3 mm long, glabrous; style head 1 mm long. *Fruit* syncarpous, ovoid, 11–11.5 by 10 mm, 1.1–1.15 times as long as wide, laterally compressed, consisting of 2 mericarps, sometimes only 1 carpel developing, glabrous, apex rounded. *Seeds* 1 in each endocarp, narrowly ovoid, 8–8.2 by 2–2.3, 3.6–4 times as long as wide, acute, glabrous. — **Fig. 89.**

Distribution — *Malesia*: Java.

Habitat & Ecology — Altitude 800–1000 m.

6. *Rauvolfia rostrata* Markgr.

Rauvolfia rostrata Markgr., Bot. Jahrb. Syst. 61 (1927) 188; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 504; Markgr., Blumea 30 (1984) 163; Hendrian & D.J. Middleton, Blumea 44 (1999) 459. — Type: *Beccari 392* (holo FI n.v.), New Guinea, Papua, Ramoi.

Rauvolfia amsoniifolia auct. non. DC.: Markgr., Bot. Jahrb. Syst. 61 (1927) 188.

Shrub or small tree 1–7 m high. *Branches* sparsely lenticellate; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 0.3–0.5(–1) cm long, glabrous; blade papery to subcoriaceous, elliptic, 7–14.5 by 1.8–4.2 cm, 2.6–3.8(–5.2) times as long as wide, apex cuspidate, rarely acuminate, base cuneate to slightly decurrent, glabrous above and beneath; secondary veins 12–23 pairs, 0.1–0.5 mm spaced, straight to rather arcuate-ascending, forming an angle of 50–80° with the midrib, forming a submarginal vein. *Inflorescence* 3–9.5 cm long, lax, 5–8-flowered, glabrous; peduncle 2.3–6 by 0.1 cm, thin, delicate, glabrous; bracteoles broadly ovate, 0.6–0.8 by 0.4–0.6 mm; pedicels 0.2–0.5 cm long, glabrous. *Sepals* ovate or subtriangular, 1–1.4 by 0.8–1.3 mm, 1.1–1.3 times as long as wide, apex obtuse, glabrous. *Corolla* white, glabrous outside, villose in a belt from just around the mouth downwards to the insertion of the stamens, 4–4.5 mm long in the mature bud and forming a broadly ovoid head of 1–1.1 by 1.3–1.4 mm with obtuse apex; tube 3.7–4 mm long, 2.8–3.7 times as long as calyx, 2.7–3.1 times as long as lobes; lobes broadly and obliquely ovate to suborbicular, 1.2–1.5 by 1–1.4 mm, 1–1.2 times as long as wide, apex rounded. *Stamens* inserted at 3.5–3.7 mm from base, 0.9–0.95 of the length of the corolla tube; filaments 0.5 mm long; anthers 1–1.1 by 0.3 mm, 3.3–3.7 times as long as wide. *Disk* cup-shaped, 1.1–1.2 by 0.5–0.6 mm, 0.4–0.6 times as long as ovary, crenate. *Pistil* mostly glabrous; ovary syncarpous, globose, 1–1.2 mm long; style filiform, 2–2.2 mm long, broader at the apex; style head 0.8 mm long. *Fruit* bluish black when mature, partly syncarpous, obversely trapezoid, 10.8–13 by 14.8–20 mm, 0.65–0.75 times as long as wide, connate for 6–7 mm, 0.55 of mericarp length, with 2 acute apices, distance between apices 8.8–14.5 mm, sometimes only 1 carpel developing, glabrous. *Seeds* 1 in each endocarp, ovoid, acute.

Distribution — *Malesia*: Moluccas, New Guinea.

Habitat & Ecology — Primary forests. On limestone soil. Altitude 100–1100 m.

7. *Rauvolfia serpentina* (L.) Benth. ex Kurz

Rauvolfia serpentina (L.) Benth. ex Kurz, Forest Fl. Burma 2 (1877) 171; Hook.f., Fl. Brit. India 3 (1882) 632; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 393; Koord., Exkurs.-Fl. Java 3 (1912) 74; Koord.-Schum., Syst. Verz. (1912) 175; Merr., Interpr. Herb. Amboin. (1917) 430; K. Heyne, Nutt.

Pl. Ned.-Ind., ed. 2 (1927) 1286; Kerr in Craib, Fl. Siam. 2 (1939) 430; Masam., Enum. Phan. Born. (1942) 623; Bakh.f., Blumea 6 (1950) 386; Monach., Econ. Bot. 8 (1954) 349; Backer & Bakh.f., Fl. Java 2 (1965) 231; H. Huber in Abeyw. (ed.), Revis. Handb. Fl. Ceylon 1 (1973) 15; in Dassan. (ed.), Revis. Handb. Fl. Ceylon 4 (1983) 49; Markgr., Blumea 30 (1984) 161; Whitmore et al., Checklist Bali, Nusa Tenggara Timor (1989) 14; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 52; M.F. Watson, Fl. Bhutan 2 (1999) 668; PROSEA 12, 1 (1999) 430; D.J. Middleton, Fl. Thailand 7 (1999) 53; Hendrian & D.J. Middleton, Blumea 44 (1999) 460; Pradhan in Singh et al., Fl. Maharashtra State, Dicot. 2 (2001) 325. — *Ophioxylon serpentinum* L., Sp. Pl. (1753) 1043; Miq., Fl. Ned. Ind. 2 (1857) 404. — Type: *Hermann* 398 [Herb. Hermann 4: 77, upper specimen] (lecto BM, designated by Leeuwenberg in Jarvis et al. (eds.), Regnum Veg. 127 (1993) 71), Sri Lanka, sine loc.

Ophioxylon album Gaertn., Fruct. Sem. Pl. 2 (1791) 129. — Type: Rumph., Herb. Amboin. 7 (Aucturarium) (1755) t. 16.

Ophioxylon trifoliatum Gaertn., Fruct. Sem. Pl. 2 (1791) 129, t. 109; Miq., Fl. Ned. Ind. 2 (1857) 404. — *Rauvolfia trifoliata* (Gaertn.) Baill., Hist. Pl. 10 (1891) 171, in adnot. — Type: icon. cit.

Ophioxylon obversum Miq., Fl. Ned. Ind. 2 (1857) 405. — *Rauvolfia obversa* (Miq.) Baill., Hist. Pl. 10 (1891) 171, in adnot. — *Rauvolfia obversa* (Miq.) Koord., Natuurk. Tijdschr. Ned.-Indië 60 (1900) 243, superfl. comb. — *Rauvolfia serpentina* (L.) Benth. ex Kurz var. *obversa* (Miq.) Bakh.f., Blumea 6 (1950) 386. — Type: *Horsfield s.n.* (lecto K, designated by Hendrian & Middleton (1999) op. cit.; iso BM, NY, U), E Java, Blambangan.

Shrub 0.3–1.5 m high, unbranched or rarely branched. *Branches* 0.3–0.4 cm diam., rather densely lenticellate; branchlets glabrous. *Leaves* confined to the apex of the branchlets, in whorls of 3 or 4 (or 5), very rarely opposite; petiole 0.3–2.4(–3) cm long, glabrous; blade papery, ovate, elliptic or obovate, 5–19.5 by 1.6–7.3 cm, 1.7–4.6 times as long as wide, apex acuminate to slightly obtuse, base cuneate to slightly decurrent, glabrous above and beneath; secondary veins 5–10 pairs, 0.4–3.3 cm spaced, arcuate-ascending, forming an angle of 45–50(–60)° with the midrib, often rather straight at base. *Inflorescence* 3.8–9(–14.1) cm long, terminal cymes, sometimes also axillary, usually solitary, congested, 20–more than 35-flowered; peduncle 2.6–9.6 by 0.1–0.2 cm; pedicels 0.1–0.4 cm long, glabrous. *Sepals* narrowly ovate, 1.3–3.5 by 0.4–0.8 mm, 3.2–4.8 times as long as wide, apex acute, glabrous. *Corolla* white or rather pinkish, 8–16 mm long in the mature bud and forming an ovoid head of 1.5–2.9 by 1–2 mm, glabrous outside, with 2 belts of indumentum inside around the insertion of the stamens and below the mouth and up to the mouth; tube 9–18 mm long, 3–6.9 times as long as calyx, 3.6–6 times as long as lobes, slightly twisted; lobes obliquely ovate, 2–3 by 1.2–2.1 mm, 1.3–1.8 times as long as wide, obtuse or rarely retuse. *Stamens* inserted at 7.5–12 mm from base, 0.6–0.8 of tube length; filaments 0.8–1 mm long; anthers 1.1–1.5 by 0.3–0.4 mm, 2.5–4.5 times as long as wide. *Disk* cup-shaped, 0.8–1 by 0.6–1 mm, 0.45–0.65 times as long as ovary, slightly crenate. *Pistil* mostly glabrous; ovary ovoid, 1.3–1.9 mm long, consisting of 2 carpels which are connate at the base; style filiform, 6.2–9.1 mm long; style head 0.5–0.6 mm long. *Fruit* black to reddish black when mature, syncarpous, cordate, mericarps connate at the base for 3–4 mm, or 0.55–0.65 of their length, sometimes only 1 carpel developing; each mericarp obliquely ovoid or subglobose, 5–6 by 4–4.5 mm, 1.2–1.3 times as long as wide, apex obtuse. *Seeds* 1 in each half, obliquely ovoid, 3–4 by 2.2–3 mm, 1.2–1.4 times as long as wide, acute, glabrous.

Distribution — India, Sri Lanka, Nepal, Burma, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia, Java, Lesser Sunda Islands.

Habitat & Ecology — In rather dry open areas, light woods, disturbed primary forests or deciduous forests. Often on limestone rock or deep coral sand. Altitude 0–500 m in *Malesia*.

Uses — Most of the uses described in the introductory chapters for *Rauvolfia* as a whole apply to this species. These include the treatment of snake bites, mental illnesses and epilepsy. In other areas it has been used as a treatment for high blood pressure, for a wide range of mental health problems, liver diseases, dysentery and in childbirth. It has also been used externally for eye problems and as a treatment for wounds.

8. *Rauvolfia sumatrana* Jack

Rauvolfia sumatrana Jack, Malayan Misc. 1, 5 (1820) 22; G. Don, Gen. Hist. 4 (1838) 99; A.DC., Prodr. 8 (1844) 337; Hassk., Flora 28 (1845) 263 (= 295); H.O. Forbes, Naturalist's Wanderings E. Archipel. (1885) 510; Koord. & Valetton, Bijdr. Boomsoort. Java 1 (1894) 93; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 393; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 424; Koord., Exkurs.-Fl. Java 3 (1912) 75; Koord.-Schum., Syst. Verz. 1 (1912) 176; Burkill, J. Straits Branch Roy. Asiat. Soc. 73 (1916) 258; Ridl., Fl. Malay Penins. 2 (1923) 336; K. Heyne, Nutt. Pl. Ned.-Ind., ed. 2 (1927) 1287; M.R. Hend., J. Malayan Branch Roy. Asiat. Soc. 17 (1939) 57; Kerr in Craib, Fl. Siam. 2 (1939) 431; Masam., Enum. Phan. Born. (1942) 624; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; Markgr., Blumea 30 (1984) 167; Whitmore & Tantra, Checklist Sumatra (1986) 20; Checklist Sulawesi (1989) 15; Whitmore et al., Checklist Bali, Nusa Tenggara Timur (1989) 14; Checklist Maluku (1989) 14; Checklist Kalimantan (1990) 26; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 52; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 128; Whitmore et al., Checklist Irian Jaya (1997) 16; PROSEA 12, 1 (1999) 430; D.J. Middleton, Fl. Thailand 7 (1999) 53; Hendrian & D.J. Middleton, Blumea 44 (1999) 462; Kessler et al., Blumea, Suppl. 14 (2002) 15; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 47. — *Cyrtosiphonia sumatrana* (Jack) Miq., Fl. Ned. Ind. 2 (1857) 401; Fl. Ned. Ind., Eerste Bijv. (1861) 228. — Type: Untraced. Neotype: *Diepenhorst s.n.* (neo K, designated by Markgraf (1984) op. cit.), W Sumatra, Pariaman.

Rauvolfia sumatrana Jack var. *longifolia* Blume, Bijdr. (1826) 1034; Koord. & Valetton, Bijdr. Boomsoort. Java 1 (1894) 94. — Type: Not found.

Rauvolfia reflexa Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 3 (1852) 329; Koord. & Valetton, Bijdr. Boomsoort. Java 1 (1894) 89; Koord., Meded. Lands Plantentuin 11 (1894) 81; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 393; Koord.-Schum., Syst. Verz. 1 (1912) 175; K. Heyne, Nutt. Pl. Ned.-Ind., ed. 2 (1927) 1286; Bakh.f., Blumea 6 (1950) 386; Backer & Bakh.f., Fl. Java 2 (1965) 251; Whitmore, Malayan Forest Rec. 26 (1971) 26; Tree Fl. Malaya 2 (1973) 21; Markgr., Blumea 30 (1984) 164; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 41; Whitmore et al., Checklist Bali, Nusa Tenggara Timur (1989) 14; PROSEA 12, 1 (1999) 429. — *Cyrtosiphonia reflexa* (Teijsm. & Binn.) Miq., Fl. Ned. Ind. 2 (1857) 402. — Type: *Teijsmann s.n.* 1867 (lecto L, designated by Markgraf (1984) op. cit.), Java, Hortus Buitenzorg (= Bogor).

Cyrtosiphonia spectabilis Miq., Fl. Ned. Ind. 2 (1857) 402; Fl. Ned. Ind., Eerste Bijv. (1861) 228. — *Rauvolfia spectabilis* (Miq.) Boerl., Handl. Fl. Ned. Ind. 2 (1899) 393; Bull. Inst. Bot. Buitenzorg 5 (1900) 12; Merr., Bibliogr. Enum. Born. Pl. (1921) 500; Masam., Enum. Phan. Born. (1942) 624; Backer & Bakh.f., Fl. Java 2 (1965) 231. — Type: *Teijsmann 995* (lecto U, designated by Hendrian & Middleton (1999) op. cit.; iso BO, L), W Sumatra, Padang.

Cyrtosiphonia madurensis Teijsm. & Binn., Cat. Hort. Bot. Bogor. (1866) 125. — *Rauvolfia madurensis* (Teijsm. & Binn.) Boerl., Handl. Fl. Ned. Ind. 2 (1899) 393; Burck ex Koord.-Schum., Syst. Verz. 1 (1912) 174. — Type: *Teijsmann s.n.* (lecto BO, designated by Hendrian & Middleton (1999) op. cit.; possible iso P), E Java, Madura.

Rauvolfia samarensis Merr., Philipp. J. Sci., Bot. 4 (1900) 316; Enum. Philipp. Fl. Pl. 3 (1923) 329; Markgr., Bot. Jahrb. Syst. 61 (1927) 189; Merr., Pl. Elmer. Born. (1929) 254; Markgr., Bot. Jahrb. Syst. 61 (1927) 189; Masam., Enum. Phan. Born. (1942) 623; Blumea 30 (1984) 165; Whitmore & Tantra, Checklist Sulawesi (1989) 15; Whitmore et al., Checklist Kalimantan (1990) 26. — Type: *Merrill 5233* (lecto L, designated by Hendrian & Middleton (1999) op. cit.; iso BO, P, US), Philippines, Samar.

Rauvolfia palawanensis Elmer, Leaflet Philipp. Bot. 4 (1912) 1462. — Type: *Elmer 12591* (lecto BM, designated by Hendrian & Middleton (1999) op. cit.; iso A, BISH, G, GH, K, L, NY, P, U, US), Philippines, Palawan.

Tree (2.5–)5–20(–27) m high. *Branches* rather densely lenticellate; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 0.6–5 cm long, glabrous; blade coriaceous, elliptic to obovate, 7–28 by 2–9.3 cm, 1.5–4.8(–6) times as long as wide, apex acuminate to rounded or emarginate, base cuneate to decurrent, glabrous above and beneath; secondary veins 9–32 pairs, 0.15–1(–1.5) cm spaced, straight or slightly arcuate-ascending, forming an angle of 45–90° with the midrib, forming a submarginal vein. *Inflorescence* (2.5–)5–21.5(–27) cm long, in whorls of 3–5(–6), 26–more than 35-flowered; peduncle 1.8–14 by 0.2–0.25 cm; pedicels 0.1–1.2 cm long, glabrous. *Sepals* 1–2 by 1.4–2 mm, 0.5–1.3 times as long as wide, apex obtuse to rounded, rarely acute, glabrous. *Corolla* white, glabrous outside, villose in a belt of 1.5–2 mm wide just at the mouth, and gradually turning sparsely so downwards, 3.5–5 mm long in the mature bud and forming a broadly ovoid to subglobose head of 1–2.2 by 1.3–2 mm, usually indistinct from the tube; tube 3.4–4.9 mm long, 2.4–3.4 times as long as calyx, 1.95–3.3 times as long as lobes; lobes obliquely and broadly ovate or suborbicular, 1.3–2.1 by 1.3–2.1 mm, 0.7–1 times as long as wide, rounded, rarely retuse. *Stamens* inserted at 2.5–4.5 mm from base, 0.7–0.9 of the length of the corolla tube; filaments 0.5–0.8 mm long; anthers 0.9–1.5 by 0.25–0.7 mm, 1.6–4 times as long as wide. *Disk* cup-shaped, 1–1.8 by 0.7–1.4 mm, or 0.6–0.9 times as long as ovary, crenate. *Pistil* glabrous; ovary ovoid, syncarpous, 1–1.75 mm long; style 1.2–2.5 mm long; style head 0.6–1 mm long. *Fruit* bluish black or purplish black when mature, syncarpous, variable in shape, globose, rounded, sometimes truncate, retuse or slightly cleft at apex, rarely ovoid or ellipsoid, 6.5–21 by 7–18 mm, 0.9–1.8 times as long as wide, connate for 6–11.7 mm, 0.9–1 of its length, distance between apices 2–3 mm, glabrous. *Seeds* 1 in each endocarp, ovoid, acute, 3–9(–12) by 1–3.2 mm, 2.2–4 times as long as wide, glabrous.

Distribution — Burma, Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Sulawesi, Lesser Sunda Islands, Moluccas.

Habitat & Ecology — In relatively open areas, scrub, secondary forests, coastal forests, swamps (fresh water, seasonal or peat swamps), lowland rain forests and montane rain forests. On sandy loam, wet clay soil, red to black soil or coral-limestone hill. Mostly occurs at 0–100 m altitude but recorded to 1600 m.

Uses — The bark is reportedly used as a laxative and to treat dysentery. Also reported to be anti-malarial. The wood is light but may be used for small objects such as knife handles.

Note — Specimens from Flores tend to have a very short inflorescence, shorter than elsewhere. However, they show no significant differences in any other characters.

9. *Rauvolfia verticillata* (Lour.) Baill.

- Rauvolfia verticillata* (Lour.) Baill., Bull. Mens. Soc. Linn. Paris 1 (1888) 768; Tsiang, Sunyatsenia 2 (1934) 109; Merr., Trans. Amer. Philos. Soc. n.s. 24 (1935) 312; Monach., Econ. Bot. 8 (1954) 358; Whitmore, Tree Fl. Malaya 2 (1973) 21; Markgr., Blumea 30 (1984) 160; Whitmore & Tantra, Checklist Sumatra (1986) 20; T.C. Huang, Taiwania 31 (1986) 100; Whitmore et al., Checklist Bali, Nusa Tenggara Timor (1989) 14; Checklist Kalimantan (1990) 26; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 129; M.F. Watson, Fl. Bhutan 2 (1999) 668; PROSEA 12, 1 (1999) 431; D.J. Middleton, Fl. Thailand 7 (1999) 54; Hendrian & D.J. Middleton, Blumea 44 (1999) 464; Pradhan in Singh et al., Fl. Maharashtra State, Dicot. 2 (2001) 326; Kessler et al., Blumea, Suppl. 14 (2002) 15; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 49. — *Dissolena verticillata* Lour., Fl. Cochinch. (1790) 137. — *Cerbera chinensis* Spreng., Syst. Veg. 1 (1825) 642, nom. illeg. — Type: *Loureiro s.n.* (lecto BM, designated by Markgraf (1984) op. cit.; iso P), China, Canton.
- Tabernaemontana microcarpa* Wall., Bot. Reg. 15 (1829) t. 1273; Miq., Fl. Ned. Ind. 2 (1857) 419. — Type: Untraced.
- Ophioxylon majus* Hassk., Flora 28 (1845) 263bis (= 295); Miq., Fl. Ned. Ind. 2 (1857) 404. — *Rauvolfia major* (Hassk.) G. Nicholson, Dict. Gard. 3 (1886) 279. — Type: *Teijsmann s.n.* (lecto L, designated by Hendrian & Middleton (1999) op. cit.), W Java, Hortus Botanicus Bogoriensis.
- Hunteria sundana* Miq., Fl. Ned. Ind. 2 (1857) 409. — Type: Untraced.
- Hunteria sundana* Miq. var. *minor* Miq., Fl. Ned. Ind. 2 (1857) 409. — Type: *Horsfield s.n.* (lecto K, designated by Hendrian & Middleton (1999) op. cit.; iso BM), E Java, Pacitan.
- Ophioxylon chinensis* Hance, J. Bot. 3 (1865) 380. — *Rauvolfia chinensis* (Hance) Hemsl., J. Linn. Soc., Bot. 26 (1889) 95. — Type: *Sampson s.n.* (holo K), China, Canton.
- Rauvolfia serpentina* (L.) Benth. ex Kurz var. *gracilis* Stapf, Trans. Linn. Soc. London, Bot. 4 (1894) 207; Merr., Bibliogr. Enum. Born. Pl. (1921) 499. — Type: *Haviland 1346* (holo K), Borneo, Sabah, Kinabalu-Penokok.
- Rauvolfia perakensis* King & Gamble, Mat. Fl. Malay. Penins. 19 (1907) 424; Ridl., Fl. Malay Penins. 2 (1923) 335; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 148. — Type: *Scortechini 8410* (lecto K, designated by Hendrian & Middleton (1999) op. cit.), Malaysia, Perak.
- Rauvolfia membranacea* Merr., Philipp. J. Sci. 14 (1919) 449. — Type: *Ramos 33214* (holo PNH†; lecto K, designated by Hendrian & Middleton (1999) op. cit.; iso A, BM, BO, L, P), Philippines, Luzon, Ilocos Norte.
- Rauvolfia loheri* Merr., Philipp. J. Sci. 27 (1925) 50. — Type: *Loher 12500* (holo PNH†; lecto K, designated by Hendrian & Middleton (1999) op. cit.; iso M, UC), Philippines, Luzon, Rizal, Montalban.
- Rauvolfia yunnanensis* Tsiang, Sci. Rep. Kwangtung Coll. For. 1 (1962) 11; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 58; Lý, Feddes Repert. 97 (1986) 430. — Type: *P.Y. Ch’iu 57896* (holo KUN n.v.), China, Yunnan, His-shuang-pan-na.
- Rauvolfia latifrons* Tsiang, Sci. Rep. Kwangtung Coll. For. 1 (1962) 13; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 58; Lý, Feddes Repert. 97 (1986) 430. — Type: *Liang Nai-K’uan 3033* (not seen), China, Guangxi, Mu-Pien.
- Ervatamia ventii* Lý, Feddes Repert. 96 (1985) 30. — Type: *Quy 025* (holo HNU), Vietnam, Lang Son, Chi Lang.
- Rauvolfia serpentina* auct. non Benth. ex Kurz: Ridl., Trans. Linn. Soc. London, Bot. 3 (1893) 319.

Shrub 0.5–5 m high. *Branches* slightly lenticellate; branchlets glabrous. *Leaves* confined to the apex of the branchlets, usually in whorls of 3 or 4, sometimes also opposite; petiole 0.2–2 cm long, glabrous; blade papery, obovate to elliptic, 5–25 by 2.2–10 cm, 2–4.5(–6.5) times as long as wide, apex acuminate to cuspidate, base cuneate to slightly decurrent, glabrous above and beneath; secondary veins 6–13 pairs, 0.5–2.5 cm spaced, arcuate-ascending, rarely straight, forming an angle of (45–)55–85° with the midrib. *Inflorescence* 3–12 cm long, usually in whorls of 3 or 4, rarely solitary, lax, 8–24(–more than 35)-flowered; peduncle 3–7.7 by 0.1–0.2 cm, rather delicate,

glabrous; pedicels 0.2–1.2 cm long, glabrous. *Sepals* ovate to subtriangular, very variable in size even within a single cyme, 2–5.5 by 0.8–1 mm, 2–7 times as long as wide, apex acute to acuminate, glabrous. *Corolla* white or slightly pinkish, 11–19 mm long in the mature bud and forming an ovoid to narrowly ovoid head of 1–2 by 2–5 mm, glabrous outside, villose from just below the mouth to about 3 mm below the insertion of the stamens; tube 9–17 mm long, 2.5–8 times as long as calyx, (2–)3.5–5 times as long as lobes, straight to slightly twisted; lobes suborbicular to obliquely ovate, 2–4.5(–6.5) by 2–3.5(–6) mm, 1–1.5 times as long as wide, obtuse to rounded. *Stamens* inserted at 6–10 mm from base, 0.4–0.7 of the length of the corolla tube; filaments 0.8–1 mm long; anthers 1–1.5 by 0.3–0.6 mm, 2.2–4.3 times as long as wide. *Disk* cup-shaped, 0.8–1.4 by 0.6–1 mm, 0.4–0.6 times as long as the ovary, slightly crenate. *Pistil* mostly glabrous; ovary 1.2–2.1 mm high, consisting of 2 carpels which are free from each other; style filiform, 4–6.5 mm long; style head 0.6–1.1 mm long. *Fruit* whitish purple when mature, usually of paired mericarps free from each other, with a very short stalk, sometimes only 1 carpel developing, ovoid, sometimes rather straight on one side and convex on the other side, 9–14 by 4.5–7 mm, 1.7–2.5 times as long as wide, apex acute to obtuse. *Seeds* 1, obliquely ovoid, 7–11 by 4–5 mm, 1.7–2.5 times as long as wide, acute at both ends, glabrous.

Distribution — India, Sri Lanka, Burma, China, Thailand, Taiwan, Laos, Cambodia, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Sulawesi, Lesser Sunda Islands, Philippines.

Habitat & Ecology — In open areas, lowland and montane rain forests. Also found in dipterocarp forests and bamboo-dominated forests. On clay, black soil or limestone rock from 30–2000 m altitude.

Uses — The root is used for hypertensive illnesses and as a sedative. Fresh leaves can be used externally to treat snake bites, wounds and eye problems.

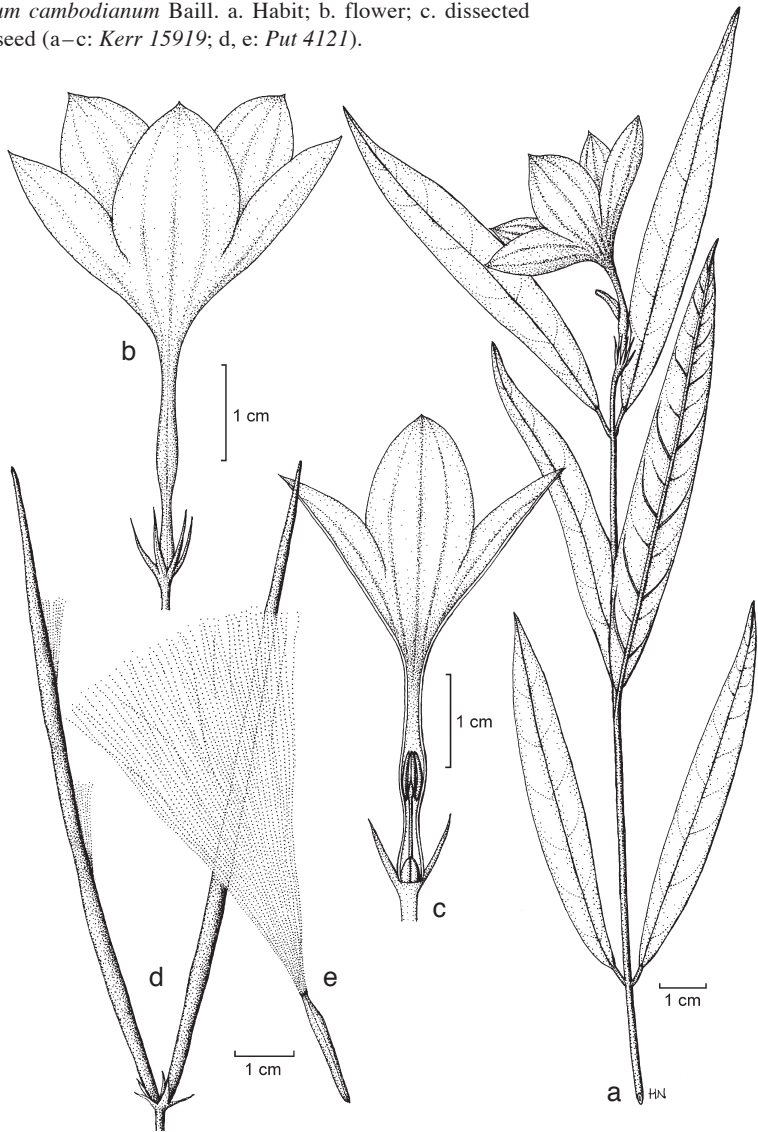
34. SPIROLOBIUM

Spirolobium Baill., Bull. Mens. Soc. Linn. Paris 1 (1889) 773, nom. cons.; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 174; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1167; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, 1 (1950) 159; M.E. Endress et al., Pl. Syst. Evol. 171 (1990) 157; D.J. Middleton, Fl. Thailand 7 (1999) 76. — Type species: *Spirolobium cambodianum* Baill.

Small shrubs. *Leaves* opposite, blades coriaceous; no glands in the axils. *Inflorescence* terminal although often appearing axillary; flowers 5-merous; solitary or in a 2- or 3-flowered cyme; bracts persistent in flower. *Sepals* long narrowly ovate. *Corolla* in mature bud club-shaped, lobes dextrorse; mature corolla infundibuliform, widening at about the middle. *Stamens* inserted on corolla tube in lower half, completely included in tube; filaments short; anthers narrowly triangular to oblong, base weakly cordate, apex acute or acuminate, fertile entire length; free from style head or only weakly adnate by short hairs on filament. *Disk* of 2 separate lobes situated between carpels. Gynoecium 2-carpellate, apocarpous but apically united into a common style; ovules numerous; style filiform; short style head. *Fruit* of paired follicles, usually held erect; long and thin; smooth. *Seeds* elliptic, without a beak; flat; bearing an apical coma.

A monotypic genus.

Fig. 90. *Spirolobium cambodianum* Baill. a. Habit; b. flower; c. dissected flower; d. fruit; e. seed (a–c: *Kerr 15919*; d, e: *Put 4121*).



***Spirolobium cambodianum* Baill.**

Spirolobium cambodianum Baill., Bull. Mens. Soc. Linn. Paris 1 (1889) 773; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1166; Kerr in Craib, Fl. Siam. 2 (1939) 451; Steenis, Bull. Jard. Bot. Buitenzorg III, 17 (1948) 408; Whitmore, Tree Fl. Malaya 2 (1973) 5; L \acute{y} , Feddes Repert. 97 (1986) 619; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 129; D.J. Middleton, Fl. Thailand 7 (1999) 76. — Type: *Godefroy in Harmand 475* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 302; iso K, P), Cambodia, Pursat.

Holarrhena pauciflora Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 132; Fl. Malay Penins. 2 (1923) 349. — Type: *Ridley 14980* (lecto K, designated by Middleton, Taxon 55 (2006) 504; iso BO, K, SING), Peninsular Malaysia, Perlis, Ginting Kabok.

Small shrub to 2 m tall. *Branchlets* sparsely puberulent, more rarely glabrous or densely puberulent. *Leaves*: blade mostly elliptic or linear, more rarely ovate or obovate, 2.7–8 by 0.3–3.3 cm, 2.2–8 times as long as wide, apex acute or acuminate, base cuneate to rounded; petiole, and often midrib, sparsely pubescent. *Inflorescence* axes pubescent. *Sepals* 2.5–6.4 mm long, 0.7–1 mm wide at base, narrower for most of length; pubescent, ciliate; often with colleters inside. *Corolla* white and pale yellow; tube 1.7–3.5 cm long, widening at 0.6–1.9 cm; sparsely pubescent to glabrous outside, pubescent below stamen insertion inside; lobes 8–15 by 10–18 mm, apex acuminate or apiculate, sparsely pubescent to almost glabrous. *Stamens* inserted at point where corolla tube widens; anthers 3.7–4 by 0.6–0.8 mm. *Ovaries* 0.9–1 mm long; style filiform, sparsely pubescent, 6–6.4 mm long. *Fruit* 8.5–19 cm by 2.2–3.5 mm. *Seeds* 4–9 by 0.8–1.4 mm; flattened; minutely pubescent on one side; coma 12–37 mm long. — **Fig. 90.**

Distribution — Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia (Langkawi, Perlis), Borneo (West Kalimantan, Anambas Islands).

Habitat & Ecology — Open grassy areas, scrub, mangrove thicket or open forests, often on sandy soil. Sea level to 300 m.

Note — This species is particularly variable in leaf shape and size. The occurrence of this species in Borneo is known only from a spirit collection in BO from West Kalimantan.

35. STROPHANTHUS

Strophanthus DC., Bull. Sci. Soc. Philom. Paris 64 (1802) 122; R.Br., Asclepiadeae (1810) 62; A.DC., Prodr. 8 (1844) 417; Benth. & Hook.f., Gen. Pl. 2 (1876) 714; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 180; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1196; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 63; Backer & Bakh.f., Fl. Java 2 (1965) 240; Beentje, Meded. Landbouwhoogeschool Wageningen 82-4 (1982) 17; D.J. Middleton, Fl. Thailand 7 (1999) 97; PROSEA 12, 2 (2001) 519; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 10. — Type species: *Strophanthus sarmentosus* DC.

Cercocoma Wall. ex G. Don, Gen. Hist. 4 (1837) 83. — Type species: *Cercocoma singaporiana* G. Don (= *Strophanthus singaporianus* (G. Don) Gilg).

For further synonymy see Beentje (1982) op. cit.

Large woody climbers, sometimes forming large shrubs with pendant branches before beginning to climb. *Branches* lenticellate; glabrous or, rarely, minutely and sparsely puberulent. *Leaves* opposite; glands in the axils, the outer two of which appear like small stipules; glabrous. *Inflorescence* a terminal cyme; bracts mostly persistent; flowers 5-merous. *Sepals* pubescent; colleters inside. *Corolla* lobes dextrorse and often forming a long twisted acumen in bud; tube widening around the middle; corona 10-lobed, inserted at the base of the lobes; lobes ovate or elongated into narrow tails; glabrous; mature corolla infundibuliform. *Stamens* completely included in the corolla tube except for long acumen on anthers, adnate to the style head; filaments short, swollen abaxially, pubescent; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base, apex drawn out into a long acumen. *Disk* absent. Gynoecium 2-carpellate, apocarpous but apically

united into a common style; ovules numerous; style glabrous; style head with basal frill, 10-lobed. *Fruit* of 2 divergent follicles, connate at the base. *Seeds* apically beaked; with a deciduous basal coma and an apical coma, flattened.

Distribution — 38 species from Africa and South and Southeast Asia eastwards to the Moluccas; in *Malesia* 5 native species.

KEY TO THE SPECIES

- 1a. Corolla lobes without a long thin terminal tail, < 15 mm long 2
 b. Corolla lobes drawn out into long thin tails, > 20 mm long 3
 2a. Leaves with 8–16 pairs of secondary veins which are straight and form an angle of 70–90° with the midrib; corolla lobes 5–10 mm long; anther acumen 4–4.3 mm long **2. *S. perakensis***
 b. Leaves with 5–9 pairs of secondary veins which are curved and form an angle of 45–65° with the midrib; corolla lobes 4–8.5 mm long; anther acumen 1.8–2 mm long **4. *S. singaporianus***
 3a. Corolla puberulous outside; anther acumen 5.5–7.5 mm long. — Lesser Sunda Islands **3. *S. puberulus***
 b. Corolla glabrous outside or puberulous only at top of tube and lobes; anther acumen 7.5–19 mm long 4
 4a. Corolla tube 9.5–19 mm long; anthers 10–16 mm long; leaves normally papery when dry, 2–12.6 cm long **5. *S. wallichii***
 b. Corolla tube 13–32 mm long; anthers 13–25 mm long; leaves papery or coriaceous when dry, (5–)8–23 cm long **1. *S. caudatus***

1. *Strophanthus caudatus* (L.) Kurz

Strophanthus caudatus (L.) Kurz, J. Asiat. Soc. Bengal 46 (1877) 257; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1199; Kerr in Craib, Fl. Siam. 2 (1939) 460; Backer & Bakh.f., Fl. Java 2 (1965) 240; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 155; Beentje, Meded. Landbouwhogeschool Wageningen 82-4 (1982) 54; Lý, Feddes Repert. 97 (1986) 636; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; P.T. Li et al., Fl. China 16 (1995) 179; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 129; D.J. Middleton, Fl. Thailand 7 (1999) 97; PROSEA 12, 2 (2001) 522; Kessler et al., Blumea, Suppl. 14 (2002) 15. — *Echites caudatus* L., Mant. Pl. 1 (1767) 52. — *Strophanthus dichotomus* DC., Bull. Sci. Soc. Philom. Paris 3 (1802) 123; Miq., Fl. Ned. Ind. 2 (1857) 441; Fl. Ned. Ind., Eerste Bijv. (1861) 556; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 16; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 468; Ridl., Fl. Malay Penins. 2 (1923) 354; Burkill & M.R. Hend., Gard. Bull. Straits Settlement. 3 (1925) 396. — Type: *Kleinhoff 23* (holo K-LINN; iso G, G-DC), Java.

Nerium scandens Lour., Fl. Cochinch. (1790) 143. — *Strophanthus scandens* (Lour.) Roem. & Schult., Syst. Veg. 4 (1819) 412; Kerr in Craib, Fl. Siam. 2 (1939) 460. — *Strophanthus dichotomus* DC. var. *loureri* A.DC., Prodr. 8 (1844) 417. — Type: *Loureiro s.n.* (holo BM), Vietnam (Cochinchina), sine loc.

Strophanthus terminalis Blume, Cat. Gew. Buitenzorg (1823) 56. — *Strophanthus caudatus* (L.) Kurz forma *undulata* Franch., Nouv. Arch. Mus. Hist. Nat. sér. 3, 5 (1893) 265. — Type: *Blume s.n.* (lecto L [898.111-371], designated by Beentje (1982) op. cit.; iso NY, P), Java.

Strophanthus cumingii A.DC., Prodr. 8 (1844) 418; Miq., Fl. Ned. Ind. 2 (1857) 442. — Type: *Cuming 1218* (lecto G, designated by Beentje (1982) op. cit.; iso L, NY, P), Philippines, Luzon, Manila.

- Strophanthus longicaudatus* Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1299; Miq., Fl. Ned. Ind. 2 (1857) 442. — Type: *Wight s.n.* (holo K), Peninsular Malaysia.
- Strophanthus griffithii* Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1300; Miq., Fl. Ned. Ind. 2 (1857) 442. — Type: *Griffith s.n.* (lecto K, designated by Beentje (1982) op. cit.; iso BM, K, P, TCD), Peninsular Malaysia.
- Strophanthus horsfieldianus* Miq., Fl. Ned. Ind. 2 (1857) 442. — Type: *Horsfield s.n.* (lecto L, designated by Beentje (1982) op. cit.; iso BM, CGE, K, U), Java.
- Strophanthus dichotomus* DC. var. *luzoniensis* D. Vidal, Sin. Gen. Pl. Leños Filip. (1883) 1181, t. 67. — Type: Illustration t. 67 in D. Vidal, Sin. Gen. Pl. Leños Filip. (1883).
- Strophanthus caudatus* (L.) Kurz var. *javanensis* Franch., Nouv. Arch. Mus. Hist. Nat. sér. 3, 5 (1893) 264. — Type: *Zollinger 1637* (lecto P, designated by Beentje (1982) op. cit.; iso BM, G, K, NY, P, W, Z), Java, Pintjong Tanduk.
- Strophanthus caudatus* (L.) Kurz var. *billardieri* Franch., Nouv. Arch. Mus. Hist. Nat. sér. 3, 5 (1893) 265. — Type: *Webb in Herb. Labillardière* (lecto P, designated by Beentje (1982) op. cit.; iso BM, G, K, P, TCD), Buton Island.
- Strophanthus caudatus* (L.) Kurz var. *macrophyllus* Franch., Nouv. Arch. Mus. Hist. Nat. sér. 3, 5 (1893) 265. — *Strophanthus macrophyllus* (Franch.) Pierre, Bull. Soc. Bot. France (1905) 491. — Type: *Balansa 2127* (lecto P, designated by Beentje (1982) op. cit.; iso P), Vietnam, between Yen Caa village and the Black River.
- Strophanthus caudatus* (L.) Kurz var. *lancoelatus* Franch., Nouv. Arch. Mus. Hist. Nat. 3, 5 (1893) 266. — Type: Untraced. Neotype: *Eberhardt 4920* (neo P, designated by Beentje (1982) op. cit.; isoneo A, NY), Vietnam, Vinh Phu, Lang Luc.
- Strophanthus pierreii* Heim, Bull. Mens. Soc. Linn. Paris 2 (1894) 1151. — *Strophanthus giganteus* Pierre, Bull. Soc. Bot. France 52 (1905) 491. — *Strophanthus caudatus* (L.) Kurz var. *giganteus* (Pierre) Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1200. — Type: *Pierre 4411* (lecto P, designated by Beentje (1982) op. cit., 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 303, 2nd step; iso A, BO, C, CAL, MO, NY, P), Vietnam, Song Be, Thudaumot.
- Strophanthus erectus* Merr., Philipp. J. Sci., Bot. 3 (1908) 261. — Type: *Merrill 695* (lecto NY, designated by Beentje (1982) op. cit.; iso K, US), Philippines, Palawan, Puerto Princesa.
- Strophanthus letei* Merr., Philipp. J. Sci. 29 (1926) 484. — Type: *Lete 263* (lecto K, designated by Beentje (1982) op. cit.), Philippines, Luzon, San Fernando.

Trailing shrub or climber to 12 m. *Branchlets* densely lenticellate. *Leaves*: petiole 3–18 mm long; blade papery to coriaceous, elliptic, obovate or ovate, 5–23 by 1.8–11.5 cm, 1.5–3.2 times as long as wide, apex acuminate to rounded or rarely emarginate, base cuneate, 6–12 pairs of veins anastomosing before margin. *Inflorescence* robust; peduncle glabrous or minutely puberulent, 2–42 cm long; pedicels 3–11 mm long; bracts ovate to ovate-linear, 2.5–4.5(–17) mm long. *Sepals* puberulent, ciliate, usually ovate, 3–19 by 1.5–6 mm, 1–6.5 times as long as wide, apex acute to acuminate. *Corolla* white with brownish purple on lobes or purplish red with white and yellow in the centre; tube 1.3–4.2 cm long, widening at 8–12 mm, glabrous or puberulous only at top of tube inside and outside; lobes 2.3–15 cm long, with long narrow tails, 2.2–4 mm wide and up to 25.5 cm long, glabrous or puberulous; corona lobes narrow triangular, 3–10 mm long. *Stamens* inserted at 0.8–2.2 cm from corolla base; anthers 13–25 by 0.8–1.6 cm long of which acumen 10–19 mm. *Ovaries* sparsely and minutely puberulent, 1.3–2.5 mm long; style and style head 10–18 mm long. *Fruit* tapering into an obtuse apex, 10–30 by 1.9–4.8 cm, lenticellate. *Seeds* 10–25 by 3–4 mm; glabrous or minutely puberulent; beak glabrous for 0.5–1.4 cm and bearing a coma for 1.8–2.3 cm, coma 5–9 cm long. — **Fig. 91.**

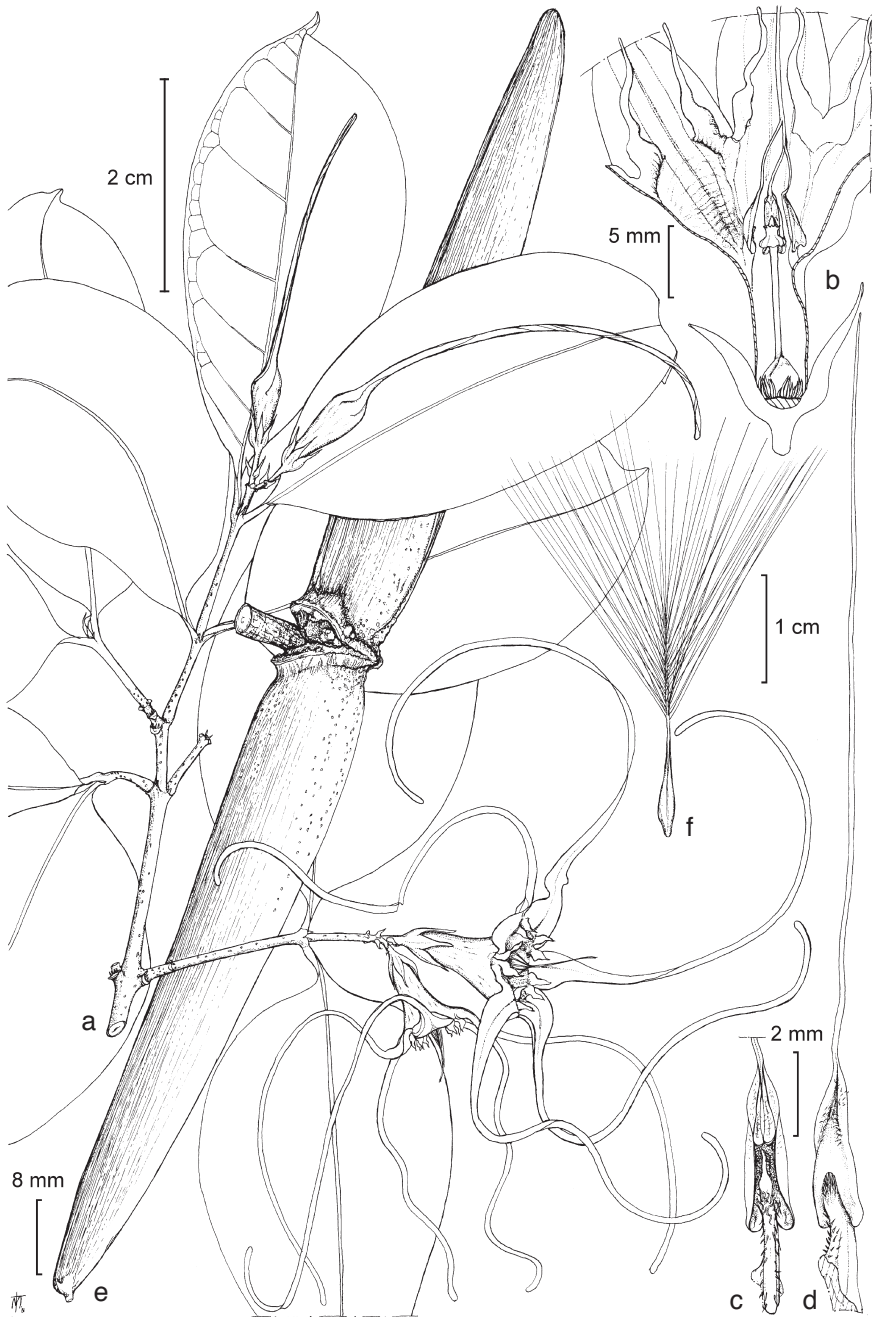


Fig. 91. *Strophanthus caudatus* (L.) Kurz. a. Flowering branches; b. section of flower; c. stamen with the acumen and part of the filament ridge removed, adaxial side; d. stamen with part of the filament ridge removed, abaxial side; e. fruit; f. seed (a: Kaudern 468; b–d: Edaño 6191; e, f: Kjellberg 2019).

Distribution — Burma, Thailand, Laos, Cambodia, Vietnam, in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines, Sulawesi, New Guinea (Papua).

Habitat & Ecology — Primary or secondary forest to 900 m.

Uses — Traditionally used as an ingredient of arrow poison. Also used locally as a heart stimulant.

2. *Strophanthus perakensis* Scort. ex King & Gamble

Strophanthus perakensis Scort. ex King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 470; Ridl., Fl. Malay Penins. 2 (1923) 355; Kerr in Craib, Fl. Siam. 2 (1939) 460; Beentje, Meded. Landbouwhoogeschool Wageningen 82-4 (1982) 119; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 129; D.J. Middleton, Fl. Thailand 7 (1999) 98. — Type: *Scortechini 1818* (lecto K, designated by Beentje (1982) op. cit.; iso CAL, NY), Peninsular Malaysia.

Strophanthus siamensis Kerr, Bull. Misc. Inform. Kew 1937 (1937) 90; in Craib, Fl. Siam. 2 (1939) 461. — Type: *Kerr 4173* (lecto K, designated by Beentje (1982) op. cit.; iso BM, BR), Thailand, Chon Buri, Sri Racha, Naung Nam Kio.

Strophanthus annamensis Tsiang, Sunyatsenia 6 (1946) 116. — Type: *Squires 901* (holo A; iso A, BM, K, M, MO, NY), Vietnam.

Strophanthus kontumensis Lý, Feddes Repert. 91 (1980) 7; 97 (1986) 633. — Type: *Tran Dinh Lý 357* (holo HN; iso HN), Vietnam, Gialai-Kontum, Dakley (Dakmon).

Slender climber reaching forest canopy, or trailing shrub. *Branchlets* densely lenticellate, more rarely sparsely so. *Leaves*: petiole 3–8 mm long; blade papery, elliptic to oblong, 2.3–12.4 by 0.6–4.1 cm, 2–4.6 times as long as wide, apex acuminate, base cuneate, glabrous, 8–16 pairs of straight secondary veins, anastomosing into a looped intramarginal vein, tertiary venation reticulate. *Inflorescence* 2.5–5 cm long, 4–24-flowered; peduncle 0.4–3 cm long; pedicels 1–2.5 mm long; bracts ovate 1.5–5 mm long, puberulent. *Sepals* 1.3–4 by 0.6–1.8 mm, 1.2–3.1 times as long as wide, ovate, apex acute, pubescent, ciliate. *Corolla* yellow, base of lobes reddish; tube 4.3–8 mm long, not drawn out into a long tail, widening at 2.5–6 mm, glabrous, 2.1–4.5 times as long as calyx; lobes ovate-linear, 5–10 by 2.2–2.7 mm, glabrous; corona lobes narrow triangular, 0.7–2 mm long. *Stamens* inserted at 3.6–4.6 mm from corolla base; anthers 4.3–6.1 by 0.7–0.9 mm of which acumen 2.5–4 mm long. *Ovaries* sparsely and minutely puberulent, 0.7–1.6 mm long; style and style head 4.1–5.1 mm. *Fruit* 9.5–11.2 by 2.1–3.5 cm, densely lenticellate, fusiform, tapering towards apex. Intact seeds not seen. — **Fig. 92.**

Distribution — Burma, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In forest to 250 m.

3. *Strophanthus puberulus* Pax

Strophanthus puberulus Pax, Bot. Jahrb. Syst. 15 (1892) 378; Beentje, Meded. Landbouwhoogeschool Wageningen 82-4 (1982) 128. — Type: *Zollinger 3416* (lecto P, designated by Beentje (1982) op. cit.; iso BM, G, L, NY), Lesser Sunda Islands, Sumbawa, between Wiera and Bima.

Climber or trailing shrub. *Branchlets* densely lenticellate. *Leaves*: petiole 3–9 mm long; blade papery, elliptic, 4–11 by 2–5 cm, 2–2.5 times as long as wide, apex obtuse



Fig. 92. *Strophanthus perakensis* Scort. ex King & Gamble. a. Flowering branches; b. opened flower; c. adaxial side of stamen (a: *Lace 3041*; b, c: *Squires 901*).

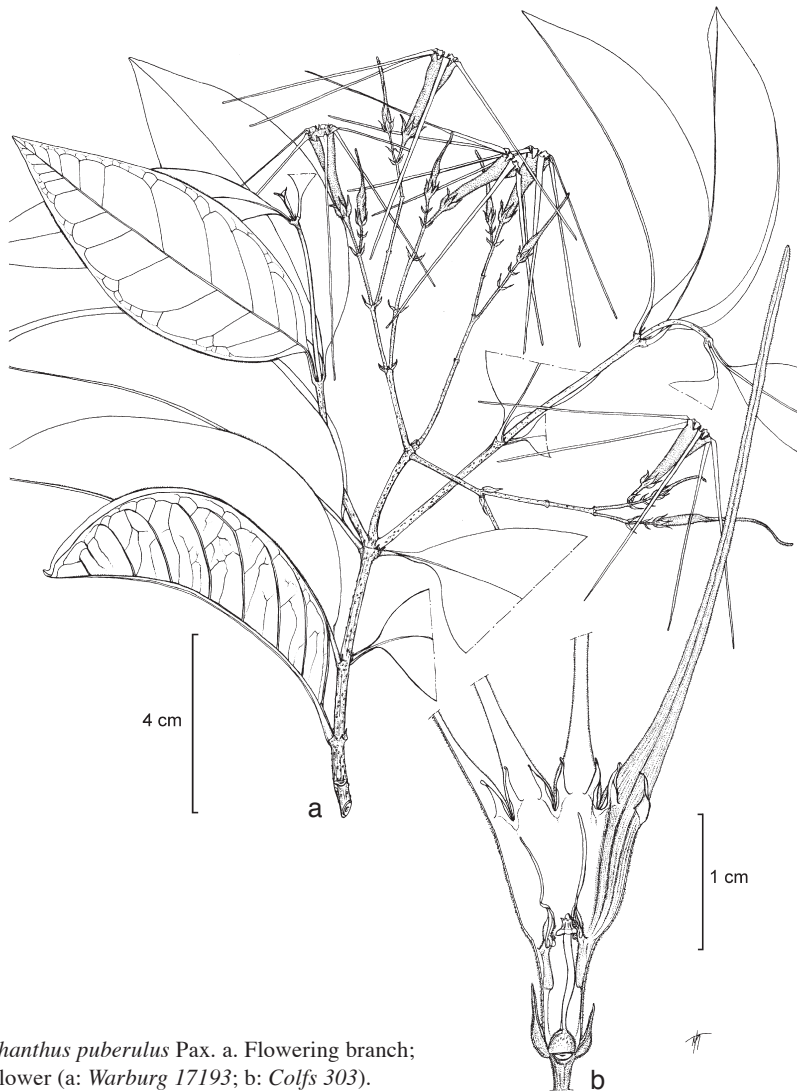


Fig. 93. *Strophanthus puberulus* Pax. a. Flowering branch; b. section of flower (a: Warburg 17193; b: Colfs 303).

to acuminate, base cuneate, 6–9 pairs of veins anastomosing before margin. *Inflorescence* 5.5–10 cm long; 6–20-flowered; peduncles absent or up to 60 cm long; pedicels 4–6 mm long; bracts linear, 2.5–8 by 1–1.5 mm. *Sepals* puberulent, 4–8 mm long. *Corolla* pink and white; tube 11–15 mm long, widening about half way, puberulous outside and inside; lobes including tails 30–58 mm long, drawn out into narrow tails, puberulous; corona lobes narrow triangular, 4–4.2 mm long. *Stamens* inserted at 8 mm from corolla base; anthers narrowly triangular, 8.5–11.5 mm long of which acumen 5.5–7.5 mm. *Ovaries* 1.2–1.7 mm high, minutely pubescent; style and style head 7–10 mm long. *Fruit* unknown. — **Fig. 93.**

Distribution — *Malesia*: Lesser Sunda Islands (Sumbawa).

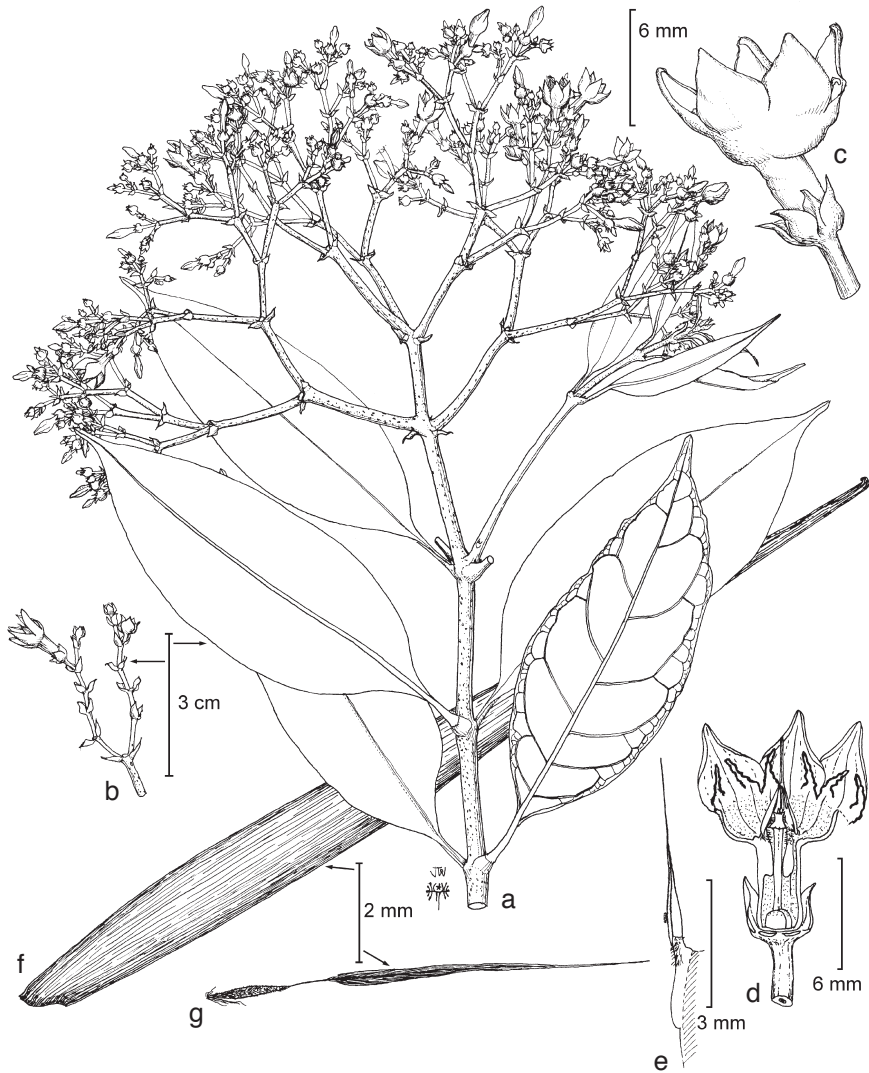


Fig. 94. *Strophanthus singaporianus* (Wall. ex G. Don) Gilg. a. Flowering branch; b. inflorescence with reduced branches; c. flower; d. section of flower; e. side view of stamen; f. follicle; g. immature seed (a: Motley 25; b: Van Niel 4637; c–e: Motley 25; f, g: Maingay 1072).

4. *Strophanthus singaporianus* (Wall. ex G. Don) Gilg

Strophanthus singaporianus (Wall. ex G. Don) Gilg in Engl., Monogr. Afrik. Pflanzen.-Fam. 7 (1903) 11; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 471; Merr., Bibliogr. Enum. Born. Pl. (1921) 502; Masam., Enum. Phan. Born. (1942) 624; Beentje, Meded. Landbouwhoogeschool Wageningen 82-4 (1982) 139; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; 47 (1997 ['1995']) 129. — *Cercocoma singaporiensis* Wall. ex G. Don, Gen. Hist. 4 (1837) 83; Miq., Fl. Ned. Ind. 2 (1857) 445. — Type: Wallich 1623 (holo K-W), Singapore.

Strophanthus brevicaudatus Wight, Icon. Pl. Ind. Orient. 4 (1848) t. 1302; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; Fl. Malay Penins. 2 (1923) 356. — Type: Collector uncertain but probably Griffith *s.n.* (lecto K, designated by Beentje (1982) op. cit.; possible iso CGE), locality uncertain but probably Peninsular Malaysia, as on the possible CGE isotype, rather than the Mergui locality suggested by Wight.

Strophanthus singaporianus (Wall. ex G. Don) Gilg var. *singaporianus* forma *hirtellus* Monach., Phytologia 3 (1951) 479. — Type: *Motley 760* (holo K), Borneo, Kalimantan, 'Bangarmassig' (probably = Banjarmasin).

Climber or trailing shrub. *Branchlets* densely lenticellate. *Leaves*: petiole 5–13 mm long; blade papery, ovate or elliptic, 3.5–13.5 by 1.2–6.2 cm, 1.7–2.8 times as long as wide, apex abruptly acuminate, base rounded to cuneate, 5–9 pairs of veins anastomosing before margin. *Inflorescence* 3.5–13 cm long, 3–80-flowered; peduncles (4–)13–38 mm long; pedicels 2–4.5 mm long; bracts ovate, 1.5–5 by 1–2 mm. *Sepals* glabrous or, rarely, slightly puberulent, ovate, 1.5–3.2 by 1.5–2.5 mm, 1.1–1.3 times as long as wide. *Corolla* yellow at the base and reddish turning purplish at the mouth outside, lobes reddish or purplish, sometimes with a yellow edge; tube 5–10 mm long, widening in upper half, glabrous outside, puberulous inside; lobes ovate, 4–8.5 mm long, apex acuminate or apiculate, glabrous; corona lobes narrow triangular, 1.8–4 mm long. *Stamens* inserted at 3.2–6.5 mm from corolla base; anthers narrowly triangular, 4.3–4.8 mm long of which acumen 1.8–2 mm. *Ovaries* 0.8–1.5 mm high, glabrous or minutely pubescent; style and style head 4–8 mm long. *Fruit* tapering to a narrow apex, 15–21 by 1.3–2.3 cm, glabrous, sparsely lenticellate or not. *Seeds*: grain 15–20 by 1.5–3 mm; pubescent; beak glabrous for 3–12 mm and bearing a coma for 15–38 mm, coma 58–70 mm long. — **Fig. 94.**

Distribution — *Malesia*: Peninsular Malaysia, Singapore, Borneo.

5. *Strophanthus wallichii* A.DC.

Strophanthus wallichii A.DC., Prodr. 8 (1844) 418; Miq., Fl. Ned. Ind. 2 (1857) 442; Hook. f., Fl. Brit. India 3 (1882) 655; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 469; Ridl., Fl. Malay Penins. 2 (1923) 355; Kerr in Craib, Fl. Siam. 2 (1939) 461; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 154; Beentje, Meded. Landbouwhoogeschool Wageningen 82-4 (1982) 151; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 54; P.T. Li et al., Fl. China 16 (1995) 179; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 129; M.F. Watson, Fl. Bhutan 2 (1999) 679; D.J. Middleton, Fl. Thailand 7 (1999) 98. — Type: *Wallich 1641* (lecto G-DC, designated by Beentje (1982) op. cit.; iso BM, C, G, K, K-W, LE, M, NY, P, W), Bangladesh, Pandua.

Strophanthus wallichii A.DC. var. *robustus* Pierre ex Gilg in Engl., Monogr. Afrik. Pflanzen-Fam. 7 (1903) 16. — *Strophanthus robustus* (Pierre ex Gilg) Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1198. — Type: *Pierre 4412* (holo B[†]; lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 303; iso P), Vietnam, Dong Nai.

Climber or trailing shrub. *Branchlets* densely lenticellate. *Leaves*: petiole 3–11 mm long; blade papery or subcoriaceous, elliptic to obovate, 2–12.6 by 1–5.5 cm, 1.4–3(–3.8) times as long as wide, apex acuminate, base cuneate or decurrent onto petiole, 4–9 pairs of veins anastomosing before margin. *Inflorescence* 6–18 cm long, 2–25-flowered; peduncles 10–54(–75) mm long; pedicels 4–11(–16) mm long; bracts linear, 4–15(–19) by 1–2 mm, pubescent. *Sepals* pubescent, ciliate, linear, 6–17.7 mm long. *Corolla* white or pale yellow with maroon or purplish parts; tube 9.5–19 mm long,

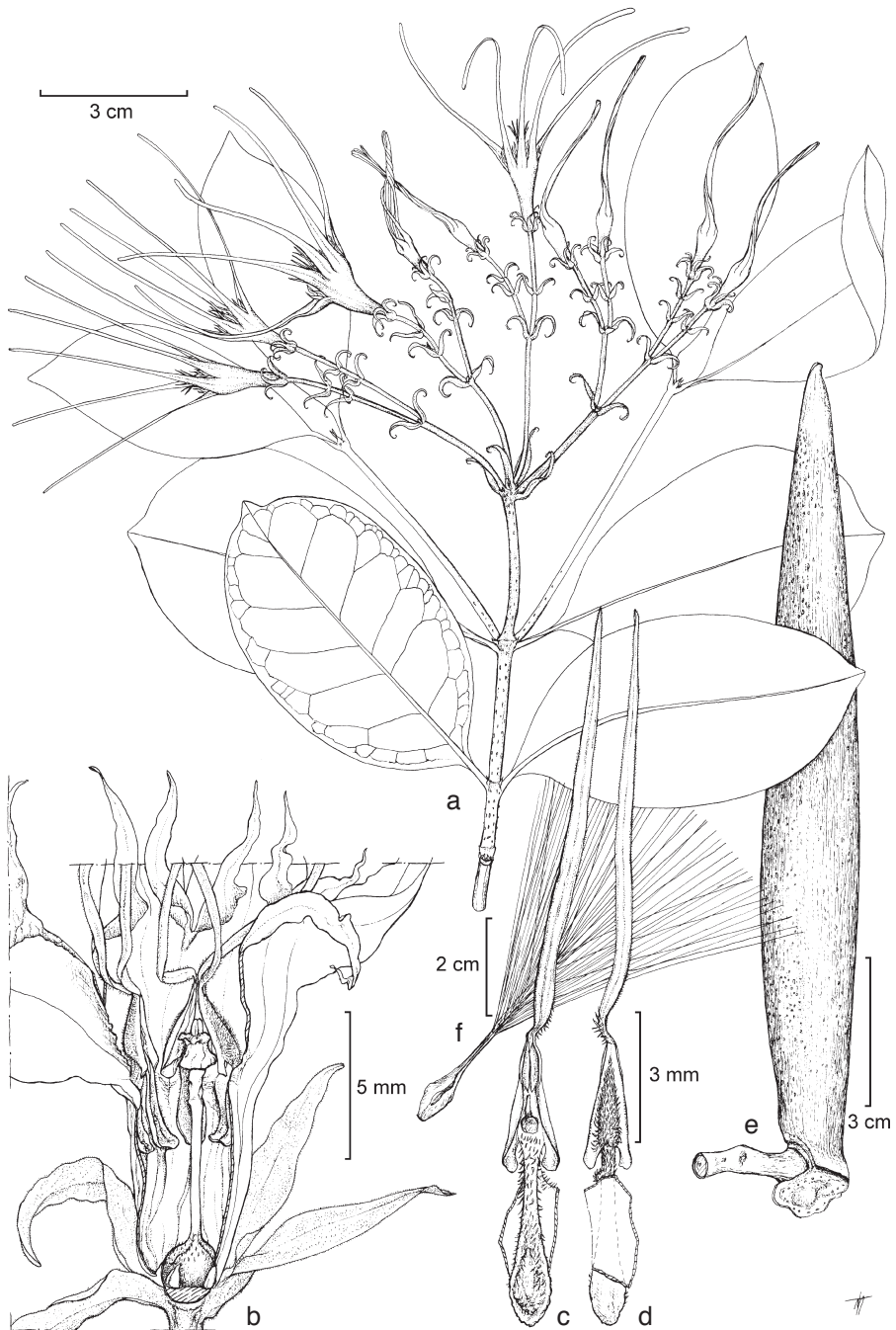


Fig. 95. *Strophanthus wallichii* A. DC. a. Flowering branch; b. opened flower; c. adaxial side of stamen; d. abaxial side of stamen; e. fruit, one follicle removed; f. seed (a: Kerr 20782; b–d: Kerr 7247; e: Cowan 424; f: Whitmore FRI.12958).

widening at 5.3–8 mm, glabrous outside, puberulous inside; lobes 2.4–9 cm long, to 6 mm wide, drawn out into narrow tails, glabrous outside and inside or puberulous inside; corona lobes narrow triangular, 2.8–6.5 mm long. *Stamens* inserted at 5–8 mm from corolla base; anthers narrowly triangular, 1–1.6 cm long of which acumen 7.5–12.5 mm. *Ovaries* 1–2.3 mm, minutely pubescent; style and style head 6.5–10 mm long. *Fruit* tapering to an obtuse apex, 11–24.5 by 2.5 cm, densely lenticellate. *Seeds* 10–18 by 3–4.3 mm; glabrous; beak glabrous for 0.8–1.5 cm and bearing a coma for 1.4–2.6 cm, coma 5.5–9 cm long. — **Fig. 95.**

Distribution — India, Bangladesh, Burma, China, Thailand, Laos, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In mixed deciduous or evergreen forest to 1500 m.

36. TABERNAEMONTANA

Tabernaemontana L., Sp. Pl. (1753) 210; R.Br., Prodr. (1810) 467; Blanco, Fl. Filip. (1837) 114; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1142; Whitmore, Tree Fl. Malaya 2 (1973) 21; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; Leeuwenb., J. Ethno-pharmacol. 10 (1984) 1; P.S. Ashton, Man. non-Dipt. Trees Sarawak 2 (1988) 41; Corner, Wayside Trees Malaya ed. 3, 1 (1988) 159; Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 1; in Baas et al., Pl. Divers. Malesia (1990) 73; Rev. *Tabernaemontana* 1 (1991) 1; 2 (1994) 213; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 54; Coode et al. (eds.), Checklist Pl. Brunei (1996) 28; D.J. Middleton in Argent et al., Man. non-Dipterocarp Trees C. Kalimantan 1 (1997) 83; Fl. Thailand 7 (1999) 27; PROSEA 12, 2 (2001) 530; Beaman et al., Pl. Mt. Kinabalu 4 (2001) 111; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 50. — Type species: *Tabernaemontana citrifolia* L.

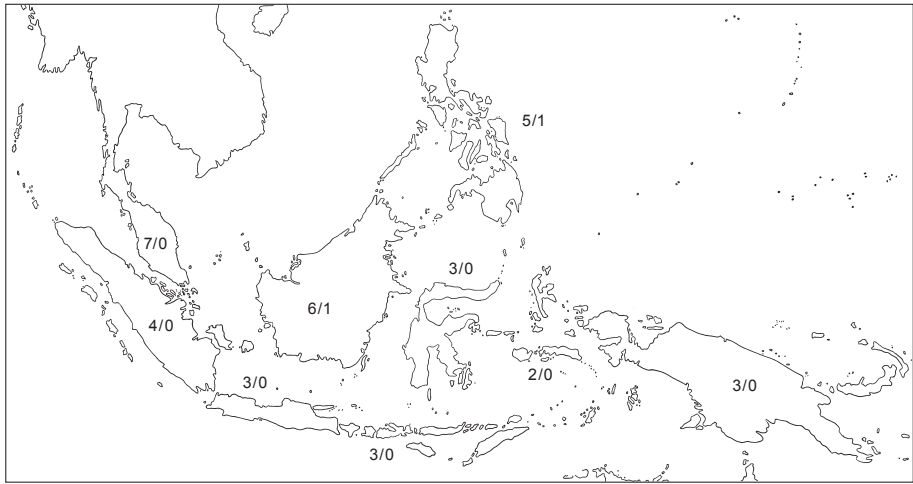
Rejoua Gaudich. in Freyc., Voy. Uranie, Bot. (1826) 451. — Type species: *Rejoua aurantiaca* (Gaudich.) Gaudich. (= *Tabernaemontana aurantiaca* Gaudich.).

Tabernaemontana L. sect. *Ervatamia* A.DC., Prodr. 8 (1844) 373. — *Ervatamia* (A.DC.) Stapf, Fl. Trop. Afr. 4, 1 (1902) 126; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 447; Ridl., Fl. Malay Penins. 2 (1923) 340; Backer & Bakh.f., Fl. Java 2 (1965) 228, Cockburn, Trees Sabah 1 (1976) 13. — Type species: *Ervatamia coronaria* (Jacq.) Stapf (= *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.).

Pagiantha Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 549. — Type species: *Pagiantha dichotoma* (Roxb. ex Wall.) Markgr.

Testudipes Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 550. — Type species: *Testudipes recurva* (Roxb. ex Lindl.) Markgr. (= *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.). See Leeuwenberg (1991) for synonymy of non-Asian genera (but see note below).

Shrubs or small trees; bark with copious white latex. *Branchlets* glabrous or sparsely pubescent. *Leaves* opposite, often a pair unequal in size, rarely in whorls of 3; distinct but small stipule-like flaps in the axils; petiolate or sessile; blade papery to coriaceous, elliptic to obovate, secondary venation arching upwards towards margins, weakly anastomosing near margin. *Inflorescence* a cyme or solitary flower, lax; 2 inflorescences at each ramification, occasionally with 1 missing; flowers 5-merous, usually fragrant. *Sepals* with or without colleters inside. *Corolla* in mature bud with a narrow tube and globose to ovoid head; corolla lobes sinistrorse (in *Malesia*) and folded inwards; mature corolla salverform. *Stamens* sessile or with short filaments; completely included in tube; anthers narrowly triangular to oblong, base cordate, apex acute, fertile entire length; free from the style head. *Disk* absent. Gynoecium 2-carpellate, apocarpous but



Map 10. Distribution of *Tabernaemontana* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

apically united into a common style; style filiform; style head short. *Fruit* of paired follicles, sometimes connate by their bases; obliquely ellipsoid to somewhat elongated; ridged or smooth, sometimes torulose. *Seeds* covered in a fleshy aril.

Distribution — Approximately 100 species throughout the Old and New World tropics; in *Malesia* 13 species. — **Map 10.**

Notes — 1. There remains some debate as to whether *Tabernaemontana* is monophyletic. In particular it is possible that the New World species of *Tabernaemontana* are more closely related to some of the genera that have not been synonymised into *Tabernaemontana* than they are to the Old World species of *Tabernaemontana* (Mary Endress, pers. com.). This may eventually lead to the genus being made larger to accommodate these other genera or to the splitting up of the genus into smaller monophyletic genera.

2. Species delimitation is rather difficult in *Tabernaemontana* and there has been some debate as to whether the broad species concepts adopted by Leeuwenberg (1991) should be followed. This is particularly true for *T. pandacaqui* which has an extremely extensive synonymy. The account here is largely adapted from Leeuwenberg (1991) rather than having been completely reworked. I have not listed all the synonyms for each species and the reader is referred back to Leeuwenberg.

KEY TO THE SPECIES

- 1a. Leaves in whorls or with occasional opposite pair **14. T. ternifolia**
- b. Leaves exclusively opposite 2
- 2a. Corolla doubled **5. T. divaricata** [cultivated]
- b. Corolla not doubled 3

- 3a. Leaves sessile, blade base subcordate **3. *T. cordata***
 b. Leaves distinctly petiolate, blade base usually not subcordate 4
 4a. Inflorescence containing empty bracts; anthers sagittate at the base
 **2. *T. aurantiaca***
 b. Inflorescence without bracts or all bracts with flowers in the axils; anthers cordate
 at the base 5
 5a. Corolla tube 4.5–5.2 mm long; inflorescences very delicate; secondary veins 6–9
 pairs **1. *T. antheonycta***
 b. Corolla tube > 7 mm long; inflorescences variable but mostly not very delicate;
 secondary veins 4–26 pairs 6
 6a. Sepals not ciliate, 3–14 mm long, leafy and often cordate, or linear but always
 narrower at the base than in the middle **12. *T. rostrata***
 b. Sepals ciliate or not, 0.9–6 mm long, not leafy or cordate, widest at the base . 7
 7a. Stamens inserted in lower half of corolla tube 8
 b. Stamens inserted around middle or in upper half of corolla tube 12
 8a. Leaves papery; cultivated **5. *T. divaricata*** [cultivated]
 b. Leaves coriaceous; native 9
 9a. Corolla tube \geq 24 mm long **11. *T. remota***
 b. Corolla tube < 24 mm long 10
 10a. Sepals not ciliate. — Peninsular Malaysia **10. *T. polyneura***
 b. Sepals ciliate. — Throughout Malesia (except New Guinea) 11
 11a. Corolla puberulent on the lobes outside **6. *T. macrocarpa***
 b. Corolla glabrous on the lobes outside **13. *T. sphaerocarpa***
 12a. Leaves thickly coriaceous; sepals 3–6 mm long **6. *T. macrocarpa***
 b. Leaves not coriaceous; sepals 0.9–4 mm long 13
 13a. Corolla lobes pubescent inside, at least in lower half, often also pubescent outside
 and at least ciliate **4. *T. corymbosa***
 b. Corolla lobes glabrous inside or pubescent only at extreme base, mostly not cili-
 ate 14
 14a. Inflorescence and flowers robust; cultivated **5. *T. divaricata*** [cultivated]
 b. Inflorescence and flowers not robust; native 15
 15a. Head of bud in mature corolla bud acuminate or acute; sepals usually not ciliate
 **8. *T. pauciflora***
 b. Head of bud in mature corolla bud rounded or obtuse; sepals ciliate or not . . 16
 16a. Corolla tube mostly glabrous inside, 3.7–11 times as long as sepals; fruit 2–40-
 seeded. — Throughout Malesia **7. *T. pandacaqui***
 b. Corolla tube pubescent inside, 8–12 times as long as sepals; fruit 1- or 2-seeded.
 — Peninsular Malaysia **9. *T. peduncularis***

1. *Tabernaemontana antheonycta* Leeuwenb.

Tabernaemontana antheonycta Leeuwenb., Rev. *Tabernaemontana* 1 (1991) 117; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 53. — Type: *Sibat ak Luang S.23639* (holo L; iso A, BO, K, KEP, SAN, SAR, SING), Borneo, Sarawak, Mt Iju, Balingian.

Shrub or small tree to 5 m tall. Bark grey, smooth; inner bark pale brown. Sapwood pale brown. *Branchlets* lenticellate, glabrous. *Leaves* opposite; petiole 2–15 mm long;

blade subcoriaceous, mostly drying yellowish, narrowly elliptic, 4–19 by 1–6 cm, 2.5–6.3 times as long as wide, base cuneate, apex acuminate, glabrous above and beneath, secondary veins 6–9 pairs, curved ascending, often somewhat obscure above, tertiary venation obscure. *Inflorescence* few-flowered, 3–15 cm long, delicate with a long thin peduncle to 6 cm long, glabrous, not densely lenticellate; pedicels 4–6 mm long. *Sepals* ovate, 1–1.2 by 0.8–1 mm, 1.1–1.2 times as long as wide, apex rounded, glabrous, ciliate, without colleters inside. *Corolla* pale yellow to white, in mature bud 6–7 mm long with small, globose head which is c. 0.25 of bud length, apex rounded; tube 4.5–5.2 mm long; lobes obliquely elliptic, 3.5–5 by 0.9–1.4 mm glabrous outside and inside. *Stamens* inserted in the upper 2/3 of corolla tube; anthers c. 1.2 by 0.4 mm. *Ovaries* glabrous, c. 1.2 mm long; style c. 0.1 mm long; style head c. 0.7 mm long. *Fruit* of paired follicles, orange, obliquely obovoid, 15–32 by 8–18 mm, with or without ridges, 1- or 2- (or 3-)seeded.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — In lowland mixed dipterocarp forest at altitudes to 250 m.

IUCN conservation category — Vulnerable due to fragmented and declining area (VU B1+2c).

Note — The name implies, and the protologue states, that the flowers in this species only open at night. Given that specimens have been seen with both closed and open flowers and with no indication at what time of the day they were collected further study is needed to clarify whether this is true.

2. *Tabernaemontana aurantiaca* Gaudich.

Tabernaemontana aurantiaca Gaudich. in Freyc., Voy. Uranie, Bot. (1826) 50; Miq., Fl. Ned. Ind. 2 (1857) 424; K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 112; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 502; Markgr., Nova Guinea 14, 2 (1926) 284; Bot. Jahrb. Syst. 61 (1927) 201; Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 3; Rev. *Tabernaemontana* 1 (1991) 119; PROSEA 12, 2 (2001) 534. — *Rejoua aurantiaca* Gaudich. in Freyc., Voy. Uranie, Bot. (1826) 451; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 503. — Type: *Gaudichaud 123* (holo P; iso G), New Guinea, Papua, Bawak (possibly = Rawak) Island.

Tabernaemontana pentasticta Scheff., Flora 52 (1869) 309. — Type: *Cult. Hort. Bogor IV A 57* (holo BO – but note caveat by Leeuwenberg (1991)), Moluccas, Aru Islands.

Tabernaemontana novoguineensis Scheff., Ann. Jard. Bot. Buitenzorg 1 (1876) 36; Markgr., Nova Guinea 14, 2 (1926) 285. — *Rejoua novoguineensis* (Scheff.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 546. — Type: *Teijsmann s.n.* (holo BO, untraced), New Guinea, Papua, Humboldt's Bay.

Tabernaemontana longepedunculata K. Schum. in K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 113; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 502. — Type: *Hollrung 723* (lecto BO, designated by Leeuwenberg (1988) op. cit), Papua New Guinea, Malu, Augusta River.

Tabernaemontana anguinea Hemsl., Bull. Misc. Inform. Kew 1895 (1895) 136. — *Tabernaemontana aurantiaca* Gaudich. forma *anguinea* (Hemsl.) Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 3. — Type: *Comins 83* (holo K), Solomon Islands, San Cristobal.

Tabernaemontana aurantiaca Gaudich. forma *piriformis* Markgr., Bot. Jahrb. Syst. 61 (1927) 202. — Type: *Peekel 740, Hollrung 550, Lauterbach 2837* (syntypes not traced).

Tree or shrub to 15 m tall, to 30 cm dbh. Bark pale grey to dark brown, inner bark white to yellowish, wood white or yellowish. *Branches* lenticellate, glabrous. *Leaves*

opposite; petiole 5–27(–45) mm long, glabrous; blade coriaceous to papery, elliptic to obovate, 5–33 by 2.4–15.5 cm, 1.5–3.6 times as long as wide, apex apiculate to shortly acuminate, base cuneate to decurrent onto petiole, glabrous above and beneath, 6–14 pairs of secondary veins, tertiary venation mostly obscure. *Inflorescence* axillary, branches with many closely spaced flowers which open successively, leaving bare branches with pedicel scars in the axils of small persistent bracts, 5.5–18.5 cm long; peduncle 2.6–10.5 cm long; pedicels 2–8 mm long, glabrous. *Sepals* suborbicular or ovate, 1.5–3 by 1.2–3 mm, 1–1.5 times as long as wide, apex rounded to obtuse, glabrous, not ciliate. *Corolla* white or slightly yellowish or greenish, throat sometimes yellowish, in mature bud 21–28 mm long with wide, ovoid head which is 0.22–0.33 of bud length, apex acute to obtuse; tube 12–24 mm long, 5–10 times as long as calyx, 0.6–1.5 times as long as lobes; lobes obliquely elliptic, 16–29 by 6–13 mm, 1.8–2.6 times as long as wide, apex rounded; glabrous outside, pubescent inside. *Stamens* inserted in the lower half of corolla tube; anthers 3.3–4.5 by 0.9–1.5 mm. *Ovaries* glabrous, 1.8–3 mm long; style 0.7–3 mm long; style head 0.9–1.6 mm long. *Fruit* elongate and curved (often question mark-shaped) to subglobose, orange to orange-red, up to 20 by 10 cm wide but hugely variable in shape and size, with or without faint ridges, 10–20-seeded.

Distribution — Western Pacific Islands, Solomon Islands; in *Malesia*: Moluccas, New Guinea.

Habitat & Ecology — In forest, mostly in seasonally flooded areas at low altitudes.

3. *Tabernaemontana cordata* Merr.

Tabernaemontana cordata Merr., Philipp. J. Sci., Bot. 7 (1912) 337; Leeuwenb., Rev. Tabernaemontana 1 (1991) 136. — *Ervatamia cordata* (Merr.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 548. — Type: *Weber 1125* (lecto G, designated by Leeuwenberg (1991) op. cit.; iso A, E, F, K, NSW), Philippines, Mindanao, Agusan del Norte, Cabadbaran.

Tree or shrub to 4.5 m tall, to 10 cm dbh. Bark yellowish. *Branches* lenticellate, glabrous. *Leaves* opposite, subsessile; blade subcoriaceous, elliptic to oblong, 3–20 by 1–7 cm, 1.7–4.6 times as long as wide, apex short acuminate, base subcordate, glabrous above and beneath, often punctate beneath, 5–12 pairs of secondary veins, ascending. *Inflorescence* axillary, dense, 2–4 cm long; peduncle 1–1.1 cm long; pedicels 4–7 mm long, glabrous. *Sepals* 1.2–1.5 by 0.8–1 mm, c. 1.5 times as long as wide, apex rounded to obtuse, glabrous, not ciliate. *Corolla* with white lobes and a yellowish tube, in mature bud 10–15 mm long with wide, subglobose head which is 0.2–0.3 of bud length, apex obtuse to rounded; tube 10–14.5 mm long, 8–12 times as long as calyx, 1.3–2 times as long as lobes; lobes 7–9 by 2–3.5 mm, 2.6–3.5 times as long as wide, apex obtuse; glabrous outside and inside. *Stamens* inserted slightly above the middle of the corolla tube; anthers 1.8–2 by 0.5–0.7 mm. *Ovaries* glabrous, 1 mm long; style 8–9.5 mm long; style head c. 1 mm long. *Fruit* obliquely ellipsoid, possibly orange, 2–3 by 1–1.5 cm, with 4 ridges on each mericarp, 5–10-seeded.

Distribution — *Malesia*: Philippines (Mindanao).

Habitat & Ecology — Understorey forest small tree or shrub at low altitude.

IUCN conservation category — Vulnerable due to habitat loss (VU A1c).

4. *Tabernaemontana corymbosa* Roxb. ex Wall.

- Tabernaemontana corymbosa* Roxb. ex Wall., Bot. Reg. 15 (1829) sub t. 1273; Miq., Fl. Ned. Ind. 2 (1857) 420; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 151; Whitmore, Tree Fl. Malaya 2 (1973) 23; Corner, Wayside Trees Malaya ed. 3, 1 (1988) 161; Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 5; Rev. Tabernaemontana 1 (1991) 138; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 54; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 129; Kochummen, Tree Fl. Pasoh Forest (1997) 152; D.J. Middleton, Fl. Thailand 7 (1999) 31; PROSEA 12, 2 (2001) 534; Beaman et al., Pl. Mt. Kinabalu 4 (2001) 111; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 53. — *Ervatamia corymbosa* (Roxb. ex Wall.) King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 448, Ridl., Fl. Malay Penins. (1923) 341; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 942. — *Pagiantha corymbosa* (Roxb. ex Wall.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 546. — Type: *Wallich 1572* (lecto K-W, designated by Leeuwenberg (1988) op. cit.; iso BM, CGE, E, K, SING), Peninsular Malaysia, Penang.
- Pseudixora sumatrana* Miq., Fl. Ned. Ind. 2 (1857) 209. — *Randia sumatrana* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 235. — *Tabernaemontana sumatrana* (Miq.) Hallier f., Bot. Jahrb. Syst. 49 (1913) 375. — Type: *Junghuhn s.n.* (holo L [908.220-1303]), Sumatra, Batak Lands, Upper Angkola.
- Tabernaemontana cymulosa* Miq., Fl. Ned. Ind. 2 (1857) 422. — Type: *Korthals 82* (lecto L, designated by Leeuwenberg (1991) op. cit.), Sumatra.
- Tabernaemontana hirta* Hook. f., Fl. Brit. India 3 (1882) 646. — *Ervatamia hirta* (Hook. f.) King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 449; Ridl., Fl. Malay Penins. (1923) 342; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 942; Whitmore, Tree Fl. Malaya 2 (1972) 23. — Type: *Maingay KD 1059* (holo K), Peninsular Malaysia.
- Ervatamia corymbosa* (Roxb. ex Wall.) King & Gamble var. *pubescens* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 449; Ridl., Fl. Malay Penins. 2 (1923) 342. — Type: *King’s Collector 4830* (lecto BM, designated by Leeuwenberg (1988) op. cit.; iso BO, K, SING), Peninsular Malaysia, Perak, Larut, Gopeng.
- Ervatamia pauciflora* Ridl., J. Straits Branch Roy. Asiat. Soc. 86 (1922) 299, non Blume (1826); Fl. Malay Penins. 2 (1923) 342. — Type: *Ridley s.n.* (lecto SING, designated by Leeuwenberg (1988) op. cit.; iso BM, K), Peninsular Malaysia, Selangor, Ginting Mts, Sempah.
- Ervatamia pauciflora* Ridl. var. *minor* Ridl., J. Straits Branch Roy. Asiat. Soc. 86 (1922) 300; Fl. Malay Penins. 2 (1923) 343. — Type: *Ridley 13033* (lecto SING, designated by Leeuwenberg (1991) op. cit.; iso K, SING), Peninsular Malaysia, Negri Sembilan, Bukit Tangga.
- Ervatamia jasminiflora* Ridl., Fl. Malay Penins. 2 (1923) 342. — Type: *Yeop in Field 836* (lecto SING, designated by Leeuwenberg (1988) op. cit.; iso K, KEP), Peninsular Malaysia, Pahang, Kwantan, Baloh Res.
- Tabernaemontana sumatrana* Merr., Contr. Arnold Arbor. 8 (1934) 139, non (Miq.) Hallier f. — Type: *Bangham & Bangham 813* (holo A; iso K, NY, SING, W), Sumatra, along road from Takigeum to Bireuen, Km 96.
- Tabernaemontana inaequifolia* Lütjeh. & Ooststr., Blumea 3 (1938) 103. — *Ervatamia inaequifolia* (Lütjeh. & Ooststr.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. — Type: *Lütjeharms 4461* (holo L; iso A, BO, K), W of Sumatra, near Bua-Bua, Enggano.
- Tabernaemontana carinata* Lütjeh. & Ooststr., Blumea 3 (1938) 104. — Type: *Lörzing 6994* (holo L; iso BO), E of Sumatra, Berhala Island.
- Tabernaemontana pubituba* Merr., Pap. Michigan Acad. Sci. 24 (1939) 87. — Type: *Rahmat si Boeea 4133* (holo MICH; iso A, K, L, NY, S), Sumatra, E Coast, Asahan Kota Pinang, Si Mandi Angin.
- For further non-Malesian synonymy see Leeuwenberg (1991) op. cit.

Tree to 12 m tall, to 20 cm dbh. Bark dark brown, shallowly fissured. *Branchlets* lenticellate, glabrous, rarely pubescent. *Leaves* opposite; petiole 3–20 mm long; blade subcoriaceous to papery, drying dark brown, elliptic to obovate, 7–37 by 2–14 cm, 2–6 times as long as wide, base cuneate, apex acuminate to caudate, glabrous or, rarely,



Fig. 96. *Tabernaemontana corymbosa* Roxb. ex Wall.
Habit.

sparsely pubescent below, secondary veins 6–16 pairs, curved ascending and weakly anastomosing before reaching the margin, tertiary venation irregularly scalariform or more or less obscure. *Inflorescence* 2–25-flowered, 5–13 cm long, glabrous to pubescent, axes lenticellate or not; pedicels 5–30 mm long. *Sepals* ovate, 2–5 by 1–2.5 mm, 1–2 times as long as wide, apex acute to rounded, ciliate, otherwise glabrous outside. *Corolla* white, in mature bud 17–38 mm long with ovoid to subglobose head which is 0.2–0.33 of bud length, apex obtuse; tube 15–31 mm long, 6–11 times as long as calyx, 1.7–2.4 times as long as lobes; lobes 9–16 by 4–10 mm, 1.8–3 times as long as wide, apex rounded; pubescent at least at base inside, usually ciliate. *Stamens* inserted in the upper half of corolla tube; anthers 2–5 by 0.5–1.5 mm. *Ovaries* glabrous or with a few hairs, 1.5–2 mm long; style 10–16 mm long; style head 1.5–2.2 mm long. *Fruit* of 2 separate follicles, red or yellow, 2–4.5 by 0.6–3 cm, with or without ridges, 5–20-seeded. *Seeds* with a red or orange aril. — **Fig. 96.**

Distribution — Southern China, Burma, Thailand, Laos, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Lesser Sunda Islands.

Habitat & Ecology — In lowland and lower montane forests at altitudes to 1500 m.

5. *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.

Tabernaemontana divaricata (L.) R.Br. ex Roem. & Schult., Syst. Veg. 4 (1819) 427; Kurz, Forest Fl. Burma 2 (1877) 174; Corner, Wayside Trees Malaya (1940) 151; Masam., Enum. Phan. Born. (1942) 624; Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 8; Rev. Tabernaemontana 1 (1991) 153; P.T. Li et al., Fl. China 16 (1995) 153; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 129; M.F. Watson, Fl. Bhutan 2 (1999) 675; D.J. Middleton, Fl. Thailand 7 (1999) 31; PROSEA 12, 2 (2001) 535; Kress et al., Checklist Pl. Myanmar (2003) 149. — *Nerium divaricatum* L., Sp. Pl. (1753) 209. — *Ervatamia divaricata* (L.) Burkill, Rec. Bot. Surv. India 10 (1925) 320; Kerr in Craib, Fl. Siam. 2 (1939) 443; Backer & Bakh.f., Fl. Java 2 (1965) 228; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 100; L y, Feddes Repert. 97 (1986) 445. — Type: *Herb. Hermann vol. 1: 7* (lecto BM, designated by Leeuwenberg, J. Ethno-pharmacol. 10 (1984) 11), cultivated Sri Lanka.

Nerium coronarium Jacq., Icon. Pl. Rar. 1 (1787) t. 52. — *Tabernaemontana coronaria* (Jacq.) Willd., Enum. Pl. (1809) 275; Miq., Fl. Ned. Ind. 2 (1857) 421; Hook.f., Fl. Brit. India 3 (1882) 646. — *Ervatamia coronaria* (Jacq.) Stapf, Fl. Trop. Afr. 4, 1 (1902) 127; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 450; Ridl., Fl. Malay Penins. 2 (1923) 342. — Type: *Jacquin s.n.* (holo W), Cult. Vienna.

Tabernaemontana siamensis Warb. ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1158. — *Ervatamia siamensis* (Warb. ex Pit.) Kerr in Craib, Fl. Siam. 2 (1939) 447. — Type: *Zimmermann 65* (lecto P, designated by Leeuwenberg (1988) op. cit.; iso BM, BO, BR, G, K, L, M, MO, S, U, US, W, WU), Thailand, Bangkok.

For further synonymy see Leeuwenberg (1991) op. cit.

Shrub or small tree to 3 m. *Branches* glabrous. *Leaves*: petiole 3–10 mm long; blade thin, elliptic, 4–15.2 by 1.7–8 cm, 2–4 times as long as wide, apex acuminate, base cuneate, glabrous above and beneath, 5–15 pairs of secondary veins, curved ascending, tertiary venation obscure. *Inflorescence* 5–18 cm long; peduncle 1.3–8 cm long, glabrous; pedicels 3–20 mm long, glabrous. *Sepals* ovate, 2–5 by 1–2.5 mm, 1.3–2.4 times as long as wide, apex mostly obtuse, more rarely acute, glabrous, sparsely ciliate or not. *Corolla* double in some cultivated plants; 21–31 mm long in mature bud with an ovoid head which is 0.23–0.41 of bud length, apex acute; tube not or slightly twisted, 14–26 mm long, 0.8–1.4 times as long as lobes, 7–10 times as long as sepals; lobes 8–26 by 7–20 mm, 1–2.4 times as long as wide, obovate, rounded; glabrous outside, pubescent inside for up to 3 mm around and below the stamen insertion. *Stamens* inserted in bottom half or around middle of corolla tube (the cultivated specimens tend to have them higher); anthers 2.6–3.3 by 0.7–0.9 mm. *Ovaries* 1.5–2 mm long; style and style head 4.3–14 mm long. *Fruit* obliquely ellipsoid, sometimes torulose, longitudinally ridged, 2.2–7 by 0.6–1.1 cm, apex acuminate, 2–10-seeded. *Seeds* obliquely ellipsoid with longitudinal grooves, 7–10 by 4–6 mm.

Distribution — North-eastern India, Nepal, Bhutan, Bangladesh, China, Burma, Thailand, Cambodia, Laos, Vietnam. Commonly cultivated and sometimes naturalised in *Malesia*.

6. *Tabernaemontana macrocarpa* Jack

Tabernaemontana macrocarpa Jack, Malayan Misc. 2, 7 (1822) 80; Miq., Fl. Ned. Ind. 2 (1857) 423; Hallier, Bot. Jahrb. Syst. 49 (1913) 374; Burkill, J. Straits Branch Roy. Asiat. Soc. 73 (1916) 258; Merr., Bibliogr. Enum. Born. Pl. (1921) 498; Masam., Enum. Phan. Born. (1942) 624; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; T.C. Huang, Taiwaniana 31 (1986) 102; P.S. Ashton,

- Man. non-Dipt. Trees Sarawak 2 (1988) 45; Leeuwenb., Rev. Tabernaemontana 1 (1991) 165; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 129; D.J. Middleton in Argent et al., Man. non-Dipterocarp Trees C. Kalimantan 1 (1997) 83; Fl. Thailand 7 (1999) 32; PROSEA 12, 2 (2001) 535; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 54. — *Pagiantha macrocarpa* (Jack) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 546. — *Ervatamia macrocarpa* (Jack) Merr., J. Arnold Arbor. 33 (1952) 246. — Type: Untraced. Neotype: *De Wilde 14396* (neo L, designated by Leeuwenberg (1991) op. cit.; iso BO, K, KEP, US, Z), Sumatra, near Bengkulu.
- Orchipeda sumatrana* Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 553. — Type: *Teijsmann 3608* (lecto L, designated by Leeuwenberg (1991) op. cit.), Sumatra, Palembang.
- Voacanga plumeriifolia* Elmer, Leaflet Philipp. Bot. 1 (1908) 333. — *Tabernaemontana plumeriifolia* (Elmer) Merr., Enum. Philipp. Fl. Pl. 3 (1923) 326. — *Ervatamia plumeriifolia* (Elmer) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 ['1948']) 220. — *Pagiantha plumeriifolia* (Elmer) Markgr., Mitt. Bot. Staatssamml. München 1 (1950) 29. — Type: *Elmer 7502* (lecto G, designated by Leeuwenberg (1991) op. cit.; iso A, BO, E, K, L, Z), Philippines, Luzon, Quezon, Lucban.
- Tabernaemontana megacarpa* Merr., Philipp. J. Sci., Bot. 6 (1909) 318. — *Pagiantha megacarpa* (Merr.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 546. — Type: *Williams 2179* (lecto NY, designated by Leeuwenberg (1991) op. cit.; iso GH, K), Philippines, Mindanao, Zamboanga, Sax River.
- Tabernaemontana sphaerocarpa* auct. non Blume: Kessler & Sidiy., Trees Balikpapan-Samarinda (1994) 54.

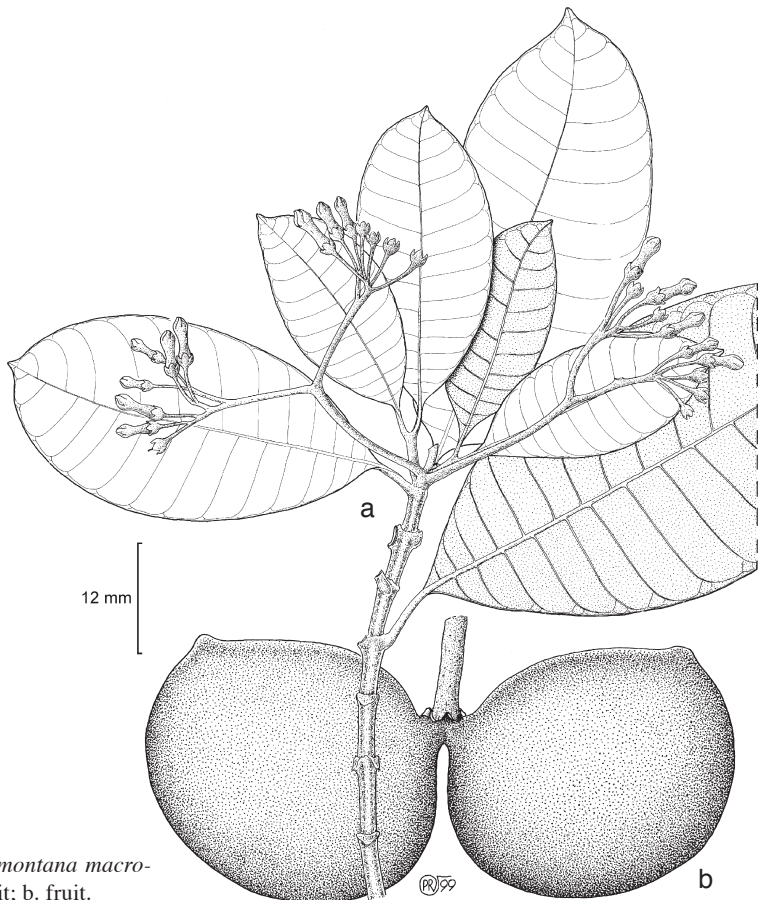


Fig. 97. *Tabernaemontana macrocarpa* Jack. a. Habit; b. fruit.

Shrub or tree to 30 m tall, to 50 cm dbh, with or without low buttresses. Bark yellowish brown, brown, grey-brown or grey, finely fissured or with corky lenticels; inner bark pale cream. Sapwood pinkish cream to white. *Branchlets* glabrous, lenticellate. *Leaves* opposite; petiole 10–40 mm long; blade mostly thickly coriaceous, elliptic, 10–41 by 1.9–22 cm, 2–6.2 times as long as wide, apex apiculate or rounded, rarely acuminate, base cuneate, glabrous above and beneath, secondary veins 9–22 pairs, more or less straight, tertiary venation mostly obscure. *Inflorescence* few- to many-flowered, 7–20 cm long, glabrous; pedicels 10–45 mm long. *Sepals* ovate or suborbicular, 3–6 by 3–5 mm, 1–1.5 times as long as wide, apex rounded, ciliate, otherwise glabrous or with a few hairs outside. *Corolla* with various combinations of cream, white and orange, in mature bud 15–31 mm long with ovoid to subglobose head which is 0.25–0.4 of bud length, apex acute to rounded; tube 10–21 mm long; lobes 14–31 by 7–15 mm, apex rounded; outside pubescent on lower half of lobes and sometimes on top of tube, inside glabrous in lower part of tube, then mostly pubescent from stamens to base of lobes. *Stamens* inserted in lower half or around middle of corolla tube; anthers 2.3–3.5 by 1–1.4 mm. *Ovaries* glabrous, 2.5–4 mm long; style 1.7–4.5 mm long; style head 0.7–2.5 mm long. *Fruit* of 2 follicles, separate or joined at base, orange, 8–16 by 5–16 cm, sometimes with faint ridges, many-seeded. *Seeds* with a red aril. — **Fig. 97.**

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

Habitat & Ecology — Common in primary and secondary lowland and lower montane forests on sandy loam soils, at altitudes to 1500 m.

7. *Tabernaemontana pandacaqui* Poir.

- Tabernaemontana pandacaqui* Poir. in Lam., Encycl. 7 (1806) 529; Tabl. Encycl. 2 (1819) 299; Miq., Fl. Ned. Ind. 2 (1857) 419; Merr., Enum. Philip. Fl. Pl. 3 (1923) 325; T.C. Huang, Taiwania 31 (1986) 101; Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 15; Rev. Tabernaemontana 1 (1991) 169; D.J. Middleton, Fl. Thailand 7 (1999) 33; PROSEA 12, 2 (2001) 535; Kessler et al., Blumea, Suppl. 14 (2002) 15; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 57. — *Pagiantha pandacaqui* (Poir.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 546. — *Ervatamia pandacaqui* (Poir.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. — Type: *Sonnerat s.n.* (lecto P-LA, designated by Leeuwenberg (1988) op. cit.; iso P), Philippines, Luzon, near Manila.
- Tabernaemontana orientalis* R.Br., Prodr. (1810) 468; K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 113; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 502; Merr., Bibliogr. Enum. Born. Pl. (1921) 499; Masam., Enum. Phan. Born. (1942) 624; Leeuwenb., J. Ethno-pharmacol. 10 (1984) 14; Kessler et al., Blumea, Suppl. 14 (2002) 15. — *Ervatamia orientalis* (R.Br.) Domin, Feddes Repert. 12 (1913) 97; Markgr., Bot. Jahrb. Syst. 61 (1927) 200; Backer & Bakh.f., Fl. Java 2 (1965) 229. — Type: *R. Brown 2858* (lecto BM, designated by Leeuwenberg (1984) op. cit.; iso K), Australia, sine loc.
- Tabernaemontana pubescens* R.Br., Prodr. (1810) 468. — *Ervatamia pubescens* (R.Br.) Domin, Feddes Repert. 12 (1913) 97; Backer & Bakh.f., Fl. Java 2 (1965) 229. — Type: *Brown 2859* (lecto BM, designated by Leeuwenberg (1984) op. cit.; iso K, MEL), Australia, sine loc.
- Tabernaemontana multiflora* Sm. in Rees, Cycl. 35 (1817) 17; Miq., Fl. Ned. Ind. 2 (1857) 420. — Type: *C. Smith* in *Herb. J.E. Smith 449.8* (holo LINN), Moluccas, Banda Island.
- Tabernaemontana indica* Lam., Tabl. Encycl. 2 (1819) 301. — Type: *Labillardière s.n.* (lecto P, designated by Leeuwenberg (1991) op. cit.), Java.
- Tabernaemontana semperflorens* Perr., Mém. Soc. Linn. Paris 3 (1824) 147. — Type: *Perrottet s.n.* (lecto G, designated by Leeuwenberg (1991) op. cit.; iso L), Philippines, Mindanao, Zamboanga.

- Tabernaemontana floribunda* Blume, Bijdr. (1826) 1028; Miq., Fl. Ned. Ind. 2 (1857) 421; J.A.R. Anderson, Checklist Trees Sarawak (1980) 149; P.S. Ashton, Man. non-Dipt. Trees Sarawak (1988) 43. — *Ervatamia floribunda* (Blume) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220; Backer & Bakh.f., Fl. Java 2 (1965) 229; Bakh.f., Blumea 6 (1950) 385. — Type: *Blume s.n.* (lecto L [925.250-252]), designated by Leeuwenberg (1984) op. cit., Java, sine loc.
- Tabernaemontana laurifolia* Blanco, Fl. Filip. (1837) 114, non L. (1753). — Type: Untraced. Neotype: *Merrill Species Blancoanae* 266 (neo L, designated by Leeuwenberg (1988) op. cit.; iso A, BM, BO, F, K, MO, NSW, NY, P, W), Philippines, Luzon, Bulacan Province, Angat.
- Tabernaemontana decaisnei* A.DC., Prodr. 8 (1844) 369; Miq., Fl. Ned. Ind. 2 (1857) 420. — *Ervatamia decaisnei* (A.DC.) Markgr., Bot. Jahrb. Syst. 61 (1927) 200. — *Tabernaemontana parviflora* Decne., Herb. Timorensis Descr. (1834) 51, non Poir. (1817) nor Roxb. (1832). — *Ervatamia parviflora* Meijer Drees, Commun. Forest Res. Inst. (1951) 33, 36. — Type: *Decaisne s.n.* (lecto P, designated by Leeuwenberg (1988) op. cit.; iso C, CGE, E, G, K, MEL, NY), Timor, sine loc.
- Tabernaemontana decaisnei* A.DC. var. *petiolata* A.DC., Prodr. 8 (1844) 369. — Type: *Decaisne s.n.* (holo G-DC), Timor, sine loc.
- Tabernaemontana cumingiana* A.DC., Prodr. 8 (1844) 373; Miq., Fl. Ned. Ind. 2 (1857) 419; Fl. Ned. Ind., Eerste Bijv. (1861) 554. — *Ervatamia cumingiana* (A.DC.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 547. — Type: *Cuming 604* (lecto G-DC, designated by Leeuwenberg (1988) op. cit.; iso A, BM, CGE, E, K, L, M, MO, NY, P, W), Philippines, Luzon, Laguna Province, Calawang.
- Tabernaemontana polygama* Blanco, Fl. Filip., ed. 2 (1845) 82. — *Ervatamia polygama* (Blanco) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 548. — Type: Untraced. Neotype: *Merrill Species Blancoanae* 243 (neo K, designated by Leeuwenberg (1988) op. cit.; iso A, BM, BO, GH, L, MO, NY, P, W, WAG), Philippines, Luzon, Rizal Province, near Mandalayon.
- Tabernaemontana laxiflora* Teijsm. & Binn., Tijdschr. Ned.-Indië 25 (1863) 403. — Type: *Teijsmann 2778* (lecto BO, designated by Leeuwenberg (1988) op. cit.; iso K), Lesser Sunda Islands, Bali, Beliling.
- Tabernaemontana riedeliana* Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 139. — Type: *Riedel 5827* (lecto U, designated by Leeuwenberg (1988) op. cit.; iso BO, L), N Celebes, Manado.
- Tabernaemontana punctulata* Warb., Bot. Jahrb. Syst. 13 (1891) 405. — *Ervatamia punctulata* (Warb.) Markgr., Nova Guinea 14, 2 (1926) 285. — *Ervatamia pubescens* (R.Br.) Domin var. *punctulata* (Warb.) Markgr., Bot. Jahrb. Syst. 61 (1927) 199. — Type: *Warburg 21327* (lecto A, designated by Leeuwenberg (1988) op. cit.; iso BM, E), Moluccas, Kai Islands.
- Tabernaemontana diclinis* Lauterb. & K. Schum. in K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 503. — Type: *Lewandowsky 11* (lecto SING, designated by Leeuwenberg (1988) op. cit.), Papua New Guinea, Stephansort.
- Tabernaemontana orientalis* R.Br. var. *grandifolia* Valetton, Bull. Dép. Agric. Indes Néerl. 10 (1907) 48. — Type: *Koch 503b* (holo BO), New Guinea, Papua, Merauke.
- Tabernaemontana caudata* Merr., Philipp. J. Sci., Bot. 4 (1909) 316. — *Ervatamia merrilliana* Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 548. — Type: *Merritt & Darling FB 14025* (lecto US, designated by Leeuwenberg (1988) op. cit.; iso NSW), Philippines, Luzon, Illocos Norte Province, Mt Bulangao.
- Tabernaemontana linearifolia* Merr., Philipp. J. Sci., Bot. 4 (1909) 317. — *Ervatamia linearifolia* (Merr.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 548. — Type: *Curran FB 10945* (lecto K, designated by Leeuwenberg (1988) op. cit.; iso US), Philippines, Luzon, Lepanto District, Mancayan.
- Tabernaemontana mucronata* Merr., Philipp. J. Sci., Bot. 4 (1909) 318. — *Ervatamia mucronata* (Merr.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 548. — Type: *Gammill FB 304* (lecto NY, designated by Leeuwenberg (1988) op. cit.; iso BM, K, US), Philippines, Guimaras Island, Nagaba.
- Tabernaemontana puberula* Merr., Philipp. J. Sci., Bot. 4 (1909) 319. — Type: *Merrill 2746* (lecto US, designated by Leeuwenberg (1988) op. cit.; iso BM), Philippines, Luzon, Rizal Province, Malapadnabato.

- Tabernaemontana biflora* Elmer, Leafl. Philipp. Bot. 4 (1912) 1463. — *Ervatamia biflora* (Elmer) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. — Type: *Elmer 10657* (lecto G, designated by Leeuwenberg (1988) op. cit.; iso A, BISH, BM, BO, E, F, HBG, K, L, MO, NY, US, W, Z), Philippines, Mindanao, Todaya, Mt Apo.
- Tabernaemontana congestiflora* Elmer, Leafl. Philipp. Bot. 4 (1912) 1464. — Type: *Elmer 12564* (lecto F, designated by Leeuwenberg (1988) op. cit.; iso A, BO, E, G, K, L, NY, P, US, W, Z), Philippines, Capiz Province, Sibuyan, Magallanes, Mt Giting-Giting.
- Tabernaemontana subglobosa* Merr., Philipp. J. Sci., Bot. 7 (1912) 242; T.C. Huang, Taiwania 31 (1986) 101. — *Pagiantha subglobosa* (Merr.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 547. — *Ervatamia subglobosa* (Merr.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. — Type: *Merrill 2511* (lecto NY, designated by Leeuwenberg (1988) op. cit.; iso GH, MO, SING, US), Philippines, Luzon, Bataan Province, Lamao River, Mt Mariveles.
- Tabernaemontana hexagona* Merr., Philipp. J. Sci., Bot. 10 (1915) 66. — *Ervatamia hexagona* (Merr.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. — Type: *Escritor BS 21241* (lecto K, designated by Leeuwenberg (1988) op. cit.; iso US), Philippines, Panay, Capiz.
- Tabernaemontana mindanaensis* Merr., Philipp. J. Sci., Bot. 10 (1915) 67. — Type: *Tarrosa & Almagro BS 14930* (holo PNH†). Neotype: *Robinson BS 11653* (neo E, designated by Leeuwenberg (1988) op. cit.; iso BO, F), Philippines, Mindanao, Cotabato Province, Craan.
- Tabernaemontana oligantha* Merr., Philipp. J. Sci., Bot. 10 (1915) 68. — *Pagiantha oligantha* (Merr.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 546. — *Ervatamia oligantha* (Merr.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. — Type: *Ramos 1621* (lecto L, designated by Leeuwenberg (1988) op. cit.; iso BM, BO, G, GH, MO, NSW, NY, P, PNH, SING, US, WAG), Philippines, Samar, Cauayan Valley.
- Tabernaemontana capsicoides* Merr., Interpr. Herb. Amboin. (1917) 428; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 149. — Type: *Robinson 76* (lecto GH, designated by Leeuwenberg (1988) op. cit.; iso BM, BO, K, NY, P), Moluccas, Ambon.
- Tabernaemontana ecarinata* Merr., Philipp. J. Sci. 14 (1919) 450. — Type: *Ramos BS 33022* (lecto K, designated by Leeuwenberg (1988) op. cit.; iso P, US), Philippines, Luzon, Ilocos Norte Province, between Bangui and Claveria.
- Tabernaemontana mindorensis* Merr., Philipp. J. Sci. 20 (1922) 434. — *Ervatamia mindorensis* (Merr.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 548. — Type: *Ramos BS 39577* (lecto NY, designated by Leeuwenberg (1988) op. cit.; iso A, BO, K), Philippines, Mindoro Occidental Province, Paluan.
- Ervatamia montensis* S. Moore, J. Bot. 61, Suppl. (1923) 32. — Type: *Forbes 478* (lecto BM, designated by Leeuwenberg (1984) op. cit.; iso A, BO, CAL, E, K, L, MEL, MO, P, US), Papua New Guinea, Sogeri Region.
- Tabernaemontana brachybotrys* Merr., Philipp. J. Sci. 29 (1926) 483. — *Ervatamia brachybotrys* (Merr.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. — Type: *Ramos BS 43257* (lecto K, designated by Leeuwenberg (1988) op. cit.; iso A, BO, G, P, UC, US), Philippines, Bohol.
- Ervatamia eriophora* Markgr., Nova Guinea 14, 2 (1926) 286; Bot. Jahrb. Syst. 61 (1927) 200. — Type: *Ledermann 8745* (holo B†). Neotype: *Gjellerup 324* (neo L, designated by Leeuwenberg (1988) op. cit.; iso BO, K), Papua New Guinea, Kaiserin Augusta River.
- Ervatamia punctulata* (Warb.) Markgr. var. *barbatocalyx* Markgr., Nova Guinea 14, 2 (1926) 286. — *Ervatamia pubescens* (R.Br.) Domin var. *barbatocalyx* (Markgr.) Markgr., Bot. Jahrb. Syst. 61 (1927) 199. — Type: *Ledermann 6756* (holo B†), Papua New Guinea. Neotype: *Koch s.n.* (neo L, designated by Leeuwenberg (1984) op. cit.), New Guinea, Papua, Merauke.
- Ervatamia punctulata* (Warb.) Markgr. var. *punctulata* subvar. *lancifolia* Markgr., Nova Guinea 14, 2 (1926) 286 (as var. *typica* subvar. *lancifolia*). — *Ervatamia pubescens* (R.Br.) Domin var. *punctulata* (Warb.) Markgr. subvar. *lancifolia* (Markgr.) Markgr., Bot. Jahrb. Syst. 61 (1927) 199. — Type: *Branderhorst 115* (lecto U, designated by Markgraf (1927) op. cit.; iso BO, L, K), New Guinea, Papua, forest near Okaba.
- Ervatamia floribunda* (Blume) Pichon var. *villosiuscula* Bakh.f. in Backer, Bekn. Fl. Java, Afl. 7, Fam. 121 (1948) 21; Backer & Bakh.f., Fl. Java 2 (1965) 229, nom. nud.

Ervatamia pubescens (R.Br.) Domin var. *glaberrima* Bakh.f., Blumea 6 (1950) 386; Backer & Bakh.f., Fl. Java 2 (1965) 229. — Type: *Hallier s.n.* (holo L), Java, cult. Bogor.
See Leeuwenberg (1991) op. cit. for further synonymy.

Shrub or small tree to 14 m tall. *Branchlets* lenticellate, occasionally sparsely pubescent. *Leaves* opposite; petiole 3–20 mm long; blade papery or subcoriaceous, elliptic or obovate, 3–14.1(–25) by 1–6.5(–10) cm, base cuneate, apex acuminate or caudate, glabrous or pubescent, lateral veins 4–14 pairs, curved ascending, weakly anastomosing near margin, frequently much paler than the blade above, tertiary venation mostly reticulate, sometimes obscure, often paler than the blade. *Inflorescence* pubescent or glabrous, 4–18 cm long, 2–many-flowered; peduncle 0.5–11 cm long; pedicels 2–20 mm long. *Flowers* weakly or not scented. *Sepals* ovate, 1–4 by 0.5–2 mm, 1–3 times as long as wide, apex rounded to acuminate, pubescent or glabrous, ciliate or not ciliate. *Corolla* white or pale yellow, in mature bud (1–)2.2–3 cm long with globose head which is 0.2–0.4 of bud length, apex rounded or obtuse; tube twisted or not, (8–)18–23 mm long, 3.7–11 times as long as sepals; lobes (6–)15–17 by 2–10 mm; glabrous outside and inside, rarely pubescent in throat, rarely pubescent at base of lobes, not ciliate. *Stamens* inserted in upper half of corolla tube; anthers 1.1–5 by 0.4–1 mm. *Ovary* 1–2.8 mm long; style and style head 1.1–1.6 mm long. *Fruit* of 2 separate follicles, orange, red or yellow, obliquely ellipsoid, 0.9–7.1 by 0.5–3 cm, apex acuminate, slightly reflexed, distinctly longitudinally ridged, glabrous or pubescent, 1–40-seeded. *Seeds* with a red or orange aril.

Distribution — Southern China, Taiwan, Thailand, northern and eastern parts of Australia, and western Pacific; in *Malesia*: Java, Borneo (Sabah), Moluccas, Philippines, Lesser Sunda Islands, New Guinea.

Habitat & Ecology — Found in a wide variety of habitats, particularly in drier areas.

Notes — 1. This is an extremely variable and widespread species that is in need of further research. P.I. Forster, Austral. Syst. Bot. 5 (1992) 521–531, has suggested that there are two widely sympatric taxa, *T. pandacaqui* and *T. orientalis*, which differ in floral morphology, leaf venation and habitat preference. Leeuwenberg (1988) op. cit., conversely, discussed why he was unable to separate the two taxa having examined specimens over a much wider range than P.I. Forster. The material is voluminous and an intensive future study should be undertaken. In the meantime I shall adopt Leeuwenberg's concept.

2. The very extensive synonymy listed above is only for those names used in *Malesia*. Leeuwenberg (1991) op. cit. has listed many more synonyms from continental Asia, Australia and the Pacific Islands.

8. *Tabernaemontana pauciflora* Blume

Tabernaemontana pauciflora Blume, Bijdr. (1826) 1028; Miq., Fl. Ned. Ind. 2 (1857) 422; Hallier, Bot. Jahrb. Syst. 49 (1913) 374; Merr., Bibliogr. Enum. Born. Pl. (1921) 499; Masam., Enum. Phan. Born. (1942) 624; Leeuwenb., Agric. Univ. Wageningen Pap. 87-5 (1988) 20; Rev. Tabernaemontana 1 (1991) 182; I.M. Turner, Gard. Bull. Singapore 45 (1993) 36; 47 (1997 ['1995']) 130; D.J. Middleton, Fl. Thailand 7 (1999) 33; PROSEA 12, 2 (2001) 536; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 58. — *Ervatamia blumeana* Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 547; Bakh.f., Blumea 6 (1950) 385; Backer & Bakh.f., Fl. Java 2 (1965) 228. — Type: *Blume 73* (lecto L [908.335-748], designated by Leeuwenberg (1988) op. cit.), Java, near Rompein.

- Tabernaemontana calycina* Wall., Bot. Reg. 15 (1829) sub t. 1273; Miq., Fl. Ned. Ind. 2 (1857) 419. — *Ervatamia calycina* (Wall.) Lace, List Trees Burma (1913) 91. — Type: *Gomez 395* in *Wallich 1577* (lecto K-W, designated by Leeuwenberg (1991) op. cit.; iso G-DC), Burma, Tavoy.
- Tabernaemontana rhynchophylla* Miq., Fl. Ned. Ind. 2 (1857) 422. — Type: *Horsfield s.n.* (lecto U, designated by Leeuwenberg (1988) op. cit.; iso BM, K), Sumatra, Bangka.
- Tabernaemontana malaccensis* Hook.f., Fl. Brit. India 3 (1882) 649; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 151; Kochummen, Tree Fl. Pasoh Forest (1997) 152. — *Ervatamia malaccensis* (Hook.f.) King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 452; Ridl., Fl. Malay Penins. 2 (1923) 343; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 942. — Type: *Maingay KD.1061* (lecto K, designated by Leeuwenberg (1988) op. cit.; iso GH, L), Peninsular Malaysia, Malacca.
- Tabernaemontana polysperma* Merr., Philipp. J. Sci. 21 (1922) 531; Masam., Enum. Phan. Born. (1942) 624. — *Ervatamia polysperma* (Merr.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. — Type: *Castillo 667* (lecto K, designated by Leeuwenberg (1988) op. cit.; iso A, L, P, PNH, US), Borneo, Sabah, Sumawang watershed.
- Ervatamia blumeana* Markgr. var. *macropetala* Bakh.f., Blumea 6 (1950) 385. — Type: *Koorders 27301* (holo L; iso BO, K), Java, Subah.
- For further non-Malesian synonymy see Leeuwenberg (1991).

Shrub or small tree to 6 m high, to 10 cm dbh. Bark pale grey to grey-brown, smooth; inner bark pale yellow. Sapwood pale yellow. *Branchlets* glabrous, with few lenticels. *Leaves* opposite; petiole 2–7 mm long; blade papery, elliptic, 3–26 by 0.6–10 cm, 2–4 times as long as wide, apex acuminate or caudate, base cuneate, glabrous, 5–20 pairs of secondary veins, curved ascending, tertiary venation obscure. *Inflorescence* 3–15-flowered, 2–16.5 cm long, glabrous to minutely puberulent; peduncle 0.5–8 cm long, glabrous or sparsely puberulent; pedicels 3–10 mm long, glabrous or sparsely puberulent. *Flowers* fragrant. *Sepals* ovate to oblong, 1.4–4 by 0.7–1.2 mm, 2–8 times as long as wide, apex acute or acuminate; not ciliate, glabrous to sparsely puberulent. *Corolla* white, in mature bud 9–24 mm long with ovoid head which is 0.2–0.5 of bud length, apex long acuminate; tube twisted or not, 11–23 mm long, 4–8 times as long as sepals; lobes 7–14 by 3–9 mm, 1.2–2.5 times as long as wide; glabrous outside, pubescent around stamen insertion inside. *Stamens* inserted in upper half of corolla tube; anthers 1.5–4 by 0.5–1 mm. *Ovaries* 0.5–2 mm long; style and style head 5.3–16 mm long. *Fruit* obliquely ellipsoid or oblong, longitudinally ridged, sometimes torulose, 2–6 by 0.7–2 cm, apex acuminate, 2–4-seeded. *Seeds* obliquely ellipsoid, 8–10 by 5–6 mm.

Distribution — Burma, Thailand, Cambodia, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java.

Habitat & Ecology — Understorey shrub or small tree.

Note — The specific limit between *T. pauciflora* and *T. rostrata* is not entirely clear. Further research may reveal that specimens with long narrow calyx lobes, which have been assigned to *T. pauciflora* by Leeuwenberg (1991) and also in this work, might have to be transferred to a more broadly defined *T. rostrata*.

9. *Tabernaemontana peduncularis* Wall.

- Tabernaemontana peduncularis* Wall., Bot. Reg. 15 (1829) sub t. 1273; Miq., Fl. Ned. Ind. 2 (1857) 421; Hook.f., Fl. Brit. India 3 (1882) 647; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 151; Leeuwenb., Rev. *Tabernaemontana* 1 (1991) 187; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 130; D.J. Middleton, Fl. Thailand 7 (1999) 34; PROSEA 12, 2 (2001) 537; Kress et al., Checklist Pl. Myanmar (2003) 149. — *Ervatamia peduncularis* (Wall.) King & Gamble, J. Asiat. Soc. Bengal

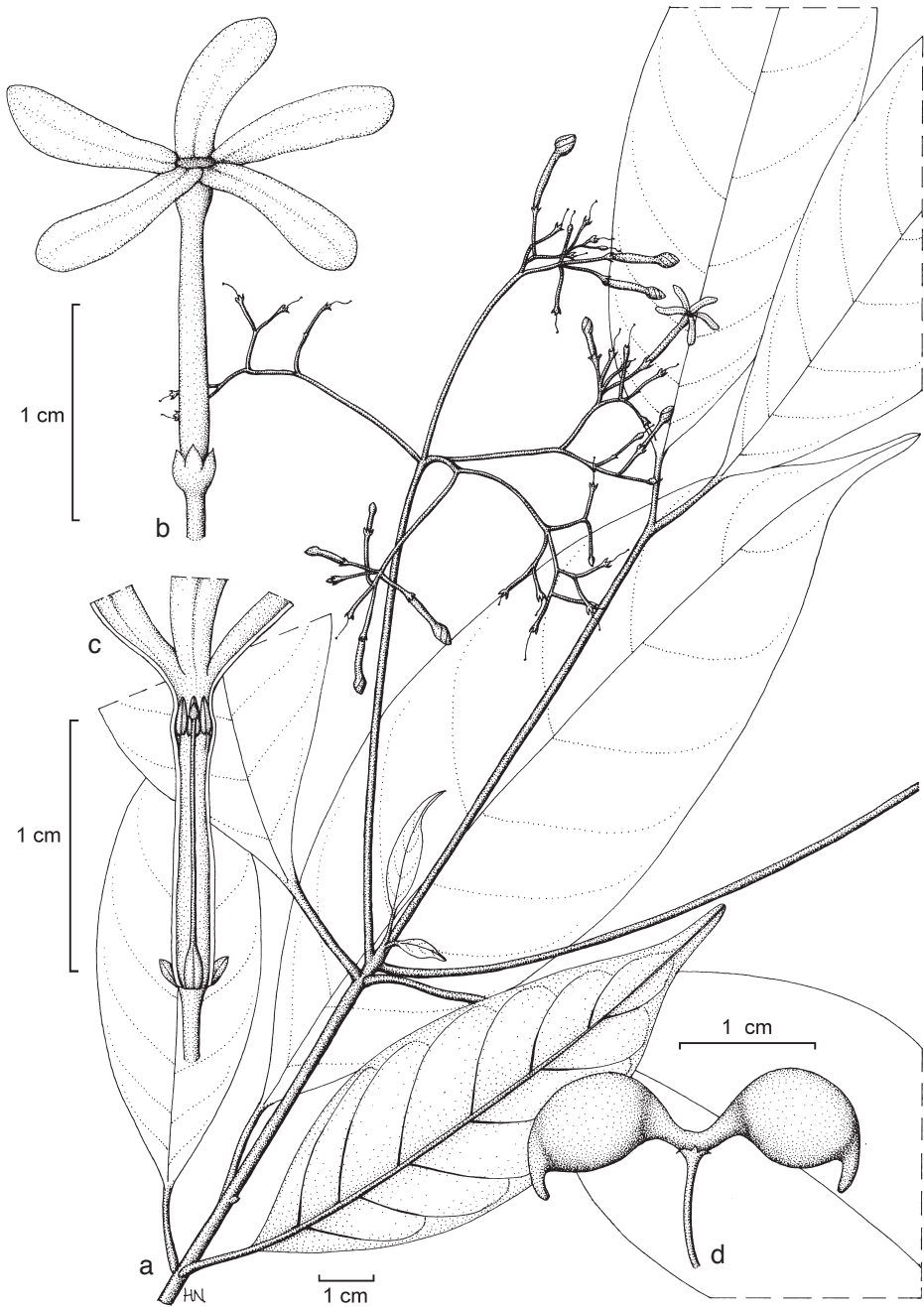


Fig. 98. *Tabernaemontana peduncularis* Wall. a. Habit; b. flower; c. dissected flower; d. fruit (a-c: Charoenphol 3578; d: Kyoto T-35963).

- 74, 2 (1907) 451; Ridl., Fl. Malay Penins. 2 (1923) 343; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 943; Kerr in Craib, Fl. Siam. 2 (1939) 446. — Type: *Wallich 1575* (lecto K-W, designated by Leeuwenberg (1991) op. cit.; iso BM, CGE, E, G, K, SING), Peninsular Malaysia, Penang.
- Tabernaemontana graciliflora* Wall., Bot. Reg. 15 (1829) sub t. 1273; Miq., Fl. Ned. Ind. 2 (1857) 418; Kurz, Forest Fl. Burma 2 (1877) 175; Hook.f., Fl. Brit. India 3 (1882) 647; Merr., Bibliogr. Enum. Born. Pl. (1921) 498; Masam., Enum. Phan. Born. (1942) 624; Kress et al., Checklist Pl. Myanmar (2003) 149. — *Ervatamia graciliflora* (Wall.) Lace, List Trees Burma (1913) 91; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 451; Kerr in Craib, Fl. Siam. 2 (1939) 444. — Type: *Wallich 1576.1b* (lecto K-W, designated by Leeuwenberg (1991) op. cit.; iso G-DC, K), Burma, Martaban.
- Ervatamia repeuensis* Pierre ex Spire, Caoutchouc Indo-Chine (1906) 141. — *Tabernaemontana repeuensis* Pierre ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1149. — Type: *Pierre 679* (lecto P, designated by Leeuwenberg (1991) op. cit.; iso A, B, BO, E, HM, NY, P, WAG), Cambodia, Koh Kong, Knang Repoen.
- Ervatamia langbianensis* Lý, Feddes Repert. 96 (1985) 181. — Type: *Khoi 95* (holo HN; iso HN), Vietnam, Lam Dong, Langbian.
- Tabernaemontana bovina* auct. non Lour.: Leeuwenb., Rev. Tabernaemontana 1 (1991) 124, p.p.

Shrub or small tree to 5 m high, to 3.5 cm dbh. *Branchlets* glabrous. *Leaves* opposite; petiole 4–15 mm long, glabrous; blade papery, elliptic to obovate, 6–33.5 by 1.8–9 cm, 2–4.5 times as long as wide, apex acuminate or caudate, base cuneate or decurrent onto petiole, glabrous above and beneath, 6–20 pairs of secondary veins. *Inflorescence* delicate, 7–25 cm long; peduncle 2.5–18 cm long, glabrous; pedicels 3–6 mm long, glabrous. *Sepals* ovate, 0.9–2 by 1–2 mm, 1–1.5 times as long as wide, apex usually obtuse, occasionally acute, glabrous, ciliate. *Corolla* in mature bud 10–29 mm long with globose head which is 0.14–0.21 of bud length, apex rounded; tube not twisted, 10–26 mm long, 8–12 times as long as sepals, 1.2–3.5 times as long as lobes; lobes 5–9 by 1.5–4 mm, 2–4 times as long as wide; glabrous outside, pubescent around stamen insertion inside. *Stamens* inserted in the upper half of the corolla tube with the anther apex just beneath the mouth; anthers 1.2–2.4 by 0.3–0.7 mm. *Ovaries* 0.5–2 mm long; style and style head 7.2–19 mm long. *Fruit* stipitate, often having a twisted appearance, 0.7–2.2 by 0.3–1.2 cm, apex caudate, usually strongly reflexed, 1- or 2-seeded. *Seeds* obliquely ellipsoid with longitudinal grooves, 8–12 by 4–8 mm. — **Fig. 98.**

Distribution — Burma, Thailand, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In scrub or forest to 1700 m.

10. *Tabernaemontana polyneura* (King & Gamble) D.J. Middleton

- Tabernaemontana polyneura* (King & Gamble) D.J. Middleton, Taxon 55 (2006) 503. — *Ervatamia polyneura* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 454; Ridl., Fl. Malay Penins. 2 (1923) 341; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 152. — Type: *Scortechini 1867* (lecto CAL n.v., designated by Leeuwenberg (1991) op. cit.; iso K), Peninsular Malaysia, Perak, Bujang Malacca (= Mt Bujang Melaka).
- Ervatamia coriacea* Ridl., J. Straits Branch Roy. Asiat. Soc. 61 (1912) 29. — Type: *Ridley 15739* (lecto SING, designated by Leeuwenberg (1988) op. cit.; iso BM, K), Peninsular Malaysia, Selangor, Sempang.
- Tabernaemontana dichotoma* auct. non Roxb. ex Wall.: Leeuwenb., Rev. Tabernaemontana 1 (1991) 149, p.p.; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 129.

Tree to 21 m tall, to 60 cm dbh. Bark brown or grey, fissured or scaly. *Leaves* opposite, ocrea large and sticky; petiole 0.7–2.7 cm long, glabrous; blade coriaceous, elliptic, 3.2–25 by 1.2–8.1 cm, 2.1–4.3 times as long as wide, apex rounded to short blunt acuminate, base cuneate, glabrous above and beneath, punctate beneath, 15–26 pairs of secondary veins almost at right angles to the midrib to weakly angled to midrib, straight, often rather obscure above. *Inflorescence* 7–11.5 cm long, glabrous; peduncle 2.5–6.6 cm long; pedicels 15–22 mm long. *Sepals* ovate, 2.8–3 by 1.6–2 mm, 1.4–1.9 times as long as wide, apex obtuse, more rarely rounded or acute, glabrous, not ciliate. *Corolla* white to yellowish green, in mature bud 20–28 mm long with ovoid head which is c. 0.4 of bud length, apex rounded to obtuse; tube 15.5–20 mm long, c. 4.6 times as long as sepals, c. 1.5 times as long as lobes; lobes 11–24 mm long; glabrous outside, usually pubescent above anthers inside. *Stamens* inserted in the lower half of the corolla tube; anthers c. 3 by 0.4 mm. *Ovaries* c. 2 mm high; style and style head c. 1.7 mm. *Fruit* oblique ellipsoid, to 37 by 14 cm, apex acuminate to obtuse.

Distribution — *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In primary or secondary forest or on mossy ridges to 1500 m altitude.

Note — Leeuwenberg (1991) synonymised *T. polyneura* from Peninsular Malaysia under *T. dichotoma* from Sri Lanka and included a number of specimens from northern Burma in the species. The status of the poor material from Burma is obscure. However, the material from Sri Lanka and Malaysia is appreciably different in the secondary venation, which is highly visible and sunken above in *T. dichotoma* and obscure or faint in *T. polyneura*. Also the Malaysian material tends to have acuminate leaf apices rather than rounded ones, the fruit is narrower and the sepals obtuse to acute rather than rounded. The flowers of the Sri Lankan material are more robust.

11. *Tabernaemontana remota* Leeuwenb.

Tabernaemontana remota Leeuwenb., Rev. *Tabernaemontana* 1 (1991) 191. — Type: *Brass* 28396 (holo L; iso A, S n.v., US), Papua New Guinea, Rossel Island, Mt Rossel.

Shrub or tree to 10 m tall, to 40 cm dbh. Bark pale brown, inner bark orange. *Leaves* opposite; petiole 5–25 mm long, glabrous, ocrea rather prominent; blade coriaceous, elliptic, 4.3–18 by 1.2–6.6 cm, 1.4–5.2 times as long as wide, apex short blunt acuminate, base cuneate or rather attenuate, glabrous above and beneath, 8–19 pairs of secondary veins, more or less straight, tertiary venation obscure. *Inflorescence* 5–22 cm long, glabrous; peduncle 1.4–12.5 cm long; pedicels 6–25 mm long; flowers robust, very fragrant. *Sepals* ovate to oblong, 3.1–5 by 2.3–4 mm, 1.1–2.2 times as long as wide, apex rounded, glabrous, not ciliate. *Corolla* white, 25–43 mm long in mature bud with a globose head which is c. 0.20–0.35 of bud length, apex rounded; tube 24–44 mm long, 7.5–13 times as long as calyx, 0.9–2 times as long as lobes; lobes 23–38 by 6–9 mm, 3–4.2 times as long as wide; glabrous inside and outside or puberulent at base of lobes inside. *Stamens* inserted in lower half of corolla tube; filaments 0.5–2.2 mm long; anthers 3.5–5 by 0.8–1.7 mm. *Ovaries* 2.7–4 mm long; style and style head 3–3.5 mm long. *Fruit* yellow or pale orange, ellipsoid, 4.2–7 by 0.8–2 by 0.8–2 cm, with prominent lateral ridges, apex acuminate.

Distribution — *Malesia*: Sulawesi, Papua New Guinea (Rossel Island).

Habitat & Ecology — On a variety of soil types, including ultrabasic, in scrub or disturbed forest at 400–700 m altitude.

IUCN conservation category — Vulnerable due to fragmented and declining area (VU B1+2c).

Note — This species shows a very unusual distribution, separated between Sulawesi and Rossel Island off SE Papua New Guinea. Further collections may lead to a reassessment of this species and a further examination of its relationship with *T. sphaerocarpa*, particularly in Sulawesi. It should be noted, however, that a similar but even wider disjunction occurs in the better known *Carruthersia pilosa* and that one cannot assume that better collections will necessarily lead to the species being dismantled.

12. *Tabernaemontana rostrata* Wall.

Tabernaemontana rostrata Wall., Bot. Reg 15 (1829) sub t. 1273; D.J. Middleton, Fl. Thailand 7 (1999) 36; PROSEA 12, 2 (2001) 537; Beaman et al., Pl. Mt. Kinabalu 4 (2001) 112; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 52. — *Ervatamia rostrata* (Wall.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 547. — Type: *Wallich 1578* (lecto K-W, designated by Leeuwenberg (1991) op. cit.; iso BM, G-DC, K), Burma, Segaing, Irawaddy River.

Ervatamia corymbosa (Roxb. ex Wall.) King & Gamble var. *kelsallii* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 449; Ridl., Fl. Malay Penins. 2 (1923) 342. — Type: *Kelsall 1992* (lecto CAL, designated by Leeuwenberg (1991) op. cit.; iso BM, SING), Peninsular Malaysia, Selangor, Bukit Etam.

Ervatamia cylindrocarpa King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 452; Ridl., Fl. Malay Penins. (1923) 344; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 942. — *Tabernaemontana cylindrocarpa* (King & Gamble) Merr., Pap. Michigan Acad. Sci. 20 (1935) 107; Corner, Wayside Trees Malaya ed. 2, 1 (1952) 151. — Type: *Wray 2806* (lecto K, designated by Leeuwenberg (1991) op. cit.), Peninsular Malaysia, Perak.

Ervatamia curtisii King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 453; Ridl., Fl. Malay Penins. (1923) 344. — Type: *Curtis 1775* (lecto CAL, designated by Leeuwenberg (1991) op. cit.; iso K), Peninsular Malaysia, Penang.

Tabernaemontana crispa auct. non Roxb.: Hook.f., Fl. Brit. India 3 (1882) 648; Leeuwenb., Rev. Tabernaemontana 1 (1991) 145; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 54; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 129.

For further synonymy see Leeuwenberg (1991) under the name *Tabernaemontana crispa*.

Shrub to 2 m tall. *Branches* sparsely lenticellate; glabrous. *Leaves* opposite; petiole 2–20 mm long, glabrous; blade thin, elliptic, 2.7–20.5 by 1–6.5 cm, 2–4 times as long as wide, apex acuminate, base cuneate, glabrous above and beneath, 4–16 pairs of secondary veins, arcuate ascending, tertiary venation obscure. *Inflorescence* 2.5–18 cm long, glabrous; peduncle 1–3 cm long; pedicels 5–25 mm long. *Sepals* often leafy, often quite variable in size even within a single flower, mostly narrower at the base than at the middle, 3–14 by 1.3–4 mm, 2–7.7 times as long as wide, apex obtuse or rounded, not ciliate. *Corolla* with an ovoid bud head which is 0.2–0.4 of bud length, apex acute; tube 7.7–22 by 1.5–1.9 mm, 2.1–3.2 times as long as calyx, 1.8–1.9 times as long as lobes, twisted or not; lobes 6.5–20 by 2.8–8 mm, 2.3–4 times as long as wide; glabrous outside and inside or pubescent around stamen insertion. *Stamens* inserted around the middle or upper half of corolla tube; anthers 2–3 by 0.5–0.8 mm. *Ovaries* 1 mm long;

style and style head 5–12.5 mm long. *Fruit* shortly stipitate, 3.8–5 by 0.8–2.3 cm, apex acuminate, sometimes torulose, several-seeded. *Seeds* ovoid, 7 by 4.5 mm.

Distribution — India (Andaman and Nicobar Islands), Burma, Thailand, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Philippines.

Habitat & Ecology — In scrub or forest at altitudes to 1400 m.

Note — See discussion under *T. pauciflora*.

13. *Tabernaemontana sphaerocarpa* Blume

Tabernaemontana sphaerocarpa Blume, Bijdr. (1826) 1028; Miq., Fl. Ned. Ind. 2 (1857) 423; Hochr., Candollea 5 (1934) 177; Backer & Bakh.f., Fl. Java 2 (1965) 228; Leeuwenb., Rev. Tabernaemontana 1 (1991) 196; PROSEA 12, 2 (2001) 538. — *Pagiantha sphaerocarpa* (Blume) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 546. — *Ervatamia sphaerocarpa* (Blume) Burkill, Bull. Misc. Inform. Kew 1935 (1935) 317; Bakh.f., Blumea 6 (1950) 385; Backer & Bakh.f., Fl. Java 2 (1965) 228. — Type: *Blume 1569* (lecto L, designated by Leeuwenberg (1991) op. cit.; iso BO, MO), Java, near Linga Jattie.

Tabernaemontana fagraeoides Miq., Fl. Ned. Ind. 2 (1857) 420. — *Pagiantha fagraeoides* (Miq.) Markgr., Mitt. Bot. Staatssamml. München 1 (1950) 29. — Type: *Horsfield s.n.* (lecto BM, designated by Leeuwenberg (1991) op. cit.; iso K, U), Java, Surakarta.

Tabernaemontana javanica Miq., Fl. Ned. Ind. 2 (1857) 422. — Type: *Horsfield 1265* (lecto BM, designated by Leeuwenberg (1991) op. cit.; iso K, U), Java, Pacitan.

Tree to 20 m high, to 40 cm dbh. Bark smooth or shallowly fissured, dark brown, lenticellate. *Leaves* in a pair equal or unequal; petiole 5–45 mm long, glabrous; blade coriaceous, elliptic, 8–32 by 2.5–13.5 cm, 2–4 times as long as wide, apex rounded to shortly acuminate or apiculate, base cuneate, glabrous above and beneath, 5–16 pairs of secondary veins, rather straight, tertiary venation obscure. *Inflorescence* 5–20 cm long, lax, glabrous; peduncle 1–15 cm long; pedicels 3–15 cm long. *Sepals* ovate to suborbicular, 2–4 by 2–4 mm, 0.8–1.5 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* white, sometimes with a greenish tube, with a globose to ovoid bud head which is 0.15–0.35 of bud length, apex rounded; tube 15–19 by 2–4 mm, 4–6.1 times as long as calyx, 0.9–1.2 times as long as lobes, glabrous outside; lobes falcate elliptic, 15–21 by 5–8 mm, 2–4.2 times as long as wide, apex rounded; ciliate on lobes, puberulent or glabrous inside. *Stamens* inserted in the lower half of the corolla tube; anthers 2.5–3.5 by 0.6–1.2 mm. *Ovaries* 2–3 mm high; style and style head 3–8 mm long. *Fruit* obliquely ellipsoid to subglobose, 40–55 by 35–45 cm, apex mostly rounded, rarely to acuminate. *Seeds* 10–12 by 5–6 by 4–5 mm.

Distribution — *Malesia*: Java, Sulawesi, Moluccas, Lesser Sunda Islands.

Habitat & Ecology — Forest or scrub to 1200 m altitude.

14. *Tabernaemontana ternifolia* D.J. Middleton

Tabernaemontana ternifolia D.J. Middleton, Harvard Pap. Bot. 9 (2005) 387. — Type: *Ridsdale SMHI 215* (holo L; iso PNH), Philippines, Palawan, Puerto Princesa municipality, Mt Beaufort, west spur, 815 m altitude.

Shrub c. 2 m tall, with copious white latex. *Leaves* in whorls of 3, with occasional opposite pairs on the same plant; petiole 7–11 mm long, glabrous; blade 5.5–13.2 by 1.7–4 cm, 2–3.6 times as long as wide, elliptic, apex obtuse to shortly acuminate with

a blunt tip, base cuneate, glabrous above and beneath, 10–16 pairs of secondary veins, at c. 90° from midrib, mostly fairly obscure, tertiary venation obscure. *Inflorescence* (immature) glabrous, few-flowered. *Sepals* ovate, apex rounded, glabrous, ciliate, with a wide row of colleters inside at base. *Corolla* (immature) white, fragrant, bud head rounded and minutely papillose pubescent, tube minutely pubescent in upper half inside. *Stamens* inserted in lower part of corolla tube. *Fruit* unknown.

Distribution — *Malesia*: Philippines (Palawan).

Habitat & Ecology — Found in stunted montane rain forest and open disturbed areas at 815–1500 m altitude.

Note — This species is only known with immature flowers. It is probably related to *T. macrocarpa* but is instantly distinguishable on the leaf arrangement. Further collecting might lead to a reassessment of its relationships.

37. TRACHELOSPERMUM

Trachelospermum Lem., Jard. Fleur. 1 (1851) t. 61, nom. cons.; Benth. & Hook.f., Gen. Pl. 2 (1876) 720; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 173; C.K. Schneid. in Sarg., Pl. Wilson. 3 (1916) 332; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1243; Woodson, Sunyatsenia 3 (1936) 65; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 190; Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 30; Backer & Bakh.f., Fl. Java 2 (1965) 234; Zijlstra et al., Taxon 47 (1998) 163; D.J. Middleton, Fl. Thailand 7 (1999) 110. — Type species: *Trachelospermum jasminoides* (Lindl.) Lem.

Dendrocharis Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 194. — Type species: *Dendrocharis inflata* (Blume) Miq. (= *Trachelospermum inflatum* (Blume) Pierre ex Pichon).

Microchonea Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 31. — Type species: *Microchonea lucida* Pierre (= *Trachelospermum asiaticum* (Siebold & Zucc.) Nakai).

Woody climbers. *Leaves* opposite, those of a pair equal; interpetiolar line with row of glands; secondary veins anastomosing before margin. *Inflorescence* a terminal and/or axillary cyme; bracts small; flowers 5-merous. *Sepals* with a row of colleters inside. *Corolla* in bud a narrow tube, bulging around the anthers, and an ovate head, lobes dextrorse, salverform when open; lobes falcate, obovate or oblong. *Stamens* subsessile, inserted below or above middle of tube, adnate at middle of anther to apex of style head and again at base of anther to base of style head; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* of 5 separate lobes; glabrous. Gynoecium 2-carpellate, apocarpous but apically united into a common style; ovules numerous; style filiform; style head small, base cup-shaped, apex pointed, no basal collar. *Fruit* of paired follicles; fusiform or linear. *Seeds* consisting of a linear seed and apical coma directed towards apex of fruit; glabrous.

Distribution — 6–10 species from India and Japan to western *Malesia*; in *Malesia* 3 species.

Notes — 1. There are considerably more names published in this genus than recognisable species but the patterns of variation have not been adequately studied. Most of these names pertain to taxa in Japan and China. The synonyms given for the taxa below are not intended to be exhaustive and I have included only those for which I have

had ready access to the type material and could confirm their status. A more thorough synonymy must await a comprehensive revision of the genus.

2. Recent research has confirmed that the North American *Trachelospermum difforme* is not closely related to the Asian taxa and should be treated in the genus *Thrysanthella*.

KEY TO THE SPECIES

- 1a. Corolla throat glabrous or with only 5 small patches of hair 2
 b. Corolla throat continuously and densely pubescent **2. T. inflatum**
 2a. Stamens inserted at top of corolla tube with anthers slightly exserted; corolla throat glabrous or with the tops of the 5 patches of hairs behind the stamens just visible **1. T. asiaticum**
 b. Stamens inserted in lower half or around middle of corolla tube, anthers not exserted from corolla tube; corolla throat glabrous **3. T. vanoverberghii**

1. *Trachelospermum asiaticum* (Siebold & Zucc.) Nakai

Trachelospermum asiaticum (Siebold & Zucc.) Nakai in T. Mori, Enum. Pl. Corea (1922) 293; Woodson, Sunyatsenia 3 (1936) 88; Ohwi, Fl. Jap. (1965) 744; T.C. Huang, Taiwania 31 (1986) 103; P.T. Li et al., Fl. China 16 (1995) 167; D.J. Middleton, Fl. Thailand 7 (1999) 111. — *Malouetia asiatica* Siebold & Zucc., Abh. Akad. München 4 (1846) 163. — Type: *Siebold s.n.* (lecto L [898.112-154], designated by Middleton, Taxon 55 (2006) 505), Japan.

Parechites borneanus Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 193; Fl. Ned. Ind. 2 (1857) 456. — *Trachelospermum borneanum* (Miq.) Boerl., Handl. Fl. Ned. Ind. 2 (1899) 400; Merr., Bibliogr. Enum. Born. Pl. (1921) 501; Masam., Enum. Phan. Born. (1942) 624. — Type: *Korthals s.n.* (holo U), Borneo, sine loc.

Trachelospermum gracilipes Hook.f., Fl. Brit. India 3 (1882) 668; C.K. Schneid. in Sarg., Pl. Wilson. 3 (1916) 339; Woodson, Sunyatsenia 3 (1936) 91; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 210; T.C. Huang, Taiwania 31 (1986) 105; Lý, Feddes Repert. 97 (1986) 638. — Type: *Lobb s.n.* (lecto K, designated by Middleton, Taxon 55 (2006) 505), India, Khasia Mts.

Microchonea lucida Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 31. — *Trachelospermum bessonii* Pierre ex Pit. in Lecomte, Fl. Indo-Chine 2 (1933) 1244; Lý, Feddes Repert. 97 (1986) 638. — Type: *Pierre 4467* (lecto P, designated by Lý (1986) op. cit., 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 300, 2nd step; iso P), Vietnam Khanh Hoa, Bao Chanh.

Trachelospermum crocostomum Stapf, Bull. Misc. Inform. Kew 1906 (1906) 74. — Type: *Unknown Collector s.n.* (*Hort. Kew July 1890*) (holo K).

Trachelospermum siamense Craib, Kew. Bull. 1911 (1911) 414; C.K. Schneid. in Sarg., Pl. Wilson. 3 (1916) 339; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1246; Woodson, Sunyatsenia 3 (1936) 90; Kerr in Craib, Fl. Siam. 2 (1939) 474. — Type: *Kerr 1133* (lecto K, designated by Middleton, Taxon 55 (2006) 505; iso K), Thailand, Chiang Mai, Doi Sutep.

Trachelospermum divaricatum Kanitz var. *brevisepalum* C.K. Schneid. in Sarg., Pl. Wilson. 3 (1916) 338. — Type: *Faurie 249* (holo A), Taiwan.

Trachelospermum gracilipes Hook.f. var. *hupehense* Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 390. — Type: *Wilson 2341* (holo A; iso K), China, Western Hupeh.

Large woody climber. *Branchlets* glabrous to densely puberulent; sparsely lenticellate. *Leaves*: petiole 5–14 mm long, glabrous to puberulent; blade coriaceous, 2.1–13 by 1–6.3 cm, 1.5–4 times as long as wide, elliptic to obovate, apex rounded to shortly and bluntly acuminate, base cuneate, glabrous above, very sparsely puberulent to

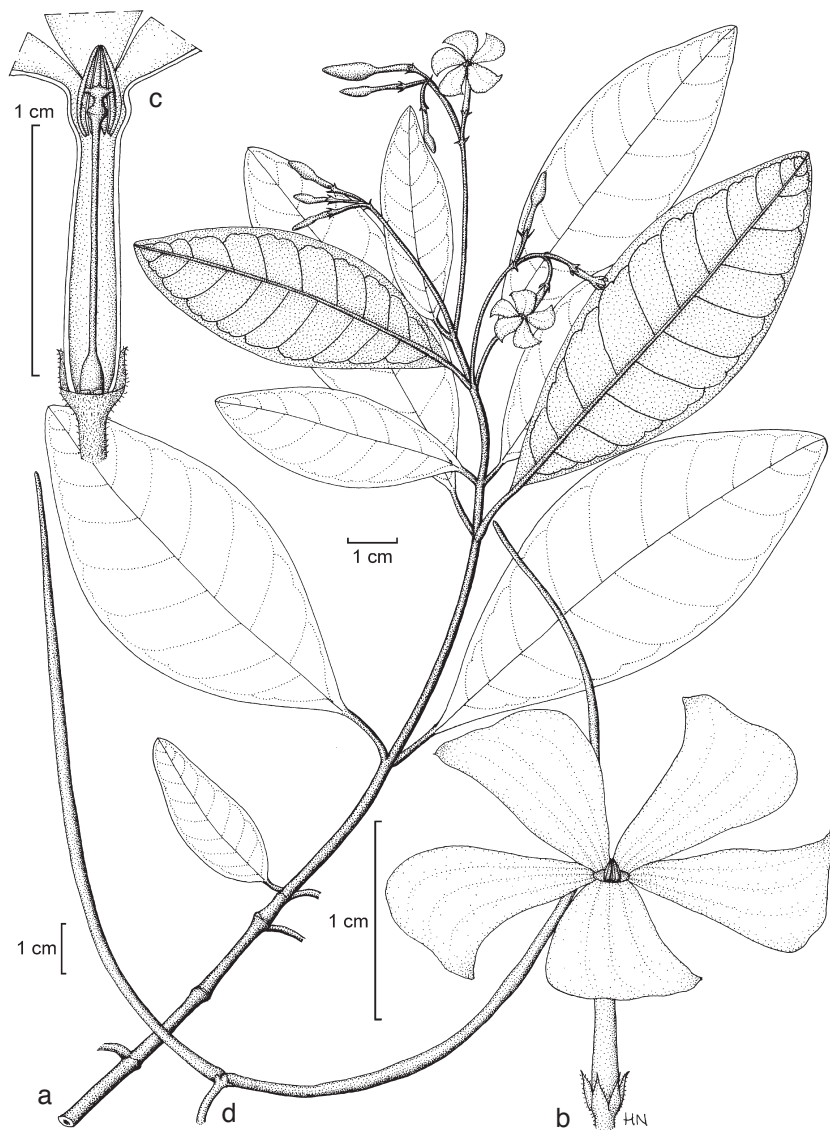


Fig. 99. *Trachelospermum asiaticum* (Siebold & Zucc.) Nakai. a. Habit; b. flower; c. dissected flower; d. fruit (a, d: Chevivat & Nimanong 6; b, c: Maxwell 76-251).

glabrous beneath, 6–14 pairs of secondary veins, ascending, anastomosing into a lopped intramarginal vein, tertiary venation reticulate, mostly prominent above and beneath. *Inflorescence* of terminal and axillary cymes, 3–13 cm long; peduncle 2.3–6.5 cm long, glabrous or sparsely puberulent; pedicels 2.7–16 mm long, glabrous to sparsely puberulent. *Sepals* 1–2 by 0.7–1.8 mm, 1.2–2 times as long as wide, ovate, apex acuminate to obtuse, glabrous, ciliate. *Corolla* white or greenish white; tube 6–10 mm long, 1.4–2.3

mm wide around stamens, 4.3–6.3 times as long as sepals, 1–1.5 times as long as lobes, glabrous outside, pubescent only immediately behind anthers inside, glabrous or hairs behind anthers visible in 5 patches in throat; lobes 4–8.5 by 1.8–5 mm, 1.2–2.2 times as long as wide, obdeltoid, glabrous outside and inside. *Stamens* inserted at 5.2–8.2 mm from corolla base which is 0.7–0.8 of tube length; anthers 2.7–3.3 by 0.6–0.8 mm, slightly exerted from corolla mouth. *Disk* of 5 free lobes or partially fused, 0.5–0.8 mm high. *Ovaries* 0.8–1.2 mm high, glabrous; style 4.6–7.7 mm long; style head 1.3–1.7 mm long. *Fruit* terete to slightly flattened, 7–27.5 cm by 3–6 mm, glabrous. *Seeds* 18–35 by 1.5–3 mm; coma 2–3.6 cm long. — **Fig. 99.**

Distribution — India, Korea, China, Japan, Burma, Thailand, Laos, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — It occurs in forest to 1000 m altitude.

2. *Trachelospermum inflatum* (Blume) Pierre ex Pichon

Trachelospermum inflatum (Blume) Pierre ex Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 191; Bakh.f., Blumea 6 (1950) 387; Backer & Bakh.f., Fl. Java 2 (1965) 234. — *Echites inflatus* Blume, Bijdr. (1826) 1039; A.DC., Prodr. 8 (1844) 478. — *Chonemorphia inflata* (Blume) G. Don, Gen. Hist. 4 (1837) 76. — *Anodendron inflatum* (Blume) Hassk., Flora 28, 19 (1845) 301 (but incorrectly as 269); Koord.-Schum., Syst. Verz. 1 (1912) 180. — *Dendrocharis inflata* (Blume) Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 194; Fl. Ned. Ind. 2 (1857) 453. — Type: *Blume s.n.* (lecto L [902.35-31]), designated by Middleton, Taxon 55 (2006) 504, Java. *Dendrocharis myrtifolia* Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 195; Fl. Ned. Ind. 2 (1857) 454. — Type: *Korthals s.n.* (holo L [898.110-107]), Sumatra.

Woody climber. *Branchlets* sparsely to densely, glabrous when older. *Leaves*: petiole 5–10 mm long, sparsely to densely pubescent when young, glabrous when older; blade subcoriaceous to coriaceous, 3–9 by 1.5–3.5 cm, 1.8–3.2 times as long as wide, ovate to elliptic, apex acuminate, base acute to cuneate, glabrous or with few hairs on midrib above, few hairs on midrib or sparsely pubescent all over beneath, few hairs on leaf margin, 7–14 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* of terminal and axillary cymes, 4.4–11 cm long; peduncle 0.3–5.8 cm long, sparsely brown pubescent; pedicels 5–9.5 mm long, sparsely brown pubescent. *Sepals* 1.3–2.2 by 1–1.5 mm, 1.1–1.3 times as long as wide, ovate, apex rounded to obtuse, glabrous, ciliate. *Corolla* white; tube 6.5–7.5 by 2.2–2.6 mm, 3.4–5.4 times as long as sepals, 0.8–1.1 times as long as lobes, glabrous outside, densely pubescent in upper tube and in throat; lobes 5.8–8 by 3.5–4.2 mm, 1.5–1.8 times as long as wide, broadly oblique obovate, glabrous outside, pubescent at base of lobes inside. *Stamens* inserted at 2.5–3.3 mm from corolla base which is 0.3–0.5 of tube length; anthers 3.5 by 0.7–0.8 mm, 4.4–5 times as long as wide; not exerted. *Disk* of 5 separate lobes, apex rounded, 0.7 mm high. *Ovaries* 0.9–1.1 mm high, glabrous; style 2.1–2.2 mm long; style head 1.5–1.7 mm long. *Fruit* linear, glabrous, 20–32 cm by 2–4.5 mm. *Seeds* c. 19 by 1–2 mm; coma 34–49 mm long.

Distribution — *Malesia*: Sumatra, Java.

Habitat & Ecology — Unknown.

Note — It is worth noting that although there are several collections of this species from *Malesia* there have been no new collections since 1897.

3. *Trachelospermum vanoverberghii* Merr.

Trachelospermum vanoverberghii Merr., Philipp. J. Sci., Bot. 7 (1912) 97. — Type: *Vanoverbergh 1230* (lecto P, designated by Middleton, Taxon 55 (2006) 505), Philippines, Luzon, Bontoc.

Woody climber. *Branchlets* glabrous to sparsely brown pubescent. *Leaves*: petiole 2–4 mm long, glabrous to brown pubescent; blade subcoriaceous to coriaceous, 1.7–6 by 0.6–2.7 cm, 1.7–3.3 times as long as wide, elliptic, apex acuminate, base cuneate, glabrous above, glabrous or with few hairs on midrib beneath and few on margin, 9–13 pairs of secondary veins, these sometimes rather obscure, tertiary venation obscure or reticulate. *Inflorescence* terminal and axillary, 3–5.5 cm long; peduncle 1.6–3.5 cm long, glabrous; pedicels 2–8 mm long, glabrous. *Sepals* 0.9–2 by 0.8–0.9 mm, 1–2.5 times as long as wide, ovate, apex rounded to acute, glabrous, ciliate, colleters in a row inside. *Corolla* probably white; tube 4.2–4.7 by 1.4–1.8 mm, 2.6–5.6 times as long as sepals, c. 0.8 times as long as lobes, glabrous outside, pubescent inside only behind anthers, glabrous in throat; lobes 5.4–6 by 4.5 mm, 1.2–1.3 times as long as wide, oblique obovate, glabrous outside and inside. *Stamens* inserted at 1.7–1.9 mm from corolla base which is 0.3–0.5 of tube length; anthers 2.8–3.1 by 0.7 mm, 4–4.4 times as long as wide; not exerted. *Disk* in a ring, apex crenate or dentate, 0.3–0.5 mm long. *Ovaries* 1.2–1.6 mm high, glabrous; style 0.7–1 mm long; style head 1.5–1.7 mm long. *Fruit* unknown.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — Unknown.

Note — Merrill listed a number of collections for this species, most of which were lost when PHN was destroyed, leaving only a few duplicates in other herbaria. It has not been recollected since the species was published. This mirrors the situation with *T. inflatum* which has also not been recollected in Malesia for more than a century.

38. URCEOLA

Urceola Roxb., Asiat. Res. 5 (1798) 169, nom. cons.; A.DC., Prodr. 8 (1844) 358; Benth. & Hook.f., Gen. Pl. 2 (1876) 716; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 163; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 84; Backer & Bakh.f., Fl. Java 2 (1965) 235; D.J. Middleton, Kew Bull. 49 (1994) 760; Blumea 41 (1996) 82; Coode et al., Checklist Pl. Brunei (1996) 28; D.J. Middleton, Fl. Thailand 7 (1999) 141; Tree Fl. Sabah & Sarawak 5 (2004) 9. — *Urceola* Roxb. sect. 1, *Urceola proper* Hook.f., Fl. Brit. India 3 (1882) 657. — *Urceola* Roxb. sect. *Euurceola* K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 163; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399 (as *Uricola*). — Type species: *Urceola elastica* Roxb.

Ecdysanthera Hook. & Arn., Bot. Beechey Voy. (1837) 198; A.DC., Prodr. 8 (1844) 442; Benth. & Hook.f., Gen. Pl. 2 (1876) 714; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 162; Spire, Contr. Apocyn. (1905) 2; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1209; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 85. — Type species: *Ecdysanthera rosea* Hook. & Arn. (= *Urceola rosea* (Hook. & Arn.) D.J. Middleton).

Chavannesia A.DC., Prodr. 8 (1844) 444; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 83. — Type species: *Chavannesia lucida* (Wall. ex G. Don) A.DC. (= *Urceola lucida* (Wall. ex G. Don) Kurz).

Urceola Roxb. sect. *Dittormos* Hook.f., Fl. Brit. India 3 (1882) 659. — Type species: *Urceola torulosa* Hook.f.

- Xylinabaria* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 26; Spire, Contr. Apocyn. (1905) 57; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1203; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 83. — *Xylinabaria* Pierre sect. *Indosinaria* Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 83. — Type species: *Xylinabaria minutiflora* Pierre (= *Urceola minutiflora* (Pierre) D.J. Middleton).
- Hymenolophus* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 13. — Type species: *Hymenolophus Van Romburghii* Boerl. (= *Urceola javanica* (Blume) Boerl.).
- Pezisicarpus* Vernet, Bull. Écon. Indochine 35 (1904) 1193. — Type species: *Pezisicarpus montana* Vernet (= *Urceola minutiflora* (Pierre) D.J. Middleton).
- Parabarium* Pierre ex Spire, Contr. Apocyn. (1905) 9; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1211; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 82; Lý, Feddes Repert. 89 (1978) 205. — Type species: *Parabarium micranthum* (Wall. ex G. Don) Pierre ex Spire (= *Urceola micrantha* (Wall. ex G. Don) D.J. Middleton).
- Xylinabariopsis* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1261; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 101. — Type species: *Xylinabariopsis reynaudii* (Jum.) Pit. (= *Urceola napeensis* (Quint.) D.J. Middleton).
- Chunechites* Tsiang, Sunyatsenia 3 (1937) 305. — Type species: *Chunechites xylinabariopsoides* Tsiang (= *Urceola xylinabariopsoides* (Tsiang) D.J. Middleton).
- Xylinabaria* Pierre sect. *Birmaria* Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 83. — Type species: *Xylinabaria esculenta* (A.DC.) Pierre ex Spire (= *Urceola lucida* (Wall. ex G. Don) Benth. ex Kurz).
- Xylinabaria* Pierre sect. *Javaria* Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 83. — Type species: *Xylinabaria koordersii* Pierre ex Koord.-Schum. (= *Urceola javanica* (Blume) Boerl.).
- Parabarium* Pierre ex Spire subsect. *Hookera* Lý, Feddes Repert. 89 (1978) 251. — Type species: *Parabarium hookeri* Pierre ex Spire (= *Urceola tournieri* (Pierre) D.J. Middleton).
- Parabarium* Pierre ex Spire sect. *Burmanicum* Lý, Feddes Repert. 89 (1978) 252. — Type species: *Parabarium burmanicum* Lý (= *Urceola tournieri* (Pierre) D.J. Middleton).
- Parabarium* Pierre ex Spire subg. *Pleiochasium* Lý, Feddes Repert. 89 (1978) 252. — Type species: *Parabarium quintareti* (Pierre) Pierre ex Spire (= *Urceola quintareti* (Pierre) D.J. Middleton).

Climbers; producing latex. *Branches* lenticellate or not; branchlets puberulent to glabrous. *Leaves* opposite, those of a pair equal; petiolate, with or without glands in axils; papery to coriaceous, entire. *Inflorescence* cymose, terminal and/or axillary sometimes forming a panicle; flowers 5-merous, actinomorphic. *Sepal* lobes free; colleters few inside or absent. *Corolla*: lobes dextrorse or valvate, bud variable in shape from globose to ovoid to ellipsoid; open corolla urceolate to campanulate; lobes triangular or falcate to the right often with a marked projection pointing to the right as viewed from the inside. *Stamens* completely included within the corolla tube, attached in a ring to the style head; filament short; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* annular to 5-dentate. Gynoecium 2-carpellate, apocarpous but apically united into a common style, superior, ovoid, densely puberulent on top; ovules numerous; style glabrous, very short; style head ovoid with a projection on top. *Fruit* of paired follicles; very variable in shape; longitudinally dehiscent. *Seeds* hirsute; ellipsoid, flattened; with a coma pointing towards the end of the fruit.

Distribution — 16 species from India and China southwards to New Guinea; in *Malesia* 9 species.

Uses — Almost all species have been recorded as producing a high quality rubber before the widespread use of *Hevea brasiliensis*.

KEY TO THE SPECIES

- 1a. Corolla lobes dextrorse, sometimes only slightly 2
 b. Corolla lobes in bud valvate 3
 2a. Corolla in bud acute or acuminate at apex; corolla lobes more or less symmetrical,
 pinkish or reddish **8. U. rosea**
 b. Corolla in bud rounded or obtuse at apex; corolla lobes falcate, white or greenish
 white **7. U. micrantha**
 3a. Leaves pubescent all over beneath 4
 b. Leaves glabrous or pubescent only in nerve axils 5
 4a. Sepals ovate or oblong, 0.6–2.1 mm long, 1–2.1 times as long as wide
 **5. U. lucida**
 b. Sepals narrow linear, 2.1–4 mm long, (2.3–)3.5–6 times as long as wide
 **2. U. elastica**
 5a. Sepals oblong to spatulate, 1.9–4 mm long; leaves usually shiny above; fruits
 distinctly torulose **9. U. torulosa**
 b. Sepals ovate to oblong, 0.6–3 mm long; leaves not shiny above; fruits not toru-
 lose 6
 6a. Sepals longer than corolla tube, oblong 7
 b. Sepals shorter than to as long as corolla tube, ovate to oblong 8
 7a. Corolla tube narrow, not noticeably wider at base; fruit dagger-shaped. — Philip-
 pines, Sulawesi, Borneo. **4. U. laevis**
 b. Corolla tube frequently noticeably wider at base; fruit fusiform to linear. — Wide-
 spread **1. U. brachysepala**
 8a. Sepals strongly reflexed 9
 b. Sepals not reflexed 10
 9a. Leaves elliptic to obovate, base often cordate, coriaceous **5. U. lucida**
 b. Leaves elliptic, base rounded, papery **6. U. malayana**
 10a. Inflorescence densely pale puberulent; corolla bud globular; fruits dagger-shaped
 11
 b. Inflorescence densely to sparsely dark puberulent; corolla bud ovoid to subglobu-
 lar; fruits linear to fusiform **1. U. brachysepala**
 11a. Leaves mostly obovate, base cordate, secondary veins very prominent beneath;
 fruit thick walled **5. U. lucida**
 b. Leaves mostly elliptic or oblong, base rounded to cuneate, secondary veins not or
 barely prominent beneath; fruit thin walled. **3. U. javanica**

1. *Urceola brachysepala* Hook. f.

Urceola brachysepala Hook. f., Fl. Brit. India 3 (1882) 659; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399; Bull. Inst. Bot. Buitenzorg 5 (1900) 17; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 474; Koord.-Schum., Syst. Verz. 1 (1912) 180; Merr., Enum. Born. Pl. (1921) 501; Ridl., Fl. Malay Penins. 2 (1923) 357; Burkill & M.R. Hend., Gard. Bull. Straits Settlements 3 (1925) 396; Masam., Enum. Phan. Born. (1942) 625; Bakh.f., Blumea 6 (1950) 388; Backer & Bakh.f., Fl. Java 2 (1965) 235, p.p.; I.M. Turner, Gard. Bull. Singapore

- 45 (1993) 36; D.J. Middleton, *Blumea* 41 (1996) 84; Coode et al., Checklist Pl. Brunei (1996) 28; I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 130; D.J. Middleton, *PROSEA* 18 (2000) 131. — *Chavannesia brachysepala* (Hook.f.) Pichon, *Bull. Mus. Hist. Nat. (Paris)*, sér. 2, 20 (1948) 302. — Type: *Maingay 1714 [KD.1079]* (lecto K, designated by Middleton (1996) op. cit.; iso P (scrap)), Peninsular Malaysia.
- Urceola maingayi* Hook.f., *Fl. Brit. India* 3 (1882) 658; Boerl., *Handl. Fl. Ned. Ind.* 2 (1899) 399; *Bull. Inst. Bot. Buitenzorg* 5 (1900) 17; Ridl., *J. Straits Branch Roy. Asiat. Soc.* 33 (1900) 111; King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 473; Merr., *Bibliogr. Enum. Born. Pl.* (1921) 501; Ridl., *Fl. Malay Penins.* 2 (1923) 357; Masam., *Enum. Phan. Born.* (1942) 625; I.M. Turner, *Gard. Bull. Singapore* 45 (1993) 37. — Type: *Maingay 3353 [KD.1083]* (lecto K, designated by Middleton (1996) op. cit.; iso K, P (scrap)), Singapore.
- Urceola acuteacuminata* Boerl., *Bull. Inst. Bot. Buitenzorg* 5 (1900) 19; Merr., *Bibliogr. Enum. Born. Pl.* (1921) 500; Masam., *Enum. Phan. Born.* (1942) 624. — Type: *Van Romburgh 27* (lecto L, designated by Middleton (1996) op. cit.; iso BO), Borneo, Kalimantan, Pontianak.
- Carruthersia imberbis* Elmer, *Leafl. Philipp. Bot.* 2 (1909) 588. — *Urceola imberbis* (Elmer) Merr., *Philipp. J. Sci., Bot.* 10 (1915) 68; *Enum. Philipp. Fl. Pl.* 3 (1923) 332. — *Chavannesia imberbis* (Elmer) Pichon, *Bull. Mus. Hist. Nat. (Paris)*, sér. 2, 20 (1948) 302. — Type: *Elmer 9239* (lecto K, designated by Middleton (1996) op. cit.; iso BM, BO, E, L, NSW, Z), Philippines, Luzon, Tayabas Province, Lucban.
- Urceola philippinensis* Merr., *Philipp. J. Sci., Bot.* 10 (1915) 69; *Enum. Philipp. Fl. Pl.* 3 (1923) 332. — *Chavannesia philippinensis* (Elmer) Pichon, *Bull. Mus. Hist. Nat. (Paris)*, sér. 2, 20 (1948) 302. — Type: *Clemens 1098* (lecto M, designated by Middleton (1996) op. cit.; iso BO, GH), Philippines, Mindanao, Lanao District, Camp Keithley.
- Urceola javanica* auct. non (Blume) Boerl.: *Koord.-Schum., Syst. Verz.* 1 (1912) 180, p.p.; Backer & Bakh.f., *Fl. Java* 2 (1965) 235, p.p.
- Urceola lucida* auct. non (Wall. ex G. Don) Benth. ex Kurz: Backer & Bakh.f., *Fl. Java* 2 (1965) 235.

Branchlets glabrous to densely puberulent. *Leaves* papery to subcoriaceous; petiole 0.6–3.4 cm long; blade ovate to elliptic, rarely obovate, 2.5–22 by 0.9–13 cm, 1.3–3.5 times as long as wide, apex acuminate, base cuneate to subcordate, 5–10 pairs of secondary veins, curved ascending, sparsely puberulent on midrib and in nerve axils, only in nerve axils or glabrous, often punctate all over beneath. *Inflorescence* terminal and axillary forming panicles; puberulent, especially in upper parts, 1.5–12.5 cm long; pedicels 0.9–3.6 mm long. *Sepals* ovate or oblong, 0.7–3 by 0.5–1.4 mm, 1.1–2.8(–4.4) times as long as wide, apex acute to rounded, puberulent. *Corolla* greenish white; corolla lobes valvate in bud; bud subglobular to ovoid, open corolla urceolate; tube 1–2.3 mm long, 1.4–3.3 times as long as lobes; lobes triangular, 0.6–1.2 by 0.5–1 mm; pubescent outside, pubescent to almost glabrous inside. *Stamens* inserted at 0.2–0.5 mm from corolla base which is 0.1–0.3 of tube length; filament 0.3–0.9 mm long; anthers 1–1.6 by 0.3–0.6 mm, 2.2–4 times as long as wide. *Disk* 5-crenate to almost annular; 0.2–0.7 mm long. *Ovaries* 0.3–0.7 mm long; style and style head 0.5–1.4 mm long. *Fruit* linear to fusiform, glabrous, 7–27 cm by 3–10 mm. *Seeds*: grain 8.5–15.2 by 1.4–3.1 mm; coma 1.9–5.5 cm long.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines.

Habitat & Ecology — In a wide variety of habitats from cliffs to primary forest or swamp forest to 1000 m.

2. *Urceola elastica* Roxb.

Urceola elastica Roxb., *Asiat. Res.* 5 (1798) 169; Miq., *Fl. Ned. Ind.* 2 (1857) 416; *Fl. Ned. Ind.*, Eerste Bijv. (1861) 228; Hook.f., *Fl. Brit. India* 3 (1882) 657; Boerl., *Handl. Fl. Ned. Ind.* 2 (1899) 399; *Bull. Inst. Bot. Buitenzorg* 5 (1900) 16; King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 472; Ridl., *Fl. Malay Penins.* 2 (1923) 356; Burkill & M.R. Hend., *Gard. Bull. Straits Settlements* 3 (1925) 396; D.J. Middleton, *Blumea* 41 (1996) 86; I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 130; D.J. Middleton, *PROSEA* 18 (2000) 132. — *Tabernaemontana elastica* (Roxb.) Spreng., *Syst. Veg.* 1 (1824) 639. — Type: Drawing in Roxb., *Asiat. Res.* 5 (1798) 165 excluding fruit.

Urceola brachysepala Hook.f. var. *pilosa* Boerl., *Bull. Inst. Bot. Buitenzorg* 5 (1900) 18; Merr., *Bibliogr. Enum. Born. Pl.* (1921) 501. — Type: *Van Romburgh 50* (lecto L, designated by Middleton (1996) op. cit.; iso BO), Borneo, Kalimantan, Biang.

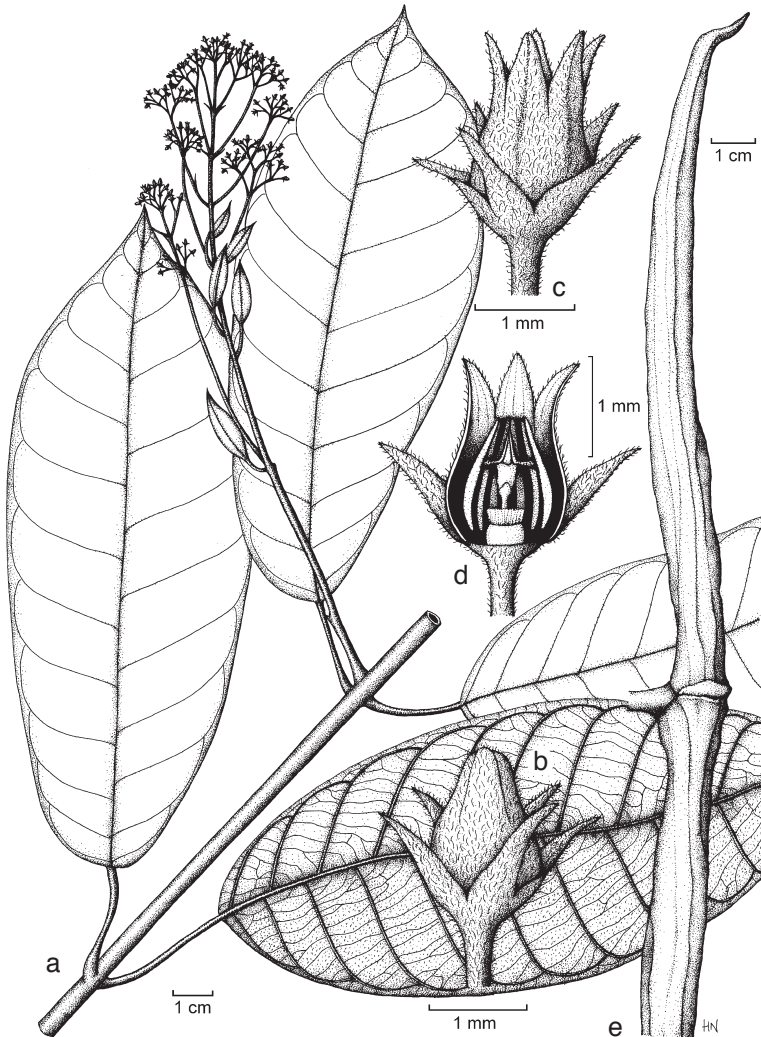


Fig. 100. *Urceola elastica* Roxb. a. Habit; b. flower in bud; c. open flower; d. flower dissection; e. fruit (a–d: *Aba & Saikah SAN.82306*; e: *Aban SAN.18618*).

Branchlets densely brown puberulent. *Leaves* coriaceous or subcoriaceous; petiole 0.8–3 cm long; blade elliptic to obovate, 3.5–19.5 by 1.6–8.5 cm, 1.4–2.6 times as long as wide, apex acuminate, rarely to obtuse, base weakly cordate to obtuse, margins often slightly inrolled, 8–16 pairs of secondary veins, strongly prominent beneath, densely to sparsely puberulent all over beneath, sparsely so to glabrous above. *Inflorescence* axillary and terminal forming panicles; densely brown puberulent, 5.2–19 cm long; pedicels 1.6–4 mm long. *Sepals* narrow linear, 2.1–4 by 0.5–1 mm, (2.3–)3.5–6 times as long as wide, apex acuminate to obtuse, puberulent. *Corolla* greenish white; corolla lobes valvate in bud; bud ovoid, open corolla urceolate; tube 1.2–2.3 mm long, 1.2–2.5 times as long as lobes; lobes triangular, 0.7–1.1 by 0.4–0.6 mm; pubescent outside, sparsely pubescent to glabrous inside. *Stamens* inserted at 0.2–0.6 mm from corolla base which is 0.1–0.3 of tube length; filament 0.4–0.7 mm long; anthers 1–1.6 by 0.4–0.5 mm, 3–4 times as long as wide. *Disk* weakly 5-crenate or 5-dentate; 0.2–0.4 mm long. *Ovaries* 0.5–0.7 mm long; style and style head 0.9–1.5 mm long. *Fruit* linear to fusiform, divergent, thick walled, sparsely puberulent, 8.5–26 by 0.5–1.5 cm. *Seeds*: grain 10–20 by 2.6–3.6 mm; coma 2.9–6.2 cm long. — **Fig. 100.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java.

Habitat & Ecology — In primary, secondary or disturbed forest to 800 m.

3. *Urceola javanica* (Blume) Boerl.

Urceola javanica (Blume) Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399; Bull. Inst. Bot. Buitenzorg 5 (1900) 18; Koord.-Schum., Syst. Verz. 1 (1912) 180, p.p.; Backer & Bakh.f., Fl. Java 2 (1965) 235; D.J. Middleton, Blumea 41 (1996) 89. — *Parsonsia javanica* Blume, Bijdr. (1826) 1041. — *Chavannesia javanica* (Blume) Miq., Fl. Ned. Ind. 2 (1857) 458. — Type: *Blume 2182b* (holo L [898.112-185]), Java, Mt Salak.

Hymenolophus romburghii Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 14. — Type: *Van Romburgh s.n.* (lecto BO, designated by Middleton (1996) op. cit.; iso BO), W Sumatra, Gunung Sungei Laboeh, 25.9.1898.

Urceola pilosa Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 19; Merr., Bibliogr. Enum. Born. Pl. (1921) 501; Masam., Enum. Phan. Born. (1942) 625. — Type: *Van Romburgh 38* (lecto BO, designated by Middleton (1996) op. cit.; iso BO), Borneo, Kalimantan, Kophiang.

Xylinabaria koordersii Pierre ex Koord.-Schum., Syst. Verz. 1, Fam. 247 (1912) 179; Bakh.f., Blumea 6 (1950) 388. — Type: *Koorders 24456* (lecto P, designated by Bakhuizen van den Brink Jr. (1950) op. cit.), Java, Pelaboean ratoe.

Xylinabaria bantamensis Pierre ex Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 83; Bakh.f., Blumea 6 (1950) 388. — Type: *Koorders 40124* (lecto P, designated by Bakhuizen van den Brink Jr. (1950) op. cit.), Java, Mt Karang.

Urceola brachysepala auct. non (Blume) Boerl.: Backer & Bakh.f., Fl. Java 2 (1965) 235, p.p.

Branchlets puberulent. *Leaves* papery to subcoriaceous; petiole 0.6–2 cm long; blade elliptic to oblong, 2.9–12.6 by 0.9–5.1 cm, 1.4–3.4 times as long as wide, apex acuminate, base rounded to cuneate, 4–11 pairs of secondary veins, puberulent on midrib beneath and in lateral vein axils, rarely puberulent all over beneath or glabrous. *Inflorescence* terminal and axillary forming panicles, delicate; densely pale pubescent, 1.9–13.1 cm long; pedicels 0.8–3.3 mm long. *Sepals* ovate, 0.6–1 by 0.5–0.7 mm, 1.1–1.8 times as long as wide, apex acute to acuminate, densely puberulent. *Corolla* white to yellowish; corolla lobes valvate in bud; bud ovoid, open corolla urceolate; tube

0.8–1.8 mm long, 1.2–2.5 times as long as lobes; lobes triangular, 0.5–0.8 by 0.4–0.8 mm; densely pubescent inside and outside. *Stamens* inserted at 0.2 mm from corolla base which is 0.1–0.2 of tube length; filament 0.2–0.4 mm long; anthers 0.9–1.5 by 0.3 mm, 3–5 times as long as wide. *Disk* 5-crenate or 5-dentate; 0.3–0.6 mm long. *Ovaries* 0.4–0.7 mm long; style and style head 0.6–0.9 mm long. *Fruit* shortly stipitate or not, dagger-shaped, tapering, glabrous, 5–11.5 by 0.4–1.9 cm. *Seeds*: grain 9.3–16.1 by 1.4–3.7 mm; coma 1.9–5.2 cm long.

Distribution — *Malesia*: Sumatra, Borneo, Java, Sulawesi, Moluccas, New Guinea. *Habitat & Ecology* — In primary or secondary forest to 1500 m.

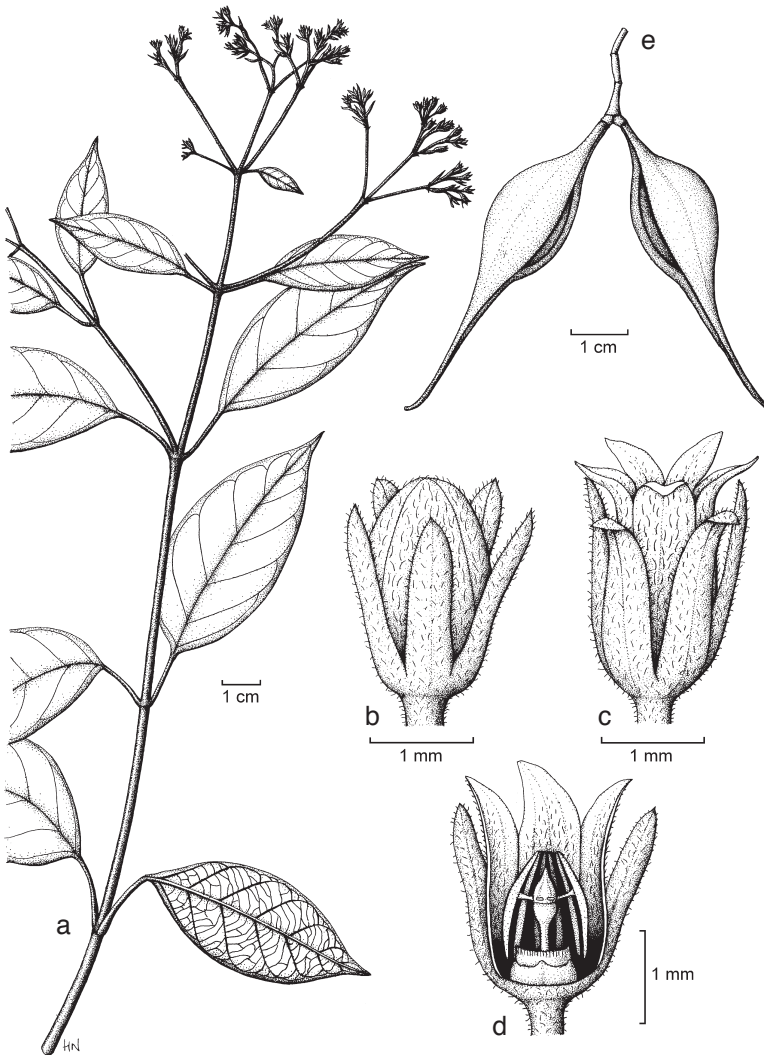


Fig. 101. *Urceola laevis* (Elmer) Merr. a. Habit; b. flower in bud; c. open flower; d. flower dissection; e. fruit (a–d: Sulit 12367; e: Podzorski SMHI.616).

4. *Urceola laevis* (Elmer) Merr.

Urceola laevis (Elmer) Merr., Philipp. J. Sci., Bot. 10 (1915) 69; Enum. Philipp. Fl. Pl. 3 (1923) 332; D.J. Middleton, Blumea 41 (1996) 91. — *Carruthersia laevis* Elmer, Leaflet Philipp. Bot. 4 (1912) 1449. — Type: *Elmer 12837* (lecto Z, designated by Middleton (1996) op. cit.; iso BISH, BM, BO, BP, E, L, MICH, NA, NSW, NY, P), Philippines, Palawan, Puerto Princesa, Mt Pulgar.

Branchlets puberulent to glabrous. *Leaves* papery to coriaceous; petiole 0.7–2.2 cm long; blade ovate to elliptic, 2.9–10.5 by 1.2–5.3 cm, 1.6–2.5 times as long as wide, apex acuminate, base rounded to obtuse, 5–8 pairs of secondary veins, glabrous or sparsely puberulent on midrib beneath and in vein axils. *Inflorescence* of few-flowered terminal and axillary cymes; puberulent, 3.8–13 cm long; pedicels 0.7–3.5 mm long. *Sepals* oblong, imbricate, 1.7–2.7 by 0.5–1.3 mm, 1.4–4.4 times as long as wide, apex rounded, rarely obtuse, sparsely puberulent. *Corolla* white or greenish; corolla lobes valvate in bud; bud ovoid, open corolla urceolate; tube 1.2–1.8 mm long, 1.4–3.3 times as long as lobes; lobes triangular, 0.5–1.1 by 0.4–0.8 mm; pubescent outside and inside. *Stamens* inserted at 0.2–0.3 mm from corolla base which is 0.1–0.2 of tube length; filament 0.4 mm long; anthers 1.3 by 0.3–0.5 mm, 2.6–4.3 times as long as wide. *Disk* 5-crenate; 0.3–0.6 mm long. *Ovaries* 0.5–0.6 mm long; style and style head 0.9–1.3 mm long. *Fruit* stipitate, dagger-shaped, puberulent when immature, c. 5.3 by 1 cm. *Seeds* not seen. — **Fig. 101.**

Distribution — *Malesia*: Borneo (Sabah), Philippines (Palawan), Sulawesi.

Habitat & Ecology — In forest to 1500 m.

5. *Urceola lucida* (Wall. ex G. Don) Benth. ex Kurz

Urceola lucida (Wall. ex G. Don) Benth. ex Kurz, J. Asiat. Soc. Bengal 46 (1877) 255; Hook.f., Fl. Brit. India 3 (1882) 658; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 475; Ridl., Fl. Malay Penins. 2 (1923) 358; Kerr in Craib, Fl. Siam. 2 (1939) 465; Bakh.f., Blumea 6 (1950) 388; Backer & Bakh.f., Fl. Java 2 (1965) 235; I.M. Turner, Gard. Bull. Singapore 45 (1993) 37; D.J. Middleton, Kew Bull. 49 (1994) 762; Blumea 41 (1996) 94; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 130; D.J. Middleton, Fl. Thailand 7 (1999) 144; PROSEA 18 (2000) 132. — *Echites lucidus* Wall. ex G. Don, Gen. Hist. 4 (1837) 75. — *Chavannesia lucida* (Wall. ex G. Don) A.DC., Prodr. 8 (1844) 444; Miq., Fl. Ned. Ind. 2 (1857) 458. — Type: *Wallich 1670* (lecto K-W, designated by Middleton (1994) op. cit.; iso BM, CGE, E, G, GH, K, K-W, L, M, MEL, NY, P, S, SING, W), Peninsular Malaysia, Penang.

Echites esculentus Wall., Numer. List 1671 (1829), nom. nud. — *Chavannesia esculenta* A.DC., Prodr. 8 (1844) 444; Miq., Fl. Ned. Ind. 2 (1857) 458. — *Urceola esculenta* (A.DC.) Benth. ex Kurz, Forest Fl. Burma 2 (1877) 184; Hook.f., Fl. Brit. India 3 (1882) 658. — *Xylinabaria esculenta* (A.DC.) Pierre ex Spire, Contr. Apocyn. (1905) 66. — Type: *Wallich 1671* (lecto G-DC, designated by Middleton (1996) op. cit.; iso BM, K-W), Burma, Martaban.

Urceola reticulata King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 477. — Type: *Ridley 2745* (lecto K, designated by Middleton (1996) op. cit.; iso NSW).

Branchlets glabrous or sparsely and minutely puberulent. *Leaves* coriaceous; petiole 0.8–2.8 cm long; blade obovate to elliptic, 3–26 by 0.9–11.2 cm, 1.6–2.6 times as long as wide, apex acuminate to caudate, base weakly cordate to obtuse, 7–13 pairs of secondary veins, prominent beneath; glabrous or, more rarely, with hairs on midrib beneath and in vein axils or sparsely all over beneath. *Inflorescence* of axillary and

terminal cymes forming a panicle; puberulent, 9.6–29 cm long; pedicels 0.9–3.2 mm long. *Sepals* ovate to oblong, often imbricate and reflexed, 0.6–2.1 by 0.5–1.2 mm, 1–2.1 times as long as wide, apex obtuse to weakly retuse, puberulent, colleter absent. *Corolla* white; lobes valvate in bud; bud ovoid, open corolla urceolate to campanulate; tube 0.8–1.5 mm long, 1–2 times as long as lobes; lobes triangular, 0.5–1 by 0.5–0.7 mm; puberulent outside, sparsely puberulent inside. *Stamens* inserted at 0.2–0.3 mm from corolla base which is 0.1–0.2 of tube length; filament 0.2–0.5 mm long; anthers

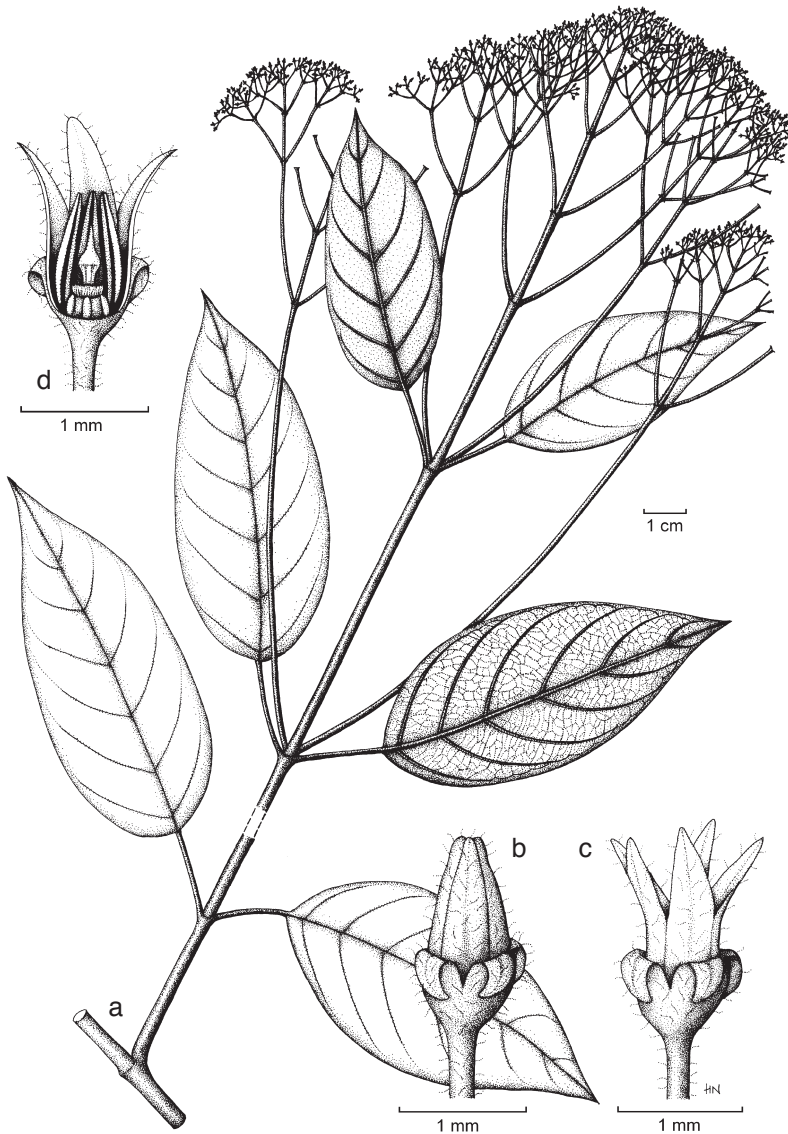


Fig. 102. *Urceola malayana* D.J. Middleton. a. Habit; b. flower in bud; c. open flower; d. flower dissection (Nur SF.32823).

0.9–1.3 by 0.2–0.4 mm, 2.8–4.3 times as long as wide. *Disk* 5-crenate; 0.2–0.4 mm long. *Ovaries* 0.3–0.5 mm long; style and style head 0.7–1.9 mm long. *Fruit* dagger-shaped, tapering, rarely stipitate, glabrous, rarely puberulent, 4.5–11 by 0.7–2 cm. *Seeds*: grain 10–17 by 3–5 mm; coma 3.4–5.4 cm long.

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

Habitat & Ecology — In evergreen or deciduous, primary or secondary forest with an altitude to 950 m.

6. *Urceola malayana* D.J. Middleton

Urceola malayana D.J. Middleton, *Blumea* 41 (1996) 95. — Type: *Nur SFN.32823* (holo L; iso A, K, SAR, SING), Peninsular Malaysia, Pahang, Cameron Highlands.

Urceola maingayi auct. non Hook.f.: I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 130.

Branchlets densely brown puberulent. *Leaves* papery; petiole 0.7–1.4 cm long; blade elliptic, 3.6–14.5 by 1.5–7.5 cm, 1.6–2.8 times as long as wide, apex acuminate, base obtuse, 7–9 pairs of secondary veins; puberulent on midrib and veins beneath. *Inflorescence* a terminal panicle; densely puberulent, 8.7–12.5 cm long; pedicels 2.2–3.8 mm long. *Sepals* ovate, reflexed, 0.7–0.9 by 0.4–0.5 mm, 1.8 times as long as wide, apex obtuse, long pubescent. *Corolla* lobes valvate in bud; bud narrow ovoid, open corolla tubular; tube 0.9–1 mm long, 1.1–1.4 times as long as lobes; lobes triangular, 0.6–0.9 by 0.6 mm; pubescent outside and inside. *Stamens* inserted at 0.3 mm from corolla base which is 0.3 of tube length; filament 0.4 mm long; anthers 1 by 0.3 mm, 3.3 times as long as wide. *Disk* 5-crenate; 0.2 mm long. *Ovaries* 0.3 mm long; style and style head 0.8 mm long. *Fruit* unknown. — **Fig. 102.**

Distribution — *Malesia*: Peninsular Malaysia.

7. *Urceola micrantha* (Wall. ex G. Don) D.J. Middleton

Urceola micrantha (Wall. ex G. Don) D.J. Middleton, *Novon* 4 (1994) 151; *Kew Bull.* 49 (1994) 762; *Blumea* 41 (1996) 97; I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 130; D.J. Middleton, *Fl. Thailand* 7 (1999) 145; *PROSEA* 18 (2000) 132. — *Echites micranthus* Wall. ex G. Don, *Gen. Hist.* 4 (1837) 75. — *Ecdysanthera micrantha* (Wall. ex G. Don) A.DC., *Prodr.* 8 (1844) 442; Miq., *Fl. Ned. Ind.* 2 (1857) 451; Hook.f., *Fl. Brit. India* 3 (1882) 662; Spire, *Bull. Écon. Indochine* 12 (1902) 859; King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 482; Ridl., *Fl. Malay Penins.* 2 (1923) 360. — *Parabarium micranthum* (Wall. ex G. Don) Pierre ex Spire, *Contr. Apocyn.* (1905) 38; Tsiang, *Sunyatsenia* 2 (1934) 117; *Bull. Fan Mem. Inst. Biol. Bot.* 9 (1939) 19; Kerr in Craib, *Fl. Siam.* 2 (1939) 21, 463; Masam., *Enum. Phan. Born.* (1942) 623; Chun & C.C. Chang, *Fl. Hainan.* 3 (1974) 238; Tsiang & P.T. Li, *Fl. Reipubl. Popularis Sin.* 63 (1977) 239; Lý, *Feddes Repert.* 89 (1978) 252; Ying & P.T. Li, *Fl. Yunnan.* 3 (1983) 559; Lý, *Feddes Repert.* 97 (1986) 666. — Type: *Wallich 1667* p.p. (lecto CGE, designated by Lý (1978) op. cit.; iso BM, CGE, E, G, K, K-W), India, Pundua.

Echites brachiatus Wall., *Numer. List.* 1668 (1829), nom. nud. — *Ecdysanthera brachiata* A.DC., *Prodr.* 8 (1844) 443; Miq., *Fl. Ned. Ind.* 2 (1857) 452; Kurz, *J. Asiat. Soc. Bengal* 46 (1877) 255; *Forest Fl. Burma* 2 (1877) 189. — *Parabarium brachiatum* (A.DC.) Pierre ex Spire, *Contr. Apocyn.* (1905) 37. — Type: *Wallich 1668* (lecto K-W, designated by Middleton (1994) op. cit.; iso BM, BR, G, G-DC, K, K-W, P), India, Pundua.

Ecdysanthera cambodiensis Pierre, *Rev. Cultures Colon.* 11 (1902) 228; Spire, *Bull. Écon. Indochine* 12 (1902) 859. — *Parabarium cambodiense* (Pierre) Pierre ex Spire, *Contr. Apocyn.* (1905) 38; Pit.

- in Lecomte, Fl. Indo-Chine 3 (1933) 1221; Lý, Feddes Repert. 89 (1978) 256; 97 (1986) 666 (as *P. cambodianum*). — Type: *Pierre 1434* (lecto P, designated by Lý (1986) op. cit., 1st step, and Middleton, *Adansonia* sér. 3, 27 (2005) 295, 2nd step; iso BR, P), Vietnam, Kien Giang, Phu Quoc.
- Ecdysanthera linearicarpa* Pierre, Rev. Cultures Colon. 11 (1902) 228; Spire, Bull. Écon. Indochine 12 (1902) 859. — *Parabarium linocarpum* Pierre ex Spire, Contr. Apocyn. (1905) 36, orth. var.; Caoutchouc Indo-Chine (1906) 36; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1215. — *Parabarium linearicarpum* (Pierre) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 302; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 243; Lý, Feddes Repert. 89 (1978) 257; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 560. — *Ecdysanthera linocarpa* (Pierre) P.T. Li, J. S. China Agric. Univ. 11 (1990) 34, orth. var. — *Urceola linearicarpa* (Pierre) D.J. Middleton, Novon 4 (1994) 151; P.T. Li et al., Fl. China 16 (1995) 185. — Type: *Tournier in Pierre 6615* (lecto P, designated by Lý (1986) op. cit.), Laos, Xieng Khouang, Tran Ninh.
- Ecdysanthera langbianii* Vernet, Bull. Écon. Indochine 35 (1904) 1185. — *Parabarium langbianii* (Vernet) Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 82; Lý, Feddes Repert. 89 (1978) 265; 97 (1986) 665 (as *langbienense*). — Type: *Vernet s.n.* (holo P), Vietnam, Ninh Thuan, Lang Bian, December 1902.
- Ecdysanthera annamensis* Vernet, Bull. Écon. Indochine 35 (1904) 1189. — Type: *Vernet s.n.* (holo P), Vietnam, Khanh Hoa, Dio Ca.
- Parabarium spireanum* Pierre ex Spire, Contr. Apocyn. (1905) 22; Caoutchouc Indo-Chine (1906) 22; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1220; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 244; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 560. — Type: *Spire 20* (lecto P, designated by Lý (1986) op. cit.; iso A, BO, HM, K, NY, P, S), Laos, Xieng Khouang, Cua Rao.
- Parabarium verneti* Pierre ex Spire, Contr. Apocyn. (1905) 34; Caoutchouc Indo-Chine (1906) 34; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1218; Lý, Feddes Repert. 89 (1978) 263; 97 (1986) 666. — Type: *Spire 11* (holo P), Laos, Xieng Khouang, Cua Rao.
- Ecdysanthera utilis* Hayata & Kawak., Bot. Mag. (Tokyo) 20 (1906) 51; Tsiang, *Sunyatsenia* 3 (1936) 139; Chun & C.C. Chang, Fl. Hainan. 3 (1974) 237; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 235; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 538; T.C. Huang, *Taiwania* 31 (1986) 96; P.T. Li, J. S. China Agric. Univ. 11 (1990) 34. — *Parabarium utile* (Hayata & Kawak.) Lý, Feddes Repert. 89 (1978) 261; 97 (1986) 666. — Type: *Kawakami s.n.* (lecto K, designated by Middleton (1994) op. cit.; iso TI), Taiwan, Shinko, Shintiku.
- Ecdysanthera multiflora* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 482; Ridl., Fl. Malay Penins. 2 (1923) 360. — *Parabarium multiflorum* (King & Gamble) Lý, Feddes Repert. 89 (1978) 260. — Type: *King 2294* (lecto BM, designated by Lý (1978) op. cit.; iso K), Peninsular Malaysia, Perak, Larut.
- Parabarium diudo* Dubard & Eberh., Agric. Prat. Pays Chaud 13, 1 (1913) 238; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1219; Lý, Feddes Repert. 89 (1978) 254; 97 (1986) 666. — Type: *Eberhardt s.n.* (lecto P, designated by Lý (1986) op. cit., 1st step, and Middleton (1996) op. cit., 2nd step; iso P), Vietnam, sine loc.
- Parabarium diudo* Dubard & Eberh. var. *longifolia* Dubard & Eberh., Agric. Prat. Pays Chaud 13, 1 (1913) 240; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1219. — Type: *Eberhardt s.n.* (lecto P, designated by Middleton (1996) op. cit.; iso P), Vietnam, sine loc.
- Parabarium chevalieri* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1212; Lý, Feddes Repert. 89 (1978) 259; 97 (1986) 665. — Type: *Chevalier 38604* (lecto P, designated by Lý (1986) op. cit., 1st step, and Middleton (1996) op. cit., 2nd step; iso P), Vietnam, Khanh Hoa, Hon Ba Massif.
- Urceola montana* M.R. Hend., Gard. Bull. Straits Settlem. 7 (1933) 108. — *Chavannesia montana* (M.R. Hend.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 302. — Type: *Henderson 23601* (lecto SING, designated by Middleton (1996) op. cit.; iso BO, K), Peninsular Malaysia, Pahang, Cameron Highlands.
- Parabarium utile* (Hayata & Kawak.) Lý var. *kerrii* Lý, Feddes Repert. 89 (1978) 263. — Type: *Kerr 9930* (holo P; iso ABD, BK, BM, E, K, L, TCD), Thailand, Korat (= Nakhon Ratchasima), Khao Lem.

Branches pale lenticellate; branchlets minutely puberulent, rarely glabrous. *Leaves* papery to subcoriaceous; petiole 0.6–2 cm long; blade elliptic to ovate, 2.8–18 by 1.1–5.7 cm, 1.7–3.7 times as long as wide, apex acuminate, base cuneate to rounded, 3–7 pairs of secondary veins, strongly ascending, tertiary venation weakly scalariform and reticulate, glabrous or with a puberulent petiole, usually with hairs in the axils of the secondary veins with the midrib, occasionally completely glabrous, sometimes punctate

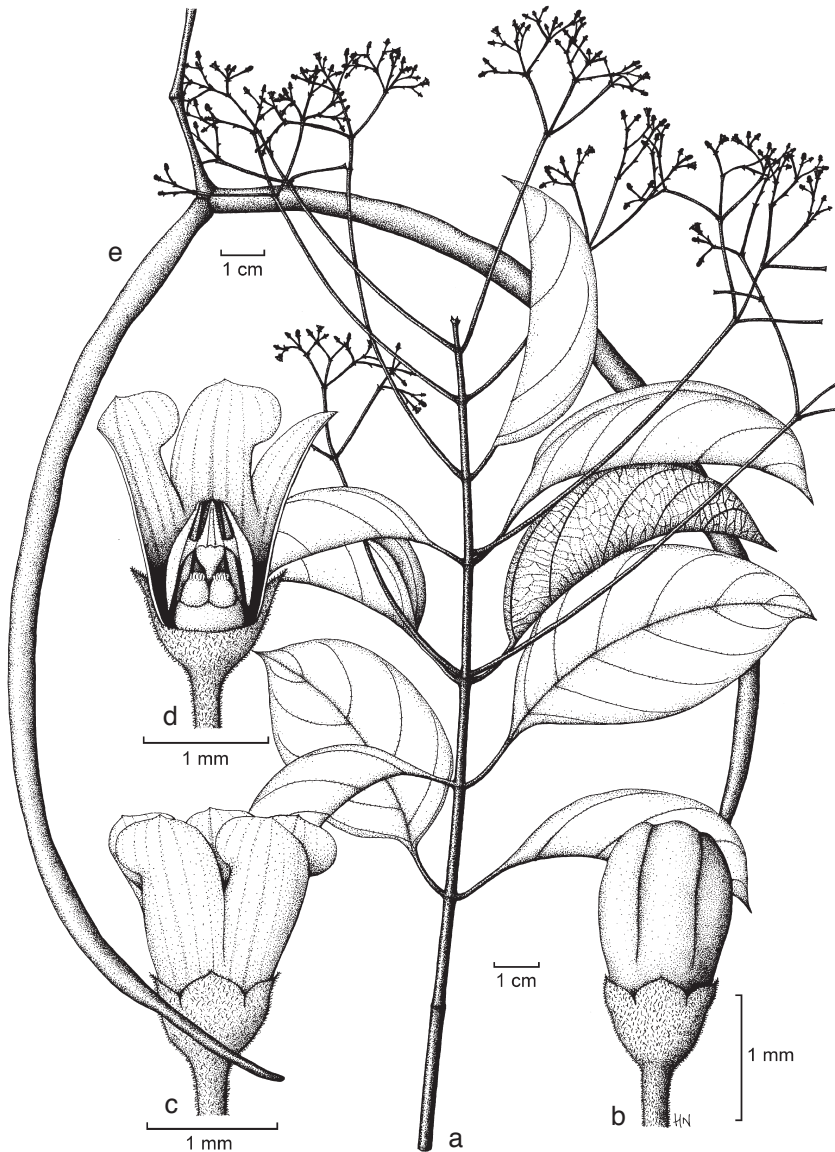


Fig. 103. *Urceola micrantha* (Wall. ex G. Don) D.J. Middleton. a. Habit; b. flower in bud; c. open flower; d. flower dissection; e. fruit (a–d: *Charoemphol, Larsen & Warncke 4188*; e: *How 73491*).

beneath. *Inflorescence* of axillary and terminal cymes, usually forming a panicle; puberulent, rarely glabrous, 5.8–19.5 cm long; pedicels 0.6–6.2 mm long. *Sepals* ovate, sometimes reflexed, 0.5–1 by 0.4–0.8 mm, 0.9–2 times as long as wide, apex abruptly acuminate, obtuse or apiculate, puberulent or glabrous, ciliate, with colleters only at edges of sepals at base inside. *Corolla* white or greenish white; lobes dextrorse; bud ovoid, open corolla campanulate; tube 0.7–1.5 mm long, (0.8–)1–2.5 times as long as lobes; lobes falcate to the right, 0.6–1.2 mm long; glabrous outside, rarely sparsely pubescent on upper parts, pubescent inside. *Stamens* inserted 0.2–0.5 mm from corolla base which is 0.1–0.4 of tube length; filament 0.1–0.5 mm long; anthers 0.9–1.3 by 0.3–0.4 mm, 2.3–3.3 times as long as wide. *Disk* 5-crenate; 0.2–0.4 mm long. *Ovaries* 0.3–0.7 mm long; style and style head 0.6–0.9 mm long. *Fruit* not stipitate, linear, mostly divergent, lenticellate, glabrous, 6.7–25 by 0.3–1 cm. *Seeds*: grain 7.3–18 by 2.2–3.9 mm; coma 2.8–6 cm long. — **Fig. 103.**

Distribution — India, Nepal, China, Taiwan, Japan (Ryukus), Burma, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — In evergreen or secondary forest to 1500 m.

8. *Urceola rosea* (Hook. & Arn.) D.J. Middleton

Urceola rosea (Hook. & Arn.) D.J. Middleton, Novon 4 (1994) 151; Kew Bull. 49 (1994) 765; Blumea 41 (1996) 107; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 130; D.J. Middleton, Fl. Thailand 7 (1999) 149. — *Ecdysanthera rosea* Hook. & Arn., Bot. Beechey Voy. (1837) 198; Spire, Contr. Apocyn. (1905) 2; Merr., Suppl. List Hainan Pl. 6 (1930) 330; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1210; Tsiang, Sunyatsenia 2 (1934) 116; 3 (1936) 140; Bull. Fan Mem. Inst. Biol. Bot. 9 (1939) 19; Kerr in Craib, Fl. Siam. 2 (1939) 463; Chun & C.C. Chang, Fl. Hainan. 3 (1974) 236; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 234; Ying & P.T. Li, Fl. Yunnan. 3 (1983) 556; T.C. Huang, Taiwanica 31 (1986) 95; Lý, Feddes Repert. 97 (1986) 662. — Type: *Vachell 144* (lecto K, designated by Middleton (1994) op. cit.; iso CGE, E), China, ‘neighbourhood of Macao’.

Ecdysanthera pedunculosa Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 557; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 16. — *Parameria pedunculosa* (Miq.) Benth. ex Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399. — Type: *Teijsmann 4305* (lecto L, designated by Middleton (1996) op. cit.; iso BO, K, MEL, U), Sumatra, Lampong, near Tega-nennin.

Antirrhoea esquirolii H. Lév., Fl. Kouy-Tcheou (1914) 364. — Type: *Esquirol 867* (holo E; scrap in A), China, Guizhou.

Branchlets glabrous or sparsely puberulent when young. *Leaves* papery; petiole 0.8–2.2 mm long; blade elliptic to obovate, 1.7–8.8 by 0.7–3.9 cm, 1.3–2.9 times as long as wide, apex acuminate to obtuse, base cuneate, 3–6 pairs of secondary veins, with domatia in lateral vein axils, usually hair filled. *Inflorescence* of axillary and terminal cymes forming panicles; puberulent, 5–17 cm long; pedicels 2–6 mm long. *Sepals* ovate, 1–2.1 by 0.5–1.2 mm, 0.9–2.4 times as long as wide, apex acute to obtuse, puberulent, with colleters only at edges of sepals at base inside. *Corolla* pink and/or red; lobes dextrorse; bud ovoid, acuminate or acute, open corolla campanulate; tube 1.4–2.4 mm long, 0.6–1.1 times as long as lobes; lobes elliptic, 1.5–2.9 by 0.8–1.7 mm, apex rounded to acute; glabrous to minutely puberulent inside, densely pubescent inside. *Stamens* inserted at 0.5–1.5 mm from corolla base which is 0.3–0.4 of corolla length; filament 0.2–0.5 mm long; anthers 1.5–1.9 by 0.3–0.5 mm, 3.8–6.3 times as long as wide. *Disk* annular

to weakly 5-crenate; 0.3–0.6 mm long. *Ovaries* 0.4–0.9 mm long; style and style head 1–1.4 mm long. *Fruit* linear, parallel, densely lenticellate, 2.8–22 by 0.5–1.8 cm. *Seeds*: grain 10.6–14.3 by 2.4–3.8 mm; coma 2.9–5.5 cm long. — **Fig. 104.**

Distribution — North-eastern India, Southern China, Taiwan, Japan (?), Burma, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Java.

Habitat & Ecology — In evergreen or secondary forest to 1600 m.

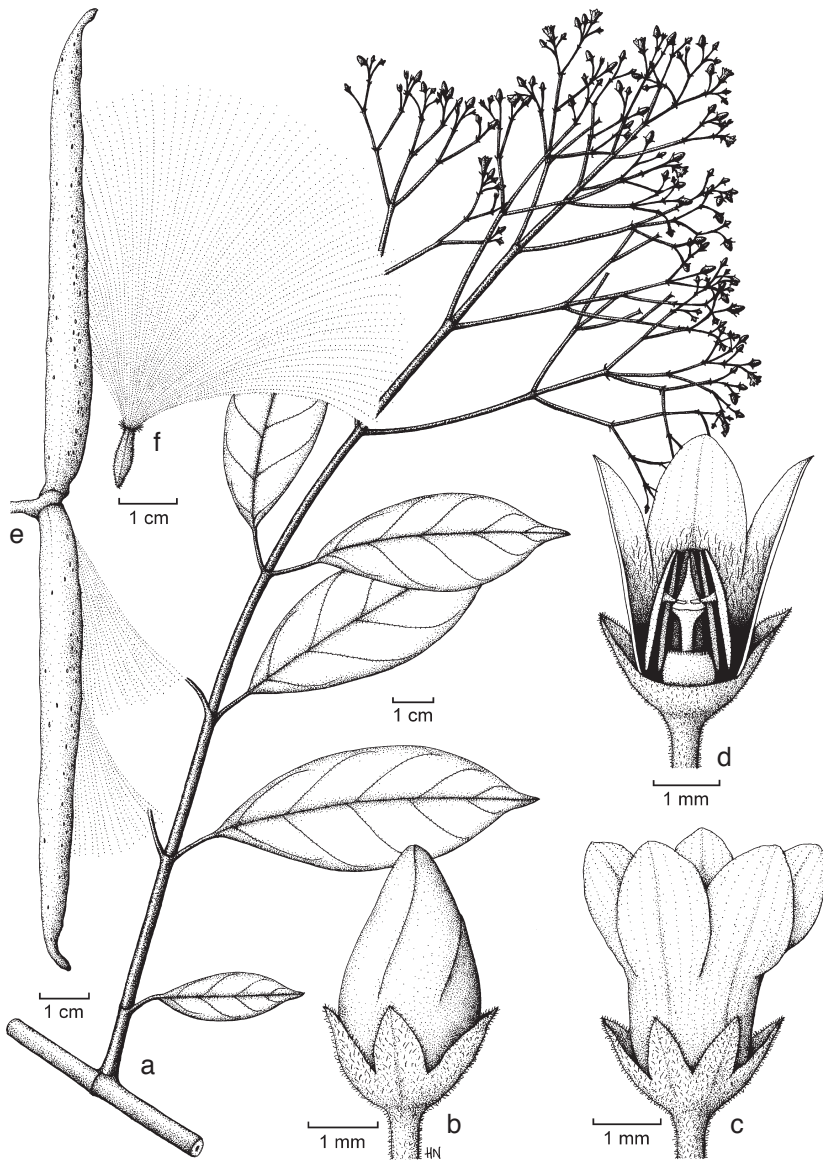


Fig. 104. *Urceola rosea* (Hook. & Arn.) D.J. Middleton. a. Habit; b. flower in bud; c. open flower; d. flower dissection; e. fruit; f. seed (a–d: Wang 40839; e, f: Rock 1961).

9. *Urceola torulosa* Hook.f.

Urceola torulosa Hook.f., Fl. Brit. India 3 (1882) 659; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 476; Ridl., Fl. Malay Penins. 2 (1923) 358; I.M. Turner, Gard. Bull. Singapore 45 (1993) 37; D.J. Middleton, Blumea 41 (1996) 110; Coode et al., Checklist Pl. Brunei (1996) 29; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 130; D.J. Middleton, PROSEA 18 (2000) 133. — *Chavannesia torulosa* (Hook.f.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 302. — Type: *Maingay 3304A [KD.1086]* (lecto K, designated by Middleton (1996) op. cit.; GH, L), Peninsular Malaysia.

Urceola malaccensis Hook.f., Fl. Brit. India 3 (1882) 658; Boerl., Handl. Fl. Ned. Ind. 2 (1899) 399; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 475; Ridl., Fl. Malay Penins. 2 (1923) 357; I.M. Turner, Gard. Bull. Singapore 45 (1993) 37. — Type: *Maingay 2937 [KD.1098]* (lecto K, designated by Middleton (1996) op. cit.; GH, K, L), Peninsular Malaysia.

Urceola longispala Merr., Pap. Michigan Acad. Sci. 19 (1934) 188. — Type: *Bartlett 7590* (holo NY; iso F, G, K, L, MICH), Sumatra, Koeloe, Loendoet Concession, near Aek Sordang.

Echites moniliferus Wall., Numer. List 1660 (1829), nom. nud.

Urceola aff. *torulosa* Coode et al., Checklist Pl. Brunei (1996) 29.

Branchlets minutely puberulent, rarely glabrous. *Leaves*: petiole 0.8–2.6 cm long; blade ovate to elliptic, 2.6–17.5 by 0.9–6.7 cm, 1.6–5 times as long as wide, apex acuminate, base rounded to cuneate, 5–9 pairs of secondary veins, with hairs in lateral vein axils, rarely glabrous. *Inflorescence* of axillary and terminal congested cymes; minutely puberulent, 2.5–5.5 cm long; pedicels 1.4–4.1 mm long. *Sepals* oblong to spatulate, 1.9–4 by 0.7–1.5 mm, 2.1–4.6 times as long as wide, apex rounded to obtuse, puberulent. *Corolla* lobes in bud valvate; bud elongate ovoid, open corolla tubular; tube 1.4–1.9 mm long, 2–2.5 times as long as lobes; lobes triangular, 0.7–0.8 by 0.6–0.7 mm; puberulent outside, sparsely puberulent inside. *Stamens* inserted at 0.2 mm from corolla base which is 0.1 of tube length; filaments 0.4 mm long; anthers 1.5 by 0.4 mm, 3.8 times as long as wide. *Disk* 5-crenate; 0.5 mm long. *Ovaries* 0.6 mm long; style and style head 1.3 mm long. *Fruit* long torulose, glabrous, 4.6–45 cm by 3–7 mm. *Seeds*: grain 7.8–11.2 by 3.2–5.4 mm; coma 1.5–3.3 cm long.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo.

Habitat & Ecology — In evergreen or secondary forest to 550 m.

39. VALLARIOPSIS

Vallariopsis Woodson, Philipp. J. Sci. 60 (1936) 228; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 89; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 10. — Type species: *Vallariopsis lancifolia* (Hook.f.) Woodson.

Climbers. *Branchlets* lenticellate; glabrous. *Leaves* opposite; those of a pair equal; petiolate; papery. *Inflorescence* terminal or axillary, cymose, shorter than subtending leaves. *Flowers* 5-merous, actinomorphic. *Sepals* with colleters in the axils. *Corolla*: lobes dextrorse; consisting of a narrow cylindrical part and an upper campanulate part starting at the point of stamen insertion; spreading lobes falcate. *Stamens* slightly exerted from the corolla tube, attached in a ring to the style head; anthers sessile,

fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. *Disk* cup-shaped, shorter than the ovary, 5-lobed. Gynoecium 2-carpellate, apocarpous but apically united into a common style, superior, ovoid, glabrous; ovules numerous; style head ellipsoid. *Fruit* of paired follicles; long and thin; glabrous. *Seeds* long narrow linear; glabrous; with a terminal coma pointing towards fruit apex.

Distribution — 1 species in Sumatra, Peninsular Malaysia, Borneo.

Vallariopsis lancifolia (Hook. f.) Woodson

Vallariopsis lancifolia (Hook. f.) Woodson, Philipp. J. Sci. 60 (1936) 228; Rudjiman, Agric. Univ. Wageningen Pap. 86-5 (1987) 89; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 130. — *Vallaris lancifolia* Hook. f., Fl. Brit. India 3 (1882) 651; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 461; Ridl., Fl. Malay Penins. 2 (1923) 352. — Type: *Maingay 1846 [KD.1102]* (lecto K, designated by Rudjiman (1987) op. cit.; iso A, K, L, MO), Peninsular Malaysia.

Branches lenticellate; glabrous. *Leaves*: petiole 2–15 mm long, glabrous or sparsely puberulent; blade papery, narrowly elliptic or ovate, 1.7–9 by 0.4–3.5 cm, 2.2–5.7 times as long as wide, apex acuminate to caudate, rarely to obtuse, base cuneate to acute, 8–19 pairs of secondary veins, tertiary venation indistinct reticulate; glabrous. *Inflorescence* terminal and axillary; 1–2.2 cm long, 3–11-flowered; peduncle 1–8 mm long; pedicels 3–9 mm long. *Sepals* ovate, 1–1.5 by 0.5–0.75 mm, 2 times as long as wide, apex acute, sometimes puberulent at apex, otherwise glabrous. *Corolla* white; tube 3.8–4.5 mm long; lobes 3.5–5 by 1.5–2.5 mm, c. 2 times as long as wide, obtuse or acute at the apex; glabrous outside, pubescent inside at base. *Stamens* inserted at 2.1–3 mm from corolla base; anthers 2.5–2.6 by 0.3–0.5 mm, 5.2–8.3 times as long as wide. *Disk* 0.4–0.5 mm long. *Ovaries* 0.7–1 mm long; style and style head 3–4 mm long. *Fruit* 30–60 cm by 1.5–2.2 mm. *Seeds*: grain c. 22 by 1.3 mm; coma 2.3–3 cm long.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

Habitat & Ecology — In open areas, forest or swamp forests to 700 m altitude.

40. VALLARIS

Vallaris Burm. f., Fl. Ind. (1768) 51; R.Br., Asclepiadeae (1810) 53; G. Don, Gen. Hist. 4 (1838) 78; A. DC., Prodr. 8 (1844) 399; Benth. & Hook. f., Gen. Pl. 2 (1876) 710; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 186; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1174; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 59; Backer & Bakh. f., Fl. Java 2 (1965) 243; Rudjiman, Meded. Landbouwhoogeschool Wageningen 82-11 (1982) 2; D.J. Middleton, Fl. Thailand 7 (1999) 94. — Type species: *Vallaris pergularia* Burm. f. (= *Vallaris glabra* (L.) Kuntze).

Emericia Roem. & Schult., Syst. Veg. 4 (1819) 401. — Type species: *Emericia pergularia* Roem. & Schult. (= *Vallaris glabra* (L.) Kuntze).

Peltanthera Roth, Nov. Pl. Sp. (1821) 132. — Type species: *Peltanthera solanacea* Roth (= *Vallaris solanacea* (Roth) Kuntze).

Parabeaumontia Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 382. — Type species: *Parabeaumontia indecora* (Baill.) Pichon (= *Vallaris indecora* (Baill.) Tsiang & P.T. Li).

Trailing or climbing shrubs. *Branches* lenticellate; branchlets glabrous or sparsely pubescent. *Leaves* opposite; glabrous or pubescent on midrib and veins; long slender

glands in the axils. *Inflorescence* an axillary cyme, all axes pubescent; flowers 5-merous. *Sepals* ovate to linear; pubescent; with or without colleters inside. *Corolla* lobes dextrorse; mature corolla infundibuliform; tube widening around the middle; lobes spreading. *Stamens* exerted; inserted on the corolla tube at the point where the tube widens, adnate to the style head; filaments short, pilose, having a large bulbous swelling at the apex; anthers fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and slightly curved sagittate appendages at the base. *Disk* 5-lobed; surrounding ovary to about the same length. Gynoecium 2-carpellate, apocarpous but apically united into a common style, pubescent; ovules numerous; style pubescent. *Fruit* a follicle, sometimes formed from only one of the carpels; not lenticellate. *Seeds* ellipsoid, flattened; pubescent; with an apical coma.

Distribution — 3 species from the Indian subcontinent to Southern China; in *Malesia* 1 species.

Vallaris glabra (L.) Kuntze

Vallaris glabra (L.) Kuntze, Revis. Gen. Pl. 2 (1891) 417; Merr., Bibliogr. Enum. Born. Pl. (1921) 502; Kerr in Craib, Fl. Siam. 2 (1939) 454; Masam., Enum. Phan. Born. (1942) 625; Backer & Bakh.f., Fl. Java 2 (1965) 243; Rudjiman, Meded. Landbouwhoogeschool Wageningen 82-11 (1982) 5; D.J. Middleton, Fl. Thailand 7 (1999) 94. — *Pergularia glabra* L., Mant. Pl. 2 (1767) 53. — Type: *Linnaeus 306.1* (holo LINN), Java.

Vallaris pergulana Burm.f., Fl. Ind. (1768) 51; Wight, Icon. Pl. Ind. Orient. 2 (1841) t. 429; Miq., Fl. Ned. Ind. 2 (1857) 427; Hook.f., Fl. Brit. India 3 (1882) 651; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 460. — *Vallaris indica* J.F. Gmel., Syst. Nat. 2 (1791) 391. — Based on: *Flos pergulanus* Rumph., Herb. Amboin. 5 (1747) 51, t. 29.

Vallaris ovalis Miq., Fl. Ned. Ind. 2 (1857) 427. — Type: *Horsfield s.n.* (lecto K, designated by Rudjiman (1982) op. cit.; iso BM, L, U), Java.

Leaves: petiole 5–30 mm; blade broadly elliptic, 6.5–17 by 4–10 cm, 1.4–2 times as long as wide, apex emarginate, rounded, apiculate or shortly acuminate, base obtuse to cuneate; 7–10 pairs of secondary veins. *Inflorescence* 3–40-flowered, 3–10 cm long; peduncle short, sometimes partly fused with branch; delicate. *Sepals* ovate or narrowly elliptic, 3–7 by 1.5–2.5 mm, apex acuminate, reflexed or spreading. *Corolla* white, creamy, pale yellow or pale green; tube 6.8–10 mm long, widening at 3.5–5 mm; lobes 5–11 by 4–7 mm, ovate, apex obtuse to acuminate; pubescent outside except at the base, pubescent inside around and below stamen insertion. *Stamens* inserted 4–5.2 mm from corolla base, exerted for 5–7 mm; filaments 2.5–3.8 mm long; anthers 4–6 by 1–1.5 mm, sagittate base 1.2–1.5 mm long. *Disk* pubescent on top. *Ovaries* densely pubescent, 1–2 mm long; style and style head 6–9 mm long, densely pubescent. *Fruit* of somewhat flattened follicles, 15.5–16 by 2.3–2.5 cm. *Seeds* not seen.

Distribution — *Malesia*: Sumatra, Java to Lesser Sunda Islands (Flores). Widely cultivated elsewhere. There is one collection, *Teijsmann 11802*, from Pangkadjene on Celebes but it cannot be ascertained from the specimen whether this was a cultivated plant or not.

Habitat & Ecology — In forest to 600 m.

41. VOACANGA

- Voacanga* Thouars, Gen. Nov. Madagasc. (1806) 10; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 409; Backer & Bakh.f., Fl. Java 2 (1965) 229; Leeuwenb., Agric. Univ. Wageningen Pap. 85-3 (1985) 9; PROSEA 12, 2 (2001) 582; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 59. — Type species: *Voacanga thouarsii* Roem. & Schult.
- Orchipeda* Blume, Bijdr. (1826) 1026; Miq., Ann. Mus. Bot. Lugduno-Batavi 1 (1864) 316. — Type species: *Orchipeda foetida* Blume (= *Voacanga foetida* (Blume) Rolfe).
- Pootia* Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 192; Fl. Ned. Ind. 2 (1857) 417. — Type species: *Pootia grandifolia* Miq. (= *Voacanga grandifolia* (Miq.) Rolfe). See Leeuwenberg (1985) for further generic synonyms based on African material.

Shrubs or trees with dichotomous branching; with white latex in all parts; trunk without buttresses. *Leaves* opposite; petiole bases joining to form short ocrea, these sometimes obscure especially in older leaves. *Inflorescence* a cyme or solitary flower, lax; 2 inflorescences at each ramification; flowers usually fragrant. *Sepals* in most species with a distinct connate tube and free lobes; usually with colleters inside; shed with the corolla. *Corolla* lobes sinistrorse; mature corolla with narrow or trumpet-shaped tube and spreading lobes. *Stamens* subsessile; completely included in tube or slightly exerted; anthers narrowly triangular, base sagittate, apex acuminate, sterile at apex; weakly attached to the style head. *Disk* adnate to sides of carpels. Gynoecium 2-carpellate, apocarpous but apically united into a common style; style filiform; style head short. *Fruit* of paired follicles, usually somewhat united at least at base. *Seeds* covered in a fleshy aril.

Distribution — The genus has 12 species of which 7 are in Africa and 5 in *Malesia*. One of the Malesian species also occurs in Australia (Queensland).

Note — This account is partly adapted from Leeuwenberg (1985) rather than completely reworked because I agree with the species delimitation he used. It has been updated to include new collections made since 1985.

KEY TO THE SPECIES

- 1a. Leaves densely pubescent beneath; corolla lobes ≥ 2 times as long as wide. — Borneo **4. *V. havilandii***
- b. Leaves mostly glabrous beneath, rarely puberulent but then corolla lobes < 2 times as long as wide. — Throughout Malesia 2
- 2a. Sepals almost free or at least with lobes much longer than tube. — Philippines **5. *V. megacarpa***
- b. Sepals connate into a tubular calyx with lobes much shorter than tube. — Throughout Malesia 3
- 3a. Calyx tube closely clasping the corolla tube, 3.5–7.7 times as long as wide; corolla lobes apex obtuse to acute. — Philippines **2. *V. globosa***
- b. Calyx tube not closely clasping the corolla tube, 1–3.3 times as long as wide; corolla lobes apex rounded to emarginate. — Throughout Malesia. 4
- 4a. Corolla tube 28–45 mm long; calyx 14–40 mm long **1. *V. foetida***
- b. Corolla tube 9–24 mm long; calyx 10–20 mm long **3. *V. grandifolia***

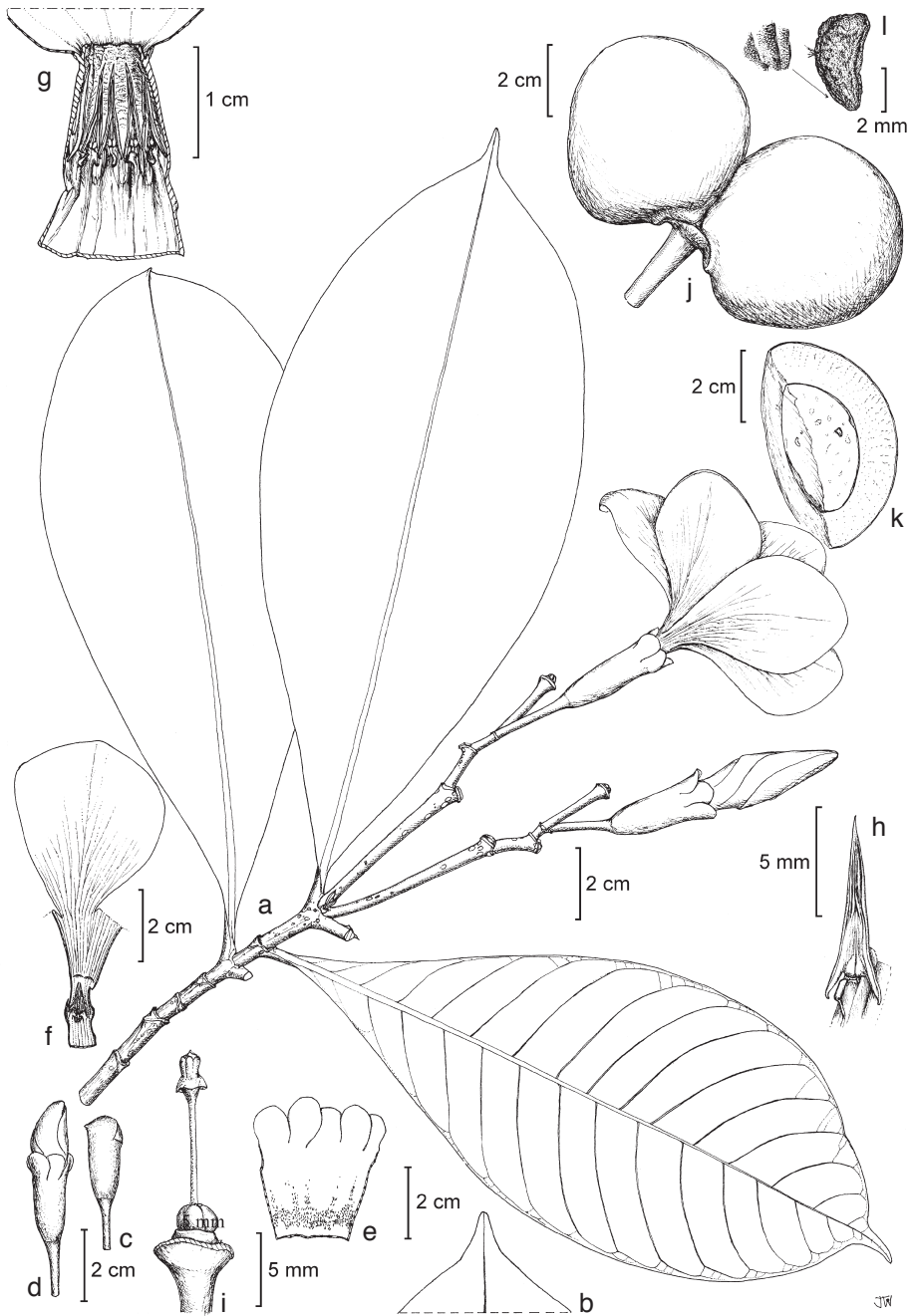


Fig. 105. *Voacanga foetida* (Blume) Rolfe. a. Flowering branch; b. leaf apex; c, d. flower buds; e. calyx inside; f. corolla segment inside; g. corolla tube inside; h. stamen; i. pistil; j. fruit; k. section of mericarp; l. seed with more enlarged detail of testa (a: Grasshoff 982; b–i: Van Steenis 2377; j–l: spirit coll. Leiden 463/2470).

1. *Voacanga foetida* (Blume) Rolfe

Voacanga foetida (Blume) Rolfe, J. Bot. London 21 (1883) 202; Backer & Bakh.f., Fl. Java 2 (1965) 229; Leeuwenb., Agric. Univ. Wageningen Pap. 85-3 (1985) 47; PROSEA 12, 2 (2001) 584; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 59. — *Orchipeda foetida* Blume, Bijdr. (1826) 1027; Miq., Fl. Ned. Ind. 2 (1857) 416; Fl. Ned. Ind., Eerste Bijv. (1861) 553. — Type: *Blume s.n.* (lecto L [898.112-361], designated by Leeuwenberg (1985) op. cit.; iso MEL, P, U), Java.

Shrub or tree to 20 m high; trunk to 40 cm dbh; bark smooth, grey, whitish brown, or grey-brown, smooth; inner bark medium yellow-brown, fibrous; sapwood pale yellow. *Branches* lenticellate; branchlets glabrous. *Leaves*: petiole 5–15 mm long; blade thin, elliptic to obovate, 7–37 by 3–11 cm, 1.9–3.5 times as long as wide, apex acuminate, base cuneate or decurrent onto petiole, glabrous above and beneath, 7–17 pairs of secondary veins, arcuate ascending, tertiary venation lax, scalariform to reticulate. *Inflorescence* few-flowered, 12–22 cm long, glabrous; peduncles 5–15 cm long; pedicels (1–)2.5–4 cm long. *Flowers* with an unpleasant smell. Calyx of a tube and erect lobes, sometimes slightly fleshy, 14–40 mm long, 7.5–16 mm wide at the top of the tube, 1.9–3.3 times as long as wide; calyx tube much wider than corolla tube, 12–28 mm long, 2.9–4.5 times as long as the lobes, glabrous outside; lobes 4–12 by 5–11 mm, 0.4–2 times as long as wide, apex rounded. *Corolla* white; tube widening slightly towards apex, 28–45 mm long, 0.9–1.2 times as long as calyx, 0.5–0.8 times as long as lobes, glabrous inside and outside; lobes obovate, 26–60(–95) by 21–44 mm, 1.2–2.2 times as long as wide, apex rounded, glabrous. *Stamens* inserted near the base of the corolla tube, at 7–10 mm from base; anthers 7–8 by 2–3 mm. *Disk* annular, c. 0.5 mm high. *Ovaries* glabrous, c. 2 mm high, style and style head c. 10 mm long. *Fruit* fleshy, free from each other, subglobose, 6–11 cm diameter. *Seeds* with an orange aril, furrowed, 10–12 by 5–7 by 4–6.5 mm. — **Fig. 105.**

Distribution — *Malesia*: Sumatra, Java, Borneo, Philippines.

Habitat & Ecology — In forest to 600 m altitude.

2. *Voacanga globosa* (Blanco) Merr.

Voacanga globosa (Blanco) Merr., Philipp. J. Sci., Bot. 4 (1909) 319; Leeuwenb., Agric. Univ. Wageningen Pap. 85-3 (1985) 50; PROSEA 12, 2 (2001) 584. — *Tabernaemontana globosa* Blanco, Fl. Filip. (1837) 116; Fl. Filip., ed. 2 (1845) 83; Miq., Fl. Ned. Ind. 2 (1857) 424. — Type: Untraced. Neotype: *Merrill Species Blancoanae* 462 (neo W, designated by Leeuwenberg (1985) op. cit.; isoneo BM, BO, F, K, L, MO, NY, P, US), Philippines, Luzon, Laguna Prov., Los Baños.

Voacanga cumingiana Rolfe, J. Linn. Soc., Bot. 21 (1884) 313. — Type: *Cuming 1806* (lecto K, designated by Leeuwenberg (1985) op. cit.; iso BM, W), Philippines, Negros.

Voacanga dolichocalyx Quisumb. & Merr., Philipp. J. Sci. 37 (1928) 192. — Type: *Ramos & Edaño Bur. Sci. 45264* (lecto NY, designated by Leeuwenberg (1985) op. cit.; iso K, US), Philippines, Luzon, Tayabas Province, Casiguran.

Voacanga latifolia Quisumb. & Merr., Philipp. J. Sci. 37 (1928) 193. — Type: *Ramos & Edaño Bur. Sci. 47070* (lecto A, designated by Leeuwenberg (1985) op. cit.; iso NY, UC), Philippines, Luzon, Isabela Province, San Mariano.

Tree to 10(–15) m tall, trunk to 35 cm dbh; bark smooth, pale grey-brown. *Branches* lenticellate, glabrous even when young. *Leaves*: petiole 8–30 mm long, glabrous; blade thin, elliptic to obovate, 4–25 by 1–9 cm, 1.9–4.4 times as long as wide, apex short

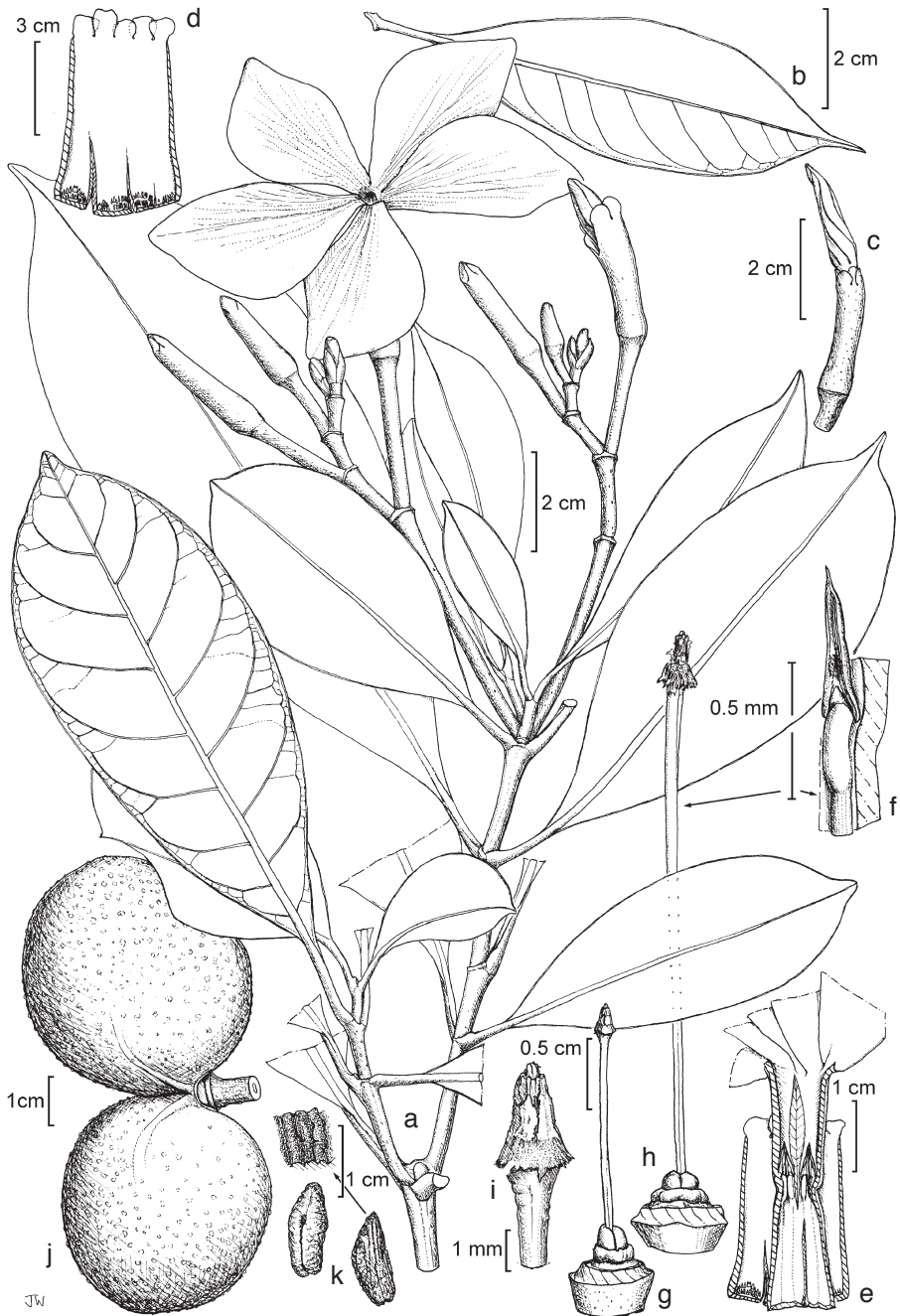


Fig. 106. *Voacanga globosa* (Blanco) Merr. a. Flowering branch; b. leaf; c. flower bud; d. opened calyx; e. opened calyx and corolla, latter also torn above stamens; f. stamen; g, h. pistils; i. pistil head; j. fruit; k. seeds with more enlarged detail of testa (a: Sulit PNH 21647; b–g, i: Jacobs 7961; h: *De Mollans s.n.*; j, k: Sulit PNH 14445).

acuminate, base cuneate, glabrous above and beneath, 6–15 pairs of secondary veins, arcuate ascending, tertiary subscalariform but hardly visible. *Inflorescence* few-flowered, 6–17 cm long, glabrous; peduncle 2–5 cm long; pedicels 8–30 mm long. *Flowers* with a pleasant smell. Calyx of a tube and erect lobes, 8–50 by 2.5–6 mm, 3.5–7.7 times as long as wide; calyx tube barely wider than corolla tube, 7–45 mm long, 5.5–12 times as long as lobes, glabrous outside; lobes ovate to orbicular, 1.4–6 by 2–6 mm, 0.6–3 times as long as wide, apex rounded. *Corolla* white; tube 24–50 mm long, 1.2–3 times as long as calyx, 0.7–1.7 times as long as lobes, glabrous inside and outside; lobes elliptic to obovate, 16–55 by 8–40 mm, 1.1–2.7 times as long as wide, apex acute to obtuse. *Stamens* inserted at 17–40 mm from corolla base; anthers 4–8 by 1.5–3 mm. *Disk* annular, c. 1 mm high. *Ovaries* 2–3 mm high, glabrous; style and style head 15–36 mm long. *Fruit* globose, rarely fusiform, 2.7–7 by 1.3–3.5 cm, brownish to reddish. *Seeds* with an orange aril, furrowed, almost round and flattened and concave on one side or crescent-shaped where the concave side has folded completely over, 7.5–12 by 4.5–10 by 3.5–4 mm. — **Fig. 106.**

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Forest or scrub to 300 m altitude.

3. *Voacanga grandifolia* (Miq.) Rolfe

Voacanga grandifolia (Miq.) Rolfe, J. Bot. London 21 (1883) 202; Hochr., Candollea 5 (1934) 178; Backer & Bakh.f., Fl. Java 2 (1965) 229; Leeuwenb., Agric. Univ. Wageningen Pap. 85-3 (1985) 55; P.I. Forst., Fl. Australia 28 (1996) 114; PROSEA 12, 2 (2001) 582; Kessler et al., Blumea, Suppl. 14 (2002) 15. — *Pootia grandifolia* Miq., Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 6 (1857) 193; Fl. Ned. Ind. 2 (1857) 417. — *Orchippeda grandifolia* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 1 (1864) 10. — Type: *Horsfield s.n.* (lecto K, designated by Leeuwenberg (1985) op. cit.; iso BM, CGE, U), Java.

Pootia exauriculata Teijsm. & Binn., Tijdschr. Ned.-Indië 25 (1863) 404. — *Orchippeda gracilipes* Miq., Ann. Mus. Bot. Lugduno-Batavi 1 (1864) 316. — *Voacanga gracilipes* (Miq.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 548. — Type: *Teijsmann 5658* (lecto BO, designated by Leeuwenberg (1985) op. cit.; iso U), Moluccas, Halmahera, Djailolo.

Tabernaemontana celebica Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 139. — Type: *Riedel HB5713* (lecto L, designated by Leeuwenberg (1985) op. cit.; iso U), Celebes, Manado.

Orchippeda papuana F. Muell., Descr. Notes Papuan Pl. 7 (1886) 30; K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 112. — *Voacanga papuana* (F. Muell.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 149; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 503; Markgr., Bot. Jahrb. Syst. 61 (1927) 204; Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 504. — Type: *D'Albertis s.n.* (holo MEL n.v.), Papua New Guinea, Fly River.

Voacanga versteegii Markgr., Nova Guinea 14, 2 (1926) 287; Bot. Jahrb. Syst. 61 (1927) 204. — Type: *Versteeg 1881* (holo U; iso L), New Guinea, Papua, Merauke.

Voacanga grandifolia (Miq.) Rolfe var. *glabrifolia* Bakh.f., Blumea 6 (1950) 386. — Type: *Koorders 126* (holo L), E Java, Rogodjampi.

Tree to 15 m tall, trunk to 20 cm dbh; bark smooth, pale brown. *Branches* lenticellate, glabrous even when young. *Leaves*: petiole 0–50 mm long, usually with only a thin lamina at the base of the blade in the very shortly petiolate or sessile leaves, glabrous; blade thin, elliptic to obovate, 8–40 by 2–16.5 cm, 2–4 times as long as wide, apex acuminate or acute, base cuneate or decurrent onto petiole, glabrous above and beneath, 10–20 pairs of secondary veins, ascending towards margin, tertiary venation scalari-

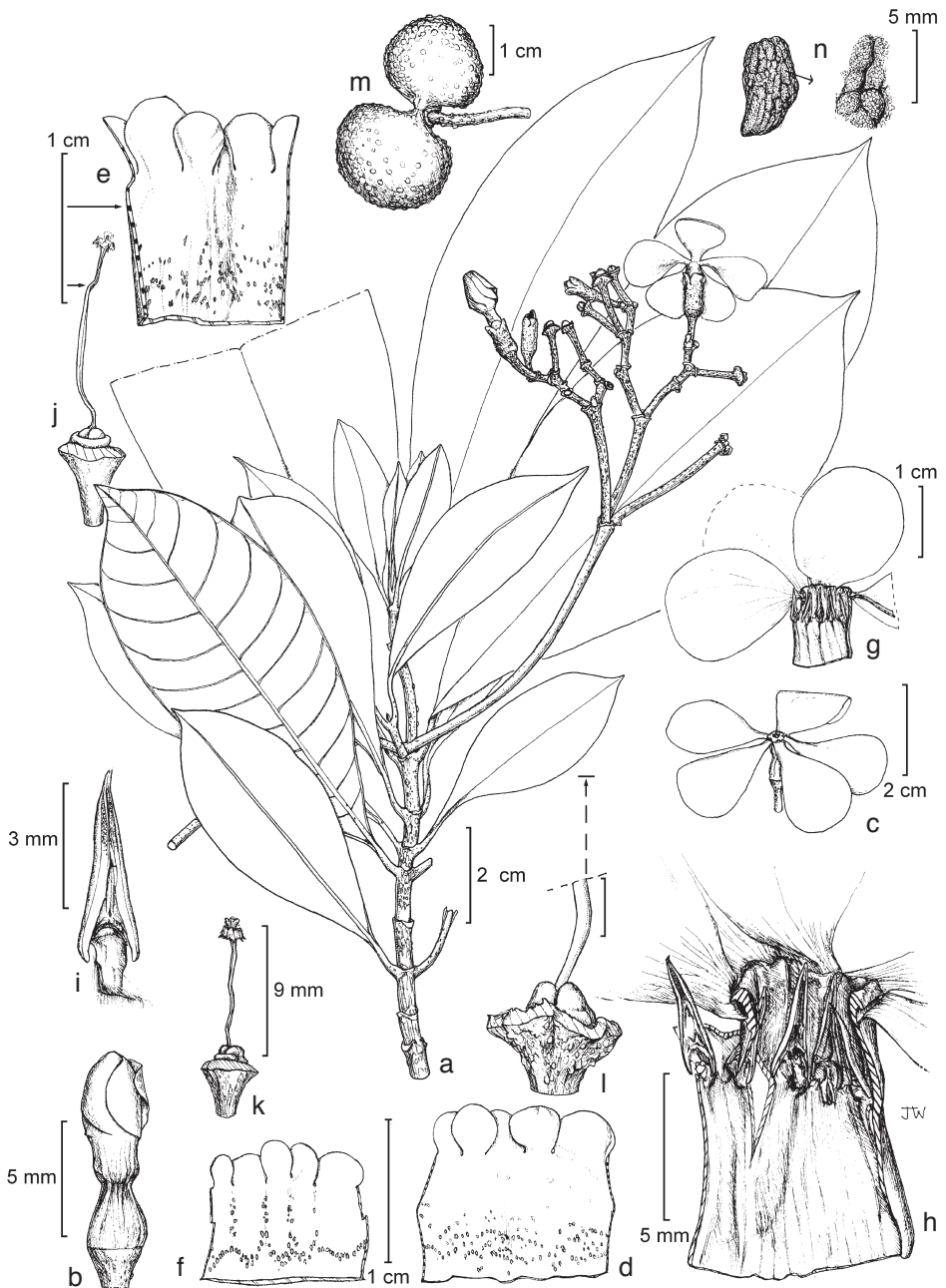


Fig. 107. *Voacanga grandifolia* (Miq.) Rolfe. a. Habit; b. flower bud without calyx tube, lateral; c. flower without calyx tube, lateral; d–f. calyx tube cut open, inner side; g. corolla tube cut open, 2 of 5 petals; h. corolla tube cut open, detail with 5 anthers; i. anther; j, k. gynoecium; l. gynoecium, not complete; m. fruits; n. seed with detail of surface (a, n: *H.B.5713* & *5716*, L; b, f, i, k: *Kaudern 58*, BO; c, d, g, l: *Koorders 16059B*, L; e, k: *Elbert 2810*, L; m: *Forman 235*, K).

form and reticulate. *Inflorescence* mostly few-flowered, sometimes many-flowered, 8–30 cm long, glabrous; peduncle 4–20 cm long; pedicels 5–30 mm long. *Flowers* poor or pleasant smelling. Calyx of a tube and erect lobes, fleshy, 10–20 by 4–12 mm, 1–3 times as long as wide; calyx tube noticeably wider than corolla tube, 7–14 mm long, 1.5–5 times as long as lobes, glabrous outside; lobes obovate to orbicular, 2.5–6 by 2.5–8 mm, 0.5–1.7 times as long as wide, apex rounded. *Corolla* white to yellowish; tube 9–24 mm long, 0.7–2 times as long as calyx, 0.5–1.3 times as long as lobes, glabrous inside and outside; lobes elliptic to obovate, 9–40 by 10–37, 0.8–1.5 times as long as wide, apex rounded to emarginate. *Stamens* inserted high in the corolla tube; anthers 3–6 by 1.2–2.5 mm. *Disk* 5-lobed, c. 1 mm high. *Ovaries* 1–2 mm high, glabrous. *Fruit* of free to united carpels (these may be present on a single tree) up to 12 by 15 by 10 cm, small when not fused, green to yellowish, with pale brown warts. *Seeds* with an orange aril, 8–13 by 4–7 by 3–6 mm. — **Fig. 107.**

Distribution — Australia (Queensland); in *Malesia*: Java, Sulawesi, Philippines (Mindanao), Lesser Sunda Islands, Moluccas, New Guinea.

Habitat & Ecology — In open forest or scrub to 1000 m altitude.

4. *Voacanga havilandii* Ridl.

Voacanga havilandii Ridl., Bull. Misc. Inform. Kew (1926) 473; Masam., Enum. Phan. Born. (1942) 625; J.A.R. Anderson, Checklist Trees Sarawak (1980) 150; Leeuwenb., Agric. Univ. Wageningen Pap. 85-3 (1985) 63; P.S. Ashton, Man. non-Dipt. Trees Sarawak (1988) 46; D.J. Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 61. — Type: *Haviland 593* (lecto K, designated by Leeuwenberg (1985) op. cit.; iso SAR), Borneo, Sarawak, Kuching.

Voacanga borneensis Markgr., Mitt. Bot. Staatssamml. München 1 (1950) 28. — Type: *Beccari 3601* (holo M), Borneo, Sarawak, near Kuching.

Small tree to 15 m tall, to 15 cm dbh. Bark pale green to whitish, lenticellate. *Branchlets* pale grey-brown with a few large lenticels, glabrous. *Leaves*: petiole 4–25 mm long, glabrous to sparsely puberulent; blade coriaceous, elliptic to obovate, 3.7–25 by 1.7–9.5 cm, 1.3–4.1 times as long as wide, base cuneate, apex acuminate to apiculate, glabrous above, densely and minutely pubescent below, 7–14 pairs of secondary veins, almost perpendicular to the midrib, anastomosing into a looped intramarginal vein. *Inflorescence* lax, many-flowered, to 35 cm long, glabrous to pubescent; peduncles 4.5–16 cm long; pedicels 1–2.4 cm long. Calyx of a tube and erect lobes, 6–12 by 4–6 mm, 1.5–2 times as long as wide; calyx tube campanulate, noticeably wider than corolla tube, 3–9.5 mm long, 0.8–6 times as long as lobes, glabrous to sparsely pubescent; lobes elliptic to orbicular, 1.5–4 by 2–5 mm, 0.6–1.3 times as long as wide, apex rounded. *Corolla* white or cream; tube 7–11 mm long, 0.6–1.2 times as long as calyx, 0.3–0.5 times as long as lobes, cylindrical, somewhat wider around the anthers; lobes elliptic to obovate, 15–24 by 7–11 mm, 2–3 times as long as wide, apex rounded, spreading or recurved. *Stamens* inserted in the upper part of corolla tube, anther apex near corolla mouth; anthers 3.5 by 1.2–1.5 mm. *Disk* annular, crenate, 0.4–0.8 mm high. *Ovaries* 1–2 mm high, glabrous. *Fruit* subglobose, 3.5–5 cm diameter. *Seeds* with an orange-red aril, 9–10 by 6–6.5 by 3.5–5 mm. — **Fig. 108.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Open forest or scrub at low altitudes.

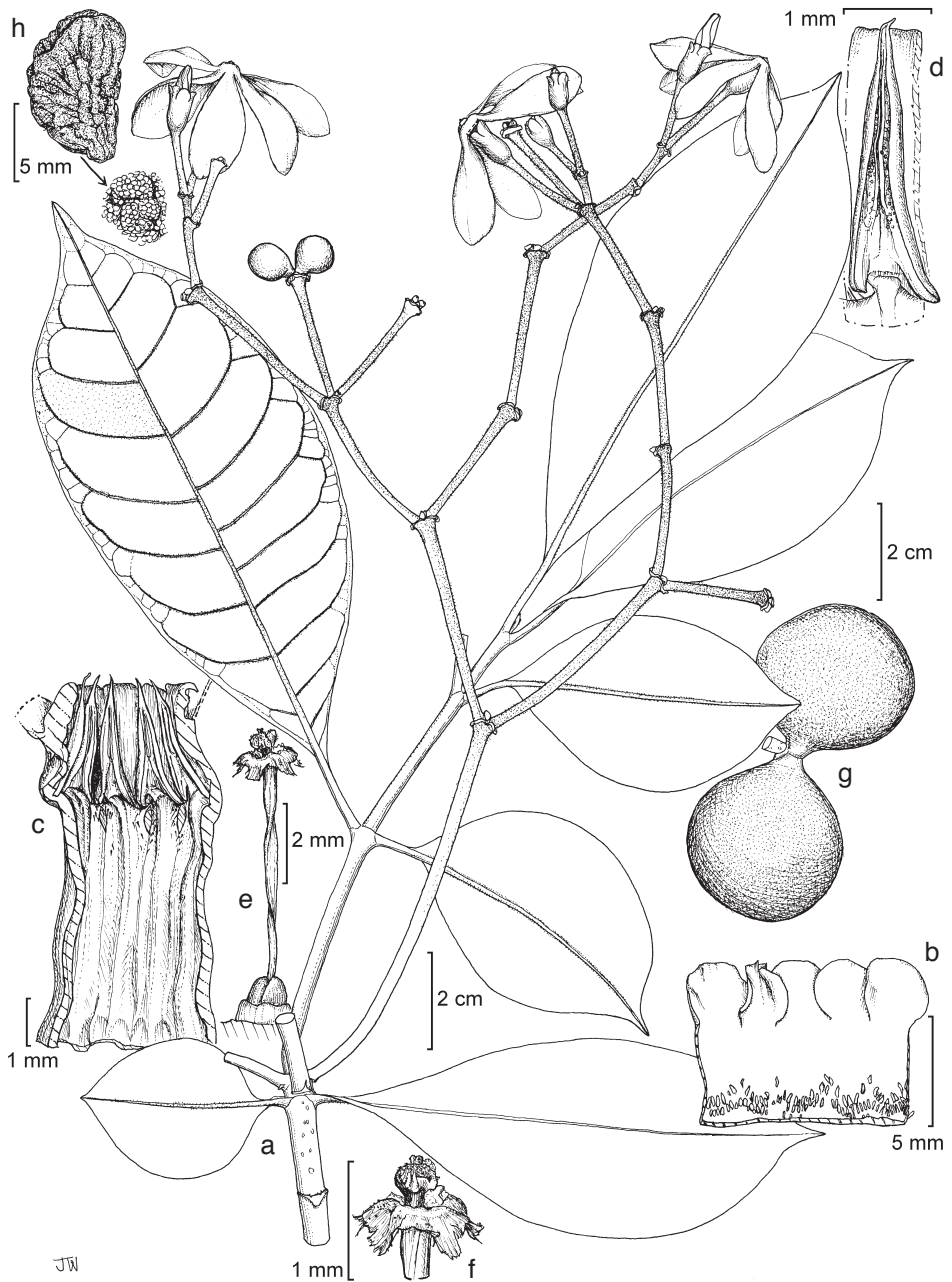


Fig. 108. *Voacanga havilandii* Ridl. a. Flowering branch; b. calyx inside; c. corolla tube inside; d. stamen; e. pistil; f. pistil head; g. fruit; h. seed with more enlarged detail of testa (a–f: *Chai & Paie* S.29303; g: *Anderson* S.25967; h: *Rena George* S.39934).

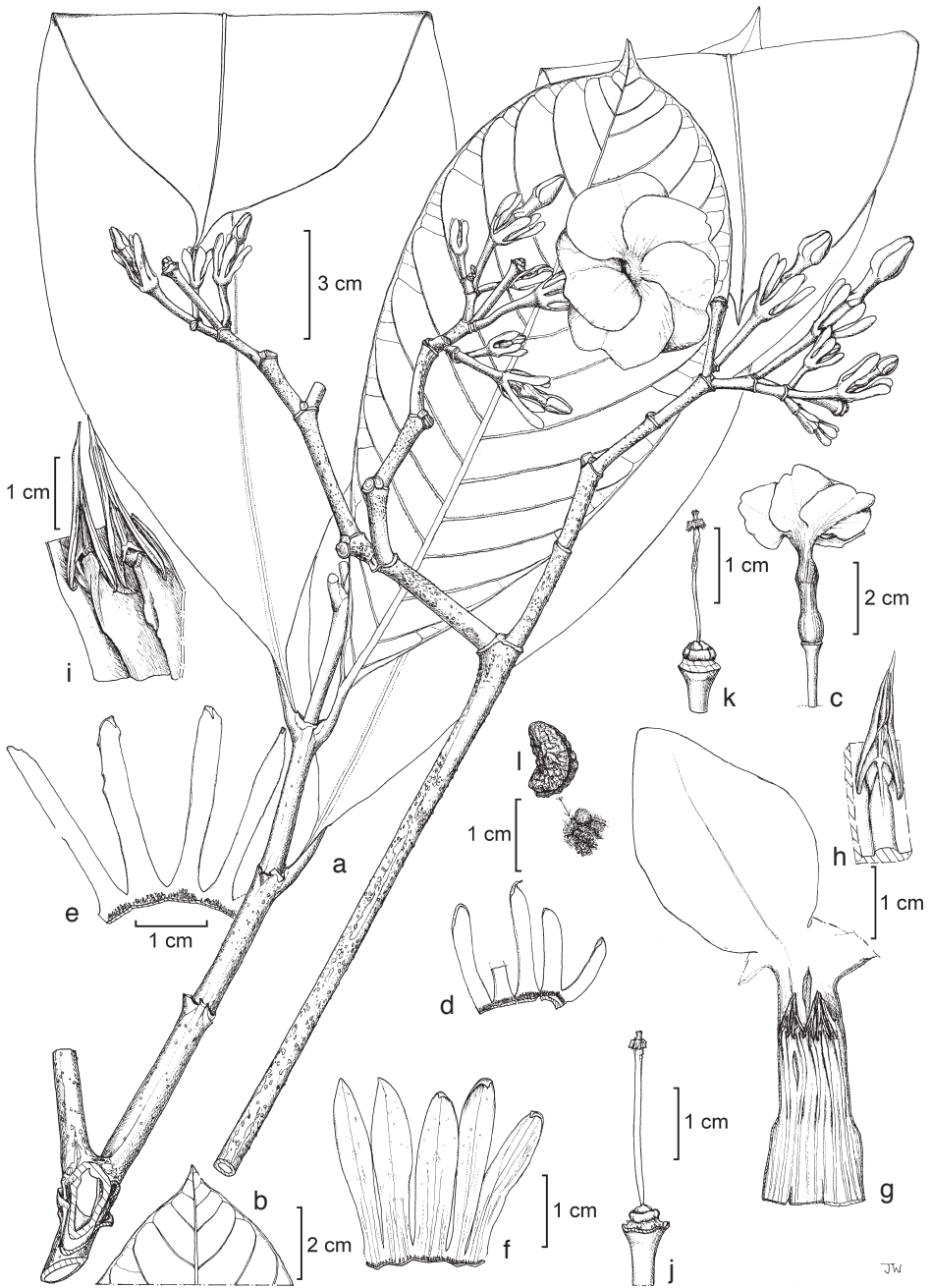


Fig. 109. *Voacanga megacarpa* Merr. a. Habit; b. leaf apex; c. flower without calyx; d–f. calyxes inside; g. partly torn corolla tube inside with incomplete lobe; h, i. stamens; j, k. pistils; l. seed with more enlarged detail of testa (a: *Mendoza PNH.18518*; b–d, k: *Hallier 10 June 1903*; e, i, l: *Elmer 15028*; f–h, j: *Ramos & Edaño BS 45424*).

5. *Voacanga megacarpa* Merr.

Voacanga megacarpa Merr., Philipp. J. Sci., Bot. 7 (1912) 336; Leeuwenb., Agric. Univ. Wageningen Pap. 85-3 (1985) 66. — Type: *Foxworthy BS 12343* (untraced). Neotype: *Whitford 829* (neo US, designated by Leeuwenberg (1985) op. cit.; iso P), Philippines, Luzon, Tayabas Prov., Binangonan.

Tree to 25 m high, to 30 cm dbh. *Branches* lenticellate; branchlets glabrous. *Leaves*: petiole 8–30 mm long, glabrous; blade obovate to elliptic, 7.2–40 by 4.5–17 cm, 1.7–3.5 times as long as wide, apex acuminate, base cuneate, glabrous above and beneath, 9–15 pairs of secondary veins, arcuate ascending near margins, tertiary venation laxly scalariform to reticulate. *Inflorescence* lax, many-flowered, 18–27(–40) cm long, glabrous; peduncle 11–14.2(–19) cm long; pedicels (6–)12–16(–22) mm long. Calyx with lobes free to base or united for up to 12.5 mm, then usually very irregularly; lobes oblong to narrowly obovate, 22–33 by 3.5–5.5 mm, 4.2–6.3 times as long as wide, apex acuminate, glabrous. *Corolla* white; tube 22–40 mm long, 1–1.3 times as long as calyx, 1–2 times as long as lobes; lobes elliptic, 16–37 by 18–37 mm, 1–1.5 times as long as wide, apex rounded to emarginate. *Stamens* inserted in the upper part of the corolla tube; anthers 5–8 by 2–2.5 mm. *Disk* annular, c. 1 mm high. *Ovaries* c. 2 mm high. *Fruit* yellow-white, paired and subglobose, only known at c. 7 cm diameter.

— **Fig. 109.**

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Secondary forest.

42. WILLUGHBEIA

Willughbeia Roxb., Pl. Coromandel 3 (1819) 77, t. 280, nom. cons.; G. Don, Gen. Hist. 4 (1837) 101; A. DC., Prodr. 8 (1844) 321; Benth. & Hook.f., Gen. Pl. 2 (1873) 691; Hook.f., Fl. Brit. India 3 (1882) 623 (as *Willoughbeia*); K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 130; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1094; Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 153; Backer & Bakh.f., Fl. Java 2 (1965) 223; D.J. Middleton, Blumea 38 (1993) 2; Coode et al., Checklist Pl. Brunei (1996) 29; D.J. Middleton, Fl. Thailand 7 (1999) 18; Tree Fl. Sabah & Sarawak 5 (2004) 6. — *Willughbeia* Roxb. subg. *Euwillughbeia* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 391. — *Pacuria* Aubl. sect. *Willughbeia* (Roxb.) Kuntze in Post & Kuntze, Lex. Gen. Phan. (1904) 412 (as *P.* sect. *Willoughbya*). — *Ancylocladus* Wall., Pl. Asiat. Rar. 3 (1832) 45; Kuntze, Revis. Gen. Pl. 1 (1891) 412; Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 94. — *Ancistrocladus* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 100, lapsu non Wall. — *Ancylocladus* Wall. sect. *Euancylocladus* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 94. — *Willughbeia* Roxb. sect. *Euancylocladus* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 54. — Type species: *Willughbeia edulis* Roxb.

Ancylocladus Wall. sect. *Hypoancylocladus* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 97. — *Willughbeia* Roxb. sect. *Hypoancylocladus* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55. — *Pacuria* Aubl. sect. *Hypoancylocladus* Kuntze in Post & Kuntze, Lex. Gen. Phan. (1904) 412. — Type species: *Ancylocladus cochinchinensis* Pierre (= *Willughbeia edulis* Roxb.).

Ancylocladus Wall. sect. *Cyclopholis* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 98. — *Willughbeia* Roxb. sect. *Cyclopholis* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55. — *Urnularia* Stapf sect. *Cyclopholis* (Pierre) Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 155. — Type species: *Ancylocladus beccarii* Pierre (= *Willughbeia flavescens* Dyer ex Hook.f.).

Urnlaria Stapf, Hooker's Icon. Pl. 28 (1901) t. 2711, nom. cons.; Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 154; Backer & Bakh.f., Fl. Java 2 (1965) 224. — *Willughbeia* Roxb. subg. *Urnlaria* (Stapf) King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 391. — *Urnlaria* Stapf sect. *Urnlaria* Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 155. — *Willughbeiopsis* Rauschert, Taxon 31 (1982) 556, nom. rejec. — Type species: *Urnlaria flavescens* (Dyer ex Hook.f.) Stapf (= *Willughbeia flavescens* Dyer ex Hook.f.).

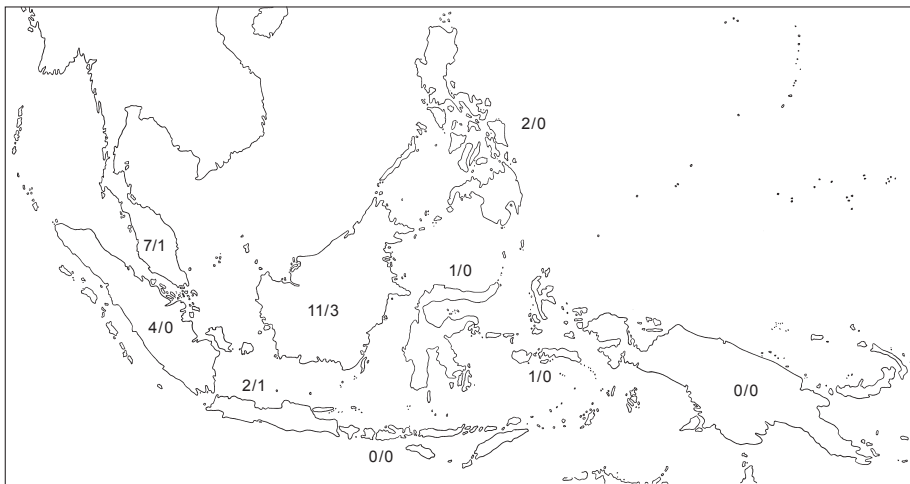
Woody climbers, producing white latex. *Branches* lenticellate, glabrous or puberulent, bearing tendrils formed from modified inflorescences. *Leaves* opposite, those of a pair equal, entire, petiolate; colleters absent from leaf axils; blade papery to coriaceous. *Inflorescence* of axillary and, rarely, terminal cymes, often very short, appearing fasciculate; axes puberulent or glabrous; bracts small, ovate or oblong. *Flowers* 5-merous, actinomorphic. *Sepals* connate at the base; lobes free and erect or slightly reflexed; colleters absent. *Corolla*: lobes in bud sinistrose forming a cone or cylinder of erect lobes; tube cylindrical, somewhat inflated around the stamens, or short and inflated; lobes spreading and ovate, elliptic or oblong. *Stamen* insertion variable, completely included within the tube, free from the style head; anthers ovate to narrowly ovate, apex acute or obtuse, base rounded. *Disk* absent. Gynoecium unilocular, with 2 parietal placentas, glabrous, superior to semi-inferior; style columnar; style head ellipsoid or cylindrical with a narrow apex, apex as long as or longer than the style head. *Fruit* brown or yellowish, a fleshy berry, spherical, ellipsoid or pear-shaped, indehiscent; few- to many-seeded. *Seeds* compressed ovoid, without a coma, smooth, with a very thin endosperm and thick horny cotyledons.

Distribution — 16 species in Indochina and western Malesia; in *Malesia* 15 species.

— **Map 11.**

Notes — 1. There is some question as to the assignment to species of sterile specimens with long narrow leaves, see Middleton (1993) op. cit.

2. Merrill wrote the names of several 'new species' on herbarium labels which he never actually published.



Map 11. Distribution of *Willughbeia* taxa in Malesia. Numbers for each region refer to total number of taxa / number of endemic taxa. The number of taxa includes species and infraspecific taxa.

KEY TO THE SPECIES

- 1a. Corolla tube > 7 mm long 2
 b. Corolla tube ≤ 7 mm long 7
 2a. Inflorescence brown pubescent; calyx lobes brown pubescent 3
 b. Inflorescence glabrous or white puberulent; calyx lobes normally glabrous . . . 6
 3a. Inflorescence axis longer than the subtending petiole; leaves dull ochre beneath when dry **2. *W. anomala***
 b. Inflorescence axis shorter or as long as the subtending petiole; leaves not dull ochre beneath when dry 4
 4a. Leaves with 1 or 2 intercalated veins parallel to the secondary veins; stamens inserted in middle of tube **12. *W. oblonga***
 b. Leaves with obscure or scalariform tertiary venation; stamens inserted below middle of tube 5
 5a. Corolla tube 28–30 mm long **11. *W. lunduensis***
 b. Corolla tube 7.5–15 mm long **15. *W. tenuiflora***
 6a. Leaves glaucous beneath; corolla tube > 9 mm long, lobes > 12 mm long **8. *W. grandiflora***
 b. Leaves not glaucous beneath; corolla tube < 9 mm long, lobes < 12 mm long **4. *W. coriacea***
 7a. Inflorescence brown puberulent 8
 b. Inflorescence glabrous or sparsely white puberulent 9
 8a. Corolla tube ≤ 3 mm long. — Java **9. *W. javanica***
 b. Corolla tube > 3 mm long. — Borneo **14. *W. sarawacensis***
 9a. Inflorescence fasciculate and dense, peduncle shorter than subtending petiole 10
 b. Inflorescence lax, peduncle longer than subtending petiole 13
 10a. Corolla tube inflated and much wider than head in bud **1. *W. angustifolia***
 b. Corolla tube inflated only around anthers, not noticeably wider than head in bud 11
 11a. Leaves with distinct intercalated veins between the secondary veins **5. *W. edulis***
 b. Leaves with indistinct venation or with veins perpendicular to secondary veins and no intercalated veins 12
 12a. Leaves thickly coriaceous, tertiary venation clearly visible perpendicular to and connected between secondary veins; calyx lobes < 1 times as long as wide **7. *W. gigantea***
 b. Leaves papery to coriaceous, tertiary venation faint or obscure; calyx lobes > 1 times as long as wide **4. *W. coriacea***
 13a. Tertiary leaf venation largely obscure; leaves glaucous beneath; corolla lobes 3–3.7 mm long **13. *W. ovatifolia***
 b. Tertiary leaf venation clearly visible; leaves not glaucous beneath; corolla lobes 1.4–2.8 mm long 14
 14a. Secondary veins in leaf almost straight with 1–3 intercalated veins between; leaves dull above and beneath **6. *W. flavescens***

- b. Secondary veins in leaf strongly ascending or, if not, then without intercalated veins and leaves shiny above. 15
- 15a. 18–30 flowers per inflorescence; leaves dull above, 1.4–2.8 times as long as wide. **3. *W. beccariana***
- b. 8–15 flowers per inflorescence; leaves shiny above, 2.3–3.8 times as long as wide. **10. *W. lanceolata***

1. *Willughbeia angustifolia* (Miq.) Markgr.

Willughbeia angustifolia (Miq.) Markgr., *Blumea* 20 (1973) 414; D.J. Middleton, *Blumea* 38 (1993) 4; I.M. Turner, *Gard. Bull. Singapore* 45 (1993) 37; Coode et al., *Checklist Pl. Brunei* (1996) 29; I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 130; D.J. Middleton, *Fl. Thailand* 7 (1999) 19; *PROSEA* 18 (2000) 133. — *Vahea angustifolia* Miq., *Fl. Ned. Ind.* 2 (1857) 394. — Type: *Diepenhorst 2088* (lecto U, designated by Middleton (1993) op. cit.; iso L), Sumatra, Priaman.

Willughbeia apiculata Miq., *Fl. Ned. Ind.*, *Eerste Bijv.* (1861) 227, 551; Boerl., *Handl. Fl. Ned. Ind.* 2 (1899) 392; *Bull. Inst. Bot. Buitenzorg* 5 (1900) 6; Hallier, *Jahrb. Hamburg Wiss. Anst.* 17, *Beih.* 3 (1900) 144; K. Heyne, *Nutt. Pl. Ned.-Ind.*, ed. 2 (1927) 1272; *Posth., Leidse Geol. Meded.* 5 (1931) 503. — Type: *Diepenhorst 2140* (lecto U, designated by Middleton (1993) op. cit.; iso L), Sumatra, Priaman.

Willughbeia rufescens Dyer ex Hook.f., *Fl. Brit. India* 3 (1882) 326; King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 398; Ridl., *Fl. Malay Penins.* 2 (1923) 325. — *Ancylodladus rufescens* (Hook.f.) Kuntze, *Revis. Gen. Pl.* 1 (1891) 412. — *Urnularia rufescens* (Hook.f.) Stapf ex S. Moore, *J. Bot.* 63, *Suppl.* (1925) 67; Markgr., *Blumea* 20 (1973) 409; I.M. Turner, *Gard. Bull. Singapore* 45 (1993) 37. — *Willughbeia flavescens* Dyer ex Hook.f. var. *rufescens* Ridl., *Fl. Malay Penins.* 2 (1923) 325. — *Willughbeioopsis rufescens* (Hook.f.) Rauschert, *Taxon* 31 (1982) 556. — Type: *Maingay 1092* (lecto K, designated by Middleton (1993) op. cit.; iso K), Peninsular Malaysia.

Chilocarpus brachyanthus Pierre, *Bull. Mens. Soc. Linn. Paris sér.* 2, 1 (1898) 101. — Type: *Beccari 307* (lecto P, designated here; iso M, NY, S), Borneo, Sarawak.

Willughbeia elmeri Merr., *Univ. Calif. Publ. Bot.* 15 (1929) 253; Tsiang, *Sunyatsenia* 2 (1934) 94; Masam., *Enum. Phan. Born.* (1942) 626; Markgr., *Blumea* 20 (1973) 414. — Type: *Elmer 21038* (lecto BM, designated by Middleton (1993) op. cit.; iso A, BR, G, GH, K, L, M, MICH, MO, NY, P, S, SING, U, Z), Borneo, Sabah, Tawao.

Willughbeia angustifolia (Miq.) Markgr. var. *gracilior* Markgr., *Blumea* 20 (1973) 414. — Type: *Endert 3562* (lecto L, designated by Middleton (1993) op. cit.; iso A, BO, K), Borneo, W Koetai.

Melodinus baueri auct. non Endl.: Leeuwenb., *Syst. Geogr. Pl.* 73 (2003) 19, p.p.

Melodinus orientalis auct. non Blume: Leeuwenb., *Syst. Geogr. Pl.* 73 (2003) 42, p.p.

Woody climber to 60 m. *Branchlets* glabrous, very rarely minutely puberulent; lenticellate. *Leaves*: petiole 0.4–1.7 cm long; blade elliptic, ovate or oblong, 2.6–20.5 by 0.9–7 cm, 1.5–4.2 times as long as wide, apex obtuse to acuminate, base rounded to cuneate, subcoriaceous to thickly coriaceous, glabrous, 9–24 pairs of secondary veins at 60–85°, reaching margin or anastomosing shortly before it, tertiary venation of 1, rarely to 3, intercalated veins and then with further reticulate venation or almost obscure. *Inflorescence* axillary, rarely up to 3 in one leaf axil; axis shorter or as long as subtending petiole, to 1.7 cm long; axes glabrous; 5–19 flowers per inflorescence; pedicel 0.8–3.7 mm long. *Sepals* ovate, 0.9–1.8 mm long, lobes 0.5–1 by 0.4–0.7 mm, 1–2.5 times as long as wide, apex obtuse to acuminate, glabrous, ciliate. *Corolla* white or greenish; tube inflated, 1.2–3 by 0.9–1.2 mm, 2–2.7 times as long as calyx, 0.6–1.2 times as long as lobes, glabrous outside and inside; lobes 1.5–4.5 by 0.6–1.3

mm, 2.5–3.3 times as long as wide, oblong or elliptic, apex rounded to obtuse, glabrous outside and inside. *Stamens* inserted at 0.6–1.7 mm from corolla base which is 0.4–0.63 of tube length; filaments 0.3–0.6 mm long; anthers 0.4–0.9 by 0.3–0.5 mm. *Ovary* 0.5–0.8 mm high; style 0.3–0.5 mm long, not impressed on ovary; style head 0.1–0.2 mm long, apex 0.1–0.2 mm long. *Fruit* globose to ovoid, 1.9–14 by 1.9–14 cm, pale green, yellow, orange or reddish. *Seeds* 1.2–2.4 by 0.6–1.4 by 0.6–1.1 cm.

Distribution — India (Nicobar Islands), Southern Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Moluccas (Buru).

Uses — Produces a poor quality rubber. The stems can be used for binding and the fruits are edible. The latex can also be used to treat ulcers.

Note — This species is very variable in leaf shape, size and venation. It can readily be distinguished from the other species of *Willughbeia* by its combination of a small inflated corolla tube and short delicate inflorescence.

2. *Willughbeia anomala* Markgr.

Willughbeia anomala Markgr., *Blumea* 20 (1973) 415; D.J. Middleton, *Blumea* 38 (1993) 6; Coode et al., Checklist Pl. Brunei (1996) 29. — Type: *Wood, Smythies & P.S. Ashton SAN.17525* (holo L; iso BO, BRI, BRUN, K, KEP, SING), Brunei, Kuala Belait, Andalau Forest Reserve.

Woody climber to 20 m. *Branchlets* glabrous or sparsely rufous pubescent; branches lenticellate. *Leaves*: petiole 0.7–1.6 cm long; blade elliptic oblong, 6–19.5 by 2.1–4.9 cm, 2.6–4.2 times as long as wide, apex acuminate, base cuneate, papery to subcoriaceous, glabrous or with a few brown hairs on midrib beneath, dull ochre beneath when dry, 12–23 pairs of secondary veins at 55–80°, reaching margin, tertiary venation faint and perpendicular to secondary veins, occasionally with 1 intercalated vein. *Inflorescence* axillary and terminal, axis longer than subtending petiole, to 4 cm long; 4–19 flowers per inflorescence; axes rufous pubescent; pedicels 1.7–3.8 mm long. *Sepals* ovate, thick, 1–1.4 mm long, lobes 0.5–0.7 by 0.3–1 mm, 0.6–2 times as long as wide, apex rounded, rufous pubescent, ciliate. *Corolla* tube cylindrical, 10–14 mm long, c. 10 times as long as calyx, rufous puberulent in 5 rows down tube or glabrous, pubescent in throat; lobes 6–8.2 mm long, oblong or elliptic, ciliate or not. *Stamens* inserted at 1.1–1.7 mm from corolla base which is 0.11–0.14 of tube length; filaments 0.4–0.8 mm long; anthers 1.3–1.4 by 0.5 mm. *Ovary* 0.6–0.9 mm; style 0.1–0.2 mm long, impressed on ovary; style head 0.3–0.4 mm long, apex 0.5–0.6 mm long. *Fruit* spherical, 6.6–8 cm diameter. *Seeds* c. 2.6 by 1.5 by 1.3 cm.

Distribution — *Malesia*: Borneo, Philippines (Mindanao).

3. *Willughbeia beccariana* (Kuntze ex Pierre) K. Schum.

Willughbeia beccariana (Kuntze ex Pierre) K. Schum. in Engl. & Prantl, *Nat. Pflanzenfam. Nachr.* 2 (1900) 55; D.J. Middleton, *Blumea* 38 (1993) 7; Coode et al., Checklist Pl. Brunei (1996) 29. — *Ancylocladus beccarianus* Kuntze [Revis. Gen. Pl. 1 (1891) 412, nom. nud.] ex Pierre, *Bull. Mens. Soc. Linn. Paris sér. 2*, 1 (1898) 98. — *Urnularia beccariana* (Kuntze ex Pierre) Stapf, *Hooker's Icon. Pl.* 28 (1901) t. 2711 (1); Merr., *Bibliogr. Enum. Born. Pl.* (1921) 497; Masam., *Enum. Phan. Born.* (1942) 625; Markgr., *Blumea* 20 (1973) 409. — *Willughbeioipsis beccariana* (Kuntze ex Pierre) Rauschert, *Taxon* 31 (1982) 556. — Type: *Beccari 3764* (lecto K, designated by Middleton (1993) op. cit.; iso FI, P), Borneo, Sarawak.

Woody climber to 35 m. *Branchlets* glabrous; densely lenticellate. *Leaves*: petiole 0.8–2.4 cm long; blade broadly elliptic, 7.7–18.5 by 2.5–8.7 cm, 1.4–2.8 times as long as wide, apex short acuminate, base cuneate to rounded, subcoriaceous to coriaceous, dull above and beneath, glabrous above and beneath, 8–15 pairs of clearly visible secondary veins at 40–70°, reaching margin, tertiary venation almost perpendicular to the midrib, oblique to the secondary veins, several in each space. *Inflorescence* axillary, sometimes 2 in an axil; axis longer than the subtending petiole, to 5 cm long; 18–30 flowers per inflorescence; axes glabrous or sparsely and minutely puberulent; pedicel 1.4–5.5 mm long. *Sepals* ovate, 1–2 mm long, lobes 0.6–1 by 0.9–1 mm, 0.7–1 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* tube inflated, 1.8–2.8 mm long, glabrous outside and inside; lobes 2–2.8 mm long, ovate, apex obtuse, glabrous. *Stamens* inserted at 1.3–2.2 mm from corolla base which is 0.57–0.71 of tube length; filaments 0.3–0.9 mm long; anthers 0.7–0.9 by 0.3–0.5 mm. *Ovary* 0.9–1.1 mm long; style 0.5–0.9 mm long, not impressed on ovary; style head 0.1 mm long, inconspicuous, apex 0.1–0.2 mm long. *Fruit* spherical, 3–11.2 by 2.2–9.5 cm, green, yellow or orange. *Seeds* 1.1–1.7 by 0.7–1.1 by 0.6–0.7 cm.

Distribution — *Malesia*: Sumatra (identity uncertain), Borneo, Sulawesi.

Note — Only one collection is known from Sumatra, in Aceh, and this collection is in fruit. It has been provisionally identified as *W. beccariana* but the discovery of flowering material may change this conclusion.

4. *Willughbeia coriacea* Wall.

Willughbeia coriacea Wall., Pl. Asiat. Rar. 3 (1832) 45; G. Don, Gen. Hist. 4 (1837) 102; A. DC., Prodr. 8 (1844) 321; Miq., Fl. Ned. Ind. 2 (1857) 391; Hook. f., Fl. Brit. India 3 (1882) 623; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 82; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 393; Ridl., Fl. Malay Penins. 2 (1923) 323; Burkill & M. R. Hend., Gard. Bull. Straits Settlements. 3 (1925) 395; Tsiang, Sunyatsenia 2 (1934) 93; Markgr., Blumea 20 (1973) 412; D. J. Middleton, Blumea 38 (1993) 8; I. M. Turner, Gard. Bull. Singapore 45 (1993) 37; Coode et al., Checklist Pl. Brunei (1996) 29; D. J. Middleton, Fl. Thailand 7 (1999) 19; PROSEA 18 (2000) 133. — *Ancylodadus coriaceus* (Wall.) Kuntze, Revis. Gen. Pl. 1 (1891) 412. — Type: *Wallich 1620* (holo K-W), Singapore.

Willughbeia firma Blume, Mus. Bot. 1 (1850) 154; Miq., Fl. Ned. Ind. 2 (1857) 390; Hook. f., Fl. Brit. India 3 (1882) 624; Stapf, Trans. Linn. Soc. London, Bot. 4 (1894) 207; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 82; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 4; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 394; Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 129; Hallier, Bot. Jahrb. Syst. 49 (1913) 371; Merr., Bibliogr. Enum. Born. Pl. (1921) 496; Ridl., Fl. Malay Penins. 2 (1923) 323; Burkill & M. R. Hend., Gard. Bull. Straits Settlements. 3 (1925) 395; Tsiang, Sunyatsenia 2 (1934) 93; Kerr in Craib, Fl. Siam. 2 (1939) 424; Masam., Enum. Phan. Born. (1942) 626; Backer & Bakh. f., Fl. Java 2 (1965) 224. — *Ancylodadus firmus* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 412. — Type: *Korthals 1042* (holo L), Sumatra.

Willughbeia firma Blume var. *oblongifolia* Blume, Mus. Bot. 1 (1850) 154. — Type: *Korthals s.n.* (holo L), Sumatra.

Willughbeia burbridgei Dyer, Kew Gardens Report (1880) 44. — Type: *Treacher s.n.* (holo K), Borneo, Sarawak, Lawas River, Menoongan.

Ancylodadus minutiflorus Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 95. — *Willughbeia minutiflora* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55; Merr., Bibliogr. Enum. Born. Pl. (1921) 496; Masam., Enum. Phan. Born. (1942) 626. — Type: *Beccari 4030* (lecto K, designated by Middleton (1993) op. cit.; iso FI, P), Borneo, Sarawak.

Ancylodadus vriesianus Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 95. — *Willughbeia vriesiana* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55; Merr., Bibliogr.

Enum. Born. Pl. (1921) 496; Masam., Enum. Phan. Born. (1942) 627. — Type: *De Vriese s.n.* (lecto L, designated by Middleton (1993) op. cit.; iso P), Sumatra.

Ancylocladus nodosus Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 96. — *Willughbeia nodosa* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55. — Type: *Beccari 1530* (lecto K, designated by Middleton (1993) op. cit.; iso FI, M, P), Borneo, Sarawak.

Willughbeia firma Blume var. *macrophylla* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 4; Merr., Bibliogr. Enum. Born. Pl. (1921) 496; Masam., Enum. Phan. Born. (1942) 626. — Type: *Van Romburgh 54* (holo BO; iso A; photo TCD), Borneo, Kalimantan, Oetan Angka riboh.

Willughbeia firma Blume var. *obtusifolia* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 4; Merr., Bibliogr. Enum. Born. Pl. (1921) 496. — Type: *Van Romburgh 48* (untraced), Borneo, Kalimantan, Moera Teweh.

Willughbeia firma Blume var. *platyphylla* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 4; Merr., Bibliogr. Enum. Born. Pl. (1921) 496. — Type: *Van Romburgh 9* (lecto BO, designated by Middleton (1993) op. cit.; iso BO; photo A, TCD), Borneo, Kalimantan, Pangkalan Lokan.

Large climber to 30 m. *Branches* mostly glabrous, very rarely puberulent; lenticellate. *Leaves*: petiole 0.6–4 cm long; blade elliptic, ovate, oblong or obovate, 3.3–29.5 by 1.4–13.2 cm, 1.6–5.2 times as long as wide, apex shortly acuminate to acute, base cuneate to rounded, papery to coriaceous, shiny above and beneath, mostly glabrous, very rarely puberulent on midrib beneath, 6–20 pairs of secondary veins at 50–80°, curving towards but not reaching margin, tertiary venation mostly obscure, sometimes faint and then perpendicular to the secondary veins. *Inflorescence* axillary, very rarely terminal; axis usually shorter than the subtending petiole, very rarely longer, to 3 cm long; 3–25 flowers per inflorescence; axes mostly glabrous, rarely minutely and sparsely puberulent; pedicel 0–5.3 cm long. *Sepals* oblong or ovate, 1.5–4 mm long, lobes 0.8–3.3 by 0.6–1.9 mm, 1.1–2.5 times as long as wide, apex rounded to acute, glabrous, ciliate. *Corolla* white or yellow, rarely tinged with red; tube cylindrical, 2.5–8 by 1.2–1.4 mm, 1.5–4.6 times as long as calyx, 0.6–1.2 times as long as lobes, outside glabrous, inside puberulent; lobes 4–10 by 0.9–1.5 mm, 2.9–10 times as long as wide, oblong, apex rounded, ciliate or not. *Stamens* inserted at 1.5–2.7 mm from corolla base which is 0.31–0.51 of tube length; filaments 0.4–0.7 mm long; anthers 0.8–1.2 by 0.2–0.5 mm. *Ovary* 0.3–1.1 mm long; style 0.4–1.1 mm long, not impressed on ovary; style head 0.2–0.5 mm long, apex 0.3–0.9 mm long. *Fruit* spherical, pear-shaped, oblong or ellipsoid, 2.6–12 by 1.7–7 cm, green, yellow or orange. *Seeds* 1.3–1.8 by 0.7–1.3 by 0.7–1.1 cm.

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

Habitat & Ecology — Climber in primary or secondary forest to 1600 m.

Uses — Before the introduction of *Hevea brasiliensis* as the main source of rubber *W. coriacea* was cultivated in plantations to produce a high quality rubber. The latex and dried powdered fruit are used to treat ulcers and the bark is used to treat headaches and to stop bleeding. A decoction of the root is used against dysentery. The fruit is edible.

5. *Willughbeia edulis* Roxb.

Willughbeia edulis Roxb., Pl. Coromandel 3 (1819) 77, pl. 280; Blume, Bijdr. (1826) 1024; Roxb., Fl. Ind. 2 (1832) 57; Wall., Pl. Asiat. Rar. 3 (1832) 45; G. Don, Gen. Hist. 4 (1837) 101; A.DC., Prodr.

- 8 (1844) 321; Miq., Fl. Ned. Ind. 2 (1857) 391; Kurz, J. Asiat. Soc. Bengal 46 (1877) 249; Forest Fl. Burma 2 (1877) 165; Hook.f., Fl. Brit. India 3 (1882) 623; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 392; Merr., Bibliogr. Enum. Born. Pl. (1921) 496; Ridl., Fl. Malay Penins. 2 (1923) 323; Burkill & M.R. Hend., Gard. Bull. Straits Settlem. 3 (1925) 395; Kerr in Craib, Fl. Siam. 2 (1939) 423; Masam., Enum. Phan. Born. (1942) 626; Backer & Bakh.f., Fl. Java 2 (1965) 224; Rao, J. Econ. Taxon. Bot. 6, 3 (1985) 725; M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 56; D.J. Middleton, Blumea 38 (1993) 11; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 130; D.J. Middleton, Fl. Thailand 7 (1999) 20; PROSEA 18 (2000) 134. — *Ambelania edulis* (Roxb.) J. Presl, Wšobecný. Rostl. 2 (1846) 1065. — *Ancylocladus edulis* (Roxb.) Kuntze, Revis. Gen. Pl. 1 (1891) 412; Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 94. — Type: Plate 280 in Roxb., Pl. Coromandel (1819) 3. This is a drawing of a plant from Chittagong in Bangladesh.
- Pacouria gudara* Buch.-Ham. ex Wall., Cat. (1829) 4465, nom. nud. — *Willughbeia gudara* Steud., Nomencl. Bot. 2 (1841) 787, nom. nud. — *Palicouria gudara* Steud., Nomencl. Bot. 2 (1841) 787, in syn. lapsu. — Based on: *Wallich 4465* (K-W).
- Willughbeia martabanica* Wall., Pl. Asiat. Rar. 3 (1832) 45, t. 2722; G. Don, Gen. Hist. 4 (1837) 102; A.DC., Prodr. 8 (1844) 321; Kurz, J. Asiat. Soc. Bengal 46 (1877) 249; Forest Fl. Burma 2 (1877) 165; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 395; Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 129. — Type: *Wallich 1619* (lecto K-W, designated by Middleton (1993) op. cit.; iso BM, G-DC, K, K-W), Burma, Martaban.
- Pacouria roxburghii* Kostel., Allg. Med.-Pharm. Fl. 3 (1834) 1070. — Type: Untraced.
- Willughbeia dulcis* Ridl., Trans. Linn. Soc. London, Bot. 3 (1893) 319; Fl. Malay Penins. 2 (1923) 325; Kerr in Craib, Fl. Siam. 2 (1939) 423; Markgr., Blumea 20 (1973) 414; I.M. Turner, Gard. Bull. Singapore 45 (1993) 37. — Type: *Ridley 1022* (holo SING), Peninsular Malaysia, Pahang, Pekan.
- Ancylocladus cochinchinensis* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 97. — *Willughbeia cochinchinensis* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1094; Kerr in Craib, Fl. Siam. 2 (1939) 423; Lý, Feddes Repert. 97 (1986) 420. — Type: *Pierre 138* p.p. (lecto HM, designated by Lý (1986) op. cit.; iso A, BR, L, MICH, MO, NY, P, SING, US), Vietnam, Dong Nai, Baria, Ninh Mts.
- Ancylocladus curtisianus* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 97. — *Willughbeia curtisiana* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55. — Type: *Curtis s.n.* (holo P), Peninsular Malaysia, Penang.
- Melodinus orientalis* auct. non Blume: Leeuwenb., Syst. Geogr. Pl. 73 (2003) 42, p.p.

Woody climber. *Branches* glabrous, lenticellate. *Leaves*: petiole 0.6–1.9 cm long; 3.2–25 by 1.2–11.5 cm, blade elliptic or oblong, 1.3–5 times as long as wide, apex acuminate to rounded, base cuneate to rounded, papery or subcoriaceous; glabrous, 9–28 pairs of secondary veins at 50–80°, usually reaching margin, tertiary venation reticulate or with 1 intercalated vein. *Inflorescence* axillary, sometimes 2 in a single leaf axis, axis mostly shorter than subtending petiole, to 2.8 cm long; 3–12 flowers per inflorescence; axes puberulent at least in upper parts; pedicels 0.5–3 mm long. *Sepals* ovate, 1.8–2.7 mm long, lobes 1.1–1.9 by 0.8–1.7 mm, 0.7–2 times as long as wide, apex rounded, rarely acute or obtuse, glabrous, ciliate. *Corolla* tube cylindrical, 3.8–6.5 by 1.5–1.9 mm, 0.4–0.7 times as long as lobes, 1.6–2.4 times as long as calyx, outside glabrous, inside puberulent; lobes oblong, 4.5–15 by 1.3–2.5 mm, 3.5–6 times as long as wide, ciliate or not. *Stamens* inserted at 1.9–3.3 mm from corolla base which is 0.35–0.73 of tube length; filaments 0.4–0.7 mm long; anthers 1–1.4 by 0.3–0.6 mm. *Ovary* 0.6–1.4 mm long; style 0.6–1.7 mm long, not impressed on ovary; style head 0.2–0.4 mm long, apex 0.6–0.9 mm long. *Fruit* spherical or oval, 1.7–5.8 by 1.2–5.8 cm, yellow or orange. *Seeds* 6–16 by 4–13 by 3–6 mm. — **Fig. 110.**

Distribution — India (incl. Nicobar Islands), Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam; in *Malesia*: Peninsular Malaysia, Singapore.

Uses — Previously exploited for a poor quality rubber before the widespread use of *Hevea brasiliensis*. The fruit is edible.

Note — Masamune (1942) reported this species from Borneo but I have seen no material from there.

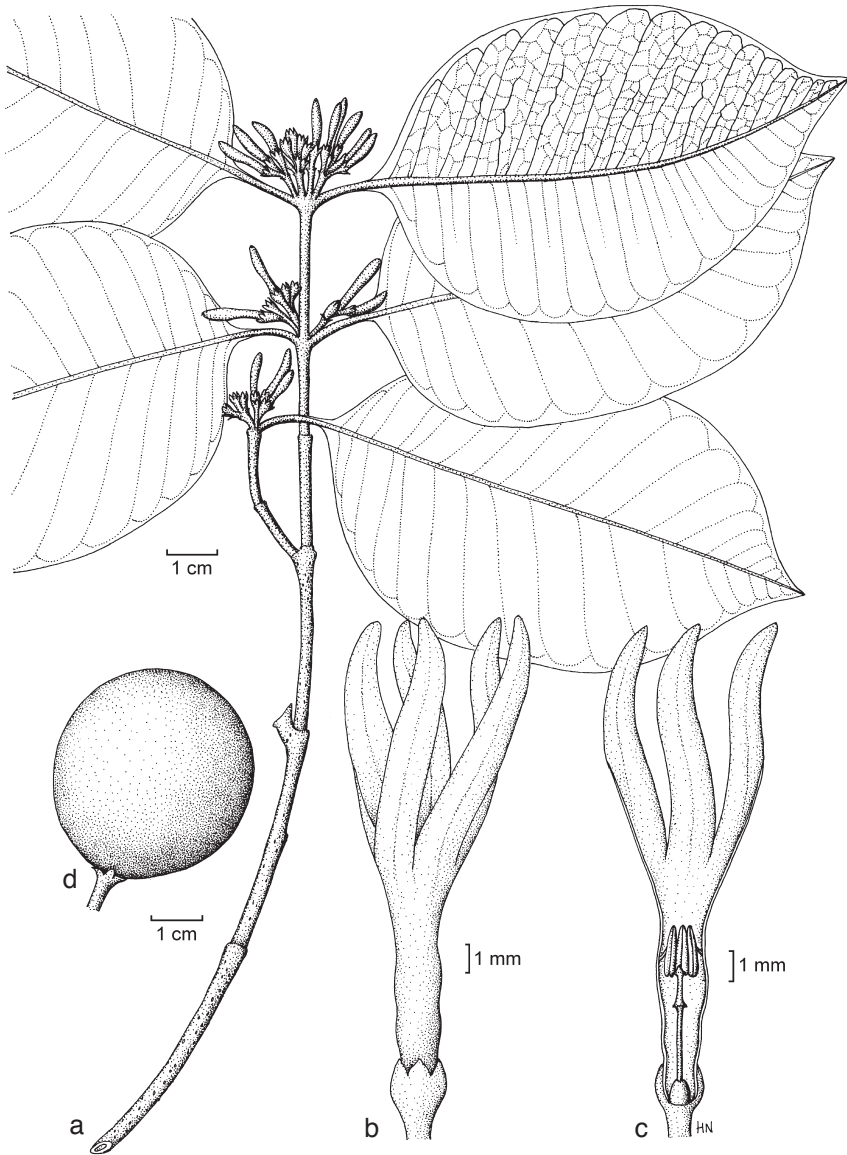


Fig. 110. *Willughbeia edulis* Roxb. a. Habit; b. flower; c. dissected flower; d. fruit (a–c: Van Beusekom 437; d: Kerr 6894).

6. *Willughbeia flavescens* Dyer ex Hook.f.

Willughbeia flavescens Dyer ex Hook.f., Fl. Brit. India 3 (1882) 625; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 83; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 397; Ridl., Fl. Malay Penins. 2 (1923) 325; D.J. Middleton, Blumea 38 (1993) 12; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 130; PROSEA 18 (2000) 134. — *Chilocarpus flavescens* Dyer, Kew Gardens Report (1880) 47, nom. nud. — *Ancylocladus flavescens* Kuntze, Revis. Gen. Pl. 1 (1891) 412. — *Urnularia flavescens* (Hook.f.) Stapf, Hooker’s Icon. Pl. 28 (1901) t. 2711: 2; Whitmore, Tree Fl. Malaya 2 (1973) 5; I.M. Turner, Gard. Bull. Singapore 45 (1993) 37. — *Willughbeiospis flavescens* (Hook.f.) Rauschert, Taxon 31 (1982) 556. — Type: *Murton 120* (lecto K, designated by Middleton (1993) op. cit.; iso A, K), Singapore, near Botanic Gardens.

Ancylocladus beccarii Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 98. — *Melodinus beccarii* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 98 (in synonymy). — *Willughbeia beccarii* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 625. — *Urnularia oblongifolia* Stapf, Hooker’s Icon. Pl. 28 (1901) t. 2711: 2; Merr., Bibliogr. Enum. Born. Pl. (1921) 497; Masam., Enum. Phan. Born. (1942) 625. — *Willughbeia stapfii* Merr., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 29; Masam., Enum. Phan. Born. (1942) 627. — *Urnularia beccarii* (Pierre) Markgr., Blumea 20 (1973) 409. — *Willughbeiospis beccarii* (Pierre) Rauschert, Taxon 31 (1982) 556. — Type: *Beccari 2272* (lecto K, designated by Middleton (1993) op. cit.; iso FI, G, M, P), Borneo, Sarawak.

Melodinus cymosus Ridl., J. Fed. Malay States Mus. 10 (1920) 146; Fl. Malay Penins. 2 (1923) 331. — Type: *Burkill 789* (lecto K, designated by Middleton (1993) op. cit.; iso SING), Peninsular Malaysia, Malacca, Selandar Forest.

Climber to 30 m. *Branches* glabrous or, more rarely, sparsely and minutely puberulent; lenticellate. *Leaves*: petiole 0.6–1.8 cm long; blade elliptic to oblong, 3.9–16.5 by 1.9–6.2 cm, 1.8–3.3 times as long as wide, apex acuminate to subcaudate, base rounded to cuneate, subcoriaceous or coriaceous, dull above and beneath, glabrous, 13–30 pairs of secondary veins at 70–80°, not clearly distinct from the 1–3 intercalated parallel veins. *Inflorescence* axillary; axis longer than subtending petiole, to 5.3 cm long; 11–17 flowers per inflorescence; axes mostly glabrous, rarely sparsely and minutely puberulent; pedicels 0.8–5 mm long. *Sepals* ovate, 0.8–1.7 mm long, lobes 0.7–1.3 by 0.7–1.2 mm, 0.7–1.7 times as long as wide, apex rounded or obtuse, glabrous, ciliate. *Corolla* yellow or yellow becoming red; tube inflated, 1.7–3.5 mm long, outside and inside glabrous; lobes 1.4–2.8 mm long, ovate or elliptic. *Stamens* inserted at 1.3–2.5 mm from corolla base which is 0.54–0.69 of tube length; filaments 0.3–1 mm long; anthers 0.5–0.7 by 0.3–0.5 mm. *Ovary* 0.6–1.1 mm long; style 0.7–1.1 mm long, not impressed on ovary; style head 0.1 mm long, indistinct, apex 0.2–0.3 mm long. *Fruit* spherical, 2.5–5 cm diameter. *Seeds* oval 2.2 by 1.7 by 0.9 mm.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo.

Uses — Previously exploited for rubber before the widespread use of *Hevea brasiliensis*.

7. *Willughbeia gigantea* (Boerl.) Markgr.

Willughbeia gigantea (Boerl.) Markgr., Blumea 20 (1973) 413; D.J. Middleton, Blumea 38 (1993) 13; Coode et al., Checklist Pl. Brunei (1996) 29. — *Leuconotis gigantea* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 8; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 621. — Type: *Van Romburgh 79* (holo BO; photo A, TCD), Borneo, Kalimantan.

Leuconotis gigantea Boerl. var. *crassifolia* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 8; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 621. — Type: *Van Romburgh 53* (holo BO; photo A, TCD), Borneo, Kalimantan, Biang.

Leuconotis gigantea Boerl. var. *ovalis* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 8; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 621. — Type: *Van Romburgh 34* (lecto L, designated by Middleton (1993) op. cit.; iso BO; photo A, TCD), Borneo, Kalimantan, Kophiang.

Large woody climber to 30 m. *Branches* glabrous, lenticellate. *Leaves*: petiole 1.8–5 cm long; blade ovate, elliptic or obovate, 10.5–42 by 6.6–24 cm, 1.6–2.1 times as long as wide, apex short acuminate to rounded, base obtuse to rounded, thickly coriaceous, brown velvety or smooth beneath, 7–15 pairs of secondary veins at 50–70°, ascending to and reaching margin, tertiary venation almost perpendicular and connecting between secondary veins. *Inflorescence* axillary; peduncle shorter than subtending petiole, robust, 1.5–5.5 cm long; 12–25 flowers per inflorescence; axes glabrous or puberulent; pedicel 2–5 mm long. *Sepals* ovate, very thick, 1.5–2 mm long, lobes 1–2 by 1.5–2 mm, 0.7–1 times as long as wide, apex rounded, glabrous or weakly puberulent, weakly ciliate. *Corolla* yellowish white; tube cylindrical, 3–6.5 mm long, outside glabrous, inside puberulent; lobes 4–11 mm long, oblong, glabrous or ciliate. *Stamens* inserted at c. 2.1 mm from corolla base which is 0.42 of tube length; filaments c. 0.8 mm long; anthers c. 1.6 by 0.6 mm. *Ovary* c. 0.7 mm; style c. 0.5 mm long, not impressed on ovary; style head c. 0.5 mm long, apex 0.6 mm long. *Fruit* ovoid, 8–10 by 6–7 cm. *Seeds* c. 5.5 by 4 cm.

Distribution — *Malesia*: Sumatra, Borneo.

Habitat & Ecology — Reported from primary and secondary forest.

8. *Willughbeia grandiflora* Dyer ex Hook.f.

Willughbeia grandiflora Dyer ex Hook.f., Fl. Brit. India 3 (1882) 625; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 83; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 392; Merr., Bibliogr. Enum. Born. Pl. (1921) 496; Ridl., Fl. Malay Penins. 2 (1923) 322; Tsiang, Sunyatsenia 2 (1934) 94; Masam., Enum. Phan. Born. (1942) 626; Markgr., Blumea 20 (1973) 411; D.J. Middleton, Blumea 38 (1993) 14; I.M. Turner, Gard. Bull. Singapore 45 (1993) 37; Coode et al., Checklist Pl. Brunei (1996) 29; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 131; D.J. Middleton, Fl. Thailand 7 (1999) 22; PROSEA 18 (2000) 134. — *Ancylocladus grandiflorus* (Hook.f.) Kuntze, Revis. Gen. Pl. 1 (1891) 412. — Type: *Maingay 1047* (lecto L, designated by Middleton (1993) op. cit.; iso K), Peninsular Malaysia.

Ancylocladus glaucinus Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 98. — *Willughbeia glaucina* (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55. — Type: *Beccari 3335* (lecto K, designated by Middleton (1993) op. cit.; iso A, FI, P), Borneo, Sarawak.

Large woody climber to 40 m. *Branchlets* usually minutely and sparsely puberulent, more rarely glabrous; branches lenticellate. *Leaves*: petiole 1–3.1 cm long; blade elliptic to obovate, 3.7–16 by 2.1–8.7 cm, 1.4–2.5 times as long as wide, apex short acuminate to rounded, base rounded to obtuse; thickly coriaceous; glaucous beneath; glabrous or minutely and sparsely puberulent on midrib beneath; 5–11 pairs of clearly visible secondary veins at c. 60–70°, curving towards but not reaching margin, tertiary venation extending between secondary veins and meeting in a network of veins. *Inflorescence*

axillary; axis shorter than subtending petiole; to 5 cm long; 8–20 flowers per inflorescence; axes minutely puberulent or glabrous on peduncle; pedicel 1.6–2.8 mm long. *Sepals* ovate, 1.9–2.6 mm long, lobes 1.1–1.6 by 1.2–2 mm, 0.7–1.1 times as long as wide, apex rounded or obtuse, often undulate edged or slightly reflexed, puberulent, ciliate. *Corolla* white, cream or greenish; tube cylindrical, 9.7–15 mm long, outside glabrous, inside puberulent around stamens; lobes 14–24 mm long, oblong, glabrous. *Stamens* inserted at 2.6–3.8 mm from corolla base which is 0.15–0.37 of tube length; filaments 0.2–0.5 mm long; anthers 1.4–2 by 0.4 mm. *Ovary* 0.5–1 mm long; style 0.8–1.2 mm long, not impressed on ovary; style head 0.4–0.5 mm long, apex 1–1.3 mm long. Immature fruits spherical.

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

Uses — The latex has been used for rubber but as the plant is not common it was never commercially exploited.

9. *Willughbeia javanica* Blume

Willughbeia javanica Blume, Bijdr. (1826) 1024; Mus. Bot. 1 (1850) 153; Miq., Fl. Ned. Ind. 2 (1857) 390; D.J. Middleton, Blumea 38 (1993) 15. — *Ancylodadus javanicus* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 412. — *Urularia javanica* (Blume) Stapf, Hooker's Icon. Pl. 28 (1901) t. 2711: 2; Backer & Bakh.f., Fl. Java 2 (1965) 224; Markgr., Blumea 20 (1973) 410. — *Willughbeiopsis javanica* (Blume) Rauschert, Taxon 31 (1982) 556. — Type: *Blume 881* (holo L [898.112-435]), Java, Gunung Seribu.

Woody climber. *Branchlets* glabrous; lenticellate. *Leaves*: petiole 0.5–1.1 cm long; blade 4.5–7.7 by 1.7–3.5 cm, 1.9–2.9 times as long as wide, elliptic or ovate, apex acuminate, base acute to cuneate, subcoriaceous or coriaceous, shiny above, dull beneath, glabrous, 11–18 pairs of secondary veins at 65–75°, not very distinct from veins, reaching margin, with 1 or 2 intercalated veins and also oblique veins almost perpendicular to the midrib. *Inflorescence* axillary or terminal; the axis as long as or longer than subtending petiole, to 2 cm long; 5–12 flowers per inflorescence; axes sparsely and minutely brown puberulent; pedicel 0.5–1.5 mm long. *Sepals* ovate, apex rounded, 1–1.2 mm long, lobes 0.7–0.9 by 0.7–1.2 mm, 0.75–1 times as long as wide; glabrous, ciliate. *Corolla* tube inflated, 1.3–3 mm long, glabrous outside and inside; lobes 1.2–2.7 mm long, ovate or elliptic, glabrous. *Stamen* insertion at 1.5–1.8 mm from corolla base which is 0.5–0.72 of tube length; filaments 0.5 mm long; anthers 0.5–0.7 by 0.3–0.4 mm. *Ovary* 0.6–1 mm long; the style 0.8–1 mm long, not impressed on ovary; style head 0.1 mm long, apex 0.1–0.2 mm long. *Fruit* unknown.

Distribution — *Malesia*: Java.

Note — Markgraf identified a number of sterile specimens with large leaves as youth forms of this species. However, there is no direct evidence of the relationship either on the specimens or in the literature so these specimens are not included in this description. Further fieldwork is needed to show the range of variation in leaf shape and venation although, as all the herbarium specimens of this species are 19th century, it may be difficult to find further examples. Only the type specimen gives location information beyond just Java.

10. *Willughbeia lanceolata* (Markgr.) D.J. Middleton

Willughbeia lanceolata (Markgr.) D.J. Middleton, *Blumea* 38 (1993) 15. — *Urularia lanceolata* Markgr., *Blumea* 20 (1973) 409. — *Willughbeiosis lanceolata* (Markgr.) Rauschert, *Taxon* 31 (1982) 556. — Type: *Clemens 40106* (holo L; iso A, BM, K, NY, P), Borneo, Sabah, Mt Kinabalu, Penibukan Ridge.

Woody climber to 20 m. *Branchlets* glabrous; lenticellate. *Leaves*: petiole 0.9–1.7 cm long; blade elliptic or ovate, 5.5–13.2 by 1.3–4.4 cm, 2.3–3.8 times as long as wide, apex acuminate, base obtuse to cuneate, coriaceous, shiny above, dull beneath, glabrous, 7–18 pairs of secondary veins at 55–75°, reaching margin, tertiary venation almost perpendicular to midrib, oblique to secondary veins, several in each space. *Inflorescence* axillary or terminal; axis longer than the subtending petiole, to 3.5 cm long; 8–15 flowers per inflorescence; axes glabrous; pedicel 3.5–5 mm long. *Sepals* ovate, 1.2 mm long, lobes 0.7 by 0.8 mm, 0.87 times as long as wide, apex rounded, glabrous, ciliate. *Corolla* white; tube inflated, 2.2–3 mm long, glabrous outside and inside; lobes 2.7 mm long, ovate, glabrous. *Stamen* insertion at 1.5–1.8 mm from corolla base which is 0.57–0.68 of tube length; filaments 0.5–0.6 mm long; anthers c. 0.9 by 0.5 mm. *Ovary* 0.8–1.2 mm long; style 0.6–0.9 mm long, not impressed on ovary; style head 0.2 mm long, inconspicuous, apex 0.2 mm long. *Fruit* spherical, 3–5.5 cm diam., green or white. *Seeds* 2 by 1.3 by 1.1 cm.

Distribution — *Malesia*: Borneo.

11. *Willughbeia lunduensis* D.J. Middleton

Willughbeia lunduensis D.J. Middleton, *Blumea* 41 (1996) 123. — Type: *Awa & Ilias Paie S.47407* (holo KEP; iso KEP, SAN, SAR), Borneo, Sarawak, 1st Division, Sebako Waterfall, Lundu.

Climber to 6 m high. *Branchlets* brown tomentose. *Leaves*: petiole 1.4–2.7 cm long; blade elliptic, oblong or slightly obovate, 14–19.7 by 4.3–8.1 cm long, 2.6–4.2 times as long as wide, apex short acuminate, base acute to obtuse, 17–19 pairs of secondary veins at 80°, tertiary venation scalariform, tomentose on midrib and secondary veins. *Inflorescence* of a short peduncled cyme with flowers clustered at ends, brown tomentose, 5.4–7 cm long; pedicels 1.3–3.5 mm long. *Sepals* ovate, strongly imbricate, 1.1–1.5 by 1.8–2.1 mm, 0.6–0.7 times as long as wide, apex rounded, tomentose. *Corolla* white; tube 28–30 mm long, tomentose outside, pubescent around stamens inside; lobes 12–14 by 3.5–4 mm, obovate. *Stamens* inserted at 7.3 mm from corolla base which is 0.3 of tube length; filaments 1.4 mm long, strongly bent; anthers 2.5 by 0.6 mm. *Ovary* 1.2 mm long; style and style head 3.7 mm long. *Fruit* unknown. — **Fig. 111.**

Distribution — *Malesia*: Borneo.

12. *Willughbeia oblonga* Dyer ex Hook.f.

Willughbeia oblonga Dyer ex Hook.f., *Fl. Brit. India* 3 (1882) 625; King & Gamble, *J. Asiat. Soc. Bengal* 74, 2 (1907) 393; Ridl., *Fl. Malay Penins.* 2 (1923) 323; Markgr., *Blumea* 20 (1973) 411; D.J. Middleton, *Blumea* 38 (1993) 16; I.M. Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 131; PROSEA 18 (2000) 135. — *Ancylodadus oblongus* (Hook.f.) Kuntze, *Revis. Gen. Pl.* 1 (1891) 412. — Type: *Maingay 1089* (lecto K, designated by Middleton (1993) op. cit.; iso K), Peninsular Malaysia.

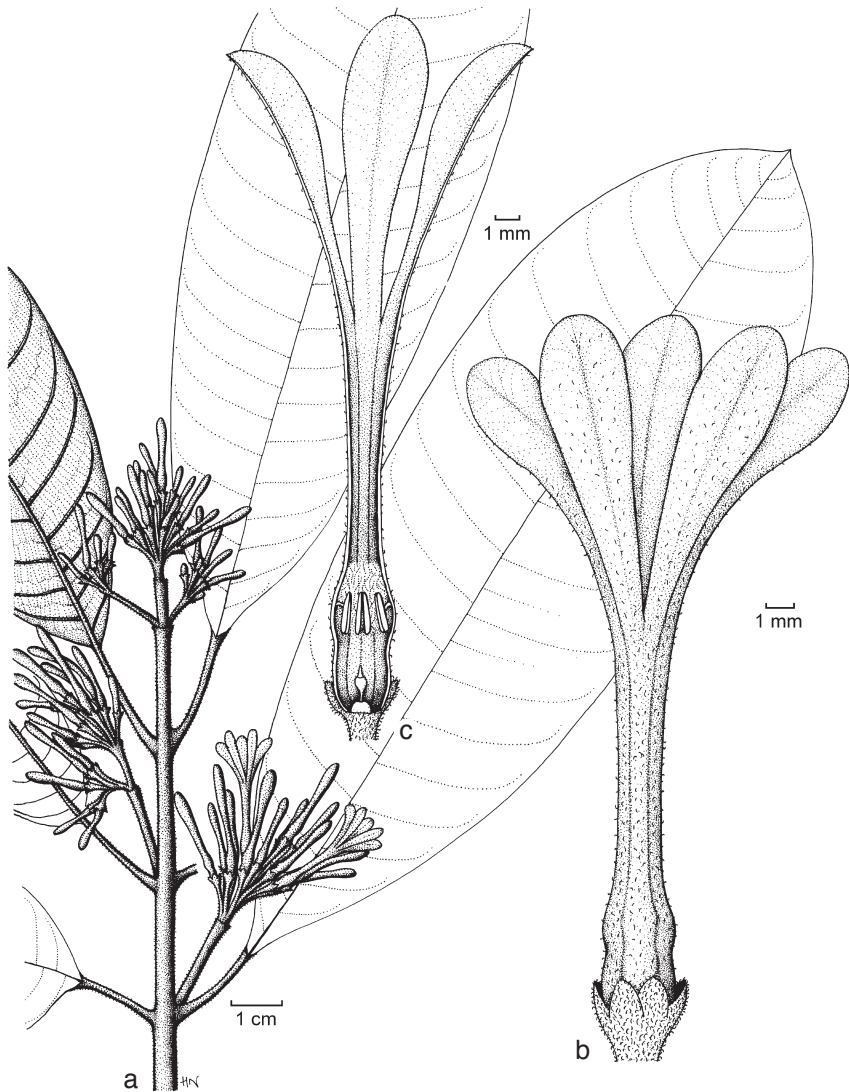


Fig. 111. *Willughbeia lunduensis* D.J. Middleton. a. Habit; b. flower; c. flower dissection (*Awa & Ilias Paie S.47407*).

Woody climber. *Branches* glabrous, pale brown; lenticellate. *Leaves*: petiole 0.7–1 cm long; blade broad elliptic, 6–16.5 by 2.6–7 cm, 1.9–2.5 times as long as wide, apex obtuse to short blunt acuminate, base acute to rounded, papery to subcoriaceous, dull above and beneath, glabrous, punctate beneath, 10–16 pairs of secondary veins at 60–80°, weakly ascending near and almost reaching margin, tertiary venation of 1 or 2 intercalated veins and weak interconnecting veins. *Inflorescence* axillary; axis shorter than the subtending petiole, to 2 cm; 3–8 flowers per inflorescence; axes brown

pubescent; pedicel 1.5–2.3 mm long. *Sepals* ovate, 2.1–2.8 mm long, lobes 1.9–2.1 by 1–1.4 mm, 1.5–1.9 times as long as wide, apex obtuse or rounded, brown puberulent, ciliate. *Corolla* tube cylindrical, c. 7.6 mm long, outside glabrous, inside puberulent; lobes partially ciliate. *Stamens* inserted at c. 4.2 mm from corolla base which is 0.55 of tube length; filaments c. 0.4 mm long; anthers c. 1.2 by 0.3 mm. *Ovary* c. 0.9 mm long; style c. 2.8 mm long, not impressed on ovary; style head c. 0.2 mm long, apex c. 1.1 mm long. *Fruit* oblong, c. 4.8 by 1.5 cm. *Seeds* rounded, flattened, 9–12 by 7–10 by 2.5–5 mm.

Distribution — *Malesia*: Peninsular Malaysia.

Uses — Said to have been exploited by local people to glue poison to their arrows.

13. *Willughbeia ovatifolia* (Stapf) Merr.

Willughbeia ovatifolia (Stapf) Merr., J. As. Soc. Mal. 1 (1923) 29; Masam., Enum. Phan. Born. (1942) 626; D.J. Middleton, Blumea 38 (1993) 17. — *Urnularia ovatifolia* Stapf, Hooker's Icon. Pl. 28 (1901) t. 2711: 3; Merr., Bibliogr. Enum. Born. Pl. (1921) 497. — *Willughbeiospis ovatifolia* (Stapf) Rauschert, Taxon 31 (1982) 556. — Type: *Haviland 2302* (lecto K, designated by Middleton (1993) op. cit.; iso BM, L, SAR, SING), Borneo, Sarawak, Kuching.

Woody climber. *Branches* glabrous; lenticellate. *Leaves*: petiole 1.3–1.6 cm long; blade broad elliptic, 5.5–10.9 by 3.1–6.2 cm, 1.5–2.1 times as long as wide, apex acuminate, base rounded; coriaceous, glaucous beneath, glabrous, punctate on midrib beneath, 13–18 pairs of secondary veins at 70–80°, reaching margin, tertiary largely obscure. *Inflorescence* axillary, axis longer than subtending petiole, to 5 cm long; c. 20 flowers per inflorescence; glabrous; pedicels 1–2.5 mm long. *Sepals* ovate, 1–1.1 mm long, lobes 0.6–0.9 by 0.6–0.8 mm, apex rounded, glabrous, ciliate. *Corolla* tube pink, lobes yellow; tube inflated, 2.5–3.8 mm long, outside and inside glabrous; lobes 3–3.7 mm long, ovate. *Stamens* inserted at c. 2.3 mm from corolla base which is 0.63 of tube length; filaments 0.8 mm long; anthers c. 0.7 by 0.3 mm. *Ovary* c. 0.9 mm long; style c. 1.1 mm long, not impressed on ovary; style head c. 0.1 mm long, indistinct, apex c. 0.2 mm. *Fruit* unknown.

Distribution — *Malesia*: Borneo (Sarawak).

Note — The fruit on the type specimen would appear to be from another plant.

14. *Willughbeia sarawacensis* (Pierre) K. Schum.

Willughbeia sarawacensis (Pierre) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55; Merr., Bibliogr. Enum. Born. Pl. (1921) 496; Masam., Enum. Phan. Born. (1942) 626; Markgr., Blumea 20 (1973) 413; D.J. Middleton, Blumea 38 (1993) 17; Coode et al., Checklist Pl. Brunei (1996) 29. — *Ancylocladus sarawhaensis* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2, 1 (1898) 96. — *Willughbeia sarawakensis* Becc., For. Borneo (1902) 603, orth. var. — *Willughbeia sarawhaensis* (Pierre) Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 153. — Type: *Beccari 3925* (lecto K, designated by Middleton (1993) op. cit.; iso FI, P), Borneo, Sarawak.

Willughbeia treacheri Dyer, Kew Gardens Report (1880) 44, nom. nud.; Merr., Bibliogr. Enum. Born. Pl. (1921) 496; Masam., Enum. Phan. Born. (1942) 627.

Woody climber to 33 m. *Branchlets* glabrous or sparsely brown pubescent; older glabrous, lenticellate. *Leaves*: petiole 1.1–1.8 cm long; blade oblong to obovate, 6–17

by 3.7–6.6 cm, 1.5–2.6 times as long as wide, apex acuminate, base rounded to cuneate, papery to subcoriaceous, glabrous or with a few hairs on the midrib beneath, 11–19 pairs of secondary veins at 60–80°, reaching margin, tertiary venation clearly visible beneath, perpendicular to secondary veins and meeting between them. *Inflorescence* axillary, axis shorter than subtending petiole, to 2.5 cm long; 8–14 flowers per inflorescence; axes brown pubescent; pedicels 1–2.8 mm long. *Sepals* ovate, 1.3–2.5 mm long, lobes 0.6–1.2 by 0.5–1 mm, 1–1.3 times as long as wide, apex rounded to acute, brown pubescent. *Corolla* white; tube cylindrical, 4.8–6.5 mm long, outside glabrous or with 5 rows of brown hairs, inside puberulent; lobes 2–6.5 mm long, oblong, ciliate. *Stamens* inserted at 2.6–2.8 mm from corolla base which is 0.32–0.36 of tube length; filaments 0.6–0.7 mm long; anthers 1.4–1.5 by 0.3–0.4 mm. *Ovary* 0.4–1.1 mm long; style 0.1–0.3 mm long, often impressed on ovary; style head 0.6 mm long, apex 0.7–0.8 mm long. *Fruit* spherical to 4–17.6 by 4–12 cm. *Seeds* c. 1.7 by 1.2 by 1.1 cm.

Distribution — *Malesia*: Borneo, Philippines (Palawan).

Note — There have been a number of spelling variations of the specific epithet. I, along with others, have assumed that the basionym name was misspelled in the protologue, as it is clearly intended to reflect the collecting locality of Sarawak, and the accepted name reflects a correction of this mistake.

15. *Willughbeia tenuiflora* Dyer ex Hook. f.

Willughbeia tenuiflora Dyer ex Hook. f., Fl. Brit. India 3 (1882) 625; Ridl., J. Straits Branch Roy. Asiat. Soc. 33 (1900) 83; Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 6; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 396; Merr., Bibliogr. Enum. Born. Pl. (1921) 496; Ridl., Fl. Malay Penins. 2 (1923) 325; Masam., Enum. Phan. Born. (1942) 626; Markgr., Blumea 20 (1973) 413; D.J. Middleton, Blumea 38 (1993) 18; I.M. Turner, Gard. Bull. Singapore 45 (1993) 37; 47 (1997 [‘1995’]) 131; PROSEA 18 (2000) 135. — *Ancylocladus tenuiflorus* (Hook. f.) Kuntze, Revis. Gen. Pl. 1 (1891) 412. — Type: *Maingay 1049* (lecto K, designated by Middleton (1993) op. cit.; iso A, K, L), Peninsular Malaysia.

Woody climber. *Branchlets* rufous pubescent to glabrous; branches lenticellate. *Leaves*: petiole 1–2 cm long; blade elliptic, oblong or obovate, 5.2–22.5 by 1.7–9.3 cm, 2.3–3.4 times as long as wide, apex acuminate, base cuneate, papery or subcoriaceous, glabrous, 17–30 pairs of secondary veins at 70–80°, fairly straight, reaching margin, tertiary venation mostly obscure or, more rarely, visible beneath and then perpendicular to the secondary veins and meeting between them. *Inflorescence* axillary, axis shorter or as long as subtending petiole, to 4.2 cm long; 8–18 flowers per inflorescence; axes rufous pubescent; pedicels 0.8–3 mm long. *Sepals* ovate, 1.2–1.8 mm long, lobes 1–1.6 by 0.8–1.6 mm, 1–1.9 times as long as wide, apex rounded to acute, rufous pubescent or, rarely, glabrous, ciliate. *Corolla* white; tube 7.5–15 by 1–1.2 mm, outside glabrous, inside pubescent in upper part of tube; lobes 8–18 mm long, oblong, glabrous. *Stamens* inserted at 1.3–2.7 mm from corolla base which is 0.15–0.25 of tube length; filaments 0.5–1 mm long; anthers 1–1.5 by 0.3–0.6 mm. *Ovary* 0.5–1 mm long; style 0.1 mm long, often impressed on ovary; style head 0.5–0.8 mm long, wide cylindrical to globular, apex 0.6–1.2 mm long. *Fruit* pear-shaped, 6–15 by 4.5–11.5 cm. *Seeds* 2.2–2.5 by 0.9–1.4 by 0.9–1.4 cm.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore.

Uses — Previously exploited for low quality rubber before the widespread use of *Hevea brasiliensis*. The fruit is edible. The latex has also been used for the treatment of scabies and other skin ailments.

43. WRIGHTIA

Wrightia R.Br., Asclepiadeae (1810) 62; Prodr. (1810) 467; Benth. & Hook.f., Gen. Pl. 2 (1876) 712; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 183; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1182; Pichon, Mém. Mus. Natl. Hist. Nat, sér. B, Bot. 1 (1950) 73; Notul. Syst. (Paris) 14 (1951) 77; Ngan, Ann. Missouri Bot. Gard. 52 (1965) 114; Backer & Bakh.f., Fl. Java 2 (1965) 241; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 119; Lý, Feddes Repert. 97 (1986) 619; P.T. Li et al., Fl. China 16 (1995) 174; P.I. Forst., Fl. Australia 28 (1996) 190; D.J. Middleton, Fl. Thailand 7 (1999) 79; Tree Fl. Sabah & Sarawak 5 (2004) 5; Harvard Pap. Bot. 10 (2005) 161. — *Wrightia* R.Br. sect. *Bammatophyton* A.DC., Prodr. 8 (1844) 404. — Type species: *Wrightia pubescens* R.Br.

Anasser Blanco, Fl. Philipp. (1837) 112. — Type species: *Anasser lanitii* Blanco (= *Wrightia pubescens* R.Br. subsp. *lanitii* (Blanco) Ngan).

Scleranthera Pichon, Notul. Syst. (Paris) 14 (1951) 88. — Type species: *Scleranthera cambodiensis* (Pierre ex Pit.) Pichon (= *Wrightia dubia* (Sims) Spreng.).

Wrightia R.Br. sect. *Walidda* A.DC., Prodr. 8 (1844) 407. — *Walidda* (A.DC.) Pichon, Notul. Syst. (Paris) 14 (1951) 87. — Type species: *Walidda antidysenterica* (L.) Pichon (= *Wrightia antidysenterica* L.).

Shrubs or small trees. *Leaves* opposite; usually with glands in the axils. *Inflorescence* a terminal cyme; few- to many-flowered. *Sepals* with 5 large or small colleters in the sinuses inside, the larger ones almost covering the inner surface of the sepals. *Corolla* lobes sinistrorse; mature flower rotate, salverform or infundibuliform; corona of varying degrees of elaboration usually present, rarely absent or completely adnate to the corolla. *Stamens* inserted at corolla mouth or in tube; strongly exserted from or completely included in corolla tube; filaments usually quite short and wide; anthers narrowly triangular, apex acuminate, base sagittate, sterile at sides and base with fertile locules on the inner upper half, adnate to the style head, often pubescent on the surface facing inwards and/or the surface facing outwards. *Disk* absent. Gynoecium of 2 free carpels united into a common style or of 2 connate carpels, glabrous, rarely pubescent; style broadest near top; ovules numerous. *Fruit* of paired follicles or connate follicles; fusiform. *Seeds* linear or narrowly fusiform; with a coma directed towards the base of the follicle.

Distribution — Approximately 25 species in Africa, Asia and Australia; in *Malesia* 8 species (one of which may not be native).

KEY TO THE SPECIES

- 1a. Corolla infundibuliform; stamens completely included in the corolla tube **2. W. dubia**
- b. Corolla rotate, salverform or somewhat infundibuliform; stamens clearly exserted from the corolla tube 2
- 2a. Flowers pendulous; corona absent **8. W. religiosa**
- b. Flowers pendulous or not; corona present 3

- 3a. Corona with antipetalous lobes divided more than half way to base giving the whole corona a fimbriate look **4. *W. laevis***
 b. Corona with antipetalous lobes entire or divided less than half way to base 4
 4a. Antipetalous corona lobes deeply divided or at least strongly dentate
 **7. *W. pubescens***
 b. Antipetalous corona lobes entire or at most weakly crenate 5
 5a. Gynoecium syncarpous; fruits solitary. — Philippines 6
 b. Gynoecium apocarpous but united into a single style; fruits paired. — Wide-
 spread 7
 6a. Corolla tube 3.8–4 mm long; stamens inserted in the upper half of the corolla
 tube **6. *W. palawanensis***
 b. Corolla tube 1.8–2.8 mm long; stamens inserted in the lower half or around the
 middle of the corolla tube **3. *W. hanleyi***
 7a. Corolla tube 3.7–10 mm long, 1.7–5.5 times as long as sepals. — Philippines . . .
 **1. *W. candollei***
 b. Corolla tube c. 3.5 mm long, c. 1.6–1.9 times as long as sepals. — New Britain .
 **5. *W. novobritannica***

1. *Wrightia candollei* S. Vidal

Wrightia candollei S. Vidal, Phan. Cuming. Philipp. (1885) 186 (as *candollei* sphalm.); Tsiang, Sunyat-senia 4 (1939) 52; D.J. Middleton, Harvard Pap. Bot. 10 (2005) 162. — *Wrightia pubescens* R.Br. subsp. *candollei* (S. Vidal) Ngan, Ann. Missouri Bot. Gard. 52 (1965) 153. — Type: *Cuming 1453* (lecto P, designated by Middleton (2005) op. cit.; iso BM, CGE, K), Philippines, Luzon, Manila.

Small trees. *Branchlets* sparsely to densely puberulent. *Leaves*: petiole 4–8 mm long, glabrous to sparsely puberulent; blade elliptic, 4–20 by 3–6.5 cm, 1.3–3.7 times as long as wide, apex acuminate, base cuneate to rounded, sparsely puberulent to glabrous above, sparsely to densely pale puberulent all over or only on midrib or glabrous beneath, 10–16 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* 2.5–3.5 cm long, often with leafy bracts; peduncle 0.2–1.3 cm long, sparsely pubescent, pedicels 4–7.5 mm long, pubescent. *Sepals* ovate, 1.1–4 by 1.8–4.5 mm, 0.3–1.1 times as long as wide, apex rounded, sparsely pubescent, ciliate, colleters large in sinuses. *Corolla* orange; tube 3.7–10 mm long, 1.7–5.5 times as long as sepals, 0.4–0.5 times as long as lobes, minutely puberulent at top of tube outside, glabrous inside; lobes 6.5–15 by 3.3–9 mm, 1.7–2 times as long as wide, minutely puberulent inside and outside; antipetalous corona lobes 4–6.5 mm long, adnate to corolla except at apex, apex subentire to weakly crenate, glabrous inside, 3.8–5 times as long as alternipetalous lobes; alternipetalous corona lobes simple or slightly bifid, 0.7–1.7 mm long; alternating corona lobes lacking. *Stamens* inserted at 0.7–0.8 of tube length from base, exerted from tube; filaments 0.8–1 mm long; anthers 5–7.8 by 1.1–1.8 mm, pubescent on the outside or only at tips outside. Gynoecium of 2 adnate carpels, ovary 1.5–2.6 mm high; style and style head 5–7 mm long. *Fruit* of a single follicle that splits lengthways at maturity as each of the 2 component follicles dehisces, 20.5–22 by 1.4–2.2 cm, glabrous.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Evergreen or mixed deciduous forests.

2. *Wrightia dubia* (Sims) Spreng.

Wrightia dubia (Sims) Spreng., Syst. Veg. 1 (1825) 638; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 465; Burkill, J. Straits Branch Roy. Asiat. Soc. 73 (1916) 258; Ngan, Ann. Missouri Bot. Gard. 52 (1965) 172; Whitmore, Tree Fl. Malaya 2 (1973) 24; Lý, Feddes Repert. 97 (1986) 622; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 131; D.J. Middleton, Fl. Thailand 7 (1999) 83; Kress et al., Checklist Pl. Myanmar (2003) 150; D.J. Middleton, Harvard Pap. Bot. 10 (2005) 164. — *Cameraria dubia* Sims in Curtis, Bot. Mag. 39 (1814) t. 1646. — *Sclerantha dubia* (Sims) Pichon, Notul. Syst. (Paris) 14 (1951) 90. — Type: Illustration in plate 1646 in Curtis, Bot. Mag. 39 (1814).

Strophanthus jackianus Wall. ex G. Don, Gen. Hist. 4 (1837) 85; Miq., Fl. Ned. Ind. 2 (1857) 442; Hook.f., Fl. Brit. India 3 (1882) 656; Ridl., Fl. Malay Penins. 2 (1923) 355. — Type: *Wallich 1643* (lecto K, designated by Beentje, Meded. Landbouwhoogeschool Wageningen 82-4 (1982) 166; iso K-W), Peninsular Malaysia, Penang.

Wrightia dubia (Sims) Spreng. var. *membranifolia* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 466. — Type: *Curtis 2915* (lecto SING, designated by Middleton (2005) op. cit.), Thailand, Phuket, Tongkah, Feb. 1893.

Wrightia cambodiensis Pierre ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1184; Kerr in Craib, Fl. Siam. 2 (1939) 456. — *Sclerantha cambodiensis* (Pierre ex Pit.) Pichon, Notul. Syst. (Paris) 14 (1951) 89. — Type: *Pierre 4402* p.p. (lecto P, designated by Ngan (1965) op. cit., 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 305, 2nd step; iso A, P), Vietnam, Ha Tay, Tri Huyen.

Wrightia rubriflora Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1185. — Type: *Poilane 5955* (lecto P, designated by Middleton, Adansonia sér. 3, 27 (2005) 306; iso HM, NY, P), Vietnam, Ninh Thuan, Ca Na.

Wrightia kontumensis Lý, Feddes Repert. 96 (1985) 173; 97 (1986) 622. — Type: *Loc P.2968* (holo HNU; iso HN), Vietnam, Gialai-Kontum.

Shrub or small tree to 3 m tall. *Branchlets* glabrous or sparsely puberulent, becoming glabrous and lenticellate. *Leaves*: petiole 2–11 mm long; blade papery to subcoriaceous, elliptic, oblong or obovate, 3.6–26.5 by 1.8–9.8 cm, 2.1–5.2 times as long as wide, apex acuminate to subcaudate, base cuneate to rounded, puberulent beneath, only on midrib and secondary veins or, rarely, glabrous and then both surfaces papillate, 6–14 pairs of secondary veins, ascending, tertiary venation reticulate. *Inflorescence* 2.5–4.5 cm long; sparsely puberulent or glabrous; pedicels 4–5.5 mm long, robust. *Flowers* inodorous. *Sepals* ovate, 1.3–3 by 1.3–2 mm, 1.1–1.3 times as long as wide, apex acute to obtuse; sparsely puberulent or glabrous, ciliate; colleter wide and large. *Corolla* orange, pink or reddish; infundibuliform; tube 6–15.5 mm long, 3.8–4.7 times as long as sepals, 0.5–0.6 times as long as lobes, glabrous or, rarely, pubescent-papillose at top of tube outside, glabrous inside; lobes 10–28 by 6–9 mm, 1.9–3.2 times as long as wide ovate, apex acuminate to obtuse, pubescent-papillose on lobes outside and slightly so inside; antipetalous corona lobes adnate to the corolla, 1.5–3.7 mm long, 1.7–2.5 times as long as alternipetalous lobes, glabrous; alternipetalous corona lobes 0.6–2.2 mm long; alternating corona lobes lacking. *Stamens* inserted at 0.3–0.4 of tube length from base, completely included in the tube; subsessile; anthers 4.9–5.6 by 1–1.2 mm, pubescent outside. Gynoecium of 2 free carpels united into a common style, ovaries 1.6–2.5 mm long, glabrous; style and style head 3–4.7 mm long. *Fruit* of paired follicles; 13–30 cm by 3.5–6 mm; glabrous; not lenticellate. *Seeds* linear; 12.5–25.4 by 1.2–2.5 mm; coma 2.6–5.5 cm long. — **Fig. 112.**

Distribution — Thailand, Cambodia, Laos, Vietnam; in *Malesia*: Peninsular Malaysia, Singapore.

Habitat & Ecology — Growing in wide variety of forest habitats at lower altitudes.

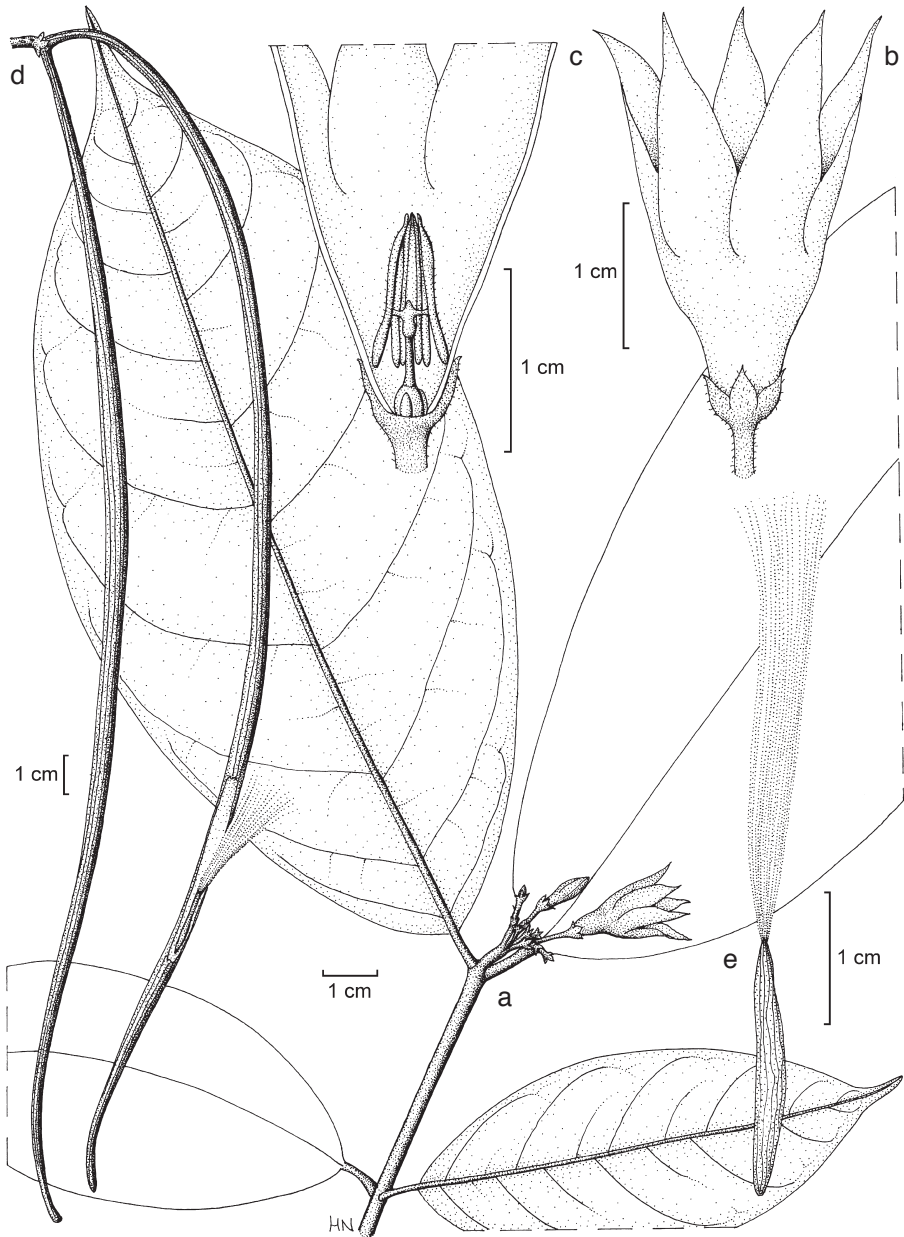


Fig. 112. *Wrightia dubia* (Sims) Spreng. a. Habit; b. flower; c. flower dissection; d. fruit; e. seed (a: Soejarto 5881; b, c: Van Beusekom 544; d, e: Geesink 7564).

3. *Wrightia hanleyi* Elmer

Wrightia hanleyi Elmer, Leafl. Philipp. Bot. 4 (1912) 1465; Tsiang, Sunyatsenia 4 (1939) 54; Ngan, Ann. Missouri Bot. Gard. 52 (1965) 168; D.J. Middleton, Harvard Pap. Bot. 10 (2005) 166. — Type: *Elmer 12873* (lecto GH, designated by Middleton (2005) op. cit.; iso A, BISH, BO, E, K, L, NSW, NY, US, Z), Philippines, Palawan, Puerto Princesa, Mt Pulgar.

Shrub or treelet to 4 m tall. *Branchlets* glabrous, sparsely lenticellate with age. *Leaves*: petiole 3 mm long, glabrous; blade narrowly ovate to elliptic, 3–11 by 1.3–4.6 cm, 1.6–3.8 times as long as wide, apex acuminate with a sharp tip, base cuneate to rounded, glabrous above and beneath, 6–15 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* terminal, 0.8–2 cm long, few-flowered; peduncle 0.1–1 cm long, glabrous; pedicels 1.5–4 mm long, glabrous. *Sepals* ovate, 1–1.5 by 0.9–1.1 mm, 1.1–1.4 times as long as wide, apex acute to obtuse, glabrous, ciliate, colleters small in the sinuses. *Corolla* greenish yellow to red; tube with a lower narrow part and a campanulate upper part, with a raised lip inside between the lower and upper tube, 1.8–2.8 mm long, 1.5–1.9 times as long as sepals, 0.6–0.7 times as long as lobes, minutely puberulent at top of tube outside, glabrous inside; lobes 3–3.9 by 1.5–3 mm, 1.3–2 times as long as wide, apex rounded, minutely puberulent inside and outside; antipetalous corona 1.5–2.9 mm long, entire, adnate to corolla on medial line but with sides free, apex subentire or slightly crenate, glabrous inside, 4.1–7.5 times as long as alternipetalous lobes; alternipetalous corona lobes apparently absent or small and simple, 0.2–0.7 mm long; alternating corona lobes lacking. *Stamens* subsessile, inserted at 0.3–0.5 of tube length from base, exerted from tube; anthers 2.6–5 by 0.4–1 mm, pubescent only at the top outside. Gynoecium of 2 free carpels united into a common style, ovaries 0.7–1.1 mm high, glabrous; style and style head 1.8–4 mm long. *Fruit* paired, linear, 6.6–18 cm by 2.5–4 mm, glabrous. *Seeds* 10 by 0.6 mm; coma 21 mm long.

Distribution — Philippines (Palawan).

Habitat & Ecology — In evergreen forest.

4. *Wrightia laevis* Hook.f.

Wrightia laevis Hook.f., Fl. Brit. India 3 (1882) 654; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 465; Ridl., Fl. Malay Penins. 2 (1923) 353; Markgr., Bot. Jahrb. Syst. 61 (1927) 212; Tsiang, Sunyatsenia 4 (1939) 48; Kerr in Craib, Fl. Siam. 2 (1939) 457; Merr. & L.M. Perry, J. Arnold Arbor. 24 (1943) 215; Ngan, Ann. Missouri Bot. Gard. 52 (1965) 136; Whitmore, Tree Fl. Malaya 2 (1973) 24; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 125; Lý, Feddes Repert. 97 (1986) 623; Whitmore & Tantra, Checklist Sumatra (1986) 20; I.M. Turner, Gard. Bull. Singapore 45 (1993) 37; PROSEA 5, 2 (1995) 513; P.T. Li et al., Fl. China 16 (1995) 175; P.I. Forst., Fl. Australia 28 (1996) 191; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 131; Whitmore et al., Checklist Irian Jaya (1997) 17; D.J. Middleton, Fl. Thailand 7 (1999) 85; Harvard Pap. Bot. 10 (2005) 168. — *Wrightia tinctoria* R.Br. var. *laevis* (Hook.f.) Pichon, Notul. Syst. (Paris) 14 (1951) 80. — Type: *Maingay 1065* (lecto K, designated by Middleton (2005) op. cit.; iso K), Peninsular Malaysia, Malacca, Mt Ophir.

Wrightia millgar F.M. Bailey, Dept. Agric. Brisbane Bot. Bull. 7 (1893) 65. — *Wrightia laevis* Hook.f. subsp. *millgar* (F.M. Bailey) Ngan, Ann. Missouri Bot. Gard. 52 (1965) 137; P.I. Forst., Fl. Australia 28 (1996) 191. — Type: *Cowley 7D* (holo BRI (comprising 2 sheets)), Australia, Queensland, Barron River.

- Wrightia hainanensis* Merr., Philipp. J. Sci. 21 (1922) 352. — Type: 'Chinese Collector' 425 (holo PNH†; photo of holotype A), China, Hainan, Fong Mok Sze.
- Wrightia balansae* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1188. — Type: *Balansa 2118* (lecto P, designated by Ngan (1965) op. cit, 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 305, 2nd step; iso P), Vietnam, Ha Tay, Tu Phap.
- Wrightia macrocarpa* Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1190. — Type: *Balansa 2115* (lecto P, designated by Ngan (1965) op. cit, 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 306, 2nd step), Vietnam, Ha Tay, Tu Phap.
- Wrightia sorsogonensis* Elmer, Leaflet. Philipp. Bot. 10 (1939) 3698, nom. nud. — Based on: *Elmer 15595* (A, BM, BO, C, GH, K, L, MO, NSW, NY, P, PNH, S, Z), Philippines, Luzon, Sorsogon, Irosin, Mt Bulusan.
- Wrightia hainanensis* Merr. var. *variabilis* Tsiang, Sunyatsenia 4 (1939) 47. — Type: *Tsiang 2679* (lecto A, designated by Middleton (2005) op. cit.; iso K, NY), China, Guangdong, Sunyi District.
- Wrightia hainanensis* Merr. var. *chingii* Tsiang, Sunyatsenia 4 (1939) 48. — Type: *Ching 5539* (holo IBSC n.v.; iso NY), China, Guangxi, Mung Tung Kon, N of Luchen.
- Wrightia laevis* Hook.f. subsp. *novoguineensis* Ngan, Ann. Missouri Bot. Gard. 52 (1965) 138. — Type: *Brass 5570* (holo A; iso BM, BO, BRI, K, NY, US), Papua New Guinea, Central Province, Mt Tafa.
- Wrightia tinctoria* auct. non R.Br.: Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1187.

Shrub or tree to 37 m tall and 106 cm dbh, buttresses present or absent. Bark smooth to rough and flaky, grey, greyish brown or cream-brown; inner bark white, cream or pale brown. *Branchlets* glabrous, sparsely lenticellate with age. *Leaves*: petiole 3–7 mm long; blade subcoriaceous, elliptic, ovate or obovate, 3.1–17.3 by 1.4–7.5 cm, 1.3–4.1 times as long as wide, apex acuminate, base cuneate to obtuse, glabrous, 4–10 pairs of secondary veins, strongly ascending, curved, tertiary venation mostly paler than lamina in dried specimens, almost perpendicular to midrib and oblique to secondary veins and also reticulate. *Inflorescence* 1.8–10 cm long; peduncle 1–1.6 cm long, glabrous to sparsely puberulent; pedicels 8–19 mm long, delicate, glabrous or puberulent. *Sepals* ovate, 0.7–2.5 by 0.8–2.3 mm, 0.9–1.2 times as long as wide, apex obtuse to rounded, glabrous to densely puberulent, ciliate; colleters wide and large. *Corolla* white, pale yellowish white to yellow-orange; subtrotate; tube 1.1–3 mm long, 1.5–1.7 times as long as sepals, 0.2–0.4 times as long as lobes, glabrous or minutely puberulent at top of tube outside, glabrous inside; lobes 6.1–14 by 2.6–5.2 mm, 1.6–2.8 times as long as wide, elliptic to slightly obovate, apex rounded, minutely puberulent outside and inside; corona of antipetalous, alternipetalous and alternate lobes; antipetalous lobes adnate to the corolla at base, fimbriate, 2.8–9.4 mm long, 0.9–1.8 times as long as alternipetalous lobes, glabrous; alternipetalous lobes free, simple, deeply bifid or sometimes compound, 2.4–6.5 mm long; alternating lobes 0.6–5.8 mm long, simple, shorter than the other 2 whorls. *Stamens* inserted at 0.8–0.9 of tube length from base, completely exserted; filaments 0.2–1.7 mm long; anthers 3.9–5.6 by 0.7–1.6 mm, pubescent outside, sometimes only sparsely so at base. Gynoecium of 2 free carpels united into a common style, ovaries 0.7–1.8 mm long, glabrous; style and style head 3.5–5.5 mm long. *Fruit* of paired follicles; 10–50 cm by 5–17 mm, glabrous, lenticellate or not. *Seeds* linear; 18–22 by 1.7–2.5 mm; coma 3.3–4 cm long.

Distribution — Southern China, continental Southeast Asia, Queensland; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Philippines, New Guinea.

Habitat & Ecology — In a wide variety of habitats.

5. *Wrightia novobritannica* (Ngan) D.J. Middleton

Wrightia novobritannica (Ngan) D.J. Middleton, Harvard Pap. Bot. 10 (2005) 171. — *Wrightia pubescens* R.Br. subsp. *novobritannica* Ngan, Ann. Missouri Bot. Gard. 52 (1965) 153. — Type: Waterhouse 270 (holo NY; iso A, F n.v., US), Papua New Guinea, New Britain, Nodup.

Tree. *Branchlets* puberulent, glabrescent with age. *Leaves*: petiole 4–6 mm long, puberulent; blade elliptic to oblong, 12.8–19 by 3.6–6.2 cm, 3.3–3.7 times as long as wide, apex acuminate, base cuneate, very sparsely puberulent all over above, at least when young, puberulent beneath, more densely so on midrib and venation, 13–15 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* terminal, many-flowered, 2.5–4.5 cm long; peduncle 0.6–0.9 cm long, densely puberulent; pedicels 6–9 mm long, densely puberulent. *Sepals* ovate, 1.8–2.2 by 1.6–1.8 mm, 1–1.4 times as long as wide, apex obtuse to rounded, densely puberulent, ciliate. *Corolla* brick red; tube c. 3.5 mm long, c. 1.6–1.9 times as long as sepals, c. 0.3 times as long as lobes, glabrous or with a few hairs at top of tube outside, glabrous inside; lobes c. 10.5 by 4.7 mm, 2.2 times as long as wide, elliptic, apex rounded, minutely pubescent outside and inside; antipetalous corona adnate to the corolla lobe for half of length, free at the margins, c. 3.5 mm long, apex entire, glabrous inside, c. 2.3 times as long as alternipetalous lobes; alternipetalous corona lobes simple, c. 1.5 mm long; alternating corona lobes lacking. *Stamens* inserted at c. 0.8 of tube length from base, strongly exerted from tube; filament c. 1 mm long; anthers 6.5 by 1 mm, pubescent outside. Gynoecium of 2 adnate carpels, ovary c. 2 mm high, glabrous; style and style head c. 5 mm long. *Fruit* of connate follicles, splitting into 2 at dehiscence, c. 17.5 by 2.4 cm, sparsely puberulent, lenticellate. *Seeds* 13.3–14.8 by 1.5–2.3 mm; coma 3.4–3.8 cm long.

Distribution — *Malesia*: Papua New Guinea (New Britain).

Habitat & Ecology — Unknown.

Note — Only known from the type collection.

6. *Wrightia palawanensis* D.J. Middleton

Wrightia palawanensis D.J. Middleton, Harvard Pap. Bot. 10 (2005) 172. — Type: Podzorski SMHI 698 (holo A; iso BO, BRI, KEP, L), Philippines, Palawan, Irawan Valley head on the lower slopes of Mt Beaufort.

Shrub or small tree to 3 m tall. *Branchlets* glabrous, sparsely lenticellate. *Leaves*: petiole 5–7 mm long, glabrous; blade elliptic, 2.6–11.1 by 1–3.3 cm, 2.4–4.3 times as long as wide, apex acuminate, base cuneate, glabrous above and beneath, 10–17 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* terminal, 2–5-flowered, 1–4 cm long; peduncle 0.2–1.4 cm long, glabrous; pedicels 5.5–7 mm long, glabrous. *Sepals* ovate, 1.9–2.1 by 2.4–2.9 mm, 0.7–0.8 times as long as wide, apex obtuse to rounded, glabrous, ciliate. *Corolla* salmon pink or yellow, infundibuliform; tube 3.8–4 mm long, widening at stamen insertion, 1.8–2.1 times as long as sepals, 0.4–0.5 times as long as lobes, sparsely and minutely puberulent at top of tube outside, glabrous inside; lobes 8.5–8.9 by 7–7.7 mm, 1.1–1.3 times as long as wide, elliptic, apex rounded, minutely puberulent outside and inside; antipetalous corona lobes adnate to the corolla lobe for entire length but free at margins, 4.3–4.5 mm long, apex subentire to crenate, glabrous

inside, c. 6 times as long as alternipetalous lobes; alternipetalous corona lobes free but often so small as to be difficult to see, simple, 0.7–0.8 mm long; alternating corona lobes lacking. *Stamens* inserted at c. 0.7 of tube length from base, exerted from tube; filament c. 1 mm long; anthers 5–7.1 by 1.1–1.7 mm, sagittate, adnate to the style head, pubescent on the outside only at the very tip. Gynoecium of 2 free carpels united into a common style, ovaries 1.7–2.2 mm high, glabrous; style and style head 3–5.5 mm long. *Fruit* unknown (see note).

Distribution — *Malesia*: Philippines (Palawan).

Habitat & Ecology — Reported from riverine and mixed forest and from ultramafic soils at 100–200 m altitude.

Note — I have not seen any fruit but they are reported on one specimen to be paired.

7. *Wrightia pubescens* R.Br.

Wrightia pubescens R.Br., Prodr. (1810) 467; Asclepiadeae (1810) 64; Miq., Fl. Ned. Ind. 2 (1857) 432; Markgr., Nova Guinea 14, 2 (1926) 289; Bot. Jahrb. Syst. 61 (1927) 212; Tsiang, Sunyatsenia 4 (1939) 49; Bakh.f., Blumea 6 (1950) 393; Pichon, Notul. Syst. (Paris) 14 (1951) 83; Ngan, Ann. Missouri Bot. Gard. 52 (1965) 150; Backer & Bakh.f., Fl. Java 2 (1965) 241; Tsiang & P.T. Li, Fl. Reipubl. Popularis Sin. 63 (1977) 123; Lý, Feddes Repert. 97 (1986) 623; Whitmore & Tantra, Checklist Sumatra (1986) 20; Checklist Sulawesi (1989) 15; Whitmore et al., Checklist Kalimantan (1990) 26; P.T. Li et al., Fl. China 16 (1995) 174; PROSEA 5, 2 (1995) 513; P.I. Forst., Fl. Australia 28 (1996) 191; Whitmore et al., Checklist Irian Jaya (1997) 17; D.J. Middleton, Fl. Thailand 7 (1999) 86; Kessler et al., Blumea, Suppl. 14 (2002) 15; D.J. Middleton, Harvard Pap. Bot. 10 (2005) 172. — Type: *Brown Iter Australiense 2861* (lecto BM, designated by P.I. Forster (1996) op. cit.), Australia, North Coast (= Northern Territories).

Hunteria eugenifolia Wall. ex G. Don, Gen. Hist. 4 (1837) 105. — *Wrightia coraia* Wall. ex A.DC., Prodr. 8 (1844) 407; Miq., Fl. Ned. Ind. 2 (1857) 435. — Type: *Wallich 1615* (lecto K-W, top left part designated here). — It is not clear as to where the various branchlets on the sheet come from, Penang or India.

Wrightia multiflora Zipp. ex Span., Linnaea 15 (1841) 325, nom. nud. — Based on: *Zippelius s.n.* (L [898.112-449]), Timor.

Wrightia calycina A.DC., Prodr. 8 (1844) 406; Miq., Fl. Ned. Ind. 2 (1857) 433; Markgr., Nova Guinea 14, 2 (1926) 289; Bot. Jahrb. Syst. 61 (1927) 212; Tsiang, Sunyatsenia 4 (1939) 52; Bakh.f., Blumea 6 (1950) 393; Backer & Bakh.f., Fl. Java 2 (1965) 242. — Type: *Unknown collector in Museum de Paris 1821* (holo G-DC), Timor.

Wrightia spanogheana Miq., Fl. Ned. Ind. 2 (1857) 434. — *Nerium macrocarpum* Span., Linnaea 15 (1841) 325, nom. nud. — Type: *Spanoghe s.n.* (lecto L [898.112-487], designated by Middleton (2005) op. cit.; iso L), Timor.

Wrightia tinctoria auct. non R.Br.: Span., Linnaea 15 (1841) 325.

KEY TO THE SUBSPECIES

- 1a. Corolla tube 1.2–1.5 times as long as sepals; sepal apex obtuse to rounded, margins and apex often slightly reflexed; antipetalous corona lobes glabrous inside **a. subsp. pubescens**
- b. Corolla tube 2–3.9 times as long as sepals; sepal apex acute to obtuse, margins not reflexed; antipetalous corona lobes mostly slightly pubescent inside **b. subsp. lanitii**

a. subsp. pubescens

Branchlets glabrous to sparsely puberulent. *Leaves*: petiole 3–6 mm long, sparsely pubescent; blade elliptic, 3.8–11.8 by 1.6–5.6 cm, 1.8–3.8 times as long as wide, apex acuminate, base cuneate, 8–11 pairs of secondary veins, tertiary venation reticulate, sparsely puberulent on midrib to sparsely pubescent all over above, sparsely puberulent on midrib and secondary veins to densely rusty pubescent all over beneath. *Inflorescence* terminal, 2.5–6 cm long; peduncle 0.2–0.8 cm long, sparsely to densely pubescent; pedicels 4.3–9.5 mm long, sparsely to densely pubescent. *Sepals* ovate, 2.8–5 by 2.2–3 mm, 1.2–1.8 times as long as wide, apex obtuse to rounded and slightly reflexed or not, margins slightly reflexed, sparsely to densely pubescent, colleters large and wide in sinuses. *Corolla* tube 3.6–6 mm long, 1.2–1.5 times as long as sepals, 0.5–0.7 times as long as lobes, minutely pubescent at top of tube outside, glabrous to sparsely puberulent inside; lobes 6.7–11 by 2.8–4.7 mm, 1.8–2.8 times as long as wide, elliptic, apex obtuse; antipetalous corona lobes 3.5–5.2 mm long, dentate at apex, adnate to corolla lobe for most of length, glabrous inside, 1.3–2.6 times as long as alternipetalous lobes; alternipetalous corona lobes 1.5–3 mm long, narrow, bifid; alternating lobes lacking. *Stamens* inserted at 0.7–0.9 of tube length from base, strongly exerted from tube; filament 1 mm long; anthers 5.6–6.6 by 1.3–1.7 mm, densely pubescent outside. Gynoecium of 2 adnate carpels, ovary 1.3–2 mm high, glabrous; style and style head 6.7–8.2 mm long. *Fruit* of connate follicles, splitting into 2 at dehiscence, 6.6–29.5 by 1.2–1.6 cm (see note), glabrous, lenticellate or not. *Seeds* 12.3–17 by 1.3–2.3 mm; coma 3.2–4.7 cm long.

Distribution — Australia (Northern Territories); in *Malesia*: Eastern Java, Lesser Sunda Islands, Moluccas, New Guinea.

Note — There are a number of specimens of this subspecies where the fruit is very short and rather misshapen. The dimensions are not included in the description above as I suspect insect damage in the formation of the fruit.

b. subsp. lanitii (Blanco) Ngan

Wrightia pubescens R.Br. var. *lanitii* (Blanco) Ngan, Ann. Missouri Bot. Gard. 52 (1965) 153; Whitmore, Tree Fl. Malaya 2 (1973) 23; I.M. Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 131; D.J. Middleton, Harvard Pap. Bot. 10 (2005) 176. — *Anasser laniti* Blanco, Fl. Filip. (1837) 112. — *Wrightia lanitii* (Blanco) Merr., Publ. Bur. Sci. Gov. Lab. 27 (1905) 59. — Type: Untraced. Neotype: *Sulit PNH 22879* (neo A, designated by Middleton (2005) op. cit.; iso L), Philippines, Laguna, Makiling National Park.

Wrightia javanica A.DC., Prodr. 8 (1844) 405; Miq., Fl. Ned. Ind. 2 (1857) 432; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 464; Ridl., Fl. Malay Penins. 2 (1923) 353; Tsiang, Sunyatsenia 4 (1939) 50; Kerr in Craib, Fl. Siam. 2 (1939) 457; Bakh.f., Blumea 6 (1950) 393; Backer & Bakh.f., Fl. Java 2 (1965) 241. — Type: *Kollmann s.n.* (holo G; scrap from holo in G-DC), Java.

Wrightia ovata A.DC., Prodr. 8 (1844) 405; Miq., Fl. Ned. Ind. 2 (1857) 432. — Type: *Cuming 1279* (lecto G, designated by Middleton (2005) op. cit.; iso P), Philippines, Luzon, Manila.

Wrightia tomentosa Roem. & Schult. var. *cochinchinensis* Pierre ex Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1186. — Type: *Pierre 1047* (lecto A, designated by Ngan (1965) op. cit., 1st step, and Middleton, Adansonia sér. 3, 27 (2005) 306, 2nd step; iso BO, MICH, MO), Vietnam, sine loc. — There is a possibility that *Pierre 1047* and *1147* have become confused and that they are in fact the same collection. There are additional specimens labelled *1147* in NY and P.

Shrub or tree to 15 m tall, to 30 cm dbh, often deciduous; wood pale. *Branchlets* sparsely pubescent to tomentose, becoming glabrous; sparsely lenticellate. *Leaves*: petiole 2–11 mm long; blade ovate, elliptic or obovate, papery to subcoriaceous, 1.5–15 by 1–7.5 cm, 1.2–4 times as long as wide, apex acuminate or apiculate, base cuneate to rounded, densely tomentose or puberulent above and beneath, sometimes glabrate or

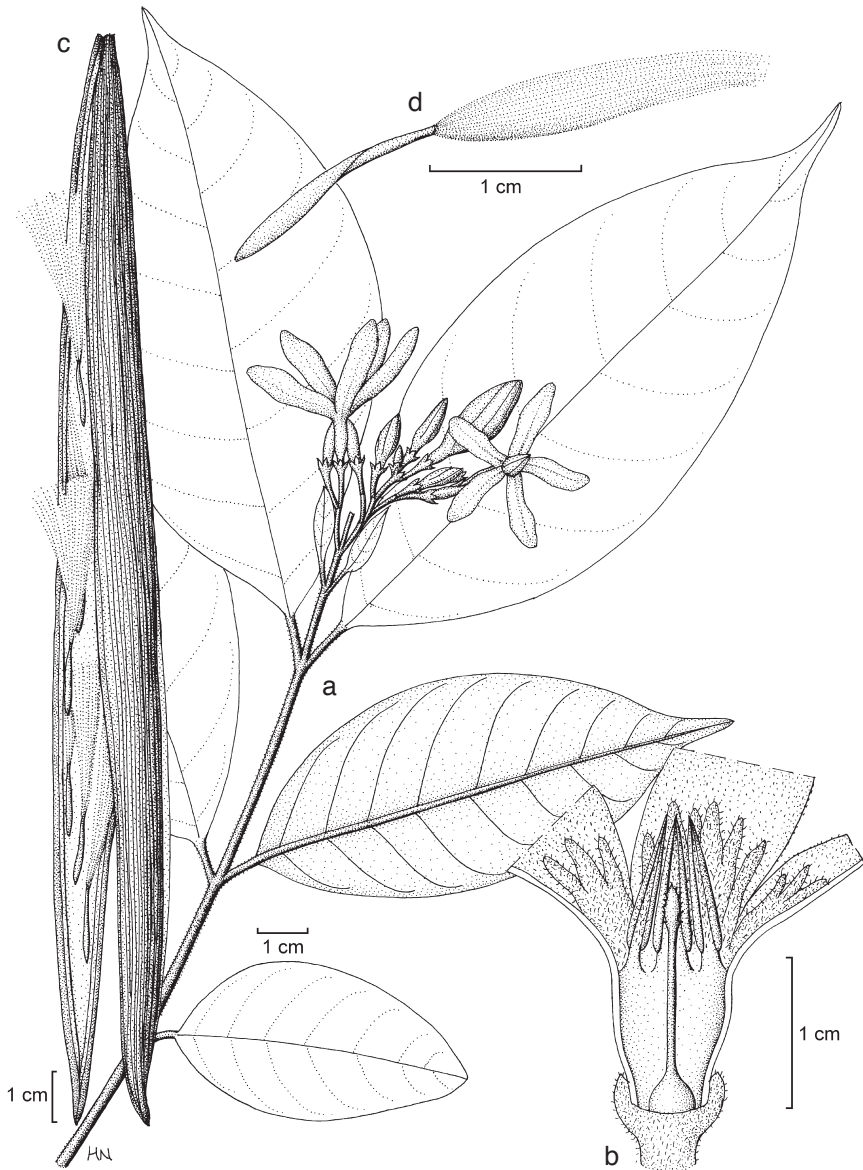


Fig. 113. *Wrightia pubescens* R.Br. subsp. *lanitii* (Blanco) Ngan. a. Habit; b. flower dissection; c. fruit; d. seed (a, b: Balansa 2120; c, d: Put 261).

only puberulent on venation, 7–15 pairs of secondary veins, tertiary venation reticulate. *Inflorescence* terminal, 3.7–7.5 cm long; tomentose or puberulent; peduncle 0.3–1.7 cm long, densely pubescent; pedicels 4.3–11 mm long, densely pubescent. *Sepals* ovate, 1–4 by 1.2–2.7 mm, 0.8–1.9 times as long as wide, apex obtuse to acute, tomentose or puberulent, colleters large and wide in the sinuses. *Corolla* white and, sometimes, pinkish; subrotate; tube 3.2–8.1 mm long, 2–3.9 times as long as sepals, 0.4–0.5 times as long as lobes, minutely puberulent at top of tube outside, glabrous inside; lobes 8.5–27.2 by 4.8–9.6 mm, 1.6–4 times as long as wide, oblong to slightly obovate, apex obtuse or rounded, minutely puberulent outside and inside; antipetalous corona 4.2–9 mm long, crenate at apex, adnate to corolla lobes except at apex and margins, sparsely pubescent inside, 0.9–1.4 times as long as alternipetalous lobes; alternipetalous corona 2.5–7.5 mm long, narrow, bifid at apex, pubescent inside; alternating lobes lacking. *Stamens* inserted at 0.7–0.9 of tube length from base, strongly exerted from tube; filaments 0.7–2 mm long; anthers 5.9–8.5 by 1.3–2.1 mm, pubescent within and without. Gynoecium of 2 adnate carpels, ovary 1.5–2.7 mm long, glabrous, carpels medially connate; style and style head 8–10.5 mm long. *Fruit* of connate follicles, splitting into 2 at dehiscence, 9.3–38 by 0.9–2.2 cm, minutely puberulent or, rarely, glabrous, minutely lenticellate or not. *Seeds* linear; 10.7–15.7 by 1–2.6 mm; coma 1.2–4.5 cm long. — **Fig. 113.**

Distribution — China, Thailand, Cambodia, Laos, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Western Java, Philippines, Sulawesi.

Note — *Wrightia pubescens* subsp. *lanitii* and subsp. *pubescens* differ in the size and shape of the sepals and, for the most part, in the pubescence of the antipetalous corona lobes. However, there are individuals that have some pubescence on the inside of the corona lobes and specimens from Sulawesi have the corona type and sepal shape of subsp. *pubescens* but the sepal size of subsp. *lanitii*.

8. *Wrightia religiosa* (Teijsm. & Binn.) Benth. ex Kurz

Wrightia religiosa (Teijsm. & Binn.) Benth. ex Kurz, J. Asiat. Soc. Bengal 46, 2 (1877) 258; Forest Fl. Burma 2 (1877) 194; Hook.f., Fl. Brit. India 3 (1882) 653; King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 467; Ridl., Fl. Malay Penins. 2 (1923) 353; Pit. in Lecomte, Fl. Indo-Chine 3 (1933) 1183; Tsiang, Sunyatsenia 4 (1939) 42; Kerr in Craib, Fl. Siam. 2 (1939) 458; Bakh.f., Blumea 6 (1950) 393; Pichon, Notul. Syst. (Paris) 14 (1951) 85; Ngan, Ann. Missouri Bot. Gard. 52 (1965) 159; Backer & Bakh.f., Fl. Java 2 (1965) 241; Whitmore, Tree Fl. Malaya 2 (1973) 24; L'ý, Feddes Repert. 97 (1986) 622; Whitmore & Tantra, Checklist Sumatra (1986) 20; P.T. Li et al., Fl. China 16 (1995) 175; I.M. Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 131; D.J. Middleton, Fl. Thailand 7 (1999) 88; Harvard Pap. Bot. 10 (2005) 179. — *Echites religiosus* Teijsm. & Binn., Tijdschr. Ned.-Indië 27 (1864) 34. — Type: *Teijsmann s.n.* (untraced). Neotype: *Collins 669* (neo E, designated by Middleton (2005) op. cit.; isoneo ABD, K, TCD), Thailand, Chon Buri, Sri Racha.

Shrub or small tree to 5 m tall. *Branchlets* puberulent, soon becoming glabrous and sparsely lenticellate. *Leaves*: petiole 1.5–4 mm long; blade papery, elliptic or oblong, 1.2–8.2 by 0.6–3.3 cm, 2.2–4.2 times as long as wide, apex acuminate, rarely to rounded, base cuneate, puberulent on midrib beneath and sometimes on midrib above, or completely glabrous, blade punctate beneath and sometimes above, 3–8 pairs of secondary veins, ascending, often obscure, tertiary venation obscure. *Inflorescence* 1.7–4.2 cm

long; glabrous or sparsely puberulent; pedicels 8–30 mm long, very delicate; flowers pendulous. *Sepals* ovate or oblong, 1–2.5 by 0.7–1 mm, 1.9–2.4 times as long as wide, apex obtuse to acute, glabrous, ciliate; colleters small and narrow. *Corolla* white; subrotate; sometimes double in cultivated plants; tube 2.1–4.2 mm long; lobes 4.8–9.8 by 1.9–2.7 mm, 2.1–2.6 times as long as wide, obovate, apex rounded; puberulent-papillose on lobes outside and inside, glabrous on tube outside and inside; corona absent. *Stamens* inserted at corolla mouth, strongly exerted from tube; filaments 1.5–2.5 mm long; anthers 3.8–4 by 0.7–0.8 mm, pubescent within and without. Gynoecium of 2 free carpels united into a common style, ovaries 0.8–1.1 mm high, glabrous, of 2 separate carpels; style and style head 5.7–8.3 mm long. *Fruit* of paired follicles; 8.5–17.5 cm by 3.3–4.5 mm; glabrous; not lenticellate. *Seeds* linear; 7–8.6 by 1.1–1.3 mm; coma 3–3.5 cm long.

Distribution — Thailand, Cambodia; in *Malesia*: Possibly Peninsular Malaysia. The natural distribution of this species is now obscure because it is so widely cultivated but is probably Thailand and maybe Cambodia. It may also be native in Peninsular Malaysia but is certainly widely cultivated in many parts of Malesia.

SPECIES EXCLUSAE

Aganosma elegans G. Don, Gen. Hist. 4 (1837) 77. = **Aganosma cymosa** (Roxb.) G. Don var. **elegans** (G. Don) Hook.f. – Miquel, Fl. Ned. Ind. 2 (1857) 446 has suggested this taxon may be in Java. However, it is only found in southern India and Sri Lanka.

Alstonia sericea Blume, Bijdr. 16 (1826) 1038. — *Blaberopus sericeus* (Blume) A. DC., Prodr. 8 (1844) 411; Miq., Fl. Ned. Ind. 2 (1857) 439; Backer & Bakh.f., Fl. Java 2 (1965) 227. — Type: *Blume s.n.* (lecto L [925.250-177], designated by Sidiyasa, Blumea, Suppl. 11 (1998) 156; iso L, U), Java, Mt Salak. = **Alstonia neriifolia** D. Don. — This species is native to the Himalayas. The species described by Blume from Mt Salak is more than likely an introduced cultivated plant and has not been recollected in Java.

Anodendron corymbosum Elmer, Leaflet Philipp. Bot. 2 (1908) 512. — Type: *Elmer 8468* (lecto NY, designated here), Philippines, Luzon, Benguet. = **Streptocaulon cumingii** Fern.-Vill.

Bleekeria kalocarpa Hassk., Natuurk. Tijdschr. Ned.-Indië 1 (1856) 40. — *Ochrosia kalocarpa* (Hassk.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4 (1869) 139. = **Ochrosia elliptica** Labill., a species native to Australia. Hasskarl described it from a specimen in Bogor Botanic Garden but it is not native to Malesia.

Kopsia majumdarii M. Gangop. & Chakr., J. Econ. Taxon. Bot. 16 (1992) 59. — Type: *King's Collector (= Kunstler) 7937* (holo CAL), Peninsular Malaysia, Perak. = **Kayea kunstleri** King (Clusiaceae).

Leuconotis tenuifolia Engl., Bot. Jahrb. Syst. 7 (1886) 470; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 501. — Type: *Naumann s.n.* (untraced) = **Garcinia spec.**

- Neuburgia musculiformis* Miq., Fl. Ned. Ind. 2 (1857) 403. = **Loganiaceae**.
- Neuburgia tuberculata* Blume, Mus. Bot. 1 (1850) 157, nom. illeg. = **Neuburgia moluccana** (Boerl.) Leenh. (Loganiaceae).
- Neuburgia tubiflora* Blume, Mus. Bot. 1 (1850) 156; Markgr., Bot. Jahrb. Syst. 61 (1927) 203. = **Loganiaceae**.
- Rheithrophyllum subverticillatum* Hassk., Flora 25 (1842) II, Beibl. 56; Miq., Fl. Ned. Ind. 2 (1857) 431. = **Aeschynanthus angustifolius** (Blume) Steud. (Gesneriaceae). – Included in the Apocynaceae by Miquel.
- Tabernaemontana cirrhosa* Blanco, Fl. Filip. (1837) 115. — Type: Blanco types unknown. Possibly a synonym of *Finlaysonia obovata* Wall.
- Willughbeia auriculata* Spreng., Syst. Veg. 4 (1827) cur. post. 71. = **Fagraea auriculata** Jack (Loganiaceae).
- Willughbeia drupacea* Blanco, Fl. Filip. (1837) 132. = **Ardisia humilis** Vahl (Myrsinaceae).
- Willughbeia elliptica* (Roxb.) Spreng., Syst. Veg. 4 (1827) cur. post. 71. = **Fagraea elliptica** Roxb. (Loganiaceae).
- Willughbeia fragrans* (Roxb.) Spreng., Syst. Veg. 4 (1827) cur. post. 71. = **Fagraea fragrans** Roxb. (Loganiaceae).
- Willughbeia multilocularis* Blanco, Fl. Filip. (1837) 131. = **Ardisia squamulosa** C. Presl (Myrsinaceae).
- Willughbeia obovata* Spreng., Syst. Veg. 4 (1827) cur. post. 71. = **Fagraea ceilanica** Thunb. (Loganiaceae).
- Willughbeia racemosa* (Jack ex Wall.) Spreng., Syst. Veg. 4 (1827) cur. post. 71. = **Fagraea racemosa** Jack ex Wall. (Loganiaceae).
- Willughbeia volubilis* Spreng., Syst. Veg. 4 (1827) cur. post. 71. = **Fagraea racemosa** Jack ex Wall. (Loganiaceae).

INSUFFICIENTLY KNOWN TAXA

(listed only by basionym)

- Alyxia heterophylla* Markgr., Bot. Jahrb. Syst. 61 (1927) 182. – The type specimen is lost and Markgraf himself was unable to place it in his work of 1977.
- Anodendron lanceolatum* King & Gamble, J. Asiat. Soc. Bengal 74, 2 (1907) 490; Ridl., Fl. Malay Penins. 2 (1923) 362. – I have only found one specimen of this species which is only of a dissected flower in Kew. It is impossible to ascertain its status from this specimen although it would appear to be close to *A. paniculatum*.

- Baissea borneensis* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 618; Merr., Bibliogr. Enum. Born. Pl. (1921) 501. — Type: *Romburgh Herb. Born. Occ.* 42 (untraced), Borneo, Kalimantan, Biang. — Possibly a *Cleghornia*.
- Baissea borneensis* Boerl. var. *crassifolia* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 618; Merr., Bibliogr. Enum. Born. Pl. (1921) 501. — Type: *Romburgh Herb. Born. Sud-Est* 37 (untraced), Borneo, Kalimantan, Pemangka. — Possibly a *Cleghornia*.
- Brabejum pinnatum* Blanco, Fl. Filip., ed. 2 (1845) 40. — This name was placed by Fernandez-Villar under *Alyxia odorata* and by Merrill under *Alyxia spec.* although in the absence of a type or an adequate description its status is not certain.
- Carissa axillaris* Roxb., Fl. Ind. 2 (1824) 526; Miq., Fl. Ned. Ind. 2 (1857) 399. — Type: Untraced. — Described from material from the Moluccas. Within Apocynaceae it could only be *Carissa spinarum* but could also have been described in the wrong family.
- Carruthersia axilliflora* Merr., Philipp. J. Sci. 27 (1925) 51. — Type: *Loher 12351* from the Philippines, Luzon, Rizal Province, Montalban. — I have been unable to locate any type material of this species. The holotype was probably destroyed in PNH. From the description it appears to be distinct from *C. pilosa* but I have seen no other material which matches the description.
- Ecdysanthera barbata* var. β Miq., Fl. Ned. Ind. 2 (1857) 452. — Type: *Korthals s.n.* — There are a number of Korthals collections of both *Parameria laevigata* and *P. polyneura* in the Leiden herbarium and it is not obvious which was intended to be the type.
- Echites clavata* Roxb., Fl. Ind. 2 (1832) 20. — *Vallaris clavata* (Roxb.) G. Don, Gen. Hist. 4 (1837) 79; Miq., Fl. Ned. Ind. 2 (1957) 427. — Type: Untraced. — The identity of this species, which Miquel (1837) suggests is found in the Moluccas, is uncertain.
- Echites cristatus* Roth in Roem. & Schult., Syst. Veg. 4 (1819) 393. — *Chonemorpha cristata* (Roth) G. Don, Gen. Hist. 4 (1837) 76. — Type: *Heyne s.n.* (untraced). — Index Kewensis suggests this is a synonym of *Aganosma marginata* = *Amphineurion marginatum*. If this is the case then the epithet *cristatum* would have priority. Displacing the current name in the absence of a type would seem unwise.
- Echites reticulatus* Roth in Roem. & Schult., Syst. Veg. 4 (1819) 394. — *Chonemorpha reticulata* (Roth) G. Don, Gen. Syst. 4 (1837) 76. — Type: *Heyne s.n.* (untraced). — Index Kewensis suggests it could be a *Cryptolepis*.
- Echites trifidus* Blanco, Fl. Filip. (1837) 109. — Possibly an *Alstonia* or *Rauvolfia*.
- Echites vestitus* Roth in Roem. & Schult., Syst. Veg. 4 (1819) 394. — *Chonemorpha vestita* (Roth) G. Don., Gen. Syst. 4 (1837) 76. — Type: Untraced. — Index Kewensis suggests it may be a *Wrightia*.

- Gardneria wallichii* Wight in Wall., Pl. Asiat. Rar. 3 (1832) t. 281; Wight, Icon. Pl. Ind. Orient. 4 (1848) 1313. – Included in the Apocynaceae by Wight but is rather Loganiaceae.
- Hunteria corymbosa* Roxb. var. “?” Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 13. – Boerlage has suggested his specimen from Sumatra represents an unknown variety but no material has been found which would clarify this.
- Leuconotis crassifolia* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 9; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 621; Markgr., Blumea 19 (1971) 155. — Type: *Van Romburgh 54* (untraced), Borneo, Kalimantan, Biang. – Note that Van Romburgh used the same number for different specimens from each of the various regions he explored. For example *Van Romburgh 54*, collected in a different place and on a different date, is also the type number of *Alyxia torulosa* Boerl. (= *Chilocarpus torulosus* (Boerl.) Markgr.).
- Leuconotis eugeniifolia* (Wall. ex G. Don) A.DC. var. *glabrior* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 7. — Type: *Van Romburgh s.n.* [Sumatra: Loeboeq Basoen (19 X 98), Kasoy (3 IX 98) & Tandjong heran (14 IX 98)]. All three syntypes untraced.
- Leuconotis intermedia* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 7; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 621. — Type: *Van Romburgh 49* (untraced).
- Leuconotis subavenis* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 9; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Markgr., Blumea 19 (1971) 156; Masam., Enum. Phan. Born. (1942) 622. — Type: *Van Romburgh 55* (untraced), Borneo, Kalimantan, Biang.
- Leuconotis subavenis* Boerl. var. *latifolia* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 9; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 622. — Type: *Van Romburgh 63* (untraced), Borneo, Kalimantan, Teloek Kemarin.
- Leuconotis subavenis* Boerl. var. *macrophylla* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 9; Merr., Bibliogr. Enum. Born. Pl. (1921) 495; Masam., Enum. Phan. Born. (1942) 622. — Type: *Van Romburgh 25* (untraced), Borneo, Kalimantan, Goenoeng Asoe.
- Lyonsia diversifolia* Warb., Bot. Jahrb. Syst. 18 (1894) 204; K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 508. — Type: *Hellwig 427* (untraced). – Markgraf (1927) noted that this species resembled the Australian *Lyonsia brownii* (= *P. brownii*) but there is no material to compare them.
- Melodinus curvinervius* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 10; Merr., Bibliogr. Enum. Born. Pl. (1921) 494; Masam., Enum. Phan. Born. (1942) 622. — Type: *Van Romburgh 83* (untraced), Borneo, Kalimantan, Boekit Soengei Simatjan. – Probably *Willughbeia beccariana* (Kuntze ex Pierre) K. Schum.

- Melodinus curvinervius* Boerl. var. *parvifolius* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 10; Merr., Bibliogr. Enum. Born. Pl. (1921) 494; Masam., Enum. Phan. Born. (1942) 622. — Type: *Van Romburgh 80* (untraced), Borneo, Kalimantan, Simpolan.
- Melodinus ovalis* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 12; Merr., Bibliogr. Enum. Born. Pl. (1921) 494; Masam., Enum. Phan. Born. (1942) 622. — Type: *Van Romburgh 8* (untraced), Borneo, Kalimantan, Panghalan Lokan.
- Melodinus pulchrinervius* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 10; Merr., Bibliogr. Enum. Born. Pl. (1921) 494; Masam., Enum. Phan. Born. (1942) 622. — Type: *Van Romburgh 10* (untraced), Borneo, Kalimantan, Soengei Sekinga. Probably *Wilughbeia flavescens* Dyer ex Hook.f.
- Melodinus rhytidophyllus* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 11; Merr., Bibliogr. Enum. Born. Pl. (1921) 494; Masam., Enum. Phan. Born. (1942) 623. — Type: *Van Romburgh 61* (untraced), Borneo, Kalimantan, Segasing; and 'Herb. Sumatra' (untraced).
- Parsonsia diversifolia* (Warb.) Markgr., Bot. Jahrb. Syst. 61 (1927) 215. — See *Lyonsia diversifolia* Warb.
- Parsonsia momiensis* Kaneh. & Hatus., Bot. Mag. (Tokyo) 55 (1941) 500. — This is probably a synonym of *Parsonsia alboflavescens* but impossible to say with certainty without the type material.
- Parsonsia subalpina* Markgr., Bot. Jahrb. Syst. 61 (1927) 217. — Type: *Ledermann 11618* (untraced). — Markgraf compares his new species to *Parsonsia wollastonii* which is now a synonym of *P. sanguinea*. It may be that this species is also a synonym of *P. sanguinea* and may be synonymous with var. *sepikensis* but without the type material or any other material identified by Markgraf its determination cannot be guaranteed.
- Phyetobasis macrocarpa* Hassk., Flora 7 (1857) 104; Miq., Fl. Ned. Ind. 2 (1857) 457; Bakh.f., Blumea 6 (1950) 393. — *Holarrhena macrocarpa* (Hassk.) Fern.-Vill., Fl. Filip., ed. 3, 4 (1880) 130. — Type: Untraced. — The genus has been synonymised in *Holarrhena* by De Kruif, Meded. Landbouwhoogeschool Wageningen 81-2 (1981) where he made the species a synonym of *Holarrhena pubescens* with a neotype from India. However, the protologue states that the corolla aestivation is sinistrorse, whereas it is dextrorse in *Holarrhena*. Also the plant was collected in Java and *Holarrhena* is unknown in Java. As the neotypification is in conflict with the protologue it can be abandoned and in the absence of any material its identity is a mystery.
- Plumeria papuana* Scheff., Ann. Jard. Bot. Buitenzorg 1 (1876) 36. — Type: not traced. — *Plumeria* is not native in Asia and the identity of this species is unclear.
- Urceola acuteacuminata* Boerl. var. *polyneura* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 19; Merr., Bibliogr. Enum. Born. Pl. (1921) 500; Masam., Enum. Phan. Born. (1942) 625. — Type: *Van Romburgh 62* (untraced), Borneo, Kalimantan, Teloek. — Probably a synonym of *Urceola brachysepala*.

Tabernaemontana subcapitata sensu Miq., Fl. Ned. Ind. 2 (1857) 419. – Leeuwenberg, Rev. Tabernaemontana 1 (1991) 128 lists *T. subcapitata* as a synonym of *Tabernaemontana bufalina* Lour., a species not known in Malesia. It is unclear what species Miquel intended.

Willughbeia celebica Blume, Mus. Bot. 1 (1850) 154; A.DC., Prodr. 8 (1844) 321; Miq., Fl. Ned. Ind. 2 (1857). — *Ancylocladus celebicus* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 412. – The type specimen was not indicated in the original description but Miquel mentions a Reinwardt specimen from Sulawesi in his account: I have been unable to locate this specimen. The only other species known from Sulawesi is *W. beccariana* although *W. angustifolia*, found in Borneo and Buru, possibly also occurs there.

Willughbeia unilocularis Blanco. – This taxon appears in a list of *Willughbeia* species in Pichon, Mém. Mus. Natl. Hist. Nat., sér. 2, 24 (1948) 153. However, I have been unable to locate it in Blanco's works and Merrill, Sp. Blancoana (1918) makes no mention of it. Pichon lists it as a species that has been published but that he has not seen. It could, therefore, be a typographical error for *W. multilocularis* Blanco which is a synonym of *Ardisia squamulosa* Presl.

Wrightia timorensis Miq., Fl. Ned. Ind. 2 (1857) 433. — Type: *Unknown s.n.* (lecto L [898.112-484], designated by Ngan, Ann. Missouri Bot. Gard. 52 (1965) 143; iso U (fragment)), Timor, sine loc. – This species was described by Miquel in 1857 from a specimen from Timor. It is a synonym of *Wrightia tinctoria*, a species otherwise known only from India. Its appearance in Timor is a mystery and is likely to be either a mistake on the label or else a cultivated plant transported from India earlier. There are no notes on the label to indicate, or otherwise, that it was a cultivated plant. Until such time as further material is collected in Timor that matches this specimen and its status can reassessed I am not including this as a Malesian species.

NOMINA NUDA

(for names which cannot otherwise be placed in synonymy for lack of information)

Microchites ovalifolius Ridl., J. Str. Med. Assoc. 5 (1897) 137.

Nerium jaspideum Span., Linnaea 15 (1841) 325.