

APOCYNACEAE

D.J. Middleton & M. Rodda

Juss., Gen. Pl. (1789) 143, as ‘Apocineae’; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 387; Ridley, Fl. Malay Penins. 2 (1923) 320; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 141; Endress & Bruyns, Bot. Rev. (Lancaster) 66 (2000) 31; Endress et al., Phytotaxa 159 (2014) 175; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 207. **Type:** *Apocynum* L.

Asclepiadaceae Borkh., Bot. Wörterb. 1 (1797) 31; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 505; Ridley, Fl. Malay Penins. 2 (1923) 369; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146. **Type:** *Asclepias* L.

For further family synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 1.

Small to very large woody or herbaceous climbers, epiphytes, large to small trees, shrubs, perennial or, rarely, annual herbs, sometimes succulents; latex usually present, most commonly white, occasionally clear, cream, yellow or pinkish. **Leaves** simple, mostly entire, rarely crenulate or with spines at the margin, sometimes absent; mostly petiolate, occasionally sessile; commonly opposite, less often alternate or whorled; stipules absent or small, then either intrapetiolar or represented only by an interpetiolar line, prophylls sometimes present, 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; venation pinnate or palmate (in *Hoya latifolia* G.Don). **Inflorescences** cymose or racemose, rarely fasciculate or flowers solitary; terminal, axillary or extra-axillary. **Flowers** bisexual, 5-merous, rarely 4-merous (in *Leuconotis* Jack), actinomorphic or, very rarely, slightly zygomorphic (noticeably in the cultivated *Allamanda* L. and almost imperceptibly in *Beaumontia* Wall.). **Calyx** often with colleters inside, these then one, few or many, in a solitary row or only in sinuses of calyx lobes. **Corolla** in a tube with free lobes, salverform, infundibuliform, campanulate, rotate or urceolate, aestivation contorted, overlapping to the left or right, more rarely valvate. **Stamens** inserted on the inside of the corolla tube, on staminal feet, or on staminal tube, completely included or exerted from corolla tube, free or adnate to the style head; anthers sagittate or ovate, sometimes with the base and apex sterile, occasionally with an elongated apex; pollen single, in tetrads, or formed into pollinia. **Nectary** present or absent. **Gynoeceum** superior or, rarely, semi-inferior, 2-carpellate and free but united into a common style, a fused 2-locular (elsewhere up to 5-locular) ovary, or a unilocular ovary, style head with a stigmatic base and an entire or 2-cleft apex, style head secretions sometimes forming into a translator for pollen transport, or into 5 hard corpuscula accompanied by 5 caudicles which attach to pollina when these are present. **Fruit** a drupe, berry, capsule or follicle, paired when formed from free ovaries. **Seeds** composed of the grain and often also an aril, a wing, a ciliate margin, or an apical and/or basal coma.

Address: Singapore Botanic Gardens, National Parks Board, Singapore.

Author contributions: D.J. Middleton: Rauvolfioids, Apocynoids; M. Rodda: Periplocoideae, Secamonoideae, Asclepiadoideae.

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Distribution. There are about 378 genera and 5350 species in the Apocynaceae (Endress et al. in Kadereit & Bittrich (ed.), *Fam. Gen. Vasc. Pl.* 15 (2019) 207–411), currently arranged into two informal groups and three subfamilies (see below). It is found throughout the world although is very much more diverse in the tropics. In Singapore there are 32 genera and 76 species, of which 3 genera and 7 species are naturalised or casual. The genera *Amphineurion* (A.DC.) Pichon, *Chilocarpus* Blume, *Holarrhena* R.Br. and *Leptadenia* R.Br. have been previously recorded for Singapore but are to be excluded (see Excluded species).

Ecology. The Apocynaceae in Singapore is a family of small trees to large emergent trees, shrubs, large forest lianas, scramblers, small twining plants and generally succulent epiphytes. Elsewhere in the world the family also includes herbs of which *Catharanthus roseus* (L.) G.Don has become naturalised in Singapore. In Singapore, amongst the tree species, most occur on relatively well-drained soils except for *Alstonia pneumatophora* Backer ex Den Berger, *Alstonia spatulata* Blume and *Kopsia singaporensis* Ridl., which all prefer swamp forest vegetation; *Cerbera manghas* L. and *Ochrosia oppositifolia* (Lam.) K.Schum., which are littoral; and *Cerbera odollam* Gaertn., which is riverine and back mangrove (although most commonly seen in Singapore as a street tree).

The flowers of the Rauvolfioids and Apocynoids are bisexual and protandrous. In the flowers of Periplocoideae the pollen tetrads or pollinia are shed onto a spoon-like translator which has a basal sticky disc by which it becomes attached to pollinators. The pollen of Asclepiadoideae and Secamonoideae is aggregated in pollinia that remain in the anther at anthesis. The pollination biology of species found in Singapore has not been reported in any detail although self-compatibility has been reported in a few species outside of Singapore (Albers & Van der Maesen, Wageningen Agric. Univ. Pap. 94 (1994) 61–81; Koch et al., *Bot. Jahrb. Syst.* 124 (2002) 83–104). The Apocynaceae contains a wide range of floral morphologies from the more simple in the Rauvolfioids to the increasingly more complex in the Apocynoids, Periplocoideae, Secamonoideae and culminating in the extremely complex flowers of Asclepiadoideae. In the Rauvolfioids and Apocynoids, the pollen is shed shortly before anthesis and may be secondarily presented on the style head that is always unreceptive to pollen. In the Rauvolfioids, where the stamens are not attached to the style head, the corolla may fall off shortly after the male phase. In the Apocynoids, where the stamens are attached to the style head, the corolla is generally longer lasting. In most genera it is clear that the shape of the corolla and the arrangement of the stamens, corona lobes, and hairs within the corolla forces insect pollinators to direct their mouth parts only in one possible way, thereby making pollination more precise. Pollen transfer is likely to be on the mouth parts. Many species have white flowers with long corolla tubes, presumably adapted for moth pollination. Moth pollination is also suggested by the presence in many species of night-scented flowers. The rotate corolla of Periplocoideae suggests fly pollination. In Asclepiadoideae and Secamonoideae the proboscis or leg of the pollinator gets caught between the guide rails of adjacent anthers and in the process of releasing itself the corpusculum gets dislodged freeing the pollinia from the anthers.

By far the most common means of seed dispersal in the Apocynaceae is by wind. In Singapore all species of Apocynoids, Periplocoideae, Secamonoideae and Asclepiadoideae, plus *Alstonia* R.Br. and *Dyera* Hook.f. from the Rauvolfioids, have dehiscent fruits and wind-blown seeds. In the Apocynoids, Periplocoideae, Secamonoideae and Asclepiadoideae the seeds usually have a coma of hairs at one or both ends (in *Sarcolobus globosus* Wall. the seeds

are glabrous), in *Alstonia* the seeds have a ciliate margin, and in *Dyera* they have a wing. The fruits of *Cerbera* L. and *Ochrosia* Juss. in Singapore are adapted to dispersal by water as two of the three species are littoral and the other riverine in their habitats. In species of *Dischidia* R.Br. and *Hoya* R.Br. dispersal is also mediated by ants (Livshultz et al., Blumea 50 (2005) 113–134). Most species in the Rauvolfioids, however, are probably dispersed by birds or mammals. Most have fleshy berries or drupes and some also a fleshy aril around the seed.

Uses. The uses of species of the Rauvolfioid and Apocynoid Apocynaceae have been discussed by Middleton (Fl. Penins. Malaysia, ser. 2, 2 (2011) 2–4), many of which will also apply to Singapore. In particular, a number of species were formerly used as a source of rubber and very many species have been used in traditional medicines, horticulture and as a minor source of timber.

The commonly cultivated exotic species in Singapore are *Adenium obesum* (Forssk.) Roem. & Schult., *Allamanda blanchetii* A.DC., *Allamanda cathartica* L., *Allamanda schottii* Pohl, *Asclepias curassavica* L., *Beaumontia grandiflora* (Roxb.) Wall., *Cerbera odollam* Gaertn., *Carissa carandas* L., *Carissa macrocarpa* (Eckl.) A.DC., *Catharanthus roseus* (L.) G.Don, various *Hoya* species, *Kopsia arborea* Blume, *Kopsia fruticosa* (Roxb.) A.DC., *Mandevilla* Lindl. hybrids, *Nerium oleander* L., *Pentalinon luteum* (L.) B.F.Hansen & Wunderlin, *Plumeria rubra* L., *Plumeria obtusa* L., *Plumeria pudica* Jacq., *Strophanthus gratus* (Wall. & Hook.) Baill., *Strophanthus preussii* Engl. & Pax., *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult., *Thevetia neriifolia* Juss. ex Steud., *Vallaris glabra* (L.) Kuntze and *Wrightia antidysenterica* R.Br. *Wrightia religiosa* (Teijsm. & Binn.) Benth. ex Kurz is a popular bonsai plant. In addition a number of native species are also cultivated, especially from the genera *Alstonia*, *Cerbera*, *Dischidia*, *Hoya* and *Kopsia* Blume.

Naturalised species. A number of non-native species have become naturalised or casual escapees but none has become invasive. Cantley (Straits Settlem. Rep. Bot. Gard. Forest Dept. (1883) A6) reports that *Thevetia neriifolia* Juss. ex Steud. has become naturalised in Singapore. There are no specimens to support this and it is not naturalising today. However, this may only be because Singapore's parks and gardens are generally well-maintained as seedlings do often appear beneath the parent plants. *Cynanchum tunicatum* (Retz.) Alston is a recently introduced and naturalising weed from India and although it is not yet proving to be invasive it might become so in the future as it grows in disturbed habitats such as construction sites, on fences and along sandy shores.

Taxonomy. It is now fairly uncontroversial that the Apocynaceae and Asclepiadaceae, until fairly recently treated as two distinct families, should all be recognised as Apocynaceae. It should be borne in mind, however, that in much of the older literature the Asclepiadaceae were kept distinct. Since the families have been merged, five subfamilies have generally been recognised: Rauvolfioideae, Apocynoideae, Periplocoideae, Secamonoideae and Asclepiadoideae. The first two correspond to the traditionally delimited Apocynaceae and the latter three are the traditionally delimited Asclepiadaceae. As both the Rauvolfioideae and Apocynoideae are paraphyletic, several recent publications have only recognised them as informal groups rather than as formal subfamilies (e.g. Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 207–411). Many previous family descriptions for Apocynaceae are only for the family in the traditional sense (including ones where it is recognised the Asclepiadaceae

also belongs in Apocynaceae but the description is only for the subfamilies comprising the traditionally delimited Apocynaceae). These include Bentham & Hooker (Gen. Pl. 2(2) (1876) 681), King & Gamble (J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 387), Ridley (Fl. Malay Penins. 2 (1923) 320), Whitmore (Tree Fl. Malaya 2 (1973) 3), Middleton (Fl. Thailand 7(1) (1999) 1), Middleton (Tree Fl. Sabah & Sarawak 5 (2004) 1) and Middleton (Fl. Males., ser. 1, 18 (2007) 1). The family description in Middleton (Fl. Penins. Malaysia, ser. 2, 2 (2011) 1) is for the wider family concept even though only the Rauvolfioids and Apocynoids are then treated.

Key to the informal groups and subfamilies of Apocynaceae

This key is adapted from Endress et al. in Kadereit & Bittrich (ed.), *Fam. Gen. Vasc. Pl.* 15 (2019) 207–411.

1. Anthers mostly free from style head; corolla lobes in bud most often overlapping to the left, sometimes overlapping to the right; fruit dehiscent or indehiscent, fused or free, a berry, drupe, follicle, or capsule; seeds simple, or with wings, a ciliate margin or with an aril, without a coma at one end **Rauvolfioids**
 Anthers adnate to the style head, sometimes only weakly so; corolla lobes in bud most often overlapping to the right, sometimes overlapping to the left or valvate; fruit dehiscent, a pair of follicles, mostly free or reduced to one or fused; seeds mostly compressed, mostly with a coma at one end, occasionally at both ends, rarely absent 2
2. Nectary, if present, in a ring around the base of the ovary; anthers 4-locular; pollen shed as monads (in Singapore), style head secretions for pollen transport normally a foamy adhesive or gummy, differentiated translators absent, pollinia absent; seeds without a thin margin **Apocynoids**
 Nectary 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
3. Anthers 2-locular, pollen enclosed in pollinia covered by waxy outer wall **Asclepiadoideae**
 Anthers 4-locular, pollen shed as tetrads or, if in pollinia, then without waxy outer wall ..
 4
4. Translators with sticky end that 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**
 Translators with hardened, clip-like corpusculum in which some part of the pollinator's body becomes caught for removal; pollen in 4 minute pollinia attached directly or indirectly to the corpusculum **Secamonoideae**

Key to the genera of Apocynaceae in Singapore

Note that the characters used to distinguish genera in the key below only work for Singapore and that several genera are much more variable in other parts of their ranges.

1. Herbs, shrubs or trees 2
Climbers or epiphytes 14
2. Herbs, sometimes with a slightly woody base, or barely branched subshrubs 3
Many-branched shrubs or trees 4
3. Leaves 1.5–6 cm long; corolla lobes not reflexed; stamens free from gynoeceium and each other, corona lobes absent; pollen not in pollinia **4. Catharanthus**
Leaves (5–)10–12 cm long; corolla lobes reflexed; stamens and gynoeceium united into a gynostegium and with complex corona lobes; pollen in pollinia **22. Asclepias**
4. Leaves spirally arranged **5. Cerbera**
Leaves opposite or whorled 5
5. Leaves whorled, sometimes with some opposite pairs but never exclusively so 5
Leaves exclusively opposite 10
6. Shrubs, often becoming scandent; corolla tube yellow, infundibuliform, more than 3.5 cm long; cultivated or naturalised **1. Allamanda**
Small to large trees; corolla colour variable, less than 3 cm long; mostly wild 7
7. Large unbuttressed trees; twigs usually distinctly ribbed; corolla tube much shorter than lobes; fruit a follicle with winged seeds **6. Dyera**
Small to large trees, with or without buttresses or fluted trunks; twigs not or only weakly ribbed; corolla tube longer than lobes; fruit a drupe or a follicle with ciliate seeds 8
8. Corolla lobes overlapping to the left in bud; fruit of paired follicles **2. Alstonia**
Corolla lobes overlapping to the right in bud; fruit of paired follicles or of drupes with a stoney or fibrous mesocarp 9
9. Leaves spatulate, apex rounded; disc absent or of two lobes; fruit of paired or solitary indehiscent drupes; found mostly near the sea **10. Ochrosia**
Leaves not spatulate, apex usually acuminate, rarely to rounded; disc a small annular thickening at base of ovaries; fruit of paired dehiscent follicles; habitat variable
..... **2. Alstonia**
10. Small intrapetiolar stipule-like structures present; corolla lobes overlapping to the left in bud; stamens free from the style head; fruit of paired capsules with arillate seeds
..... **11. Tabernaemontana**
Small intrapetiolar stipule-like structures absent; flower characters variable; fruit of paired follicles or of drupes, seeds without an aril, sometimes with a coma 11

11. Leaves with domatia on the undersurface **16. Kibatalia**
 Leaves without domatia on the undersurface 12
12. Corolla lobes overlapping to the left in bud **21. Wrightia**
 Corolla lobes overlapping to the right in bud 13
13. Leaves with 4–7 secondary veins on each side of midrib; stamens exerted from corolla throat, anthers attached to style head **16. Kibatalia**
 Leaves with 7–15 secondary veins on each side of midrib; stamens completely included in corolla, anthers free from style head **7. Kopsia**
14. Epiphytic plants, not rooted in the ground 15
 Small climbers to huge lianas, rooted in the ground 16
15. Corolla rotate, campanulate or reflexed **26. Hoya**
 Corolla urceolate **24. Dischidia**
16. Leaves whorled 17
 Leaves opposite 19
17. Corolla tube yellow, infundibuliform, more than 3.5 cm long; cultivated or naturalised ..
 **1. Allamanda**
 Corolla white, off-white and/or with pinkish or brownish markings, less than 1.5 cm long; native 18
18. Stamens adnate to the style head; fruit a solitary follicle; seeds with a coma
 **18. Parsonsia**
 Stamens free from the style head; fruit of paired drupes, often in moniliform chains; seeds without a coma **3. Alyxia**
19. Leaf blades conspicuously punctate beneath; flowers 4-merous **8. Leuconotis**
 Leaf blades not punctate beneath; flowers 5-merous 20
20. Stamens free from the style head; fruit of berries 21
 Stamens attached to style head; fruit of paired or solitary follicles 22
21. Lianas without tendrils; corolla with a corona in the throat; fruit a hard-walled berry
 **9. Melodinus**
 Lianas with tendrils; corolla without a corona in the throat; fruit a soft-walled berry
 **12. Willughbeia**
22. Corolla lobes with long projections or not; anthers with elongated anther apex
 **19. Strophanthus**
 Corolla without long projections; anthers without an elongated anther apex 23

23. Corolla tube ≥ 1.5 cm long 24
 Corolla tube < 1.5 cm long or tube absent 26
24. Colleters present at junction of leaf blade and petiole; flowers with pollinia
 **27. Jasminanthes**
 Colleters absent at junction of leaf blade and petiole; flowers without pollinia 25
25. Inflorescence umbelliform; sepals free, 5 mm or shorter; corolla lobes less than 20 mm
 long **15. Epigynum**
 Inflorescence not umbelliform; sepals fused into a tube (in Singapore), more than 5 mm
 long; corolla lobes more than 20 mm long **14. Chonemorpha**
26. Corolla urceolate 27
 Corolla not urceolate 28
27. Colleters present at junction of leaf blade and petiole; flowers with pollinia
 **25. Gongronema**
 Colleters absent at junction of leaf blade and petiole; flowers without pollinia
 **20. Urceola**
28. Stipule-like structure present between petiole insertions; interstaminal corona present
 **23. Cynanchum**
 Stipule-like structure absent between petiole insertions; interstaminal corona absent
 29
29. Corolla salverform or campanulate; flowers without pollinia 30
 Corolla rotate; flowers with pollinia 34
30. Corolla with a corona **31. Gymnanthera**
 Corolla without a corona 31
31. Stamens more or less completely exerted from corolla tube **18. Parsonsia**
 Stamens included in corolla tube or only tips of anthers exerted 32
32. Ovary glabrous; seed rostrate **13. Anodendron**
 Ovary pubescent; seed not rostrate 33
33. Corolla lobes overlapping to the left in bud; stamens inserted at base of corolla tube; seed
 grain hirsute **20. Urceola**
 Corolla lobes overlapping to the right in bud; stamens inserted around middle of corolla
 tube; seed grain glabrous **17. Microchites**
34. Corolla diameter > 2 cm **26. Hoya**
 Corolla diameter < 1.5 cm 35

35. Filaments free **30. Finlaysonia**
 Filaments fused into a tube 36
36. Corona absent (in Singapore); seeds without a coma **28. Sarcolobus**
 Corona present; seeds with a coma 37
37. Pollinia 2 **29. Vincetoxicum**
 Pollinia 4 **32. Secamone**

RAUVOLFIOIDS

Trees, shrubs or climbers, rarely herbs. **Leaves** opposite or in whorls or spirally arranged, entire (in Singapore); petioles without colleters at the junction with the blade. **Inflorescences** cymose, flowers rarely solitary; terminal or axillary; flowers 5-merous, rarely 4-merous (in *Leuconotis*), actinomorphic or, very rarely, slightly zygomorphic. **Calyx** lobes with or without colleters inside. **Corolla** sympetalous, mostly salverform; lobes usually sinistrorse, rarely dextrorse (in *Alstonia* 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. **Nectary** present or absent. **Gynoeceum** 2-carpellate and apocarpous but united into a common style, or a syncarpous 2-locular ovary (to 5-locular outside Singapore), 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.

This informal group corresponds to subfamily Rauvolfioideae (previously referred to as subfamily Plumerioideae) of earlier publications. As it is quite evidently not monophyletic, the most recent classifications of the Apocynaceae use the informal term ‘Rauvolfoids’ in preference. There are approximately 79 genera and 844 species worldwide of which there are 10 genera and 19 native species in Singapore. There are an additional 4 naturalised species in 3 genera, two of these genera only being known from introduced species.

1. ALLAMANDA L.

(Frederick Allamand, 1736–after 1803, Swiss surgeon
 and botanist who worked in Surinam and Russia)

Mant. Pl. 2 (1771) 146; Don, Gen. Hist. 4 (1837) 102; De Candolle, Prodr. 8 (1844) 318; Bentham & Hooker, Gen. Pl. 2(2) (1876) 690; Schumann in Engler & Prantl, Nat. Pflanzenfam. 4(2) (1895) 127; Sakane & Shepherd, Revista Brasil. Bot. 9 (1986) 125; Middleton, Fl. Thailand 7(1) (1999) 70; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 14; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 277. **Type:** *Allamanda cathartica* L.

Climbers or shrubs. **Leaves** in whorls of 3–5; lamina with intramarginal vein; petioles with colleters in the axils. **Inflorescences** terminal or axillary cymes; flowers 5-merous, large and

showy. **Calyx** with or without colleters inside. **Corolla** lobes overlapping to the left in bud, mature corolla infundibuliform, narrowly cylindrical at base, widening at point of stamen insertion, slightly zygomorphic, lobes broadly ovate. **Stamens** weakly coherent to the style head, completely included in the corolla tube; filaments short; anthers lanceolate, base sagittate or cordate, fertile for more or less the entire length, without appendages. **Nectary** annular or crenate. **Gynoecium** unilocular with 2 parietal placentas; style filiform, style head collared. **Fruit** a spiny capsule. **Seeds** smooth, ovoid.

Distribution. A genus of 14 species in tropical America. In Singapore 1 naturalised species.

Allamanda cathartica L.

(Greek, *catharsis* = purification; used medicinally as a purgative)

Mant. Pl. 2 (1771) 214; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 143; Middleton, Fl. Thailand 7(1) (1999) 70, fig. 23; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 12, 104, 262; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 15. **Type:** *Collector unknown s.n.* (neotype LINN [Herb. Linn. no. 298.1], designated by Leeuwenberg in Jarvis et al. (ed.), List Linn. Gen. Names [Regnum Veg. 127] (1993) 16). **Fig. 1.**

Allamanda schottii auct. non Pohl: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; Ridley, Fl. Malay Penins. 2 (1923) 320.

Shrub or scandent climber, branchlets glabrous. **Leaves:** petiole 2.5–5 mm long; lamina thin to coriaceous, elliptic to obovate, 2.5–14.4 × 0.8–5 cm, base cuneate, apex acuminate to caudate, secondary veins 11–15 pairs, glabrous or pilose beneath. **Inflorescences** 8.5–17.5 cm long, glabrous or pilose; bracts inconspicuous; pedicels 4–8 mm long. **Calyx** lobes lanceolate or narrowly elliptic, 9.7–20 × 2.8–4(–8) mm, glabrous, without colleters inside. **Corolla** yellow; tube 4.9–7 cm long, the lower part of tube more or less the same length as the upper part; lobes 1.6–3.7(–5) cm long, glabrous outside, pubescent around stamens inside. **Stamens** inserted at 2.9–3.7 cm from base; anthers 4.8–5.4 × 1.5 mm. **Nectary** c. 0.4 mm long. **Ovary** 1.5–1.9 mm long, glabrous; style and style head 3.5–3.6 cm. **Fruit** 3–3.5 cm long, 2.4–2.6 cm diam.; with spines to 15 mm long.

Distribution. Native to tropical America and the Caribbean. Commonly cultivated in Singapore and sometimes naturalising, for example in Jurong (*Whitmore 94*, 23 Feb 1957, SING [SING0201084]), Changi (*Ganesan & Yap SKG65*, 23 Apr 2004, SING [SING0055013]), the Central Catchment (*Hardie et al. 796*, 7 May 1992, SINU) and Pulau Tekong (*Tan et al. T1117*, 15 Aug 1996, SINU).

Ecology. In disturbed areas, sometimes along roads and on waste land.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.

Notes. Ridley (J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110) noted that '*Allamanda schottii* Pohl has run wild in a few places' and Ridley (Fl. Malay Penins. 2 (1923) 320) says *Allamanda*



Figure 1. *Allamanda cathartica* L. (From Singapore, Tiong Bahru Housing Estate. Photo: L.M.J. Chen).

schottii has ‘occasionally escaped but is hardly established’. As no naturalised material of *Allamanda schottii* from Singapore has been found, nor any material annotated by Ridley as such, it is assumed that the species being referred to is rather *Allamanda cathartica*, for which there are herbarium specimens and which can still occasionally be found growing.

2. ALSTONIA R.Br.

(Charles Alston, 1685–1760, a Scottish botanist)

Pulai (Malay)

Asclepiadeae (1810) 64, nom. cons.; Brown, Mem. Wern. Nat. Hist. Soc. 1 (1811) 75; Bentham & Hooker, Gen. Pl. 2(2) (1876) 705; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 641; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 435; Ridley, Fl. Malay Penins. 2 (1923) 345; Whitmore, Tree Fl. Malaya 2 (1973) 7; Kochummen & Wong, Blumea 29(2) (1984) 515; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 149; Sidiyasa, Blumea, Suppl. 11 (1998) 77; Middleton, Fl. Thailand 7(1) (1999) 41; Sidiyasa, Tree Fl. Sabah & Sarawak 5 (2004) 14; Sidiyasa, Fl. Males., ser. 1, 18 (2007) 31; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 15; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 257. **Type:** *Alstonia scholaris* (L.) R.Br., typ. cons.

Winchia A.DC., Prodr. 8 (1844) 326; Bentham & Hooker, Gen. Pl. 2(2) (1876) 695; Schumann in Engler & Prantl, Nat. Pflanzenfam. 4(2) (1895) 125; Pitard, Fl. Indo-Chine 3, fasc. 8 (1933) 1100; Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 298; Lý, Feddes Repert. 97 (1986) 613. **Type:** *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 & Bakhuizen van den Brink, Fl. Java (Spermatoph.) 2 (1965) 226; Lý, Feddes Repert. 97 (1986) 615. **Type:** *Blaberopus venenatus* (R.Br.) A.DC., lectotype designated by Monachino, Pacific Sci. 3 (1949) 140 (= *Alstonia venenata* R.Br.).

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

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

Trees, sometimes with pagoda-like branching; branches smooth to slightly rough, lenticellate or not; puberulous or pubescent; latex white. **Leaves** in whorls (in Singapore) when plants are mature, often opposite when seedlings or saplings, more or less equal in size within a whorl, lamina not punctate beneath; petiolate or sessile, colleter(s) present in the axils. **Inflorescences** terminal, cymose, often in whorls, few- to many-flowered; flowers 5-merous, mostly fragrant. **Calyx** without colletes in the axils. **Corolla** lobes overlapping to the right or the left in bud, corona absent; tube cylindrical or slightly widened around stamens, longer than the lobes; lobes spreading. **Stamens** not attached to the style head; filaments short, filiform; anthers ovate or narrowly ovate. **Nectary** a simple annular thickening at the base, often barely noticeable. **Gynoecium** 2-carpellate, carpels free but apically united into a common style, glabrous or pubescent; style mostly filiform, style head simple, without a basal collar. **Fruit** a pair of follicles, these thin, long and fairly straight. **Seeds** numerous, elliptic to oblong, ends rounded to acuminate, or caudate, glabrous or pubescent, margin with long cilia.

Distribution. Approximately 43 species in tropical Africa, tropical and subtropical East and Southeast Asia, Australia and the islands of the Pacific. In Singapore 6 species, 2 of which are likely naturalised.

Ecology. In Singapore *Alstonia scholaris* is commonly encountered as a street tree and readily grows in waste land from the copious seeds; *A. macrophylla* Wall. ex G.Don has likewise become naturalised in secondary forest. *Alstonia angustiloba* and *A. angustifolia* are both found in primary and secondary forest; *A. spatulata* and *A. pneumatophora* are both found in swamp forest or as remnants on drained land. *Alstonia scholaris*, *A. angustiloba*, *A. spatulata* and *A. pneumatophora* have a characteristic growth form whereby an axillary shoot grows vertically and quickly and then sends out almost horizontal branches, and then the system repeats. This produces a characteristic pagoda-like growth form when the plants are young and the ring of horizontal branches may be a mechanism for shading out potentially competing plants beneath the tree. Flowering generally occurs after drier weather.

Notes. This is a particularly variable genus and the description above applies only to the species as found in Singapore. Elsewhere the plants may be shrubs, the leaves may be opposite, and there may be differences from the nectary and ovary characters given here.

Key to *Alstonia* species

1. Colleter(s) in the leaf axils wide and deltoid, usually more or less as wide as the leaf scars, persistent, sometimes obscured by intrapetiolar stipule; corolla lobes overlapping to the left; seeds rounded at both ends; leaves in whorls of (3–)4–9 2
 Colleters in the leaf axils small and narrow with several in each leaf axil, often caducous, never with an intrapetiolar stipule; corolla lobes overlapping to the right; seeds acuminate or caudate at least at one end; leaves consistently in whorls of 3–4 5
2. Leaves with a distinct intrapetiolar stipule at the base of the petiole; intercostal veins slightly prominent above; corolla densely pubescent outside, except sometimes at base **5. *A. scholaris***
 Leaves without a distinct intrapetiolar stipule at the base of the petiole; intercostal veins variable but mostly not prominent above; corolla glabrous or sparsely pubescent outside ... 3
3. Tree with pneumatophore roots (these usually absent for remnant trees in drier conditions); leaves sessile or petiole short, usually < 7 mm long; follicles pubescent **4. *A. pneumatophora***
 Tree without pneumatophore roots; leaves with petioles 4–30 mm long, often slightly winged; follicles glabrous 4
4. Tree to 50 m tall in a variety of forest types; leaves obovate, elliptic or narrowly so; inflorescence many-flowered, dense; pedicels and calyx outside pubescent **2. *A. angustiloba***
 Tree to 25 m tall in swamp forest; leaves spatulate or sometimes obovate with a rounded apex; inflorescence few-flowered, lax; pedicels and calyx outside glabrous **6. *A. spatulata***
5. Sepals glabrous or laxly puberulous outside **3. *A. macrophylla***
 Sepals grey- or rusty-pubescent outside **1. *A. angustifolia***

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

(Latin, *angusti-* = narrow, *-folia* = leaves; with narrow leaves)

Prodr. 8 (1844) 409; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 440; Ridley, Fl. Malay Penins. 2 (1923) 348; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 151; Whitmore, Tree Fl. Malaya 2 (1973) 8; Markgraf, Blumea 22(1) (1975 [‘1974’]) 26; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 143; Turner, Gard. Bull. Singapore 45 (1993) 34; Sidiyasa, Blumea, Suppl. 11 (1998) 101, fig. 5.3; Sidiyasa, Tree Fl. Sabah & Sarawak 5 (2004) 15, fig. 1; Sidiyasa, Fl. Males., ser. 1, 18 (2007) 37, fig. 2; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 12, 104, 225; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 17, fig. 1. **Type:** *Wallich s.n.* [EIC 1650], Singapore (lectotype G-DC, designated by Sidiyasa, Blumea, Suppl. 11 (1998) 101; isolectotypes BR [BR0000006955731], G [G00169217], K [K000857316, K000857317, K000857319], K-W [K001113717], SING [SING0061678]). **Fig. 2.**

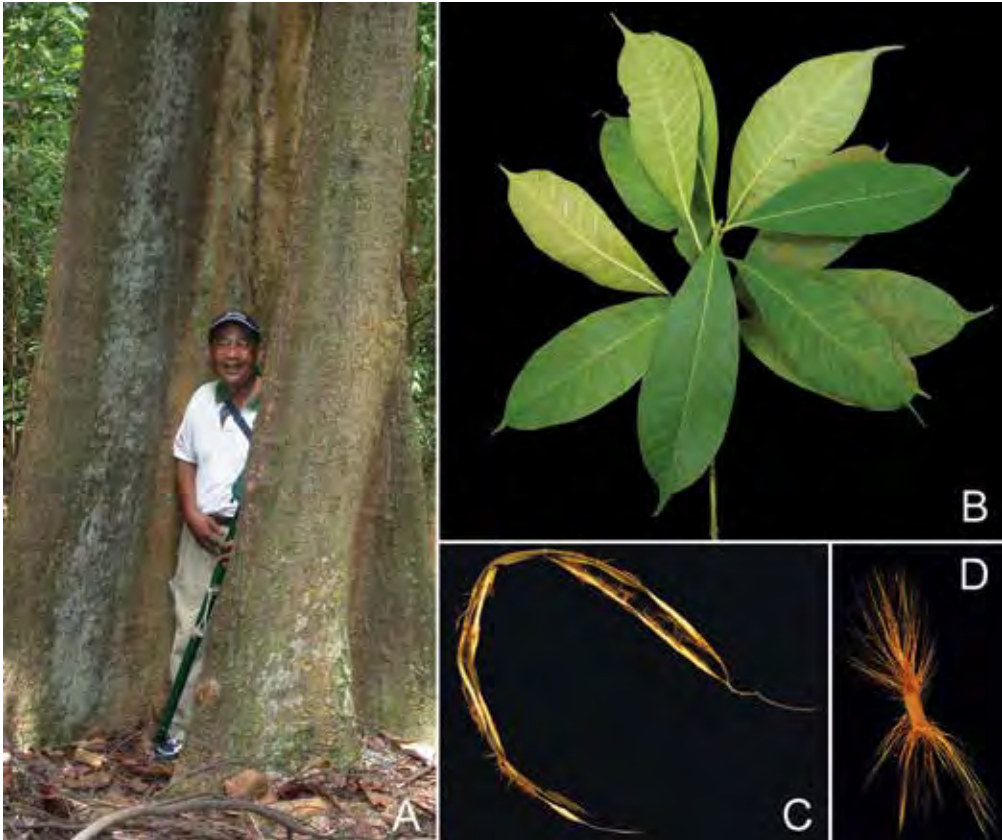


Figure 2. *Alstonia angustifolia* Wall. ex A.DC. **A.** Trunk. **B.** Leaves. **C.** Old fruit. **D.** Seed. (From Singapore, A from Bukit Timah Nature Reserve; B from MacRitchie; C, D from Admiralty Road West, *Lua SING2013-256*. Photos: A, S. Lee; B–D, P.K.F. Leong).

Amblyocalyx beccarii Benth., Hooker's Icon. Pl. 12 [ser. 3, 2], fasc. 4 (1876) 69, pl. 1179; Merrill, Bibliogr. Enum. Born. Pl. (1921) 500; Masamune, Enum. Phan. Born. (1942) 618. **Synonym:** *Alstonia beccarii* (Benth.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 297. **Type:** *Beccari 1628*, [Malaysia], Sarawak (holotype K [K000857306]; isotypes G [G00169216, G00169215], P [P00492390]).

Alstonia angustifolia Wall. ex A.DC. var. *elliptica* King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 441. **Type:** *Curtis s.n.*, [Malaysia], Penang (CAL n.v.).

Alstonia angustifolia Wall. ex A.DC. var. *latifolia* King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 441; Whitmore, Tree Fl. Malaya 2 (1973) 9. **Synonym:** *Alstonia latifolia* (King & Gamble) Ridl., Fl. Malay Penins. 2 (1923) 347; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 151. **Type:** *Maingay 1070/1*, [Malaysia], Penang (lectotype L [L0004882], designated by Monachino, Pacific Sci. 3 (1949) 160; isolectotypes BO, K [K000857320]).

Tree to 50 m tall, to 70 cm diam., base fluted or with buttresses, sometimes flowering when as small as 1.5 m tall. **Bark** smooth, shallowly fissured or with scattered lenticels, grey or brownish, without white latex. **Branchlets** glabrous or puberulent. **Leaves** in whorls of 3 (rarely 4); petiole 6–30 mm long, colleters small; lamina papery to coriaceous, obovate or, rarely, elliptic, 3.8–18 × 1.5–7 cm, 1.9–4.7 times as long as wide, apex acuminate, base cuneate, glabrous above, glabrous or puberulous beneath, secondary veins 10–20 pairs, arcuate ascending, intercostal veins reticulate. **Inflorescences** 3–9 cm long, many-flowered; pedicels 0.5–3 mm long, pubescent; flowers fragrant. **Calyx** lobes 1.3–2 × 0.7–1.2 mm, apex acute to rounded, usually reflexed, rusty pubescent. **Corolla** white to pale yellow, rusty pubescent outside, pilose inside, lobes ciliate; tube 3–4.5 mm long, 0.8–1.6 mm wide; lobes overlapping to the right, suborbicular or ovate, 1–2.3 × 1–1.8 mm, 1–1.5 times as long as wide. **Stamens** inserted at 2–2.8 mm from the base; anthers ovate, 0.7–1 × 0.3–0.4 mm. **Nectary**-like thickening at the base of ovary 0.1–0.3 mm high. **Ovaries** 0.5–1 mm high, glabrous; style 1–1.8 mm long, style head 0.3–0.5 mm long. **Fruit** a pair of follicles, 20–53 cm long, 1.7–3 mm in diam., glabrous. **Seeds** densely pubescent, elliptic to oblong, 4–8.6 × 1.2–2 mm, acuminate at one end, rounded at the other; cilia to 13 mm long, shorter along the margins.

Distribution. Sumatra, Peninsular Malaysia and Borneo. In Singapore known from practically all forests in the country, including the Singapore Botanic Gardens' Rain Forest (*Ridley 14138*, 1904, K), Bukit Timah (*Ngadiman SFN 36467*, 15 Jun 1939, K), MacRitchie (*Burkill HMB 3218*, 18 Oct 1963, SING [SING0115342]), Pulau Ubin (*Ali Ibrahim et al. PU 2014-003*, 2 Jun 2014, SING [SING0226775]) and Tampines (*Goodenough 2715*, 25 Nov 1889, SING [SING0062842]).

Ecology. The most common species of *Alstonia* in Singapore in a variety of forest habitats, including secondary forest.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Pulai penipu paya* (Malay).

2. *Alstonia angustiloba* Miq.

(Latin, *angusti* = narrow, *-loba* = lobes;
referring to the narrow calyx lobes)

Fl. Ned. Ind. 2, fasc. 3 (1857) 438; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 438; Ridley, Fl. Malay Penins. 2 (1923) 347; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 151; Whitmore, Tree Fl. Malaya 2 (1973) 9, fig. 1; Markgraf, Blumea 22(1) (1975 ['1974']) 24; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 143; Turner, Gard. Bull. Singapore 45 (1993) 34; Sidiyasa, Blumea, Suppl. 11 (1998) 104, fig. 5.5; Middleton, Fl. Thailand 7(1) (1999) 42; Sidiyasa, Tree Fl. Sabah & Sarawak 5 (2004) 17; Sidiyasa, Fl. Males., ser. 1, 18 (2007) 39, fig. 3; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 12, 104, 225; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 19. **Synonym:** *Paladelpa angustiloba* (Miq.) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 19 (1947) 299. **Type:** *Blume 910*, [Indonesia], Java (lectotype L [L0040169], designated by Sidiyasa, Blumea, Suppl. 11 (1998) 104). **Fig. 3.**

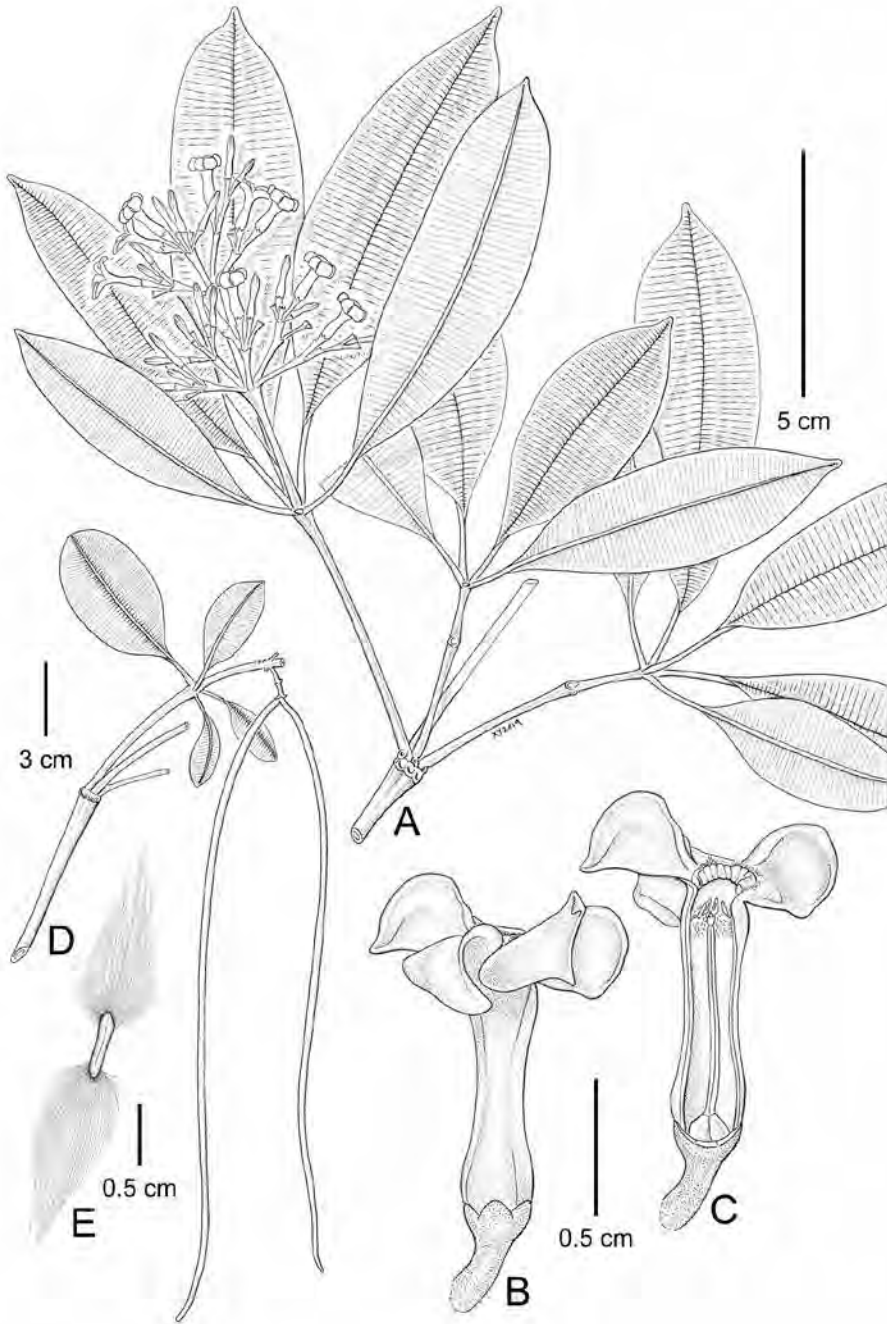


Figure 3. *Alstonia angustiloba* Miq. **A.** Habit. **B.** Flower. **C.** Flower dissection. **D.** Twig with fruit. **E.** Seed. (From Singapore, A from Bukit Timah Nature Reserve, *Sidek & Sao 19/A-10*; B, C from Singapore Botanic Gardens, *Furtado SFN 33681*; D–E from Mount Faber, *Sao 25/A-4*. Drawn by X.Y. Loh).

Alstonia calophylla Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 439. **Type:** *Teijsmannn HB994*, [Indonesia], Sumatra, Loeboe Aloeng [Lubuk Alung] (lectotype L [L0004884], designated by Monachino, Pacific Sci. 3 (1949) 152; isolectotypes K, U [U0000454]).

Alstonia angustiloba Miq. var. *glabra* Koord. & Valetton, Bijdr. Boomsort. Java 1 [Meded. Lands Plantentuin 11] (1894) 120. **Type:** *Koorders 4*, [Indonesia], Java, Pekalongan (lectotype BO, designated by Sidiyasa, Blumea, Suppl. 11 (1998) 104).

Alstonia scholaris auct. non (L.) R.Br.: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110.

Tree to 40 m tall, to 100 cm diam., fluted at base and forming tall buttresses to 8 m. **Bark** rough, fissured, 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 wide deltoid or scale-like colleters in the axils but no intrapetiolar stipule; lamina subcoriaceous to coriaceous, narrowly elliptic to obovate, 4.5–22 × 2.1–7 cm, (1.8–)2.2–4.1(–6.4) times as long as wide, generally longer and narrower in juvenile plants, apex obtuse, sometimes rounded or slightly retuse, more rarely shortly acuminate with a blunt apex, especially when young, base obtuse to acute, glabrous on both sides, secondary veins 30–70 pairs, straight and forming an angle of 80–90° with the midrib, 1–3(–4) mm from each other, intercostal veins inconspicuous or very faint. **Inflorescences** 3–9(–14) cm long, many-flowered, flowers usually quite crowded; pedicels (0–)1–3 mm long, pubescent; flowers fragrant. **Calyx** lobes ovate, 1.2–2 × 0.7–1 mm, apex obtuse, rarely acute, pubescent outside, ciliate. **Corolla** white, yellow or cream, glabrous outside, hairs inside tube and lobes densely pubescent at extreme base inside; tube 5.6–10.1 mm long, 1.2–1.8 mm wide; lobes overlapping to the left, oblique, ovate or oblong, 4–6.5 × 1.6–3 mm, 1.8–3.3 times as long as wide. **Stamens** inserted at 4.2–8.3 mm from base; anthers 0.8–1 × 0.35–0.4 mm. **Nectary**-like thickening at base of ovaries present or absent. **Ovaries** 0.8–1.1 mm high, mostly entirely glabrous, rarely sparsely hairy around the apex; style 3.7–6.6 mm long, style head 0.5–0.7 mm high. **Fruit** a pair of follicles, (15–)20–35 cm long, 1.6–2.3 mm in diam., brownish-tomentose. **Seeds** oblong, 5–7 × 1.3–1.5 mm, ends rounded or obtuse, cilia to 15 mm long.

Distribution. Thailand, Sumatra, Peninsular Malaysia, Borneo and Java. In Singapore found throughout forested areas of the country, including the offshore islands, such as Lazarus Island (*Samsuri et al. LZ6*, May 2003, SING [SING0045133]), Pulau Ubin (*Ali Ibrahim SING2010-923*, 29 Dec 2010, SING [SING0153675]), Bukit Timah (*Ngadiman SF 37007*, 1 Sep 1939, K, SING [SING0037839]), Sentosa (*Ridley s.n.*, May 1908, SING [SING0037837]) and MacRitchie (*Burkill HMB 3218*, 18 Oct 1963, K, SING [SING0115342]).

Ecology. It is a fairly common species of *Alstonia* in Singapore and found in a variety of forest types.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Pulai* (Malay).

Notes. This species is similar to *Alstonia scholaris* but easily distinguished by the lack of an intrapetiolar stipule at the base of the petiole.

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

(Greek, *macro-* = long or large, *-phylla* = leaf; with large leaves)

Gen. Hist. 4 (1837) 87; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 439; Ridley, Fl. Malay Penins. 2 (1923) 347; Markgraf, Bot. Jahrb. Syst. 61 (1927) 178; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 151; Whitmore, Tree Fl. Malaya 2 (1973) 9, fig. 1; Sidiyasa, Blumea, Suppl. 11 (1998) 149, fig. 5.24; Middleton, Fl. Thailand 7(1) (1999) 44; Sidiyasa, Tree Fl. Sabah & Sarawak 5 (2004) 20; Sidiyasa, Fl. Males., ser. 1, 18 (2007) 46, fig. 7; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 12, 104, 264; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 20. **Type:** *Wallich s.n.* [EIC 1648], India, Hort. Bot. Calcutta (lectotype K-W [K001113713], first step designated by Huber in Abeywickrama (ed.), Revis. Handb. Fl. Ceylon 1(1) (1973) 12, second step designated by Middleton, Gard. Bull. Singapore 71 (2019) 70; isolectotypes K-W [K001113714], P [P00492394]).

Alstonia macrophylla Wall. ex G.Don var. *glabra* A.DC., Prodr. 8 (1844) 410; Markgraf, Bot. Jahrb. Syst. 61 (1927) 178. **Synonym:** *Alstonia costata* Wall. ex Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 439, nom. illeg. non (G.Forst.) R.Br. (1810). **Type:** *Wallich 51* [EIC 1649], [Malaysia], Penang (lectotype K-W [K001113715], designated by Sidiyasa, Blumea, Suppl. 11 (1998) 149; isolectotype K [K000857314, K000857315]).

Alstonia pangkorensis King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 442; Ridley, Fl. Malay Penins. 2 (1923) 348. **Type:** *Scortechini 1024*, [Malaysia], Perak, Pangkor Island (lectotype CAL, designated by Monachino, Pacific Sci. 3 (1949) 166; isolectotype BM [BM000021847]).

For additional synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 46.

Tree to 50 m tall, to 100 cm diam., buttresses usually absent or low and only shallowly spreading. **Bark** smooth or rough, minutely scaly or weakly fissured, silver-grey to dark brown; inner bark usually cream or pale yellow, sometimes with orange streaks, without white latex. **Branchlets** glabrous. **Leaves** in whorls of 3–4; petiole 2–25 mm long, colleters minute and densely packed together in the axils; lamina papery to coriaceous, obovate, sometimes elliptic, 4.5–25(–32) × 1.5–10.5 cm, 1.7–4.8(–5.8) times as long as wide, apex rounded to narrowly acuminate, acumen 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, secondary veins 12–31 pairs (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 to form a submarginal vein; intercostal veins reticulate, conspicuous beneath or sometimes on both sides. **Inflorescences** 2–11 cm long, many-flowered; pedicels 0–6 mm long, puberulous or glabrescent; flowers fragrant. **Calyx** lobes 1–2.5 × 0.8–1.8 mm, apex obtuse or rounded, ciliate, glabrous or puberulous outside, glabrous inside, erect or slightly spreading. **Corolla** white or cream, occasionally with some pink, glabrous or sparsely hairy around the stamens and on the lobed margins outside, hairs in tube, pilose at the base of lobes to over half the length of the lobes inside, ciliate (rarely not); tube 4–6.3 mm long, 0.9–1.8 mm wide around the stamens, lobes overlapping to the right, ovate or narrowly ovate, sometimes slightly falcate or oblique, (2.8–)3.6–7 × 1–2.6 mm, 2.2–5 times as long as wide, apex rounded. **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. **Nectary**-like annular thickening at base present, 0.2–0.4 mm high. **Ovaries** (0.6–)0.8–1.4 mm high, glabrous; style 1.4–2.5(–2.9) mm long, style head 0.5–1.4 mm long. **Fruit** a pair of follicles, 25–62 cm long, 2–4(–4.5) mm in diam., glabrous. **Seeds** elliptic (sometimes slightly ovate), 5–10.5(–12) × 1.6–2.5 mm, pubescent on both sides, one end acuminate (sometimes bifid

at the apex), the other end rounded (rarely obtuse); longest cilia 5–10 mm long, becoming gradually shorter along the margins.

Distribution. Sri Lanka, India (Nicobar Islands), Thailand, Cambodia, Vietnam, Sumatra, Peninsular Malaysia, Borneo, the Philippines, Moluccas and New Guinea. In Singapore it is likely not native but is widely naturalised such as on Sentosa (*Heaslett s.n.*, 29 Jan 1973, SING [SING0037875]), Pulau Subar Darat (*Hung et al. SS18*, 10 Feb 2015, SINU) and Pulau Ubin (*Ali Ibrahim et al. SING2007-419*, Dec 2007, SING [SING0114755]).

Ecology. In Singapore it is establishing at forest margins and disturbed secondary forest.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.

Vernacular name. *Pulai penipu bukit* (Malay).

Notes. Although now quite widespread in Singapore, the earliest collection of it is from only 1973. It is not recorded as occurring in Singapore in any of the early literature and does not occur naturally south of Selangor in Peninsular Malaysia. For these reasons, the presence of this species in Singapore is presumed to be from planted trees followed by naturalisation.

4. *Alstonia pneumatophora* Backer ex Den Berger

(Greek, *pneumato-* = air, *-phora* = bearing; referring to the knee-shaped breathing roots)

Meded. Proefstat. Thee 97 (1926) 153; Whitmore, Tree Fl. Malaya 2 (1973) 11, fig. 1; Markgraf, Blumea 22(1) (1975 [‘1974’]) 25; Sidiyasa, Blumea, Suppl. 11 (1998) 165; Sidiyasa, Tree Fl. Sabah & Sarawak 5 (2004) 21; Sidiyasa, Fl. Males., ser. 1, 18 (2007) 52; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 12, 104, 200; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 22. **Type:** *Endert 28E.iP.505*, [Indonesia], Sumatra Selatan, Banjoeasin [Banyuasin] (lectotype L [L0004868], designated by Sidiyasa, Blumea, Suppl. 11 (1998) 165; isolectotypes BO, K [K000857308], P [P00492386], U [U0007970]). **Fig. 4.**

Alstonia pneumatophora Backer ex Den Berger var. *petiolata* Monach., Pacific Sci. 3 (1949) 153; Whitmore, Tree Fl. Malaya 2 (1973) 11. **Type:** *Endert 28E.iP.537*, [Indonesia], Sumatra Selatan, Palembang, Bayung Lincir, Banyuasin [Banjoeasin] (holotype L [L0004870]; isotypes BO, L [L0004869, L0004871], U).

Tree to 55 m tall, to 100(–200) cm diam. (one tree described as having 7 trunks with a total girth of 5 m), base fluted or with buttresses; knee-shaped pneumatophore roots present in natural conditions (absent in cultivated areas and on drier ground), these grey and often with horizontal lenticels. **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, without a distinct intrapetiolar stipule at the base of the petiole; petiole absent (leaves sessile) or to 7(–20) mm long, slightly winged, with deltoid or scale-like colleters in the axils; lamina coriaceous, spatulate, sometimes obovate, 4.3–13 × 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



Figure 4. *Alstonia pneumatophora* Backer ex Den Berger. **A.** Trunk. **B.** Flowers. **C.** Seeds. (From Singapore, A from Pulau Ubin; B from Singapore Botanic Gardens; C from Nee Soon, *O'Dempsey* SING2011-007. Photos: A, L.M.J. Chen; B, X.Y. Ng; C, T. O'Dempsey).

on both sides, not glaucous beneath, secondary veins 18–30 pairs, straight and forming an angle of (70–)80–90° with the midrib, 1.5–4(–6) mm from each other; intercostal veins usually inconspicuous on both sides. **Inflorescences** 3–9 cm long, composed of two bunches of densely clustered flowers; pedicels 0–1 mm long, puberulous or densely pubescent; flowers fragrant. **Calyx** lobes ovate, 1.5–2(–3.5) × 0.5–1.2 mm, apex obtuse, pubescent outside, laxly puberulous around the apex and glabrous at base inside, ciliate, erect, very often spreading. **Corolla** white, glabrous outside, hairs in tube, pilose with white hairs at the extreme base of lobes inside; tube almost cylindrical, 7–10 mm long, 0.8–1 mm wide; lobes overlapping to the left, ovate, 3–5 × 2–3.2 mm, 1.2–1.5(–2.5) times as long as wide, apex obtuse or rounded. **Stamens** inserted at 5.2–8.4 mm from the base; anthers 0.7–0.9 × 0.3–0.4 mm. **Nectary**-like thickening at base present or absent. **Ovaries** 0.8–1.2 mm high; style 5–8 mm long, style head 0.5–1 mm high. **Fruit** a pair of follicles, 10–20(–40) cm long, 1.5–2 mm wide, shortly pubescent or tomentose, with a blunt or narrowly acute apex. **Seeds** oblong, 4–4.9 × 1–1.2 mm, ends rounded, glabrous on both sides, longest cilia 8–12 mm long, shorter on the margins.

Distribution. Sumatra, Peninsular Malaysia, Borneo and Sulawesi. In Singapore this species is known from Nee Soon (*O'Dempsey* SING2011-007, 11 Dec 2010, SING [SING0153701]), the Central Catchment (*Wong et al.* 15, Aug 1994, SING [SING0062848]), the Western Catchment (*Ali Ibrahim et al.* SING2007-347, 25 Jun 2007, SING [SING0106387]), Pulau Ubin (*Ali Ibrahim et al.* SING2012-423, 31 Sep 2012, SING [SING0190199]) and in all places there are only a very small numbers of trees.

Ecology. In Singapore found in freshwater swamp forest. Elsewhere in its distribution also found in peat swamp forest.

Vernacular name. *Pulai basong* (Malay).

Provisional conservation assessment. Globally Endangered (EN A2c) due to the loss of more than 50% of the peat swamp and freshwater swamp forest habitats from throughout its distribution range in recent decades. It is assessed here Critically Endangered (CR/D) in Singapore as it is believed there are fewer than 50 trees left.

Notes. Although the relative sizes of the trees, the pneumatophores and various characters of the flowers and fruits serve to readily distinguish *Alstonia pneumatophora* from *A. spatulata*, many herbarium collections are present in herbaria that only have twigs with leaves and no fertile parts and insufficient notes and then the two species are difficult to distinguish. *Alstonia pneumatophora* tends to have shorter or almost no petiole and *A. spatulata* a much more distinct petiole although there is an overlap.

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

(Latin, *schola* = school; pertaining to a school, referring to the use of the wood for making slates for writing)

Asclepiadeae (1810) 65; Brown, Mem. Wern. Nat. Hist. Soc. 1 (1811) 76; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 436; Ridley, Fl. Malay Penins. 2 (1923) 346; Markgraf, Bot. Jahrb. Syst. 61 (1927) 177; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 152, fig. 39, pl. 15, 154; Whitmore, Tree Fl. Malaya 2 (1973) 11, fig. 1; Markgraf, Blumea 22(1) (1975 [‘1974’]) 23; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 143; Sidiyasa, Blumea, Suppl. 11 (1998) 176, fig. 5.36; Middleton, Fl. Thailand 7(1) (1999) 45; Sidiyasa, Tree Fl. Sabah & Sarawak 5 (2004) 22; Sidiyasa, Fl. Males., ser. 1, 18 (2007) 57, fig. 11; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 12, 104, 233; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 25. **Basionym:** *Echites scholaris* L., Mant. Pl. 1 (1767) 53. **Type:** *Collector unknown s.n.*, India (lectotype LINN [Herb. Linn. no. 302.2], designated by Huber in Abeywickrama (ed.), Revis. Handb. Fl. Ceylon 1(1) (1973) 12). **Fig. 5.**

Alstonia scholaris (L.) R.Br. var. *velutina* Monach., Pacific Sci. 3 (1949) 150; Whitmore, Tree Fl. Malaya 2 (1973) 11. **Type:** *Holttum SFN 24680*, [Malaysia], Pahang (holotype SING [SING0055220]; isotype NY [NY00297885]).

For additional synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 57.

Tree to 50(–60) m tall, to 80(–130) cm diam., fluted at the base or forming tall and steep buttresses to 10 m tall, 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 deltoid colleters in the axils; lamina narrowly elliptic to obovate, 5–22 × 1.5–8.5 cm, 1.7–4.5 times as long as wide, apex obtuse or rounded or often retuse (in young tree the



Figure 5. *Alstonia scholaris* (L.) R.Br. **A.** Trunk. **B.** Leaves and inflorescences. **C.** Inflorescence. **D.** Corolla from the front. **E.** Fruit. **F.** Seeds. (From Singapore, A from Singapore Botanic Gardens, B–D from Sin Ming Avenue, E from East Coast Park, F from Jurong. Photos: A–D, L.M.J. Chen; E, Zaki Jamil; F, K.M. Ngo).

leaves are generally larger and more acuminate), base often decurrent onto the petiole, less often acute or obtuse, glabrous or velutinous beneath, secondary veins 25–45(–55) pairs, rather straight, forming an angle of (70–)80–90° with the midrib, (1.5–)2–5(–7) mm from each other, secondary and intercostal veins mostly prominent above. **Inflorescences** 4–13(–17) cm long, many-flowered, mostly formed of two dense bunches of flowers; pedicels 0–2 mm long, pubescent; flowers fragrant. **Calyx** lobes ovate, 1.5–2.4 × 0.8–1.9 mm, apex mostly obtuse, pubescent outside, minutely pubescent or glabrous inside, erect, ciliate. **Corolla** white, yellow or cream, pubescent but sometimes glabrous at base outside, hairs inside, pubescent at base of lobes inside; tube 7–10 mm long, 0.8–1.6 mm wide; lobes overlapping to the left, broadly ovate or suborbicular, 3–5 × 2.5–4.5(–7) mm, 0.6–1.1 times as long as wide. **Stamens** inserted at 5.2–8.4 mm from the base; anthers 0.9–1.2 × 0.4–0.5 mm. **Nectary**-like thickening at base present or absent. **Ovaries** 0.9–1.5 mm high, densely pubescent; style 4.2–8 mm long, style head 0.8–1.7 mm long. **Fruit** a pair of follicles, 20–40(–63) cm long, c. 2(–2.5) mm in diam., glabrous. **Seeds** oblong, 4.5–5.5(–7) × 1.2–1.6(–2) mm, glabrous on both sides, ends rounded; cilia 8–12(–14) mm long, shorter or glabrous at the margins.

Distribution. India, Nepal, Bangladesh, Sri Lanka, Bhutan, Pakistan, Myanmar, China, Thailand, Cambodia, Laos, Vietnam, China, throughout Malesia, Australia and the Solomon Islands. In Singapore it would appear to be naturalised and not native even though its natural distribution includes all surrounding regions. Naturalised plants are infrequently collected but have been collected from MacRitchie (*Abu Kassim s.n.*, 13 Feb 1958, SINU).

Ecology. In Singapore it is very commonly cultivated and appears to escape from cultivation, readily producing seedlings around the parent plants. It does not, however, penetrate into primary or older secondary forest.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.

Uses. In Singapore the tree is frequently used as an ornamental. Elsewhere in the region this species is the principal source of *pulai* timber which is used for household items and high quality paper and has some local medicinal uses.

Vernacular name. *Pulai* (Malay).

Notes. This species is sometimes confused with *Alstonia angustiloba* but can readily be distinguished from it by the distinct intrapetiolar stipule at the base of each petiole.

6. *Alstonia spatulata* Blume

(Latin, *spatulatus* = spatula-shaped; referring to the leaf)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1037; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 642; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 437; Ridley, Fl. Malay Penins. 2 (1923) 346; Corner, Wayside Trees Malaya, ed. 3, 1 (1988)

152, pl.19; Whitmore, *Tree Fl. Malaya* 2 (1973) 12, fig. 1; Markgraf, *Blumea* 22(1) (1975 [‘1974’]) 25; Keng, *Concise Fl. Singapore*, vol. 1, *Gymn. Dicot.* (1990) 143, as ‘*spathulata*’; Turner, *Gard. Bull. Singapore* 45 (1993) 35; Sidiyasa, *Blumea*, Suppl. 11 (1998) 181, fig. 5.39; Middleton, *Fl. Thailand* 7(1) (1999) 46; Sidiyasa, *Tree Fl. Sabah & Sarawak* 5 (2004) 23; Sidiyasa, *Fl. Males.*, ser. 1, 18 (2007) 59, fig. 12; Tan et al. in Davison et al. (ed.), *Singapore Red Data Book*, ed. 2 (2008) 215; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 12, 104, 219; Middleton, *Fl. Penins. Malaysia*, ser. 2, 2 (2011) 26. **Type:** *Blume s.n.*, [Indonesia], West Java, near Rompin (holotype L [L0004860]). **Fig. 6.**

Tree to 25 m tall, to 40 cm diam., sometimes forming plank buttresses to 1.2 m tall. **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 3–4(–5), without a distinct intrapetiolar stipule at the base of the petiole; petiole 4–10(–15) mm long, sometimes slightly winged, colleters in the axils deltoid, mostly not persistent; lamina spathulate or obovate, 3–12 × 1.8–4.8 cm, 1.6–3 times as long as wide, base obtuse to decurrent onto the petiole, apex rounded, sometimes retuse, glabrous above and beneath, secondary veins 20–35(–40) pairs, straight and forming an angle of 70–80° with the midrib, 1.5–3(–4) mm from each other; intercostal veins mostly not visibly prominent above. **Inflorescences** 3–11 cm long, lax, few-flowered; pedicels (2.5–)4–9 mm long, glabrous; flowers fragrant. **Calyx** lobes ovate, 1.2–2 × 1–2 mm, erect, apex obtuse to rounded, ciliate, glabrous on both sides. **Corolla** white, yellow, or cream, glabrous outside, pubescent at base of lobes inside, lobes not ciliate; tube 7–8 mm long, 1–1.5 mm wide around the stamens; lobes overlapping to the left, elliptic, 6.7–11 × 3.5–6 mm, 1.4–2.1 times as long as wide, mostly undulate. **Stamens** inserted at 5–6.5 mm from the base; anthers 1–1.4 × 0.4–0.5 mm. **Nectary**-like thickening absent. **Ovaries** 0.8–1.5 mm high; style 4.3–5.5 mm long, style head 0.8–1 mm high. **Fruit** a pair of follicles, 12–25 cm long, 2.5–3 mm in diam., glabrous. **Seeds** oblong, 5–6 × 1.6–2.2 mm, ends obtuse or rounded, glabrous, longest cilia 12–22 mm long, shorter at the margins.

Distribution. Myanmar, Thailand, Cambodia, Vietnam, Sumatra, Peninsular Malaysia, Java, Borneo and New Guinea. In Singapore now only known from the Central Catchment (*Sinclair 9364*, 29 Oct 1957, SING [SING0003416]; *Sidek et al. 36/A*, 24 Nov 1983, SINU), although there are remnant trees elsewhere such as Tampines (*Saifuddin SING2012-008*, 20 Jan 2012, SING [SING0171423]).

Ecology. Usually on waterlogged sandy soils in swamp forest or by streams.

Provisional conservation assessment. Globally Least Concern (LC) as it is extremely widespread but it should be monitored as the wetland habitats it prefers are threatened throughout the region. It is assessed here as Endangered (EN/D) in Singapore as the remaining population is likely fewer than 250 individuals.

Vernacular name. *Pulai paya* (Malay).

Notes. See notes under *Alstonia pneumatophora*.

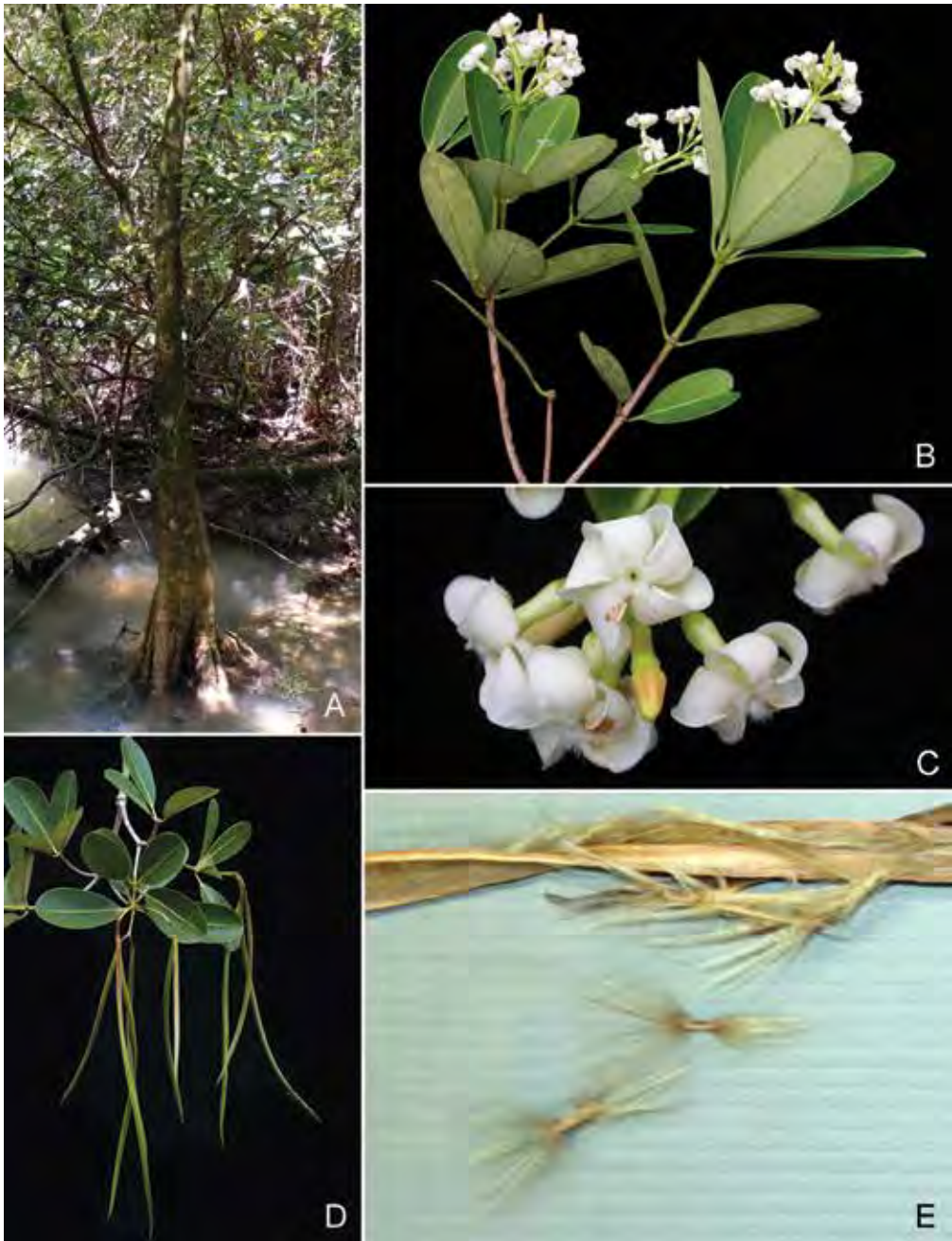


Figure 6. *Alstonia spatulata* Blume. **A.** Trunk. **B.** Leaves and inflorescences. **C.** Flowers. **D.** Leaves and fruits. **E.** Seeds. (A from Singapore, MacRitchie; B, C from Singapore Botanic Gardens, *Leong SING2008-467*; D from Singapore Sixth Avenue state land; E from Peninsular Malaysia, cultivated. Photos: A–C, P.K.F. Leong; D, Zaki Jamil; E, X.Y. Ng).

3. ALYXIA R.Br.

(Greek, *halusis* = chain; referring to the fruit shape)
Pulasari (Malay)

Prodr. Fl. Nov. Holland. (1810) 469, nom. cons.; Roemer & Schultes, Syst. Veg., ed. 15 bis, 4 (1819) 439; Bentham & Hooker, Gen. Pl. 2(2) (1876) 697; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 634; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 415; Ridley, Fl. Malay Penins. 2 (1923) 332; Middleton, Fl. Thailand 7(1) (1999) 55; Middleton, Blumea 45 (2000) 1; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 7; Middleton, Fl. Males., ser. 1, 18 (2007) 64; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 27; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 276. **Type:** *Alyxia spicata* R.Br., typ. cons.

Climbers without tendrils, scramblers or shrubs; latex white. **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 outside of Singapore), lamina not punctate beneath; petiolate with colleters present in the axils. **Inflorescences** axillary and/or terminal, consisting of solitary flowers or simple cymes (or of large terminal panicles outside of Singapore); flowers 5-merous. **Calyx** lobes ovate to linear, colleters absent. **Corolla** tube cylindrical, somewhat inflated around stamens, without a corona, lobes overlapping to the left, 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 length, free from style head. **Nectary** absent. **Gynoecium** 2-carpellate, carpels free but apically united into a common style, glabrous to pubescent, ovules several; style filiform, style head small. **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 ellipsoid (in Singapore); endocarp thin and papery, sometimes somewhat thicker to quite tough, mesocarp fleshy, often very thinly so; pericarp thin and coloured. **Seeds** simple, without an aril or coma; endosperm ruminant.

Distribution. About 106 species in northeastern India, southern China, Taiwan and throughout continental Southeast Asia and Malesia to Australia, the Solomon Islands and the Pacific islands to Henderson Island and Hawaii. In Singapore 1 native species (see also Excluded species).

Alyxia reinwardtii Blume

(Caspar Georg Carl Reinwardt, 1773–1854, founder and first Director
of the Botanic Gardens at Buitenzorg, now Bogor)

Cat. Gew. Buitenzorg (1823) 43; Markgraf, Blumea 23(2) (1977) 386; Turner, Gard. Bull. Singapore 45 (1993) 35; Middleton, Fl. Thailand 7(1) (1999) 55, fig. 18; Middleton, Blumea 45 (2000) 100, fig. 13; Middleton, Fl. Males., ser. 1, 18 (2007) 112, fig. 25; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 12, 104, 225; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 33. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L0004623], designated by Middleton, Blumea 45 (2000) 100; isolectotypes GH, NY). **Fig.** 7, 8.

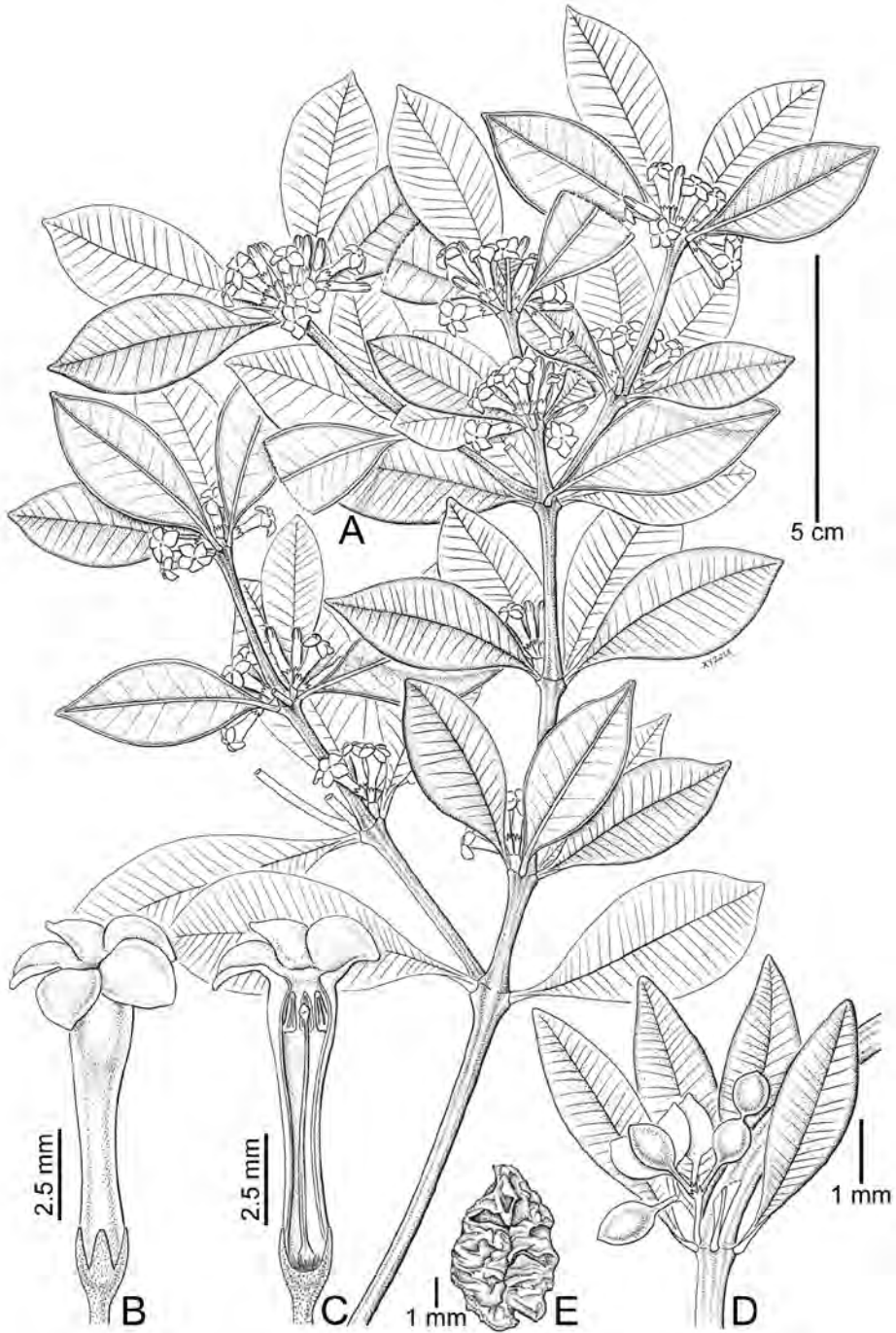


Figure 7. *Alyxia reinwardtii* Blume. **A.** Habit. **B.** Flower. **C.** Flower dissection. **D.** Twig with fruit. **E.** Seed. (From Singapore, A–C the Central Catchment Nature Reserve, Bukit Kalang, *Chua 2010-01*; D–E from the Western Catchment, *Lee et al. WC71*. Drawn by X.Y. Loh).



Figure 8. *Alyxia reinwardtii* Blume. **A.** Leaves and inflorescences. **B.** Flowers. **C.** Fruit. (From Singapore, MacRitchie, Lee *et al.* MRR22. Photos: S. Lee).

Alyxia lucida Wall. in Roxburgh, Fl. Ind. 2 (1824) 540; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 635; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 417; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; Ridley, J. Straits Branch Roy. Asiat. Soc. 59 (1911) 129; Ridley, Fl. Malay Penins. 2 (1923) 332; Henderson, Malay. Wild Fls., Dicot. (1959) 279, fig. 261. **Synonym:** *Alyxia reinwardtii* Blume var. *lucida* (Wall.) Markgr., Blumea 23(2) (1977) 389; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 143; Turner, Gard. Bull. Singapore 45 (1993) 35. **Type:** *Wallich s.n.* [EIC 1605], Singapore (lectotype K-W [K001113573], as 1605.1, designated by Middleton, Blumea 45 (2000) 101; isolectotypes A (scrap), BM [BM001014029], K [K000894010, K000894011], K-W [K001113574]).

Alyxia odorata Wall. ex G. Don, Gen. Hist. 4 (1837) 97; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 636; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 418. **Type:** *Wallich 1705* [EIC 1606], [Myanmar], Tenasserim, between Chappedong and Amherst, 1827 (lectotype K-W [K001113576], designated by Middleton, Blumea 45 (2000) 101; isolectotype G-DC).

Alyxia pumila Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 635; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 420; Ridley, Fl. Malay Penins. 2 (1923) 333. **Synonym:** *Alyxia reinwardtii* Blume var. *pumila* (Hook.f.) Markgr., Blumea 23(2) (1977) 388. **Type:** *Lobb s.n.*, [Malaysia], 'Malacca', Mt. Ophir [G. Ledang, Johor] (lectotype K [K000894008], designated by Middleton, Blumea 45 (2000) 101).

Alyxia lucida Wall. var. *meiantha* Stapf, Trans. Linn. Soc. London, Bot. 4 (1894) 207; Merrill, Bibliogr. Enum. Born. Pl. (1921) 499. **Synonym:** *Alyxia reinwardtii* Blume var. *meiantha* (Stapf) Markgr., Blumea 23(2) (1977) 389; Turner, Gard. Bull. Singapore 45 (1993) 35; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 124. **Type:** *Haviland 1185*, [Malaysia], Sarawak, Kira Batu (holotype K [K000894055]; isotype SAR).

Alyxia forbesii King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 420; Ridley, Fl. Malay Penins. 2 (1923) 334. **Type:** *Wallich s.n.* [EIC 1604], [Malaysia], Penang, 1822 (lectotype K-W [K001113571], as 1604.1, designated by Middleton, Blumea 45 (2000) 101).

Alyxia oleifolia King & Gamble var. *tenuifolia* Ridl., Fl. Malay Penins. 2 (1923) 333; Markgraf, Blumea 23(2) (1977) 385, p.p. **Type:** *Robinson s.n.*, [Malaysia], Selangor, Gunung Mengkuang (lectotype K [K000894007], designated by Middleton, Blumea 45 (2000) 101; isolectotypes BM [BM000508433], SING [SING0055208]).

Alyxia reinwardtii Blume var. *insularis* Markgr., Blumea 23(2) (1977) 387. **Type:** *Seimund s.n.*, [Malaysia], Perak, Pulau Lalang (holotype SING [SING0055210]; isotypes BO, UC).

Alyxia stellata auct. non (J.R.Forst. & G.Forst.) Roem. & Schult.: Blume, Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1031; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 636.

Alyxia pilosa auct. non Miq.: Markgraf, Blumea 23(2) (1977) 382, p.p.; Turner, Gard. Bull. Singapore 45 (1993) 35; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 12, 104, 187.

Alyxia schlechteri auct. non H.Lév.: Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 124.

For additional synonyms see Middleton, Blumea 45 (2000) 100–102.

Ground creepers or climbers. **Branchlets** terete, weakly or strongly angled, sparsely lenticellate or not, glabrous to sparsely puberulent. **Leaves** in whorls of 3–5; petiole 2–9 mm long, glabrous

or pubescent; lamina coriaceous to papery, elliptic, obovate or spatulate, 2.2–9.5 × 1–3.5 cm, 1.6–3.7 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. **Inflorescences** axillary or terminal, most frequently congested in leaf axils, glabrous to puberulent in upper parts or all over, 1–1.5 cm long; peduncle 0.2–0.7 cm long; flowers 3–12; pedicels 0.5–4.4 mm long. **Calyx** lobes ovate, 1–1.5 × 0.4–0.8 mm, apex acute, ciliate, sparsely puberulent. **Corolla** fragrant, creamy white to pale orange; tube cylindrical, 6.5–9 mm long, glabrous around top of tube outside, glabrous or pubescent in upper half and around stamens inside, lobes orbicular to elliptic, 1.1–2.2 × 1.5–1.9 mm, 0.6–1.5 times as long as wide, apex rounded to acute. **Stamens** inserted in upper half of corolla tube; filaments 0.2–0.8 mm long; anthers 0.6–1.5 × 0.3–0.6 mm; ovaries 0.4–1.2 mm high, glabrous, pubescent; style 0.9–6 mm long, style head 0.4–0.7 mm long. **Fruit** maturing black, with 1 or 2 articles in each string, c. 1 mm between articles, glabrous or sparsely puberulent at ends, articles with thin flesh, 6–15 × 5–8 mm, ellipsoid or globose, symmetrical, apex rounded, acuminate or apiculate.

Distribution. Southern China, Myanmar, Thailand, Cambodia, Laos, Vietnam, Sumatra, Peninsular Malaysia, Borneo, the Philippines (Palawan), Java and Bali. In Singapore known from Bukit Kalang (*Chua YK 2010-01*, 14 Jul 2010, SING [SING0146668]), Sungai Morai (*Ridley 5659*, 1893, SING [SING0003420]), MacRitchie (*Lee et al. MRR 22*, 6 Jul 2004, SING [SING0055702]), the Western Catchment (*Lee et al. WC 71*, 4 May 2004, SING [SING0054969]), Pulau Ubin (*Ali Ibrahim et al. SING2010-863*, 24 Jun 2010, SING [SING0153599]), Bukit Timah, Kranji, Mandai, Sentosa, Jurong and several offshore islands.

Ecology. Grows in a wide variety of primary and secondary forest and disturbed vegetation. It is said that the flowers are so fragrant that they can be detected from quite some distance.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Pulasari* (Malay).

Notes. This is a particularly variable species not always easily distinguished from its closest relatives. The description given here applies to the species as found in Singapore. Elsewhere it can be shrubby and both smaller and larger in many of its features.

4. CATHARANTHUS G. Don

(Greek, *catharo-* = pure, *-anthus* = flower; referring to the beauty of the flowers)

Gen. Hist. 4 (1837) 95; Turner, Gard. Bull. Singapore 45 (1993) 35; Van Bergen, Wageningen Agric. Univ. Pap. 96(3) (1996) 9; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 37; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 260. **Synonym:** *Lochnera* Rchb. ex Endl., Gen. Pl., fasc. 8 (1838) 583; Schumann in Engler & Prantl, Nat. Pflanzenfam. 4(2) (1895) 145. **Type:** *Catharanthus roseus* (L.) G. Don

Erect herb, sometimes with a woody base. **Branchlets** sparsely puberulent. **Leaves** opposite, equal; with colleters in the leaf axils and on the interpetiolar ridge. **Inflorescences** terminal but often appearing axillary, 1–2-flowered; flowers 5-merous. **Calyx** lobes without colleters inside. **Corolla** lobes overlapping to the left in bud, mature corolla salverform, constricted at throat, without a corona; lobes obovate. **Stamens** free from the style head; completely included in the corolla tube; filaments short; anthers oblong, fertile entire length. **Nectary** of 2 narrow lobes. **Gynoecium** 2-carpellate, carpels free but apically united into a common style, pubescent, ovules numerous; style filiform with a collared style head. **Fruit** of paired follicles; many seeded. **Seeds** cylindrical, blunt ended, rugose, without a coma.

Distribution. A genus of 8 species in Madagascar, India and Sri Lanka. *Catharanthus roseus* is cultivated and naturalised throughout the tropics.

Catharanthus roseus (L.) G. Don

(Latin, *roseus* = rose; referring to the flower colour)

Gen. Hist. 4 (1837) 95; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Turner, Gard. Bull. Singapore 45 (1993) 35; Middleton, Fl. Thailand 7(1) (1999) 48, fig. 16; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 24, 105, 265; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 38. **Basionym:** *Vinca rosea* L., Syst. Nat., ed. 10, 2 (1759) 944. **Synonym:** *Lochnera rosea* (L.) Rchb. ex Spach, Hist. Nat. Vég. 8 (1839) 526; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 390; Ridley, Fl. Malay Penins. 2 (1923) 340; Henderson, Malay. Wild Fls., Dicot. (1959) 281, fig. 263. **Type:** [Published illustration] Miller, Fig. Pl. Gard. Dict. 2 (1757) pl. 186. **Fig. 9.**

Stems puberulent. **Leaves:** petiole 2–8 mm long; lamina papery, elliptic or slightly obovate, 1.5–6 × 0.6–2.6 cm, apex obtuse or rounded and apiculate, base obtuse to cuneate, sparsely puberulent beneath, 7–10 pairs of strongly ascending secondary veins. **Inflorescences** of 1 or 2 flowers, terminal but appearing axillary, axes puberulent. **Calyx** lobes lanceolate, 1.5–5 × 0.5–0.7 mm, puberulent. **Corolla** usually deep pink with a purple, pink or yellow eye, sometimes white with a pink eye, completely white or other combinations of colours; tube 2.3–2.9 cm long; lobes 1.3–1.9 cm long, puberulent on tube outside, around mouth and inside at top of tube. **Stamens** situated at top of corolla tube; filaments c. 0.4 mm long; anthers 2.6–2.8 × 0.6–0.8 mm. **Nectary** lobes lanceolate, 2.3–2.6 mm long. **Ovaries** 1.9–3 mm long, puberulent; style and style head 1.9–2.1 cm long. **Fruit** narrowly oblong, longitudinally grooved, apex acute, sparsely puberulent, 1.5–2.5 cm long, 1.5–3.2 mm wide. **Seeds** 1.6–2.1 × 0.7–1.2 mm.

Distribution. Native to Madagascar. Widely cultivated and formerly widely naturalising in Singapore but not generally collected (e.g. *Chen LCMJ 2018-020*, 23 May 2018, SING [SING0267378], from plants naturalising in the Singapore Botanic Gardens; *Lua SING2018-730*, 26 Jul 2018, SING [SING0257448], from plants naturalising along Niven Road at the junction with Mount Emily Road).

Ecology. In disturbed areas. It is now less commonly found as older estates are redeveloped but does self-seed easily from cultivated plants when not mown or weeded out.



Fig. 9. *Catharanthus roseus* (L.) G. Don. (From Singapore, Tiong Bahru Housing Estate. Photo: L.M.J. Chen).

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.

Vernacular names. *Madagascar periwinkle* (English), *kemunting Cina* (Malay).

5. CERBERA L.

(Greek, *cerberos* = the dog guarding the gates of the underworld in Greek mythology; inference obscure but maybe due to the presence of tooth-like scales over the stamens at the red corolla throat in *Cerbera manghas*)

Sp. Pl. 1 (1753) 208; Bentham & Hooker, Gen. Pl. 2(2) (1876) 699; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 426; Ridley, Fl. Malay Penins. 2 (1923) 338; Whitmore, Tree Fl. Malaya 2 (1973) 12; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 152; Van Welzen, PROSEA 5(3) (1998) 154; Middleton, Fl. Thailand 7(1) (1999) 65; Leeuwenberg, Wageningen Agric. Univ. Pap. 98(3) (1999 [‘1998’]) 5; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 23; Middleton, Fl. Males., ser. 1, 18 (2007) 157; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 38; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 279. **Type:** *Cerbera manghas* L., lectotype designated by Hitchcock, Nom. Prop. Brit. Bot. (1929) 135.

Shrubs or small trees; latex white. **Leaves** spirally arranged, lamina usually drying black; petioles with colleters in the axils. **Inflorescences** of terminal panicles; flowers 5-merous. **Calyx** lobes without colleters inside. **Corolla** lobes overlapping to the left; 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; more or less sessile; connate to each other by appendages on the top of the anthers, not attached to style head; anthers ovate, fertile for the entire length except for appendages. **Nectary** absent. **Gynoecium** 2-carpellate, carpels free but apically united into a common style, glabrous, ovules several; 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 Ryuku Islands to Australia (Queensland). In Singapore 2 native species.

Ecology. *Cerbera* species flower and fruit throughout the year. Their fibrous fruits are dispersed by water and are commonly found on beaches or at back mangrove or along rivers.

Uses. *Cerbera odollam* is a common street tree. In other parts of the region, the latex of several species can be used externally against sores and an extract from the roots and bark used internally as a purgative. The seeds of *Cerbera mangas* and *C. odollam* are poisonous.

Notes. Care must be exercised when interpreting the previous literature on *Cerbera* because the species found in Singapore have often been confused with each other.

Key to *Cerbera* species

1. Corolla white with a red 'eye', corolla tube pubescent inside for more or less the entire length; stamens inserted near mouth of corolla tube; fruit oblong or ellipsoid **1. *C. manghas***
- Corolla white with a yellow 'eye', corolla tube pubescent inside only in top half; stamens inserted around middle of corolla tube; fruit spherical to ovoid **2. *C. odollam***

1. *Cerbera manghas* L.

(from the Portuguese word for mango; referring to the mango-like fruit)

Sp. Pl. 1 (1753) 208; Blanco, Fl. Filip. (1837) 125; Merrill, Bibliogr. Enum. Born. Pl. (1921) 500; Markgraf, Nova Guinea 14(2) (1926) 284; Markgraf, Bot. Jahrb. Syst. 61 (1927) 197; Merrill, Contr. Arnold Arbor. 8 (1934) 144; Hochreutiner, Candollea 5 (1934) 179; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 514, p.p.; Kerr, Fl. Siam. 2(5) (1939) 435; Browne, Forest Trees Sarawak & Brunei (1955) 66; Backer & Bakhuizen van den Brink, Fl. Java (Spermatoph.) 2 (1965) 233; Whitmore, Tree Fl. Malaya 2 (1973) 12; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 153; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Turner, Gard. Bull. Singapore 45 (1993) 35; Turner, Gard. Bull.

Singapore 47 (1997 [‘1995’]) 125; Middleton, Fl. Thailand 7(1) (1999) 67; Leeuwenberg, Wageningen Agric. Univ. Pap. 98(3) (1999 [‘1998’]) 21, fig. 2, 3; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 24; Middleton, Fl. Males., ser. 1, 18 (2007) 160; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 25, 105, 202; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 39. **Type:** *Osbeck s.n.* (lectotype LINN [Herb. Linn. no. 298.2], designated by Leeuwenberg, Taxon 41 (1992) 560). **Fig. 10.**

Cerbera odollam auct. non Gaertn.: Hooker, Fl. Brit. India 3, fasc. 9 (1882) 638, p.p.; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 427, p.p.

Cerbera lactaria auct. non Buch.-Ham. ex Spreng.: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; Ridley, Fl. Malay Penins. 2 (1923) 339.

Additional synonyms have been listed by Leeuwenberg, Wageningen Agric. Univ. Pap. 98(3) (1999 [‘1998’]) 21.

Tree or shrub to 20 m tall, to 60 cm diam. **Branchlets** with very visible leaf scars, glabrous. **Leaves:** petiole 0.9–4.5 cm long, glabrous; lamina papery to coriaceous, elliptic to obovate, 5–31 × 1–7 cm, 1.7–7 times as long as wide, apex acuminate, apiculate or, rarely, rounded, base cuneate, glabrous above and beneath, secondary veins 12–40 pairs, anastomosing into an intramarginal vein, intercostal veins reticulate. **Inflorescences** 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. **Calyx** lobes linear, lanceolate or oblanceolate, 8–21 × 2–9 mm, 2–5.6 times as long as wide, glabrous. **Corolla** white with a red eye (reported also as pure white from outside Singapore); tube 17–43 mm long, narrow, widening near the throat, 2–5.5 mm wide around stamens, glabrous outside, pubescent most of length of tube inside; lobes obliquely elliptic, 15–29 × 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 × 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 cm long, 3–7 cm diam.

Distribution. From the Seychelles through eastern Asia and throughout Malesia to the Pacific islands and northern Australia. In Singapore now mostly only on the offshore islands such as St John’s Island (*Sidek & Tang* 838, 10 Aug 1995, SING [SING0016233]) and Pulau Semakau (*Foo & Yang* *JF* 01, 10 May 2008, SING [SING0113784]) but also known from the Western Catchment and Labrador (*Maxwell* 82-176, 24 Jun 1982, SING [SING0003429]). Historically also known from Kranji, Changi (*Hullett* 87, Mar 1885, SING [SING0003431]) and Geylang (*Teruya* 2230, 5 Feb 1933, SING [SING0059827]).

Ecology. On sandy and rocky seashores.

Provisional conservation assessment. Globally Least Concern (LC) as it is an extremely widespread species. It is assessed here as Critically Endangered (CR/D) in Singapore due to habitat loss.

Vernacular names. *Pong pong tree* (English), *pokok pong pong* (Malay).



Figure 10. *Cerbera manghas* L. **A.** Trunk. **B.** Leaves and inflorescences. **C.** Flower from the front. **D.** Fruit with pericarp partially removed. (From Singapore, A from Singapore Botanic Gardens; B–D from St John’s Island. Photos: A, S.L. Koh; B–D, Zaki Jamil).

2. *Cerbera odollam* Gaertn.

(from an Indian plant name)

Fruct. Sem. Pl. 2, fasc. 2 (1791) 193; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 638, p.p.; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; King & Gamble; J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 427, p.p.; Ridley, Fl. Malay Penins. 2 (1923) 339; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 153; Whitmore, Tree Fl. Malaya 2 (1973) 12; Anderson, Checkl. Trees Sarawak (1980) 148; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Turner, Gard. Bull. Singapore 45 (1993) 35; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 125; Middleton, Fl. Thailand 7(1) (1999) 67, fig. 22; Leeuwenberg, Wageningen Agric. Univ. Pap. 98(3) (1999 ['1998']) 34, fig. 4, 5; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 25, fig. 3; Middleton, Fl. Males., ser. 1, 18 (2007) 163, fig. 39; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 25, 105, 220; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 40. **Synonym:** *Tanghinia odollam* (Gaertn.) G. Don, Gen. Hist. 4 (1837) 98. **Type:** [Published illustration] '*Odallam*' in Rheede, Hort. Malab. 1 (1678) fig. 39. **Fig. 11.**

Cerbera lactaria Buch.-Ham. ex Spreng., Syst. Veg. (ed. 16) 1 (1824 ['1825']) 642. **Type:** *Collector unknown*, Moluccas (not traced).

Cerbera manghas auct. non L.: Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 514, p.p.

Tree or shrub to 12 m tall, to 20 cm diam. **Branchlets** with very visible leaf scars, glabrous. **Leaves:** petiole 1.6–3.8 cm long, glabrous; lamina papery to coriaceous, obovate, 7.5–26 × 2.4–5.7 cm, 2.5–5 times as long as wide, apex acuminate, base cuneate, glabrous above and beneath, secondary veins 12–25 pairs, anastomosing into an intramarginal vein, intercostal veins reticulate. **Inflorescences** few to many-flowered, robust, lax, 8.8–35 cm long, glabrous; peduncle 3–20 cm long; pedicels 1.2–4 cm long. **Calyx** lobes linear, lanceolate or oblanceolate, 8.6–26 × 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 middle, 2–4 mm wide, glabrous outside, pubescent in upper half of tube inside; lobes 12–38 × 8–15 mm, 1.4–3 times as long as wide. **Stamens** inserted around 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 × 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 cm long, 3.7–6.6 cm diam.

Distribution. From Sri Lanka and South India to southern Thailand and throughout Malesia to the western Pacific islands. In Singapore it is now most commonly seen as a street tree but natural populations have been collected from Seletar (*Leong-Škorničková et al. SING2011-288*, 22 Aug 2011, SING [SING0205853]; *Ridley s.n.*, 29 Oct 1889, SING [SING0059826]), Kranji (*Goodenough s.n.*, Feb 1889, SING [SING0059824]; *Ridley s.n.*, 1896, SING [SING0003435]) and Pulau Punggol Timor (*Tan 980*, 18 Dec 2003, SINU).

Ecology. Mostly coastal on tidal mud or sand in mangroves.

Provisional conservation assessment. Globally Least Concern (LC). It is assessed here as Vulnerable (VU/D) in Singapore because even though it is commonly seen as a roadside tree, the loss of most of its natural habitat in Singapore means the natural population is now rather small.



Figure 11. *Cerbera odollam* Gaertn. **A.** Cultivated tree. **B.** Leaves and inflorescence. **C.** Flower from the front. **D.** Fresh and old fruit. (From Singapore, A, C from HortPark; B, D from Labrador Nature Reserve. Photos: A, C, W.F. Ang; B, D, Zaki Jamil).

Uses. Frequently grown as a roadside tree in Singapore.

Vernacular names. *Pong pong tree* (English), *buta-butua* (Malay).

Notes. Its latex is poisonous and can cause permanent blindness, hence its local name.

6. DYERA Hook.f.

(William T. Thiselton-Dyer, 1843–1928, an English botanist
and former director of the Royal Botanic Gardens Kew)
Jelutong (Malay)

J. Linn. Soc., Bot. 19 (1882) 293; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 643; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 442; Ridley, Fl. Malay Penins. 2 (1923) 344; Monachino, Lloydia 9 (1946) 182; Whitmore, Tree Fl. Malaya 2 (1973) 13; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 154; Middleton, Fl. Thailand 7(1) (1999) 36; Middleton, Gard. Bull. Singapore 55 (2003) 210; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 27; Middleton, Fl. Males., ser. 1, 18 (2007) 186; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 51; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 258. **Type:** *Dyera costulata* (Miq.) Hook.f., lectotype designated by Monachino, Lloydia 9 (1946) 184.

Trees, often growing to enormous size; buttresses absent; white latex in all plant parts. **Branchlets** usually longitudinally ribbed when young, sometimes only weakly so. **Leaves** whorled; lamina often weakly crenulate at margin, glabrous; petioles relatively long with distinct intrapetiolar stipules. **Inflorescences** of umbelliform or paniculate cymes; lax or somewhat congested in upper parts; flowers 5-merous. **Calyx** lobes with colleters inside, connate at base, lobes often of different sizes. **Corolla** rotate; tube much shorter than the lobes, without a corona; lobes overlapping to the left in bud, oblong to lanceolate, 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 lanceolate, base cordate, apex apiculate, sterile at apex, dehiscing laterally. **Nectary** annular, inconspicuous, adnate to the ovary. **Gynoeceum** 2-carpellate, carpels free but apically united into a common style with carpels closely associated and appearing fused, pubescent, ovules numerous; 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. A genus of 2 species from southern Thailand, Sumatra, Peninsular Malaysia and Borneo. In Singapore 1 native species.

Dyera costulata (Miq.) Hook.f.

(Latin, *costulatus* = finely ribbed; possibly in reference to the ribbed twigs)

J. Linn. Soc., Bot. 19 (1882) 293; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 644; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 443; Ridley, Fl. Malay Penins. 2 (1923) 345; Monachino,

Lloydia 9 (1946) 190; Whitmore, Tree Fl. Malaya 2 (1973) 13, fig. 2; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 154, fig. 39; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Turner, Gard. Bull. Singapore 45 (1993) 35; Middleton, Fl. Thailand 7(1) (1999) 36, fig. 12; Middleton, Gard. Bull. Singapore 55 (2003) 211; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 28, fig. 4; Middleton, Fl. Males., ser. 1, 18 (2007) 187, fig. 43; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 37, 105, 227; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 52. **Basionym:** *Alstonia costulata* Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 556. **Type:** *Diepenhorst HB1114*, [Indonesia], Sumatra, Priaman (lectotype U [U0000501], designated by Middleton, Gard. Bull. Singapore 55 (2003) 211; isolectotypes K, L [L0004481]). **Fig. 12.**

Alstonia eximia Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 555. **Type:** *Teijsmann HB3358*, [Indonesia], Sumatra, Bangka, near Djebus (lectotype U [U0000502], designated by Middleton, Gard. Bull. Singapore 55 (2003) 211; isolectotypes BO, L [L0004480]).

Alstonia grandifolia Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 555; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 442. **Type:** *Teijsmann HB4044*, [Indonesia], Sumatra, Palembang (lectotype U [U0000503], designated by Middleton, Gard. Bull. Singapore 55 (2003) 211; isolectotypes K [K000857355], L [L0004482]).

Dyera laxiflora Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 644; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 444; Ridley, Fl. Malay Penins. 2 (1923) 345. **Type:** *Cantley 226*, Singapore (lectotype K [K001129590], designated by Middleton, Gard. Bull. Singapore 55 (2003) 211; isolectotype P [P00253131]).

Emergent tree to 80 m tall, to 3 m diam., sometimes with somewhat exposed roots but not buttressed. **Bark** dark grey, brown or black, smooth with squarish scales; inner bark cream, pale grey or pale reddish; wood cream or white. **Twigs** 3.5–9 mm wide, glabrous. **Stipules** 3–6 mm long. **Leaves** in whorls of 4–8; petiole 2–6.2 cm long, glabrous; lamina coriaceous to papery, obovate, oblong or elliptic, 5.5–42 × 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, secondary veins 12–24 pairs, at 45–80° from midrib, clearly distinguishable from intercostal veins and prominent or flat above and prominent beneath, intercostal veins reticulate or subscalariform, prominent above and beneath. **Inflorescences** arranged in whorls, 4–18 cm long, glabrous, many-flowered; peduncle 2.5–9.2 cm long; pedicels 1.5–6.5 mm long. **Calyx** lobes ovate or orbicular, 1–3 × 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, glabrous inside and outside; lobes 3–9 × 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 × 0.4–0.5 mm, 2.7–3 times as long as wide, exserted 0–0.9 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 cm long, 2.5–4 cm wide. **Seed** grains c. 2.5 × 1.5 cm, with wing c. 5 × 2 cm.

Distribution. Southern Thailand, Sumatra, Peninsular Malaysia and Borneo. In Singapore it is known from Bukit Timah (*Noor 1495*, 12 Feb 1973, SING [SING0011872]), MacRitchie (*Corner s.n.*, 2 Jan 1988, SING [SING0037890]), Nee Soon (*Samsuri et al. NES 138*, 29 Jul 2003, SING [SING0045844]) and the Singapore Botanic Gardens' Rain Forest (*Ali Ibrahim 342*, 25 Jul 1998,

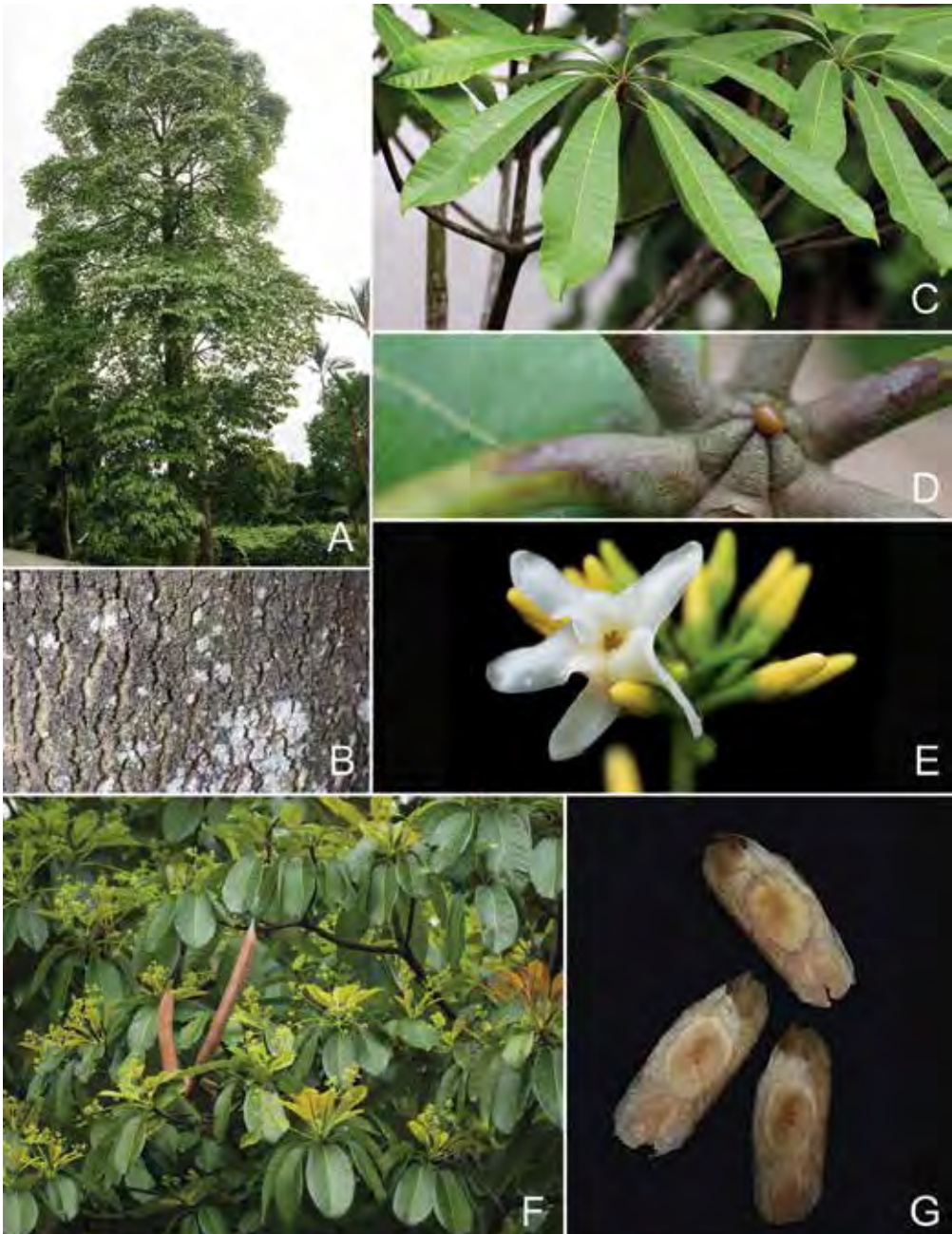


Figure 12. *Dyera costulata* (Miq.) Hook.f. **A.** Habit. **B.** Bark. **C.** Leaves in whorls. **D.** Intrapetiolar stipules. **E.** Flower. **F.** Flowering branches and one mature fruit. **G.** Seeds. (From Singapore, A–D, G from Singapore Botanic Gardens; E, F, from Singapore Island Country Club. Photos: A, B, D, L.M.J. Chen; C, X.Y. Ng; E, F, Zaki Jamil; G, S. Lee).

SING [SING0037891]). The earliest unlocalised collection from Singapore is *Hullet* 343, Dec 1886 (SING [SING0037887]).

Ecology. In lowland dipterocarp forest. The flowers are nocturnal, opening between 5–7 pm and falling early next morning. Its light winged seeds are dispersed by wind.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC). This species, however, grows into a large emergent forest tree and with the loss of forest habitats in much of the distribution its status should be monitored.

Uses. Formerly jelutong was tapped for making rubber and for the manufacture of chewing gum but this industry is long gone in Singapore and elsewhere. The soft, finely grained white timber of jelutong is used to make pencils in other countries.

7. KOPSIA Blume

(Jan Kops, 1765–1849, a Dutch botanist)

Cat. Gew. Buitenzorg (1823) 12, nom. cons.; Don, Gen. Hist. 4 (1837) 100; Bentham & Hooker, Gen. Pl. 2(2) (1876) 701; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 639; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 429; Ridley, Fl. Malay Penins. 2 (1923) 336; Whitmore, Tree Fl. Malaya 2 (1973) 18; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 155; Middleton, Fl. Thailand 7(1) (1999) 60; Middleton, Harvard Pap. Bot. 9 (2004) 92; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 35; Middleton, Fl. Males., ser. 1, 18 (2007) 232; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 57; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 259. **Type:** *Kopsia arborea* Blume

Shrubs or small trees, buttresses absent; latex white. **Branchlets** terete to winged; glabrous or more rarely pubescent, lenticellate or not. **Leaves** opposite; lamina mostly subcoriaceous to coriaceous, rarely papery, more or less equal in size, entire; petiolate (in Singapore), bases mostly clasping the terminal bud when young and the stem when older, colleters present in the axils. **Inflorescences** terminal, basically dichasial, more rarely trichasial, but often with elongated branches that do not further branch so as to appear somewhat cincinnate, axes glabrous to densely pubescent; pedunculate or not; bracts and bracteoles small; flowers 5-merous. **Calyx** lobes erect, without colleters inside, outside with a gland just below the apex. **Corolla** lobes overlapping to the right, without a corona, salverform with a narrow tube, slightly wider around the stamens, and spreading lobes. **Stamens** inserted around the middle of the tube to near the tube throat, very rarely near base, not exerted from throat; filaments straight, short, thin; anthers ovate, fertile for most of length, free from style head. **Nectary** of two lobes alternating with the two free carpels, more than half the length of the ovary. **Gynoecium** 2-carpellate, carpels free but apically united into a common style, glabrous or pubescent, ovules 2 in each carpel although only ever one develops; style filiform, glabrous, style head with a collar at the base, otherwise short and cylindrical. **Fruit** of paired thin-walled drupes, more rarely solitary, ellipsoid to falcate, flattened to various degrees (hardly at all in *Kopsia arborea*), usually with spur-like appendages facing inwards towards each other, rarely absent. **Seed** curved, broader at one end, other end acuminate.

Distribution. A genus of 23 species from southern China and Myanmar to northern Australia and Vanuatu. In Singapore 1 native species.

Uses. *Kopsia arborea*, *Kopsia fruticosa* and *Kopsia singaporensis* are commonly cultivated as ornamentals in Singapore.

Notes. The label on the type specimen of *Kopsia macrophylla* Hook.f., a Lobb collection, says it was collected in Singapore but Ridley (Fl. Malay Penins. 2 (1923) 338) notes that this is a mistake for Penang. As *Kopsia macrophylla* is not otherwise known in Singapore it is excluded from this account (but note that the name was also misapplied to *Kopsia singaporensis*).

***Kopsia singaporensis* Ridl.** (of Singapore)

Fl. Malay Penins. 2 (1923) 336; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 156, fig. 39, pl. 21; Timmerman-Van der Sleen, Fl. Males. Misc. Rec. 1 (1959) 11; Whitmore, Tree Fl. Malaya 2 (1973) 19, fig. 4; Markgraf, Blumea 20(2) (1973 [1972]) 421; Turner, Gard. Bull. Singapore 45 (1993) 35; Middleton, Harvard Pap. Bot. 9 (2004) 127, fig. 7; Middleton, Fl. Males., ser. 1, 18 (2007) 254, fig. 67; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 53, 105, 207; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 71. **Type:** *Ridley s.n.*, Singapore, Chan Chu Kang, 21 March 1894 (lectotype K [K000852952], designated by Middleton, Harvard Pap. Bot. 9 (2004) 127). **Fig. 13.**

Kopsia macrophylla auct. non Hook.f.: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110.

Kopsia fruticosa (Roxb.) A.DC. var. *albiflora* auct. non (Teijsm. & Binn.) King & Gamble: King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 431, p.p.

Tree to 12 m tall, to 24 cm diam. **Branchlets** glabrous, sparsely lenticellate or not, weakly angled. **Leaves:** petiole robust, 5–12 mm long, glabrous; lamina subcoriaceous to coriaceous, elliptic, 6.1–19.5 × 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. **Inflorescences** 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 long, 1.4–1.8 mm wide, glabrous or puberulent; pedicels 1–5.3 mm long, glabrous to densely puberulent, subtending bracts present on pedicel, smaller than sepals, persistent or absent. **Calyx** lobes ovate or oblong, 2–4 × 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 mm long, 1.8–2.9 mm wide, pubescent inside above, around and slightly below the stamens, throat pubescent, glabrous or rarely sparsely puberulent at top of tube outside; lobes 15–24 × 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; filaments 0.2–1 mm long, pubescent; anthers 1.7–2.1 × 0.7–0.8 mm, 2.4–3 times as long as wide, apex 1.2–2.2



Figure 13. *Kopsia singaporensis* Ridl. **A.** Treelet; **B.** Inflorescence. (Cultivated in Singapore Botanic Gardens. Photos: Zaki Jamil).

mm from corolla throat. **Nectary** 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 non-hooked spur on one side, 26–33 × 6–7 × 11.5–14 mm, angle/spur 2.5–3 mm long, glabrous.

Distribution. Peninsular Malaysia. In Singapore it is known from Nee Soon (*O’Dempsey SING2011-193*, 11 Jan 2011, SING [SING0159980]; *Leong et al. SING2011-367*, 9 Sep 2011, SING [SING0165926]) and Upper Seletar (*O’Dempsey SING2012-032*, 26 Jan 2012, SING [SING0171431]). In the past it has also been collected from Mandai (*Kiah 37714*, 28 Jul 1920, SING [SING0003438]).

Ecology. In Singapore only known from freshwater swamp forest.

Provisional conservation assessment. Globally VU B2ab(i,ii,iii) due to habitat loss and the fragmented remaining populations. It is assessed here as Critically Endangered (CR/D) in Singapore as there are estimated to be fewer than 50 remaining mature trees.

Vernacular name. *Singapore Kopsia* (English)

Notes. Although now Critically Endangered in the wild in Singapore it has been introduced into cultivation.

8. LEUCONOTIS Jack

(Greek, *leuco-* = white, *-notis* = sap; with white sap)

Trans. Linn. Soc. London 14 (1823) 121; Bentham & Hooker, Gen. Pl. 2(2) (1876) 691; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 627; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 407; Ridley, Fl. Malay Penins. 2 (1923) 328; Middleton, Fl. Thailand 7(1) (1999) 13; Leeuwenberg, Syst. & Geogr. Pl. 72 (2002) 112; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 7; Middleton, Fl. Males., ser. 1, 18 (2007) 264; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 74; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 262. **Type:** *Leuconotis anceps* Jack

Climbers without tendrils; latex white. **Leaves** opposite; lamina usually with distantly spaced secondary veins, punctate beneath; distinctly petiolate, colleters absent in the axils. **Inflorescences** axillary and/or terminal cymes; flowers 4-merous. **Calyx** with outer pair and inner pair sometimes of slightly different sizes, with many small colleters at the base inside. **Corolla** lobes overlapping to the left in bud, without a corona, open corolla salverform. **Stamens** completely included in the tube, free from the style head; filaments short, filiform; anthers lanceolate, rounded at the base, fertile for the entire length. **Nectary** absent. **Ovary** syncarpous, bilocular, with 2–3 ovules in each locule; style short, style head globose. **Fruit** a berry, pulpy inside. **Seeds** simple, with a membranous testa.

Distribution. A genus of 4 species in southern Thailand, Sumatra, Peninsular Malaysia and Borneo. In Singapore 1 native species. *Leuconotis eugeniifolia* (Wall. ex G. Don) A. DC. has also been recorded for Singapore but this was based only on cultivated material (see Excluded species).

Ecology. All species are confined to everwet forest and hence the genus only reaches the extreme south of Thailand.

Leuconotis griffithii Hook.f.

(William Griffith, 1810–1845, English botanist
known for his work in India and Malaya)

Fl. Brit. India 3, fasc. 9 (1882) 628; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 409; Ridley, Fl. Malay Penins. 2 (1923) 329; Markgraf, Blumea 19 (1971) 156; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Turner, Gard. Bull. Singapore 45 (1993) 36; Middleton, Fl. Thailand 7(1) (1999) 14, fig. 5; Middleton, Fl. Males., ser. 1, 18 (2007) 268, fig. 72; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 54, 105, 222; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 77. **Type:** *Maingay 1842* [Kew Distribution 1051], [Malaysia] (lectotype K [K000832855], designated by Leeuwenberg, Syst. & Geogr. Pl. 72 (2002) 113; isolectotype L [L0237160]). **Fig. 14, 15.**

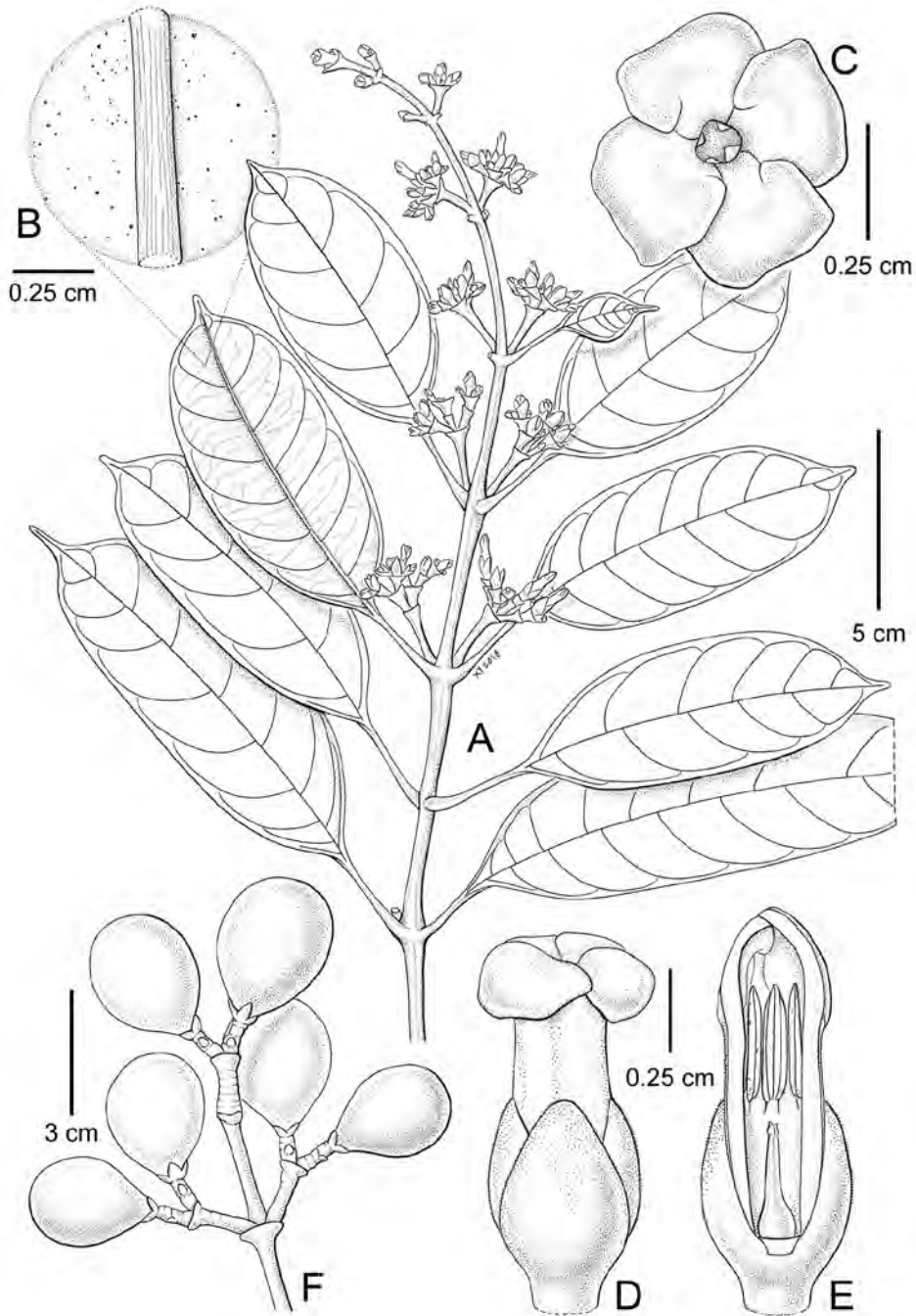


Figure 14. *Leuconotis griffithii* Hook.f. **A.** Habit. **B.** Underside of leaf to show punctae. **C.** Corolla from the front to show 4-merous flowers. **D.** Flower. **E.** Flower dissection. **F.** Fruit. (From Singapore, Mandai, A, C–E from Lee *et al.* SING2005-70; B from Ridley 2735. Drawn by X.Y. Loh).

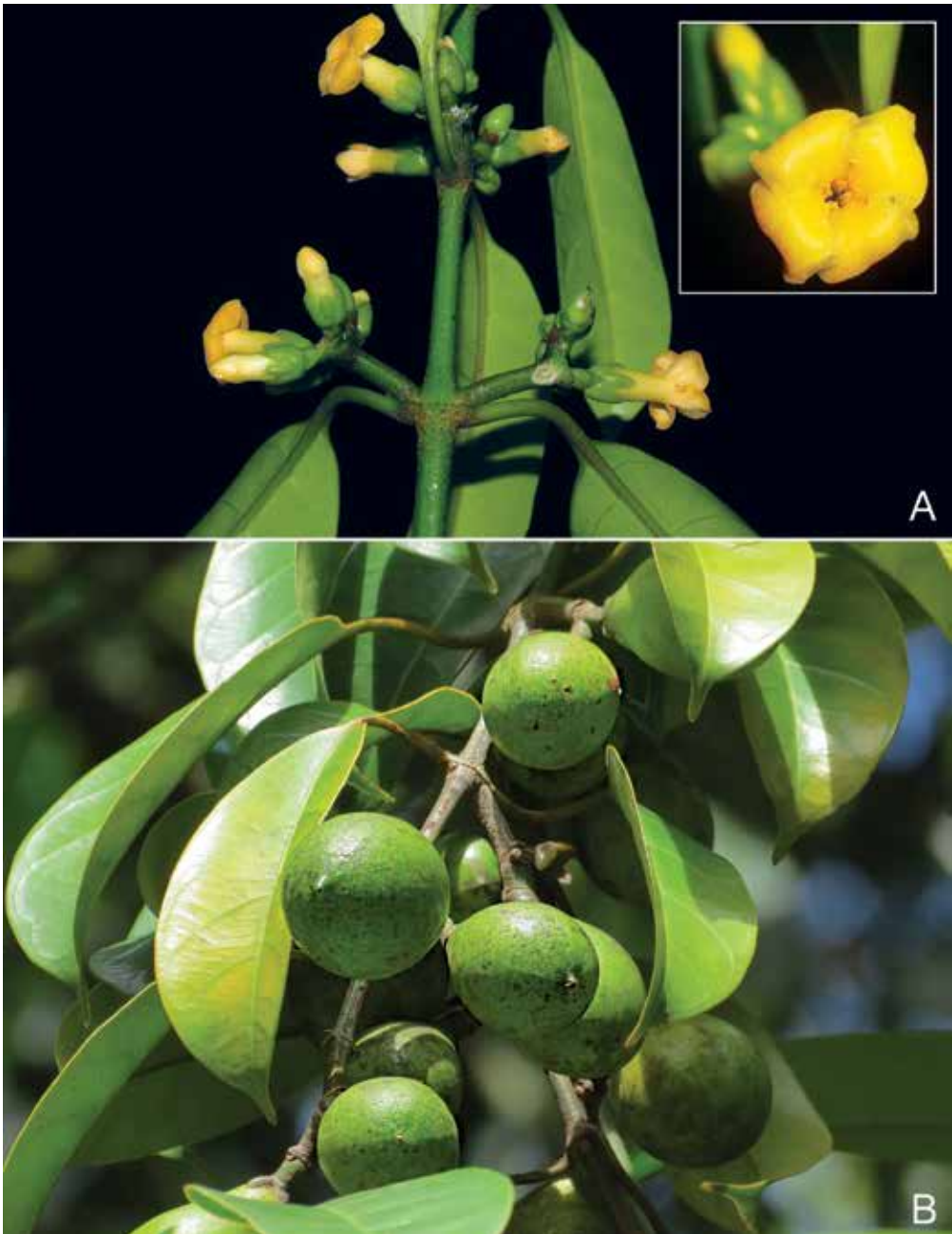


Figure 15. *Leuconotis griffithii* Hook.f. **A.** Inflorescences. **B.** Fruit. (From Singapore, A from Mandai Road, B from Upper Seletar. Photos: Y.S. Yeoh).

Leuconotis maingayi Dyer ex Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 628; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 408; Ridley, Fl. Malay Penins. 2 (1923) 329; Markgraf, Blumea 19 (1971) 156; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Turner, Gard. Bull. Singapore 45 (1993) 36; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215. **Type:** *Maingay* 3359 [Kew Distribution 935], Singapore (lectotype K [K000832858], designated by Middleton, Gard. Bull. Singapore 71 (2019) 78; isolectotype K [K000832859]).

Leuconotis elastica Becc., Nelle Foreste di Borneo (1902) 562; Merrill, Bibliogr. Enum. Born. Pl. (1921) 495; Masamune, Enum. Phan. Born. (1942) 621; Leeuwenberg, Syst. & Geogr. Pl. 72 (2002) 117. **Synonym:** *Leuconotis subavenis* Boerl. var. *elastica* (Becc.) Markgr., Blumea 19 (1971) 156. **Type:** *Beccari* 899, [Malaysia], Sarawak, Kuching (lectotype FI [FI013027], designated by Middleton, Fl. Males., ser. 1, 18 (2007) 268; isolectotype K [K000832850]).

Leuconotis griffithii Hook.f. var. *sumatrana* Markgr., Blumea 19 (1971) 156. **Type:** *Meijer* 4384, [Indonesia], Central Sumatra, West Indragiri, Taluk region, Hutan Pulau Lawas (holotype L [L0004564]; isotype SING [SING0016001]).

Leuconotis anceps auct. non Jack: Leeuwenberg, Syst. & Geogr. Pl. 72 (2002) 113, p.p.

Large woody climber to 15 m tall. **Branchlets** lenticellate, glabrous to minutely puberulent. **Leaves:** petiole 2–5 cm long, often slightly swollen at base and opposite bases forming a ridge across the stem, glabrous; lamina coriaceous, elliptic, 4.5–22 × 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, secondary veins 2–5(–9) pairs, 70–90° to midrib, straight, widely spaced, anastomosing into an intramarginal vein, intercostal veins faint and parallel to secondary veins. **Inflorescences** short, congested, 2.2–4 cm long; peduncle 0.2–1 cm long, minutely puberulent; pedicels c. 1 mm long, glabrous to densely puberulent. **Calyx** lobes ovate, 2.4–5.5 × 1.8–4.5 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 8–11.2 mm long, 2.1–2.8 mm wide, glabrous outside, densely minutely puberulent at base inside becoming sparser higher up tube; lobes 2–5.5 × 3–7 mm, 0.7–1.1 times as long as wide, obliquely suborbicular, 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 3.2–4 × 0.5–1.2 mm, sometimes with very few hairs, apex at corolla throat. **Ovary** 1.2–2 mm high, glabrous; style 1.7–2.8 mm long, style head 0.5–0.9 mm long. **Fruit** globose to ovoid, 3–4.6 cm long, 2.4–3 cm diam., smooth.

Distribution. Peninsular Thailand, Peninsular Malaysia, Sumatra and Borneo. In Singapore it has been collected from many forested areas and is known from Mandai (*Lee et al. SING2005-70*, 28 Mar 2005, SING [SING0060017]), MacRitchie, Upper Seletar (*Lua SING2015-287*, 23 Nov 2015, SING [SING0222214]) and Nee Soon (*Yeo et al. SING2012-148*, 23 Apr 2012, SING [SING0179565]). Historically it has also been collected in Sungei Jurong (*Ridley 3868*, 1892, SING [SING0003455]) and Serangoon Road (*Ridley 9166*, 1898, SING [SING0003442]).

Ecology. In primary, secondary and freshwater swamp forest in Singapore.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Uses. Previously locally exploited for a high quality rubber before the widespread use of *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg. (Ridley, Fl. Malay Penins. 2 (1923) 330).

Notes. This species has been confused with *Leuconotis anceps* Jack in Peninsular Malaysia and Singapore. The lack of pubescence on the inside of the corolla tube in *Leuconotis griffithii* versus the hairs on the inside of the tube in *L. anceps* distinguishes these two species but it is now known there is a much larger overlap in the number of secondary veins between the two species than previously thought, 2–5(–9) pairs in *Leuconotis griffithii* and 5–10 pairs in *L. anceps*. Singaporean sterile material with > 5 pairs of secondary veins has been assigned to *Leuconotis griffithii* due to the larger leaves than is known in *L. anceps* and the lack of evidence from flowering material that *L. anceps* occurs at all in Singapore.

9. MELODINUS J.R.Forst. & G.Forst.

(Greek, *melon* = apple, *dine* = swirl; referring to the twining habit and apple-like fruits)

Char. Gen. (1776) 37; Bentham & Hooker, Gen. Pl. 2(2) (1876) 694; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 628; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 410; Ridley, Fl. Malay Penins. 2 (1923) 330; Markgraf, Blumea 19 (1971) 150; Middleton, Fl. Thailand 7(1) (1999) 14; Leeuwenberg, Syst. & Geogr. Pl. 73 (2003) 4; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 11; Middleton, Fl. Males., ser. 1, 18 (2007) 270; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 79; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 273. **Type:** *Melodinus scandens* J.R.Forst. & G.Forst.

For the many other generic synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 270.

Climbers without tendrils; latex white. **Leaves** opposite; lamina with venation often raised, veins anastomosing before margin and forming a weak intramarginal vein; usually with the base of the petioles meeting across the stem and few colleters in the axils or absent. **Inflorescences** axillary and/or terminal cymes, often forming terminal panicles; flowers 5-merous. **Calyx** of free lobes, without colleters inside. **Corolla** lobes overlapping to the left in bud, open corolla infundibuliform or salverform, with a corona at the mouth of the corolla. **Stamens** free from style head, completely included in tube; filaments short, filiform; anthers narrowly elliptic or lanceolate, base very short bluntly sagittate, fertile for the entire length. **Nectary** absent. **Ovary** syncarpous, bilocular, glabrous, with numerous ovules; style slender, style head globose or ellipsoid. **Fruit** a hard-walled solitary berry. **Seeds** ellipsoid, flattened, surface patterned.

Distribution. Approximately 25 species from the Himalayas and S China through continental Southeast Asia and Malesia to Australia, New Caledonia, Vanuatu and Fiji. In Singapore 1 native species.

Melodinus orientalis Blume

(Latin, *orientalis* = eastern; from the East)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1026; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 629; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 412; Ridley, Fl. Malay Penins. 2 (1923) 330; Markgraf, Blumea 19 (1971) 154; Middleton, Fl. Thailand 7(1) (1999) 18; Leeuwenberg, Syst. & Geogr. Pl. 73 (2003) 42, p.p.; Middleton, Fl. Males., ser. 1, 18 (2007) 279; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 60, 105, 195; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 81. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L0004581], designated by Middleton, Fl. Males., ser. 1, 18 (2007) 279). **Fig. 16.**

Alyxia coriacea Wall. in Roxburgh, Fl. Ind. 2 (1824) 541. **Type:** *Wallich s.n.* [EIC 1610], [Malaysia], Penang (lectotype K-W [K001113585], first step designated by Leeuwenberg, Syst. & Geogr. Pl. 73 (2003) 27, second step designated by Middleton, Gard. Bull. Singapore 71 (2019) 70; isolectotypes BM [BM000508455], G [G00169666], K-W [K001113584]). Note that this is not homotypic with *Melodinus coriaceus* Oliv. so does not have priority.

Hunteria cuspidata Wall. ex A.DC., Prodr. 8 (1844) 350. **Type:** *Wallich s.n.* [EIC 1609], [Malaysia], Penang (lectotype G-DC, designated by Middleton, Taxon 55 (2006) 504; isolectotypes BM [BM000603843], BR [BR-SP 695 835], C [C10005844], E, G [G00169663], K [K000832893], K-W [K001113583], M [M-0005431], MEL [MEL2079301], NY [NY00564042], P [P00495765, P00646682, P00646683], W).

Melodinus micranthus Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 629; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 413; Ridley, Fl. Malay Penins. 2 (1923) 331; Markgraf, Blumea 19 (1971) 154; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Turner, Gard. Bull. Singapore 45 (1993) 36; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215. **Type:** *Maingay 1846* [Kew Distribution 1090], Singapore (lectotype K [K000832889], designated by Middleton, Taxon 55 (2006) 505; isolectotype L [L0004578]).

Melodinus coriaceus Oliv., Hooker's Icon. Pl. 18 [ser. 3, 8], fasc. 3 (1888) pl. 1758; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 414; Ridley, Fl. Malay Penins. 2 (1923) 331; Markgraf, Blumea 19 (1971) 153; Leeuwenberg, Syst. & Geogr. Pl. 72 (2002) 27. **Type:** *Curtis 1040*, [Malaysia], Penang, October 1886 (lectotype K [K000832896], designated by Middleton, Taxon 55 (2006) 505; possible isolectotype K [K000832897]).

Melodinus citriformis King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 413; Ridley, Fl. Malay Penins. 2 (1923) 331. **Type:** *King's Collector 6525*, [Malaysia], Perak, near Larut (lectotype K [K000832890], designated by Middleton, Fl. Males., ser. 1, 18 (2007) 280; isolectotypes CAL n.v., K [K000832891]).

Melodinus perakensis King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 413; Ridley, Fl. Malay Penins. 2 (1923) 331; Markgraf, Blumea 19 (1971) 153. **Type:** *King's Collector 7031*, [Malaysia], Perak (lectotype K [K000832888], designated by Middleton, Fl. Males., ser. 1, 18 (2007) 280).

For additional synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 279–280.

Woody climber to 5 m tall. **Branchlets** glabrous or minutely papillose-puberulent. **Leaves:** petiole 6–17 mm long, glabrous; lamina elliptic to oblong or slightly obovate, 3.7–23.5 × 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, secondary veins 8–26 pairs, slightly

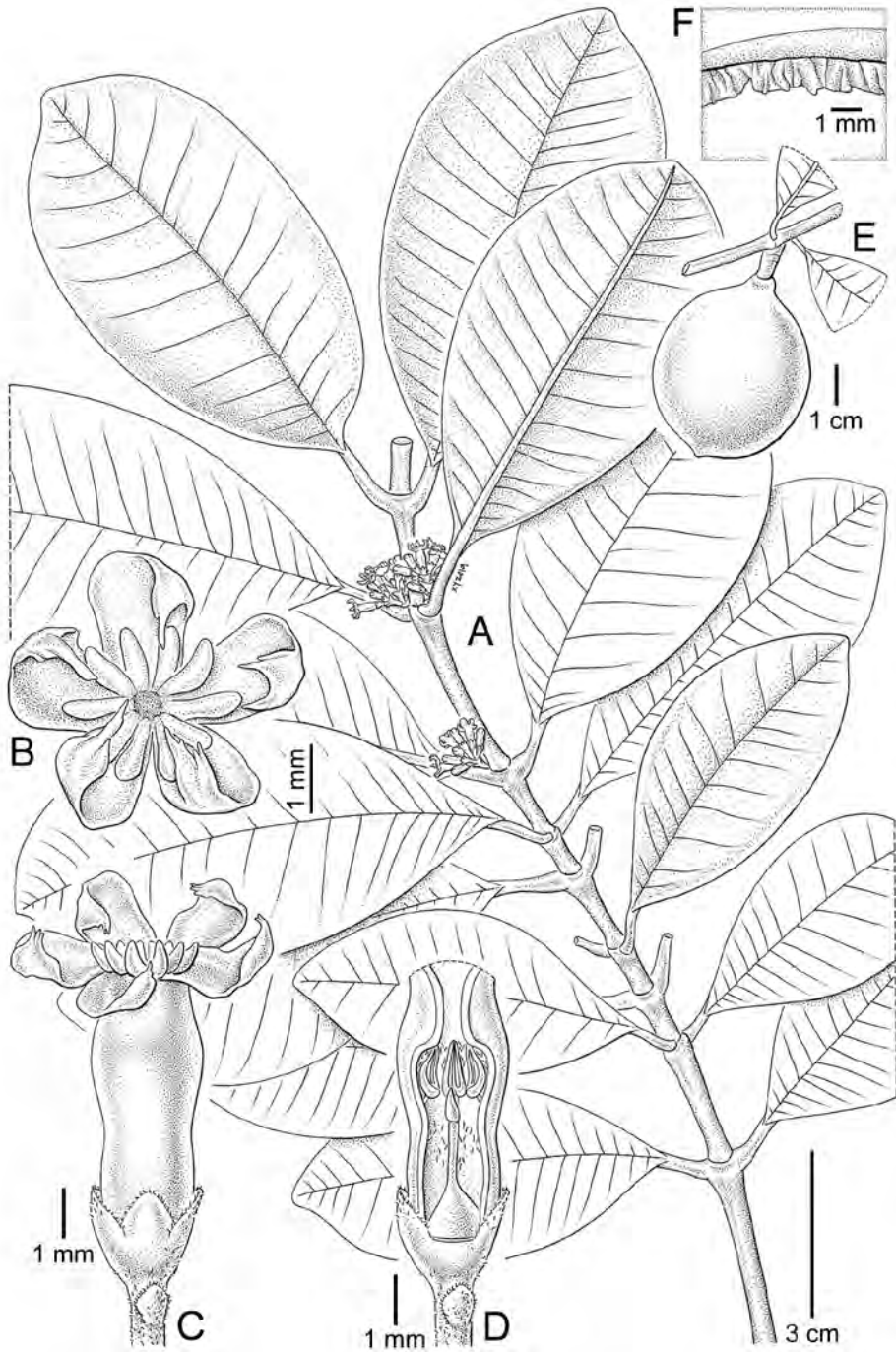


Figure 16. *Melodinus orientalis* Blume. **A.** Habit. **B.** Flower from the front to show corona. **C.** Flower. **D.** Flower dissection. **E.** Fruit. **F.** Cross section of fruit pericarp. (From Peninsular Malaysia, Penang, A–D from *Burkill 1514*; E–F from *Henderson SFN35752*. Drawn by X.Y. Loh).

ascending, intercostal veins subperpendicular to midrib and oblique to secondary veins, and also reticulate. **Inflorescences** axillary, 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. **Calyx** lobes ovate, often somewhat fused at base, 0.7–1.3 × 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, 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 × 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 from each other, 0.4–0.8 mm long, glabrous. **Stamens** inserted at 1.7–2.9 mm from corolla base which is c. half of tube length; filaments c. 0.4 mm long; anthers 0.9–1.6 × 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 cm long, 3.3–7.5 cm diam. **Seeds** 9–15 mm long, 4–7 mm wide, c. 3 mm thick.

Distribution. Thailand, Peninsular Malaysia, Sumatra, Java, Borneo, Bali, Sulawesi and the Philippines. In Singapore known from one old collection from Jalan Bray (*Mat 5999*, Feb 1894, SING [SING0056506]).

Ecology. In the rest of its distribution it is found in lowland to hill dipterocarp forest to 800 m.

Provisional conservation assessment. Globally Least Concern (LC) as this is a very widespread and often-collected species. In Singapore presumed Nationally Extinct.

Vernacular name. *Akar ujul* (Malay).

Uses. Yields a poor quality rubber which is said to be highly poisonous but likely never commercially exploited in Singapore.

10. OCHROSIA Juss.

(Greek, *ochros* = ochre-yellow colour; possibly referring to the colour of the centre of the flowers)

Gen. Pl. (1789) 144; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 638; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 428; Ridley, Fl. Malay Penins. 2 (1923) 339; Markgraf, Bot. Jahrb. Syst. 61 (1927) 189; Whitmore, Tree Fl. Malaya 2 (1973) 20; Markgraf, Blumea 25 (1979) 233; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 156; Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 47; Middleton, Fl. Thailand 7(1) (1999) 64; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 42; Hendrian, Blumea 49 (2004) 104; Hendrian, Fl. Males., ser. 1, 18 (2007) 289; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 83; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 259. **Type:** *Ochrosia maculata* Jacq.

Neisosperma Raf., Sylva Tellur. (1838) 162; Fosberg & Sachet, Micronesica 8 (1972) 48, as ‘*Neisosperma*’; Fosberg et al., Adansonia, sér. 2, 17 (1977) 28; Markgraf, Blumea 25 (1979) 241; Endress & Bruyns, Bot. Rev. (Lancaster) 66 (2000) 34. **Type:** *Neisosperma muricatum* Raf., lectotype designated by Markgraf, Blumea 25 (1979) 241 (= *Ochrosia oppositifolia* (Lam.) K.Schum.).

Trees or shrubs; latex white. **Branchlets** not lenticellate. **Leaves** 3–4(–5)-whorled (opposite or up to 6-whorled elsewhere), glabrous. **Inflorescences** of terminal and axillary cymes, in whorls or solitary, glabrous; flowers 5-merous. **Calyx** lobes without colleters inside, connate at base. **Corolla** salverform, without a corona, lobes overlapping to the right. **Stamens** completely included within tube, free from the style head; filaments filiform, short; anthers ovate, base cordate, apex acute, fertile entire length. **Nectary** of two small lobes (in Singapore). **Gynoecium** 2-carpellate, carpels free but apically united into a common style (in Singapore), style filiform. **Fruit** usually free, rarely partially fused or completely fused (not in Singapore), drupaceous; endocarps split into diverging fibres, (or consisting of thick and massive tissue, surrounding 2 lateral cavities but not in Singapore). **Seeds** 1–3 in each half, with a wing-like structure along the margin.

Distribution. About 40 species from the Mascarenes and Seychelles in the west throughout South Asia, continental Southeast Asia, Malesia, northern Australia and Pacific islands as far east as the Marquesas and Hawaiian islands. In Singapore 1 native species.

Ochrosia oppositifolia (Lam.) K.Schum.

(Latin, *oppositus* = opposite, *folium* = leaves; with opposite leaves)

in Engler & Prantl, Nat. Pflanzenfam. 4(2) (1895) 156; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 157; Whitmore, Tree Fl. Malaya 2 (1973) 20; Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 51; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 145; Middleton, Fl. Thailand 7(1) (1999) 65, fig. 21; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 45, fig. 7; Hendrian, Blumea 49 (2004) 113; Hendrian, Fl. Males., ser. 1, 18 (2007) 299, fig. 74; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 64, 106, 196; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 84. **Basionym:** *Cerbera oppositifolia* Lam., Encycl. 1, fasc. 1 (1783) 62. **Synonyms:** *Neisosperma oppositifolia* (Lam.) Fosberg & Sachet, Micronesica 8 (1972) 48, as ‘*Neisosperma*’; Markgraf, Blumea 25 (1979) 243; Anderson, Checkl. Trees Sarawak (1980) 149; Ashton, Man. non-Dipterocarp Trees Sarawak 2 (1988) 40; Turner, Gard. Bull. Singapore 45 (1993) 36; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 128; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215, as ‘*oppositifolium*’. **Type:** [Published illustration] Rumphius, Herb. Amboin. 2 (1741) t. 84. **Fig. 17.**

Ochrosia borbonica auct. non J.F.Gmel.: King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 428; Ridley, Fl. Malay Penins. 2 (1923) 340.

For additional synonyms see Hendrian, Fl. Males., ser. 1, 18 (2007) 299.

Tree, 2.5–45(–60) m tall. **Leaves** 3–4(–5)-whorled; petiole 1.5–6.6 cm long, glabrous; laminas usually obovate, very rarely elliptic, 6.5–36 × 3.4–18 cm, 1–3 times as long as wide, apex mostly rounded or slightly retuse, less often to acuminate, base decurrent onto petiole, secondary veins 21–42 pairs, straight to rather arcuate ascending, not reaching the margin, forming a distinct submarginal vein which is close to the margin. **Inflorescences** 2–17 cm long, of terminal and axillary cymes, in whorls of 2–4, congested; peduncle 1–10.5 cm long; flowers more than 30 in each inflorescence. **Calyx** lobes ovate, apex rounded. **Corolla** whitish or yellowish white, glabrous outside, densely pubescent inside; tube 5.3–7 mm long; lobes 4.3–6.5 mm long. **Stamens** inserted at 0.5–0.7 of corolla tube length; filaments 0.5–0.7 mm



Figure 17. *Ochrosia oppositifolia* (Lam.) K.Schum. Inflorescence. Inset: flower. (Cultivated in Thailand, garden of the Bangkok Herbarium. Photos: D.J. Middleton).

long; anthers 1.2–1.4 × 0.4–0.5 mm. **Nectary** c. 0.2 mm long. **Ovaries** glabrous, 0.8–1 mm long; style and style head 1–2.6 mm long. **Fruit** composed of 2 separate mericarps, mericarps ovoid to ellipsoid, sometimes subglobose, apex apiculate or acuminate; endocarps with fibres penetrating the mesocarps; mostly 1-seeded.

Distribution. Seychelles, Sri Lanka, India (Andaman Islands), Thailand, Peninsular Malaysia, Sumatra, Java, Borneo, the Philippines, Sulawesi, Moluccas, New Guinea and Pacific islands. In Singapore only known from one unlocalised collection from 1822 (*Wallich s.n.* [EIC 1584], 1822, K-W [K001113518]) although it has recently been re-established on Coney Island. Ridley (*Fl. Malay Penins.* 2 (1923) 340) also remarked that he knew the plant in Singapore only from the Wallich collection.

Ecology. In Singapore now only known from planted trees in sandy soil on Coney Island. In other parts of the region it can be locally common in the strand community on rocky or sandy beaches. The fruit is dispersed by sea currents.

Provisional conservation assessment. Globally Least Concern (LC) as this is an extremely widespread species. However, its preferred habitat is subject to development pressure throughout the region so its status should be monitored. In Singapore it was presumed Nationally Extinct but has recently been reintroduced.

11. TABERNAEMONTANA L.

(Jakob Theodor of Bergzabern, d. 1590, German botanist;

Tabernaemontana is the latinisation of Bergzabern)

Sp. Pl. 1 (1753) 210; Brown, Prodr. Fl. Nov. Holland. (1810) 467; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 645; Whitmore, Tree Fl. Malaya 2 (1973) 21; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 159; Leeuwenberg, Rev. Tabernaemontana 1 (1991) 1; Leeuwenberg, Rev. Tabernaemontana 2 (1994) 213; Middleton, Fl. Thailand 7(1) (1999) 27; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 50; Middleton, Fl. Males., ser. 1, 18 (2007) 371; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 91; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 270. **Type:** *Tabernaemontana citrifolia* L., lectotype designated by Hitchcock, Nom. Prop. Brit. Bot. (1929) 136.

Tabernaemontana L. sect. *Ervatamia* A.DC., Prodr. 8 (1844) 373. **Synonym:** *Ervatamia* (A.DC.) Stapf, Fl. Trop. Afr. 4, sect. 1(1) (1902) 126; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 447; Ridley, Fl. Malay Penins. 2 (1923) 340. **Type:** *Ervatamia coronaria* (Jacq.) Stapf (= *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.).

For additional extensive synonymy see Middleton, Fl. Males., ser. 1, 18 (2007) 371.

Shrubs or small trees; bark with copious white latex. **Branchlets** glabrous or sparsely pubescent. **Leaves** opposite (in Singapore), often a pair unequal in size; lamina secondary venation arching upwards towards margins, weakly anastomosing near margin; petiolate or sessile with distinct but small stipule-like flaps in the axils. **Inflorescences** a cyme or solitary flower, lax; 2 inflorescences at each ramification, occasionally with one missing; flowers 5-merous, usually fragrant. **Calyx** lobes with or without colleters inside. **Corolla** lobes overlapping to the left (in Singapore) and folded inwards, without a corona, mature corolla salverform. **Stamens** subsessile or with short filaments, free from the style head, completely included in tube; anthers narrowly triangular to oblong, base cordate (in Singapore), apex acute, fertile entire length. **Nectary** absent. **Gynoecium** 2-carpellate, carpels free but 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. About 120 species throughout the Old and New World tropics. In Singapore 2 native species (but see notes below and Excluded species).

Uses. *Tabernaemontana* species are very frequently cultivated in gardens and in municipal landscapes. The most frequently cultivated species in Singapore is *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult., of which there are many and varied cultivars.

Notes. There are three specimens in SING of *Tabernaemontana peduncularis* Wall. collected by Cantley, supposedly from Singapore. One of them with a single plant has a second label with Malacca written on it. Given the well-known problem of correct localisation of Cantley collections (Middleton & Turner, Fl. Singapore 1 (2019) 22, 32), previous authors have not included this species for Singapore. Due to the lack of any other specimens of the species from Singapore, *Tabernaemontana peduncularis* is omitted from this account.

Key to *Tabernaemontana* species

1. Calyx lobes 1–2 times as long as wide, ciliate; corolla bud head obtuse, lobes pubescent inside, at least in lower half, often also pubescent outside and at least ciliate **1. *T. corymbosa***
- Calyx lobes 2–8 times as long as wide, usually not ciliate; corolla bud head acute to acuminate, lobes glabrous inside or pubescent only at extreme base, mostly not ciliate **2. *T. pauciflora***

1. *Tabernaemontana corymbosa* Roxb. ex Wall.

(Latin, *corymbosus* = with flowers arranged in corymbs;
referring to the structure of the inflorescence)

Bot. Reg. 15 (1829) sub t. 1273; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; Whitmore, Tree Fl. Malaya 2 (1973) 23, fig. 5; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 161, fig. 40; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 145; Leeuwenberg, Rev. *Tabernaemontana* 1 (1991) 138, fig. 41; Turner, Gard. Bull. Singapore 45 (1993) 36; Middleton, Fl. Thailand 7(1) (1999) 31; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 53; Middleton, Fl. Males., ser. 1, 18 (2007) 376, fig. 96; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 84, 106, 218; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 92. **Synonyms:** *Ervatamia corymbosa* (Roxb. ex Wall.) King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 448; Ridley, Fl. Malay Penins. 2 (1923) 341. – *Pagiantha corymbosa* (Roxb. ex Wall.) Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 546. **Type:** *Wallich s.n.* [EIC 1572], [Malaysia], Penang, 1822 (lectotype K-W [K001113488], designated by Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 5; isolectotypes BM [BM001014005], CGE, E [E00288656], JE [JE00003931], K [K000857401, K000857402], SING [SING0056549]). **Fig. 18.**

Pseudixora sumatrana Miq., Fl. Ned. Ind. 2, fasc. 2 (1857) 209. **Synonyms:** *Randia sumatrana* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4, fasc. 8 (1869) 235. – *Tabernaemontana sumatrana* (Miq.) Hallier f., Bot. Jahrb. Syst. 49 (1913) 375. **Type:** *Junghuhn s.n.*, [Indonesia], Sumatra, Batak Lands, Upper Angkola (holo L [L0004717]).

Tabernaemontana cymulosa Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 422. **Type:** *Korthals* 82, [Indonesia], Sumatra (lectotype L [L0004722], designated by Leeuwenberg, Rev. *Tabernaemontana* 1 (1991) 138).

Tabernaemontana hirta Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 646; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110. **Synonym:** *Ervatamia hirta* (Hook.f.) King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 449; Ridley, Fl. Malay Penins. 2 (1923) 342; Whitmore, Tree Fl. Malaya 2 (1973) 23. **Type:** *Maingay 2441* [Kew Distribution 1059], [Malaysia] (lectotype K [K000857397], designated by Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 5).

Ervatamia corymbosa (Roxb. ex Wall.) King & Gamble var. *pubescens* King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 449; Ridley, Fl. Malay Penins. 2 (1923) 342. **Type:** *King’s Collector 4830*, [Malaysia], Perak, Larut, Gopeng (lectotype BM [BM001014006], designated by Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 5; isolectotypes BO, K).

Ervatamia pauciflora Ridl., J. Straits Branch Roy. Asiat. Soc. 86 (1922) 299; Ridley, Fl. Malay Penins. 2 (1923) 342. **Type:** *Ridley et al. s.n.*, [Malaysia], Selangor, Ginting [Genting] Sempah (lectotype K

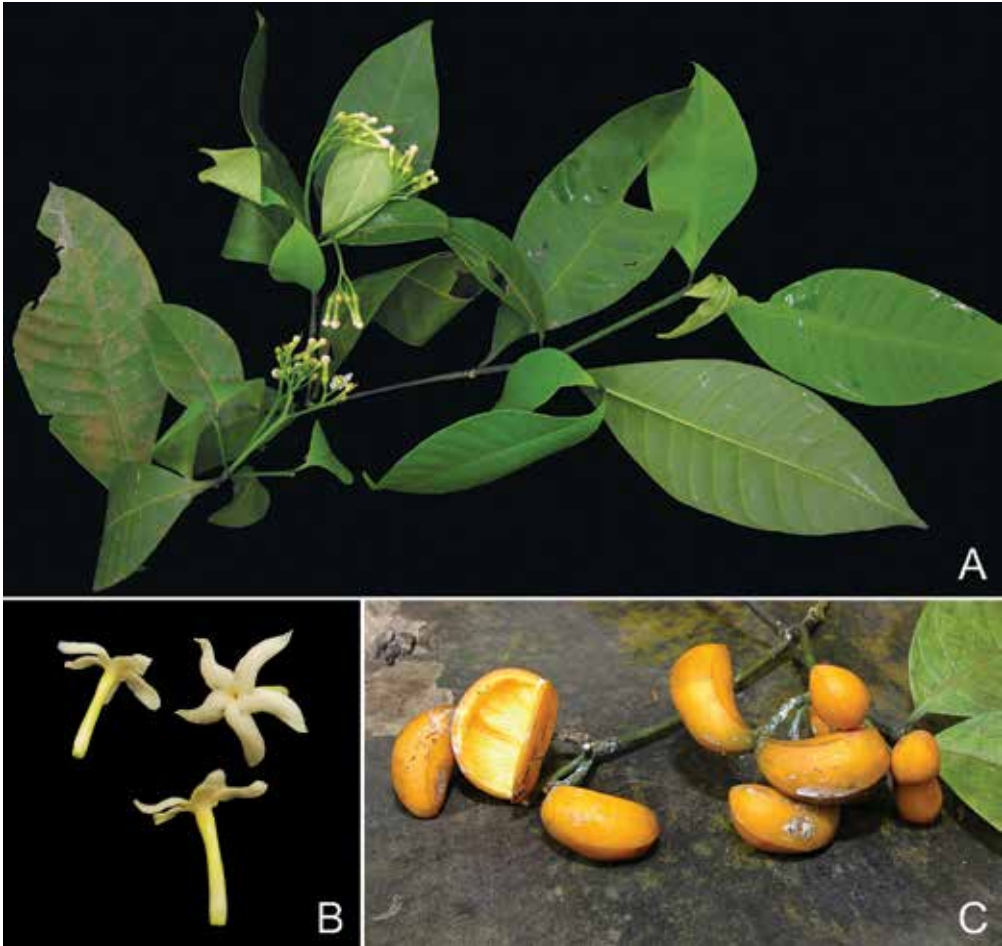


Figure 18. *Tabernaemontana corymbosa* Roxb. ex Wall. **A.** Habit. **B.** Corollas. **C.** Fruit. (From Singapore, A from Nee Soon, Ng SING2019-116; B from Nee Soon, Lua SING2015-258; C from MacRitchie, Liew SING2006-16. Photos: A, W.H. Lim; B, C, P.K.F. Leong)

[K000857404], designated by Middleton, Gard. Bull. Singapore 71 (2019) 75; isoelectotypes BM [BM001014004], K [K000857403]).

Ervatamia pauciflora Ridl. var. *minor* Ridl., J. Straits Branch Roy. Asiat. Soc. 86 (1922) 300; Ridley, Fl. Malay Penins. 2 (1923) 343. **Type:** Ridley 13033, [Malaysia], Negeri Sembilan, Bukit Tinggi (lectotype SING [SING0056562], designated by Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 6; isoelectotype SING [SING0056561]; probable isoelectotypes but without number K [K000857399, K000857400]).

Ervatamia jasminiflora Ridl., Fl. Malay Penins. 2 (1923) 342. **Type:** Yeop FMS 836, [Malaysia], Pahang, Kuantan [Kuantan], Baloh Res. (lectotype SING [SING0056555], designated by Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 6; isoelectotypes K [K000857398], KEP).

Tabernaemontana sumatrana Merr., Contr. Arnold Arbor. 8 (1934) 139, nom. illeg. non (Miq.) Hallier f. (1913). **Type:** *Bangham & Bangham 813*, [Indonesia], Sumatra, along road from Takigeum to Bireuen, Km 96 (holotype A [A00093128]; isotypes K [K000857481], NY [NY00318411], SING [SING0056566], W).

Tabernaemontana inaequifolia Lütjeh. & Ooststr., Blumea 3(1) (1938) 103. **Synonym:** *Ervatamia inaequifolia* (Lütjeh. & Ooststr.) Pichon, Mém. Mus. Natl. Hist. Nat. 27 (1949 [‘1948’]) 220. **Type:** *Lütjeharms 4461*, [Indonesia], W of Sumatra, Enggano [Island], near Bua-Bua (holotype L [L0004720, L0004721 – a single specimen over 2 sheets]; isotypes A [A00093032], BO, K).

Tabernaemontana carinata Lütjeh. & Ooststr., Blumea 3 (1938) 104. **Type:** *Lörzing 6994*, [Indonesia], E of Sumatra, Berhala Island (holotype L [L0004719]; isotype BO).

Tabernaemontana pubituba Merr., Pap. Michigan Acad. Sci. 24 (1939) 87. **Type:** *Rahmat si Boeea 4133*, [Indonesia], Sumatra, East Coast, Asahan Kota Pinang, Si Mandi Angin (holotype MICH [MICH1111574]; isotypes A [A00093127], K [K000857485], L [L0004718], NY [NY00318410], S, US [US00067922]).

For additional synonymys see Leeuwenberg, Rev. Tabernaemontana 1 (1991) 138.

Shrub or small tree to 12 m tall, to 20 cm diam. but usually much less. **Bark** dark brown, shallowly fissured. **Twigs** lenticellate, glabrous, rarely pubescent. **Leaves** opposite; petiole 3–20 mm long; lamina subcoriaceous to papery, drying dark brown, elliptic to obovate, 7–37 × 2–14 cm, 2–6 times as long as wide, base cuneate, apex acuminate to caudate, glabrous or, rarely, sparsely pubescent below, secondary veins 6–16 pairs, curved-ascending and weakly anastomosing before reaching the margin, intercostal veins irregularly scalariform or more or less obscure. **Inflorescences** 2–25-flowered, 5–13 cm long, glabrous to pubescent, axes lenticellate or not; pedicels 5–30 mm long. **Calyx** lobes ovate, 2–5 × 1–2.5 mm, widest at the base, 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 0.2–0.33 times the length of bud, apex obtuse; tube 15–31 mm long; lobes 9–16 × 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 × 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 cm long, 0.6–3 cm diam. with or without ridges, 5–20-seeded. **Seeds** with a red or orange aril.

Distribution. Southern China, Myanmar, Vietnam, Laos, Thailand, Peninsular Malaysia, Sumatra, Borneo and Lesser Sunda Islands. In Singapore it is fairly widespread in forested areas and is known from several places in the Central Catchment including Mandai (*Lua et al. SING2012-504*, 28 Dec 2012, SING [SING0192213]), MacRitchie (*Liew et al. SING2006-16*, 9 Sep 2016, SING [SING0081385]) and Nee Soon (*Samsuri et al. NES 18*, 24 Jun 2003, SING [SING0045727]). In the past it was also collected on Grange Road (*Ridley 6243*, 1894, SING [SING0003478]). The earliest but unlocalised collection in Singapore is from 1861 (*Anderson 117*, Oct 1861, K).

Ecology. In Singapore in primary and secondary forest and freshwater swamp forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is widespread and common over much of its distribution. It is assessed here as Vulnerable (VU/D) in Singapore.

Vernacular name. *Jelutong badak* (Malay).

2. *Tabernaemontana pauciflora* Blume

(Latin, *pauci-* = few, *-flora* = flower; with few-flowered inflorescence)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1028; Miquel, Fl. Ned. Ind. 2, fasc. 3 (1857) 422; Leeuwenberg, Rev. *Tabernaemontana* 1 (1991) 182, fig. 50; Turner, Gard. Bull. Singapore 45 (1993) 36; Middleton, Fl. Thailand 7(1) (1999) 33; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 58, fig. 10; Middleton, Fl. Males., ser. 1, 18 (2007) 383; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 84, 106, 224; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 97, fig. 14. **Synonym:** *Ervatamia blumeana* Markgr., Notizbl. Bot. Gart. Berlin-Dahlem 12 (1935) 547; Bakhuizen van den Brink, *Blumea* 6(2) (1950) 385; Backer & Bakhuizen van den Brink, Fl. Java (Spermatoph.) 2 (1965) 228. **Type:** *Blume* 73, [Indonesia], Java, near Rompein (lectotype L [L0004752], designated by Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 20). **Fig.** 19, 20.

Tabernaemontana malaccensis Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 649; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; Henderson, Malay. Wild Fls., Dicot. (1959) 282, fig. 265; Corner, Wayside Trees Malaya, ed. 3, 1 (1988) 161; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 145. **Synonym:** *Ervatamia malaccensis* (Hook.f.) King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 452; Ridley, Fl. Malay Penins. 2 (1923) 343. **Type:** *Maingay 1843* [Kew Distribution 1061], [Malaysia], Malacca (lectotype K [K000857405], designated by Leeuwenberg, Agric. Univ. Wageningen Pap. 87(5) (1988 [‘1987’]) 20; isolectotypes GH [GH00093033], L [L0004751]).

For further synonymy see Leeuwenberg, Rev. *Tabernaemontana* 1 (1991) 182.

Shrub or small tree to 6 m tall, to 10 cm diam. **Bark** pale grey to grey-brown, smooth; inner bark pale yellow. **Sapwood** pale yellow. **Twigs** glabrous, with few lenticels. **Leaves** opposite; petiole 2–7 mm long; lamina papery, elliptic, 3–26 × 0.6–10 cm, (1.7–)2–4 times as long as wide, apex acuminate or caudate, base cuneate, glabrous, secondary veins 5–20 pairs, curved ascending, intercostal veins obscure. **Inflorescences** 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. **Calyx** lobes ovate to oblong, widest at the base, 1.4–4 × 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 acute to long acuminate; tube twisted or not, 11–23 mm long; lobes 7–14 × 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 × 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 cm long, 0.7–2 cm diam., apex acuminate, 2–16 seeded. **Seeds** obliquely ellipsoid, 8–10 mm long, 5–6 mm wide.

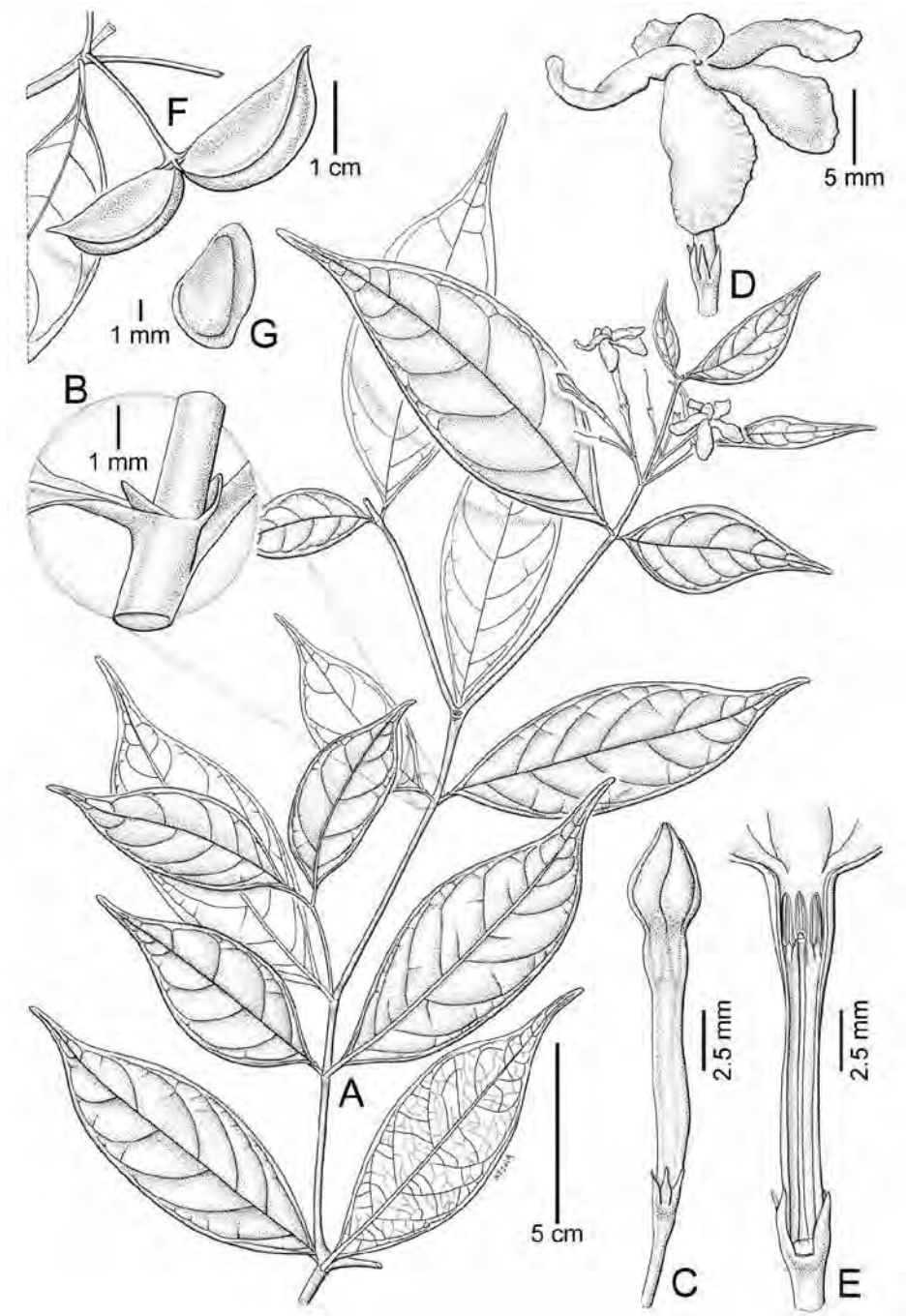


Figure 19. *Tabernaemontana pauciflora* Blume. **A.** Habit. **B.** Close up of stipule-like flaps in leaf axils. **C.** Flower bud. **D.** Open flower. **E.** Flower dissection. **F.** Fruit. **G.** Seed covered in aril. (From Singapore, A–E from Nee Soon, *Leong et al. SING2011-372*; F, G from Chestnut Avenue, *Liew SING2008-201*. Drawn by X.Y. Loh).

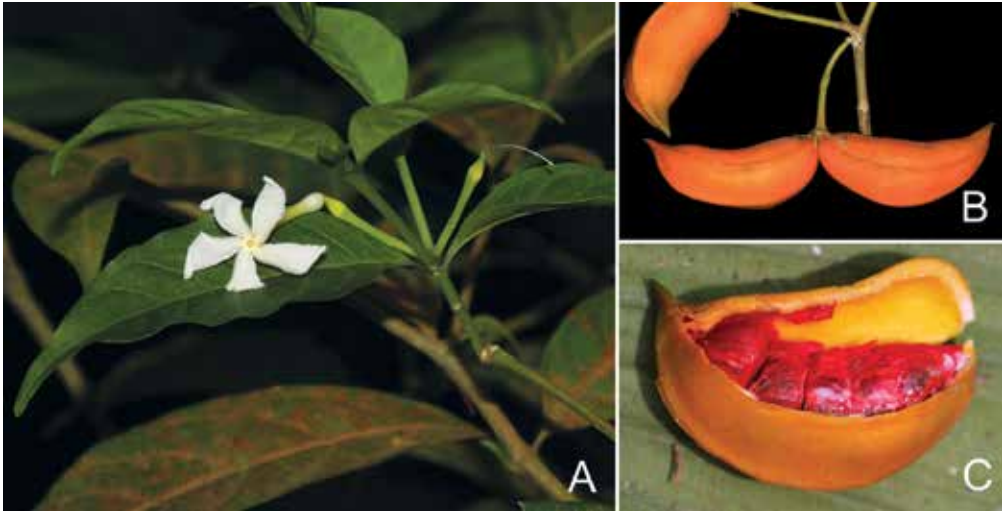


Figure 20. *Tabernaemontana pauciflora* Blume. **A.** Habit. **B.** Fruit. **C.** Dehiscent fruit and seeds with arils. (From Singapore, MacRitchie. Photos: A, C, X.Y. Ng; B, W.F. Ang).

Distribution. Myanmar, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java and Borneo. In Singapore known from Nee Soon (*Yeo et al. SING2012-194*, 14 May 2012, SING [SING0173597]), Mandai (*Gwee et al. SING2009-21*, 6 Jan 2009, SING [SING0137310]); *Yeo et al. SING2012-348*, 7 Aug 2012, SING [SING0183486]) and Chestnut (*Liew SING2008-201*, 28 May 2008, SING [SING0109158]). In the past also collected on Bukit Timah (*Idris 11344*, 1908, K, SING [SING0038001]).

Ecology. Understorey in primary and secondary forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is widespread and common over much of its distribution. It is assessed here as Vulnerable (VU/D) in Singapore.

Vernacular name. *Lada-lada* (Malay).

12. WILLUGHBEIA Roxb.

(Francis Willughby, 1635–1672, English zoologist)

Pl. Coromandel 3, fasc. 4 (1820 [‘1819’]) 77, pl. 280, nom. cons.; Don, Gen. Hist. 4 (1837) 101; Bentham & Hooker, Gen. Pl. 2(2) (1876) 691; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 623, as ‘*Willoughbeia*’; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 391; Ridley, Fl. Malay Penins. 2 (1923) 322; Markgraf, Blumea 20(2) (1973 [‘1972’]) 410; Middleton, Blumea 38(1) (1993) 2; Middleton, Fl. Thailand 7(1) (1999) 18; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 6; Middleton, Fl. Males., ser. 1, 18 (2007) 420; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 102; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 262. **Type:** *Willoughbeia edulis* Roxb.

Urnlularia Stapf, Hooker's Icon. Pl. 28 [ser. 4, 8], fasc. 1 (1901) pl. 2711, nom. cons.; Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 154; Backer & Bakhuizen van den Brink, Fl. Java (Spermatoph.) 2 (1965) 224; Markgraf, Blumea 20(2) (1973 [1972]) 407. **Synonyms:** *Willughbeia* Roxb. subg. *Urnlularia* (Stapf) King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 391. – *Urnlularia* Stapf sect. *Urnlula* Pichon, Mém. Mus. Natl. Hist. Nat. 24 (1948) 155. – *Willughbeiopsis* Rauschert, Taxon 31 (1982) 556, nom. rej. **Type:** *Urnlularia flavescens* (Dyer ex Hook.f.) Stapf (= *Willughbeia flavescens* Dyer ex Hook.f.).

For full generic synonymy see Middleton, Blumea 38(1) (1993) 2.

Large woody climbers; latex white. **Branches** lenticellate, glabrous or puberulent, bearing tendrils formed from modified inflorescences. **Leaves** opposite, those of a pair equal; lamina papery to coriaceous; petiolate, colleters absent in leaf axils. **Inflorescences** of axillary and, rarely, terminal cymes, often very short, appearing fasciculate; axes puberulent or glabrous; bracts small, ovate or oblong; flowers 5-merous. **Calyx** lobes connate at the base, lobes free and erect or slightly reflexed, colleters absent. **Corolla** lobes in bud overlapping to the left forming a cone or cylinder of erect lobes, without a corona; tube cylindric, 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 lanceolate, apex acute or obtuse, base rounded. **Nectary** absent. **Ovary** unilocular, with 2 parietal placentas, glabrous, superior to semi-inferior; style columnar, style head ellipsoid or cylindric with a narrow apex, apex as long as or longer than the style head. **Fruit** brown, yellowish, sometimes bluish when immature, 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. A genus of 16 species in continental Southeast Asia and western Malesia. In Singapore 5 native species.

Uses. In the past *Willughbeia coriacea* was an important source of rubber and most other species were of minor use, either because they were uncommon or their latex was inferior. Commercially, they were superceded when latex from *Hevea brasiliensis* became available (Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 2260). Latex from most species has been used medicinally and several have edible fruit. None has been regularly cultivated.

Key to *Willughbeia* species

1. Inflorescence axes brown pubescent; calyx lobes brown pubescent; corolla tube 7.5–15 mm long **5. W. tenuiflora**
 Inflorescence axes glabrous or white puberulent; calyx lobes normally glabrous; corolla tube 1.2–8 mm long
2. Inflorescence lax, peduncle longer than subtending petiole **4. W. flavescens**
 Inflorescence fasciculate and dense, peduncle shorter than subtending petiole

3. Corolla tube inflated and much wider than head in bud **1. *W. angustifolia***
 Corolla tube inflated only around anthers, not noticeably wider than head in bud 4
4. Leaves with distinct intercalated veins between the secondary veins, lamina papery to subcoriaceous **3. *W. edulis***
 Leaves without distinct intercalated veins between the secondary veins, lamina subcoriaceous to thickly coriaceous **2. *W. coriacea***

1. *Willughbeia angustifolia* (Miq.) Markgr.

(Latin, *angusti-* = narrow, *-folia* = leaves; with narrow leaves)

Blumea 20(2) (1973 [‘1972’]) 414; Turner, Gard. Bull. Singapore 45 (1993) 37; Middleton, Blumea 38(1) (1993) 4; Middleton, Fl. Thailand 7(1) (1999) 19; Middleton, Fl. Males., ser. 1, 18 (2007) 423; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 90, 106, 199; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 104. **Basionym:** *Vahea angustifolia* Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 394. **Type:** *Diepenhorst HB2088*, [Indonesia], Sumatra, Priaman (lectotype U [U0000581], designated by Middleton, Blumea 38(1) (1993) 4).

Willughbeia apiculata Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 551; Boerlage, Handl. Fl. Ned. Ind. 2(2) (1899) 392; Boerlage, Bull. Inst. Bot. Buitenzorg 5 (1900) 6; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146. **Type:** *Diepenhorst 2140*, [Indonesia], Sumatra, Priaman (lectotype U [U0000582], designated by Middleton, Blumea 38(1) (1993) 4; isolectotype L [L0004792]).

Willughbeia rufescens Dyer ex Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 326; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 398; Ridley, Fl. Malay Penins. 2 (1923) 325. **Synonyms:** *Willughbeia flavescens* Dyer ex Hook.f. var. *rufescens* (Dyer ex Hook.f.) Ridl., Fl. Malay Penins. 2 (1923) 325. – *Urularia rufescens* (Hook.f.) Stapf ex S. Moore, J. Bot. 63, Suppl. (1925) 67; Markgraf, Blumea 20(2) (1973 [‘1972’]) 409; Turner, Gard. Bull. Singapore 45 (1993) 37. – *Willughbeiaopsis rufescens* (Dyer ex Hook.f.) Rauschert, Taxon 31 (1982) 556. **Type:** *Maingay 3140* [Kew Distribution 1092], [Malaysia], Malacca (lectotype K [K000832842], designated by Middleton, Blumea 38(1) (1993) 4; isolectotype K [K000832843]).

Chilocarpus brachyanthus Pierre, Bull. Mens. Soc. Linn. Paris, sér. 2, 1 (1898) 101. **Type:** *Beccari 307*, [Malaysia], Sarawak (lectotype P [P026273], designated by Middleton, Fl. Males., ser. 1, 18 (2007) 423; isolectotypes K [K000894127], M [M-0005448], NY, S).

Willughbeia elmeri Merr., Univ. Calif. Publ. Bot. 15 (1929) 253; Tsiang, Sunyatsenia 2 (1934) 94; Masamune, Enum. Phan. Born. (1942) 626; Markgraf, Blumea 20(2) (1973 [‘1972’]) 414. **Type:** *Elmer 21038*, [Malaysia, Sabah], Tawao (lectotype BM [BM000838607], designated by Middleton, Blumea 38(1) (1993) 4; isolectotypes A [A00067388], BR [BR0000005213757], C [C10005908], CAS [CAS0005239], G [G00190777], GH [GH00003088], K [K000832829], L [L0004794], M [M-0183376], MICH [MICH1111579], MO [MO022197], NY [NY00318438, NY00318439], P [P00496003], PH [PH00029429], S, SING [SING0056573], U [U0000583], UC [UC312111], Z).

Willughbeia angustifolia (Miq.) Markgr. var. *gracilior* Markgr., Blumea 20(2) (1973[‘1972’]) 414. **Type:** *Endert 3562*, [Indonesia], Borneo, [Kalimantan], W Koetai (lectotype L [L0004793], designated by Middleton, Blumea 38 (1993) 4; isolectotypes A [A00067386], BO, K [K000832830]).

Woody climber to 60 m. **Branchlets** glabrous, very rarely minutely puberulent; lenticellate. **Leaves:** petiole 0.4–1.7 cm long; lamina elliptic, ovate or oblong, 2.6–10.7(–20.5) × 0.9–4.8(–7) cm, 1.5–4.2 times as long as wide, apex obtuse to acuminate, base rounded to cuneate, subcoriaceous to thickly coriaceous, glabrous, secondary veins 9–24 pairs, at 60–85°, reaching margin or anastomosing shortly before it, intercostal veins of 1, rarely to 3, intercalated veins and then with further reticulate venation or almost obscure. **Inflorescences** axillary, rarely to 3 in one leaf axil, fasciculate and dense, 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. **Calyx** 0.9–1.8 mm long, lobes ovate, 0.5–1 × 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, in bud much wider than the head, 1.2–3 mm long, 0.9–1.2 mm wide, glabrous outside and inside; lobes 1.5–4.5 × 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 × 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 cm long, 1.9–14 cm diam., pale green, yellow, orange or reddish. **Seeds** 1.2–2.4 cm long, 0.6–1.4 cm wide, 0.6–1.1 cm thick.

Distribution. India (Nicobar Islands), southern Thailand, Peninsular Malaysia, Borneo, Sumatra and Buru. In Singapore historically known from Changi (*Ridley s.n.*, 1893, SING [SING0003524]; *Mat 6023*, Mar 1894, K, SING [SING0003526]), Jurong (*Mat 6047*, 1894, SING [SING0003527]), Mandai (*Kiah 37135*, 25 Jul 1940, SING [SING0003525]) and Chan Chu Kang (*Ridley 6143*, 1894, SING [SING0003522]).

Ecology. Formerly found in primary and secondary forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is widespread and often-collected. In Singapore presumed Nationally Extinct.

Notes. This species is very variable in leaf shape, size and venation. In Singapore the leaves are generally rather small but elsewhere they can be much larger. It can be confused with *Willughbeia flavescens* when in fruit as the structure of the inflorescence is then rather obscured.

2. *Willughbeia coriacea* Wall.

(Latin, *coriaceous* = coriaceous, leathery; referring to the leaf texture)

Pl. Asiat. Rar. 3 (1832) 45; Don, Gen. Hist. 4 (1837) 102; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 623; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 108; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 393; Ridley, Fl. Malay Penins. 2 (1923) 323; Markgraf, Blumea 20(2) (1973 [‘1972’]) 412; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146; Turner, Gard. Bull. Singapore 45 (1993) 37; Middleton, Blumea 38(1) (1993) 8; Middleton, Fl. Thailand 7(1) (1999) 19; Middleton, Fl. Males., ser. 1, 18 (2007) 425; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 105. **Synonym:** *Ancylocladus coriaceous* (Wall.) Kuntze, Revis. Gen. Pl. 2 (1891) 412. **Type:** *Wallich s.n.* [EIC 1620], Singapore, 1822 (lectotype K-W [K001113597], designated by Middleton, Blumea 38(1) (1993) 8). **Fig. 21, 22.**

Willughbeia firma Blume, Mus. Bot. 1, fasc. 10 (1850) 154; Stapf, Hooker's Icon. Pl. 24 [ser. 4, 4], fasc. 2 (1894) pl. 2344; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 624; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 108; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 394; Ridley, J. Straits Branch Roy. Asiat. Soc. 59 (1911) 129; Ridley, Fl. Malay Penins. 2 (1923) 323, fig. 105. **Synonym:** *Ancylocladus firmus* (Blume) Kuntze, Revis. Gen. Pl. 2 (1891) 412. **Type:** *Korthals 1042*, [Indonesia], Sumatra (lectotype L [L0004799], designated by Middleton, Blumea 38(1) (1993) 8).

Willughbeia firma Blume var. *oblongifolia* Blume, Mus. Bot. 1, fasc. 10 (1850) 154. **Type:** *Korthals s.n.*, [Indonesia], Sumatra (holotype L [L0004797]).

Willughbeia burbridgei Dyer, Rep. Progr. Condition Roy. Gard. Kew 1880 (1880) 44. **Type:** *Treacher s.n.*, [Malaysia], Sarawak, Lawas River, Menoongan (lectotype K [K000832823], designated by Middleton, Blumea 38(1) (1993) 9).

Ancylocladus minutiflorus Pierre, Bull. Mens. Soc. Linn. Paris, sér. 2, 1 (1898) 95. **Synonym:** *Willughbeia minutiflora* (Pierre) K. Schum. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55; Merrill, Bibliogr. Enum. Born. Pl. (1921) 496; Masamune, Enum. Phan. Born. (1942) 626. **Type:** *Beccari 4030*, [Malaysia], Sarawak (lectotype K [K000832828], designated by Middleton, Blumea 38(1) (1993) 8; isolectotypes FI [FI013020], P [P00496010]).

Ancylocladus vriesianus Pierre, Bull. Mens. Soc. Linn. Paris, sér. 2, 1 (1898) 95. **Synonym:** *Willughbeia vriesiana* (Pierre) K. Schum. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55; Merrill, Bibliogr. Enum. Born. Pl. (1921) 496; Masamune, Enum. Phan. Born. (1942) 627. **Type:** *De Vriese s.n.*, [Indonesia], Sumatra (lectotype L, designated by Middleton, Blumea 38(1) (1993) 8; isolectotype P [P00496006]).

Ancylocladus nodosus Pierre, Bull. Mens. Soc. Linn. Paris, sér. 2, 1 (1898) 96. **Synonym:** *Willughbeia nodosa* (Pierre) K. Schum. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55. **Type:** *Beccari 1530*, [Malaysia], Sarawak (lectotype K [K000832822], designated by Middleton, Blumea 38(1) (1993) 8; isolectotypes FI, G [G00190775], M [M-0183375], P [P00496007]).

Willughbeia firma Blume var. *macrophylla* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 4; Merrill, Bibliogr. Enum. Born. Pl. (1921) 496; Masamune, Enum. Phan. Born. (1942) 626. **Type:** *Van Romburgh 54*, [Indonesia], Borneo, Kalimantan, Oetan Angka Riboh (holotype BO; isotype A).

Willughbeia firma Blume var. *obtusifolia* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 4; Merrill, Bibliogr. Enum. Born. Pl. (1921) 496. **Type:** *Van Romburgh 48*, [Indonesia], Borneo, Kalimantan, Moera Teweh (not traced).

Willughbeia firma Blume var. *platyphylla* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 4; Merrill, Bibliogr. Enum. Born. Pl. (1921) 496. **Type:** *Van Romburgh 9*, [Indonesia], Borneo, Kalimantan, Pangkalan Lokan (lectotype BO, designated by Middleton, Blumea 38(1) (1993) 8; isolectotype BO).

Large climber to 30 m. **Branches** mostly glabrous, very rarely puberulent; sparsely lenticellate or not. **Leaves:** petiole 0.6–4 cm long; lamina elliptic, ovate, oblong or obovate, 3.3–29.5 × 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, not glaucous beneath, mostly glabrous, very rarely puberulent on midrib beneath, margin not undulate, secondary veins 6–20 pairs, at 50–80° curving towards but not reaching margin, intercostal veins mostly obscure, sometimes faint and then perpendicular to the secondary veins. **Inflorescences** axillary, very rarely terminal, axis usually shorter than the subtending petiole, very rarely longer, to 3 cm

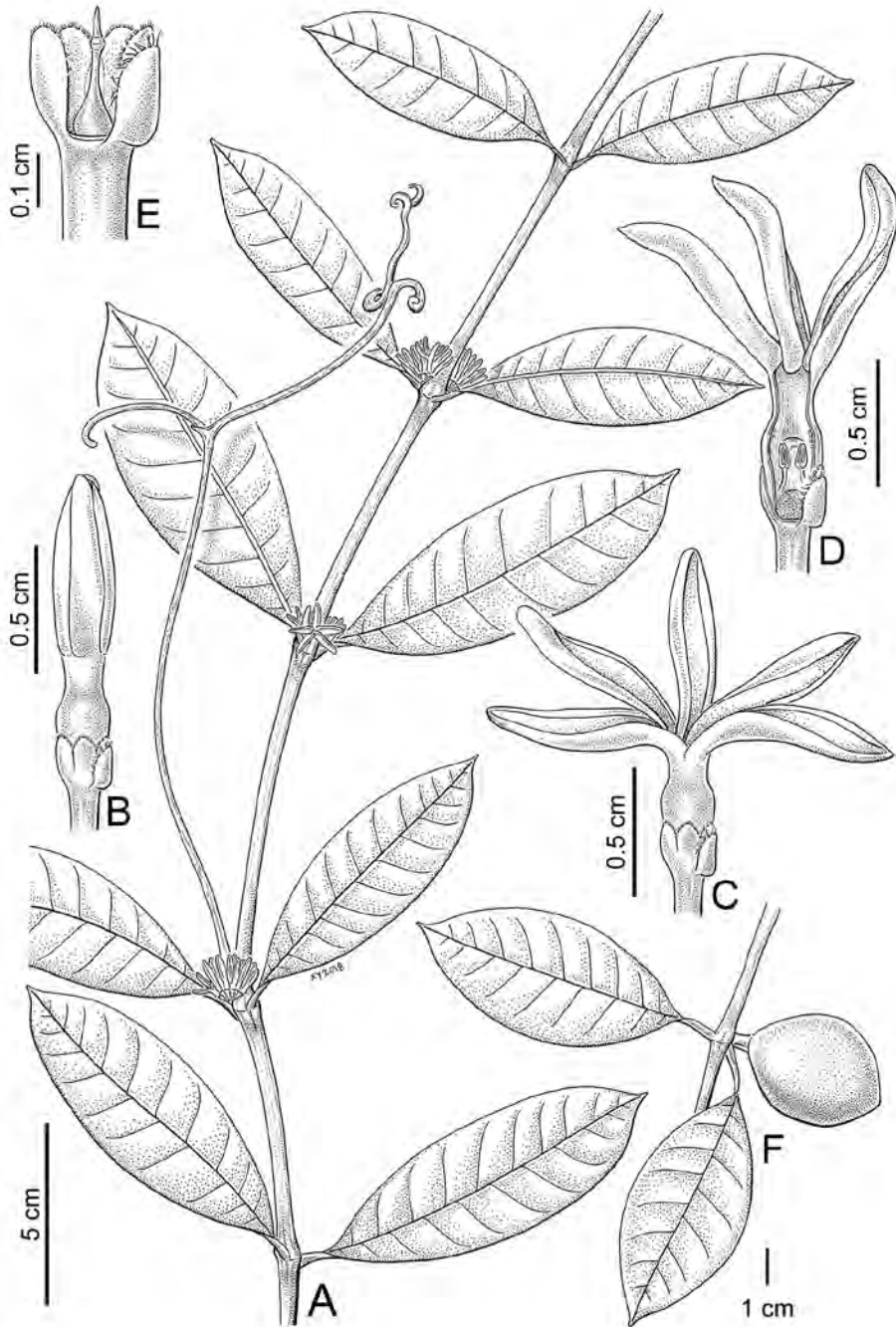


Figure 21. *Willughbeia coriacea* Wall. **A.** Habit. **B.** Flower bud. **C.** Flower. **D.** Flower dissection. **E.** Gynoecium and calyx. **F.** fruit. (From Singapore, A from MacRitchie, *Boo SING2011-347*; B–E from Nee Soon firing range, *Lua et al. LHK 11-58*; F without exact location, *O’Dempsey SING2013-014*. Drawn by X.Y. Loh).



Figure 22. *Willughbeia coriacea* Wall. **A.** Habit. **B.** Inflorescences. **C.** Fruit. **D.** Fruit split open showing seeds embedded in pulp. (From Singapore, A from Chestnut Nature Park; B, C from MacRitchie; D from Bukit Timah Nature Reserve, *Bazilah et al 2015-293*. Photos: A, D, P.K.F. Leong; B, C, X.Y. Ng.)

long, 3–25 flowers per inflorescence, axes mostly glabrous, rarely minutely and sparsely puberulent; pedicel 0–5.3 cm long. **Calyx** 1.5–4 mm long, lobes oblong or ovate, 0.8–3.3 × 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, sweetly scented; tube cylindric, 2.5–8 mm long, 1.2–

1.4 mm wide, outside glabrous, inside puberulent; lobes 4–10 × 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 × 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 cm long, 1.7–7 cm wide, green, yellow or orange. **Seeds** 13–18 mm long, 7–13 mm wide, 7–11 mm thick.

Distribution. Southern Thailand, Peninsular Malaysia, Sumatra, Java and Borneo. In Singapore known from Nee Soon (*Lua et al. SING2014-305*, 12 Sep 2014, SING [SING0216259]), Pulau Ubin (*Gwee et al. GAT123*, 17 Dec 2002, SING [SING0042673]), MacRitchie (*Sinclair SF 40219*, 4 Mar 1954, SING [SING0003545]), Bukit Timah and Pulau Tekong. In the past also in Changi (*Goodenough 4431*, 1892, SING [SING0003543]) and many other parts of Singapore. The oldest but unlocalised Singapore collection is from 1822 (*Wallich s.n.* [EIC 1620], K [K001113597]).

Ecology. In primary and secondary forest and in freshwater swamp forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is widespread and fairly common. In Singapore also likely to be Least Concern (LC).

Uses. Previously used as a source of latex for rubber before the introduction of *Hevea brasiliensis*.

3. *Willughbeia edulis* Roxb.

(Latin, *edulis* = edible; referring to the fruit)

Pl. Coromandel 3, fasc. 4 (1820 [‘1819’]) 77, pl. 280; Roxburgh, Fl. Ind., ed. 2, 2 (1832) 57; Wallich, Pl. Asiat. Rar. 3 (1832) 45; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 623; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 392; Ridley, Fl. Malay Penins. 2 (1923) 323; Middleton, Blumea 38(1) (1993) 11; Middleton, Fl. Thailand 7(1) (1999) 20, fig. 7; Middleton, Fl. Males., ser. 1, 18 (2007) 426, fig. 110; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 90, 106, 199; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 107. **Type:** [Published illustration] Roxburgh, Pl. Coromandel 3, fasc. 4 (1820 [‘1819’]), pl. 280. **Fig. 23.**

Willughbeia martabanica Wall., Pl. Asiat. Rar. 3 (1832) 45, t. 272; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 395; Ridley, J. Straits Branch Roy. Asiat. Soc. 59 (1911) 129. **Type:** *Wallich 1803* [EIC 1619], [Myanmar], Amherst [Kyaikkhami], 1827 (lectotype K-W [K001113596], designated by Middleton, Blumea 38(1) (1993) 11; isolectotypes BM [BM000997987], G-DC, K [K000832846], K-W [K001113595]).

Willughbeia dulcis Ridl., Trans Linn. Soc. London, Bot. 3 (1893) 319; Ridley, Fl. Malay Penins. 2 (1923) 325; Markgraf, Blumea 20(2) (1973 [‘1972’]) 414; Turner, Gard. Bull. Singapore 45 (1993) 37. **Type:** *Ridley 1022*, [Malaysia], Pahang, Pekan (lectotype SING [SING0056572], designated by Turner et al., Gard. Bull. Singapore 70 (2018) 321).

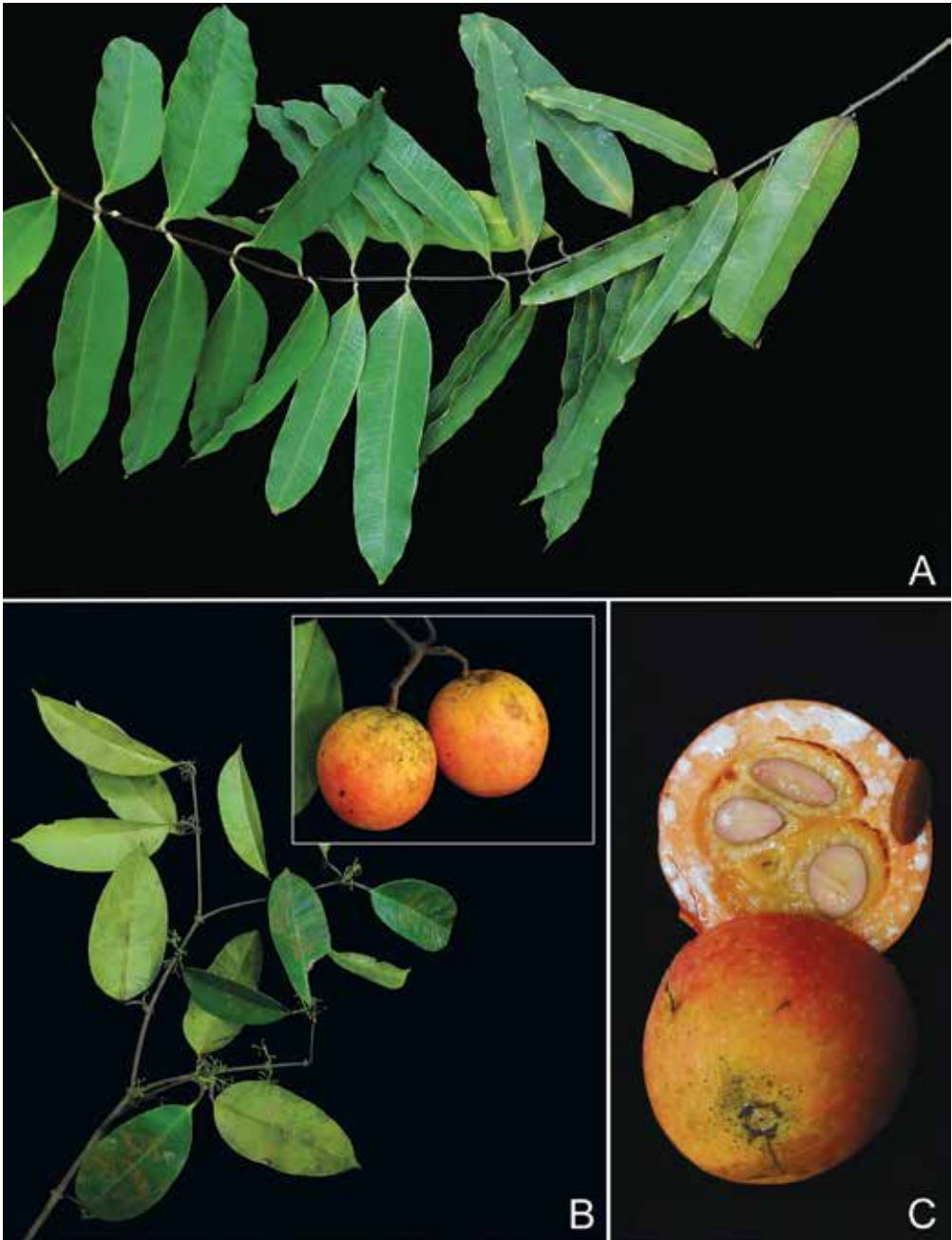


Figure 23. *Willughbeia edulis* Roxb. **A.** Habit. *Willughbeia flavescens* Dyer ex Hook.f. **B.** Habit. Inset: fruit. **C.** Cross section of fruit. (From Singapore, A from Sentosa; B, C from MacRitchie, *Lim et al. SING2018-412*. Photos: P.K.F. Leong).

Ancylocladus cochinchinensis Pierre, Bull. Mens. Soc. Linn. Paris, sér. 2, 1 (1898) 97. **Synonym:** *Willughbeia cochinchinensis* (Pierre) K.Schum. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55; Pitard, Fl. Indo-Chine 3, fasc. 8 (1933) 1094; Kerr, Fl. Siam. 2(5) (1939) 423; Lý, Feddes Repert. 97 (1986) 420. **Type:** *Pierre 138*, Vietnam, Ba Ria-Vung Tau, Baria, Ninh Mountains (lectotype K [K000832831], designated by Lý, Feddes Repert. 97 (1986) 420; isolectotypes A [A00056831], BR [BR0000005215225], L [L0004800], MO [MO022196], P [P00495999, P00496000, P00496001, P00496002, P04227808], SING [SING0056571], US [US00432556]).

Ancylocladus curtisianus Pierre, Bull. Mens. Soc. Linn. Paris, sér. 2, 1 (1898) 97. **Synonym:** *Willughbeia curtisiana* (Pierre) K.Schum. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 2 (1900) 55. **Type:** *Curtis s.n.*, [Malaysia], Penang (lectotype P [P00496008], designated by Middleton, Blumea 38(1) (1993) 11).

Woody climber. **Branches** glabrous, usually densely lenticellate. **Leaves:** petiole 0.6–1.9 cm long; 3.2–25 × 1.2–11.5 cm, lamina elliptic or oblong, 1.3–5 times as long as wide, apex acuminate to rounded, base cuneate to rounded, papery or subcoriaceous, glabrous, margin usually distinctly undulate, secondary veins 6–20 pairs, at 50–80°, usually reaching margin, intercostal veins usually with one intercalated vein. **Inflorescences** axillary, fasciculate and dense, sometimes two 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. **Calyx** 1.8–2.7 mm long, lobes ovate, 1.1–1.9 × 0.8–1.7 mm, 0.7–2 times as long as wide, apex rounded, rarely acute or obtuse, glabrous, ciliate. **Corolla** sweetly scented, white or cream; tube cylindric, inflated only around anthers, not wider than the head, 3.8–6.5 mm long, 1.5–1.9 mm wide, outside glabrous, inside puberulent; lobes oblong, 4.5–15 × 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 × 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 cm long, 1.2–5.8 cm wide, yellow or orange. **Seeds** 6–16 mm long, 4–13 mm wide, 3–6 mm thick.

Distribution. India (including Nicobar Islands), Bangladesh, Myanmar, Thailand, Cambodia, Laos, Vietnam and Peninsular Malaysia. In Singapore known from Labrador (*Chong et al.* 26, 3 Jun 2016, SING [SING0241645]). In the past collected in Pasir Ris (*Sinclair SF 40240*, 27 Mar 1954, SING [SING0003528]) and Tampines (*Burkill s.n.*, 8 Apr 1916, K, SING [SING0113309]).

Ecology. In primary and secondary forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is very widespread and commonly collected. It is assessed here as Critically Endangered (CR/D) in Singapore as the known population is very small.

4. *Willughbeia flavescens* Dyer ex Hook.f.

(Latin, *flavescens* = yellowish; probably in relation to the flowers)

Fl. Brit. India 3, fasc. 9 (1882) 625; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 397; Ridley, Fl. Malay Penins. 2 (1923) 325;

Middleton, *Blumea* 38(1) (1993) 12; Middleton, *Fl. Males.*, ser. 1, 18 (2007) 429; Tan et al. in Davison et al. (ed.), *Singapore Red Data Book*, ed. 2 (2008) 216; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 90, 106, 213; Middleton, *Fl. Penins. Malaysia*, ser. 2, 2 (2011) 110. **Synonym:** *Urmularia flavescens* (Dyer ex Hook.f.) Stapf, *Hooker's Icon. Pl.* 28 [ser. 4, 8], fasc. 1 (1901) pl. 2711 (page 2), fig. 7; Markgraf, *Blumea* 20(2) (1973 ['1972']) 409; Whitmore, *Tree Fl. Malaya* 2 (1973) 5; Turner, *Gard. Bull. Singapore* 45 (1993) 37. – *Willughbeiosis flavescens* (Dyer ex Hook.f.) Rauschert, *Taxon* 31 (1982) 556. **Type:** *Murton 120*, Singapore, near Botanic Gardens (lectotype K [K000832840], designated by Middleton, *Blumea* 38(1) (1993) 12; isoelectotypes GH [GH00106507], K [K000832839, K000832841]).

Ancylocladus beccarii Pierre, *Bull. Mens. Soc. Linn. Paris*, sér. 2, 1 (1898) 98. **Synonyms:** *Melodinus beccarii* Pierre, *Bull. Mens. Soc. Linn. Paris*, sér. 2, 1 (1898) 98, nom. inval. (in synonymy). – *Willughbeia beccarii* (Pierre) K.Schum. in Engler & Prantl, *Nat. Pflanzenfam. Nachtr.* 2 (1900) 55. – *Urmularia oblongifolia* Stapf, *Hooker's Icon. Pl.* 28 [ser. 4, 8], fasc. 1 (1901) pl. 2711 (page 2). – *Willughbeia stapfii* Merr., *J. Malayan Branch Roy. Asiat. Soc.* 1 (1923) 29. – *Urmularia beccarii* (Pierre) Markgr., *Blumea* 20(2) (1973 ['1972']) 409. – *Willughbeiosis beccarii* (Pierre) Rauschert, *Taxon* 31 (1982) 556. **Type:** *Beccari 2272*, [Malaysia], Sarawak (lectotype K [K000832872], designated by Middleton, *Blumea* 38(1) (1993) 12; isoelectotypes FI, G [G00190774], M [M-0183374], P [P00496011]).

Melodinus cymosus Ridl., *J. Fed. Malay States Mus.* 10 (1920) 146; Ridley, *Fl. Malay Penins.* 2 (1923) 331. **Type:** *Burkill 789*, [Malaysia], Malacca, Selandar Forest (lectotype K [K000832838], designated by Middleton, *Blumea* 38(1) (1993) 12; isoelectotype SING [SING0056496]).

Willughbeia grandiflora auct. non Dyer ex Hook.f.: Ridley, *J. Straits Branch Roy. Asiat. Soc.* 33 (1900) 109; Markgraf, *Blumea* 20(2) (1973 ['1972']) 411, p.p.; Turner, *Gard. Bull. Singapore* 45 (1993) 37; Tan et al. in Davison et al. (ed.), *Singapore Red Data Book*, ed. 2 (2008) 216; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 90, 106, 199.

Climber to 30 m. **Branches** glabrous or, more rarely, sparsely and minutely puberulent, lenticellate. **Leaves:** petiole 0.6–1.8 cm long; lamina elliptic to oblong, 3.9–16.5 × 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, secondary veins 13–30 pairs, at 70–80°, not clearly distinct from the 1–3 intercalated parallel veins. **Inflorescences** axillary, lax, 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. **Calyx** 0.8–1.7 mm long, lobes ovate, 0.7–1.3 × 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 × 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 c. 0.1 mm long, indistinct, apex 0.2–0.3 mm long. **Fruit** spherical, 2.5–5 cm diam. **Seeds** oval 2.2 mm long, 1.7 mm wide, 0.9 mm thick.

Distribution. Peninsular Malaysia, Sumatra and Borneo. In Singapore previously recorded from near the Singapore Botanic Gardens (*Murton 120*, A, K), Bukit Timah (*Ngadiman SFN36372*, 21 Mar 1939, K, SING [SING0037916]), Jurong (*Corner 26161*, 26 Dec 1932, SING [SING0037915]) and Pulau Ubin (*Ridley s.n.*, 1893, SING [SING0037914]). Currently only known from Nee Soon (*Ng SING2018-123*, 4 Feb 2018, SING [SING0261171]).

Ecology. Currently only known from freshwater swamp forest but older collections are from a variety of forest types.

Provisional conservation assessment. Globally Least Concern (LC) as this species is rather widespread although subject to the pressures of other forest species. It is assessed as Critically Endangered (CR/D) in Singapore as it is known from very few individuals.

5. *Willughbeia tenuiflora* Dyer ex Hook.f.

(Latin, *tenui*- = thin, *-flora* = flowers; referring to the thin flowers in bud)

Fl. Brit. India 3, fasc. 9 (1882) 625; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 109; Ridley, Fl. Malay Penins. 2 (1923) 325; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 396; Markgraf, Blumea 20(2) (1973 ['1972']) 413; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146; Turner, Gard. Bull. Singapore 45 (1993) 37; Middleton, Blumea 38(1) (1993) 18; Middleton, Fl. Males., ser. 1, 18 (2007) 435; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 90, 106, 213; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 112. **Type:** *Maingay s.n.* [Kew Distribution 1049], [Malaysia], Malacca (lectotype K [K000832832], first step designated by Markgraf, Blumea 20(2) (1973 ['1972']) 413, second step designated by Middleton, Blumea 38(1) (1993) 18; isolectotypes GH [GH00067389], K [K000832833], L [L0004806]). **Fig. 24.**

Woody climber. **Branchlets** rufous pubescent to glabrous; branches lenticellate. **Leaves:** petiole 1–2 cm long; lamina elliptic, oblong or obovate, 5.2–22.5 × 1.7–9.3 cm, 2.3–3.4 times as long as wide, apex acuminate, base cuneate, papery or subcoriaceous, glabrous, secondary veins 17–30 pairs, at 70–80°, fairly straight, reaching margin, intercostal veins mostly obscure or, more rarely, visible beneath and then perpendicular to the secondary veins and meeting between them. **Inflorescences** axillary, axis shorter or as long as subtending petiole, to 4.2 cm long, 8–18 flowers per inflorescence, axes brown pubescent, pedicels 0.8–3 mm long. **Calyx** 1.2–1.8 mm long, lobes ovate, 1–1.6 × 0.8–1.6 mm, 1–1.9 times as long as wide, apex rounded to acute, brown pubescent, ciliate. **Corolla** white; tube 7.5–15 mm long, 1–1.2 mm wide, 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 × 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 cm long, 4.5–11.5 cm wide. **Seeds** 2.2–2.5 × 0.9–1.4 × 0.9–1.4 cm.

Distribution. Peninsular Malaysia and Sumatra. In Singapore known from Pulau Ubin (*Ali Ibrahim et al. SING2011-495*, Nov 2011, SING [SING0182050]), MacRitchie (*Ridley 4826*, 1893, SING [SING0003552]; *Ng SING2016-109*, 23 May 2016, SING [SING0241631]), Seletar (*Mhd Shah MS4075*, 5 Mar 1981, SING [SING0003549]), Bukit Timah (*Ridley 11333*, 1892, K, SING [SING003531]) and other parts of the Central Catchment.

Ecology. Lowland or hill dipterocarp forest to 1000 m.

Provisional conservation assessment. Globally Least Concern (LC) as this species is rather widespread. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from very few individuals.



Figure 24. *Willughbeia tenuiflora* Dyer ex Hook.f. Habit. Inset: flowers. (From Singapore, MacRitchie. Photos: X.Y. Ng).

APOCYNIDS

Trees, shrubs or climbers. **Leaves** opposite or, rarely, in whorls, entire; petiolate, petioles without colleters at the junction with the blade (in Singapore); blade occasionally with domatia on the undersides of the laminas in the axils of the secondary veins with the midrib. **Inflorescences** cymose, rarely fasciculate or flowers solitary; terminal or axillary; flowers 5-merous, actinomorphic, rarely weakly zygomorphic. **Calyx** 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 (*Urceola* p.p., *Wrightia* R.Br.). **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. **Nectary** present or absent. **Gynoecium** 2-carpellate, carpels free but apically united into a common style, sometimes postgenitally fused (*Parsonsia* R.Br., *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 outside Singapore).

This informal group corresponds to subfamily Apocynoideae (previously referred to as subfamily Echitoideae) of earlier publications. As it is quite evidently not monophyletic, the most recent classification of the entire Apocynaceae use the informal term ‘Apocynoids’ in preference. There are approximately 77 genera and 811 species worldwide of which there are 9 genera and 18 (or 19 – see *Epigynum* Wight) species in Singapore.

13. ANODENDRON A.DC.

(Greek, *ano-* = climbing, *-dendron* = tree; referring to the habit)

Prodr. 8 (1844) 443; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 668; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 485; Ridley, Fl. Malay Penins. 2 (1923) 361; Middleton, Blumea 41 (1996) 38; Middleton, Fl. Thailand 7(1) (1999) 127; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 7; Middleton, Fl. Males., ser. 1, 18 (2007) 132; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 120; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 302. **Type:** *Anodendron paniculatum* A.DC. (= *Anodendron parviflorum* (Roxb.) I.M.Turner).

Climbers or scramblers without tendrils; latex white. **Branches** lenticellate or not; branchlets glabrous or, rarely, pubescent. **Leaves** opposite, those of a pair equal, lamina coriaceous to papery; petiolate, colleters in axils. **Inflorescences** of axillary and/or terminal cymes, often forming panicles; flowers 5-merous. **Calyx** lobes free, colleters at sepal margins at the base inside. **Corolla** lobes overlapping to the right, corona absent, a narrow cylindrical tube that 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 sessile (in Singapore), fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. **Nectary** annular, 5-dentate or 5-crenate. **Gynoecium** 2-carpellate, carpels free but apically united into a common style, 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 sub-divergent; wide at base, narrowing to end; longitudinally dehiscent. **Seed** grains narrow ovate or elliptic, flattened, glabrous; with an apical stalk, coma arising along the stalk, pointing towards end of fruit.

Distribution. There are 17 species from India, Japan and China and southwards through continental Southeast Asia and Malesia to Vanuatu. In Singapore there are perhaps 2 native species although one is only known from sterile specimens, the identification of which is not completely certain.

Key to *Anodendron* species

1. Lamina thickly coriaceous; inflorescences mostly axillary, if terminal not forming large panicles **1. A. candolleianum**
- Lamina coriaceous; inflorescences terminal and forming large panicles **2. A. parviflorum**

1. *Anodendron candolleianum* Wight

(Alphonse Pyramus de Candolle, 1806–1893, Swiss botanist based in Geneva)

Icon. Pl. Ind. Orient. 4(2) (1848) 5, pl. 1309; Miquel, Fl. Ned. Ind. 2, fasc. 3 (1857) 455; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 669; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 487; Ridley, Fl. Malay Penins. 2 (1923) 362; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 143; Turner, Gard. Bull. Singapore 45 (1993) 35; Middleton, Blumea 41 (1996) 47; Middleton, Fl. Thailand 7(1) (1999) 128; Middleton, Fl. Males., ser. 1, 18 (2007) 137; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 13, 104, 200; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 122. **Type:** *Wight s.n.*, [Malaysia], Malacca, (lectotype K [K000894520], designated by Middleton, Blumea 41 (1996) 47; isolectotype K [K000894519]). **Fig. 25.**

Branchlets glabrous. **Leaves:** petiole 1.5–5.2 cm long; lamina thickly coriaceous, elliptic or oblong, 4.6–27 × 1.7–12 cm, 1.6–3.1 times as long as wide, apex acuminate to abruptly acuminate or apiculate, base rounded to obtuse, secondary veins 8–12 strong pairs, intercostal veins oblique to midrib, glabrous above and beneath. **Inflorescences** mostly axillary delicate cymes, sometimes also terminal, glabrous, 3–23 cm long; pedicels 2.1–4 mm long, bracteoles at base. **Calyx** lobes ovate, 0.6–1 × 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; lobes strongly twisted to the left in bud, 1.7–2.9 × 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 × 0.3–0.4 mm. **Nectary** 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 cm long, 0.8–1.5 cm wide. **Seed** grain 22–22.5 × 4–5 mm; stalk 11–15 mm long; coma 8.5–9 cm long.



Figure 25. *Anodendron candolleianum* Wight. Leaves. Inset: seeds (see comment in Distribution below). (From Singapore, Bukit Timah Nature Reserve. Photos: P.K.F. Leong).

Distribution. Thailand, Peninsular Malaysia, Java, Sumatra, Borneo and the Philippines. In Singapore, until recently, only known from sterile material from Chestnut Avenue (*Gwee SING2010-675*, 31 Mar 2010, SING [SING0145703]), Bukit Timah, MacRitchie (*Gwee SING2009-645*, 15 Dec 2009, SING [SING0138146]) and Lower Pierce (*Gwee SING2008-33*, 26 Feb 2008, SING [SING0105435]). Loose seeds that possibly also belong to this species have been collected on Bukit Timah (Fig. 25).

Ecology. In lowland dipterocarp forest to 200 m.

Provisional conservation assessment. Globally Least Concern (LC) as this species is very widespread. It is assessed here as likely to be Critically Endangered (CR/D) in Singapore due to very low population size.

Notes. No flowering or fruiting material (but see comment about seeds above) has been collected from Singapore, the description of inflorescence and fruit characters above is for the species throughout its range. The lack of flowering material may lead to a reassessment of this species for Singapore if otherwise matching flowering material is found.

2. *Anodendron parviflorum* (Roxb.) I.M. Turner

(Latin, *parvi*- = small, *-florum* = flower; with small flowers)

Webbia 71 (2016) 227. **Basionym:** *Echites parviflorus* Roxb., Fl. Ind., ed. 2, 2 (1832) 20. **Type:** [Unpublished illustration] Icones Roxburghianae no. 2465 (lectotype K, designated by Middleton, Blumea 41 (1996) 65). **Fig. 26, 27.**

Echites manubriatus Wall. [Numer. List no. 1663 (1829), nom. nud.] ex Steud., Nomencl. Bot., ed. 2, 1 (1840) 540. **Synonyms:** *Echites paniculatus* Roxb., Fl. Ind., ed. 2, 2 (1832) 17, nom. illeg. non Poir. (1812); Don, Gen. Hist. 4 (1837) 75. – *Anodendron paniculatum* A.DC., Prodr. 8 (1844) 444, nom. illeg. superfl.; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 668; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 486; Ridley, Fl. Malay Penins. 2 (1923) 361; Markgraf, Bot. Jahrb. Syst. 61 (1927) 208; Middleton, Blumea 41 (1996) 54; Middleton, Fl. Thailand 7(1) (1999) 129, fig. 40; Middleton, Fl. Males., ser. 1, 18 (2007) 139, fig. 30; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 127. – *Anodendron manubriatum* (Wall. ex Steud.) Merr., Philipp. J. Sci., C 7 (1912) 333. **Type:** [Unpublished illustration] Icones Roxburghianae no. 2203 (lectotype K, designated by Turner, Taxon 63 (2014) 682).

Tabernaemontana tenuiflora Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 554. **Synonym:** *Anodendron tenuiflorum* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4, fasc. 5 (1869) 140; Boerlage, Handl. Fl. Ned. Ind. 2(2) (1899) 400; Bakhuizen van den Brink, Blumea 6(2) (1950) 387. **Type:** *Diepenhorst* 2234, [Indonesia], Sumatra, Priaman (lectotype U [U0000461], designated by Middleton, Blumea 41 (1996) 54; isolectotype L [L0004426]).

Branchlets glabrous. **Leaves:** petiole 0.7–2.6 cm long; lamina coriaceous, elliptic, oblong or obovate, 13.9–28.5 × 1.3–10.4 cm, 1.7–4.6 times as long as wide, apex acuminate, more rarely apiculate, base cuneate to rounded, secondary veins 8–18 pairs, usually slightly prominent beneath, intercostal veins obscure, glabrous above and beneath, not glaucous beneath. **Inflorescences** axillary and terminal, usually forming a panicle, glabrous, 5.5–15.2 cm long; pedicels 1.4–3.3 mm long, bracteoles at base. **Calyx** lobes ovate, 0.7–1.3 × 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 or pale brown; tube 1.2–2.7 mm long; lobes strap-shaped, falcate, strongly twisted to the left in bud, 1.7–4.4 × 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 × 0.2–0.4 mm. **Nectary** 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 cm long, 1–3 cm wide. **Seed** grains 14–22 mm long, 6–9 mm diam.; stalk 6–17 mm long; coma 5.2–9 cm long.

Distribution. Sri Lanka, India, Bangladesh, Myanmar, Thailand, Cambodia, Laos, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Philippines, Lesser Sunda Islands, Sulawesi and Moluccas. In Singapore currently only known from Pulau Semakau (*Lai LJ46*, 1996, SING [SING0008015]; *Bazilah Ibrahim et al. SING2014-046*, 27 Feb 2014, SING [SING0231949]).

Ecology. Climbing at edge of forest in full sun.

Provisional conservation assessment. Globally Least Concern (LC) as this species is common and widespread in much of its distribution. It is assessed here as Critically Endangered (CR/D) in Singapore as it is only known from fewer than 50 plants.

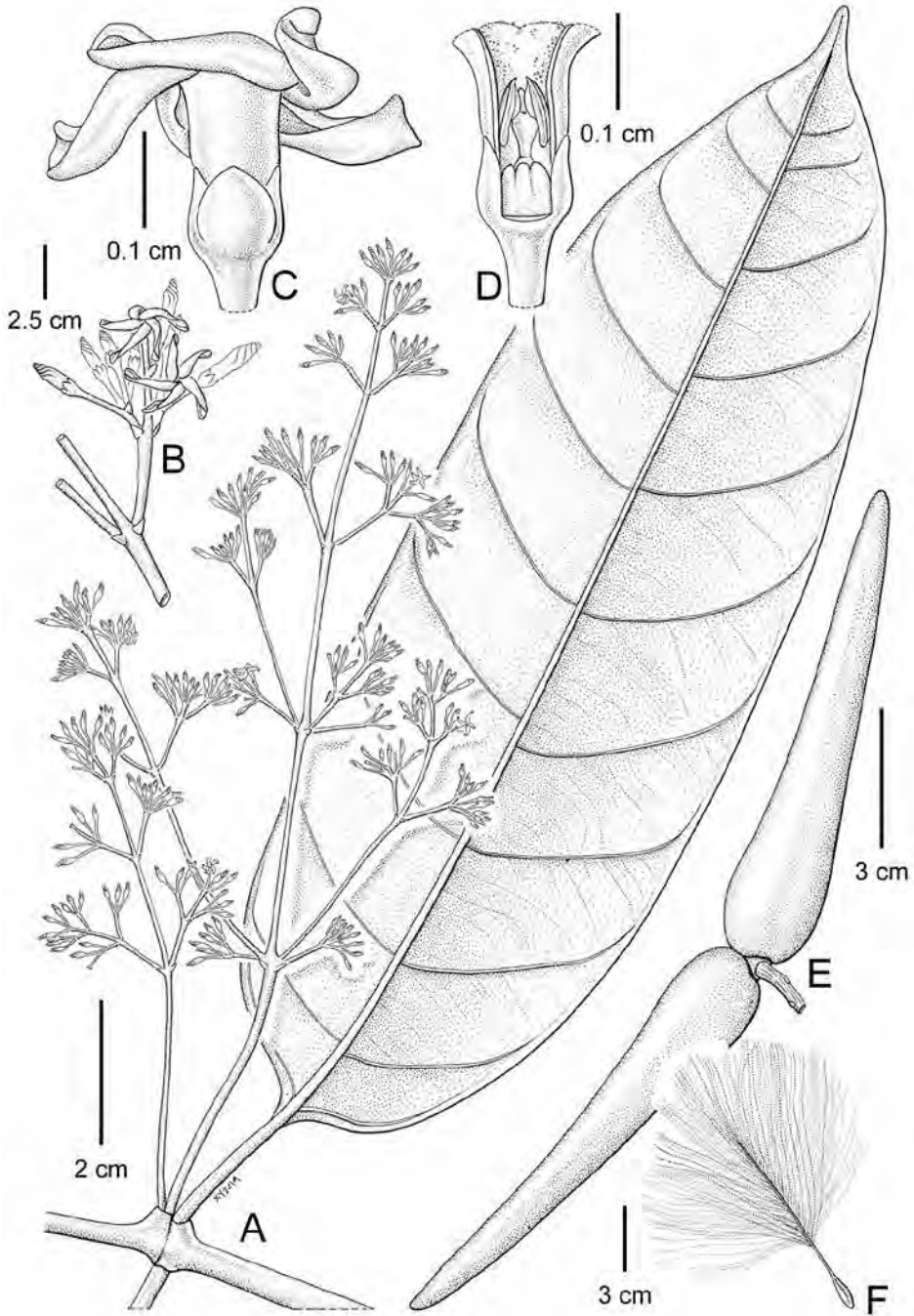


Figure 26. *Anodendron parviflorum* (Roxb.) I.M.Turner. **A.** Habit. **B.** Inflorescence. **C.** Flower. **D.** Flower dissection. **E.** Fruit. **F.** Seed. (A–D from Singapore, Pulau Semakau, *Bazilah Ibrahim et al. SING2014-046*; E–F from Thailand, *Middleton et al. 3159*. Drawn by X.Y. Loh).

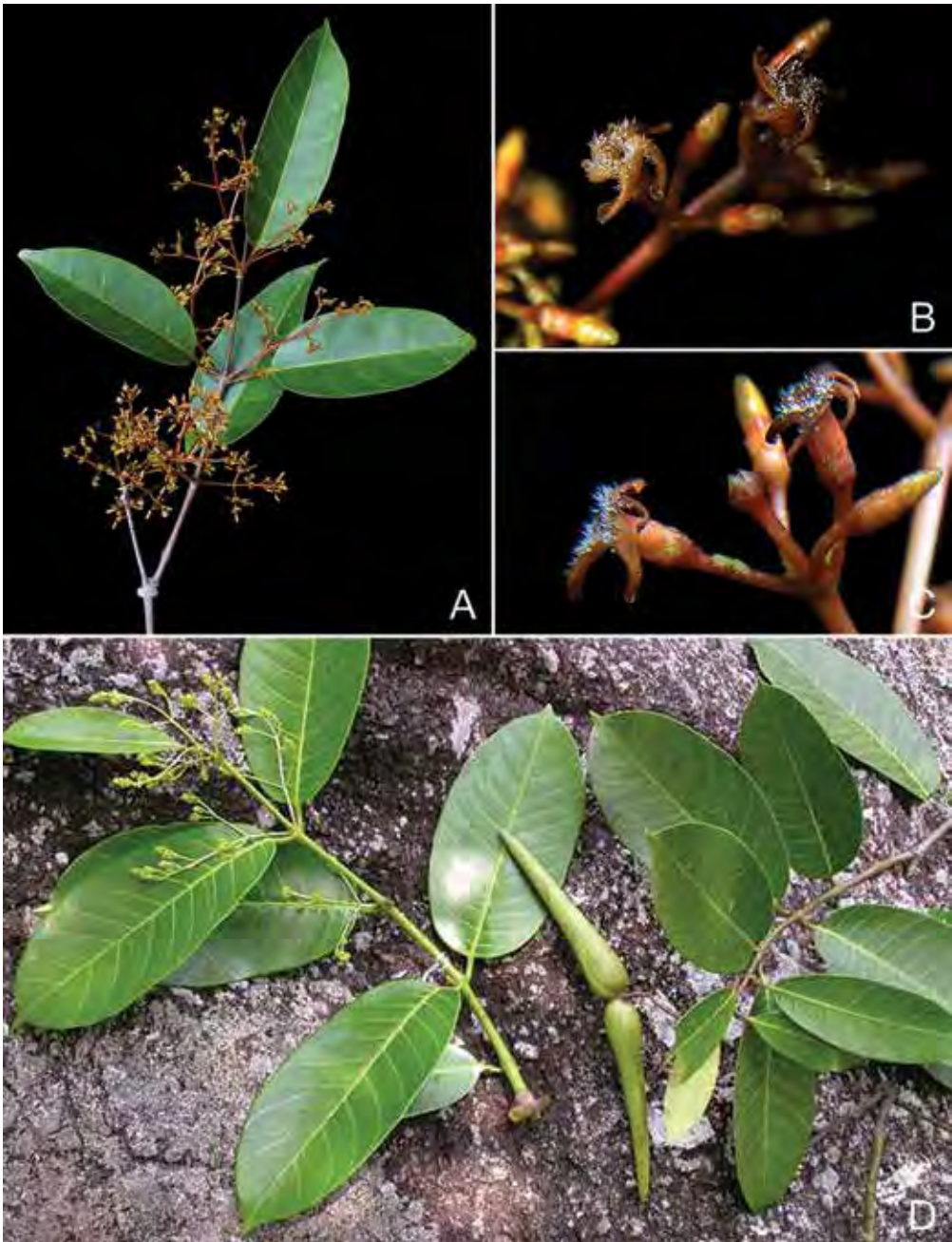


Figure 27. *Anodendron parviflorum* (Roxb.) I.M.Turner. **A.** Flowering branch. **B, C.** Flowers. **D.** Flowering and fruiting branch. (A–C from Singapore, Pulau Semakau, *Bazilah Ibrahim et al. SING2014-046*; D from Thailand, *Middleton et al. 3159*). Photos: A–C, J. Leong-Škorničková; D, D.J. Middleton).

Notes. Until recently this species was widely known as *Anodendron paniculatum*. Unfortunately a proposal to conserve the name over *Echites parviflorus* and *Echites manubriatus* was rejected by the Nomenclature Committee. As it is only known from one flowering specimen and no fruiting specimens in Singapore the description above is for the species over its range.

14. CHONEMORPHA G.Don

(Greek, *chone*- = funnel, *-morpha* = form, shape;
with funnel-shaped flowers)

Gen. Hist. 4 (1837) 76, nom. cons.; Bentham & Hooker, Gen. Pl. 2(2) (1876) 720; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 661; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 483; Ridley, Fl. Malay Penins. 2 (1923) 360; Furtado, Gard. Bull. Straits Settlem. 9(1) (1935) 113; Middleton, Fl. Thailand 7(1) (1999) 121; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 13; Middleton, Fl. Males., ser. 1, 18 (2007) 178; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 131; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 305. **Type:** *Chonemorpha macrophylla* G.Don (= *Chonemorpha fragrans* (Moon) Alston).

Rhynchospermum A.DC., Prodr. 8 (1844) 431, as '*Rhynchospermum*', nom. illeg. non Reinw. (1825). **Replaced name:** *Rhynchodia* Benth. in Bentham & Hooker, Gen. Pl. 2(2) (1876) 719; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 666; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 484; Ridley, Fl. Malay Penins. 2 (1923) 361. **Type:** *Rhynchospermum wallichii* A.DC. (= *Chonemorpha verrucosa* (Blume) D.J.Middleton).

Large woody climbers without tendrils; latex white. **Branchlets** frequently lenticellate; bud scales or bud scale scars present at base of new growth. **Leaves** opposite; lamina with secondary veins ascending and forming an indistinct and strongly looped intramarginal vein; petiolate with colleters present in axils. **Inflorescences** terminal panicles; flowers 5-merous, often quite large. **Calyx** lobes free or usually connate for large part of length, colleters in a row inside. **Corolla** lobes overlapping to the right and twisted to the left in bud, corona absent; 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 less than 1 cm long; 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. **Nectary** entire, 5-dentate, shorter than the ovaries, glabrous. **Gynoeceium** 2-carpellate, carpels free but apically united into a common style, often somewhat semi-inferior, glabrous, ovules numerous. **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 Indonesia. In Singapore 1 native species.

Chonemorpha fragrans (Moon) Alston

(Latin, *fragrans* = fragrant; referring to the flowers)

Ann. Roy. Bot. Gard. (Peradeniya) 11 (1929) 203; Furtado, Gard. Bull. Straits Settlement. 9(1) (1935) 115; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Middleton, Fl. Thailand 7(1) (1999) 122; Middleton, Fl. Males., ser. 1, 18 (2007) 179; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 26, 105, 202; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 132. **Basionym:** *Echites fragrans* Moon, Cat. Pl. Ceylon (1824) 20. **Type:** [Published illustration] '*Belutta-Kaka-Kodi*' in Rheede, Hort. Malab. 9 (1689) t. 5, lectotype designated by Middleton, Gard. Bull. Singapore 71 (2019) 75. **Fig. 28, 29.**

Chonemorpha grandiflora G.Don, Gen. Hist. 4 (1837) 76; Almeida & Almeida, J. Bombay Nat. Hist. Soc. 90 (1994) 427, isonym. **Synonyms:** *Echites grandiflora* Roth in Roemer & Schultes, Syst. Veg., ed. 15 bis, 4 (1819) 393, nom. illeg. non G.Mey (1818). **Type:** *Savantwadi SMA 2180*, India (neotype BLAT n.v., designated by Almeida & Almeida, J. Bombay Nat. Hist. Soc. 90 (1994) 427).

Chonemorpha macrophylla G.Don, Gen. Hist. 4 (1837) 76; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 661; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 483; Furtado, Gard. Bull. Straits Settlement. 9(1) (1935) 115. **Type:** *Wallich s.n.* [EIC 1657], India, cultivated in Calcutta Botanic Garden (lectotype K-W [K001113738], as 1657.2, designated by Middleton, Taxon 55 (2006) 503; isolectotypes BR [BR0000005909056], K [K000895080], M [M-0183796]).

Chonemorpha rheedei Ridl., Agric. Bull. Straits Fed. Malay States 10 (1911) 146. **Type:** *Collector unknown s.n.*, Singapore, Botanic Gardens' Plant House, 25 July 1910 (lectotype K [K000895071], designated by Turner et al., Gard. Bull. Singapore 70 (2018) 310).

Chonemorpha penangensis Ridl., Agric. Bull. Straits Fed. Malay States 10 (1911) 147; Ridley, Fl. Malay Penins. 2 (1923) 360; Furtado, Gard. Bull. Straits Settlement. 9(1) (1935) 116; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 26, 105, 238. **Type:** *Curtis 832*, May 1893, [Malaysia], Penang (lectotype SING [SING0040281], designated by Middleton, Taxon 55 (2006) 504; isolectotypes SING [SING0058317, SING0040282]).

For additional synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 179.

Large woody climbers to 20 m tall. **Branchlets** sparsely to very densely pubescent or hispid, rarely glabrous; lenticellate. **Leaves:** petiole 0.7–3.5(–9) cm long, densely pubescent; lamina orbicular, elliptic or obovate, 4–26(–38) × 2.8–16.5(–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, secondary veins 7–11 pairs, ascending, anastomosing into a looped intramarginal vein, subscalariform and reticulate. **Inflorescences** terminal, 10–19(–30) cm long; peduncle 1–7(–13) cm long, densely pubescent; pedicels 4–18(–31) mm long, densely pubescent. **Calyx** fused into a tube with 5 lobes (5 free lobes recorded outside Singapore), these lobes sometimes irregular, entire calyx 5.5–10 mm long, glabrous to densely pubescent outside, fused for up to 89% of length, lobes 1–2.5 × 1.5–3 mm, 0.7–1 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, sometimes with some pink, fragrant; tube 18–35(–65) mm long, glabrous or sparsely puberulent outside, densely pubescent inside; lobes 21–30(–63) × 11–16(–55) mm, 1.1–2.3 times as long as wide, oblique

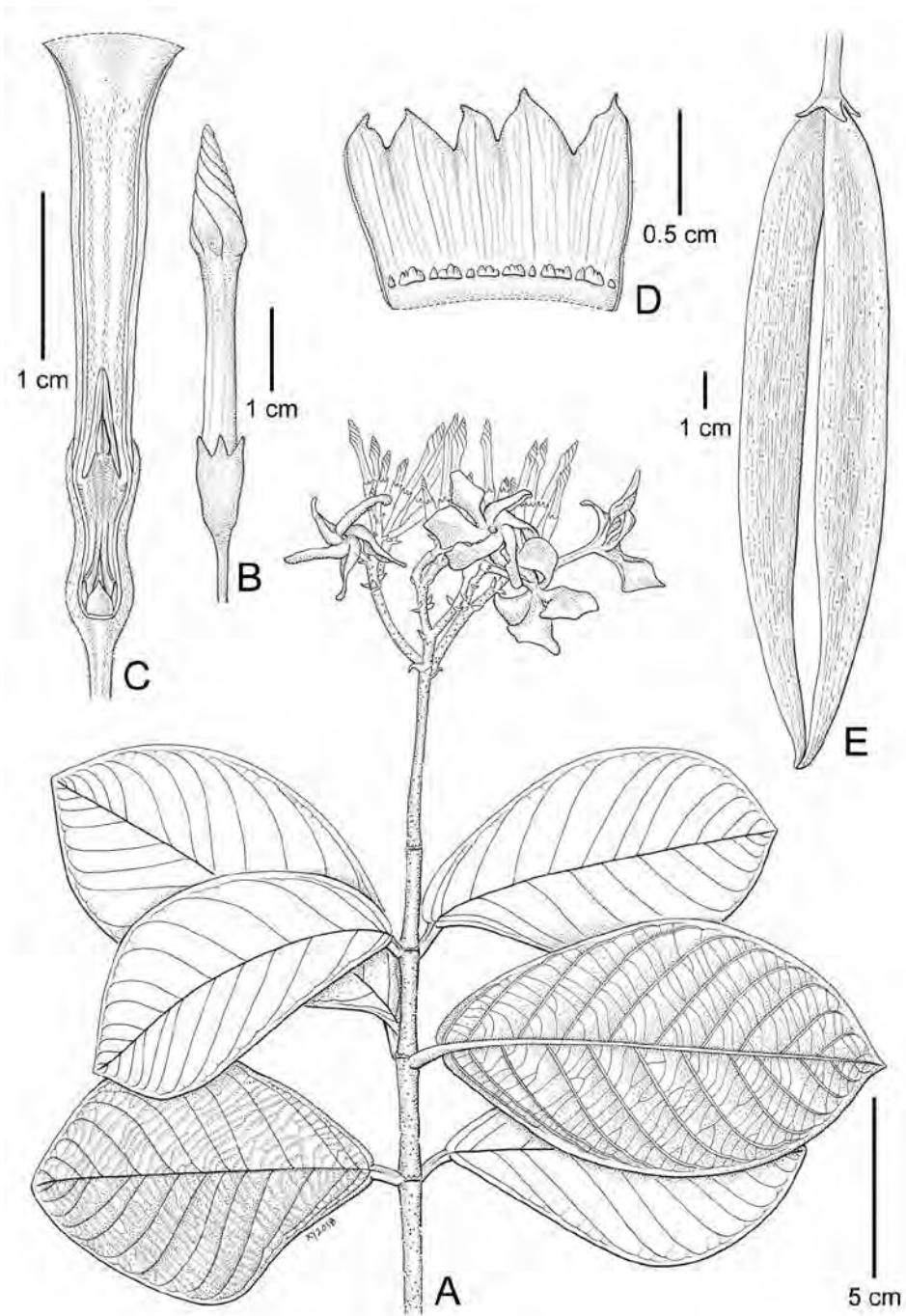


Figure 28. *Chonemorpha fragrans* (Moon) Alston. **A.** Habit. **B.** Flower bud. **C.** Flower dissection. **D.** Calyx opened out showing colleters on the inside. **E.** Fruit. (A–D from Singapore, Ng SING2018-418; E from Thailand, based on photograph of living plant. Drawn by X.Y. Loh).



Figure 29. *Chonemorpha fragrans* (Moon) Alston. **A.** Habit. **B.** Flowers. **C.** Flower buds. (From Singapore, A from Nee Soon; B cultivated in Gardens by the Bay; C cultivated in Pasir Panjang Nursery. Photos: A, B, X.Y. Ng; C, Zaki Jamil).

obovate with a sharp projection on one side, glabrous outside and inside. **Stamens** inserted at 5.2–6(–12.5) mm from corolla base which is c. 0.2 of tube length; anthers 7.2–13.2 × 1.2–2.2 mm, 4.3–8.8 times as long as wide. **Nectary** 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 cm long, 1–2.3 cm wide, fusiform, flattened, glabrous to puberulent. **Seeds** 13–35 × 4–7 mm with a stalk 4–19 mm long; coma arising only at end of stalk, 26–70 mm long.

Distribution. Sri Lanka, India, Nepal, Bhutan, Bangladesh, southern China, Myanmar, Thailand, Cambodia, Laos, Vietnam, Peninsular Malaysia, Sumatra, Borneo (one record from Brunei), Java, Lesser Sunda Islands, Sulawesi, Philippines and East Timor. In Singapore known from Upper Seletar (*Saat et al. SING2005-74*, 23 Mar 2005, SING [SING0060021]) and Nee Soon (*Ali Ibrahim AI263*, 8 Apr 1996, SING [SING0011416]; *Lai LJ102*, 1996, SING [SING0008219]).

Ecology. In Singapore found in secondary and swamp forest.

Provisional conservation assessment. Globally Least Concern (LC) as this is a very widespread and often-collected species. It is assessed here as Critically Endangered (CR/D) in Singapore as there are estimated to be fewer than 50 plants.

Vernacular name. *Akar gerip merah* (Malay).

Notes. This is an extremely variable species throughout its wide range although those from more seasonal climates in Thailand to the north and east tend to have larger flowers. As the flowering material in Singapore is so sparse, the sometimes larger features of this species found outside of Singapore are included in brackets in the description.

15. EPIGYNUM Wight

(Greek, *epi-* = upon, *-gynum* = female; with superior ovary)

Icon. Pl. Ind. Orient. 4(2) (1848) 4, pl. 1308. Bentham & Hooker, Gen. Pl. 2(2) (1876) 717; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 665; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 499; Ridley, Fl. Malay Penins. 2 (1923) 366; Middleton, Fl. Thailand 7(1) (1999) 118; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 12; Middleton, Harvard Pap. Bot. 10 (2005) 68; Middleton, Fl. Males., ser. 1, 18 (2007) 192; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 139; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 307. **Type:** *Epigynum griffithianum* Wight

Large woody climbers without tendrils; latex white. **Branchlets** weakly lenticellate or not, pubescent at least when young. **Leaves** opposite; lamina with secondary veins arcuate ascending, anastomosing before margin; petiolate with colleters in axils. **Inflorescences** umbelliform panicles formed from terminal and axillary cymes; bracts small; flowers 5-merous. **Calyx** lobes free, colleters absent (in Singapore). **Corolla** lobes overlapping to the right, corona absent, salverform when open, a long tube and shorter lobes, lobes falcate-obovate, mostly with a sharp projection on one side. **Stamens** inserted near base of tube (in Singapore) and

completely included in the tube; filaments broad, 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. **Nectary** of a ring with a crenate margin (in Singapore), glabrous. **Gynoeceium** 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. **Seeds** consisting of a flattened grain and a coma directed towards the fruit apex.

Distribution. A genus of 5 species in continental Southeast Asia, Borneo and Sumatra. In Singapore 1 native species (but see notes).

Notes. Sterile specimens collected in Bukit Timah may belong to *Epigynum griffithianum* Wight but this is far from certain until flowering material is collected. It is included in italics in the key below to distinguish it from *Epigynum ridleyi* King & Gamble in case both species do indeed occur in Singapore.

Key to *Epigynum* species

1. Secondary veins 9–14 pairs but always with at least some leaves on plant with more than 9 pairs; ovary densely to sparsely puberulent **E. ridleyi**
Secondary veins 5–9(–11) pairs; ovary glabrous *E. griffithianum* (see notes above)

Epigynum ridleyi King & Gamble

(Henry Nicholas Ridley, 1855–1956, prolific botanist and first Director of the Singapore Botanic Gardens)

J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 502; Ridley, Fl. Malay Penins. 2 (1923) 367; Middleton, Harvard Pap. Bot. 10 (2005) 77; Middleton, Fl. Males., ser. 1, 18 (2007) 195; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 39, 105, 205; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 143. **Type:** *Ridley 7567*, [Malaysia], Selangor, Rawang (lectotype SING [SING0040345], designated by Middleton, Gard. Bull. Singapore 71 (2019) 75; isolectotype K [K000894489]). **Fig. 30.**

Epigynum forbesii King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 503; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Turner, Gard. Bull. Singapore 45 (1993) 35; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215. **Type:** *Forbes 3236*, [Indonesia], Sumatra, near Bijin Telok (lectotype K [K000894487], designated by Middleton, Gard. Bull. Singapore 71 (2019) 75).

Epigynum borneense Merr., J. Malayan Branch Roy. Asiat. Soc. 1 (1923) 27. **Type:** *Ramos 1117*, Malaysia, Sabah, Sandakan (lectotype A [A00051684], designated by Middleton, Harvard Pap. Bot. 10 (2005) 78; isolectotypes BO, GH [GH00078705], K [K000894486], P, US [US00112106])

Climber, recorded to 8 m tall but probably can grow taller. **Branchlets** sparsely lenticellate or not; densely brown pubescent, becoming less densely so with age. **Leaves:** petiole 4–7 mm long, sparsely to densely pubescent; lamina elliptic, 2.3–13 × 0.6–5.1 cm, 2.1–6.2 times as

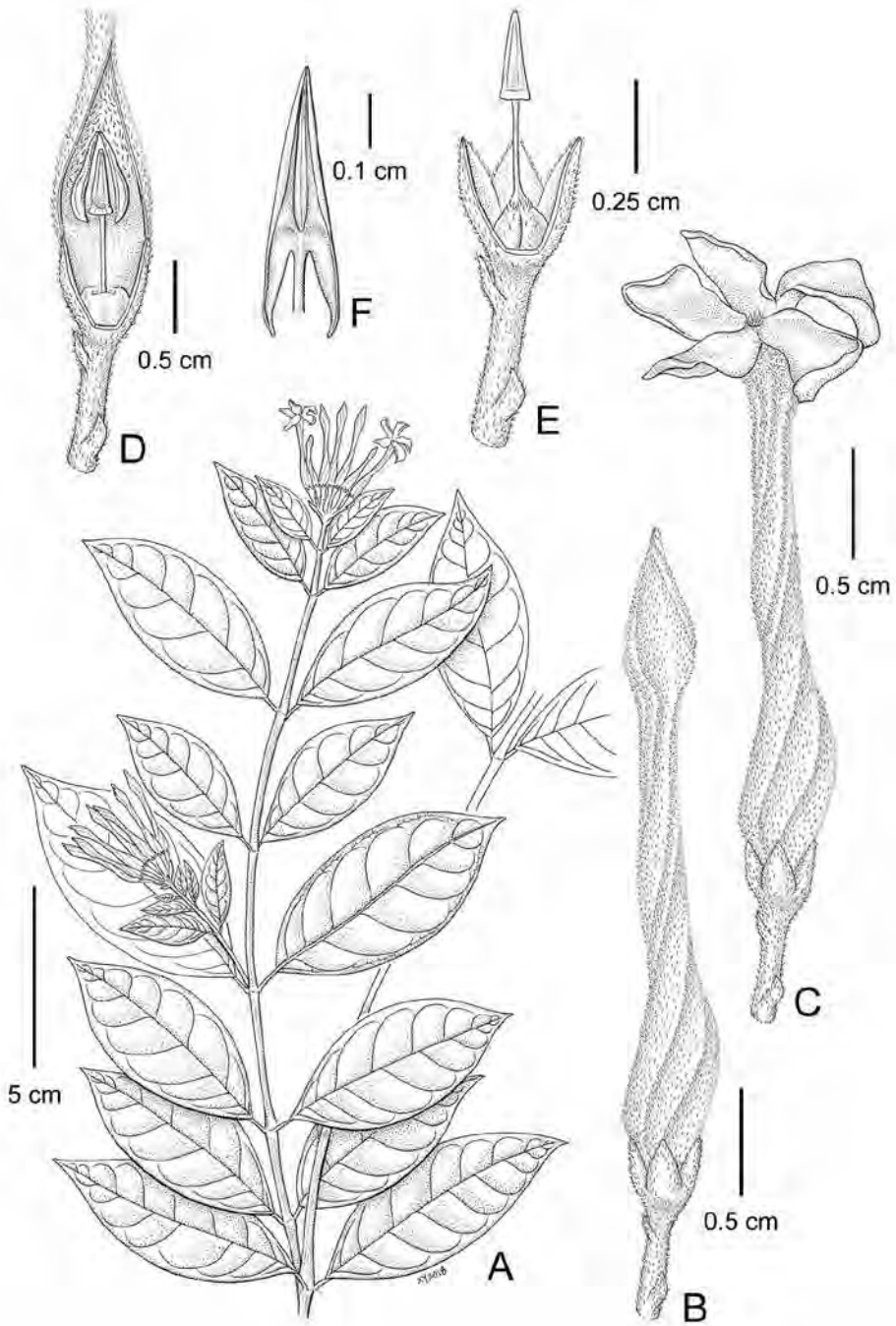


Figure 30. *Epigynum ridleyi* King & Gamble. **A.** Habit. **B.** Flower bud. **C.** Open flower. **D.** Flower dissection. **E.** Gynoecium and calyx. **F.** Anther. (From Singapore, Nee Soon, *Maxwell 82-148*. Drawn by X.Y. Loh).

long as wide, apex acuminate with a sharp tip, base cuneate to rounded, glabrous to pubescent above and beneath, never with tuft of hairs in lateral vein axils with midrib unless the entire lamina beneath pubescent, secondary veins 9–14 pairs, intercostal veins subperpendicular to midrib and/or laxly reticulate. **Inflorescences** 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. **Calyx** lobes narrowly ovate, 2–5 × 0.8–1.9 mm, 1.8–3.8 times as long as wide, apex acuminate, densely brown pubescent, colleters absent inside. **Corolla** white, or white with yellow in throat; tube 15.5–38 mm long, 2.2–3 mm wide, 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 × 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 × 0.8–1 mm. **Nectary** 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 long, 3.5–5.5 mm wide, densely to sparsely pubescent. **Seeds** not seen.

Distribution. Sumatra, Peninsular Malaysia and Borneo. In Singapore only known from Nee Soon (*Maxwell 82-148*, 23 Apr 1982, SING [SING0003437]; *Keng & Jumali H.3907*, 4 Feb 1969, SINU) and elsewhere in the Central Catchment (*Tan et al. 0102*, 3 Apr 1992, SINU).

Ecology. In Singapore only known from freshwater swamp forest but elsewhere also in lowland evergreen forest. The flowers have been reported as fragrant.

Provisional conservation assessment. Globally Least Concern (LC) as this species is widespread. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from fewer than 50 plants.

16. KIBATALIA G. Don

(from *ki batali*, a Sundanese name for *Kibatalia arborea* (Blume) G. Don)

Jelutong pipit (Malay)

Gen. Hist. 4 (1837) 86; Woodson, Philipp. J. Sci. 60 (1936) 209; Whitmore, Tree Fl. Malaya 2 (1973) 16; Rudjiman, Agric. Univ. Wageningen Pap. 86(5) (1987 [‘1986’]) 36; Latiff et al., Gard. Bull. Singapore 48 (1998 [‘1996’]) 198; Middleton, Fl. Thailand 7(1) (1999) 90; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 31; Middleton, Fl. Males., ser. 1, 18 (2007) 207; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 153; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 290. **Type:** *Kibatalia arborea* (Blume) G. Don

Trees or large shrubs; latex white (but often not very obvious in the Singapore species). **Branches** sparsely lenticellate, often transversely fissured. **Leaves** opposite; lamina with or without domatia on the undersurface; petiolate, colleters in the axils present or absent. **Inflorescences** with a very short peduncle and appearing as a fascicle; flowers 5-merous. **Calyx** lobes ovate, colleters inside. **Corolla** lobes overlapping to the right, corona absent,

mature corolla salverform, tube widening at point of stamen insertion (in Singapore). **Stamens** sessile or subsessile, 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. **Nectary** not as high as the ovary, 5-lobed, glabrous. **Gynoeceum** 2-carpellate, carpels free 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 stalk directed towards base of fruit and with a coma along the stalk and the hairs directed back down towards seed grain.

Distribution. A genus of 15 species in Southeast Asia and Malesia. In Singapore 1 native species.

Uses. In other parts of the region, the wood can be used for household items, the latex is used medicinally against stomach disorders or worms, and the flowers can be cooked and eaten.

Kibatalia maingayi (Hook.f.) Woodson

(Alexander Carroll Maingay, 1836–1869, British surgeon, botanist and magistrate in Malacca, Peninsular Malaysia)

Philipp. J. Sci. 60 (1936) 213; Whitmore, Tree Fl. Malaya 2 (1973) 18, fig. 3; Rudjiman, Agric. Univ. Wageningen Pap. 86(5) (1987 [‘1986’]) 69, fig. 19; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 144; Middleton, Fl. Thailand 7(1) (1999) 92, fig. 29; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 34, fig. 5; Middleton, Fl. Males., ser. 1, 18 (2007) 223, fig. 56; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 52, 105, 207; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 156. **Basionym:** *Vallaris maingayi* Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 651; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 461; Ridley, Fl. Malay Penins. 2 (1923) 351. **Type:** *Maingay 2948* [Kew Distribution 1084], [Malaysia], Malacca (lectotype K [K000857973]; isolectotypes K [K000857975, K000857976], L [L0004546]). **Fig. 31, 32.**

Tree to 40 m tall; trunk to 120 cm diam., 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; lamina coriaceous, narrowly to broadly elliptic, 3.5–14 × 1–6 cm, 2.1–4.8 times as long as wide, apex acuminate or subcaudate, base cuneate or decurrent onto petiole, secondary veins 4–7 pairs, intercostal veins obscure, with or without domatia, if present with or without hairs, otherwise glabrous above and beneath. **Inflorescences** 1.5–3 cm long, 4–25-flowered; peduncle 1–3 mm long; pedicels 7–12(–15) mm long. **Flowers:** sepals 1.5–3 × 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 × 3–7 mm, 1.4–2.3 times as long as wide, minutely puberulent outside and inside. **Stamens** exerted, inserted at tube apex; anthers 2–2.5(–3) × 0.5–1 mm. **Nectary** 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** slender, 8–50 cm long, 0.4–0.6 cm wide. **Seeds:** grains 20–35 × 1.5–3 mm; stalk glabrous for 5–10 mm, bearing a coma for up to 65 mm; coma hairs 10–80 mm long.

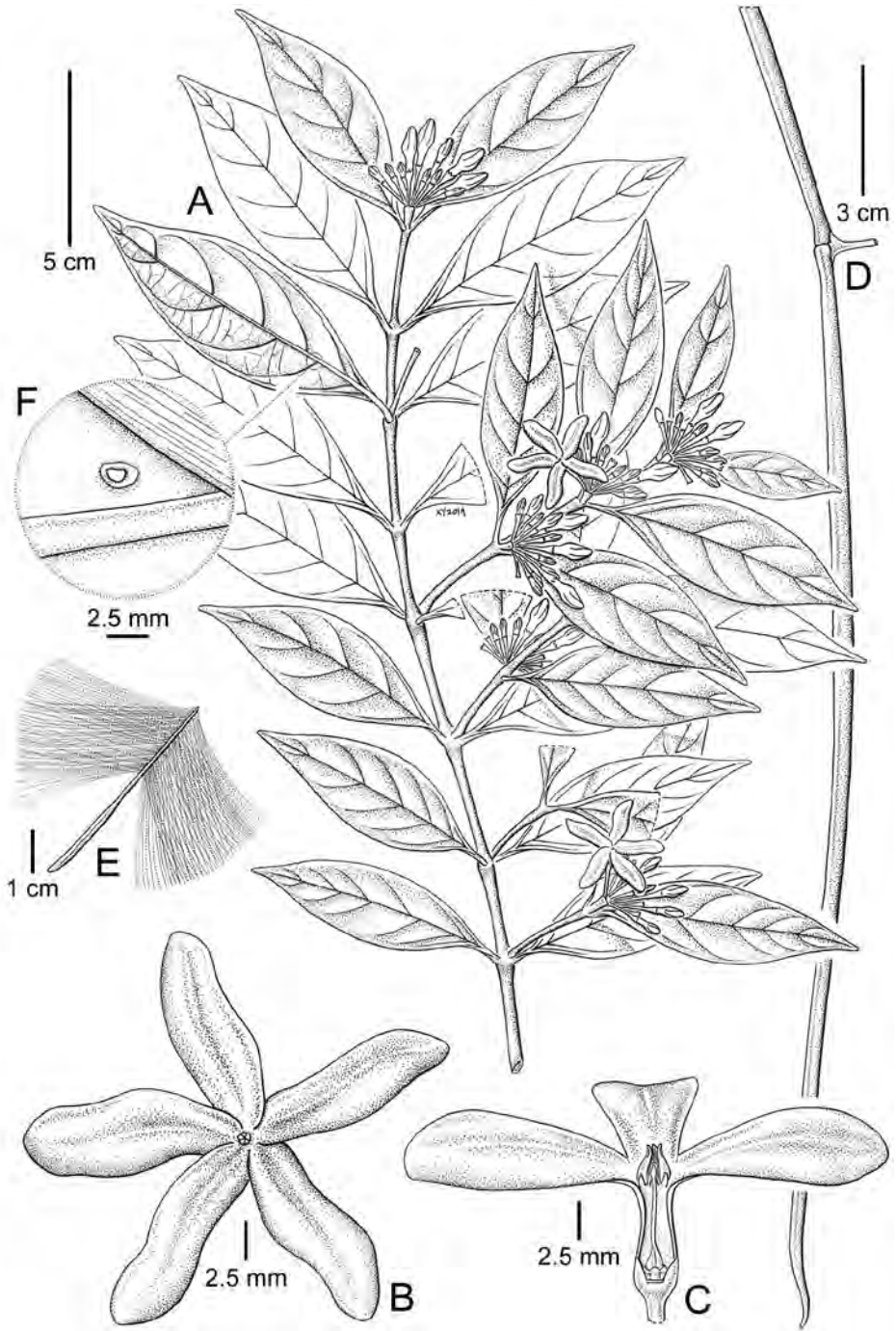


Figure 31. *Kibatalia maingayi* (Hook.f.) Woodson. **A.** Habit. **B.** Corolla from the front. **C.** Flower dissection. **D.** Fruit. **E.** Seed. **F.** Domatia in axils of secondary veins. (A–C, F from Peninsular Malaysia, *Curtis* 2748; D, E from Borneo, Kalimantan, *Kostermans* 6698. Drawn by X.Y. Loh).



Figure 32. *Kibatalia maingayi* (Hook.f.) Woodson. **A.** Looking upwards towards crown. **B.** Trunk. **C.** Leaves. **D.** Domatia. (From Singapore, Singapore Botanic Gardens' Rain Forest, Chia et al. SING2018-788. Photos: P.K.F. Leong).

Distribution. Thailand, Peninsular Malaysia, Borneo, Sumatra and the Philippines (Mindanao). In Singapore known from Nee Soon (*Lee et al. SING2005-17*, 24 Jan 2005, SING [SING0060073]), Lower Pierce (*Leong et al. SING2009-53*, 13 Jan 2009, SING [SING0120398]), Upper Seletar (*Gwee SING2010-627*, 16 Jan 2010, SING [SING0145632]) and the Singapore Botanic Gardens' Rain Forest (*Ridley 4917*, 1893, K; *Ali Ibrahim et al. SING2018-788*, 27 Aug 2018, SING [SING0261172]).

Ecology. In Singapore it is found in primary and secondary forest and in freshwater swamp forest.

Provisional conservation assessment. Globally Least Concern (LC) as this species is widespread and locally common. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from fewer than 50 trees.

17. MICRECHITES Miq.

(Greek, *micro-* = small, *-echites* = pertaining to *Echites* P.Brown)

Fl. Ned. Ind. 2, fasc. 3 (1857) 457; Bentham & Hooker, Gen. Pl. 2(2) (1876) 714; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 670; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 503; Ridley, Fl. Malay Penins. 2 (1923) 367; Middleton, Fl. Males., ser. 1, 18 (2007) 281; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 159; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 305. **Type:** *Micrechites polyanthus* (Blume) Miq.

Vallariopsis Woodson, Philipp. J. Sci. 60 (1936) 228; Rudjiman, Agric. Univ. Wageningen Pap. 86(5) (1987 [‘1986’]) 89; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 10; Middleton, Fl. Males., ser. 1, 18 (2007) 408; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 197. **Type:** *Vallariopsis lancifolia* (Hook.f.) Woodson (= *Micrechites lancifolius* (Hook.f.) D.J.Middleton & Livsh.).

Climbers without tendrils; stems sometimes with corky protuberances; latex white. **Leaves** opposite, those of a pair equal; lamina without an obvious intramarginal vein; petiolate when mature, colleters present in axils. **Inflorescences** terminal and/or axillary, cymose or often appearing thyrsoid; flowers 5-merous. **Calyx** lobes free or slightly fused at base, with colleters in the axils. **Corolla** lobes overlapping to the right in bud, mature corolla salverform; tube cylindrical or somewhat inflated, widening at the point of stamen insertion, corona absent. **Stamens** inserted at around the middle of or near the apex of the corolla tube, included within the tube or exserted, adnate to the style head; filaments short; anthers narrowly triangular, fertile in the upper half only, the lower half sterile, laterally with lignified guide rails and sagittate appendages at the base. **Nectary** of 5 lobes or in a ring, shorter than the ovaries. **Gynoecium** 2-carpellate, carpels free but apically united into a common style, ovules numerous, style head cup-shaped with columnar upper part. **Fruit** of paired follicles; linear and narrow; pubescent or glabrous. **Seeds** not stalked, narrowly lanceolate or linear, glabrous, with an apical coma.

Distribution. A genus of 11 species from the Himalayas to New Guinea. In Singapore 2 native species.

Notes. Many species of *Micrechites* show a marked distinction between the younger and older growth forms, with much smaller leaves in the younger forms, which may even flower. In the older literature the genus name was treated as feminine but now must be treated as masculine. The names below are updated to reflect this without comment.

Key to *Micrechites* species

1. Anthers partially exerted from corolla; ovaries glabrous; leaves 2.2–5.7 times as long as wide **1. *M. lancifolius***
 Anthers mostly included in corolla, rarely with only tips exerted; ovaries pubescent; leaves 1.1–3.3 times as long as wide **2. *M. serpyllifolius***

1. *Micrechites lancifolius* (Hook.f.) D.J.Middleton & Livsh.

(Latin, *lanci-* = narrow, *-folius* = leaves; with narrow leaves)

Taxon 67 (2018) 355, as '*lancifolia*'; Middleton et al., Gard. Bull. Singapore 70 (2018) 13, as '*lancifolia*'.
Basionym: *Vallaris lancifolia* Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 65; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 461; Ridley, Fl. Malay Penins. 2 (1923) 352. **Synonym:** *Vallariopsis lancifolia* (Hook.f.) Woodson, Philipp. J. Sci. 60 (1936) 229; Rudjiman, Agric. Univ. Wageningen Pap. 86(5) (1987 ['1986']) 89; Middleton, Fl. Males., ser. 1, 18 (2007) 409; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 198. **Type:** *Maingay 1846* [Kew Distribution 1102], [Malaysia] (lectotype K [K000857600], designated by Rudjiman, Agric. Univ. Wageningen Pap. 86(5) (1987 ['1986']) 89; isolectotypes A [A00093158], K [K000857599], L [L0004779]). **Fig. 33.**

Climber to 11 m tall. **Branches** lenticellate, glabrous. **Leaves:** petiole 0.2–1.5 cm long, glabrous or sparsely puberulent throughout; lamina papery, narrowly elliptic or ovate, 1.7–9 × 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, glabrous above and beneath, secondary veins 8–19 pairs, hardly distinct from tertiary venation. **Inflorescences** terminal and axillary, 1–2.2 cm long, shorter than subtending leaves; peduncle 1–8 mm long, glabrous to sparsely pubescent; pedicels 3–9 mm long, glabrous. **Calyx** lobes ovate, 1–1.5 × 0.5–0.9 mm, 1.3–2 times as long as wide, apex acute to obtuse, ciliate, sometimes puberulent at apex, otherwise glabrous, with colleters in the sepal sinuses inside. **Corolla** white or pale yellow; tube 3.8–5.3 mm long, consisting of a narrow cylindrical part and an upper wider part starting at the point of stamen insertion, glabrous outside; lobes falcate, 3.5–5.7 × 1.5–2.7 mm, about twice as long as wide, glabrous outside, densely pubescent at base of lobes inside and in upper tube with clavate hairs. **Stamens** inserted at 2.1–3.3 mm from corolla base, partially exerted from the corolla tube; anthers sessile, narrowly triangular, 2.5–3.2 × 0.3–0.8 mm, 4–8.3 times as long as wide, apex acuminate, base sagittate. **Nectary** cup-shaped, of 5 square lobes, 0.4–0.7 mm long. **Ovaries** 0.7–1.1 mm, glabrous; style c. 2.6 mm long, style head c. 1.3 mm long. **Fruit** 30–60 cm long, 1.5–2.2 mm wide, glabrous. **Seeds** linear, c. 2.2 mm long, 1.3 mm diam.; coma 2.3–3 cm long.

Distribution. Peninsular Malaysia, Sumatra and Borneo. In Singapore only known from Nee Soon (*Lua et al. SING2016-015*, 27 Jan 2016, SING [SING0222229]).



Figure 33. *Microchites lancifolius* (Hook.f.) D.J.Middleton & Livsh. **A.** Habit. **B.** Leaves. **C.** Inflorescence. (From Singapore, Nee Soon, *Lua SING2016-015*. Photos: X.Y. Ng).

Ecology. Adjacent to the Nee Soon pipeline in an area that is occasionally inundated and can become swampy, especially during the rainy season. The habitat is bright but the plants are hardly exposed to direct sunlight.

Provisional conservation assessment. Globally Data Deficient (DD) as it is known from very few collections although over quite a wide area. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from fewer than 50 plants.

2. *Microchites serpyllifolius* (Blume) Kosterm.

(Latin, *serpylli*- = thyme, *-folius* = leaves; with leaves like thyme, *Thymus vulgaris* L.)

Reinwardtia 5 (1960) 246; Middleton, Fl. Males., ser. 1, 18 (2007) 287; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 61, 105, 209; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 162. **Basionym:** *Ficus serpyllifolia* Blume, Bijdr. Fl. Ned. Ind., pt 9 (1825) 443. **Synonym:** *Ichnocarpus serpyllifolius* (Blume) P.I.Forst., Austral. Syst. Bot. 5 (1992) 539; Middleton, Blumea 39 (1994) 85; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 126; Middleton, Fl. Thailand 7(1) (1999) 117; Kessler et al., Blumea, Suppl. 14 (2002) 14; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L0004534], first step designated by Forster, Austral. Syst. Bot. 5 (1992) 539, second step designated by Middleton, Blumea 39 (1994) 85; possible isolectotypes BO, L [L0004535], P [P06755914]). **Fig. 34.**

Dischidia wallichii Wight, Contr. Bot. India (1834) 43. **Type:** *Wallich s.n.* [EIC 8183, Asclep. 64], Singapore (lectotype K-W [K001129170], designated by Turner et al., Gard. Bull. Singapore 70 (2018) 296; isolectotype E [E00179595], probable isolectotype K K000196298]).

Microchites furcatus Ridl., J. Straits Branch Roy. Asiat. Soc. 79 (1918) 95; Ridley, Fl. Malay Penins. 2 (1923) 368. **Type:** *King’s collector* 8859, [Malaysia], Perak, Bernam River (lectotype K [K000857755], designated by Middleton, Blumea 39 (1994) 85; isolectotypes BM [BM000884879], K [K000857756]).

Microchites tenuifolius Ridl., J. Straits Branch Roy. Asiat. Soc. 79 (1918) 96; Ridley, Fl. Malay Penins. 2 (1923) 369. **Type:** *Maingay 3394* [Kew Distribution 1081], [Malaysia], Malacca (holotype K [K000857759]).

Microchites brachypetalus Ridl., J. Straits Branch Roy. Asiat. Soc. 79 (1918) 96; Ridley, Fl. Malay Penins. 2 (1923) 368. **Type:** *Curtis 850*, [Malaysia], Penang, Penara Bukit (lectotype K [K000857758], designated by Middleton, Blumea 39 (1994) 85; isolectotypes BM [BM000884880], SING [SING0056499, SING0056500]).

Microchites polyanthus auct. non (Blume) Miq.: King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 504.

Woody climber to over 30 m tall. **Branchlets** sparsely villous or puberulent, becoming glabrous with age, often sparsely lenticellate. **Leaves:** petiole (0.4–)0.6–1.6 cm long, glabrous or puberulent; lamina coriaceous, rarely subcoriaceous, elliptic or obovate, (0.6–)3–11.5 × (0.3–)1–5.6 cm, 1.1–3.3 times as long as wide, apex usually short blunt acuminate, sometimes obtuse or rounded, base cuneate to rounded, very sparsely puberulent on midrib beneath, sparsely puberulent all over beneath, completely glabrous or, rarely, sparsely villous beneath, secondary veins 5–16 pairs, hardly distinct from tertiary venation or more or less distinct. **Inflorescences** axillary and terminal, 1.2–12 cm long; peduncle 0.3–5 cm long, tomentose or puberulent, rarely glabrous; pedicels tomentose or puberulent, 0.4–2.1 mm long. **Calyx** lobes ovate, 0.8–1.5 × 0.6–1.1 mm, 0.7–2 times as long as wide, apex obtuse to rounded, tomentose or puberulent, colleters few or many. **Corolla** cream, in bud the tube is somewhat inflated and with a small narrow head, narrower than the tube; tube 2.1–5 mm long, 1.2–1.5 mm wide, outside glabrous or rarely puberulent, pubescent inside in upper part of tube; lobes 0.7–2.1 × 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, included in the corolla tube



Figure 34. *Microchites serpyllifolius* (Blume) Kosterm. Habit of young plant with juvenile foliage. Inset: seeds. (From Singapore, Bukit Timah Nature Reserve. Photos: P.K.F. Leong).

or rarely with tips exserted; anthers subsessile, narrowly triangular, $1.3\text{--}2.5 \times 0.3\text{--}0.7$ mm, 3.6–5.3 times as long as wide, apex acuminate, base sagittate. **Nectary** entire, broadly 5-lobed, 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. **Fruit** 1.8–7.2 cm long, 2.5–5.6 mm wide, glabrous. **Seeds** linear, 12–29 mm long, 1.3–2.3 mm wide; coma 1.8–4.6 cm long.

Distribution. Thailand, Peninsular Malaysia, Java, Sumatra, Borneo, Philippines and Sulawesi. In Singapore known from Bukit Timah (*Samsuri et al. EP42*, 9 Mar 2004, SING [SING0052819]; *Tang & Sidek 999*, 12 Oct 1995, SING [SING0016238]; *Ali Ibrahim AI212*, 14 Sep 1994, SING [SING0037884]) and MacRitchie (*Nura Abdul Karim et al. NK150*, 8 Sep 1994, SING [SING0011417]; *Gwee SING2009-595*, 15 Dec 1999, SING [SING0144695]).

Ecology. In primary and secondary forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is very widespread and locally common. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from fewer than 50 plants.

Notes. This species is a small-leaved creeper when young. When larger and climbing in the canopy it becomes more of a liana with much larger leaves. In Singapore it is currently only known from the small-leaved juvenile sterile form but this material is distinct enough to be confident of the identification. The description of fertile parts above is based on the species throughout its range.

18. PARSONSIA R.Br.

(James Parsons, 1705–1770, English naturalist)

Asclepiadeae (1810) 53, nom. cons.; Brown, Prodr. Fl. Nov. Holland. (1810) 465; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 650; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 455; Ridley, Fl. Malay Penins. 2 (1923) 350; Middleton, Blumea 42 (1997) 193; Middleton, Fl. Thailand 7(1) (1999) 135; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 12; Middleton, Fl. Males., ser. 1, 18 (2007) 310; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 168; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 300. **Type:** *Parsonsia capsularis* (G.Forst.) R.Br.

For additional synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 310.

Shrubby climbers without tendrils; bark variable; latex white. **Branches** with or without lenticles; branchlets glabrous, puberulent or tomentose. **Leaves** opposite or in whorls of 3 or more, equal in size at a node; petioles with colleters in the axils and frequently in a ring around the stem. **Inflorescences** 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. **Calyx** lobes almost free, connate at the very base, erect or reflexed, ovate to linear, with colleters inside. **Corolla** lobes overlapping to the right in bud, often so very slightly as to appear valvate, corolla salverform, corona absent; 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; filaments straight, bent or strongly twisted, most often pubescent; anthers usually narrowly triangular, sometimes oblong, apex acuminate, base sagittate, sterile at base and apex, adnate to the style head. **Nectary** 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, ovules numerous; style narrow, style head ovoid. **Fruit** of one follicle clearly composed of two 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. About 82 species from India, Sri Lanka to China, southwards through continental Southeast Asia and Malesia, Australia and New Zealand to the western Pacific islands. In Singapore 2 native species.

Key to *Parsonsia* species

1. Leaves opposite; filaments curled around the style **1. P. alboflavescens**
Leaves in whorls of 3–4; filaments straight **2. P. curvisepala**

1. *Parsonsia alboflavescens* (Dennst.) Mabb.

(Latin, *albo-* = white, *-flavescens* = yellowish; white-yellowish, probably in relation to the flowers)

Taxon 26 (1977) 532; Middleton, *Blumea* 42 (1997) 196; Middleton, *Fl. Thailand* 7(1) (1999) 136, fig. 43; Middleton, *Fl. Males.*, ser. 1, 18 (2007) 313, fig. 77; Tan et al. in Davison et al. (ed.), *Singapore Red Data Book*, ed. 2 (2008) 215; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 67, 106, 209; Middleton, *Fl. Penins. Malaysia*, ser. 2, 2 (2011) 169. **Basionym:** *Periploca alboflavescens* Dennst., *Schlüssel Hortus Malab.* (1818) 12, 23, 35. **Type:** [Published illustration] ‘*Kudici Kodi*’ in Rheede, *Hort. Malab.* 9 (1689) t. 9. **Fig. 35, 36.**

Helygia javanica Blume, *Bijdr. Fl. Ned. Ind.*, pt 16 (1826–1827) 1043; Miquel, *Fl. Ned. Ind.* 2, fasc. 3 (1857) 429, as ‘*Heligme javanica*’. **Synonym:** *Parsonsia javanica* (Blume) K.Schum. in Engler & Prantl, *Nat. Pflanzenfam.* 4(2) (1895) 184. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L0004640], designated by Middleton, *Blumea* 42 (1997) 196; isolectotype BO).

Parsonsia spiralis Wall. ex G.Don, *Gen. Hist.* 4 (1837) 80; Ridley, *J. Straits Branch Roy. Asiat. Soc.* 33 (1900) 110; King & Gamble, *J. Asiat. Soc. Bengal*, Pt. 2, *Nat. Hist.* 74(2) (1908) 456; Ridley, *Fl. Malay Penins.* 2 (1923) 350; Markgraf, *Bot. Jahrb. Syst.* 61 (1927) 217. **Type:** *Wallich s.n.* [EIC 1631], Bangladesh, Sylhet (lectotype K-W [K001113648], designated by Middleton, *Blumea* 42 (1997) 196; isolectotypes G [G00169756], K [K000857552]).

Parsonsia helicandra Hook. & Arn., *Bot. Beechey Voy.*, fasc. 5 (1837) 197; Henderson, *Malay. Wild Fls.*, *Dicot.* (1959) 280; Keng, *Concise Fl. Singapore*, vol. 1, *Gymn. Dicot.* (1990) 145; Turner, *Gard. Bull. Singapore* 45 (1993) 36. **Type:** Not traced.

Parsonsia kunstleri King & Gamble, *J. Asiat. Soc. Bengal*, Pt. 2, *Nat. Hist.* 74(2) (1908) 457; Ridley, *Fl. Malay Penins.* 2 (1923) 350. **Type:** *King’s Collector 1824*, [Malaysia], Perak, Larut (lectotype K [K000857546], designated by Middleton, *Blumea* 42 (1997) 196).

For additional synonyms see Middleton, *Blumea* 42 (1997) 196.

Slender twining climber. **Branches** lenticellate or not; branchlets glabrous or sparsely to densely minutely puberulent. **Leaves** opposite; petiole 0.7–4.7(–6.7) cm long, glabrous or sparsely puberulent; lamina papery to thickly coriaceous when dried, elliptic, ovate or, rarely, obovate or oblong, 3.5–23(–26) × 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, secondary veins 5–10 pairs, ascending, intercostal veins laxly reticulate to scalariform, rarely obscure. **Inflorescences** of axillary and, more rarely, terminal cymes, 3–21 cm long, sparsely to densely shortly puberulent; peduncles 1.2–13.5 cm long; pedicels 2.2–8.5 mm long. **Calyx** lobes ovate, sometimes somewhat saccate at base of each lobe, not reflexed, 1.2–2.8 × 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, not fleshy, bud cylindrical or wider around the middle with a rounded to acute head, not papillose outside, lobes slightly overlapping, open corolla with erect to only slightly spreading lobes, glabrous to shortly puberulent outside and glabrous, puberulent in throat or sparsely puberulent down tube inside; tube 1.6–4.5 mm long; lobes oblong to narrowly triangular, 2.1–5.8 × 0.7–1.5 mm, apex rounded to acute. **Stamens** inserted at 0.9–2.5 mm from corolla base which is 0.2–0.7 of tube length; filaments strongly twisted around the style (rarely not outside Singapore), 1.1–4.3

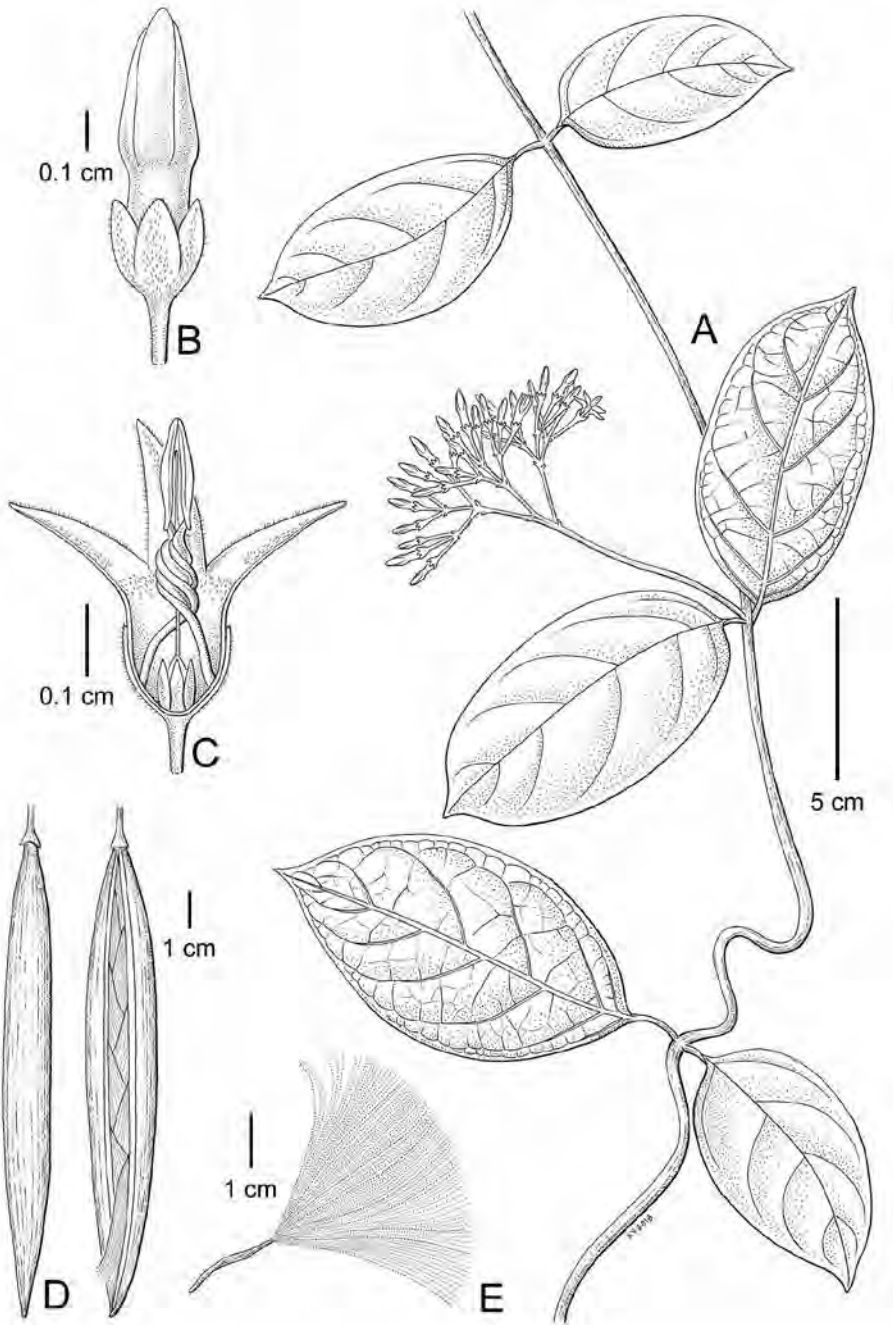


Figure 35. *Parsonsia alboflavescens* (Dennst.) Mabb. **A.** Habit. **B.** Flower bud. **C.** Flower dissection. **D.** Fruit. **E.** Seed. (From Singapore, A, B, D, E from Pandan *Mhd Shah SFN 40976*; C from Nee Soon, *Boo et al. SING2007-365*. Drawn by X.Y. Loh).



Figure 36. *Parsonsia alboflavescens* (Dennst.) Mabb. Habit. Inset: Inflorescence. (From Singapore, Nee Soon, Boo *et al.* SING2007-365. Photos: P.K.F. Leong).

mm long; anthers $2.6\text{--}4.2 \times 0.5\text{--}0.8$ mm, 4.3–8 times as long as wide. **Nectary** usually 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 cm long, 0.7–1.4 cm wide. **Seed** grains $9.5\text{--}24 \times 1.2\text{--}3$ mm; coma 1.8–4.6 cm long.

Distribution. From southern China and Taiwan to India and Sri Lanka and eastwards to Vietnam, throughout Malesia, northern Australia and the Solomon Islands. In Singapore known from Nee Soon (Boo *et al.* SING2007-365, 3 Jul 2007, SING [SING0116756]), Bukit Timah (Ho *et al.* BT2017-018, 11 Apr 2017, SING [SING0261173]), Seletar (Ridley *s.n.*, 22 Jul 1892, SING [SING0037893]), Jurong (Burkill 256, 23 Dec 1914, K, SING [SING0119832]), Pulau Brani (Ridley *s.n.*, Feb 1890, SING [SING0037894]) and Changi. It was also collected at many other places around Singapore in the late nineteenth and early twentieth centuries but now appears to be confined to Nee Soon and Bukit Timah.

Ecology. Historically in Singapore most common in coastal vegetation and in swamp forest. Today in swamp forest and lowland dipterocarp forest.

Provisional conservation assessment. Globally Least Concern (LC) as this is a very widespread and locally common species. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from fewer than 50 plants.

Notes. This species has the widest variation of any species in the genus. The species in Singapore tends to have more triangular corolla lobes than is usual for the species over much of its range. The corolla colour varies across the species with the plants in Singapore being towards the darker range of variation and with more red in the flowers. Plants in cultivation in Singapore mostly appear to have been sourced from regions with paler flowers.

2. *Parsonsia curvisepala* K.Schum.

(Latin, *curvi-* = curved, *-sepala* = sepal;
referring to the reflexed sepals)

Bot. Jahrb. Syst. 9 (1888) 215; Middleton, *Blumea* 42 (1997) 207; Middleton, *Fl. Males.*, ser. 1, 18 (2007) 321; Middleton, *Fl. Penins. Malaysia*, ser. 2, 2 (2011) 173. **Type:** *Hollrung* 96, Papua New Guinea (lectotype K [K000857520], designated by Middleton, *Blumea* 42 (1997) 207).

Parsonsia stenocarpa King & Gamble, *J. Asiat. Soc. Bengal*, Pt. 2, *Nat. Hist.* 74(2) (1908) 458; Ridley, *Fl. Malay Penins.* 2 (1923) 351. **Type:** *Wray* 3263, [Malaysia], Perak (lectotype K [K000857540], designated by Middleton, *Blumea* 42 (1997) 207; isolectotype SING [SING0056546]).

Twining climber to 16 m. **Branchlets** short to long brown tomentose. **Leaves** 3–4-whorled; petiole 0.5–2.6 cm long; lamina papery to subcoriaceous, elliptic to obovate, 1.5–13.5 × 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, sometimes pubescent only on midrib, secondary veins 4–8 pairs, intercostal veins reticulate, sometimes prominent beneath. **Inflorescences** 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. **Calyx** lobes linear, strongly reflexed, more rarely erect and/or broader obovate, 2–4.5 × 0.5–1.4(–2.2) mm, (1.7–)1.9–7 times as long as wide, apex acute, tomentose. **Corolla** yellowish, not fleshy, buds cylindrical, head acute to acuminate, lobes only slightly overlapping, open corolla salverform; tube 2.1–4.5 mm long; lobes triangular, apex acute to acuminate, 1.3–2.6 × 0.6–1.2 mm, sparsely to densely brown pubescent or, rarely, glabrous outside, pubescent in upper tube inside especially in throat. **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 × 0.5–0.6 mm, 4.8–7 times as long as wide. **Nectary** 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 long, 3.2–5.3 mm wide. **Seed** grains 7–17 mm long, 0.4–2 mm diam.; coma yellowish, 1.3–4.7 cm long.

Distribution. Peninsular Malaysia, Philippines, Sulawesi, New Guinea and the Solomon Islands. In Singapore only known from a single specimen from Nee Soon (*Maxwell* 80-208, 28 Nov 1980, SING [SING0037904], SINU).

Ecology. In Singapore only known from freshwater swamp forest.

Provisional conservation assessment. Globally Least Concern (LC). As it has not been seen since 1980 it is presumed to be Nationally Extinct.

Notes. This species is second only to *Parsonsia alboflavescens* in the genus in its variability and geographic distribution. As the species is only known from one collection in Singapore the description above is for the species throughout its range except that a very occasional specimen has been collected with opposite leaves elsewhere.

19. STROPHANTHUS DC.

(Greek, *stropho-* = twist, turning, *-anthus* = flower;
with twisting corolla lobes)

Bull. Sci. Soc. Philom. Paris 3(64) (1802) 122, pl. 8; Brown, Asclepiadeae (1810) 62; Bentham & Hooker, Gen. Pl. 2(2) (1876) 714; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 655; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 467; Ridley, Fl. Malay Penins. 2 (1923) 353; Beentje, Meded. Landbouwhogeschool Wageningen 82(4) (1982) 17; Middleton, Fl. Thailand 7(1) (1999) 97; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 10; Middleton, Fl. Males., ser. 1, 18 (2007) 361; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 180; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 286. **Type:** *Strophanthus sarmentosus* DC., lectotype designated by Beentje, Belmontia, new ser. 13 (1982) 17.

Large woody climbers, sometimes forming large shrubs with pendent branches before beginning to climb; latex clear or seemingly absent. **Branches** lenticellate; glabrous or, rarely, minutely and sparsely puberulent. **Leaves** opposite; petioles with colleters in the axils, the outer two of which appear like small stipules. **Inflorescences** terminal cymes; bracts mostly persistent; flowers 5-merous. **Calyx** lobes free, colleters inside. **Corolla** infundibuliform, lobes overlapping to the right in bud, often forming a long twisted acumen; tube widening around the middle; lobes ovate or elongated into narrow tails, glabrous; corona 10-lobed, inserted at the base of the lobes. **Stamens** completely included in the corolla tube except for long acumen on anthers; filaments short, swollen abaxially, pubescent; anthers narrowly triangular, base sagittate, apex drawn out into a long acumen, adnate to the style head. **Nectary** absent. **Gynoeceum** 2-carpellate, carpels free 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** with a long apical stalk and the coma hairs arising along the stalk, also with a deciduous basal coma, seed grain flattened.

Distribution. A genus of 38 species from Africa and South and Southeast Asia eastwards to Moluccas. In Singapore 2 native species.

Uses. *Strophanthus gratus* (Wall. & Hook.) Baill., a West African shrubby species, is commonly cultivated and frequently planted along Singapore's streetscape and in parks.

Key to *Strophanthus* species

1. Corolla lobes drawn out into long tails, more than 20 mm long **1. *S. caudatus***
 Corolla lobes not drawn out into long tails, less than 15 mm long
 **2. *S. singaporianus***

1. *Strophanthus caudatus* (L.) Kurz

(Latin, *caudatus* = tailed; referring to the long corolla apices)

J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46(2) (1877) 257; Beentje, Meded. Landbouwhogeschool Wageningen 82(4) (1982) 54; Turner, Gard. Bull. Singapore 45 (1993) 36; Middleton, Fl. Thailand 7(1) (1999) 97; Kessler et al., Blumea, Suppl. 14 (2002) 15; Middleton, Fl. Males., ser. 1, 18 (2007) 362, fig. 91; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 82, 106, 212; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 181. **Basionym:** *Echites caudatus* L., Mant. Pl. 1 (1767) 52. **Synonym:** *Strophanthus dichotomus* DC., Bull. Sci. Soc. Philom. Paris 3(64) (1802) 123; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 468; Ridley, Fl. Malay Penins. 2 (1923) 354, fig. 106; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 145. **Type:** *Collector unknown s.n.* (lectotype LINN [Herb. Linn. no. 302.1], designated by Beentje in Jarvis (ed.), Order Out of Chaos (2007) 490). **Fig. 37, 38.**

Strophanthus griffithii Wight, Icon. Pl. Ind. Orient. 4(2) (1848) 3, pl. 1300; Miquel, Fl. Ned. Ind. 2, fasc. 3 (1857) 442. **Type:** *Griffith s.n.*, [Malaysia], Malacca (lectotype K [K000857791], designated by Beentje, Meded. Landbouwhogeschool Wageningen 82(4) (1982) 54; isolectotypes BM [BM001014069], K [K000857788, K000857789, K000857790], P [P00495803], TCD).

Strophanthus longicaudatus Wight, Icon. Pl. Ind. Orient. 4(2) (1848) 3, pl. 1299; Miquel, Fl. Ned. Ind. 2, fasc. 3 (1857) 442. **Type:** *Wight s.n.*, [Malaysia], Malacca (holotype K [K000857792]).

Trailing shrub or large woody climber to 12 m, 2 cm diam. **Branchlets** densely lenticellate. **Leaves:** petiole 3–18 mm long; lamina papery to coriaceous, elliptic, obovate or ovate, 4.2–17.5(–23) × 1.5–7.5(–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. **Inflorescences** robust; peduncle glabrous or minutely puberulent, 2–42 cm long; bracts ovate to ovate-linear, 2.5–4.5(–17) mm long; pedicels 3–11 mm long. **Calyx** lobes usually ovate, 3–19 × 1.5–6 mm, 1–6.5 times as long as wide, apex acute to acuminate, puberulent, ciliate. **Corolla** white with brownish-purple on lobes or purplish-red with white and yellow in the centre; tube 13–25 mm long, widening at 8–13 mm, glabrous or puberulous only at top of tube inside and outside; lobes 6–17 mm long (not including tails), with long narrow tails, 2.2–4 mm wide and to 13 cm long (reported to over 25 cm long elsewhere), glabrous or puberulous; corona lobes narrowly triangular, 3–10 mm long. **Stamens** inserted at 8–13 mm from corolla base, for most of attachment within tube presenting a conspicuous ridge that ends abruptly; anthers 3–6 × 0.8–1.6 mm (not including elongated acumen), acumen 10–19 mm long. **Ovaries** sparsely and minutely puberulent, 1.3–2.5 mm long; style and style head 10–18 mm long. **Fruit** large and woody, oblong, tapering into an obtuse apex, 10–31 cm long, 1.9–4.8 cm wide, lenticellate. **Seed** grains 10–25 × 3–4 mm, glabrous or minutely puberulent; stalk glabrous for 5–14 mm and bearing a coma for 18–23 mm, coma 50–90 mm long.

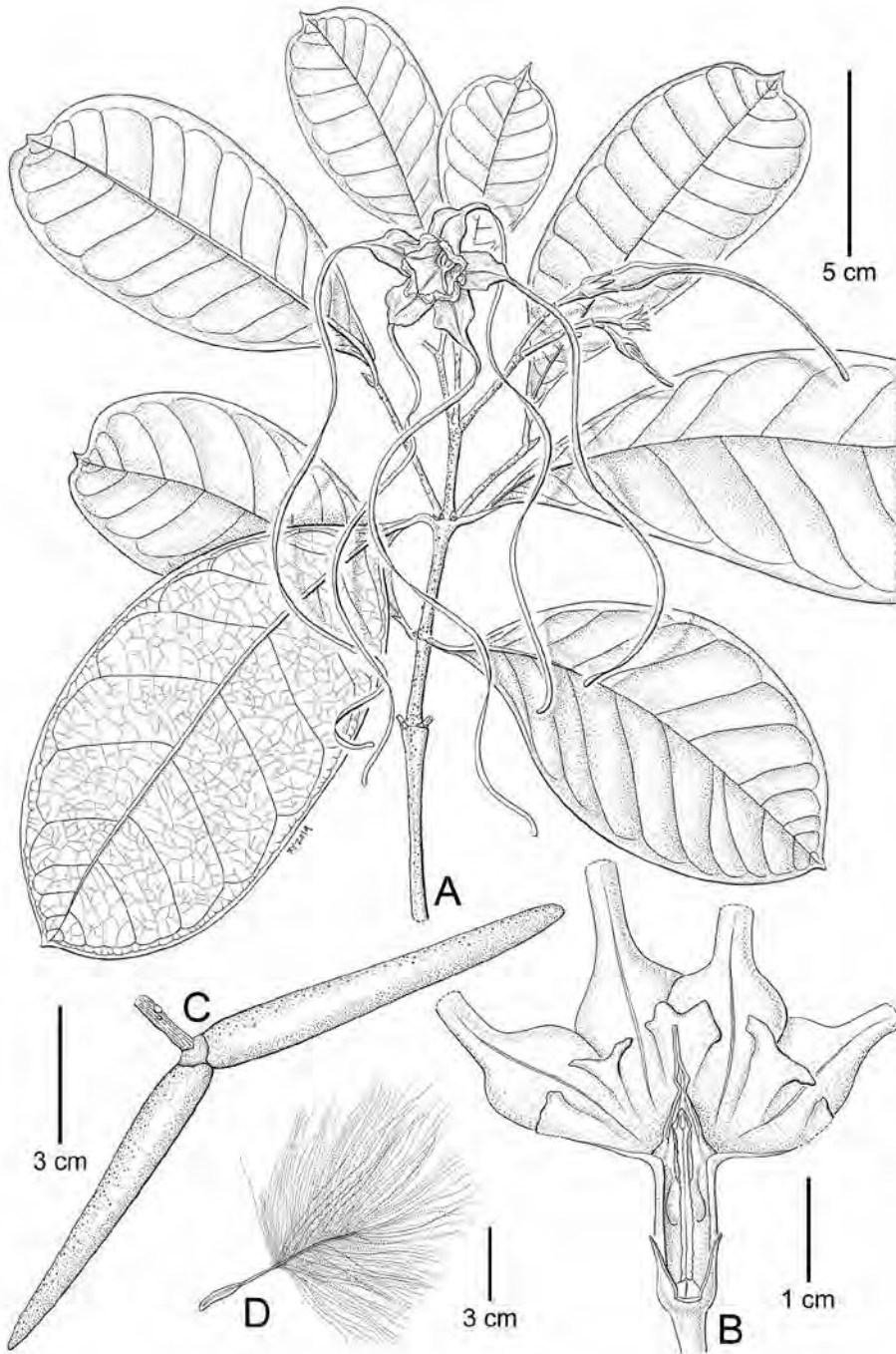


Figure 37. *Strophanthus caudatus* (L.) Kurz. **A.** Habit. **B.** Flower dissection. **C.** Fruit. **D.** Seed. (From Singapore, A, B from the Western Catchment *Leong et al. WC97*; C, D from the Central Catchment *Ngon YK 2007-05*. Drawn by X.Y. Loh).



Figure 38. *Strophanthus caudatus* (L.) Kurz. **A.** Leaves. **B.** Flower. **C.** Flower showing corona and anther appendages. **D.** Fruit. (A–C from Singapore, MacRitchie; D from Vietnam, Averyanov 20833. Photos: A–C, X.Y. Ng; D, L. Averyanov).

Distribution. Myanmar, Thailand, Cambodia, Laos, Vietnam, Peninsular Malaysia, Sumatra, Borneo, Java, Sulawesi, Philippines and West Papua. In Singapore it is now known only on Pulau Ubin (*Lai & Ali Ibrahim SING2011-456*, Nov 2011, SING [SING0171394]), the Western Catchment (*Leong et al. WC97*, 11 May 2004, SING [SING0054368]) and several parts of the Central Catchment such as MacRitchie (*Leong et al. SING2015-078*, 17 Mar 2015, SING [SING0213513]; *Ngon YK 2007-05*, 18 Sep 2007, SING [SING0096330]). In the past it was also known from Changi (*Ridley 3994*, 1892, SING [SING0003468]).

Ecology. In lowland forest, occasionally in swampy forest.

Provisional conservation assessment. Globally Least Concern (LC) as this species is very widespread and locally common. It is assessed here as Endangered (EN/D) in Singapore as there are likely to be fewer than 250 plants but possibly more than 50.

Vernacular name. *Tanduk-tanduk* (Malay).

2. *Strophanthus singaporianus* (Wall. ex G.Don) Gilg (of Singapore)

in Engler, Monogr. Afrik. Pflanzen.-Fam. 7 (1903) 11; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 471; Beentje, Meded. Landbouwhogeschool Wageningen 82(4) (1982) 139; Turner, Gard. Bull. Singapore 45 (1993) 36; Middleton, Fl. Males., ser. 1, 18 (2007) 368, fig. 94; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 82, 106, 198; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 183. **Basionym:** *Cercocoma singaporiana* Wall. ex G.Don, Gen. Hist. 4 (1837) 83; Miquel, Fl. Ned. Ind. 2, fasc. 3 (1857) 445. **Type:** *Wallich s.n.* [EIC 1623], Singapore, 1822 (lectotype K-W [K001113612], designated by Beentje, Meded. Landbouwhogeschool Wageningen 82(4) (1982) 139).

Strophanthus brevicaudatus Wight, Icon. Pl. Ind. Orient. 4(2) (1848) 3, pl. 1302; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 656; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; Ridley, Fl. Malay Penins. 2 (1923) 356; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 145. **Type:** Collector and locality uncertain but probably *Griffith s.n.* from Peninsular Malaysia (lectotype K [K000857786], designated by Beentje, Meded. Landbouwhogeschool Wageningen 82(4) (1982) 139; possible isotype CGE).

Climber or trailing shrub. **Branchlets** densely lenticellate. **Leaves:** petiole 5–13 mm long; lamina papery, ovate or elliptic, 3.5–13.5 × 1.2–6.2 cm, 1.7–2.8 times as long as wide, apex abruptly acuminate, base rounded to cuneate, secondary veins 5–9 pairs, anastomosing before margin. **Inflorescences** 3.5–13 cm long, 3–80-flowered; peduncles (4–)13–38 mm long; bracts ovate, 1.5–5 × 1–2 mm; pedicels 2–4.5 mm long. **Calyx** lobes glabrous or, rarely, slightly puberulent, ovate, 1.5–3.2 × 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, not drawn out into a long tail, glabrous; corona lobes narrowly triangular, 1.8–4 mm long. **Stamens** inserted at 3.2–6.5 mm from corolla base; anthers narrowly triangular, 2.5–2.8 mm long (not including elongated

acumen), acumen 1.8–2 mm long; 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 cm long, 1.3–2.3 cm wide, glabrous, sparsely lenticellate or not. **Seed** grain 15–20 × 1.5–3 mm, pubescent; stalk glabrous for 3–12 mm and bearing a coma for 15–38 mm, coma 58–70 mm long.

Distribution. Peninsular Malaysia and Borneo. In Singapore formerly known from Tanglin (*Ridley 6702*, 1894, SING [SING0120017]), Jurong (*Ridley 6040*, Mar 1894, K, SING [SING0003474]), Punggol (*Ridley s.n.*, 1898, SING [SING0003472]) and Balestier (*Ridley 9149*, 1898, SING [SING0003473]).

Ecology. Ridley (Fl. Malay Penins. 2 (1923) 356) reported it from ‘open country in the south, in damp open spots’.

Provisional conservation assessment. Globally Data Deficient (DD) as this species has been collected over quite a wide area but almost all of the collections were made decades ago. In Singapore presumed Nationally Extinct.

20. URCEOLA Roxb.

(Latin, *urceolus* = urn-shaped; referring to the corolla)

Asiat. Res. 5 (1798) 169; Bentham & Hooker, Gen. Pl. 2(2) (1876) 716; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 657; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 472; Ridley, Fl. Malay Penins. 2 (1923) 356; Middleton, Kew Bull. 49 (1994) 760; Middleton, Blumea 41 (1996) 82; Middleton, Fl. Thailand 7(1) (1999) 141; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 9; Middleton, Fl. Males., ser. 1, 18 (2007) 394; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 188; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 305. **Type:** *Urceola elastica* Roxb.

Ecdysanthera Hook. & Arn., Bot. Beechey Voy., fasc. 5 (1837) 198; Bentham & Hooker, Gen. Pl. 2(2) (1876) 714; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 662; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 481; Ridley, Fl. Malay Penins. 2 (1923) 359. **Type:** *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:** *Chavannesia lucida* A.DC. (= *Urceola lucida* (A.DC.) Kurz ex Benth.).

Parameria Benth. in Bentham & Hooker, Gen. Pl. 2(2) (1876) 715; Schumann in Engler & Prantl, Nat. Pflanzenfam. 4(2) (1895) 162; Pitard, Fl. Indo-Chine 3, fasc. 9 (1933) 1200; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 102; Backer & Bakhuizen van den Brink, Fl. Java (Spermatoph.) 2 (1965) 233; Coode et al., Checkl. Pl. Brunei (1996) 28; Middleton, Blumea 41 (1996) 74; Middleton, Fl. Thailand 7(1) (1999) 150; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 8; Middleton, Fl. Males., ser. 1, 18 (2007) 304; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 163. **Type:** *Parameria glandulifera* (Wall. ex G.Don) Benth. ex Kurz (= *Urceola laevigata* (Juss.) D.J.Middleton & Livsh.).

Parameriopsis Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 299; Pichon, Mém. Mus. Natl. Hist. Nat., sér. B, Bot. 1 (1950) 85. **Type:** *Parameriopsis polyneura* (Hook.f.) Pichon (= *Urceola polyneura* (Hook.f.) D.J.Middleton & Livsh.).

For additional synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 394–395.

Climbers; latex white. **Branches** lenticellate or not; branchlets puberulent to glabrous. **Leaves** opposite, those of a pair equal; petiolate, with or without colleters in axils. **Inflorescences** cymose, terminal and/or axillary sometimes forming a panicle; flowers 5-merous. **Calyx** lobes free, colleters few inside or absent. **Corolla** lobes in bud overlapping to the left or valvate (or to the right outside Singapore), bud variable in shape from globose to ovoid to ellipsoid, corona absent, open corolla urceolate, salverform or campanulate. **Stamens** completely included within the corolla tube, attached at base of corolla tube, adnate to the style head; filaments short; anthers narrowly triangular, base sagittate, sterile at apex and base. **Nectary** annular to 5-dentate. **Gynoeceium** 2-carpellate, carpels free 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. **Seed** grains hirsute, ellipsoid, flattened, with a coma pointing towards the end of the fruit.

Distribution. A genus 18 species from India and China southwards to New Guinea. In Singapore 6 native species (but see comments under *Urceola laevigata*).

Notes. Many previously recognised genera are now included in *Urceola*.

Key to *Urceola* species

1. Corolla lobes distinctly overlapping to the left in bud; corolla lobes in mature flowers falcate, 1.7–4.7 mm long; mature corolla salverform to campanulate 2
 Corolla lobes valvate in bud; corolla lobes in mature flowers triangular, 0.5–1.2 mm long; mature corolla urceolate to campanulate 3
2. Leaves drying rather reddish; corolla bud densely pubescent all over; fruits 37–90 cm long, weakly torulose; leaves with 4–9 pairs of secondary veins **5. *U. polyneura***
 Leaves not drying rather reddish; corolla bud glabrous or pubescent only on tube; fruits to 32 cm long, strongly and distantly torulose; leaves with 3–6 pairs of secondary veins **3. *U. laevigata***
3. Leaves pubescent all over beneath 4
 Leaves glabrous, sparsely pubescent only on venation or pubescent only in vein axils 5
4. Sepals ovate or oblong, 0.6–2.1 mm long, 1–2.1 times as long as wide **4. *U. lucida***
 Sepals narrow linear, 2.1–4 mm long, (2.3–)3.5–6 times as long as wide **2. *U. elastica***
5. Sepals about twice length of corolla tube or more; fruits strongly torulose **6. *U. torulosa***
 Sepals shorter or longer than corolla tube but always less than twice as long; fruits not torulose 6

6. Corolla bud subglobular or ovoid; bracts throughout inflorescence oblong or linear, very much longer than wide; fruits fusiform to linear **1. U. brachysepala**
 Corolla bud globular; bracts throughout inflorescence triangular or narrowly triangular and only up to twice as long as wide; fruit lanceolate in outline **4. U. lucida**

1. *Urceola brachysepala* Hook.f.

(Greek, *brachy-* = short, *-sepala* = sepal; with short sepals)

Fl. Brit. India 3, fasc. 9 (1882) 659; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 474; Ridley, Fl. Malay Penins. 2 (1923) 357; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146; Turner, Gard. Bull. Singapore 45 (1993) 36; Middleton, Blumea 41 (1996) 84; Middleton, Fl. Males., ser. 1, 18 (2007) 396; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 88, 106, 218; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 190. **Type:** *Maingay 1714* [Kew Distribution 1079], [Malaysia] (lectotype K [K000857866], designated by Middleton, Blumea 41 (1996) 84; isolectotype P [P00495987]). **Fig. 39, 40A.**

Urceola maingayi Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 658; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 473; Ridley, Fl. Malay Penins. 2 (1923) 357; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146; Turner, Gard. Bull. Singapore 45 (1993) 37; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216. **Type:** *Maingay 3353* [Kew Distribution 1083], Singapore, 1867-68 (lectotype K [K000857868], designated by Middleton, Blumea 41 (1996) 84; isolectotypes K [K000857869], P).

Urceola acuteacuminata Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 19, as '*acute-acuminata*'; Merrill, Bibliogr. Enum. Born. Pl. (1921) 500; Masamune, Enum. Phan. Born. (1942) 624. **Type:** *Van Romburgh 27*, [Indonesia], Borneo, Kalimantan, Pontianak (lectotype L [L0004763], designated by Middleton, Blumea 41 (1996) 84; isolectotype BO).

Carruthersia imberbis Elmer, Leaf. Philipp. Bot. 2 (1909) 588. **Synonyms:** *Urceola imberbis* (Elmer) Merr., Philipp. J. Sci., C 10 (1915) 68; Merrill, Enum. Philipp. Fl. Pl. 3 (1923) 332. – *Chavannesia imberbis* (Elmer) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 302. **Type:** *Elmer 9239*, Philippines, Luzon, Tayabas Province, Lucban (lectotype K [K000894244], designated by Middleton, Blumea 41 (1996) 84; isolectotypes A [A00055317], BM [BM001014055], BO, E [E00288616], G [G00169279, G00169280], L [L0004764], MO [MO022159], NY [NY00021301], NSW, US [US00112095], Z).

Urceola philippinensis Merr., Philipp. J. Sci., C 10 (1915) 69; Merrill, Enum. Philipp. Fl. Pl. 3 (1923) 332. **Synonyms:** *Chavannesia philippinensis* (Elmer) Pichon, Bull. Mus. Hist. Nat. (Paris), sér. 2, 20 (1948) 302. **Type:** *Clemens 1098*, Philippines, Mindanao, Lanao District, Camp Keithley (lectotype M [M-0183636], designated by Middleton, Blumea 41 (1996) 84; isolectotypes BO, GH).

Large liana. **Branchlets** glabrous to densely puberulent. **Leaves:** petiole 0.6–3.4 cm long; lamina papery to subcoriaceous, not shiny above, ovate to elliptic, rarely obovate, 2.5–22 × 0.9–13 cm, 1.3–3.5 times as long as wide, apex acuminate, base cuneate to subcordate, secondary veins 5–10 pairs, curved ascending, sparsely puberulent on midrib and/or in vein axils or glabrous, often punctate all over beneath. **Inflorescences** terminal and axillary forming panicles, 1.5–12.5 cm long, densely to sparsely dark puberulent, especially in upper parts;

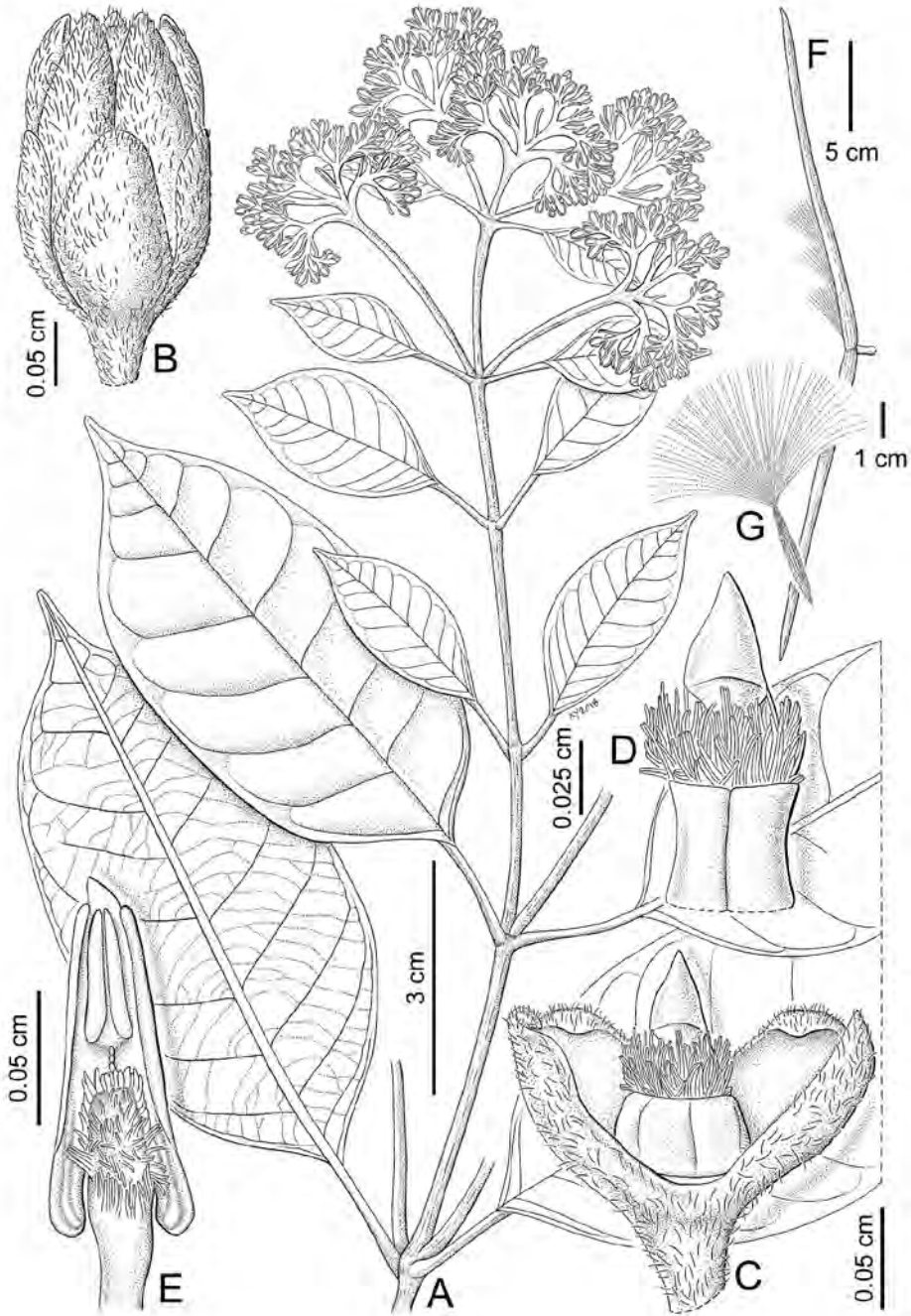


Figure 39. *Urceola brachysepala* Hook.f. **A.** Habit. **B.** Flower. **C.** Flower dissection. **D.** Ovary and style with nectary removed showing hairs. **E.** Anther from the front. **F.** Fruit. **G.** Seed. (From Singapore, A–E from MacRitchie, Chua & Nagarajan YK 2005-02; F, G from Kranji Goodenough 2717. Drawn by X.Y. Loh).

bracts narrowly oblong or linear, much longer than wide; pedicels 0.9–3.6 mm long. **Calyx** lobes ovate or oblong, 0.7–3 × 0.5–1.4 mm, 1.1–2.8(–4.4) times as long as wide, apex acute to rounded, puberulent. **Corolla** greenish white, lobes valvate in bud, bud subglobular to ovoid, open corolla urceolate, pubescent outside, pubescent to almost glabrous inside; tube 1–2.3 mm long; lobes triangular, 0.6–1.2 × 0.5–1 mm. **Stamens** inserted at 0.2–0.5 mm from corolla base which is 0.1–0.3 of tube length; filaments 0.3–0.9 mm long; anthers 1–1.6 × 0.3–0.6 mm, 2.2–4 times as long as wide. **Nectary** 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 long, 3–10 mm wide. **Seed** grains 8.5–15.2 mm long, 1.4–3.1 mm diam.; coma 1.9–5.5 cm long.

Distribution. Peninsular Malaysia, Borneo, Sumatra, Java and the Philippines. In Singapore formerly recorded from many forested areas in the country including without locality (*Maingay* 3353, 1867–68, K, P), Kranji (*Goodenough* 2717, 7 Dec 1889, K, SING [SING0003502]), Changi (*Hullet* 398, Mar 1885, SING [SING0003500]), Bukit Timah, Bedok, Mandai, Jurong, Chua Chu Kang and Seletar. Recently collected in the Western Catchment (*Lua et al.* SING2016-029, 3 Feb 2016, SING [SING0243735]), Nee Soon (*Lua* SING2014-165, 4 Apr 2014, SING [SING0205835]) and around the Central Catchment.

Ecology. In primary and secondary forest and swamp forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is widespread and often collected. Nationally probably also Least Concern (LC) although it was recorded in Tan et al. (in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216) as Endangered (EN/D). Lianas are generally undercollected compared to trees and herbs but it has nevertheless been often collected.

Vernacular name. *Akar gerip hitam* (Malay).

2. *Urceola elastica* Roxb.

(Latin, *elasticus* = elastic; probably in reference to the latex)

Asiat. Res. 5 (1798) 169; Miquel, Fl. Ned. Ind. 2, fasc. 3 (1857) 416; Miquel, Fl. Ned. Ind., Eerste Bijv., fasc. 2 (1861) 228; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 657; Boerlage, Handl. Fl. Ned. Ind. 2(2) (1899) 399; Boerlage, Bull. Inst. Bot. Buitenzorg 5 (1900) 16; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 472; Ridley, Fl. Malay Penins. 2 (1923) 356; Burkill & Henderson, Gard. Bull. Straits Settlements 3 (9–12) (1925) 396; Middleton, Blumea 41 (1996) 86; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 130; Middleton, Fl. Males., ser. 1, 18 (2007) 398; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 88, 106, 213; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 191. **Synonym:** *Tabernaemontana elastica* (Roxb.) Spreng., Syst. Veg. (ed. 16) 1 (1824 [‘1825’]) 639. **Type:** [Published illustration] Roxburgh, Asiat. Res. 5 (1798) [166], excluding fruit. **Fig. 40B.**

Urceola brachysepala Hook.f. var. *pilosa* Boerl., Bull. Inst. Bot. Buitenzorg 5 (1900) 18; Merrill, Bibliogr. Enum. Born. Pl. (1921) 501. **Type:** *Van Romburgh* 50, [Indonesia], Borneo, Kalimantan, Biang (lectotype L [L0004765], designated by Middleton, Blumea 41 (1996) 86; isolectotype BO).

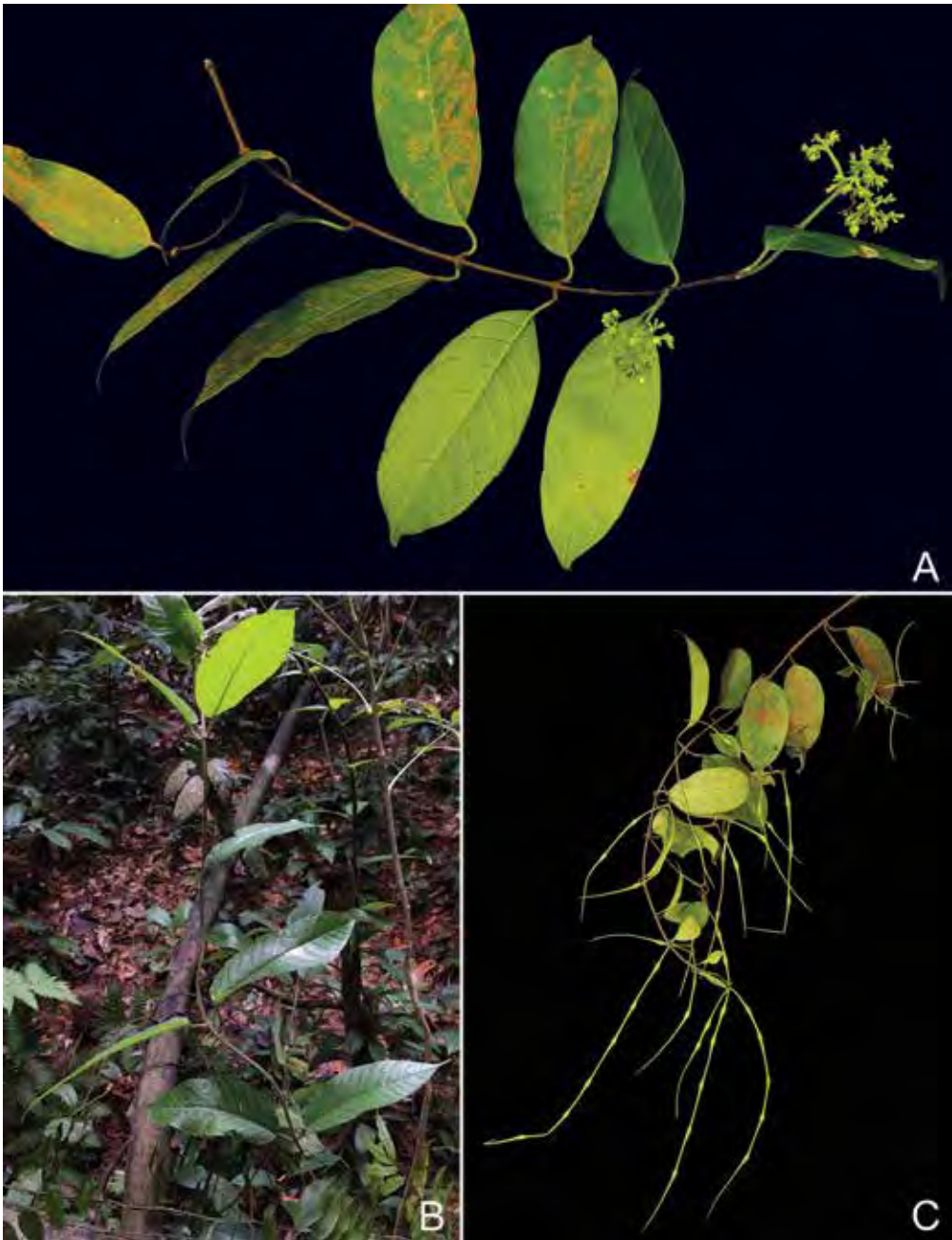


Figure 40. *Urceola brachysepala* Hook.f. **A.** Leaves and inflorescences. *Urceola elastica* Roxb. **B.** Habit. *Urceola torulosa* Hook.f. **C.** Leaves and infructescences. (From Singapore, A from Nee Soon, *Lua SING2014-165*; B from Bukit Timah Nature Reserve, *Ho et al. BTFV44-09C*; C from MacRitchie, *Lua SING2014-258* Photos: P.K.F. Leong).

Liana. **Branchlets** densely brown puberulent. **Leaves:** petiole 0.8–3 cm long; lamina coriaceous or subcoriaceous, elliptic to obovate, 3.5–19.5(–24) × 1.6–8.5(–13.7) 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. **Inflorescences** axillary and terminal forming panicles, 5.2–19 cm long, densely brown puberulent; pedicels 1.6–4 mm long. **Calyx** lobes narrowly linear, 2.1–4 × 0.5–1 mm, (2.3–)3.5–6 times as long as wide, apex acuminate to obtuse, puberulent. **Corolla** greenish white, lobes valvate in bud, bud ovoid, open corolla urceolate, pubescent outside, sparsely pubescent to glabrous inside; tube 1.2–2.3 mm long; lobes triangular, 0.7–1.1 × 0.4–0.6 mm. **Stamens** inserted at 0.2–0.6 mm from corolla base which is 0.1–0.3 of tube length; filaments 0.4–0.7 mm long; anthers 1–1.6 × 0.4–0.5 mm, 3–4 times as long as wide. **Nectary** 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 × 0.5–1.5 cm. **Seed** grains 10–20 × 2.6–3.6 mm; coma 2.9–6.2 cm long.

Distribution. Sumatra, Peninsular Malaysia, Borneo and Java. In Singapore known from Bukit Timah (*Ho et al. BTTTS20-12C*, 19 Jan 2016, SING [SING0267377]).

Ecology. In primary forest in Singapore.

Provisional conservation assessment. Globally Least Concern (LC) as this species is widespread. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from fewer than 50 plants.

Notes. In Singapore only sterile material has been collected but the large robust and hairy leaves are fairly characteristic.

3. *Urceola laevigata* (Juss.) D.J.Middleton & Livsh.

(Latin, *laevigatus* = smooth and polished; referring to the leaf surface)

Taxon 67 (2018) 356. **Basionym:** *Aegiphila laevigata* Juss., Ann. Mus. Hist. Nat. 7 (1806) 76. **Synonym:** *Parameria laevigata* (Juss.) Moldenke, Revista Sudamer. Bot. 6 (1940) 176; Middleton, Blumea 41 (1996) 76; Middleton, Fl. Thailand 7(1) (1999) 151; Middleton, Fl. Males., ser. 1, 18 (2007) 305, fig. 75; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 66, 106, 209; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 165. **Type:** *Lahaye s.n.* [Herb. Juss. 5037], locality unknown (holotype P-JU [P00657540]).

Echites glanduliferus Wall. ex G.Don, Gen. Hist. 4 (1837) 75. **Synonym:** *Parameria glandulifera* (Wall. ex G.Don) Benth. ex Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46(2) (1877) 255; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 660; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 478; Ridley, Fl. Malay Penins. 2 (1923) 358; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 145; Turner, Gard. Bull. Singapore 45 (1993) 36. **Type:** *Wallich 1465* [EIC 1659], [Myanmar], Amherst [Kyaikkami], 1827 (lectotype K-W [K001113742], designated by Middleton, Blumea 41 (1996) 76; isolectotypes BM [BM001014064], CGE, E [E00288622], G [G00169817], G-DC, K [K000857738, K000857739], K-W [K001113743], M [M-0183639], W).

Ecdysanthera griffithii Wight, Icon. Pl. Ind. Orient. 4(2) (1848) 4, pl. 1307; Miquel, Fl. Ned. Ind. 2, fasc. 3 (1857) 452. **Type:** *Griffith s.n.*, [Malaysia], Malacca (lectotype CGE, designated by Middleton, Blumea 41 (1996) 76; isolectotypes BM [BM001014061, BM001014062], CGE, K [K000857732, K000857733, K000857734, K000857735]).

For additional synonyms see Middleton, Blumea 41 (1996) 76.

Large liana, sometimes forming low thickets. **Branches** often lenticellate; branchlets glabrous to densely and minutely puberulent. **Leaves:** petiole 1–4 mm long; lamina papery, elliptic to obovate, 1.5–15 × 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, secondary veins 3–6 pairs, curved ascending, intercostal veins lax and obscure, puberulent in domatia in vein axils with midrib or, rarely, glabrous. **Inflorescences** of axillary and/or terminal cymes often forming a panicle, axis delicate, 2–16 cm long, glabrous to densely and minutely puberulent; pedicels 1.2–7.5 mm long. **Calyx** lobes ovate, 0.5–1.3 × 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, glabrous to puberulent on tube outside, glabrous inside; tube 1.2–2.5 mm long, 1–1.2 mm wide; lobes falcate, apex rounded, 1.7–4 × 1–2.7 mm, 1–1.8 times as long as wide. **Stamens** inserted at c. 0.2 mm from corolla base which is c. 0.1 of tube length; filaments 0.2–0.5 mm long; anthers 0.8–1.4 × 0.3–0.4 mm. **Nectary** 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 disc; style and style head 0.6–1.2 mm long. **Fruit** distantly torulose, glabrous, 12–32 cm long, 0.4–0.7 cm wide. **Seed** grain 5.7–12 × 1.1–4 mm; coma 1.7–3.2 cm long.

Distribution. India (Andaman Islands), China, Myanmar, Thailand, Cambodia, Laos, Vietnam, Peninsular Malaysia, western Malesia to Sulawesi and the Philippines. In Singapore recorded only twice without specific localities by *Lobb* (K) and *Cantley* (SING [SING0037905]), for both of whom questions exist as to the veracity of at least some of their Singapore collections. It may be possible, therefore, that this species has never been collected in Singapore although it is recorded from the surrounding regions.

Ecology. Unknown in Singapore. Elsewhere in the region in lowland to hill dipterocarp forest, occasionally on limestone.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct although see above as to whether it was ever present at all.

4. *Urceola lucida* (A.DC.) Benth. ex Kurz

(Latin, *lucidus* = shining, clear, transparent; referring to the leaf surface)

J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46(2) (1877) 255; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 658; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 475; Ridley, Fl. Malay Penins. 2 (1923) 358; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146; Turner, Gard. Bull. Singapore 45 (1993) 37; Middleton, Kew Bull. 49 (1994)

762; Middleton, *Blumea* 41 (1996) 94; Middleton, *Fl. Thailand* 7(1) (1999) 144; Middleton, *Fl. Males.*, ser. 1, 18 (2007) 401; Tan et al. in Davison et al. (ed.), *Singapore Red Data Book*, ed. 2 (2008) 216; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 88, 106, 199; Middleton, *Fl. Penins. Malaysia*, ser. 2, 2 (2011) 192. **Basionym:** *Chavannesia lucida* A.DC., *Prodr.* 8 (1844) 444; Miq., *Fl. Ned. Ind.* 2, fasc. 3 (1857) 458. **Synonym:** *Echites lucidus* Wall. ex G.Don, *Gen. Hist.* 4 (1837) 75, nom. illeg. non Willd. ex Roem. & Schult. (1819). **Type:** *Wallich s.n.* [EIC 1670], [Malaysia], Penang, 1822 (lectotype K-W [K001113768], designated by Middleton, *Blumea* 41 (1996) 94; isolectotypes BM [BM001014053], BR [BR0000006961633, BR0000006962036], C [C10005905], CGE, E [E00288618], G [G00190754], GH, K [K000857861, K000857862], K-W [K001113769], L [L0004770], M [M-0183634], MEL [MEL720258], NY, P [P00495990, P00495991], S, SING [SING0056575], W).

Chavannesia esculenta A.DC., *Prodr.* 8 (1844) 444; Miquel, *Fl. Ned. Ind.* 2, fasc. 3 (1857) 458. **Synonyms:** *Echites esculentus* Wall., *Numer. List no.* 1671 (1829), nom. nud. – *Urceola esculenta* (A.DC.) Benth. ex Kurz, *Forest Fl. Burma* 2 (1877) 184; Hooker, *Fl. Brit. India* 3, fasc. 9 (1882) 658. – *Xylinaebaria esculenta* (A.DC.) Pierre ex Spire, *Contr. Apocyn.* (1905) 66. **Type:** *Gomez s.n.* [EIC 1671], Burma [Myanmar], Martaban (lectotype G-DC, designated by Middleton, *Blumea* 41 (1996) 94; isolectotypes BM [BM001014060], K-W [K001113770]).

Urceola reticulata King & Gamble, *J. Asiat. Soc. Bengal*, Pt. 2, *Nat. Hist.* 74(2) (1908) 477. **Type:** *Ridley 2745*, Singapore (lectotype K [K000857859], designated by Middleton, *Blumea* 41 (1996) 94; isolectotype NSW).

Large liana. **Branchlets** glabrous or sparsely and minutely puberulent. **Leaves** coriaceous, not shiny above; petiole 0.8–2.8 cm long; lamina obovate to elliptic, 3–26 × 0.9–11.2 cm, 1.6–2.6 times as long as wide, apex acuminate to caudate, base weakly cordate, less often to obtuse, secondary veins 7–13 pairs, prominent beneath, glabrous or more rarely with hairs on midrib beneath and in vein axils or sparsely all over beneath. **Inflorescences** of axillary and terminal cymes forming a panicle, 9.6–29 cm long, densely pale puberulent; bracts triangular or narrowly triangular, about twice as long as wide; pedicels 0.9–3.2 mm long. **Calyx** lobes ovate to oblong, often reflexed, 0.6–2.1 × 0.5–1.2 mm, 1–2.1 times as long as wide, apex obtuse to weakly retuse, puberulent, colleters absent. **Corolla** white, lobes valvate in bud, bud ovoid, open corolla urceolate to campanulate, puberulent outside, sparsely puberulent inside; tube 0.8–1.5 mm long; lobes triangular, 0.5–1 × 0.5–0.7 mm. **Stamens** inserted at 0.2–0.3 mm from corolla base which is 0.1–0.2 of tube length; filaments 0.2–0.5 mm long; anthers 0.9–1.3 × 0.2–0.4 mm, 2.8–4.3 times as long as wide. **Nectary** 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** lanceolate in outline, tapering, rarely stipitate, glabrous, rarely puberulent, 4.5–11 cm long, 0.7–2 cm wide. **Seed** grains 10–17 mm long, 3–5 mm diam.; coma 3.4–5.4 cm long.

Distribution. Myanmar, Thailand, Sumatra and Peninsular Malaysia. In Singapore recorded from Pulau Ubin (*Ridley 2745*, 1891, K, NSW; *Ridley 5658*, 1893, SING [SING0145658]; *Hullett 425*, Mar 1885, SING [SING0003496]) and Changi (*Ridley 2416*, 1891, SING [SING0003497]).

Ecology. No specific data for Singapore but generally in the region in lowland forest.

Provisional conservation assessment. Globally Least Concern (LC) as this species is widespread and not under specific threats. In Singapore presumed Nationally Extinct.

Vernacular name. *Akar gerip putih* (Malay).

5. *Urceola polyneura* (Hook.f.) D.J.Middleton & Livsh.

(Greek, *poly-* = many, *-neura* = nerves; with many secondary veins)

Taxon 67 (2018) 356. **Basionym:** *Parameria polyneura* Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 660; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 479; Ridley, Fl. Malay Penins. 2 (1923) 359; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 145; Turner, Gard. Bull. Singapore 45 (1993) 36; Middleton, Blumea 41 (1996) 80; Middleton, Fl. Thailand 7(1) (1999) 153, fig. 48; Middleton, Fl. Males., ser. 1, 18 (2007) 308, fig. 76; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 66, 106, 209; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 166. **Type:** *Griffith 9* (also as *s.n.*), [Malaysia] (lectotype K [K000857727], designated by Middleton, Blumea 41 (1996) 80; isolectotypes AAU, BO, BR [BR0000006957711, BR0000006958367], CGE, GH [GH00056847], K [K000857728, K000857729], L, M [M-0183637, M-0183638], P [P04252090]).

Liana. **Branches** lenticellate or not; branchlets glabrous to puberulent. **Leaves:** petiole 3–9 mm long; lamina subcoriaceous, elliptic, obovate or oblong, 3–12.8(–15.5) × 1.1–6.2 cm, 1.8–3.1 times as long as wide, apex acuminate to acute, base cuneate to obtuse, secondary veins 4–9 pairs, intercostal veins conspicuous, puberulent in domatia in vein axes with midrib. **Inflorescences** terminal and/or axillary, often forming panicles, 5.5–12.4 cm long, densely short puberulent; pedicels 2–4.8 mm long. **Calyx** lobes ovate, 0.8–1.6 mm long, 0.6–1 mm wide, 1.1–2 times as long as wide, apex acute to obtuse, densely puberulent, colleters only at basal margins of calyx lobes inside. **Corolla** white and pinkish, bud ovoid, open corolla salverform to campanulate, densely puberulent on tube and on parts exposed in bud outside, sparsely puberulent in tube inside; tube 1–1.8 mm long; lobes oblong, falcate, 2.6–4.7 mm long, 1–1.6 mm wide, 2.4–4.3 times as long as wide. **Stamens** inserted at 0.3–0.4 mm from corolla base which is c. 0.2 of tube length; filaments 0.3–0.7 mm long; anthers 1–1.4 × 0.2–0.5 mm. **Nectary** 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 cm long, 0.4–0.5 cm wide. **Seed** grains 14.5–22 mm long, 2.6–3 mm diam.; coma 3–4.1 cm long.

Distribution. Southern Myanmar, Thailand, Sumatra, Peninsular Malaysia and Borneo. In Singapore formerly known from Changi (*Hullett 394*, Mar 1885, SING [SING0003464]), Cluny Road (*Ridley 2721*, 1890, K, SING [SING0003461]), Tanglin (*Ridley 2713*, 1891, K) and Mandai (*Kiah SF 37733*, 7 Aug 1940, K, SING [SING0003465]). All recent material is from the Western Catchment (*Samsuri et al. WC62*, 27 Apr 2004, SING [SING0054259]).

Ecology. In lowland forest.

Provisional conservation assessment. Globally Least Concern (LC) as this species is widespread and not under specific threats. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from fewer than 50 plants.

Notes. None of the recently collected material is fertile and generally has slightly larger leaves than the known fertile material. This is added in brackets in the description.

6. *Urceola torulosa* Hook.f.

(Latin, *torulus* = contracted at regular intervals; referring to the fruit)

Fl. Brit. India 3, fasc. 9 (1882) 659; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 476; Ridley, Fl. Malay Penins. 2 (1923) 358; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146; Turner, Gard. Bull. Singapore 45 (1993) 37; Middleton, Blumea 41 (1996) 110; Middleton, Fl. Males., ser. 1, 18 (2007) 408; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 89, 106, 218; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 196. **Type:** *Maingay 3304A* [Kew Distribution 1086], [Malaysia] (lectotype K [K000857852], designated by Middleton, Blumea 41 (1996) 110; isolectotypes GH [GH00056835], L [L0004777]). **Fig. 40C.**

Urceola malaccensis Hook.f., Fl. Brit. India 3, fasc. 9 (1882) 658; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 475; Ridley, Fl. Malay Penins. 2 (1923) 357; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 146; Turner, Gard. Bull. Singapore 45 (1993) 37. **Type:** *Maingay 2937* [Kew Distribution 1098], [Malaysia] (lectotype K [K000857848], designated by Middleton, Blumea 41 (1996) 110; isolectotypes GH [GH00056837], K [K000857849], L [L0004776]).

Liana. **Branchlets** minutely puberulent, rarely glabrous. **Leaves:** petiole 0.8–2.6 cm long; lamina ovate to elliptic, 2.6–17.5 × 0.9–6.7 cm, 1.6–5 times as long as wide, apex acuminate, base rounded to cuneate, usually shiny above, secondary veins 5–9 pairs, with hairs in lateral vein axils, rarely glabrous. **Inflorescences** of axillary and terminal congested cymes, 2.5–5.5 cm long, minutely puberulent; bracts narrowly oblong or linear, much longer than wide; pedicels 1.4–4.1 mm long. **Calyx** lobes oblong to spatulate, 1.9–4 × 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, puberulent outside, sparsely puberulent inside; tube 1.4–1.9 mm long; lobes triangular, 0.7–0.8 × 0.6–0.7 mm. **Stamens** inserted at c. 0.2 mm from corolla base which is c. 0.1 of tube length; filaments 0.4 mm long; anthers c. 1.5 × 0.4 mm, c. 3.8 times as long as wide. **Nectary** 5-crenate, c. 0.5 mm long. **Ovaries** c. 0.6 mm long; style and style head c. 1.3 mm long. **Fruit** long torulose, glabrous, 4.6–45 cm long, 3–7 mm wide. **Seed** grains 7.8–11.2 mm long, 3.2–5.4 mm diam.; coma 1.5–3.3 cm long.

Distribution. Peninsular Malaysia, Sumatra and Borneo. In Singapore previously known from Tyersall (*Hullett s.n.*, 1893, SING [SING0003507]), Seletar (*Ridley 6317*, 1894, SING [SING0003514]), Bukit Timah (*Ridley 4960*, 1892, SING [SING0003513]), Tampines, Changi, Chan Chu Kang and Mandai. Recently collected in MacRitchie (*Lua SING-186*, 30 May 2014, SING [SING0205590]) and Nee Soon (*Gwee SING2010-492*, 3 Mar 2010, SING [SING0144614]).

Ecology. In primary and secondary forest and swamp forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is widespread and often collected. Nationally probably also Least Concern (LC) although it was recorded in Tan et al. (in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216) as Endangered (EN/D). Lianas are generally undercollected compared to trees and herbs but it has nevertheless been often collected.

Vernacular name. *Akar serapat* (Malay).

21. WRIGHTIA R.Br.

(William Wright, 1735–1819, a British physician and botanist)

Asclepiadeae (1810) 62; Bentham & Hooker, Gen. Pl. 2(2) (1876) 712; Hooker, Fl. Brit. India 3, fasc. 9 (1882) 652; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 463; Ridley, Fl. Malay Penins. 2 (1923) 352; Ngan, Ann. Missouri Bot. Gard. 52 (1965) 114; Whitmore, Tree Fl. Malaya 2 (1973) 23; Middleton, Fl. Thailand 7(1) (1999) 79; Middleton, Tree Fl. Sabah & Sarawak 5 (2004) 5; Middleton, Harvard Pap. Bot. 10 (2005) 161; Middleton, Fl. Males., ser. 1, 18 (2007) 436; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 199; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 284. **Type:** *Wrightia pubescens* R.Br., lectotype designated by Ngan, Ann. Missouri Bot. Gard. 52 (1965) 114.

For additional synonyms see Middleton, Fl. Males., ser. 1, 18 (2007) 436.

Shrubs or small trees; latex white. **Leaves** opposite; petioles usually with colleters only in the axils. **Inflorescences** a terminal cyme; few- to many-flowered; flowers 5-merous. **Calyx** lobes with 5 large or small colleters in the sinuses inside, the larger ones almost covering the inner surface of the sepals. **Corolla** lobes overlapping to the left in bud, 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 exerted 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. **Nectary** absent. **Gynoeceum** of 2 free carpels united into a common style or of two connate carpels, glabrous, rarely pubescent, ovules numerous; style broadest near top. **Fruit** of paired follicles or connate follicles, fusiform. **Seeds** linear or narrowly fusiform; with a coma directed towards the base of the follicle.

Distribution. About 25 species in Africa, Asia and Australia. In Singapore 1 native species.

Notes. Both *Wrightia antidysenterica*, from Sri Lanka, and *Wrightia religiosa*, probably native to Myanmar and Thailand, are commonly cultivated in Singapore. *Wrightia religiosa* is a favourite for bonsai enthusiasts.

Wrightia laevis Hook.f.

(Latin, *laevis* = smooth; referring to the absence of hairs on the shoots or leaves)

Fl. Brit. India 3, fasc. 9 (1882) 654; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 465; Ridley, Fl. Malay Penins. 2 (1923) 353; Markgraf, Bot. Jahrb. Syst. 61 (1927) 212; Ngan, Ann. Missouri Bot. Gard. 52 (1965) 136; Whitmore, Tree Fl. Malaya 2 (1973) 24; Turner, Gard. Bull. Singapore 45 (1993) 37; Middleton, Fl. Thailand 7(1) (1999) 85; Middleton, Harvard Pap. Bot. 10 (2005) 168; Middleton, Fl. Males., ser. 1, 18 (2007) 440; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 90, 106, 213; Middleton, Fl. Penins. Malaysia, ser. 2, 2 (2011) 201. **Type:** *Maingay 2490* [Kew Distribution 1065], [Malaysia, Johor], Mount Ophir [G. Ledang] (lectotype K [K000857655], designated by Middleton, Harvard Pap. Bot. 10 (2005) 168; isolectotype K [K000857656]). **Fig. 41, 42.**

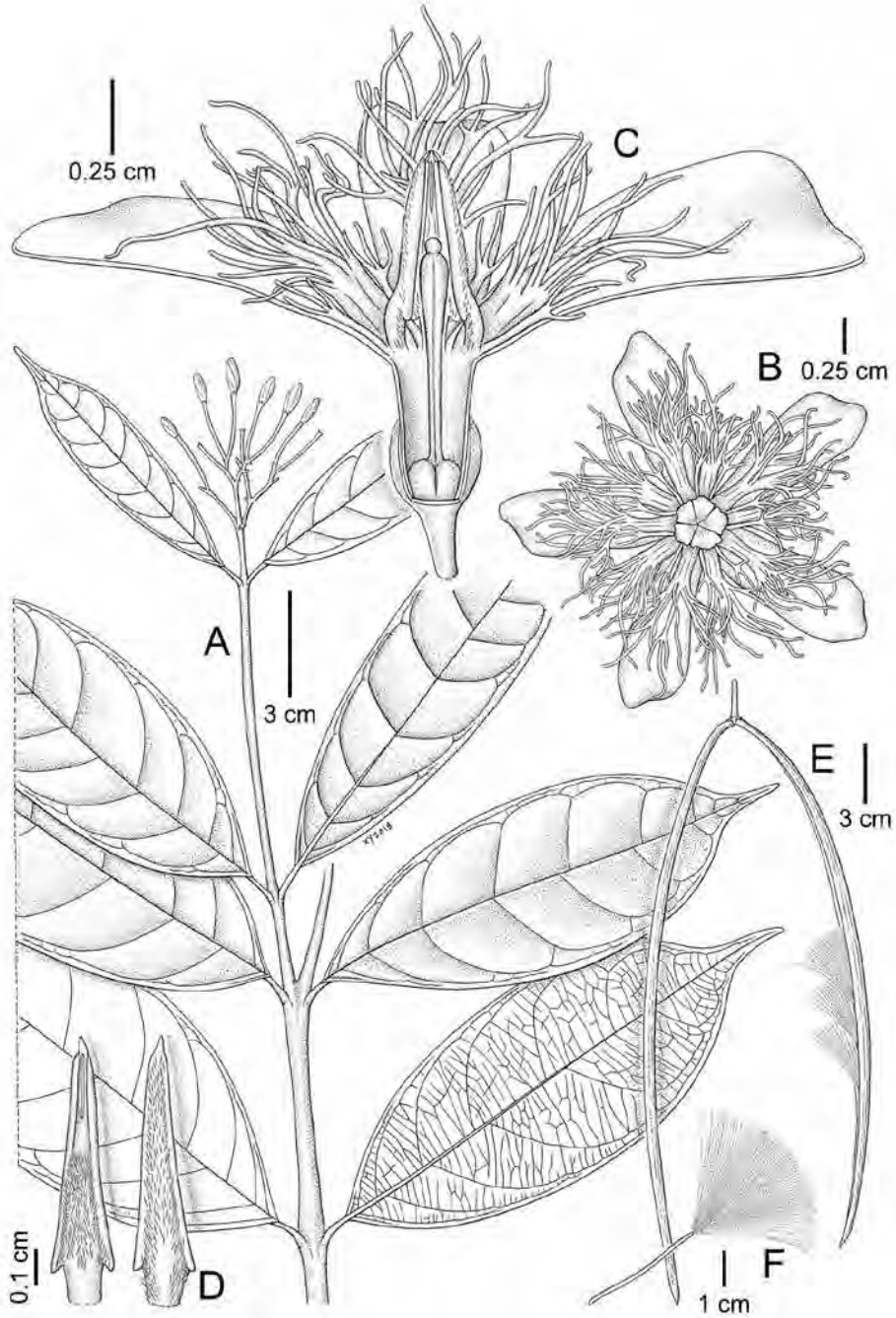


Figure 41. *Wrightia laevis* Hook.f. **A.** Habit. **B.** Corolla from above. **C.** Flower dissection. **D.** Anthers from the front and back. **E.** Fruit. **F.** Seed. (A from Peninsular Malaysia, *Kochummen FRI 16446*; B–D from Singapore, Bukit Timah Nature Reserve, *Leong-Škorničková et al. SING2015-099*; E, F from Peninsular Malaysia, *Samsuri & Ahmad SA 691*. Drawn by X.Y. Loh).



Figure 42. *Wrightia laevis* Hook.f. **A.** Looking up towards crown. **B.** Trunk. **C.** Leaves. **D.** Corolla. (From Singapore, A–C from Bukit Timah Nature Reserve, *Ho et al. BTFVS42-01T*; D from Bukit Timah Nature Reserve, *Leong-Škorničková SING2015-099*. Photos: A–C, P.K.F. Leong; D, J. Leong-Škorničková).

Shrub or tree to 37 m tall and 106 cm diam., 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; lamina subcoriaceous, elliptic, ovate or obovate, 3.1–17.3 × 1.4–7.5 cm, 1.3–4.1 times as long as wide, apex acuminate, base cuneate to obtuse, glabrous, secondary veins 4–10 pairs, strongly ascending, curved, intercostal veins mostly paler than lamina in dried specimens, almost perpendicular to midrib and oblique to secondary veins and also reticulate. **Inflorescences** 1.8–10 cm long; peduncle 1–1.6 cm long, glabrous to sparsely puberulent; pedicels 8–19 mm long, delicate, glabrous or puberulent; flowers mostly not pendulous. **Calyx** lobes ovate, 0.7–2.5 × 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, greenish white, pale yellowish white or yellow-orange (not recorded but perhaps changing from white to yellowish with age), subrotate; tube 1.1–4.3 mm long, glabrous or minutely puberulent at top of tube outside, glabrous inside; lobes 6.1–14 × 2.6–6.5 mm, 1.6–2.8 times as long as wide, elliptic to slightly obovate, apex rounded, minutely puberulent outside and inside; corona of antepetalous, alternipetalous and alternate lobes, antepetalous lobes adnate to the corolla at base, divided more than half way to base, fimbriate, 2.8–10 mm long, 0.9–1.8 times as long as alternipetalous lobes, glabrous, alternipetalous lobes free, simple, deeply bifid to many times branched, 2.4–11 mm long, alternating lobes 0.6–5.8 mm long, simple or apex divided into 3, shorter than the other two whorls. **Stamens** inserted at 0.8–0.9 of tube length from base, completely exerted; filaments 0.2–1.7 mm long; anthers 3.9–5.6 × 0.7–1.6 mm, pubescent outside, sometimes only sparsely so at base. **Gynoecium** of 2 free carpels united into a common style, ovaries free, 0.7–1.8 mm long, glabrous; style and style head 3.5–5.5 mm long. **Fruit** of paired follicles; 10–50 cm long, 5–17 mm wide, glabrous, lenticellate or not. **Seeds** linear, 18–27 × 1.7–2.5 mm; coma 3.3–4 cm long.

Distribution. Southern China, continental Southeast Asia, Peninsular Malaysia, Singapore, Sumatra, the Philippines, New Guinea and Australia (Queensland). In Singapore only known from Bukit Timah (*Ridley s.n.*, 1900, SING [SING0003553]; *Leong-Škorničková et al.* 2015-099, 6 Apr 2015, SING [SING0232272]).

Ecology. In Singapore known from primary and mature secondary forest.

Provisional conservation assessment. Globally Least Concern (LC) as this species is particularly widespread and often collected. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from fewer than 50 trees.

Vernacular name. *Jelutong pipit* (Malay).

Notes. This species is particularly widespread and very variable. In Singapore the corona on the only known flowering material is particularly many-branched and finely divided compared to many populations from other parts of its distribution. As only one flowering specimen is known from Singapore, the description is for the species throughout its range.

ASCLEPIADOIDEAE

R.Br. ex Burnett, *Outlines Bot.* (1835) 1012. **Type:** *Asclepias* L.

Climbers, twining or not twining, terrestrial or epiphytic; latex coloured or clear. **Roots** fibrous, basal or adventitious. Leaves opposite (rarely alternate or whorled), petiolate (rarely subsessile); lamina entire or with undulate margin, narrowly lanceolate to round, sometimes pitcher-shaped venation usually pinnate; colleters at lamina base usually present, prophylls absent or present. **Inflorescences** racemose or corymbose, simple to much branched, umbelliform to paniculate, rarely a solitary flower; peduncle extra-axillary or terminal; flowers 5-merous; actinomorphic. **Calyx** lobes free, spreading, generally with colleters inside. **Corolla** salverform, urceolate, campanulate or rotate; lobes valvate or contorted in bud. **Corolline corona** present or absent. **Stamens** 5, usually inserted at the base of the corolla tube, connate into a gynostegium. **Filaments** fused into a tube. **Anthers** 2-locular, with membranous appendages. **Pollinaria** 5 with 2 erect, horizontal or pendulous pollinia each. **Pollen** aggregated into pollinia surrounded by pollinium walls. **Gynostegial corona** often present, staminal, rarely interstaminal. **Gynoecium** superior, 2-carpellate and apocarpous but united into a common style, ovary unilocular. **Fruit** of 2 dehiscent follicles, rarely fleshy, one often aborted. **Seeds** numerous, simple, often flattened, often comose.

There are approximately 181 genera and 3000 species worldwide of which 8 genera and 28 species are native in Singapore. An additional 3 species are naturalised.

22. ASCLEPIAS L.

(Asclepios, the Greek god of medicine)

Sp. Pl. 1 (1753) 214; King & Gamble, *J. Asiat. Soc. Bengal*, Pt. 2, *Nat. Hist.* 74(2) (1908) 530; Ridley, *Fl. Malay Penins.* 2 (1923) 379; Keng, *Concise Fl. Singapore*, vol. 1, *Gymn. Dicot.* (1990) 147; Turner, *Gard. Bull. Singapore* 45 (1993) 42; Endress et al. in Kadereit & Bittrich (ed.), *Fam. Gen. Vasc. Pl.* 15 (2019) 370. **Type:** *Asclepias syriaca* L., lectotype designated by Hitchcock, *Nom. Prop. Brit. Bot.* (1929) 136.

Herb with woody base; latex white. **Roots** fibrous, basal. **Branches** sparsely pubescent, erect. **Leaves** opposite or whorled, petiolate; lamina herbaceous, entire, elliptic-lanceolate; colleters at lamina base absent, prophylls absent. **Inflorescences** corymbose; peduncle extra-axillary or terminal, sparsely pubescent. **Calyx** lobes free, with colleters. **Corolla** reflexed, lobes valvate; tube present, lobes elliptic. **Corolline corona** absent. **Stamens** inserted at the base of the tube, not included within the tube, connate into a gynostegium. **Gynostegial corona** staminal, lobes erect. **Pollinarium** with pendulous pollinia lacking pellucid margins. **Style head** capitate. **Ovary** glabrous. **Fruit** a follicle, single or paired, fusiform, glabrous. **Seeds** broadly elliptic, with a coma.

Distribution. A genus of about 100 species in the Americas. In Singapore 1 formerly naturalised species.

Uses. *Asclepias curassavica* is cultivated as an ornamental throughout the tropics and subtropics.

***Asclepias curassavica* L.**

(derived from the name of Curaçao island in the southern Caribbean Sea,
where the plant was first collected)

Sp. Pl. 1 (1753) 215; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 530; Ridley, Fl. Malay Penins. 2 (1923) 379; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 147; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 16, 104, 264. **Type:** *Collector unknown s.n.*, Curaçao (lectotype LINN [Herb. Linn. no. 310.19], designated by Woodson, Ann. Missouri Bot. Gard. 41 (1954) 59). **Fig. 43.**

Herb with woody base and white latex in all vegetative parts. **Roots** fibrous, basal. **Stems** erect, to 1 m tall, branched or unbranched; leafy stems terete, 3–6 mm in diam., mid green when young, later dark brownish green, sparsely pubescent, more pubescent at nodes; turning glabrescent when old; internodes (1–)2.5–5(–10) cm long. **Leaves:** petiole cylindrical, channelled above, 7–15 mm long, 1–1.2 mm in diam., sparsely pubescent when young; lamina herbaceous, elliptic-lanceolate, (5–)10–12 × 1–3 cm, apex acute to acuminate, base acute or acuminate, mid green above, glabrous, paler green underneath with paler midrib, glabrous with sparsely pubescent midrib, midrib raised on adaxial surface, secondary veins 7–10(–15) on each side. **Inflorescences** simple corymbs, bearing 5–15 flowers; peduncle extra-axillary or terminal, negatively geotropic, 2–6 cm long, 0.8–1 mm in diam., sparsely pubescent; pedicels filiform, 1.2–2.5 cm long, 0.3–0.5 mm in diam., sparsely pubescent. **Calyx** 6–8 mm in diam., lobes free, lanceolate, 3.5–5 × c. 1 mm, apex acute, outside pubescent, inside glabrous; calycine collectors 1 at each calyx lobe sinus. **Corolla** reflexed, 7–10 mm in diam., orange-red or yellow; tube 1–1.5 mm long, glabrous outside, papillose inside; lobes elliptic, 5–8 × 2–3 mm, apex acute, glabrous. **Corolline corona** absent. **Staminal corona** stipitate, 5–6 mm high × 3.5–4 mm wide, yellow-orange, stipe 2–2.5 × 0.8–1 mm diam.; corona lobes erect, outer process spoon-shaped, 3–3.5 mm long, inner process acuminate, c. 1.5 mm long, incurved over the style head. **Pollinia** pendulous, clavate 950–1050 × 300–350 µm, base acute, apex rounded, corpusculum ovate, c. 300 × 220 µm, caudicles ribbon-shaped, c. 600 µm long. **Style head** capitate, c. 2 mm long. **Ovary** conical, 1–1.5 mm long, 0.5–0.81 mm in basal diameter. **Fruit** a follicle, single or paired, fusiform, 6–10 × c. 1 cm, base with pedicel attached straight, apex acuminate. **Seeds** broadly elliptic c. 7 × 5 mm, long comose, coma 2–3 cm long.

Distribution. Native to South America. Formerly naturalised in Katong (*Hullett 124*, Nov 1883, SING [SING0037652]), Bukit Timah (*Ridley s.n.*, 1898, SING [SING0037653]) and Chan Chu Kang (*Ridley s.n.*, 1898, SING [SING0037654]).

Ecology. Cultivated and formerly naturalising in Singapore. It is still commonly planted along roadsides and in parks because it is a host plant for caterpillars. Currently it does not appear to naturalise, likely due to intensive management of parks.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.



Figure 43. *Asclepias curassavica* L. **A.** Plant, from above (red form). **B.** Inflorescence (red form). **C.** Inflorescence (yellow form). **D.** Inflorescence, from above (yellow form). (Cultivated in Singapore Botanic Gardens. Photos: M. Rodda)

Vernacular names. *Tropical milkweed, blood flower* (English), *bunga mas* (Malay).

23. CYNANCHUM L.

(Greek, *cyno-* = dog, *-anchum* = to strangle; the dog strangling vine)

Dog-strangling vine (English)

Sp. Pl. 1 (1753) 212; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 533; Ridley, Fl. Malay Penins. 2 (1923) 381; Liede, Blumea 44 (1999) 472; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 377. **Type:** *Cynanchum acutum* L., lectotype designated by Meyer, Comm. Pl. Afr. Austr. (1838) 216.

Raphistemma Wall., Pl. Asiat. Rar. 2 (1831) 50, t. 163. **Type:** *Raphistemma pulchellum* (Roxb.) Wall. (= *Cynanchum pulchellum* (Roxb.) Liede & Khanum).

For additional synonyms see Khanum et al., Taxon 65 (2016) 477.

Terrestrial climbers; latex white. **Roots** fibrous, basal. **Branches** glabrous or sparsely pubescent, twining, ascending or pendulous. **Leaves** opposite, petiolate; lamina herbaceous, entire, ovate to lanceolate; colleters at lamina base present, prophylls present. **Inflorescences** spirally-elongating racemes; peduncle extra-axillary, glabrous or pubescent along a single line. **Calyx** lobes free, colleters absent. **Corolla** rotate, lobes subvalvate; tube present or absent, lobes oblong. **Corolline corona** absent. **Stamens** inserted at the base of the tube, not included within the tube, connate into a gynostegium. **Gynostegial corona** staminal and interstaminal, tubular. **Pollinarium** with pendulous pollinia lacking pellucid margins. **Style head** umbonate. **Ovary** glabrous. **Fruit** follicle, single or paired, fusiform, glabrous, many-seeded. **Seeds** compressed ovate, with a coma.

Distribution. Cosmopolitan, found in tropical and subtropical regions. Most diverse in Africa and Asia with overall c. 250 species. In Singapore 2 species, one native and one likely to be recently naturalised.

Ecology. In Singapore *Cynanchum ovalifolium* Wight is found on roadsides and secondary vegetation while *C. tunicatum* is an introduced weed which is naturalising in disturbed habitats.

Uses. Some species are poisonous, others are used in traditional Chinese medicine.

Taxonomy. *Cynanchum* was revised in Malesia by Liede (Blumea 44 (1999) 471–495) and included nine species and one subspecies. The circumscription of *Cynanchum* was later greatly expanded by Khanum et al. (Taxon 65 (2016) 467–486) to include 11 other genera, including *Raphistemma* Wall. (two species), a genus not occurring in Singapore but found elsewhere in Malesia.

Notes. This is a particularly variable genus and the description above applies only to the species as found in Singapore. Elsewhere the plants may be succulent leafless climbers and the corolla and corona may be different.

Key to *Cynanchum* species

1. Lamina ovate, base rounded or very shallowly cordate; corolla 3.5–5.5 mm long **1. *C. ovalifolium***
 Lamina narrowly ovate to lanceolate, base cordate to deeply cordate; corolla 5–6 mm long **2. *C. tunicatum***

1. *Cynanchum ovalifolium* Wight

(Latin, *ovali-* = ovate, *-folium* = leaf; referring to the ovate leaves)

Contr. Bot. India (1834) 57; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 533; Ridley, Fl. Malay Penins. 2 (1923) 381; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 147; Turner, Gard. Bull. Singapore 45 (1993) 42; Liede, Blumea 44 (1999) 485; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 105, 220. **Synonym:** *Cynoctonum ovalifolium* (Wight) Decne. in De Candolle, Prodr. 8 (1844) 529. **Type:** *Wallich s.n.* [EIC 8226], [Malaysia], Penang, August 1822 (lectotype K-W [K001129292], designated by Liede, Blumea 44 (1999) 485; possible isolectotype K [K000894641]).

Holostemma laeve Blume, Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1055. **Synonyms:** *Cynoctonum blumei* Decne. in De Candolle, Prodr. 8 (1844) 528, nom. illeg. superfl. – *Vincetoxicum laeve* (Blume) Kuntze, Revis. Gen. Pl. 2 (1891) 423. – *Cynanchum laeve* (Blume) K.Schum. in Engler & Prantl, Nat. Pflanzenfam. 4(2) (1895) 252, nom. illeg. non (Michx.) Pers. (1805). **Type:** *Blume s.n.*, [Indonesia], Java, Mt Salak (lectotype L [L0004287], designated by Liede, Blumea 44 (1999) 485).

Cynoctonum formosanum Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 23 (1877) 370. **Synonyms:** *Cynanchum formosanum* (Maxim.) Hemsl., J. Linn. Soc., Bot. 26 (1889) 106. – *Vincetoxicum formosanum* (Maxim.) Kuntze, Revis. Gen. Pl. 2 (1891) 424. – *Cyathella formosana* (Maxim.) C.Y.Wu & D.Z.Li, Acta Phytotax. Sin. 28 (1990) 464. **Type:** *Oldham 333*, Taiwan, Tamsuy (lectotype LE [LE01036909], designated by Rodda, Gard. Bull. Singapore 71 (2019) 71; isolectotypes K [K000872722], P [P032523], S [sheet no. S-G-1845]).

Vincetoxicum discolor Warb., Bot. Jahrb. Syst. 13 (1891) 469. **Type:** *Warburg*, [Indonesia, Papua], ‘Sigar am McCluersgolf, holl. Neu-Guinea’ (type B, destroyed).

Cynoctonum zollingeri Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 479. **Synonym:** *Cynanchum zollingeri* (Miq.) Boerl., Handl. Fl. Ned. Ind. 2(2) (1899) 436. **Type:** *Zollinger 2416*, [Indonesia], Java? (lectotype P [P032525], designated by Rodda, Gard. Bull. Singapore 71 (2019) 72; isolectotype BM [BM000053517]).

Marsdenia javanica Koord. in Koorders-Schumacher, Syst. Verz. 1, Fam. 248 (1911) 8. **Synonym:** *Cynanchum javanicum* (Koord.) Bakh.f., Blumea 6(2) (1950) 369. **Type:** *Koorders 32271*, [Indonesia], Java, Res. Besoeki, Pantjoer Idjen (lectotype BO, designated by Liede, Blumea 44 (1999) 485; isolectotype L [L.2704738]).

Cynanchum luzonicum Schltr., Feddes Repert. 12 (1915) 538. **Type:** *Merrill 7702*, Philippines, Luzon, Bontoc (lectotype BM [BM000053507], designated by Liede, Blumea 44 (1999) 485; isolectotype US [US00112319]).

Cynanchum crassifolium Hatus., Hokuriku J. Bot. 12 (1963) 9, nom. illeg. non *Cynanchum crassifolium* R.Br. (1809). **Replaced synonym:** *Cynanchum hatusimae* P.T.Li, J. S. China Agric. Univ. 12(3) (1991) 41, as '*hatusimai*'. **Type:** Suzuki 9391, Taiwan (holotype KAG [KAG005926]).

Cynanchum formosanum (Maxim.) Hemsl. var. *ovalifolium* Tsiang & P.T.Li, Acta Phytotax. Sin. 12 (1974) 109. **Synonym:** *Cyathella formosana* (Maxim.) C.Y.Wu & D.Z.Li var. *ovalifolia* (Tsiang & P.T.Li) C.Y.Wu & D.Z.Li, Acta Phytotax. Sin. 28 (1990) 465. **Type:** Suzuki 11935, Taiwan, Mt Kwan-Non (Herb. Bot. Inst. Kwangtung, n.v.)

Terrestrial climber with white latex in all vegetative parts. **Roots** fibrous, basal. **Stems** ascending or pendulous to 5 m long; leafy stems terete, 1–2 mm in diam., glabrous; internodes (5–)10–20 cm long. **Prophylls** ovate, (5–)7–10 × (5–)7–10 mm, sometimes missing. **Leaves:** petiole cylindrical, slightly channelled above, (5–)10–20 mm long, 0.8–1.2 mm in diam., sparsely pubescent above; lamina herbaceous, ovate, (3–)5–10 × (1–)2–6 cm, apex acuminate or apiculate, base rounded or very shallowly cordate, pubescent when young underneath along the midrib, otherwise glabrous, midrib raised on adaxial surface, secondary veins 3–8 on each side; colleters 2–3(–4) at the base of each lamina, ovate 0.2–0.3 mm long. **Inflorescences** spirally-elongating racemes, bearing 1–5 open flowers; peduncle extra-axillary, 15–35 mm long, 1–1.2 mm in diam., pubescent along a single line, hairs 250–300 µm long; floral bracts triangular, c. 1.5 × 0.6 mm wide at the base, glabrous; pedicels 5–12 mm long, c. 1.5 mm in diam., sparsely pubescent. **Calyx** 3–4 mm in diam., lobes free, ovate 1.2–2 × 1–1.5 mm, apex obtuse, outside pubescent, ciliate, inside glabrous; calycine colleters not observed. **Corolla** rotate, 3.5–5.5 mm long (6–7 mm wide), outside cream, inside brown; tube c. 1 mm long, glabrous; lobes oblong, 3–4 × c. 1.5 mm, glabrous, apex obtuse. **Staminal and interstaminal corona** tubular, fused for more than 3/4 of corona length, 3–4 mm in diam., 3–4 mm high, cream-white, staminal and interstaminal apices laminar, triangular, flat, apically erect with lacerate margins. **Gynostegium** short-columnar, 2–2.5 mm high, 2–2.5 mm diam; style head c. 1.5 mm diam., c. 0.5 mm high; **pollinia** pendulous, oblong, 350–400 × 200–300 µm, apex and base rounded; corpusculum ovoid, 300–400 × 150–200 µm; caudicles flattened, trapezoid, c. 180 µm long. **Anther appendages** membranous, hyaline, apically obtuse, c. 1.5 × 1.5 mm. **Ovary** oblong, c. 1.5 mm long, c. 0.5 mm in basal diameter, glabrous. **Fruit** a single follicle, fusiform, 9–13 × 1.5–2 cm base with pedicel laterally attached, glabrous, apex beaked. **Seeds** ovate, flattened, 6–8 × 4–5 mm, coma 2–4 cm long.

Distribution. The most widespread species of *Cynanchum* in Malesia, occurring in India, Taiwan, Thailand, Peninsular Malaysia, Sumatra, Java, Borneo, Sulawesi, Philippines, Moluccas, New Guinea and Australia. In Singapore the most recent collection is from Pulau Tekong (*Samsuri et al.* 68, 1 Nov 2001, SING [SING0039745]). In the past it was more common and also collected along Holland Road (*Ridley 11456*, 1902, SING [SING0080206]), Balestier Road (*Ridley s.n.*, 1899, SING [SING0080205]), Bukit Timah (*Ridley s.n.*, 1890, SING [SING0080203]) and Bukit Panjang (*Ridley s.n.*, 10 Jan 1889, SING [SING0003961]).

Ecology. Formerly found on roadsides and secondary vegetation including grassland, currently occurring in secondary forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. It is assessed here as Critically Endangered (CR/D) in Singapore.

Vernacular names. *Akar rambut Chambang, akar banok jantan, selampayan bukit, sembukan* (Malay).

Notes. The Singapore specimens available are very poor, therefore the flower description has been expanded from the description in Liede (*Blumea* 44 (1999) 471–495) and on Malaysian and Thai materials. The species is discussed and illustrated in Forster (*Austrobaileya* 3(3) (1991) 458–460, fig. 8).

2. *Cynanchum tunicatum* (Retz.) Alston

(Latin *tunicatus*, tunicate or with a coat; referring to the corona enveloping the gynostegium)

in Trimen, *Handb. Fl. Ceylon* 6, Suppl. (1931) 194. **Basionym:** *Periploca tunicata* Retz., *Observ. Bot.* 2 (1781) 15. **Synonym:** *Vincetoxicum tunicatum* (Retz.) Kuntze, *Revis. Gen. Pl.* 2 (1891) 423. **Type:** *Koenig s.n.*, [India, Tamil Nadu] ‘E Tranquebaria misit optimus König’ (lectotype LD [LD1731246] designated by Fischer, *Bull. Misc. Inform. Kew* 1932 (1932) 60). **Fig. 44.**

Terrestrial climber with white latex in all vegetative parts. **Roots** fibrous, basal. **Stems** twining or pendulous to 5 m long; leafy stems terete, 0.5–2 mm in diam., glabrous, or very sparsely pubescent when young; internodes (3–)5–15(–20) cm long. **Prophylls** round, 2–10 mm in diam. **Leaves:** petiole cylindrical, channelled above, 10–40 mm long, 0.8–1 mm in diam., pubescent above; lamina herbaceous, narrowly ovate to lanceolate (3–)5–10(–15) × 2–5(–7) cm, apex acuminate or apiculate, base cordate to deeply cordate, pubescent when young above, underneath glabrous, secondary veins 4–8 on each side; colleters 3–5 at each lamina base, conical, 0.3–0.5 mm long. **Inflorescences** spirally-elongating racemes, bearing 1–3 open flowers; peduncle extra-axillary, 4–15 mm long, 0.5–1 mm in diam., glabrous; floral bracts triangular, 1.5–2.5 × c. 0.5 mm wide at the base, glabrous; pedicel 3–5 mm long, c. 0.5 mm in diam., glabrous. **Calyx** 3.5–4.5 mm in diam., lobes free, triangular 1.5–2 × 0.8–1 mm, apex acuminate, glabrous, ciliate, greenish red; calycine colleters not observed. **Corolla** rotate, 5–6 mm long (6–8 mm wide), outside yellowish green; lobes free, oblong, 3–4 × c. 1.5 mm, glabrous, apex round. **Staminal** and **interstaminal corona** tubular, fused for about 2/3 of corona length, 2.5–3 mm in diam., 4–5 mm high, cream-white, interstaminal apices triangular, c. 1.5 mm long, acuminate; staminal apices triangular, c. 0.2 mm long, obtuse. **Gynostegium** conical-truncate, 1.7–1.9 mm high, c. 1.5 mm diam.; style head c. 0.8 mm diam., c. 0.5 mm high; **pollinia** pendulous, elliptic, 280–320 × 150–180 μm, apex and base rounded; corpusculum ovoid, c. 200 × 100 μm; caudicles triangular, c. 100 μm long. **Anther appendages** membranous, hyaline, apically acute, c. 0.7 × 0.5 mm. **Ovary** conical, c. 0.7 mm long, c. 0.4 mm in basal diameter, glabrous. **Fruit** of usually paired follicles, fusiform, 4–7 × 0.5–0.8 cm, glabrous, apex truncate. **Seeds** ovate, flattened, 5–6 × 3–4 mm, coma 2–4 cm long.

Distribution. Native to India. Naturalised in Singapore where it occurs on Coney island (*Samsuri et al. SING2004-39*, 28 Sep 2004, SING [SING0057839]), Pulau Sudong (*Lua et al. SING2015-255*, 16 Oct 2015, SING [SING0231898]), Pulau Ubin (*Rodda MR12-036*, 18 Apr.

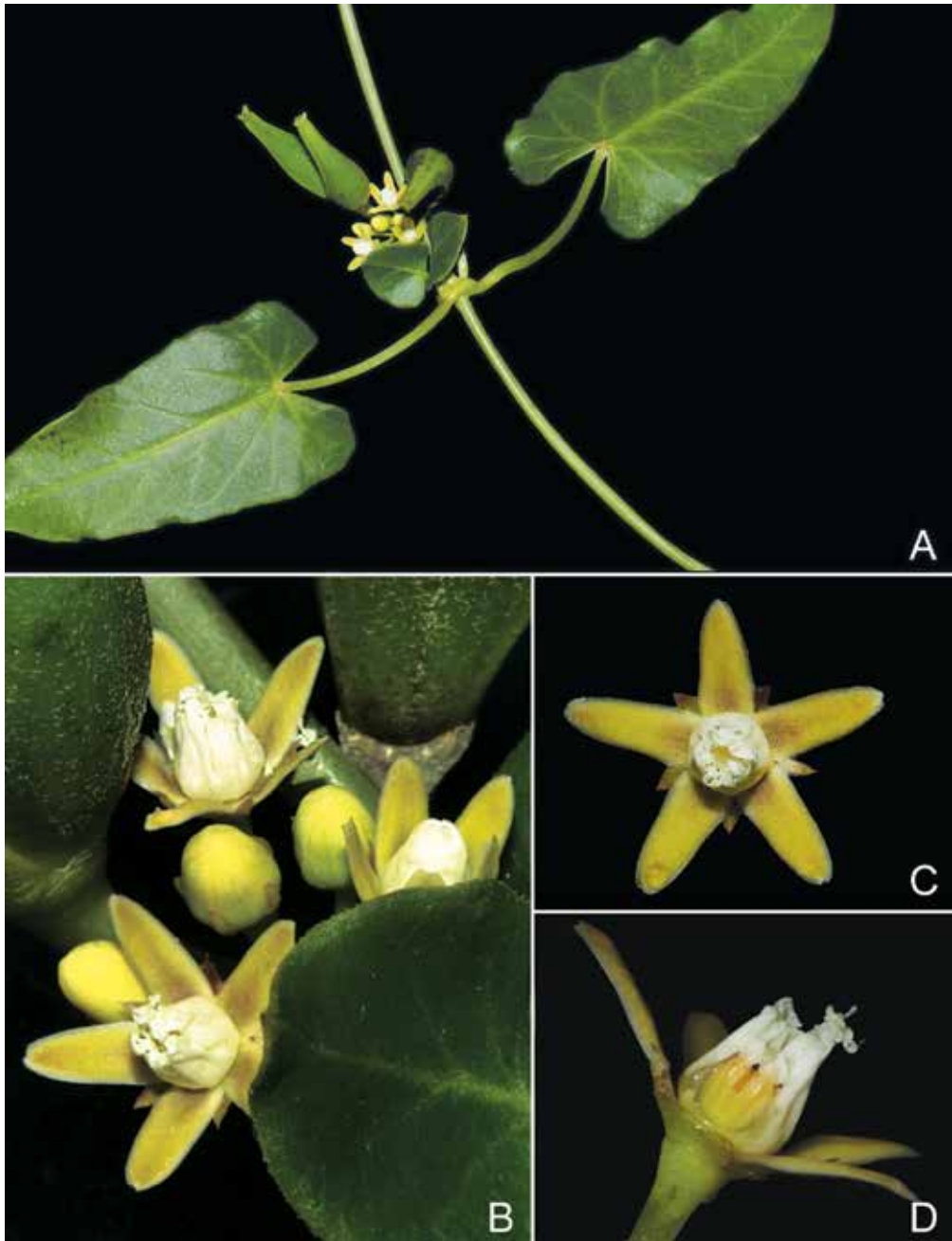


Figure 44. *Cynanchum tunicatum* (Retz.) Alston **A.** Fertile branch with flowers and follicles subtended by prophylls. **B.** Inflorescence detail with open flowers and buds. **C.** Flower, top view. **D.** flower, side view with one corolla lobe and part of the corona removed exposing the gynostegium. (From Singapore, Changi, Rodda & Niissalo MR1836. Photos: M. Rodda).

2012, SING [SING0266613]) and in Changi (*Rodda & Niissalo MRI836*, 5 Nov 2018, SING [SING0266612]).

Ecology. In Singapore the species appears to be an introduced weed and it is found in disturbed habitats such as construction sites, on fences and along sandy shores.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.

Notes. All Singapore collections have been made fairly recently (the earliest collection is from 2004) suggesting it has only recently been introduced, possibly with construction materials.

24. DISCHIDIA R.Br.

(Greek, *dis* = two, Greek, *askidion* = ascidium; referring to the leaves which in some species develop into pitchers)

Prodr. Fl. Nov. Holland. (1810); King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 580; Ridley, Fl. Malay Penins. 2 (1923) 402; Rintz, Blumea 26 (1980) 83; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 330. **Type:** *Dischidia nummularia* R.Br.

Collyris Vahl, Skr. Naturhist.-Selsk. 6 (1810) 110. **Type:** *Collyris major* Vahl, lectotype designated by Panigrahi, Bangladesh J. Bot. 15 (1986) 195 (= *Dischidia major* (Vahl) Merr.).

Conchophyllum Blume, Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1060. **Type:** *Conchophyllum imbricatum* Blume, lectotype designated by Hoffmann et al. in Albers & Meve, Ill. Handb. Succ. Pl. Asclepiadaceae (2002) 118 (= *Dischidia imbricata* (Blume) Steud.).

Leptostemma Blume, Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1057. **Type:** *Leptostemma hirsutum* Blume, lectotype designated by Rodda, Gard. Bull. Singapore 71 (2019) 77 (= *Dischidia hirsuta* (Blume) Decne.).

Dischidiopsis Schltr. in Perkins (ed.), Fragm. Fl. Philipp. 2 (1904) 128. **Type:** *Dischidiopsis philippinensis* Schltr. (combination in *Dischidia* pending).

Spathidolepis Schltr. in Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee (1905) 356. **Type:** *Spathidolepis torricellensis* Schltr. (= *Dischidia torricellensis* (Schltr.) P.I.Forst.).

Oistonema Schltr., Bot. Jahrb. Syst. 40(3, Beibl. 92) (1908) 12. **Type:** *Oistonema dischidioides* Schltr. (combination in *Dischidia* pending).

Dolichostegia Schltr., Repert. Spec. Nov. Regni Veg. 13(381–384) (1915) 554. **Type:** *Dolichostegia boholensis* Schltr. (= *Dischidia boholensis* (Schltr.) Livsh.).

Hoyella Ridl., J. Fed. Malay States Mus. 8(4) (1917) 62. **Type:** *Hoyella rosea* Ridl. (= *Dischidia hoyella* Omlor).

Epiphytic or rarely hemi-epiphytic succulent herb or vine; latex white. **Roots** fibrous, mostly adventitious. **Branches** glabrous or pubescent, twining or pendulous, sometimes leafless. **Leaves** opposite (rarely alternate), petiolate or sessile; lamina succulent, flat (orbicular,

reniform, ovate, elliptic or lanceolate), adaxially concave and abaxially convex, or pitcher-like, glabrous or pubescent; colleters at lamina base generally present, prophylls absent. **Inflorescences** spirally-elongating often sessile racemes, branched or unbranched; peduncle extra-axillary, glabrous or pubescent. **Calyx** lobes free and spreading, colleters present or absent inside. **Corolla** urceolate or tubular, lobes valvate; tube present, lobes triangular. **Corolline corona** present or absent. **Stamens** inserted at the base of the tube completely included within the tube, connate into a gynostegium. **Gynostegial corona** staminal with 5 erect stalked lobes with two downcurved apices. **Pollinarium** with erect pollinia lacking pellucid margins. **Style head** conical or flat, with oblong, acute or acuminate tip. **Ovary** glabrous. **Fruit** of single or paired follicles, fusiform, glabrous, many-seeded. **Seeds** compressed ovate, with a coma.

Distribution. *Dischidia* (c. 80 species) species occur from northern India and southern China, throughout continental Southeast Asia, Malaysia and northern Australia to the Pacific islands. In Singapore 10 species, one of which is not native (see also Excluded species).

Ecology. Epiphytic and lithophytic (not in Singapore), pendulous or climbing. Often the plants grow out of the nests of ants in the genera *Crematogaster* and *Pholidris*, and ants also live underneath abaxially convex leaves or inside modified abaxially convex or pitcher-shaped leaves (Kaufmann et al., Insectes Soc. 48 (2001) 125–133; Livshultz et al., Blumea 50 (2005) 113–134). The seeds are usually wind dispersed but dispersal is also mediated by ants (Livshultz et al., Blumea 50 (2005) 113–134).

Uses. *Dischidia* is commonly used in traditional medicine in Southeast Asia. Latex and leaves are applied externally to treat ringworm, eczema, herpes, burns, wounds and goitre. Decoctions of leaves and whole plants are taken internally to treat gonorrhoea, framboesia (yaws), liver dysfunction and peptic ulcers, and as an anti-inflammatory. A decoction of the roots is used to treat coughs.

Taxonomy. The circumscription of *Dischidia* has been expanded to include seven segregate genera: *Collyris* Vahl, *Conchophyllum* Blume, *Leptostemma* Blume, *Oistonema* Schltr., *Dischidiopsis* Schltr., *Spathidolepis* Schltr. (monotypic), *Hoyella* Ridl, and *Dolichostegia* Schltr. (Omlor, Gen. Revis. Marsdenieae, 1998; Livshultz, Systematics of *Dischidia* R.Br. (Apocynaceae, Asclepiadoideae). Ph.D. Dissertation. Cornell University, 2003). The most recently published phylogeny to include *Dischidia* species (Wanntorp et al., Taxon 63 (2014) 89–102) does not confirm the monophyly of *Hoya* relative to *Dischidia* since the latter was designated as the outgroup. In a taxonomically reduced dataset (their fig. 5A), *Dischidia* is nested within *Hoya* but with minimal bootstrap support.

Taxonomic revisions are available for Peninsular Malaysia (Rintz, Blumea 26 (1980) 81–126) and Thailand (Thaithong et al., Handb. Asclepiads Thailand (2018) 112–147).

Key to *Dischidia* species

1. Lamina of two types, the first laminar, flat, the other pitcher-shaped 2
- Lamina of one type, laminar, flat or abaxially convex 3

2. Pitcher-shaped leaves orbicular, 2–6 × 3–6 cm, often with a smaller pitcher inside **6. D. complex**
 Pitcher-shaped leaves oblong, 4.5–10 × 1.5–4.5 cm, without a smaller pitcher inside **8. D. major**
3. Lamina abaxially convex, adpressed to host tree bark 4
 Lamina flat, not adpressed to host tree bark 5
4. Corolla white or white with pink lobes or pale yellow with pink lobes **3. D. albiflora**
 Corolla orange to red, corolla lobe apex blue to purple inside **5. D. cochleata**
5. Lamina elliptic or lanceolate, 4–7 × 1.5–4 cm (to 10 × 5 cm in cultivation) **1. D. acutifolia**
 Lamina lanceolate, obovate, ovate, ovate-elliptic to almost round, to 3(–5) × 1.5 cm 6
6. Leaves sparse along the stems, often not developing at every node **4. D. bengalensis**
 Leaves developing at every node 7
7. Stems and leaves hirsute (glabrescent when old); corolla 4–6 × 3–4 mm, basally dark red, progressively fading into light pink at the lobe apices **7. D. hirsuta**
 Stems glabrous or sparsely pubescent, leaves glabrous; corolla smaller than 4 × 2.5 mm, white or pink 8
8. Lamina lanceolate, obovate to almost round, base cuneate **10. D. oiantha**
 Lamina ovate, ovate-elliptic to almost round, base obtuse or rounded 9
9. Lamina 1–1.9 × 0.6–1.1 cm; corolla tubular **2. D. albida**
 Lamina 0.5–0.8 × 0.4–0.6 cm; corolla urceolate **9. D. nummularia**

1. *Dischidia acutifolia* Maingay ex Hook.f.

(Latin, *acuti-* = acute, *-folia* = leaves; referring to the acute leaf apex)

Fl. Brit. India 4, fasc. 10 (1883) 51; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 590; Ridley, Fl. Malay Penins. 2 (1923) 408; Rintz, Blumea 26 (1980) 101; Rodda et al., Gard. Bull. Singapore 67 (2015) 30. **Type:** *Maingay 1960* [Kew Distribution 1122], [Malaysia], Malacca (lectotype K [K000911032], designated by Rintz, Blumea 26 (1980) 101). **Fig. 45.**

Dischidia zollingeri Schltr., Bot. Jahrb. Syst. 40(3, Beibl. 92) (1908) 11. **Type:** *Zollinger 2490*, [Indonesia], Java (lectotype B [B 10 0003227], designated by Rintz, Blumea 26 (1980) 101).

Dischidia brachystele Schltr., Repert. Spec. Nov. Regni Veg. 13(381–384) (1915) 555. **Type:** *Merrill s.n.*, Philippines, Luzon, Bataan, Lamao River (lectotype B [B 10 0003228], designated by Rintz, Blumea 26 (1980) 101).

Dischidia hoyoides Schltr., Beih. Bot. Centralbl. 34(2) (1916) 9. **Type:** *Schlechter 20695*, [Indonesia, Sulawesi], Hugel, Toli-Toli, c. 300 m (lectotype B [B 10 0003201], designated by Rintz, *Blumea* 26 (1980) 101).

Dischidia pedunculata Schltr., Beih. Bot. Centralbl. 34(2) (1916) 10. **Type:** *Schlechter 15884*, [Indonesia], Sumatra, Padang, Tambangan, c. 1000 m (lectotype B [B 10 0003229], designated by Rintz, *Blumea* 26 (1980) 101).

Epiphytic or hemi-epiphytic climber, herbaceous, glabrous. **Roots** on mature plants adventitious, produced at the node, along the internodes and just below each node, where they are sometimes paired. **Stems** loosely rooted along the host tree stems, clinging by adventitious roots, rarely pendulous. **Stems** terete, 1–2.5 mm diam., dark green; internodes (2–)5–20(–25) cm long. **Leaves:** petiole cylindrical, slightly flattened above, 4–7 mm long, 1.5–2 mm in diam.; lamina fleshy, stiff (less so in cultivation), ovate, elliptic or lanceolate, 4–7 × 1.5–4 cm (to 10 × 5 cm in cultivation), apex acute-apiculate, base (round) acute, above dark green, underneath lighter green with darker midrib and margin, midrib and secondary veins slightly raised on adaxial surface, secondary veins 3–6 pairs, branching at 35–60° from midrib. **Inflorescences** simple or branched racemes, usually bearing a single open flower at a time (up to 5 in cultivation) and 2–4 developing buds; peduncle extra-axillary or apparently axillary when borne on very short shoots, persistent, rachis bearing scars of previous flowerings 2–5 mm long, 1.5–2.5 mm in diam. (to 2 cm long in cultivation); pedicels 0.6–0.8 mm long, c. 0.6 mm in diam. **Calyx** c. 2 mm in diam., green, lobes ovate (rarely round), 0.6–0.8 × 0.5–0.8 mm, apex rounded, sparsely ciliate; calycine colleters 1 or 2 at each calyx lobe sinus, ovate, with a round apex, 100–120 × 80–100 µm. **Corolla** succulent, urceolate, 3.5–4 × 2–2.5 mm, basally lighter yellow, progressively fading into light pink or white at the lobe apices, externally glabrous, corolla throat with one ring of retrorse hairs; lobes triangular, 0.5–0.7 × c. 0.6 mm, apex acute. **Corolline corona** absent. **Staminal corona** lobes 1.5–1.7 mm high, c. 1.5 mm in diam., composed of five light yellow appendages shaped like an inverted anchor with a stipe and lunate apex. **Pollinia** 230–250 × 90–100 µm, apex and base rounded to obtuse; corpusculum 170–190 × 60–70 µm; caudicles elongated, laterally crested, 250–270 µm long. **Anther appendages** membranous, hyaline, apically acute, c. 0.3 × 0.3 mm. **Style head** conical, hidden by the anther appendages. **Ovary** bi-carpellate, conical, 1–1.5 mm long, each carpel c. 0.7 mm in basal diameter. **Fruits** and **seeds** not seen.

Distribution. A very widespread species, occurring in continental Southeast Asia, Sumatra, Java, Borneo, Sulawesi, Philippines, Moluccas and New Guinea. In Singapore it is a recent discovery but nevertheless assumed to be native. It was first collected in 2013 at Sungei Buloh (*Rodda et al. MR898*, 30 Oct 2014, SING [SING0266614]).

Ecology. An epiphytic or hemi-epiphytic delicate vine in lowland primary and secondary forests in the understorey.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from a single individual at a single locality.



Figure 45. *Dischidia acutifolia* Maingay ex Hook.f. **A.** Leafy branch with peduncles and small buds. **B.** Inflorescence with buds. **C.** Inflorescence with open flowers. (From Singapore, Sungei Buloh, Rodda *et al.* MR898. Photos: M. Rodda).

2. *Dischidia albida* Griff.

(Latin *albidus* = somewhat white, whitish;
referring to the colour of the flowers)

Not. Pl. Asiat. 4 (1854) 46; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 588; Ridley, Fl. Malay Penins. 2 (1923) 407; Rintz, Blumea 26 (1980) 100; Turner, Gard. Bull. Singapore 45 (1993) 42; Hoffmann *et al.* in Albers & Meve, Ill. Handb. Succ. Pl. Asclepiadaceae (2002) 119; Tan *et al.* in Davison *et al.* (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong *et al.*, Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 204. **Type:** *Griffith 3781*, [Malaysia], Malacca (lectotype K [K000911035], designated by Rintz, Blumea 26 (1980) 100).

Dischidia kawengica Schltr., Beih. Bot. Centralbl. 34(2) (1916) 9. **Type:** *Schlechter 20597*, [Indonesia, Sulawesi], Minahassa, Kaweng mountain, c. 1000 m (B [B 10 0003211], designated by Rintz, Blumea 26 (1980) 100).

Dischidia semperflorens Schltr., Beih. Bot. Centralbl. 34(2) (1916) 12. **Type:** *Schlechter 15873*, [Indonesia], Sumatra, Padang Pandjang, c. 800 m (lectotype B [B 10 0003212], designated by Rintz, Blumea 26 (1980) 100).

Dischidia lagenifera Ridl., J. Fed. Malay States Mus. 8(4) (1917) 63. **Type:** *Ridley s.n.*, [Indonesia], Sumatra (not traced).

Dischidia fultonii M.R.Hend., Gard. Bull. Straits Settlements. 4(2&3) (1927) 51. **Type:** *Holtum 10727*, Malaysia, Johore, Gunung Belumut, 3000 ft. [914 m] (lectotype SING [SING0015010], designated by Rintz, Blumea 26 (1980) 100).

Epiphytic climber. **Roots** adventitious, arising just below the nodes and along the stems. **Stems** twining or pendulous or adpressed to host plant to 2 m long; leafy stems terete, 0.7–1.5 mm in diam., pale green when young; glabrous or sparsely pubescent, internodes (1–)2–6 cm long. **Leaves:** petiole cylindrical, channelled above, 1–4 mm long, 0.6–1 mm in diam., sparsely pubescent when young; lamina fleshy, coriaceous, ovate, ovate-elliptic, 1–1.9 × 0.6–1.1 cm, pale to mid green above, lighter green underneath, apex acute, base obtuse to round, glabrous, venation pinnate, lateral veins obscure; colleters not observed on mature leaves. **Inflorescences** simple racemes, bearing 1–5 flowers; peduncle extra-axillary, persistent, (0.1–)2–5 cm long, 0.8–1 mm in diam., glabrous, rachis bearing scars of previous flowerings; bracts attached at base of pedicel, triangular, c. 0.5 × 0.3 mm, apex acute, glabrous; pedicels 0.8–2 mm long, 0.3–0.4 mm in diam., glabrous. **Calyx** c. 2.5 mm in diam., lobes free, oblong, 0.7–1 × 0.3–0.4 mm, apex round or acute, glabrous; calycine colleters one at each calyx lobe sinus, ovate, c. 0.1 mm long. **Corolla** cylindrical, 2.8–4 mm long, 1.5–2.5 mm in diam.; corolla tube 3.5–3.5 mm long, inflated at base, cream or pinkish white, glabrous; lobes triangular, 0.8–1 × 0.5–0.6 mm, pink, inside pubescent at the base, outside glabrous. **Corolline corona** absent. **Staminal corona** 1–1.2 mm in diam., 1.3–1.5 mm high, corona stipitate, stipe 0.2–0.3 mm tall, lobes anchor-shaped, c. 1.5 × 1 mm, stalked. **Pollinia** ellipsoid, 0.3–0.4 × 0.10–0.12 µm, apex and base rounded; corpusculum oblong, c. 0.2 × 0.05 mm; caudicles broadly spatulate, 0.15–0.2 mm long. **Anther appendages** membranous, hyaline, apically round, c. 0.5 × 0.3 mm. **Style head** conical c. 1 mm in diam., style head apex oblong, c. 1 mm long. **Ovary** conical, 0.8–1 mm long, c. 0.4 mm in basal diameter, glabrous. **Fruit** a single follicle, linear, 5–6 × 0.2–0.3 cm, apex acuminate. **Seeds** 2.5–3 × c. 0.5 mm, long comose, coma 3–4 cm long.

Distribution. India, Myanmar, Thailand, Peninsular Malaysia, Borneo and Sulawesi. In Singapore it has only been collected at Bajau (*Ridley s.n.*, SING [SING0037674]).

Ecology. An epiphytic vine in lowland primary and secondary forests in the understorey.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. In Singapore presumed Nationally Extinct.

Notes. Rintz (Blumea 26 (1980) 100) indicated *Dischidia kutcinensis* Becc. as a synonym of *D. albida*. This is erroneous and the species is here reinstated as a Bornean species easily separated from *Dischidia albida* by its very succulent glaucous leaves and very short to almost absent peduncles. The Singapore record of *Dischidia albida* is based on a single sterile specimen. The description of the flowers is based on specimens from Peninsular Malaysia and Thailand.

3. *Dischidia albiflora* Griff.

(Latin, *albi*- = white, *-flora* = flowers; referring to the white flower)

Not. Pl. Asiat. 4 (1854) 47; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 588; Rintz, Blumea 26 (1980) 94; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 42; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 204. **Type:** *Griffith 3779*, [Malaysia], Malacca, Tabong (lectotype K [K000911047], designated by Rintz, Blumea 26 (1980) 94).

Dischidia borneensis Becc., Malesia 2(3) (1886) 262. **Type:** *Beccari PB793*, [Malaysia], Sarawak, Kuching (lectotype FI [FI008057], designated by Rodda, Gard. Bull. Singapore 71 (2019) 72; isolectotypes K [K000911025], M [M-0031479]).

Dischidia borneensis Becc. var. *pilosa* Becc., Malesia 2(3) (1886) 263. **Type:** *Beccari PB6564*, [Malaysia], Sarawak, Undup [lectotype FI [FI013046], designated by Rodda, Gard. Bull. Singapore 71 (2019) 72).

Dischidia collyris auct. non Wall.: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 583; Ridley, Fl. Malay Penins. 2 (1923) 404.

Epiphytic climber. Wax chimneys present on old stems and leaves. **Roots** fibrous, adventitious mostly produced just below the nodes and developing underneath the leaves. **Stems** adpressed to the host plant; leafy stems terete, 2–3 mm in diam., mid green, glaucous, glabrous, papillose; internodes 1.5–3(–7) cm long. **Leaves** subsessile, petiole cylindrical, slightly channelled above, 0–1.5 mm long, c. 1 mm in diam., glabrous; lamina fleshy, stiff, orbicular or reniform, abaxially convex, 10–35 × 10–40 mm, apex obtuse, base cordate or very slightly peltate, mid green above, pubescent, glaucous green underneath, pubescent, pubescence often lost on old specimens, venation pinnate, secondary venation indistinct; colleters at lamina base not observed. **Inflorescences** simple or bifid racemes, bearing 3–5 flowers held erect; peduncle extra-axillary, persistent, 0–7 mm long, 0.7–2 mm in diam., glabrous, rachis bearing scars of previous flowerings, 1–2 mm in diam., to 5 mm long; bracts glabrous or puberulent, sometimes ciliate; pedicels 1–1.2 cm long, 0.5–1 mm in diam., sparsely pubescent. **Calyx** c. 2 mm in diam., lobes free, ovate, 0.7–0.9 × 0.6–0.7 mm, apex obtuse to acute, outside sparsely pubescent, inside glabrous, ciliate; calycine colleters present. **Corolla** urceolate, 2–3 mm long, c. 2.5 mm in diam., white or white with pink lobes or pale yellow with pink lobes, abaxially glabrous; tube c. 1.5 mm, glabrous; lobes triangular, 1–1.4 × 0.8–0.9 mm, apex cucullate, sparsely ciliate. **Corolline corona** annular, right below lobe sinuses, thicker opposite corolla lobe sinuses. **Staminal corona** 0.7–0.8 mm in diam., 1–1.2 mm high, stipe c. 0.2 mm high, staminal corona lobes anchor-shaped, c. 0.5 × 0.5 mm, stalked. **Pollinia** obovate, 200–220 × 80–100 µm, apex and base obtuse; corpusculum 160–180 × 50–60 µm, apex obtuse; caudicles 200–220 × 80–100 µm. **Anther appendages** membranous, hyaline, not covering the style head apex. **Style head** conical, 0.5–0.7 mm in diam., style head apex oblong c. 1 mm long. **Ovary** conical, c. 1 mm long, c. 0.5 mm in basal diameter, glabrous. **Fruit** a follicle, fusiform, lunate, 5–6 × 0.3–0.5 cm, sparsely pubescent, base with pedicel laterally attached, apex acuminate, recurved. **Seeds** c. 3.5 × 0.5 mm, long comose, coma c. 3 cm long.

Distribution. Peninsular Malaysia, Sumatra and Borneo. In Singapore it has been collected on Jurong Road, 12th mile (*Burkill 3505*, 28 Oct 1918, K, SING [SING0003896]), Chan Chu Kang (*Ridley 2728*, 1891, SING [SING0003894]) and Kranji (*Ridley s.n.*, 17 Jan 1889, SING [SING0003893]).

Ecology. Found in the canopy in lowland dipterocarp forest, associated with ants which nest underneath the abaxially convex leaves.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. In Singapore presumed Nationally Extinct.

Notes. On the folder of *Dischidia albiflora* at Kew, there is an undated note by Ridley stating that the species was common in Singapore. It is possible that Ridley had the chance to observe it frequently on the branches of recently felled trees. Rintz's assertion that *Dischidia albiflora* occurs in Thailand, Burma [Myanmar] and eastern India (Rintz, *Blumea* 26 (1980) 94) is based on the erroneous synonymy of *D. collyris* Wall. with *D. albiflora*.

4. *Dischidia bengalensis* Colebr.

(of Bengal)

Trans. Linn. Soc. London 12 (1818) 357, t. 15 (labelled *Dischidia bengalensis*, not *Strychnos axillaris*); Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 586; Ridley, Fl. Malay Penins. 2 (1923) 405; Rintz, *Blumea* 26 (1980) 97; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 42; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 191. **Type:** [Published illustration] Colebrooke, Trans. Linn. Soc. London 12 (1818) 357, t. 15 (labelled *Dischidia bengalensis*, not *Strychnos axillaris*), lectotype designated by Rodda, Gard. Bull. Singapore 71 (2019) 72. **Fig. 46.**

Dischidia cuneifolia Wall., Numer. List no. 4206 (1831), nom. nud.

Dischidia bengalensis Colebr. var. *cuneifolia* Kuntze, Revis. Gen. Pl. 2 (1891) 419. **Type:** *Wallich 1946* [EIC 4206], [Myanmar], Attran [Ataran river], 1827 (lectotype K-W [K001038386], designated by Rintz, *Blumea* 26 (1980) 97).

Dischidia loeseneriana Schltr., Beih. Bot. Centralbl. 34(2) (1916) 10. **Type:** *Schlechter 15960*, [Indonesia], Sumatra, Padang, Merapi mountain, Soengei Poea, c. 1200 m (lectotype B [B 10 0003214], designated by Rintz, *Blumea* 26 (1980) 98).

Dischidia pseudobenghalensis Costantin, Fl. Indo-Chine 4, fasc. 1 (1912) 148. **Type:** *Pierre 4521*, Vietnam, Tay Ninh Province, Deon Ba mountain (lectotype P [P00639856], designated by Rodda, Gard. Bull. Singapore 71 (2019) 74; isolectotypes P [P00218978, P00639857]).

Dischidia spathulata Blume, Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1060. **Synonym:** *Dischidia bengalensis* Colebr. var. *spathulata* (Blume) Kuntze, Revis. Gen. Pl. 2 (1891) 419. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L.2725227], designated by Rodda, Gard. Bull. Singapore 71 (2019) 74).



Figure 46. *Dischidia bengalensis* Colebr. **A.** Habit, showing the almost leafless stems. **B.** Flower, side view. (From Malaysia, Sarawak, Bako National Park, *Rodda MR1053*. Photos: M. Rodda).

Epiphytic or hemi-epiphytic glabrous climber. Wax chimneys on old leaves and stems present. **Roots** fibrous, adventitious, produced at or just below the nodes. **Stems** twining, creeping or pendulous to 10 m long, with sparse leaves; leafy stems terete, 1.5–3 mm in diam., mid green to pale yellow, later dark green or greyish brown; stems often partially leafless; internodes (1.5–)5–10(–25) cm long. **Leaves** shortly petiolate to almost sessile, petiole cylindrical, channelled above, (0.5–)1–4 mm long, 1–1.5 mm in diam.; lamina thick, succulent, ovate, 0.8–1.2 × 0.3–0.7 cm, apex obtuse to rounded or slightly retuse (rarely acute), base cuneate, glaucous mid green, venation obscure; colleters at lamina base not observed. **Inflorescences** simple or branched racemes, ageotropic, bearing 1–3(–5) flowers; peduncle extra-axillary, persistent, simple or bifid, 0–1 mm long, 1–1.5 mm in diam., glabrous, rachis bearing scars of previous flowerings; bracts numerous, ovate, c. 0.7 × 0.5 mm, pubescent outside, ciliate; pedicels 2–3 mm long, 0.3–0.5 mm in diam., glabrous. **Calyx** c. 2.5 mm in diam., lobes free, ovate, 0.8–1.2 × 0.5–0.8 mm in diam., glabrous, sometimes ciliate; calycine colleters not observed. **Corolla** urceolate, 2.5–3.5 mm long, 2.5–3 mm wide; tube 1.9–2.2 mm long, inflated, 1.8–3 mm in diam., glabrous, white; lobes fleshy, triangular, spatulate, 0.8–1.2 × 0.5–0.1 mm, white, inside pubescent, apex acute. **Staminal corona** c. 1.5 mm in diam., c. 1 mm high, corona lobes stalked with a retuse apex and 2 recurved spatulate lobes, stalk 0.4–0.5 mm tall, arms recurved, c. 0.4 mm long. **Pollinia** oblong 250–300 × 100–120 μm, apex and base rounded; corpusculum ovate

100–120 × 60–80 µm; caudicles broadly spatulate, c. 120 µm long. **Anther appendages** membranous, hyaline, apically acute, c. 0.7 × 0.5 mm. **Style head** conical c. 1 mm in diam., style head apex acute, c. 0.5 mm long. **Ovary** conical, 1–1.2 mm long, c. 0.4 mm in basal diameter, apex acuminate, glabrous. **Fruit** a single follicle, linear, slightly curved, 5–7 × 0.2–0.4 cm apex acuminate. **Seeds** 1.8–2.2 × 0.3–0.5 mm, coma 1.5–2 cm long.

Distribution. One of the most widespread species of *Dischidia*, found in India, continental Southeast Asia, Sumatra, Borneo and Java. In Singapore it has been collected at Sungei Buloh (*Ridley 2728*, SING [SING0003894]), Kranji (*Ridley 2729*, 9 Jan 1890, SING [SING0003902]), Bukit Timah (*Ridley s.n.*, 1900, SING [SING0003903]) and Seletar (*Ridley 6325*, 31 Jun 1894, SING [SING0003904]). The latest collection is from MacRitchie (*Sinclair 10770*, 21 Feb 1965, SING [SING0003905]).

Ecology. Primary and secondary forests, epiphytic or lithophytic in exposed sunny locations or in shade. Less common in dense forest, from sea level to above 1000 m across its range.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. In Singapore presumed Nationally Extinct.

Notes. Specimens collected outside Singapore may have leaves of a different shape, terete, oblanceolate, spatulate to linear and generally longer, (1–)2–4 × 0.3–0.6 cm

5. *Dischidia cochleata* Blume

(Latin, *cochleatus* = coiled like a snail's shell;
referring to the shape of the leaves)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1060; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 42; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 204. **Type:** *Blume 1692*, [Indonesia], Java (lectotype L [L.2725239], designated by Rintz, Blumea 26 (1980) 90). **Fig. 47.**

Dischidia coccinea Griff., Not. Pl. Asiat. 4 (1854) 45; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 584; Ridley, Fl. Malay Penins. 2 (1923) 404. **Type:** *Griffith s.n.* [Kew Distribution 3780], [Malaysia], Malacca (lectotype K [K000911056], designated by Rodda, Gard. Bull. Singapore 71 (2019) 73).

Epiphytic climber, all vegetative parts glabrous. Wax chimneys present on old stems and leaves. **Roots** fibrous, adventitious mostly produced just below the nodes and developing underneath the leaves. **Stems** adpressed to the host plant; leafy stems terete, 0.7–2 mm in diam., mid to yellowish green; internodes 1.5–5(–10) cm long. **Leaves:** petiole cylindrical, 1–3 mm long, c. 2 mm in diam.; lamina fleshy, stiff, orbicular or reniform, abaxially convex, 7–25 × 9–40 mm, apex obtuse (rarely apiculate), base shallowly cordate or very slightly peltate, mid green above, purplish green underneath, venation indistinct; colleters at lamina base present but indistinct on dry specimens. **Inflorescences** simple or bifid racemes, negatively geotropic, bearing 1–7 erect flowers and buds each; peduncle extra-axillary, persistent, 0–7 mm long, 1–1.5 mm in



Figure 47. *Dischidia cochleata* Blume. Habit, showing the orbicular leaves growing adpressed to the host plant. Inset: flower, side view. (From Malaysia, Sarawak, Gunung Mulu National Park, Rodda MR967. Photo: M. Rodda).

diam., glabrous or very sparsely pubescent, rachis bearing scars of previous flowerings; bracts glabrous, ciliate; pedicels 2.5–3.2 mm long, 0.9–1.1 mm in diam., glabrous. **Calyx** 1.2–2 mm in diam., lobes free, ovate, 0.5–0.9 × 0.6–1.1 mm, apex obtuse or acute, glabrous, ciliate; calycine colleters one at each calyx lobe sinus, ovate, c. 0.1 mm long. **Corolla** urceolate, 3–4.5 mm long, 2–3 mm in diam., orange to red, glabrous; tube 2.5–3.5 mm long, basally ribbed; lobes cucullate, 0.8–1 × 0.4–0.6 mm, apex blue to purple inside. **Corolline corona** of 5 lunate wedges, inserted c. 1 below lobe sinuses. **Staminal corona** 1.5–1.8 mm in diam., 1.3–1.8 mm high, stipe c. 0.2 mm high, staminal corona lobes anchor-shaped, stalk c. 0.5 mm high, arms c. 0.6 × 0.3 mm. **Pollinia** clavate, 650–750 × 130–170 μm, apex round; corpusculum 220–260 × 80–120 μm, apex obtuse; caudicles 50–70 × 60–70 μm. **Anther appendages** membranous, hyaline, covering the style head apex. **Style head** conical c. 0.5 mm in diam., style head apex oblong c. 0.5 mm long. **Ovary** conical, c. 0.8 mm long, c. 0.5 mm in basal diameter, glabrous.

Fruit a single erect follicle, fusiform, 2–2.7 × 0.3–0.4 cm, glabrous, base with pedicel held at an acute angle, apex acuminate. **Seeds** c. 1–1.3 × 0.4–0.5 mm, long comose, coma 1–1.5 cm long.

Distribution. Peninsular Malaysia, Borneo, Sumatra and Java. In Singapore it has been collected in Ulu Pandan (*Mhd Ismail 65*, 6 Apr 1965, SING [SING0003906]), Jurong (*Ridley s.n.*, 1897, SING [SING0003907]), Bukit Timah (*Ridley s.n.*, 21 Sep 1898, SING [SING0003909]), Chua Chu Kang (*Ridley 6705*, 1894, SING [SING0003910]) and Seletar (*Ridley s.n.*, 1889, SING [SING0003912]).

Ecology. Across its range in lowland primary forest to hill forest to 800 m. It usually inhabits the top branches of tall trees where it is exposed to good air flow and bright light. It appears to be unable to grow in a closed canopy with low light and airflow.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. In Singapore presumed Nationally Extinct.

6. *Dischidia* complex Griff.

(Latin, *complexus* = complex; possibly referring to the unusual pitcher leaves)

Not. Pl. Asiat. 4 (1854) 50; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 586; Ridley, Fl. Malay Penins. 2 (1923) 405; Rintz, Blumea 26 (1980) 97; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 191. **Type:** *Griffith s.n.*, [Malaysia], Malacca (lectotype K [K000911040], designated by Rintz, Blumea 26 (1980) 97).

Dischidia shelfordii Pearson, Ann. Bot. (Oxford) 17 (1903) 617. **Type:** *Shelford s.n.*, [Malaysia], Borneo, Sarawak, Kuching, 31 December 1902 (lectotype K [K000911021], first step designated by Rintz, Blumea 26 (1980) 97, second step designated by Rodda, Gard. Bull. Singapore 71 (2019) 74; isolectotypes K [K000911022, one without barcode]).

Epiphytic climber with twining or pendulous stems to 1 m long, vegetative parts glabrous. Epicuticular wax on old stems and leaves. **Roots** fibrous, adventitious, produced along the stems and just below the nodes; those produced at nodes bearing pitcher leaves growing within the pitcher. **Leafy stems** terete, up to 1.5 mm in diam.; internodes 5–20 cm long. **Leaves** subsessile, cylindrical; lamina of two types, the first produced along shorter internodes, fleshy, stiff, ovate, 8–15 × 7–8 mm, apex round to obtuse, base round, venation obscure; the other pitcher-shaped orbicular, 2–6 × 3–6 cm, often with a smaller pitcher inside, deep purple inside; colleters at lamina base not visible on dry specimens. **Inflorescences** simple racemes, negatively geotropic, bearing 1–4 flowers; peduncle extra-axillary, persistent, to (1–)5–10(–20) cm long, c. 1.5 mm in diam., glabrous; pedicels c. 1 mm long, c. 0.5 mm in diam., glabrous. **Calyx** 1.5–2 mm in diam., lobes free, triangular c. 0.8 × 0.5 mm, glabrous; calycine colleters not observed.

Corolla urceolate, c. 3 mm in diam., tube c. 1.5 mm long; lobes triangular, reflexed, c. 1 × 0.8 mm, apex acute, pale yellow, inside with a few hairs at the base of the corolla lobes, otherwise glabrous. **Corolline corona** absent. **Staminal corona** c. 1.5 mm in diam., 1.5 mm high, corona lobes stalked c. 0.8 × 0.8 mm with an emarginate apex and 2 recurved lobes. **Pollinia** oblong c. 200 × 80 µm, apex and base rounded; corpusculum lanceolate, c. 200 × 30 µm; caudicles c. 250 µm long. **Anther appendages** membranous, hyaline, apically acute, c. 0.6 × 0.3 mm. **Style head** conical, c. 0.5 mm in diam., style head apex oblong c. 1 mm long. **Ovary** conical, c. 1 mm long, c. 0.3 mm in basal diameter. **Fruit** a single follicle, linear, 4–6.5 cm × 3–5 mm, base and apex acuminate. **Seeds** 1.5–1.8 × 0.4–0.5 mm, long comose, coma c. 2 cm long.

Distribution. Peninsular Malaysia and Borneo. In Singapore it was collected once in Jurong (*Corner s.n.*, Jan 1933, SING [SING0059298]).

Ecology. Epiphytic climber on thin branches exposed to bright light such as on top of the tree canopy.

Provisional conservation assessment. Globally Least Concern (LC) as it is a widespread species. In Singapore presumed Nationally Extinct.

7. *Dischidia hirsuta* (Blume) Decne.

(Latin, *hirsutus* = hirsute, with coarse stiff hairs; referring to the hairy leaves)

in A.DC., Prodr. 8 (1844) 632; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 589; Ridley, Fl. Malay Penins. 2 (1923) 406; Rintz, Blumea 26 (1980) 94; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 42; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 191. **Basionym:** *Leptostemma hirsutum* Blume, Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1058. **Type:** *Blume s.n.*, [Indonesia], Java, ‘circa Kuripan Provinciae Buitenzorg’ (lectotype L [L.2725198], first step designated by Rintz, Blumea 26 (1980) 94), second step designated by Rodda, Gard. Bull. Singapore 71 (2019) 77; isolectotypes L [L.2725194, L.2725195], possible isolectotype P [P00218706]. **Fig. 48.**

Leptostemma fasciculatum Blume, Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1058. **Synonym:** *Dischidia fasciculata* (Blume) Decne. in De Candolle, Prodr. 8 (1844) 623. **Type:** *Collector unknown s.n.* (Blume?), [Indonesia, Java] ‘in montosis Pantjar Provinciae Buitenzorg’ (lectotype P [P00218707], designated by Rodda, Gard. Bull. Singapore 71 (2019) 77).

Dischidia brunoniana Griff., Calcutta J. Nat. Hist. 8(29) (1847) 85. **Type:** *Griffith s.n.* [Kew Distribution 3872], [Myanmar], Mergue (lectotype K [K000911063], designated by Rodda, Gard. Bull. Singapore 71 (2019) 73).

Dischidia eurylooma Schltr. in Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee (1905) 358. **Type:** *Schlechter 14620*, [Papua New Guinea], Neu Mecklenburg [New Ireland] (lectotype B [B 10 0003234], designated by Rintz, Blumea 26 (1980) 94).

Dischidia subpelligera Schltr. in Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee (1905) 360. **Type:** *Schlechter 14601*, [Papua New Guinea], Kaiser-Wilhelmsland, Torricelli Gebirges, c. 100 m (lectotype B [B 10 0003236], designated by Rintz, Blumea 26 (1980) 94).

Dischidia pulchella Schltr., Beih. Bot. Centralbl. 34(2) (1916) 12. **Type:** *Schlechter 20636*, [Indonesia], Sulawesi, Menado, c. 15 m (lectotype B [B 10 0003235], designated by Rintz, Blumea 26 (1980) 94).

Dischidia verruculosa Schltr., Beih. Bot. Centralbl. 34(2) (1916) 13. **Type:** *Schlechter 20650*, [Indonesia], Sulawesi, Abati, Kuala Besar, Toli-Toli, c. 30 m (lectotype B [B 10 0003235], designated by Rintz, Blumea 26 (1980) 94).

Plants succulent, herbaceous; epiphytic vines growing tightly appressed to the host tree stems, clinging by adventitious roots, rarely pendulous, usually preferring to colonise small canopy branches up to 5 cm diam. **Roots** on mature plants adventitious, produced just below each node and along the internodes. **Leafy stems** terete, up to 2.5 mm diam., dark green, hirsute when young; internodes 1–2(–5) cm long. **Leaves:** petiole cylindrical, 1.5–2.5 mm long, c. 1 mm in diam., sparsely pubescent; lamina coriaceous, fleshy, (rarely orbicular) broadly ovate (rarely lanceolate), 1–2.5 × 0.6–1.5 cm, apex acute-apiculate, base round-truncate (rarely shortly attenuate), above dark green, underneath lighter green with darker spots, hirsute on both surfaces when young, main vein evident on adaxial surface, marked by a dark green line on abaxial surface, secondary veins 3–4 pairs, branching at 60–80(–90)° from main vein. **Inflorescences** simple racemes, usually bearing a single open flower at a time; peduncle extra-axillary, perennial, bearing scars of previous flowerings, 2–5 mm long, c. 1 mm in diam., pubescent; pedicels 2–3 mm long, c. 0.7 mm in diam., glabrous, (rarely sparsely hirsute). **Calyx** c. 3 mm in diam., red-purple, lobes ovate 1–1.5 × 0.6–1 mm, apex acute to round, glabrous. **Corolla** succulent, urceolate, 4–6 × 3–4 mm, basally dark red, progressively fading into light pink at the lobe apices; tube 3–4 mm long, externally glabrous, corolla throat with two rings of hairs, the first just below the corolla lobe sinus, the second at the same height as the anther appendages; lobes ovate, up to 2 mm long. **Corolline corona** absent. **Staminal corona** c. 3 mm high, 3 mm in diam., basally pubescent, composed of five hyaline appendages with a truncate apex and two downcurved lobes. **Pollinia** oblong, c. 600 × 200 µm, apex and base rounded to obtuse; corpusculum c. 420 × 120 µm; caudicles broad, laterally crested, c. 400 µm long. **Anther appendages** membranous, hyaline, apically acute, c. 1 × 0.5 mm. **Style** head prominent, convex, hidden by the anther appendages. **Ovary** obconical, 1.5 mm long, each carpel c. 0.7 mm in basal diameter, glabrous. **Fruits** and **seeds** not seen.

Distribution. A very widespread species, occurring in Myanmar, Thailand, Cambodia, Laos, Vietnam, Peninsular Malaysia, Borneo, Indonesia and the Solomon Islands. Native in Singapore but now only found in Upper Seletar (*Rodda et al. MR11-008*, 3 May 2011, SING [SING0126958]). In the past it was rather widespread and collected along Nassim Road (*Ridley 14165*, 1901, SING [SING0003915]), Seletar (*Ridley 2730*, 1889, SING [SING0003916]; *Goodenough s.n.*, 10 Apr 1890, SING [SING0003919]), Kranji (*Ridley s.n.*, 26 Feb 1889, SING [SING0003914]) and Woodlands (*Ridley s.n.*, Jun 1903, SING [SING0003917]).

Ecology. In Singapore it is an epiphytic climber on thin branches in the top layer of the canopy. Outside Singapore it can also be found lower down the tree trunk and on rocks.



Figure 48. *Dischidia hirsuta* (Blume) Decne. Habit, showing the fleshy leaves, conspicuous adventitious roots and red corolla. Inset: Flower, showing the ring of hairs at the corolla throat. (From Singapore, Upper Seletar, Rodda *et al.* MR11-008. Photos: main photo, M. Rodda; inset, J. Leong-Škorničková.)

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. It is assessed here as Critically Endangered (CR/D) in Singapore.

8. *Dischidia major* (Vahl) Merr.

(Latin *major* = greater; likely referring to the large size of the pitcher-shaped leaves)

Interpr. Herb. Amboin. (1917) 437; Rintz, Blumea 26 (1980) 92; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 42; Chong *et al.*, Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 227. **Basionym:** *Collyris major* Vahl, Skr. Naturhist.-Selsk. 6 (1810) 460. **Type:** *Koenig s.n.*, [Malaysia], Malacca or Selangor (lectotype C, first step designated by Panigrahi, Bangladesh J. Bot. 15 (1986) 195), second step designated by Rodda, Gard. Bull. Singapore 71 (2019) 70–71, excluding abaxially convex leaves belonging to a different species). **Fig. 49.**

Dischidia rafflesiana Wall., Pl. Asiat. Rar. 2 (1831) 35, t. 142; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 585; Ridley, Fl.

Malay Penins. 2 (1923) 405. **Type:** *Koenig s.n.*, [Malaysia] (lectotype [BM000907129], designated by Rintz, Blumea 26 (1980) 92).

Dischidia timorensis Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 377, t. 17. **Type:** *Guichenot s.n.*, [Timor-Leste] (lectotype P [P00639926], designated by Rodda, Gard. Bull. Singapore 71 (2019) 74).

Dischidia merguiensis Becc., Malesia 2(3) (1886) 264. **Type:** [Published illustration] [Myanmar] Mergui ‘*Dischidia rafflesiana*’, Griffith, Trans. Linn. Soc. London 20(3) (1851) t. 17 sub p. 390.

Dischidia bauerlenii Schltr., Bot. Jahrb. Syst. 40(3, Beibl. 92) (1908) 7. **Type:** *Bäuerlen 99*, Australia, Thursday Island, 3 July 1888 (lectotype B [B 10 0003240], designated by Rintz, Blumea 26 (1980) 92; isolectotype MEL [MEL0566768A]).

Dischidia pubiflora Schltr., Beih. Bot. Centralbl. 34(2) (1916) 11. **Type:** *Schlechter 20686*, [Indonesia], Sulawesi, Kabetan, Toli-Toli, 5–10 m (lectotype B [B 10 0003241], designated by Rintz, Blumea 26 (1980) 92).

Dischidia singaporensis Ridl., Fl. Malay Penins. 2 (1923) 407; Rintz, Blumea 26 (1980) 92; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 191. **Type:** *Ridley s.n.*, Singapore, Changi, Changi Police Station (lectotype SING [SING0044741], designated by Rintz, Blumea 26 (1980) 92), syn. nov.

Dischidia palawanensis Elmer, Leafl. Philipp. Bot. 10 (1938) 3561, nom. nud.

Epiphytic climber to 5 m long. Epicuticular wax on old stems and leaves. **Roots** fibrous, adventitious, produced along the stems and just below the nodes; those produced at nodes bearing pitcher leaves growing within the pitcher. **Stems** twining, creeping or pendulous; leafy stems terete, 2–4 mm in diam., green to yellowish green, glabrous or sparsely pubescent becoming glabrescent when mature; internodes (1–)5–15(–25) cm long. **Leaves** dimorphic, the first laminar, produced along nodes (5–)10–15(–25) cm apart, with petiole 2–4 mm long, 1.5–2.5 mm in diam., glabrous, lamina fleshy, stiff, orbicular or ovate, flat to slightly abaxially convex, (1–)1.5–3.5 × 1.5–2.5 cm, apex obtuse to acute, base round, above pale green to yellowish green, below yellow, glabrous, venation pinnate, 2–5 veins each side, almost obscure; the other pitcher-shaped, produced along nodes 0.5–3(–5) cm apart, with petiole 2–5 mm long, 2–3 mm in diam., glabrous, lamina oblong, 4.5–10 cm long, 1.5–4.5 cm in diam., green to yellowish green, glabrous, filled with adventitious roots; colleters at lamina base not visible on dry specimens. **Inflorescences** simple or bifid racemes, negatively geotropic, bearing 1–5(–10) flowers; peduncle extra-axillary, persistent, (0.2–)0.5–2 cm long, 1–3 mm in diam., simple or bifid, glabrous; bracts minute, attached at base of pedicel, triangular, yellowish green, apex acute; pedicels 3–5 mm long, c. 0.7 mm in diam., green or yellowish, pubescent. **Calyx** 3–5 mm in diam., lobes free, oblong or ovate, 1–2 × 0.7–1.3 mm, apex acute to obtuse, glabrous inside, pubescent outside, ciliate; calycine colleters one at each calyx lobe sinus, conical, c. 0.25 × 0.1 mm. **Corolla** urceolate, 5–7 mm long, 2–4 mm in diam., green turning yellow with green stripes alternating with corolla lobes; tube c. 4 mm long, glabrous; lobes triangular, 1–1.5 × 0.5–1 mm, apex acute inside pubescent, outside pubescent to glabrescent. **Corolline corona** present at throat or below the sinuses of lobes. **Staminal corona** c. 2.5–3 mm in diam., 2–3 mm high, corona lobes stalked, c. 1 × 0.8 mm with an emarginate apex and 2 recurved



Figure 49. *Dischidia major* (Vahl) Merr. **A.** Habit. **B.** Flowers, side view. **C.** Dissected flower, side view, with part of the corolla removed exposing the gynostegium. **D.** Laminar and pitcher-shaped leaves. **E.** Dissected pitcher-shaped leaf showing the roots growing inside. **F.** Follicle. (From Singapore, Pulau Ubin, *Rodda MR318*. Photos: M. Rodda).

lobes; stalk 0.8–1 by 0.2–0.4 mm, arms lunate, downward curved, c. 0.7 mm long. **Pollinia** clavate, 500–700 × 200–250 µm, apex rounded, base cuneate; corpusculum oblong, 300–350 × 100–120 µm; caudicles triangular, 80–100 µm long. **Anther appendages** membranous, hyaline, ovate, c. 0.7 × 0.5 mm. **Style head** conical c. 0.5 mm in diam., style head apex oblong c. 1 mm long. **Ovary** conical, 0.7–0.9 mm long, c. 0.3 mm in basal diameter. **Fruit** a single follicle, fusiform, 5–7 cm × c. 0.5 cm, base obtuse, apex acuminate. **Seeds** oblong, 1.5–2 × 0.5–2 mm, long comose, coma c. 2 cm long.

Distribution. India, Myanmar, continental Southeast Asia, Peninsular Malaysia, Borneo, Java, Sumatra, Sulawesi, Philippines, New Guinea, Australia and the Solomon Islands. In Singapore it is a widespread and rather common species collected in Pulau Tekong (*Samsuri et al.* 186, 6 Dec 2001, SING [SING0039862]), Pulau Tekong Kechil (*Gwee et al.* 45, 29 Nov 2002, SING [SING0042674]), Pulau Ubin (*Leong et al.* 16, 5 Nov 2002, SING [SING0042358]), Mandai (*Choo* 376, 26 May 1996, SINU [SINU2007021876]) and Sungei Buloh (*Turner & Choong SB1096*, 22 May 1991, SINU [SINU2007019614]). It is also found on Lazarus Island, Pulau Unum, West Coast, Semakau, NUS Bukit Timah Campus, Sungei Simpang and it is commonly seen on trees both in the nature reserves and on the roadside. However, it is difficult to collect and easily overlooked as it grows on high branches.

Ecology. In Singapore it is an epiphytic climber on thin branches in exposed locations such as edge of mangroves and top of the tree canopy. Elsewhere it can grow from along the coast to 1000 m. It is always found associated with ants that form colonies among the roots and inside the pitcher leaves.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC) as it is a very widespread and common species.

Uses. In Peninsular Malaysia the roots growing in the pitcher leaves are added to betel quid to treat coughs. In the Philippines the leaves of a *Dischidia* species, possibly *Dischidia major*, are applied externally, crushed with salt, to treat goitre. In Sabah the pitcher leaves are boiled and the water used to treat a variety of ailments including chest pain, haemorrhoids and high cholesterol.

Vernacular names. *Akar kul*, *akar banok*, *akar bani* (Malay).

Notes. *Dischidia singaporensis* Ridl. is newly synonymised under *D. major*. It appears to have been described on a specimen without the distinctive pitcher leaves but its laminar leaves and flowers are otherwise indistinguishable from *Dischidia major*.

9. *Dischidia nummularia* R.Br.

(Latin, *nummum* = coin; referring to the coin-shaped leaves)

Prodr. Fl. Nov. Holland. (1810) 461; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 587; Rintz, Blumea 26 (1980) 98; Keng,

Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 36, 105, 227. **Synonym:** *Dischidia gaudichaudii* Decne. in De Candolle, Prodr. 8 (1844) 632, nom. illeg. superfl.; Ridley, Fl. Malay Penins. 2 (1923) 406. **Type:** *Banks s.n.*, Australia, Queensland, Endeavour (lectotype BM [BM000906937], designated by Rintz, Blumea 26 (1980) 98). **Fig. 50, 51.**

Collyris minor Vahl, Skr. Naturhist.-Selsk. 6 (1810) 111. **Synonym:** *Dischidia minor* (Vahl) Merr., Lingnan Sci. J. 13 (1934) 67. **Type:** *Koenig s.n.*, East Indies (lectotype C, designated by Rintz, Blumea 26 (1980) 98).

Dischidia orbicularis Decne. in De Candolle, Prodr. 8 (1844) 632. **Type:** *Collector unknown s.n.*, Timor (lectotype P [P00218805], designated by Rodda, Gard. Bull. Singapore 71 (2019) 73; isolectotype P [P00218806]).

Dischidia beiningiana Schltr. in Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee (1905) 356. **Type:** *Schlechler 13686*, [Papua New Guinea], Neu Pommern. Beining-Gebirges (lectotype B [B 10 0003225], designated by Rintz, Blumea 26 (1980) 98).

Dischidia dirhiza Schltr. in Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee (1905) 356. **Type:** *Schlechler 13669*, [Papua New Guinea], Tamara (lectotype B [B 10 0003204], designated by Rintz, Blumea 26 (1980) 98).

Dischidia ridleyana Schltr. in Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee (1905) 358. **Type:** *Schlechler s.n.*, Singapore (lectotype B [B 10 0003220], designated by Rintz, Blumea 26 (1980) 98).

Dischidia schumanniana Schltr. in Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee (1905) 360. **Type:** *Schlechler 14291*, [Papua New Guinea], Dorfe Bongu (lectotype B, designated by Rintz, Blumea 26 (1980) 98).

Dischidia copelandii Schltr., Philipp. J. Sci. 1, Suppl. 4 (1906) 298. **Type:** *Copeland 512*, Philippines, Mindanao, Davao (lectotype B [B 10 0003226], designated by Rintz, Blumea 26 (1980) 98; isolectotype K).

Dischidia microphylla Schltr., Bot. Jahrb. Syst. 40(3, Beibl. 92) (1908) 10. **Type:** *Schlechler 13327*, [Indonesia], Borneo, [Kalimantan], Samarinda (lectotype B [B 10 0003221], designated by Rintz, Blumea 26 (1980) 98).

Dischidia aemula Schltr., Bot. Jahrb. Syst. 50(1) (1913 ['1914']) 100. **Type:** *Schlechler 18428*, New Guinea, [Papua New Guinea], Keneyia, Eitape (lectotype B [B 10 0003224], designated by Rintz, Blumea 26 (1980) 98; isolectotypes BR [BR0000006963088], K [K000910993]).

Dischidia sepikana Schltr., Bot. Jahrb. Syst. 50(1) (1913 ['1914']) 98. **Type:** *Schlechler 19962*, [Papua New Guinea], Kaiserin-Augusta Fluss, [Sepik river] (lectotype B [B 10 0003254], designated by Rintz, Blumea 26 (1980) 98).

Dischidia actephila Schltr., Beih. Bot. Centralbl. 34(2) (1916) 6. **Type:** *Schlechler 20647*, [Indonesia], Sulawesi, Kuala Besar, Toli-Toli (lectotype B [B 10 0003223], designated by Rintz, Blumea 26 (1980) 98).

Dischidia decipiens Schltr., Beih. Bot. Centralbl. 34(2) (1916) 8. **Type:** *Schlechler 20588*, [Indonesia], Sulawesi, Tonsea (lectotype B [B 10 0003252], designated by Rintz, Blumea 26 (1980) 98).

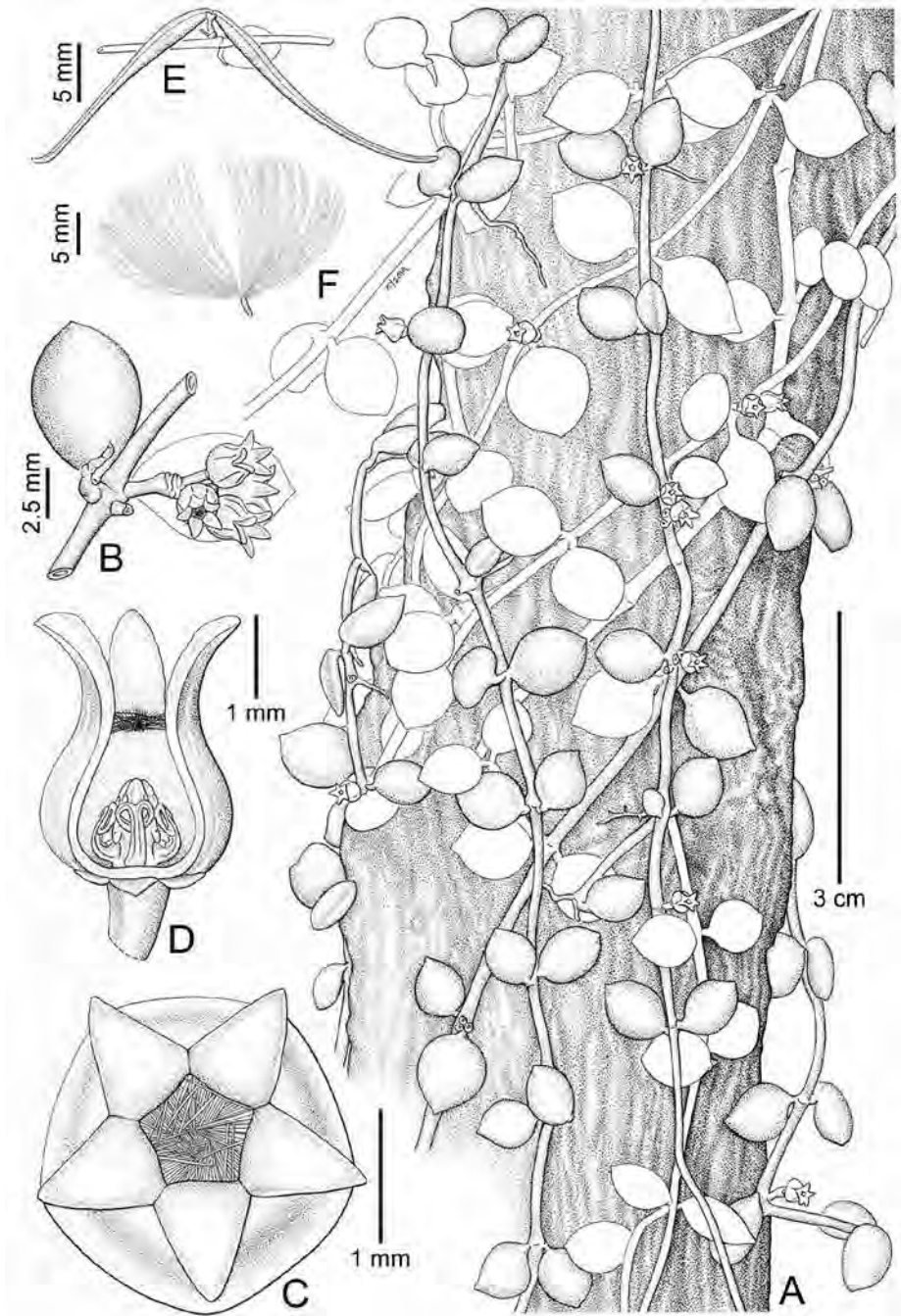


Figure 50. *Dischidia nummularia*. R.Br. **A.** Flowering branch addressed to the host tree trunk. **B.** Inflorescence, side view. **C.** Corolla, from above, showing the ring of hairs at the corolla throat. **D.** Flower, side view, with part of the corolla removed exposing the gynostegium. **E.** Fruit. **F.** Seed. (From Singapore Botanic Gardens, *Rodda MR1841*. Drawn by X.Y. Loh).

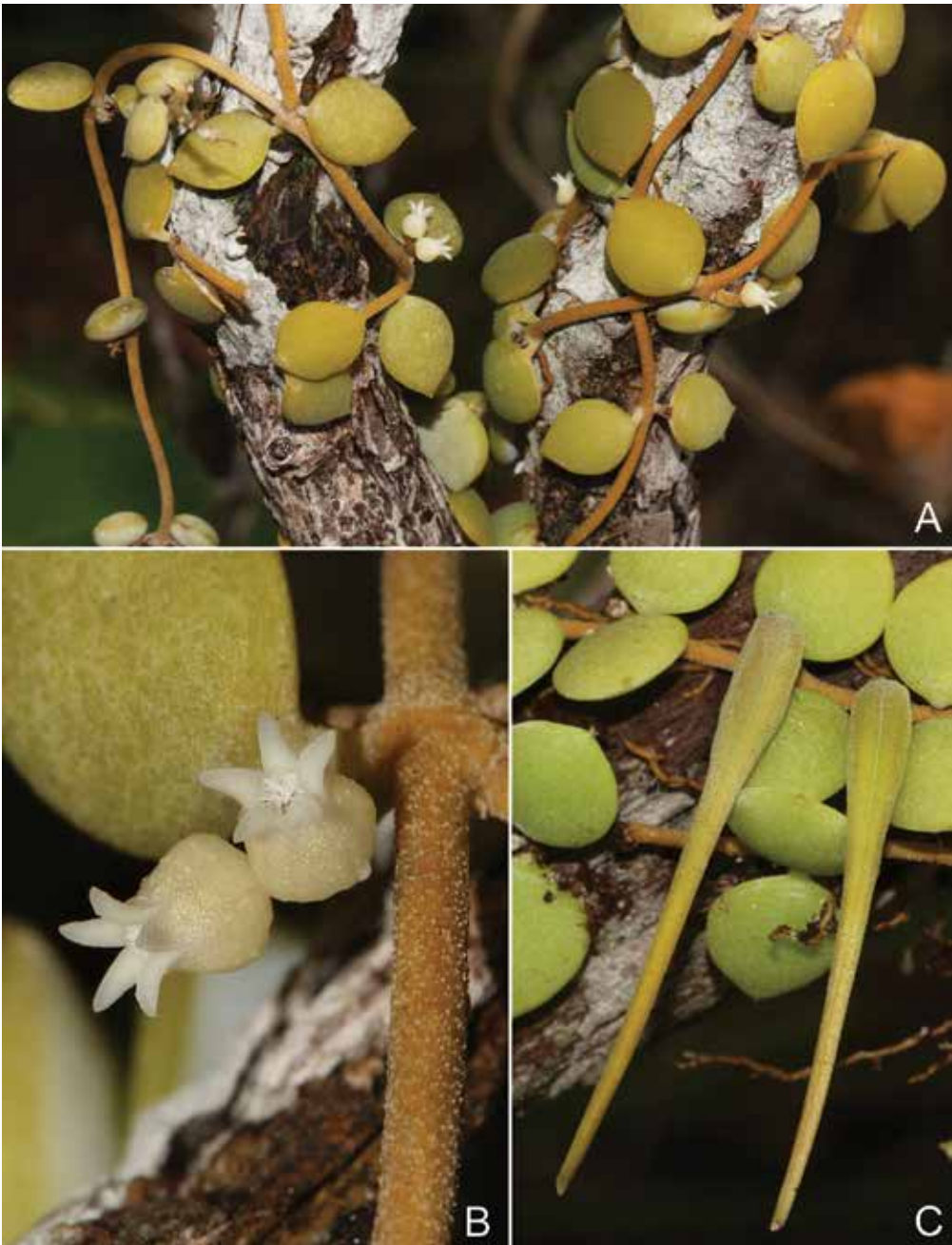


Figure 51. *Dischidia nummularia* R.Br. **A.** Habit. **B.** Flowers, showing the ring of hairs at the corolla throat. **C.** Follicles. (A from Singapore Botanic Gardens; B, C from Malaysia, Sarawak. Photos: A, J. Leong-Škorničková; B, C, M. Rodda).

Epiphytic glabrous climber. Wax chimneys on old leaves and stems present. **Roots** fibrous, adventitious, produced just below the nodes. **Stems** creeping or pendulous to 3 m long; leafy stems terete, 1–2 mm in diam., pale to mid green; internodes 0.5–2 cm long. **Leaves:** petiole cylindrical, 1–2 mm long, c. 0.5 mm in diam.; lamina thick, succulent, ovate to almost round, 0.5–0.8 × 0.4–0.6 cm, apex acute to mucronulate, base rounded to obtuse, glaucous mid green, venation obscure; colleters at base of lamina present on young leaves, 1, conical, 0.1–0.2 mm long. **Inflorescences** simple racemes, bearing 1–5 flowers; peduncle extra-axillary, ageotropic, 0.5–1–3 mm long, 0.5–0.7 mm in diam., glabrous; pedicels 0.8–2 mm long, 0.3–0.5 mm in diam., glabrous. **Calyx** 1.5–2 mm in diam., lobes free, triangular c. 0.7 × 0.4 mm wide, glabrous; calycine colleters one at each calyx lobe, oblong, 0.15–0.2 × c. 0.1 mm. **Corolla** urceolate, 2.5–3.5 mm long, white; tube c. 2 mm long, inflated, 1.5–2 mm in diam., glabrous; lobes triangular to spatulate, 0.8–1 × 0.3–0.4(–0.7) mm, white, inside with a ring of hairs at the base, outside glabrous, apex acute. **Corolline corona** absent. **Staminal corona** 0.8–1 mm high, 1–1.5 mm in diam., corona lobes stalked with a retuse apex and 2 recurved spatulate lobes, stalk 0.4–0.6 mm tall, arms recurved, c. 0.5 mm long. **Pollinia** oblong 250–350 × 90–120 µm, apex and base rounded; corpusculum lanceolate 140–160 × 40–50 µm; caudicles broadly spatulate c. 300 µm long. **Anther appendages** triangular, membranous, hyaline, apically acute, c. 0.5 × 0.5 mm. **Style head** globose, c. 0.5 mm in diam. **Ovary** conical, 0.5–0.8 mm long, c. 0.5 mm in basal diameter, glabrous, tip acute. **Fruit** of single or paired follicles, fusiform, pendulous, 2–3.5 × 0.3–0.5 cm base, glabrous, with pedicel laterally attached, apex acuminate. **Seeds** oblong, 1.5–2.5 × 0.4–0.7 mm, coma 1.5–2.5 cm long.

Distribution. India, Myanmar, continental Southeast Asia, Peninsular Malaysia, Sumatra, Java, Borneo, Philippines, Sulawesi, Moluccas, New Guinea, Solomon Islands and Australia. In Singapore it is a common epiphyte but is infrequently collected. It can be found throughout the country including at Bukit Timah (*Koh et al. SING2019-200*, 14 Feb 2019, SING [SING0266615]), Mount Pleasant Road (*Lua SING2016-104*, 6 May 2016, SING [SING0232217]), East Coast Park, Kent Ridge Park, Pulau Salu, Pulau Seking (*Chua et al. 848*, 22 Sep 1992, SINU [SINU2007001196]), Pulau Semakau, Pulau Sudong, Pulau Tekong (*Koh, SING2012-011*, 26 Jan 2012, SING [SING0174834]), Pulau Ubin (*Gwee GAT10*, 28 Jan 2002, SING [SING0038954]), Singapore Botanic Gardens, St John’s Island, Sungei Buloh and Sungei Mandai.

Ecology. Very common in the canopy of trees in primary and secondary forests as well as along roadsides. It usually prefers to grow on thinner higher branches but can also survive on lower branches in shadier spots.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC) as it is a very common and widespread species.

Vernacular name. *Pitis-pitis kecil* (Malay).

10. *Dischidia oiantha* Schltr.

(Greek, *oi-* = egg, *-antha* = flower; egg-shaped flower)

in Perkins (ed.), *Fragm. Fl. Philipp.* 2 (1904) 127. **Type:** *Merrill 7200*, Philippines, Busuanga (neotype B [B 10 0003245], designated by Rodda, *Gard. Bull. Singapore* 71 (2019) 73; isoneotype K [K000911004]). **Fig. 52.**

Epiphytic glabrous climber. Wax chimneys on old leaves and stems present. **Roots** fibrous, adventitious, produced just below the nodes and along internodes. **Stems** creeping or pendulous to 15 m long; leafy stems terete, 1.5–3 mm in diam., pale glaucous green; internodes (1–)3–10(–15) cm long. **Leaves:** petiole cylindrical, 2–10 mm long, 1–1.5 mm in diam.; lamina thick, succulent, lanceolate, obovate, to almost round, 1–3(–5) × (0.5–)1–1.5 cm, apex obtuse to round, base cuneate, glaucous pale green, venation pinnate with 2–5 secondary veins on each side of the main vein, almost obscure; colleters at lamina base 1 or 2, triangular, 0.1–0.15 mm long. **Inflorescences** simple or 1–2 branched racemes bearing 1–7(–15) flowers; peduncle extra-axillary, ageotropic, 0.2–3 cm long, 1–1.5 mm in diam., glabrous; pedicel 1–2 mm long, 0.3–0.5 mm in diam., glabrous. **Calyx** c. 2 mm in diam., lobes free, triangular 0.7–1 × 0.4–0.6 mm wide, apex acute or round, glabrous; calycine colleters one at each calyx lobe, oblong, 0.15–0.2 × c. 0.1 mm. **Corolla** urceolate, 2–2.5 mm long, white; tube 1.5–2 mm long, inflated, c. 2 mm in diam., white, glabrous outside, inside with a ring of hairs at throat; lobes triangular, spatulate, c. 0.5 × 0.5 mm, white, glabrous, apex acute. **Corolline corona** absent. **Staminal corona** c. 1 mm high, c. 0.8 mm in diam., corona lobes stalked with a retuse apex and 2 recurved spatulate lobes, stalk 0.5–0.7 mm tall, arms recurved, c. 0.3 mm long. **Pollinia** oblong 200–300 × 60–80 µm, apex and base rounded; corpusculum oblong, c. 70 × 40 µm; caudicles broadly spatulate c. 130 µm long. **Anther appendages** triangular, membranous, hyaline, c. 0.4 × 0.2 mm. **Style head** c. 0.5 mm diam, flat, style head apex linear, c. 0.3 mm long. **Ovary** conical, 0.4–0.5 mm long, c. 0.15 mm in basal diameter, glabrous, tip acute. **Fruit** a single follicle, fusiform, pendulous, 5–6 × 0.2–0.3 cm, base and apex acuminate. **Seeds** linear, 3–4.5 × c. 0.5 mm, comose, coma 2.5–3 cm long.

Distribution. Native to the Philippines. Naturalised in Singapore. Common on roadsides e.g. in Bedok (*Leong SING2019-212*, 31 Mar 2019, SING [SING0258915]), Sentosa and Changi (*Rodda & Niissalo MR1837*, 5 Nov 2018, SING [SING0266616]).

Ecology. Found on trees along roadsides where it forms very large colonies that spread vegetatively. It appears to flower rarely and it has not been observed in fruit in Singapore.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.



Figure 52. *Dischidia oiantha* Schltr. Fertile branch with buds and open flowers. (Cultivated in Singapore, Pasir Panjang Nursery, Rodda MR453. Photo: M. Rodda).

25. GONGRONEMA (Endl.) Decne.

(Greek, *gongro-* = a swelling, *-nema* = filament; referring to the presence of a corona lobe at the base of the staminal column)

Decne. in De Candolle, Prodr. 8 (1844) 624; Ridley, Fl. Malay Penins. 2 (1923) 385; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 542; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 331. **Basionym:** *Gymnema* R.Br. subg. *Gongronema* Endl., Gen. Pl., fasc. 8 (1838) 595. **Type:** *Gongronema nepalense* (Wall.) Decne., lectotype designated by Bullock, Kew Bull. 15 (1961) 196.

Terrestrial climbers; latex colour unknown. **Roots** fibrous, basal. **Branches** glabrous or pubescent along two longitudinal lines only, twining. **Leaves** opposite, petiolate; petiole bases connected by a line across the node; lamina herbaceous, entire, elliptic to lanceolate, colleters at lamina base present, prophylls absent. **Inflorescences** simple or bifid racemes; peduncle extra-axillary, sparsely pubescent. **Calyx** lobes free, spreading, with colleters inside. **Stamens**

inserted at the base of the tube, included within the tube, connate into a gynostegium. **Corolla** urceolate; lobes dextrorse; tube present, swollen. **Corolline corona** absent. **Gynostegial corona** staminal, lobes oblong, with a globose spreading basal process. **Pollinarium** with erect pollinia lacking pellucid margins. **Style head** conical. **Ovary** glabrous; **Fruit** a single follicle, glabrous. **Seeds** numerous, pyriform, comose.

Distribution. A genus of about 15 species found in Africa, South Asia, China, Southeast Asia. In Singapore 1 native species.

Taxonomy. No species of *Gongronema* have been included in a molecular phylogeny and its relationships with other genera in Marsdenieae are unclear. It was last revised in Malaya by Ridley (Fl. Malay Penins. 2 (1923) 385–387) and no other regional revisions are available. The centre of diversity appears to be Borneo where there are numerous unpublished species.

***Gongronema wallichii* (Wight) Decne.**

(Nathaniel Wallich, 1786–1854, Superintendent of the Calcutta Botanic Gardens)

in A.D.C., Prodr. 8 (1844) 624; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 542; Ridley, Fl. Malay Penins. 2 (1923) 386. **Basionym:** *Gymnema wallichii* Wight, Contr. Bot. India (1834) 46. **Type:** *Wallich s.n.* [EIC 8195B, Asclep. 135a], Singapore (lectotype K [K001129202], designated by Rodda, Gard. Bull. Singapore 71 (2019) 77; isolectotype E [E00288666]). **Fig. 53.**

Terrestrial climber. **Roots** fibrous. **Stems** twining or pendulous, sparsely branched; leafy stems terete, herbaceous, 1–3 mm in diam., glabrous or pubescent along two longitudinal lines only; internodes (3–)5–10–15 cm long. **Leaves:** petiole cylindrical, channelled above, 10–15 mm long, 0.8–1.5 mm in diam., sparsely pubescent; base of petioles connected by a line across the node, pubescent; lamina herbaceous, elliptic to lanceolate, (5–)8–15 × (1–)3–5 cm, apex acuminate to caudate, base rounded (rarely cuneate), glabrous with sparsely pubescent midrib above, glabrous or very sparsely pubescent underneath, midrib slightly raised on adaxial surface, secondary veins 4–8 on each side, arching and anastomosing, tertiary venation reticulate, sparse; colleters 8–10 at each lamina base, ovate, 0.2–0.5 × c. 0.15 mm. **Inflorescences** simple or bifid racemes bearing 10–15 flowers, 4–5 open at a time; peduncle extra-axillary, one per node, 3–5 mm long, c. 0.8 mm in diam., sparsely pubescent; bracts subtending partial inflorescence triangular, 0.8–1 × 0.5–0.8 mm, pubescent outside only; pedicels 3–8 mm long, c. 0.2 mm in diam., glabrous. **Calyx** c. 4 mm in diam., lobes free, oblong, 1–1.5 × 0.5–0.8 mm, apex round or obtuse, glabrous; calycine colleters 1 at each calyx lobe base sinus, c. 0.15 × 0.05 mm. **Corolla** thin, urceolate, 3–4 mm in diam.; tube 2.5–3 mm long, glabrous outside, inside pubescent, more densely so towards the mouth; lobes triangular, 1–1.2 × 1–1.2 mm, apex rounded. **Staminal corona** c. 2–2.5 mm in diam.; 1.5–2 mm high, corona lobes connate to the back of anthers, oblong, c. 1.2 mm long, with a globose spreading basal process c. 0.8 × 0.8 mm. **Pollinia** oblong, c. 300 × 100 µm; corpusculum ovate, c. 150 × 100 µm; caudicles c. 150 × 20 µm. **Anther appendages** membranous, ovate, c. 0.8 × 0.5 mm. **Style head** conical, c. 0.8 mm in diam., c. 0.8 mm high. **Ovary** conical, c. 1.2 mm long, c. 0.4 mm in basal diameter, glabrous. **Fruit** a single follicle, fusiform, 12–14 × c. 1 cm glabrous, apex and base acuminate. **Seeds** pyriform 8–10 × 3–4 mm, coma 4–5 cm long.

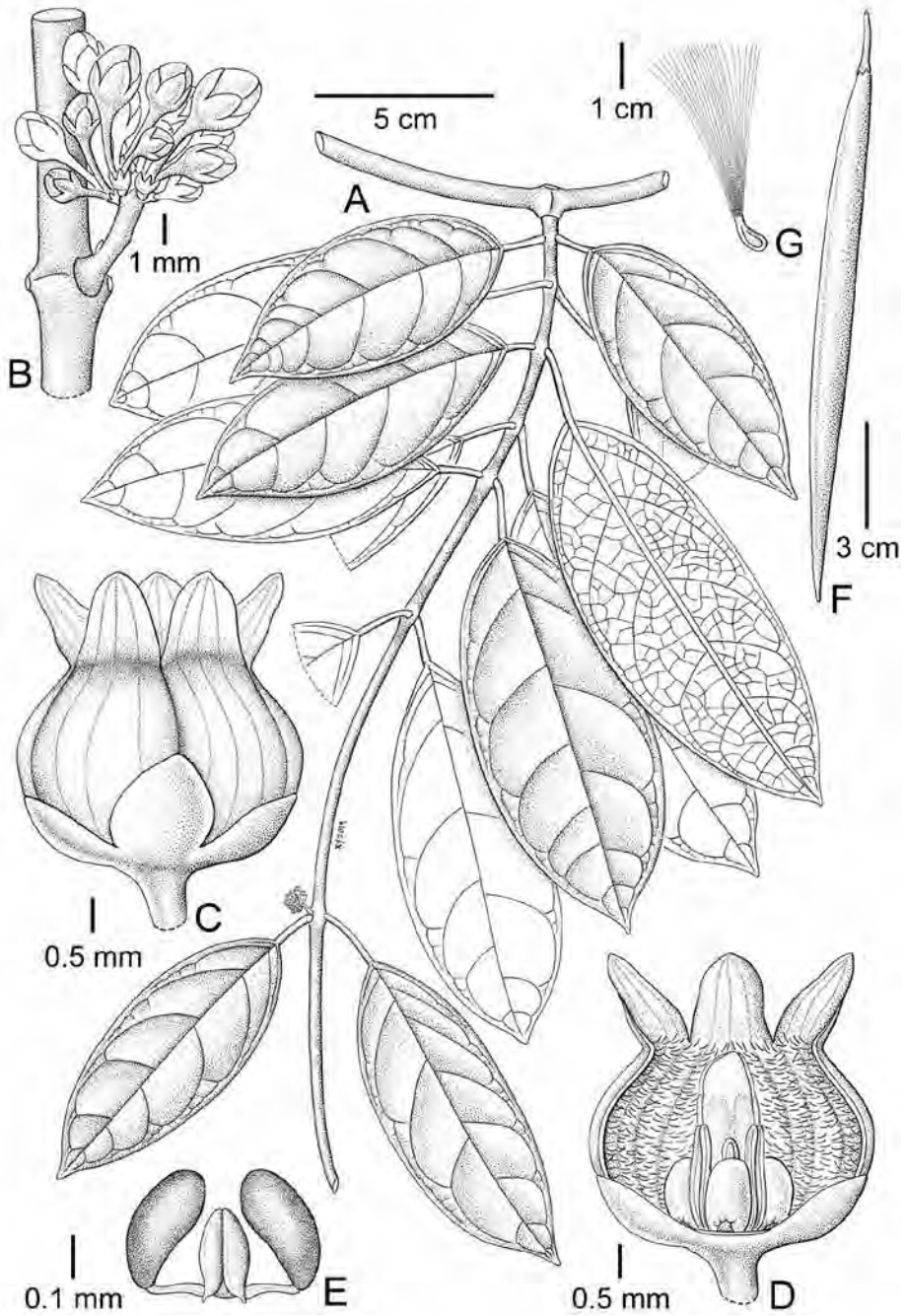


Figure 53. *Gongronema wallichii* (Wight) Decne. **A.** Leafy branch. **B.** Inflorescence. **C.** Flower, side view. **D.** Flower, side view, with part of the corolla removed exposing the gynostegium. **E.** Pollinarium, **F.** Fruit. **G.** Seed. (From Peninsular Malaysia, A–E from *Mhd Nur 1419*, F, G from *Maingay 3066*. Drawn by X.Y. Loh).

Distribution. Peninsular Malaysia, Borneo. In Singapore it is only known from the type specimen that does not bear a precise locality.

Ecology. A terrestrial vine in lowland primary forests.

Provisional conservation assessment. Globally Endangered (EN B2ab(iii)). *Gongronema wallichii* is a rarely collected species only known from few and far apart collections. In Singapore presumed Nationally Extinct.

Notes. The Bornean collections of *Gongronema wallichii* are different from the Malayan collections in corona shape and might be described as a separate taxon.

26. HOYA R.Br.

(Thomas Hoy, c.1750–1822, gardener for the Duke of Northumberland)

Wax plant, wax vine, wax flower, porcelain flower (English)

Prodr. Fl. Nov. Holland. (1810) 459; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 559; Ridley, Fl. Malay Penins. 2 (1923) 393; Rintz, Malayan Nat. J. 30(3&4) (1978) 467; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 333. **Type:** *Hoya carnosa* (L.f.) R.Br.

Sperlingia Vahl, Skr. Naturhist.-Selsk. 6 (1810) 112. **Type:** *Sperlingia verticillata* Vahl (= *Hoya verticillata* (Vahl) G.Don).

Physostelma Wight, Contr. Bot. India (1834) 39. **Type:** *Physostelma wallichii* Wight (= *Hoya wallichii* (Wight) C.M.Burton).

Cystidianthus Hassk., Tijdschr. Natuurl. Gesch. Physiol. 10 (1843) 125. **Type:** *Cystidianthus campanulatus* (Blume) Hassk. (= *Hoya campanulata* Blume).

Otostemma Blume, Rumphia 4 (1849) 30. **Type:** *Otostemma lacunosum* (Blume) Blume (= *Hoya lacunosa* Blume).

Absolmsia Kuntze, Revis. Gen. Pl. 2 (1891) 417. **Type:** *Absolmsia spartioides* (Benth.) Kuntze (= *Hoya spartioides* (Benth.) Kloppenb.).

Clemensia Schltr., Repert. Spec. Nov. Regni Veg. 13(378–380) (1915) 542, nom. illeg. non Merr. (1908). **Replaced synonym:** *Clemensiella* Schltr., Repert. Spec. Nov. Regni Veg. 13(381–384) (1915) 566. **Type:** *Clemensia marie* Schltr. (= *Hoya mariae* (Schltr.) L.Wanntorp & Meve).

Madangia P.I.Forst. et al., Austrobaileya 5 (1997) 53. **Type:** *Madangia inflata* P.I.Forst. et al. (= *Hoya inflata* (P.I.Forst. et al.) L.Wanntorp & P.I.Forst.).

Eriostemma (Schltr.) Kloppenb. & Gilding, Fraterna 14(2) (2001) 1. **Type:** *Eriostemma coronaria* (Blume) Kloppenb. & Gilding (= *Hoya coronaria* Blume).

Hiepia V.T.Pham & Aver., Turczaninowia 14 (2011) 6. **Type:** *Hiepia corymbosa* V.T.Pham & Aver. (= *Hoya ignorata* T.B.Tran et al.).

For additional synonyms see Omlor, Gen. Revis. Marsdenieae (1998) 144.

Epiphytic or hemi-epiphytic vines or subshrubs, rarely terrestrial; latex white or yellow. **Roots** fibrous, basal or adventitious. **Branches** glabrous or pubescent, twining or pendulous. **Leaves** opposite, petiolate; lamina succulent or coriaceous, entire or with undulate margin, lanceolate to broadly ovate, glabrous or pubescent; colleters at lamina base present or absent, prophylls absent. **Inflorescences** spirally-elongating racemes, umbelliform, rarely a solitary flower; peduncle extra-axillary, usually unbranched; glabrous or pubescent. **Calyx** lobes free, spreading, with colleters generally present inside. **Corolla** rotate, campanulate or reflexed, lobes valvate; tube present; lobes triangular to ovate, sometimes much reduced. **Corolline corona** usually absent. **Stamens** inserted at the base of the tube, fused into a gynostegium. **Gynostegial corona** staminal with 5 lobes variable in shape. **Pollinarium** with erect pollinia generally with pellucid margins. **Style head** conical (convex), apex acute, round or umbonate. **Ovary** glabrous; **Fruit** follicle, single or paired, fusiform, glabrous or pubescent, many-seeded. **Seeds** compressed, ovate, with a coma.

Distribution. *Hoya* includes 350–450 species found from India and southern China through continental Southeast Asia and Malesia to the Solomon Islands and Australia. In Singapore 13 native species, five of which are presumed Nationally Extinct.

Ecology. Mostly found in primary forests from sea level to about 2600 m. The largest number of species are epiphytic climbers or small shrubs growing in the upper part of the tree canopy. A few species are hemi-epiphytic. Lithophytic species are only found in continental Southeast Asia.

Uses. *Hoya* species produce abundant latex that is mildly toxic. The latex is used in traditional medicine in Southeast Asia to stimulate digestion and as a diuretic. A poultice of the leaves is applied externally to wounds, boils, ulcers, swellings, burns, stings of insects and poisonous fish, and for rheumatism. A decoction of the leaves is used internally against coughs, asthma and gonorrhoea. Young leaves are sometimes cooked and eaten as a vegetable. Contact with *Hoya* latex may cause dermatitis or even anaphylactic shock in hypersensitive individuals. Numerous species are cultivated as ornamentals in pots or as a garden plant..

Taxonomy. The genus has been relatively recently revised in much of continental Southeast Asia including Malaya (Rintz, Malayan Nat. J. 30(3&4) (1978) 467–522), Cambodia, Laos and Vietnam (Averyanov et al., Turczaninowia 20 (2017) 103–147) and Thailand (Thaithong et al., Handb. Asclepiads Thailand (2018) 174–263). The most recent phylogeny of *Hoya* was published by Wanntorp et al. (Taxon 63 (2014) 89–102).

Key to *Hoya* species

1. Corolla campanulate, tube > 2 times as long as lobes 2
 Corolla rotate, reflexed or revolute, tube shorter than lobes 3
2. Inflorescence with up to 30 flowers, corona lobes white **1. *H. campanulata***
 Flowers solitary, corona lobes purple **13. *H. wallichii***

3. Inflorescence flat, concave or slightly convex, pedicels of different lengths 4
 Inflorescence convex or globose, pedicels of the same length 6
4. Corolla >10 mm diameter **2. *H. caudata***
 Corolla < 7 mm diameter 5
5. Corona lobes entire, inner process yellowish, outer process white; corolla white
 **7. *H. lacunosa***
 Corona lobes bilobed, inner process red, outer process white; corolla pale pink
 **10. *H. revoluta***
6. Peduncles clustered **8. *H. latifolia***
 Peduncles solitary 7
7. Corolla rotate when fully open 8
 Corolla reflexed or revolute when fully open 10
8. Corolla densely pubescent inside **5. *H. diversifolia***
 Corolla glabrous inside 9
9. Corolla puberulous outside, glossy creamy white **4. *H. coronaria***
 Corolla glabrous outside, yellow or white **9. *H. obtusifolia***
10. Corolla densely pubescent inside **3. *H. coriacea***
 Corolla glabrous or puberulent 11
11. Corona lobe outer process obtuse **11. *H. scortechinii***
 Corona lobe outer process acute 12
12. Corolla white or pink; corona lobes white with deep pink inner process
 **12. *H. verticillata***
 Corolla lobes yellowish with deep red tips; corona white **6. *H. finlaysonii***

1. *Hoya campanulata* Blume

(Latin, *campanulatus* = bell-shaped; referring to the shape of the corolla)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1064; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 578; Rintz, Malayan Nat. J. 30(3&4) (1978) 495; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 193; Rodda et al., Gard. Bull. Singapore 68 (2016) 183. **Synonym:** *Physostelma campanulatum* (Blume) Decne. in De Candolle, Prodr. 8 (1844) 633. – *Cystidanthus campanulatus* (Blume) Hassk., Tijdschr. Natuurl. Gesch. Physiol. 10 (1843) 125. **Type:** *Collector unknown s.n.*, [Indonesia], Java, ‘ex horto, mento septembre, Tjunkankan, Burangarang’ (lectotype L [L0004389], designated by Rodda et al., Gard. Bull. Singapore 68 (2016) 183). **Fig. 54.**

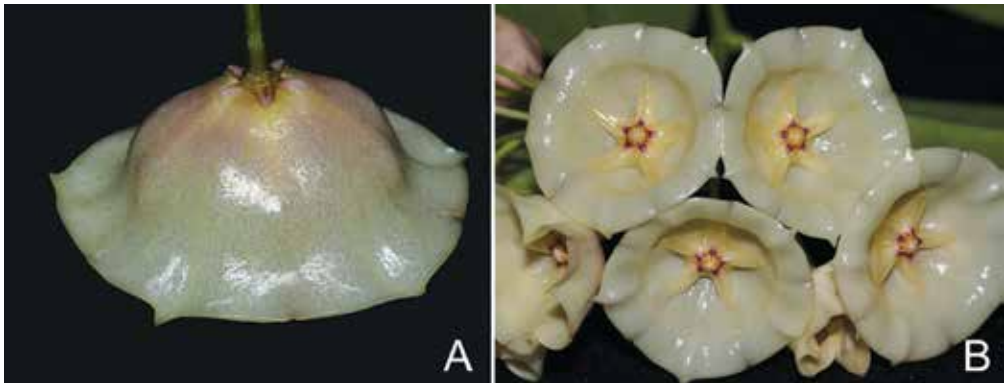


Figure 54. *Hoya campanulata* Blume. **A.** Calyx and corolla, from underneath. **B.** Detail of inflorescence showing the glossy campanulate corolla and the star shaped staminal corona. (Cultivated in Singapore Botanic Gardens. Photos: M. Rodda).

Cystidanthus laurifolius Blume, Mus. Bot. 1, fasc. 4 (1849) 57. **Replaced synonym:** *Hoya cystiantha* Schltr., Bot. Jahrb. Syst. 50(1) (1913 [‘1914’] 127. **Type:** *Korthals s.n.*, [Indonesia], Sumatra (lectotype L [L0004387], designated by Rodda et al., Gard. Bull. Singapore 68 (2016) 183); isolectotype L [L0004388]). **Epitype:** *Green 99009*, Indonesia, Sumatra, Ketambe, Aceh Province, South edge of Taman Gunung Leuser (epitype BISH [BISH1016621], designated by Rodda et al., Gard. Bull. Singapore 68 (2016) 183).

Wiry terrestrial or epiphytic climber or subshrub with white latex in all vegetative parts. **Roots** fibrous, basal; adventitious roots absent, unless in direct contact with substrate. **Stems** horizontal or pendulous to 3 m long; leafy stems terete, 1.5–3 mm diam., pale green when young, later dark green or greyish brown, apically sparsely puberulent, older stems leafless, glabrous, rugose; internodes 3–5(–18) cm long. **Leaves:** petiole cylindrical, channelled above, rugose below, 4–8 mm long, c. 2 mm wide, glabrous; lamina chartaceous, elliptic lanceolate, 5–7(–12) × (2–)3–5 cm, apex apiculate-cuspidate, base cuneate, pale to mid green above, lighter green underneath, glabrous, venation pinnate, main vein depressed on adaxial surface, evident on abaxial surface, secondary veins 4–6(–8) pairs, evident when dry, curved and anastomosing to form an intra-marginal nerve along the margin, branching at 50–60° from main vein; colleters at lamina base absent. **Inflorescences** umbelliform, convex, positively geotropic, up to 20-flowered; peduncle extra-axillary, terete, persistent, 1–2(–5) cm long, c. 1.5 mm in diam., glabrous, rachis bearing scars of previous flowerings; pedicels terete, 3–4 cm by c. 1 mm, glabrous; fruit-bearing pedicels more stout, up to 2 mm wide. **Calyx** c. 5 mm in diam., lobes lanceolate to oblong, 2–2.5 × 1–1.5 mm, apex rounded, margins ciliate; calycine colleters c. 0.4 mm long. **Corolla** campanulate, membranous, 2–3 cm in diam., white to cream-coloured, sometimes yellow or pink-flushed, glabrous; tube (0.7–)1–1.5 cm long; lobes reduced to a triangular tip, c. 2 × 2 mm. **Staminal corona** star-shaped, 3–4 mm high, 7–10 mm diam., corona lobes boat-shaped, terete, 4.5–5.5 mm long, 1.5–2 mm broad, white, sulcate underneath, outer process ascending; basal process laterally spreading, when viewed perpendicularly to the corona forming a disk of 3–4 mm radius. **Pollinia** oblong, c. 800 × 230 µm, with pellucid margin, apex and base rounded to truncate; corpusculum rhomboid, c. 280 ×

130 µm; caudicles c. 150 µm long. **Anther appendages** membranous, hyaline, apically round, c. 1.5 × 1 mm. **Style head** conical c. 2 mm in diam.; style head apex convex, c. 1.5 mm high. **Ovary** conical, c. 1.5 mm long, glabrous. **Fruit** a single follicle, fusiform, developing singly but up to 5 for each inflorescence, 12–18 cm long, 5–7 mm in diam. **Seeds** spindle-shaped, 4–5 × c. 1 mm, long comose.

Distribution. Peninsular Malaysia, Sumatra and Java. In Singapore it is only known Tampines (*Almeida s.n.*, Nov 1893, SING [SING0012210]).

Ecology. An epiphytic vine in lowland to hill primary forests. In Sumatra it occurs up to 1600 m.

Provisional conservation assessment. Globally Least Concern (LC). It is a widespread species that is still locally common. In Singapore it is, however, presumed Nationally Extinct.

2. *Hoya caudata* Hook.f.

(Latin *caudatus* = tailed; referring to the elongated anther appendages)

Fl. Brit. India 4, fasc. 10 (1883) 60; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 568; Ridley, Fl. Malay Penins. 2 (1923) 395; Rintz, Malayan Nat. J. 30(3&4) (1978) 484; Rodda & Ang, Nat. Singapore 5 (2012) 123–128. **Type:** *Maingay 1956* [Kew Distribution 1128], [Malaysia], Malacca (lectotype K [K000895134], first step designated by Rintz, Malayan Nat. J. 30(3&4) (1978) 484, second step designated by Rodda, Gard. Bull. Singapore 69 (2017) 36; isolectotypes K [K000895133], L [L0004315]). **Fig. 55.**

Hoya crassifolia Ridl., J. Straits Branch Roy. Asiat. Soc. 61 (1912) 30, nom. illeg. non (J.Jacq.) Haw. (1819). **Synonym:** *Hoya caudata* Hook.f. var. *crassifolia* Ridl., Fl. Malay Penins. 2 (1923) 395. **Type:** *Ridley 14059*, Malaysia, Perak, Tapah, on the trees on the Temoh Road (lectotype SING [SING0059473], designated by Rodda, Gard. Bull. Singapore 69 (2017) 36; isolectotype K [K001096330]).

Epiphytic climber with white or yellow latex in all vegetative parts. **Roots** adventitious, produced all along the stems. **Stems** twining or pendulous to 5 m long; leafy stems terete, 1–4 mm in diam., pale green when young, later greyish brown, pubescent, becoming glabrescent; internodes 3–10(–15) cm long. **Leaves:** petiole cylindrical, often thicker than stem, 5–10 mm long, 2–3 mm in diam., dark brown, pubescent; lamina fleshy, stiff, ovate to elliptic, (6–)10–15 × 3–6 cm, apex acuminate to cuspidate, base rounded, above mid green often with greyish spots, sparsely pubescent when young, lighter green underneath, sparsely papillose, margin flat or undulate, more so and recurved when dry, secondary veins almost obscure, 4–6 on each side, branching at c. 45° from midrib; colleters one or two at each lamina base, ovate, c. 0.7 × 0.5 mm, pale brown. **Inflorescences** umbelliform, positively geotropic, slightly concave, bearing 8–12 flowers; peduncle extra-axillary, persistent, 2–10 cm long, 1–1.5 mm in diam., reddish brown pubescent, rachis bearing scars of previous flowerings; pedicels 0.5–2.5 cm long, 0.7–1 mm in diam., greenish white sometimes flushed pink, glabrous or sparsely pubescent. **Calyx** c. 3–5 mm in diam., pale greenish pink, lobes free, narrowly triangular, 1–2 × 0.6–0.8 mm, apex acuminate to round, outside sparsely pubescent, inside glabrous; calycine colleters one



Figure 55. *Hoya caudata* Hook.f. **A.** Inflorescence, side view. **B.** Inflorescence with open flowers showing the pubescent corolla and the long anther appendages. (From Singapore, Nee Soon, *Rodda MR242*. Photos: M. Rodda).

at each calyx lobe sinus, triangular, $0.2\text{--}0.3 \times 0.15$ mm. **Corolla** rotate, 10–12 mm in diam. (to 15 mm when flattened); tube c. 2.5 mm long, glabrous, pale pink; lobes broadly triangular, $4\text{--}5 \times 3\text{--}4.5$ mm, apex acuminate, sides and apex recurved, pale pink, almost white at the tip, glabrous outside, pubescent inside around the margins, hairs to 2 mm long. **Staminal corona** 6–7 mm in diam., 3–4 mm high, corona lobes ovate, $3\text{--}3.5 \times 1.4\text{--}1.7$ mm, sulcate underneath, outer process spreading, rounded, pale red, inner process raised, acuminate, dark red. **Pollinia** oblong $350\text{--}450 \times 120\text{--}140$ μm , with pellucid margin, apex and base rounded; corpusculum oblong, $180\text{--}200 \times 400\text{--}500$ μm ; caudicles spathulate, c. 120 μm long. **Anther appendages** membranous, hyaline, linear, to 3 mm long. **Style head** conical c. 1.5 mm in diam., style head apex rounded, c. 1 mm long. **Ovary** conical, 1.4–1.8 mm long, c. 0.8 mm in basal diameter, pale green, glabrous. **Fruit** and **seeds** not observed.

Distribution. Thailand, Peninsular Malaysia, Sumatra and Borneo. In Singapore only known from Nee Soon (*Rodda MR242*, 4 Feb 2013, SING [SING0266617]; *Rodda MR1035*, 14 Mar 2015, SING [SING0266621]).

Ecology. A lowland species usually occurring in very humid shady habitats, commonly near streams in primary forest. In Singapore only collected from freshwater swamp forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from very few individuals at a single locality.

3. *Hoya coriacea* Blume

(Latin, *coriaceus* = coriaceous, leathery;
likely referring to the leaf texture)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1063; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 573; Ridley, Fl. Malay Penins. 2 (1923) 397; Rintz, Malayan Nat. J. 30(3&4) (1978) 495; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 193. **Type:** *Blume s.n.*, [Indonesia], Java, Salak, 'In fruticetis ad pedem montis Salak' (lectotype L [sheet no. 898.168-117], designated by Rodda, Gard. Bull. Singapore 69 (2017) 37; possible isolectotype P [P00639838]), **Fig. 56.**

Hoya brunoniana Wight, Contr. Bot. India (1834) 37. **Type:** *Wallich s.n.* [EIC 8163, Asclep. 37], [Malaysia], Penang? (holotype K; isotypes K [K001129108], E [E00179575]).

Hoya fraterna Blume, Rumphia 4 (1849) 32 [Oct 1849]; Blume, Mus. Bot. 1, fasc. 3 (1849) 44 [Nov 1849]. **Type:** *Collector unknown s.n.* (Blume?), [Indonesia], Java, [West Java, Kuripan] 'In calcareis Kuripan Javae occidentalis' (lectotype L [L0004318], designated by Rodda, Gard. Bull. Singapore 69 (2017) 37).

Hoya occlusa Ridl., J. Straits Branch Roy. Asiat. Soc. 61 (1912) 31; Ridley, Fl. Malay Penins. 2 (1923) 398. **Type:** *Ridley s.n.*, [Malaysia], Selangor, top of the Batu Caves, December 1890 (lectotype SING [SING0059478], designated by Rodda, Gard. Bull. Singapore 69 (2017) 38).

Hoya angustisepala Elmer ex C.M.Burton, Hoya 8(4) pt 2 (1987) b. **Synonym:** *Hoya mindanaensis* Elmer, Leafl. Philipp. Bot. 10 (1938) 3584, nom. inval. [no Latin descr.]. **Type:** *Elmer 10829*, Philippines, Davao, Mindanao, Todaya, Mt. Apo, Sibulan River, 3000 ft. [914 m] (lectotype B [B 10 0277215], designated by Rodda, Gard. Bull. Singapore 69 (2017) 38; isolectotypes BISH [BISH1000876], BM [BM000945404], BO, E [E00288757], K [K000911125], L [L0004313], NY [NY00318664], U [U1102604], US [US00170056]).

Terrestrial, epiphytic or hemi-epiphytic climber with white latex in all vegetative parts, glabrous. **Roots** fibrous, basal; adventitious roots rarely produced. **Stems** twining or pendulous to 10 m long; leafy stems terete, up to 5 mm in diam., mid green when young, later dark green or brown; internodes (4–)8–20 cm long. **Leaves:** petiole cylindrical, channelled above, 8–15 mm long, c.1 mm in diam., lamina thinly coriaceous, (5–)10–15 × 2.5–6 cm, apex acute, acuminate to cuspidate, base cuneate (rarely round), pale to mid green above, lighter green underneath, midrib raised on adaxial surface, secondary veins 3–6 on each side, branching at c. 50° from midrib, tertiary venation reticulate; colleters one at each lamina base, globose, c. 0.5 mm in diam. **Inflorescences** umbelliform, positively geotropic, bearing 20–40 flowers; peduncle extra-axillary, persistent, 5–10 cm long, 2–4 mm in diam., glabrous, rachis bearing scars of previous flowerings; pedicels 2.5–3 cm long, c.1 mm in diam., sparsely pubescent, becoming to 4 cm long, 2 mm in diam., glabrous when in fruit. **Calyx** 6–12 mm in diam., lobes free, linear, 2.5–4.5 × 0.5–1.2 mm, apex acuminate, outside sparsely pubescent, inside glabrous; calycine colleters one at each calyx lobe sinus, oblong, c. 0.3 × 0.15 mm. **Corolla** reflexed, c. 1.5 cm in diam. (2–2.5 cm when flattened), outside pale whitish pink, inside yellow with white hairs; tube campanulate, 4–6 mm long, outside glabrous, inside pubescent, more thickly so towards the margin; lobes ovate, 7–9 × 6–8 mm, outside glabrous, inside thickly



Figure 56. *Hoya coriacea* Blume **A.** Inflorescence, side view. **B.** Detail of inflorescence with open flowers showing the pubescent corolla and the large ovate corona lobes. (Cultivated in Singapore Botanic Gardens. Photos: M. Rodda).

pubescent, apex acute. **Staminal corona** 8–10 mm in diam., 5–7 mm high, corona lobes obovate, $5-6 \times 2.5-3.5$ mm, convex above, sulcate underneath, outer process white, apex acute, downcurved, inner process pink, raised with an acuminate tip, incurved over the style head. **Pollinia** oblong, $700-800 \times 230-270$ μm , with pellucid margin, apex obliquely truncate, base rounded; corpusculum narrowly rhomboid, $350-450 \times c. 150$ μm ; caudicles triangular, $c. 250 \times 150$ μm . **Anther appendages** membranous, hyaline, apically acute, $2-2.2 \times 1.2-2.5$ mm. **Style head** conical $c. 1.5$ mm in diam., style head apex acute, $c. 0.5$ mm long. **Ovary** conical, 2–2.5 mm long, $c. 1$ mm in basal diameter, glabrous, apex round. **Fruit** a single follicle, fusiform, $10-16 \times 1-1.5$ cm, base with pedicel laterally attached. **Seeds** oblanceolate, $5-7 \times c. 2$ mm, long comose, coma 3–4 cm long.

Distribution. Thailand, Peninsular Malaysia, Sumatra, Java and the Philippines. In Singapore it has only been collected from Changi (*Ridley, s.n.*, 1893, SING [SING0003934]) and Jurong (*Ridley s.n.*, 1897, SING [SING0012209]).

Ecology. Across its range an epiphytic climber in lowland to hill primary forests.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. In Singapore presumed Nationally Extinct.

Uses. In Peninsular Malaysia a decoction of the leaves is drunk to treat coughs and asthma.

4. *Hoya coronaria* Blume

(Latin, *coronarius* = with a crown; likely referring to the large fleshy corona)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1063; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 566; Ridley, Fl. Malay Penins. 2 (1923) 400; Rintz, Malayan Nat. J. 30(3&4) (1978) 505; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 193. **Synonym:** *Eriostemma coronaria* (Blume) Kloppenb. & Gilding, Fraterna 14(2) (2001) 1. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L0004319], designated by Kleijn & Van Donkelaar, Blumea 46 (2001) 469; isolectotype L [L0004320]). **Fig. 57.**

Eriostemma obtusifolioides Gilding & T.Green, Fraterna 22(3) (2009) 5. **Type:** Originally from Malaysia, Sabah, Apin Apin, cultivated in USA, Hawaii, Oahu, Ka'a'awa, Green Plant Research, vouchered in 2007 as *Green s.n.* (holotype BISH [BISH1072387]).

Terrestrial or hemi-epiphytic climber with white latex in all vegetative parts. **Roots** fibrous, basal; adventitious roots rarely produced. **Stems** twining or pendulous to 20 m long; leafy stems terete, up to 5 mm in diam., pale green when young, later mid green, pubescent, hairs lost in older stems; internodes 5–10(–25) cm long. **Leaves:** petiole cylindrical, 10–25 mm long, 2–2.5 mm in diam., pubescent; lamina coriaceous, elliptic, (3.5–)7–10 × (1–)2–4.5 cm, apex acute to apiculate, base cuneate to round, sometimes very shallowly peltate, margin recurved, pale to mid green above, pubescent when young, lighter green underneath, pubescent, midrib raised on adaxial surface, secondary veins often obscure, 4–6 on each side, branching at 70–80° from midrib, tertiary venation reticulate; colleters at lamina base 1 or 2, broadly ovate, c. 0.2 × 0.2 mm, often present on very young leaves only. **Inflorescences** umbelliform, positively geotropic or laterally held, bearing 1–6 flowers; peduncle extra-axillary, persistent, 8–20 mm long, 3–5 mm in diam., pubescent, rachis bearing scars of previous flowerings; pedicels 2.5–3 cm long, 1–1.5 mm in diam. (to 3.5 when alive), pubescent. **Calyx** 8–12 mm in diam., lobes free, round, 3.5–4.5 × 3–5 mm, apex rounded, outside pubescent, pale green with red markings, inside glabrous, pale green, ciliate; calycine colleters 1–3 at each calyx sinus, oblong, 0.2–0.5 mm long. **Corolla** succulent, rotate, 2.5–3 cm in diam. (to 4.5 cm when fresh), outside pale green with red markings, pubescent, inside glossy creamy white, glabrous; tube 5–7 mm long; lobes broadly triangular, 8–14 × 8–12 mm (to 16 × 13 when fresh), margins recurved, apex acute to acuminate. **Corolline corona** annular, 0.8–1 cm diam., c. 2 mm thick, surrounding the staminal corona. **Staminal corona** 9–12 mm in diam., 3–4 mm high, corona lobes ovate to orbicular, 5–6 × 3.5–4.5 mm, convex above, sulcate underneath, outer process spreading, raised, greenish white, apex rounded, inner process oblong with a round tip, greenish, fading brown. **Pollinia** clavate, 1000–1500 × 300–450 µm, without pellucid margin, apex and base rounded; corpusculum squarish, 450–750 × 450–550 µm; caudicles c. 500 µm long. **Anther appendages** triangular, membranous, hyaline, apically round, c. 2 × 2 mm. **Style head** concave, c. 3 mm in diam., style head apex convex. **Ovary** oblong, 3–4 mm long, 1.5–2 mm in basal diameter, apex rounded, glabrous. **Fruit** a single follicle, fusiform, 15–25 × 3–4 cm, pubescent, base with pedicel laterally attached, apex rounded, slightly recurved. **Seeds** flattened, slightly convex, 6–10 × 2–3 mm, with coma to 6 cm long.



Figure 57. *Hoya coronaria* Blume. **A.** Flower, side view. **B.** Flower, from above. (From Singapore, Upper Peirce, Rodda MR333. Photos: M. Rodda).

Distribution. Southern Thailand, Peninsular Malaysia, Sumatra, Borneo, Java, Sulawesi and New Guinea. In Singapore it is now known only from Upper Peirce (Rodda MR333, 30 Apr 2013, SING [SING0266618]). In the past it was collected from Pulau Tekong (Ridley 2731, 1890, SING [SING0003936]), Jurong (Ridley s.n., 1897, SING [SING0003935]), Changi (Ridley s.n., 1894, SING [SING0003937]), Serangoon (Ridley 2731a, 1891, SING [SING0003938]), Ulu Berih and Kranji.

Ecology. A large climber usually rooted in the ground that can climb to the top of the canopy where it develops pendulous branches that bear flowers. It can also be hemi-epiphytic. It is able to grow in low altitude primary as well as secondary forests.

Provisional conservation assessment. Globally Least Concern (LC) as it is a widespread and common species. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from very few individuals at a single locality.

Uses. The bitter latex causes vomiting when swallowed. However in Java it is mixed with *Capsicum* leaves to stimulate digestion. Young leaves are eaten cooked as a vegetable (Sarawak).

Vernacular name. *Akar setebal* (Malay).

Notes. *Hoya coronaria* is the oldest name in a species complex that is very widespread and variable. Only by revising the complex as a whole will it be possible to work out the species boundaries and synonymies.

5. *Hoya diversifolia* Blume

(Latin, *diversi-* = different, *folia* = leaves; referring to the variable leaf size and shape)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1064; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 570; Ridley, Fl. Malay Penins. 2 (1923) 396; Rintz, Malayan Nat. J. 30(3&4) (1978) 517; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 207. **Synonym:** *Hoya esculenta* Tsiang, Sunyatsenia 3 (1936) 176, nom. illeg. superfl. **Type:** [Published illustration] Rumphius, Herb. Amboin. 5 (1747) t. 175: fig. 2, lectotype designated by Rodda, Gard. Bull. Singapore 69 (2017) 40. **Epitype:** *Collector unknown s.n.* (Blume?), locality unknown, '*Hoya heterophylla*' (epitype L [sheet no. 989168-147], designated by Rodda, Gard. Bull. Singapore 69 (2017) 40). **Fig. 58.**

Hoya crassipes Turcz., Bull. Soc. Imp. Naturalistes Moscou 21 (1848) 261. **Type:** *Zollinger 2581*, [Indonesia], Java (lectotype K-W [K001000511], designated by Rodda, Gard. Bull. Singapore 69 (2017) 40; isolectotype A [A00961506]).

Hoya orbiculata Wall. ex Wight, Contr. Bot. India (1834) 36. **Type:** *Wallich s.n.* [EIC 8151, Asclep. 32], [Myanmar], Prome in Ava, [1826] (lectotype K (Herb. Wight Propr., with a sketch of the flower in Wight's hand), designated by Rodda, Gard. Bull. Singapore 69 (2017) 40; isolectotypes E [E00179565], K [K001129088, two others without barcodes]).

Hoya zollingeriana Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 518. **Type:** *Zollinger s.n.*, [Indonesia], Java, bij Lalaei (lectotype P [P05029459], designated by Rodda, Gard. Bull. Singapore 67 (2015) 306).

Hoya liangii Tsiang, Sunyatsenia 3 (1936) 177. **Type:** *Liang 26867*, China, Hainan, Ngai Yuen, (lectotype IBSC [IBSC0005685], designated by Rodda, Gard. Bull. Singapore 69 (2017) 40; isolectotype NY [NY00318649]).

Hoya el-nidicus Kloppenb., Fraterna, 3rd quarter, Suppl. (1991) I, nom. inval.; Kloppenb., Fraterna, 4th quarter, Suppl. (1991) I. **Synonym:** *Hoya diversifolia* Blume subsp. *el-nidicus* (Kloppenb.) Kloppenb., Fraterna 14(1) (2001) 13. **Type:** *Pancho s.n.*, Philippines, Palawan, El Nido rest area (holotype UPLB [sheet no. 41931], n.v.)

Hoya persinicoronaria Shao Y.He & P.T.Li, Novon 19 (2009) 475. **Type:** *He et al. 0708086*, China, Hainan Prov., Bawangling, on a tree in montane tropical rain forest, 19°06'N 109°06'E, 214 m (holotype CANT n.v.).

Epiphytic climber with white latex in all vegetative parts, glabrous. **Roots** fibrous, basal or adventitious, produced all along the stems. **Stems** erect, twining or pendulous to 10 m long; leafy stems terete, up to 8 mm in diam., dull green when young, later yellowish brown; internodes (5–)10–25) cm long. **Leaves:** petiole cylindrical, 3–10(–20) mm long, 2–4 mm in diam.; lamina fleshy, stiff, orbicular, elliptic or oblong, (3–)5–15(–20) × 1.5–5(–7) cm, apex acute to rounded, base rounded or cuneate, margin slightly recurved, mid green above, lighter green underneath with paler midrib, midrib raised on adaxial surface, secondary veins usually obscure, 3–6 on each side; colleters one or two at each lamina base, ovate, c. 0.5 × 0.5 mm, often visible on immature leaves only. **Inflorescences** umbelliform, convex, positively geotropic or held laterally, bearing 10–15(–20) flowers; peduncle extra-axillary, persistent,



Figure 58. *Hoya diversifolia* Blume. **A.** Habit. **B.** Inflorescence with buds and open flowers. (From Singapore, Pulau Ubin, Rodda *et al.* MRI2-S040. Photos: M. Rodda).

(4–)10–70 mm long, 1.5–2.5(–4) in diam., glabrous, rachis bearing scars of previous flowerings; pedicels 12–15 mm long, 0.5–0.7 mm (–1.2 mm when fresh) in diam., pale green to dark red, glabrous. **Calyx** 3.5–5 mm in diam., lobes free, broadly ovate 1.7–2 × 1.5–2 mm, apex round (acute), outside pale yellow or green with red markings, sparsely pubescent, inside glabrous, pale yellow or green, margin ciliate; calycine colleters absent. **Corolla** rotate, 7–9 mm (–14 mm when fresh) in diam., pale greenish yellow flushed purple; tube 1.7–2.1 mm long, glabrous outside, pubescent inside; lobes broadly triangular, 3–3.5 × 2.8–3.2 mm, apex acuminate, outside glabrous, inside thickly pubescent, tip glabrous. **Staminal corona** 3.5–4.5 mm (–6 mm when fresh) in diam., 1.5–2 mm high, corona lobes ovate-oblong, 1.8–2 × 1–1.2 mm, slightly convex above, sulcate underneath, outer process purple, apex rounded, raised, inner process purple, raised with an acute tip. **Pollinia** oblong 400–600 × 170–200 µm, with pellucid margin, apex obliquely truncate, base rounded; corpusculum lanceolate, 170–200 × c. 50 µm; caudicles c. 100 µm long. **Anther appendages** membranous, hyaline, apically acute, c. 1 × 0.5 mm. **Style head** conical c. 1.5 mm in diam., style head apex acuminate, c. 0.5 mm long. **Ovary** ovate, 1–1.2 mm long, 0.5–0.8 mm in basal diameter, apex acute, glabrous. **Fruit** a single follicle, fusiform, slightly lunate, 10–15 × 0.5–1 cm, base with pedicel attached straight, apex acuminate. **Seeds** oblanceolate, 5–6 × 1.5–2 mm, long comose, coma 3–4 cm long.

Distribution. Southern China, continental Southeast Asia, Sumatra, Borneo, Java, Philippines and Sulawesi. In Singapore it has been collected in Mandai (*Gwee SING2010-187*, 26 Jan 2010, SING [SING0146601]), Pulau Pawai (*Lua SING2010-801*, 13 Jul 2010, SING [SING0146707]), Pulau Tekong (*Samsuri et al. PT188*, 6 Dec 2001, SING [SING0039864]), Pulau Serangoon (*Tan et al. CI16*, 25 Sep 1998, SINU) and Sungei Simpang North (*Tan 1292*, 18 Jun 2005, SINU). In the past it was also collected in the Singapore Botanic Gardens, Kranji, Jurong and Serangoon.

Ecology. A large epiphytic climber found in lowland primary and secondary forest. Occasionally found on roadside trees. It can grow in shade from the tree canopy as well as in full sun.

Provisional conservation assessment. Globally Least Concern (LC) as it is a widespread and rather common species. In Singapore the number of individuals of *Hoya diversifolia* is estimated at between 250 and 1000 and is, therefore, assessed here as Vulnerable (VU/D).

Uses. In Peninsular Malaysia and Vietnam, the water in which leaves have been boiled is used as a bath to treat rheumatism. An extract of *Hoya diversifolia* has shown strong antinematodal activity against the pine wood nematode *Bursaphelenchus xylophilus*.

Vernacular names. *Akar sesudu bukit, akar serapat, akar chaping kera* (Malay).

6. *Hoya finlaysonii* Wight

(George Finlayson, 1790–1823, naturalist and surgeon
for the East India Company)

Contr. Bot. India (1834) 38; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 574; Ridley, Fl. Malay Penins. 2 (1923) 397; Rintz, Malayan Nat. J. 30(3&4) (1978) 511; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 193. **Type:** *Wallich s.n.* [EIC 8166B, Asclep. 42], Singapore (lectotype K [K000895121], designated by Rodda, Gard. Bull. Singapore 69 (2017) 42; isolectotypes E [E00179577], K [K001129114]). **FIG. 59.**

Epiphytic climber with white latex in all vegetative parts, glabrous. **Roots** fibrous, basal or adventitious, produced all along the stems. **Stems** twining or pendulous to 5 m long; leafy stems terete, up to 5 mm in diam., dark green or greyish brown; internodes (2.5–)5–20(–25) cm long. **Leaves:** petiole cylindrical, 10–30 mm long, 1.5–4 mm in diam.; lamina fleshy, stiff, lanceolate, 12–20 × 3.5–6 cm, apex acuminate, base cuneate, margin finely undulate, pale to dark green above with darker venation, lighter green underneath with darker midrib, midrib raised on adaxial surface, venation pinnate, secondary veins 7–9 on each side, branching at c. 70° from midrib, tertiary venation reticulate; colleters at lamina base not observed. **Inflorescences** umbelliform, laterally held or negatively geotropic, convex, bearing 10–25(–30) flowers; peduncle extra-axillary, persistent, 0.5–2 cm long, 2–4 mm in diam., glabrous or sparsely pubescent, rachis bearing scars of previous flowerings; pedicel filiform, 1.5–2 cm long, c. 0.5 mm in diam., glabrous or very sparsely pubescent. **Calyx** 3–4 mm in diam., lobes free, broadly ovate, 1–2 × 1–1.5 mm, apex rounded, outside sparsely pubescent, inside glabrous, ciliate; calycine colleters one at each calyx lobe sinus, oblong, 0.2–0.3 × 0.1–0.15 mm. **Corolla** thin, reflexed, 0.8–1.2 cm in diam.; tube shallowly campanulate, 1–1.5 mm long, white; lobes ovate, 3–4.5 × 2.8–3.5 mm, apex acute, inside white, very sparsely pubescent, outside white, fading to reddish maroon at the margin and tip, glabrous. **Staminal corona** 5–6 mm in diam., c. 2 mm high, white; corona lobes oblong to broadly ovate, 2.5–2.7 × 1.2–1.5 mm, slightly convex above, sulcate underneath, outer process apex rounded, inner process apiculate, raised. **Pollinia** oblong, 350–450 × 120–150 µm, with pellucid margin, apex



Figure 59. *Hoya finlaysonii* Wight. **A.** Inflorescence and leaves showing venation on upper leaf surface. **B.** Inflorescence with fully open flowers with reflexed corolla. (Cultivated in Singapore Botanic Gardens, Rodda MR569. Photos: M. Rodda).

obliquely truncate, base rounded; corpusculum ovate, c. $150 \times 100 \mu\text{m}$; caudicles broad, c. $80 \mu\text{m}$ long. **Anther appendages** membranous, hyaline, broadly triangular, c. $0.7 \times 1 \text{ mm}$. **Style head** concave, c. 1.5 mm in diam., style head apex acuminate, c. 0.5 mm long. **Ovary** conical, c. 1 mm long, c. 0.5 mm in basal diameter, apex rounded, glabrous. **Fruit and seeds** not observed.

Distribution. Thailand, Peninsular Malaysia, Sumatra and Borneo. In Singapore only known by the very old type collection which lacks precise locality information.

Ecology. Across its range, an epiphytic vine in lowland to hill primary forests. It usually grows in deep shade.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. In Singapore presumed Nationally Extinct.

Notes. Ridley (Fl. Malay Penins. 2 (1923) 398) based the Singapore record on *Wallich s.n.* [EIC 2724] (K) but that is erroneous because this specimen is *Orthosiphon glabratus* Benth. Specimens from Malaysia sometimes have sparsely pubescent young stems and leaves, while the Singapore material appears to be glabrous.

7. *Hoya lacunosa* Blume

(Latin, *lacunosus* = covered with depressions, pitted with shallow holes; likely referring to the depressions between the secondary veins of the lamina)

Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1063; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 569; Ridley, Fl. Malay Penins. 2 (1923) 395; Rintz, Malayan Nat. J. 30(3&4) (1978) 490; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 216. **Synonym:** *Otostemma lacunosum* (Blume) Blume, Rumphia 4 (1849) 30. **Type:** *Collector unknown s.n.*, [Indonesia, Java] 'circa Buitenzorg at arbores' (lectotype L [sheet no. 898168-188], designated by Rodda, Gard. Bull. Singapore 69 (2017) 44). **Fig. 60.**

Epiphyte or climber with white latex in all vegetative parts. **Roots** adventitious, produced just below the nodes and more rarely all along the stems. **Stems** pendulous or growing adpressed to host tree trunk to 1 m long; leafy stems terete, up to 2 mm in diam., pale green when young, later mid to dark green, sparsely pubescent when young, later glabrous; internodes (0.2–)1–5(–15) cm long. **Leaves:** petiole cylindrical, 1–5 mm long, c. 1 mm in diam., sparsely pubescent when young; lamina fleshy, stiff, broadly ovate to lanceolate, 1–3(–8) × (0.8–)1–2 cm, apex acute to acuminate, base rounded to cuneate, mid green above, sparsely pubescent at the margin when young, pale glaucous green underneath, glabrous, midrib raised on adaxial surface, secondary veins 3–6 on each side, branching at c. 90° from midrib; colleters one at each lamina base, conical, c. 0.5 × 0.5 mm, brown, often visible on immature leaves only. **Inflorescences** umbelliform, positively geotropic, flat or slightly convex, bearing 15–25 flowers; peduncle extra-axillary, persistent, 1.5–5.5 cm long, 1–1.5 mm in diam., sparsely pubescent, rachis bearing scars of previous flowerings; pedicels curved, 0.7–1.5 cm long, c. 0.5 mm in diam., glabrous. **Calyx** c. 2 mm in diam., lobes free, broadly ovate, c. 0.8 × 0.8 mm, apex rounded, outside sparsely pubescent, greenish yellow, inside glabrous, greenish yellow, ciliate; calycine colleters 1 at each calyx lobe sinus, ovate, 0.15–0.2 × 0.07–0.1 mm. **Corolla** globose, 4–5 mm in diam. (c. 7 mm when flattened), white; tube c. 1.5 mm long, outside glabrous, inside basally glabrous, apically pubescent; lobes ovate, 2–2.5 × c. 2 mm, outside glabrous, inside pubescent, apex acute, glabrescent. **Staminal corona** 2.5–3.5 mm in diam. 1–1.5 mm high, stalked, stipe c. 0.5 mm tall; corona lobes obovate, c. 1 × 0.5 mm, slightly convex above, sulcate underneath, cream-yellow, outer process apex rounded, raised, inner process raised with an acute tip. **Pollinia** oblong, 300–400 × 90–110 µm, with pellucid margin, apex obliquely truncate, base rounded; corpusculum oblong, c. 100 × 50 µm; caudicles c. 100 µm long. **Anther appendages** membranous, hyaline, triangular apically acute, c. 0.5 × 0.5 mm. **Style head** slightly concave c. 1 mm in diam. with an acute tip, c. 0.2 mm in diam. **Ovary** ovate, c. 0.8 mm long, c. 0.5 mm in basal diameter, glabrous. **Fruit** and **seeds** not seen.

Distribution. Thailand, Peninsular Malaysia, Sumatra, Borneo, Java and the Philippines. In Singapore it is found in Nee Soon (*Maxwell* 78-50, 24 Mar 1978, SINU [SINU2007001245]; *Rodda* MR12-H222, 26 Nov 2012, flowered in cultivation, SING [SING0264213]; *Turner et al.* 640, 30 Apr 1992, SINU [SINU2007018996]) and Pulau Unum (*Loo et al.* PU3, 30 Sep 1998, SINU [SINU2007017028]). In the past it was also found at Bukit Mandai (*Ridley s.n.*, 30 May 1889, SING [SING0059289]) and Chan Chu Kang (*Ridley s.n.*, 1889, SING [SING0003954]).



Figure 60. *Hoya lacunosa* Blume. **A.** Inflorescence, side view. **B.** Inflorescence with flowers showing the pubescent corolla and yellow corona. (From Singapore, Nee Soon, *Rodda MR12-H222*. Photos: M. Rodda)

Ecology. An epiphytic climber usually found in lowland primary forest. In Peninsular Malaysia it can be also found in hill forest.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from very few individuals at two localities.

8. *Hoya latifolia* G. Don

(Latin, *lati-* = broad and *-folia* = leaf; with broad leaves)

Gen. Hist. 4 (1837) 127; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 568; Ridley, Fl. Malay Penins. 2 (1923) 395; Rintz, Malayan Nat. J. 30(3&4) (1978) 508; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 216. **Synonym:** *Hoya macrophylla* Wight, Contr. Bot. India (1834) 38, nom. illeg. non Blume (1826). **Type:** *Wallich s.n.* [EIC 8161A, Asclep. 138], [Malaysia], Penang (lectotype K [K000895124], p.p., designated by Rodda, Gard. Bull. Singapore 69 (2017) 45; isolectotypes CGE (x2, one a mixed collection), E [E00179576], K [K000895125]. **Fig. 61, 62A–C.**

Hoya polystachya Blume, Mus. Bot. 1, fasc. 3 (1849) 45, fig. 9. **Type:** Pending typification, [Indonesia], ‘In montanis insularum Javae et Sumatrae’.

Epiphytic or hemi-epiphytic climber with white latex in all vegetative parts, glabrous. **Roots** adventitious produced all along the stems. **Stems** twining or pendulous to 10 m long; leafy stems terete, up to 10 mm in diam., green or reddish when young, later dark green or greyish brown; internodes (5–)10–20(–25) cm long. **Leaves:** petiole cylindrical, 10–20(–35) mm long, 3–6 mm in diam.; lamina fleshy, stiff, broadly ovate to broadly lanceolate,

10–20(–30) × 7–15(–20) cm, apex acute, acuminate or cuspidate, base obtuse or rounded, mid green to maroon above, lighter green underneath with darker midrib, midrib raised on adaxial surface, venation palmate with 3–5 veins arising from the lamina base; colleters one at each lamina base, triangular, c. 1 × 1.5 mm, pale brown, often visible on immature leaves only. **Inflorescences** umbelliform, globose, positively geotropic to horizontal, bearing 10–30 flowers; peduncle extra-axillary, often branched 1–2(–6) times at the base, with up to 10 secondary peduncles, persistent, 30–80 mm long, 1.5–3 mm in diam., very finely pubescent or glabrescent, rachis bearing scars of previous flowerings; pedicels 1–1.5 cm long, 0.5–0.7 mm in diam., puberulous. **Calyx** 2–3 mm in diam., lobes free, triangular, 0.8–1.2 × 0.5–0.7 mm, apex acute, pale pink or pale green, outside sparsely pubescent or glabrescent, inside glabrous, sparsely ciliate; calycine colleters not present. **Corolla** rotate, 7–9 mm in diam., pale green/yellow or pink; tube campanulate, 1–1.5 mm long, glabrous; lobes ovate, 3–4 × 2–3 mm, outside glabrous, inside finely pubescent, apex acute. **Staminal corona** 3–3.5 mm in diam., c. 1.5 mm high, cream, or pale pink, corona lobes ovate, 1.3–1.6 × 0.9–1.1 mm, convex above, sulcate underneath, apex raised, round, minutely bilobed, raised with a triangular tip. **Pollinia** oblong, 300–350 × 130–150 µm, with pellucid margin, apex obliquely truncate, base rounded; corpusculum oblong 150–170 × 80–90 µm; caudicles 80–100 µm long. **Anther appendages** membranous, hyaline, triangular, apically acute, c. 0.5 × 0.3 mm. **Style head** flat c. 1 mm in diam., style head apex acuminate c. 0.5 mm long. **Ovary** ovate, 1–1.2 mm long, 0.4–0.5 mm in basal diameter, glabrous. **Fruit** a single follicle, linear, 10–15 × 0.4–0.5 cm, base with pedicel laterally attached, apex acuminate. **Seeds** oblong, 4–4.5(–7) × 1–1.5 mm, long comose, coma 3–4 cm long.

Distribution. Thailand, Peninsular Malaysia, Sumatra, Borneo and Java. In Singapore it occurs in Bukit Kallang (*Mhd Shah & Ali MS4167*, 28 Jan 1982, SING [SING0120846]), Upper Seletar (*Hassan & Lua, SING2012-059*, 7 Mar 2012, SING [SING0174841]), Bukit Timah (*Ho et al. SING2016-111*, 10 May 2016, SING [SING0236460, SING0236461]), Mandai (*Gwee SING2010-182*, 26 Jan 2010, SING [SING0146597]). It is also found along roads such as Sime Road (*Teo SR44*, 2000, SINU [SINU2007001247]) and Margaret Drive, and on Coney Island. In the past it was also collected on Pulau Tekong, Jurong River, Chan Chu Kang, Changi and Nassim Road.

Ecology. A large epiphytic climber found on large trees in lowland primary and secondary forest. Occasionally found on roadside trees. It climbs on the larger main branches where it is shaded by the tree canopy.

Provisional conservation assessment. Globally and locally Least Concern (LC) as it is a widespread and rather common species, although rarely collected and underrepresented in herbaria.

Uses. The latex is used as a diuretic to treat ascites.

Notes. *Hoya latifolia* has two distinct colour forms, one with pink flowers and maroon leaf venation and lamina underside, the other with pale green/yellow flowers and green leaf venation and lamina underside. Both can be found growing together on the same tree and there is no evidence to recognise them as separate taxa.

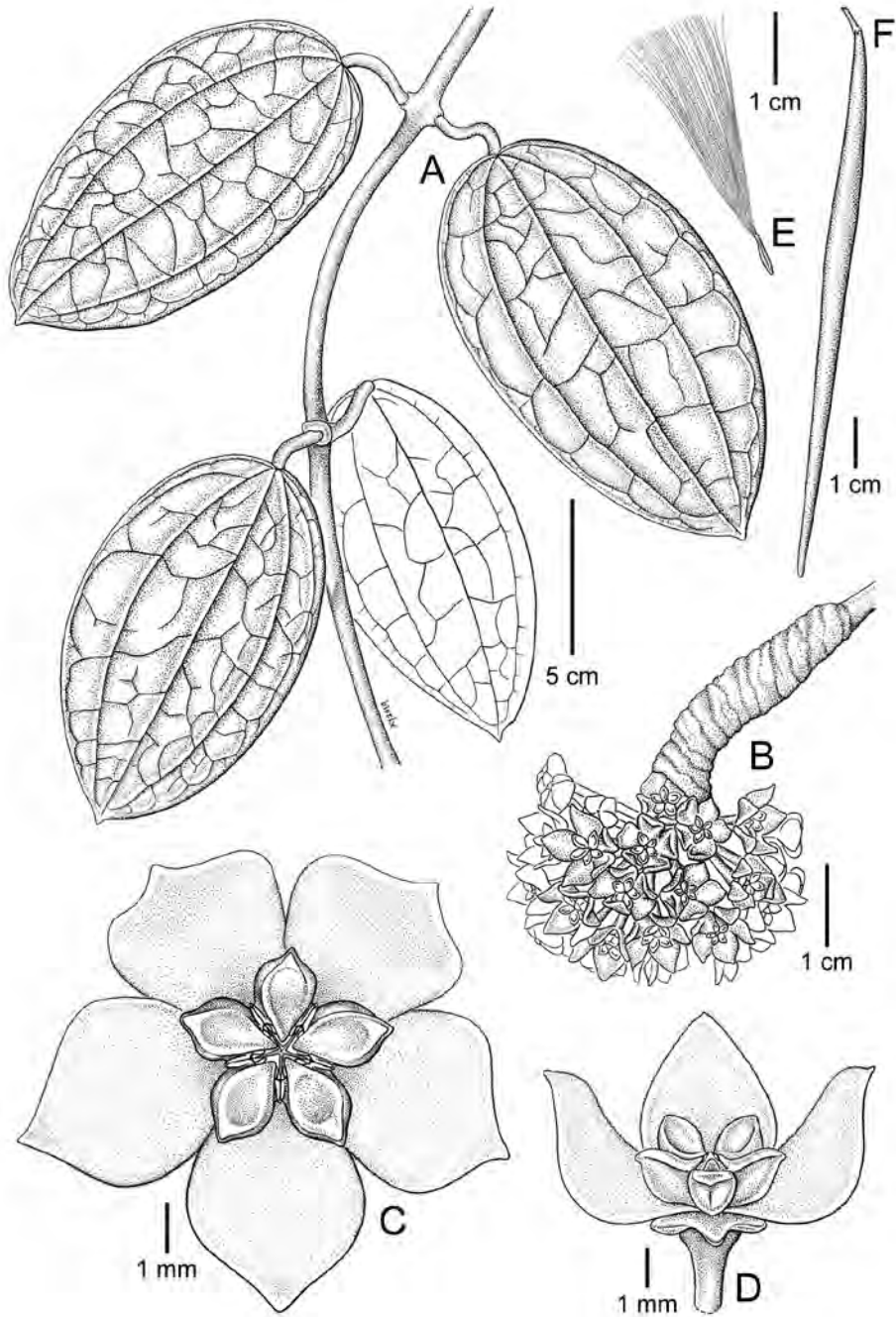


Figure 61. *Hoya latifolia*. G.Don. **A.** Leafy branch. **B.** Inflorescence, showing the elongated persistent peduncle. **C.** Corolla, from above. **D.** Flower, side view, with part of the corolla removed exposing the gynostegium. **E.** Seed. **F.** Fruit. (From Singapore, A, F from Upper Seletar, *Lok s.n.*; B, E from Singapore Zoo, *Rodda MR12-S045*; C, D from Singapore Zoo, *Rodda MR12-S043*. Drawn by X.Y. Loh).

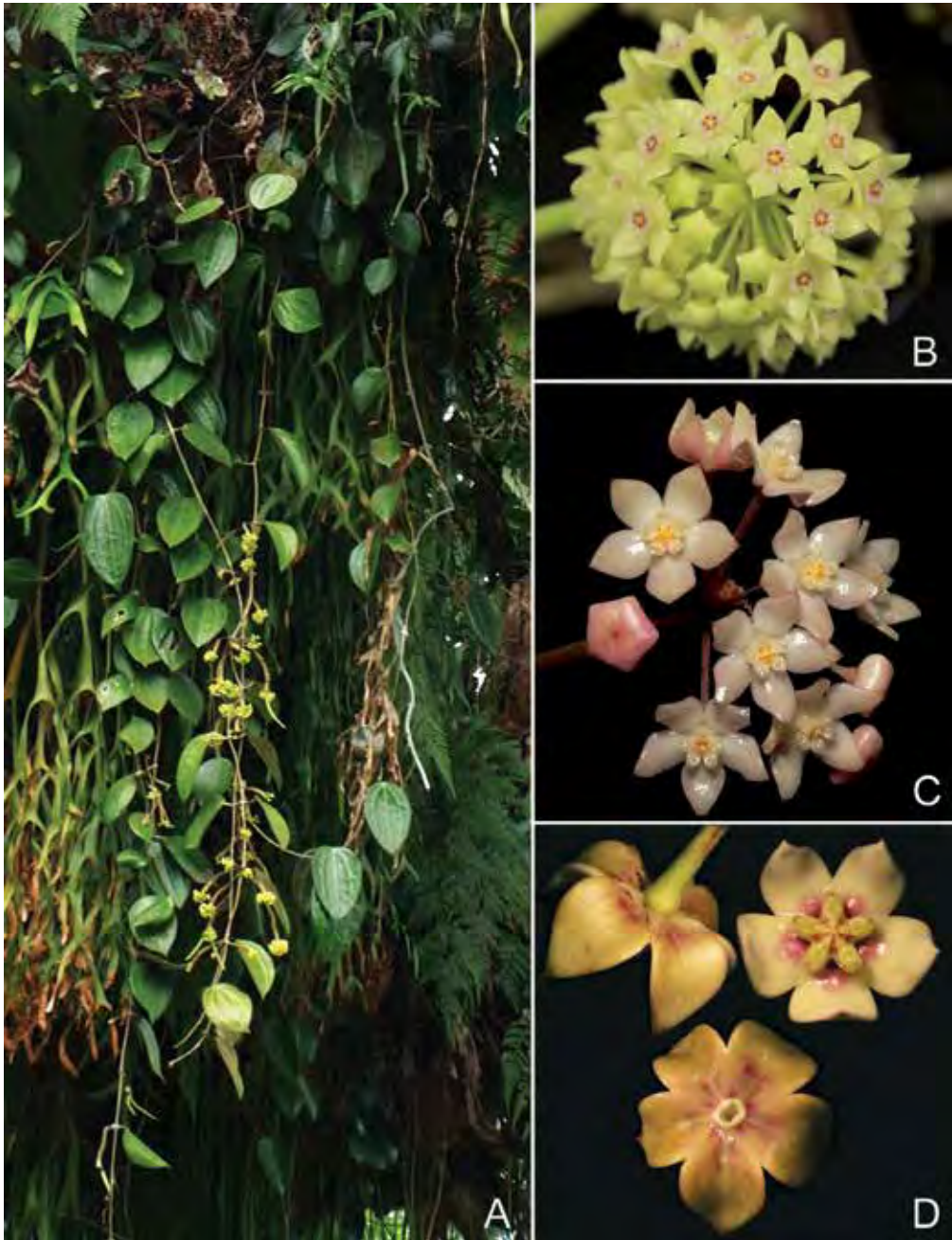


Figure 62. *Hoya latifolia* G.Don. **A.** Habit with leafy branches and fertile almost leafless branches. **B.** Inflorescence with buds and open flowers, yellow-green colour form. **C.** Inflorescence with buds and open flowers, pink colour form. *Hoya obtusifolia* Wight. **D.** Flower, side and top view, and back of corolla. (A, B from Singapore Zoo, Rodda MR12-S045, C from Malaysia, Sarawak; D from Singapore, Pulau Ubin. Photos: M. Rodda).

9. *Hoya obtusifolia* Wight

(Latin, *obtus-* = obtuse, *-folia* = leaves;
referring to the obtuse leaves)

Contr. Bot. India (1834) 38; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 563; Ridley, Fl. Malay Penins. 2 (1923) 399; Rintz, Malayan Nat. J. 30(3&4) (1978) 520; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 149; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 193; Rodda & Lai, Nat. Singapore 11 (2018) 45. **Type:** *Wallich s.n.* [EIC 8167, Asclep. 38], [Malaysia, Penang?] (holotype K [K000895115]; isotypes E [E00179578], K [K001129115]). **Fig. 62D.**

Hoya teysmanniana Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 522. **Type:** *Teijsmann HB1170*, [Indonesia], Sumatra, Soengi Pagoe (lectotype U [U0000686], designated by Rodda, Gard. Bull. Singapore 69 (2017) 50; possible isolectotype K [K000894744]).

Epiphytic or hemi-epiphytic climber with white latex in all vegetative parts. **Roots** fibrous, basal; adventitious roots rarely produced. **Stems** erect or pendulous, to 10 m long; leafy stems terete, up to 10 mm in diam., pale green when young, later dark green or greyish brown, pubescent, hairs lost in older stems; internodes 5–20(–25) cm long. **Leaves:** petiole cylindrical, slightly channelled above, 10–20 mm long, 3–8 mm in diam., pubescent when young; lamina fleshy, stiff, elliptic, 10–20 × 4–8 cm, apex obtuse to acute apiculate or cuspidate, base rounded or very shallowly cordate, pale to mid green above, pubescent when young, lighter green underneath with paler midrib, papillose with pubescent midrib when young, midrib raised on adaxial surface, secondary veins 4–10 on each side, branching at c. 70° from midrib; colleters one at each lamina base, ovate, c. 0.2 × 0.1 mm, pale brown, often visible on immature leaves only. **Inflorescences** umbelliform, convex, positively geotropic, bearing 8–15(–30) flowers; peduncle extra-axillary, persistent, 20–50 mm long, 2.5–5 mm in diam., sparsely pubescent, rachis bearing scars of previous flowerings, up to 9 mm in diam.; pedicels 2–3 cm long, 2–2.5 mm in diam., sparsely pubescent. **Calyx** 10–12 mm in diam., lobes free, triangular, 3–5 × 2–2.5 mm, apex rounded, outside pubescent, pale yellow with red markings at the margin, inside glabrous, pale yellow with red markings at the margin, ciliate; calycine colleters missing. **Corolla** succulent, rotate, c. 2 cm in diam. (2.5–3 cm when flattened), glabrous, outside white to pale yellow, with a pale pink patch in between the calyx lobes, inside basally purple-pink, progressively fading into pale cream; tube 3.5–5 mm long; lobes triangular, 9–11 × 9–11 mm, apex acute. **Staminal corona** 8–9 mm in diam., 4–5 mm high, corona lobes obovate, 3.5–5 × 2–2.2 mm, slightly convex above, sulcate underneath, outer process greenish white, apex obtuse, raised, inner process white, raised with an acuminate tip, incurved over the style head. **Pollinia** oblong, 950–1050 × 300–350 µm, with pellucid margin, apex and base rounded; corpusculum rhomboid, 350–450 × 200–250 µm; caudicles c. 250 µm long. **Anther appendages** membranous, hyaline, apically round, c. 1.5 × 1 mm. **Style head** conical c. 2 mm in diam., style head apex acuminate, c. 2 mm long. **Ovary** conical, 1.8–2 mm long, c. 1 mm in basal diameter, glabrous. **Fruit** a single follicle, fusiform, c. 12.5 × 2 cm, glabrous, base with pedicel laterally attached, apex acute, recurved. **Seeds** 3–3.5 × 1–1.2 mm, long comose.

Distribution. Thailand, Peninsular Malaysia, Sumatra, Borneo and Java. In Singapore it is currently only known from Pulau Ubin (*Lai SING2016-165*, 6 Oct 2016, SING [SING0202925

spirit]). In the past it was also collected on Bukit Timah (*Burkill s.n.*, 15 Sep 1914, SING [SING0120853]), Serangoon (*Collector unknown 8932*, 1897, SING [SING0120854]) and Changi (*Ridley s.n.*, Feb 1894, SING [SING0120852]).

Ecology. An epiphytic vine in lowland to hill primary forests.

Provisional conservation assessment. Globally Least Concern (LC) as it is a widespread species. It is assessed here as Critically Endangered (CR/D) in Singapore as it is currently only known from a single plant in the wild.

10. *Hoya revoluta* Wight ex Hook.f.

(Latin, *revolutus* = revolute, rolled back from edge towards the lower side; referring to the revolute corolla)

Fl. Brit. India 4, fasc. 10 (1883) 55; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 577; Ridley, Fl. Malay Penins. 2 (1923) 401; Turner, Gard. Bull. Singapore 45 (1993) 44; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 193; Rodda & Simonsson Juhonewe, Webbia 68 (2013) 10; Rodda, Gard. Bull. Singapore 69 (2017) 52. **Type:** *Maingay 3101* [Kew Distribution 1127], [Malaysia] (lectotype K [K000279860], designated by Forster & Liddle, Austrobaileya 3(4) (1992) 638). **Epitype:** *Henderson 24439*, Malaysia, Pahang, Tasek Bera, low altitude (epitype SING, designated by Rodda & Simonsson Juhonewe, Webbia 68 (2013) 10).

Epiphytic climber with white latex in all vegetative parts, glabrous. **Roots** adventitious, all along the stems. **Stems** twining or pendulous, to 5 m long; leafy stems terete, 2–4 in diam., mid green when young, later dark green or brown; internodes 2–6(–10) cm long, sometimes only 3–5 mm long at branching point, forming tufts of leaves. **Leaves:** petiole slightly flattened towards the lamina base, usually curved, 3–8 × 2–3 mm diam., dark green or maroon; lamina fleshy, stiff, ovate or ovate–lanceolate, 2–5(–9) × 1–2.5 cm, base attenuate or acuminate, apex acuminate, margins thickened, dull green, venation pinnate, inconspicuous; colleters at lamina bases between the thickened leaf margins, minute. **Inflorescences** umbelliform, positively geotropic, concave, bearing up to 25 flowers; peduncle extra-axillary, persistent, 2–8 cm long, 1–1.5 mm in diam., glabrous, rachis bearing scars of previous flowerings, up to 3 cm long; pedicels 0.7–4 cm long, c. 0.6 mm diam., glabrous, the outer longer pedicels strongly curved. **Calyx** 1.5–2 mm in diam., purplish red, lobes free, ovate or oblong, 0.6–1 × 0.5–0.7 mm, apex rounded, outside sparsely pubescent, inside glabrous; calycine colleters one at each calyx lobe sinus, oblong, c. 0.2 × 0.1 mm. **Corolla** reflexed, 3.5–5 mm diam. (7–10 mm diam. when flattened), pale pink; tube 1–1.5 mm long, pubescent inside; lobes reflexed, triangular, 2.5–3.5 × 2–2.7 mm, apex acuminate, revolute, inside pubescent, tip glabrous. **Staminal corona** 1.5–2 mm high, 2.7–3.7 mm in diam., pale pink, dark purple in the centre, corona lobes oblong, flattened above, 1.8–2.2 × 1–1.2 mm, inner process erect, as high as the anthers, outer process bilobed. **Pollinia** oblong, 210–250 × 100–110 µm, with pellucid margin, apex obliquely truncate, base rounded; corpusculum narrowly ovoid, c. 80–110 × 35–50 µm; caudicles broadly spatulate. **Anther appendages** membranous, hyaline, triangular, apically acute, c. 0.4 × 0.4 mm. **Style head** c. 0.7 mm in diam., style head apex umbonate, c. 0.5 mm in diam.

Ovary conical, 1–1.5 mm long, c. 0.5 mm in basal diameter, glabrous. **Fruit** a single follicle, fusiform, 4–8 × c. 0.5 cm, glabrous. **Seeds** not seen.

Distribution. Peninsular Malaysia, Sumatra, Pulau Jamaja and Borneo (Kalimantan). In Singapore only known by a very old collection from Woodlands (*Ridley s.n.*, 1906, SING [SING0120855]).

Ecology. An epiphytic climber, often with pendulous stems, in lowland primary and secondary forests.

Provisional conservation assessment. Globally Least Concern (LC) as it is a widespread and locally common species. In Singapore it is, however, presumed Nationally Extinct.

11. *Hoya scortechinii* King & Gamble

(Benedetto Scortechini, 1845–1886, Italian priest and botanist)

J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 567; Ridley, Fl. Malay Penins. 2 (1923) 400; Rodda, Gard. Bull. Singapore 69 (2017) 52. **Type:** *Scortechini 464b*, Malaysia, Perak (lectotype K [K000895122], designated by Rodda, Gard. Bull. Singapore 69 (2017) 52). **Fig. 63A–C.**

Epiphytic climber with white latex in all vegetative parts, glabrous. **Roots** adventitious, produced all along the stems. **Stems** twining or pendulous, to 3 m long; leafy stems terete, up to 3 mm in diam., pale green when young, later pale greyish brown; internodes 5–10(–20) cm long. **Leaves:** petiole cylindrical, thicker than stems, slightly channelled above, (3–)10–15 mm long, 1–2 mm in diam.; lamina fleshy, stiff, ovate-lanceolate, (3–)5–10(–20) × 1–3 cm, apex acute or acuminate, base rounded or very shallowly cordate, margin recurved, pale to mid green above with darker venation, lighter green underneath with paler midrib, secondary veins 3–10 on each side, almost completely obscure; colleters one at each lamina base, triangular, c. 0.5 × 1 mm, pale brown, often visible on immature leaves only. **Inflorescences** umbelliform, rounded, bearing 5–15 flowers; peduncle extra-axillary, positively geotropic, persistent, 2–10 cm long, 1.5–2 mm in diam., glabrous, rachis bearing scars of previous flowerings; pedicels negatively geotropic, 8–10(–15) mm long, 0.5–0.7 mm in diam., glabrous. **Calyx** 3–4 mm in diam., lobes free, triangular, 1–1.5 × 1–1.5 mm, apex acute to obtuse, outside sparsely pubescent, inside glabrous, ciliate; calycine colleters one at each calyx lone sinus, oblong, 0.3–0.4 × c. 0.1 mm. **Corolla** fleshy, reflexed, 6–8 mm in diam. (to 14 mm when flattened), tube 1–1.5 mm long, outside white to pale pink, glabrous outside, finely pubescent inside; lobes ovate, 4–5.5 × 3.5–4 mm, white turning pink at the tips glabrous outside, finely pubescent inside, apex acute. **Staminal corona** 5–6 mm in diam., c. 2 mm high, cream, corona lobes ovate, 2.5–3.5 × 1.3–1.7 mm, slightly convex above, sulcate underneath, apex obtuse, raised with an acuminate tip, incurved over the style head. **Pollinia** oblong, 530–560 × 190–210 µm, with pellucid margin, apex and base rounded; corpusculum ovoid, 370–400 × 160–180 µm; caudicles c. 150 µm long. **Anther appendages** membranous, hyaline, triangular, apically acute, c. 1.1 × 1 mm. **Ovary** oblong, 1–1.2 mm long, c. 0.5 mm in basal diameter, apex rounded, glabrous. **Style head** concave, c. 2 mm in diam. **Fruit** a single follicle, linear, 8–15 ×

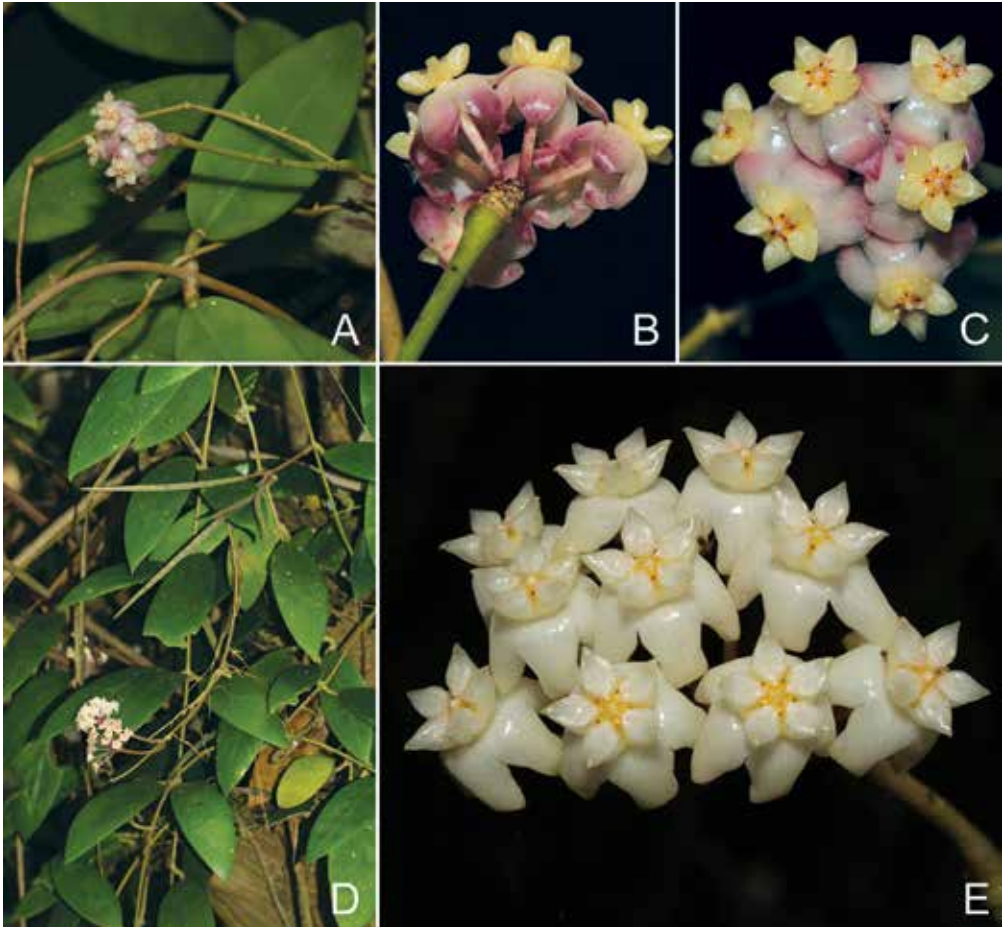


Figure 63. *Hoya scortechinii* King & Gamble. **A.** Leaves and inflorescence. **B.** Inflorescence, from underneath. **C.** Inflorescence showing the fully open flowers with reflexed corolla. *Hoya verticillata* (Vahl) G.Don. **D.** Habit with leafy branches, inflorescences and follicles. **E.** Inflorescence with fully open flowers with reflexed corolla. (From Singapore, A–C from Nee Soon, *Rodda MR711*; D from Pulau Ubin, *Rodda et al. MR1835*; E from Pulau Tekong, *Rodda et al. MR12-S043*. Photos: M. Rodda).

0.3–0.5 cm, base with pedicel perpendicularly attached, apex acuminate. **Seeds** oblong, 4–4.5 × 0.8–1.2 mm, long comose, coma 2–3 cm long.

Distribution. Peninsular Malaysia, Sumatra and Borneo. In Singapore it is now known only in Nee Soon (*Liew SING2006-04*, May 2006, SING [SING0081380]; *Hassan et al. SING2013-085*, 15 May 2013, SING [SING0200417]). In the past it was collected from Selatar (*Ridley s.n.*, 1894, SING [SING0047797]), Chan Chu Kang (*Ridley s.n.*, 1894, SING [SING0047796]) and Sungei Buloh (*Ridley s.n.*, SING [SING0003960]).

Ecology. An epiphytic vine in lowland to hill primary forests. It usually grows in deep shade.

Provisional conservation assessment. Globally Least Concern (LC). It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from very few individuals at a single locality.

12. *Hoya verticillata* (Vahl) G. Don

(Latin, *verticillatus* = arranged in a whorl; erroneously referring to the supposedly verticillate leaf arrangement)

Gen. Hist. 4 (1837) 128; Rintz, Malayan Nat. J. 30(3&4) (1978) 514; Veldkamp et al., Blumea 40 (1995) 427; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 49, 105, 228; Rodda, Gard. Bull. Singapore 69 (2017) 54. **Basionym:** *Sperlingia verticillata* Vahl, Skr. Naturhist.-Selsk. 6 (1810) 113. **Type:** *Flohr s.n.* [Herb. Vahl ex Ind. Orient. Cynanchum?] (lectotype C [C10006735], designated by Veldkamp et al., Blumea 40 (1995) 427; possible isolectotype C [C10006736]). **Fig. 63D, E.**

Asclepias parasitica Roxb. [Hort. Bengal. (1814) 20, nom. nud.] Fl. Ind., ed. 2, 2 (1832) 42, nom. illeg. non Wall. ex Hornem. (1819). **Synonyms:** *Hoya parasitica* Wall. ex Wight, Contr. Bot. India (1834) 37; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 113; Turner, Gard. Bull. Singapore 45 (1993) 43; Veldkamp et al., Blumea 40 (1995) 427; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 572; Ridley, Fl. Malay Penins. 2 (1923) 396; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 149. **Type:** [Unpublished illustration] [India], Icones Roxburghianae no. 1382 (lectotype K, designated by Rodda, Gard. Bull. Singapore 69 (2017) 54).

Hoya ridleyi King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 575; Ridley, Fl. Malay Penins. 2 (1923) 401; Rintz, Malayan Nat. J. 30(3&4) (1978) 514. **Type:** *Ridley 10358*, Singapore, Grange Road (lectotype SING [SING0047800], designated by Rodda, Gard. Bull. Singapore 69 (2017) 55; isolectotype K, a dissection by Gamble).

Hoya globiflora Ridl., J. Fed. Malay States Mus. 5 (1915) 164; Rintz, Malayan Nat. J. 30(3&4) (1978) 514, as '*globifera*'; Veldkamp et al., Blumea 40 (1995) 427. **Type:** *Robinson 5756*, Thailand, Surat Thani (lectotype K, designated by Rodda, Gard. Bull. Singapore 69 (2017) 55).

For additional synonyms see Rodda, Gard. Bull. Singapore 69 (2017) 54–57.

Epiphytic climber with white latex in all vegetative parts, all vegetative parts glabrous. **Roots** adventitious, produced all along the stems. **Stems** twining or pendulous, to 10 m long; leafy stems terete, up to 3 mm in diam., pale green when young, later dark green or greyish brown; internodes 5–10(–25) cm long. **Leaves:** petiole cylindrical, slightly channelled above, 5–10(–20) mm long, 1.5–4 mm in diam.; lamina fleshy, stiff, lanceolate, elliptic, 4–10(–15) × (1.5–)2–5 cm, apex acute or acuminate, base acute or cuneate (rarely to rounded), pale to mid green above, lighter green underneath, venation pinnate, sometimes with 2 prominent basal secondary veins, secondary veins 4–6 on each side, often obscure, tertiary venation reticulate when visible; colleters at lamina base not present in mature leaves. **Inflorescences** umbelliform, rounded, positively geotropic or held laterally, bearing 10–25 flowers; peduncle extra-axillary, persistent, 1–5(–10) cm long, 2–3 mm in diam., glabrous, rachis bearing scars of previous flowerings; pedicels filiform, 1.2–2 cm long, c. 0.5 mm in diam., glabrous. **Calyx** 3–4 mm in diam., lobes free, triangular to ovate, 1.2–1.5 × 1–1.3 mm, whitish green, apex rounded, outside papillose, inside glabrous; calycine colleters one at each lobe sinus,

triangular, 200–300 × 100–250 µm. **Corolla** rotate, reflexed, 8–10 mm in diam., white or pink; tube c. 1.5 mm long, inside finely pubescent, outside glabrous; lobes ovate, 5–6 × 3–4 mm, apex acute, inside finely pubescent, outside glabrous. **Staminal corona** 5–6.5 mm in diam., c. 2.5 mm high, white or pinkish white, with a darker centre, corona lobes obovate, 2.5–3 × c. 1.5 mm, slightly carinate above, sulcate underneath, acute, slightly raised with an acuminate tip. **Pollinia** oblong 450–550 × 150–200 µm, with pellucid margin, apex obliquely truncate base rounded; corpusculum rhomboid, c. 200 × 150 µm; caudicles c. 100 µm long. **Anther appendages** membranous, hyaline, apically acute, c. 1.2 × 1 mm. **Style head** conical, c. 2 mm in diam., style head apex acuminate, c. 0.5 mm long. **Ovary** broadly conical, 1–1.2 mm long, 0.7–0.9 mm in basal diameter, glabrous. **Fruit** a single follicle, fusiform, c. 8–12 × 0.3–0.4 cm, base with pedicel attached perpendicularly, apex acuminate. **Seeds** 3.5–4.5 × 0.8–1.1 mm, long comose, coma 2–3.5 cm.

Distribution. India, Sri Lanka, China, continental Southeast Asia, Sumatra, Philippines, Borneo and Java. In Singapore it is commonly found in forested areas and also on roadside trees. Localities include Pulau Ubin (*Lee et al. PU318*, 27 May 2003, SING [SING0045121]), Pulau Tekong (*Samsuri et al. PT38*, 31 Oct 2001, SING [SING0039715]), Pulau Pawi, Pulau Subar Laut, Coney Island, Kusu Island, Sime Road, Pulau Subar Darat, Pulau Sakeng, Nee Soon (*Hassan et al. SING2013-085*, 15 May 2013, SING [SING00200417]), Sungei Mandai (*Tan & Tan 388*, 5 Jun 2003, SINU), Yishun Park (*Liew SING2007-578*, 25 Sep 2007, SING [SING0096102]), Singapore Botanic Gardens and Tyersall.

Ecology. A common species in the lowlands, found both in primary and secondary forests.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Notes. A very variable species, the description is based only on Singapore specimens. Kidyoo et al. (*Gard. Bull. Singapore 58(2)* (2007) 179–198) show how collections from Thailand can display a large variation in corolla, calyx and leaf characters that is, however, not observed in Singapore collections.

13. *Hoya wallichii* (Wight) C.M.Burton

(Nathaniel Wallich, 1786–1854, Superintendent of the Calcutta Botanic Gardens)

Hoyan 18(1) pt 2 (1996) 5; Rodda et al., *Gard. Bull. Singapore* 68 (2016) 182. **Basionym:** *Physostelma wallichii* Wight, *Contr. Bot. India* (1834) 40; Ridley, *J. Straits Branch Roy. Asiatic Soc.* 33 (1900) 113; Keng, *Concise Fl. Singapore*, vol. 1, *Gymn. Dicot.* (1990) 149. **Type:** *Collector unknown s.n.* [Asclep. 130; *Herb. Wight Propr.*], [Singapore] (lectotype K [K000449753], designated by Rodda et al., *Gard. Bull. Singapore* 68 (2016) 182). **Fig. 64.**

Semi-woody, slender, wiry terrestrial twiner or subshrub; latex white. **Stems** cylindrical, 1.5–3 mm diam., apically sparsely puberulent, older stems leafless, glabrous with waxy bark; internodes (1–)2.5–5(–15) cm long, adventitious roots absent. **Leaves:** petiole flattened or channelled above, rugose below, 5–10 mm long, c. 2 mm wide, glabrous; lamina chartaceous,

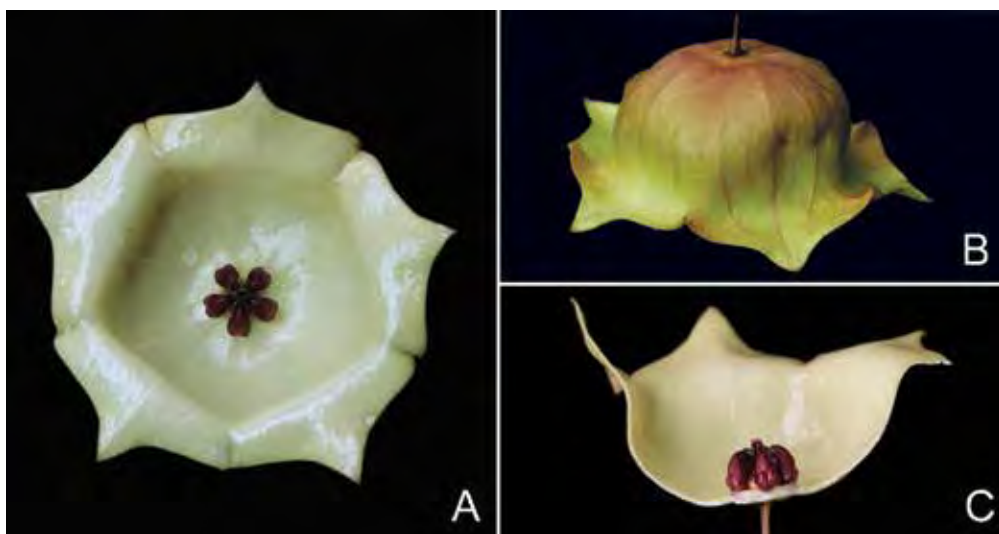


Figure 64. *Hoya wallichii* (Wight) C.M.Burton. **A.** Fully open flower showing the glossy campanulate corolla and the purple corona. **B.** Calyx and corolla, from underneath. **C.** Flower, side view, with part of the corolla removed showing the purple corona. (Cultivated in Singapore Botanic Gardens. Photos: M. Rodda).

flexible, elliptic-lanceolate, 4.5–10 × (1.5–)2–3(–4) cm, widest in the central portion, apex apiculate-cuspidate, base cuneate, penninerved, main vein depressed on adaxial surface, evident on abaxial surface, secondary veins 5–8 pairs, evident when dry, curved and anastomosing to form an intra-marginal nerve along the margin, branching at 70–80°(–90°) from main vein. **Inflorescences** a spirally elongating raceme, with only one flower fully open at a time; peduncle terete, extra-axillary, perennial, bearing scars of previous flowerings, 1.5–3 cm long, c. 1.5 mm wide, glabrous; pedicels terete, 2–4 × c. 1 mm, glabrous, fruit-bearing pedicels more stout, c. 1.5 mm wide. **Calyx** c. 4 mm in diam., lobes round to rhomboid, c. 1.5 × 1–1.5 mm, apex rounded, margins denticulate, sparsely ciliate; calycine colleters one at each lobe sinus, c. 0.3 mm long. **Corolla** campanulate, membranous, 3–4 cm in diam., white to cream-coloured, glabrous; tube 1–1.5 cm long, lobes triangular, c. 5 × 3 mm, apex acute. **Staminal corona** 5–6 mm high, 6–7 mm diam., purple, lobes erect, kidney-shaped, c. 5 mm high, c. 2 mm wide, basally broadened into a swollen process with basal revolute margins, apically forming a single acuminate appendage, c. 1.2 mm long, extending c. 2 mm above the anthers. **Pollinia** oblong, c. 600 × 200 μm, apex and base round; corpusculum c. 300 × 170 μm; caudicles c. 200 μm long. **Style head** conical, c. 1.5 mm in diam., style head apex acuminate, c. 1 mm long. **Ovary** conical, c. 2 mm long, glabrous. **Fruit** a single follicle, cylindrical, 12–20 cm long, 5–7 mm in diam. **Seeds** spindle-shaped, 7–8 × c. 2 mm, comose.

Distribution. Peninsular Malaysia (Johor) and Borneo (Brunei). In Singapore it has been collected in Kranji (*Goodenough 2684*, 29 Nov 1889, SING [SING0120837]; *Ridley s.n.*, 8 Jan 1890, SING [SING0120836]), Tampines River (*Ridley, s.n.*, Feb 1894, SING [SING0012208]) and Sarimbun (*Mat 6691*, 2 Oct 1894, SING [SING0012207]).

Ecology. Lowland primary forest in dappled shade on the ground or on moss-covered rocks.

Provisional conservation assessment. Globally Critically Endangered (CR B2ab(iii)). In Singapore presumed Nationally Extinct.

27. JASMINANTHES Blume

(*jasmīn-* = pertaining to *Jasminum* L., Greek, *-anthes* = flower;
referring to the salver shaped flower similar to that of *Jasminum* species)

Mus. Bot. 1(10) (1850) 148, fig. 28; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 333; Rodda, Phytotaxa 405 (2019) 129. **Type:** *Jasminanthes suaveolens* Blume.

Large climber, terrestrial; latex clear. **Roots** fibrous, basal. **Branches** twining, sparsely pubescent turning glabrescent when mature. **Leaves** opposite, petiolate, lamina coriaceous, entire, elliptic to ovate; colleters at lamina base present, prophylls absent. **Inflorescences** simple racemes; peduncle extra-axillary, pubescent to glabrescent. **Calyx** lobes free, spreading, colleters present inside. **Corolla** salverform; lobes dextrorse; tube cylindrical, sparsely pubescent outside, inside with 5 patches of retrorse trichomes in the lowermost part of the tube. **Corolline corona** absent. **Stamens** inserted at the base of the corolla tube, included within the tube, connate into a gynostegium. **Gynostegial corona** absent. **Pollinarium** with erect pollinia lacking pellucid margins. **Style head** umbonate. **Ovary** glabrous or apically pubescent. **Fruit** a single follicle, glabrous. **Seeds** numerous, simple, ovate, comose.

Distribution. A genus of 13 species from southern China and southern Japan through continental Southeast Asia and Borneo. In Singapore 1 native species.

Ecology. Usually found in lowland forests from sea level to 500 m. Occasionally to 1600 m.

Taxonomy. The genus was revised by Rodda (Phytotaxa 405 (2019) 127–146).

Jasminanthes maingayi (Hook.f.) Rodda

(Alexander Carroll Maingay, 1836–1869, British surgeon, botanist
and magistrate in Malacca, Peninsular Malaysia)

Phytotaxa 405 (2019) 137. **Basionym:** *Stephanotis maingayi* Hook.f., Fl. Brit. India 4, fasc. 10 (1883) 39; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 550; Ridley, Fl. Malay Penins. 2 (1923) 389; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 149; Turner, Gard. Bull. Singapore 45 (1993) 44; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 81, 106, 198. **Synonym:** *Marsdenia maingayi* (Hook.f.) P.I.Forst., Austral. Syst. Bot. 8 (1995) 700; Yeoh et al., Gard. Bull. Singapore 65 (2013) 244. **Type:** *Maingay 1731* [Kew Distribution 1112], [Malaysia], Malacca (lectotype K [K000821736], designated by Yeoh et al., Gard. Bull. Singapore 65 (2013) 244; isolectotype K [K000821737]). **Fig. 65, 66.**

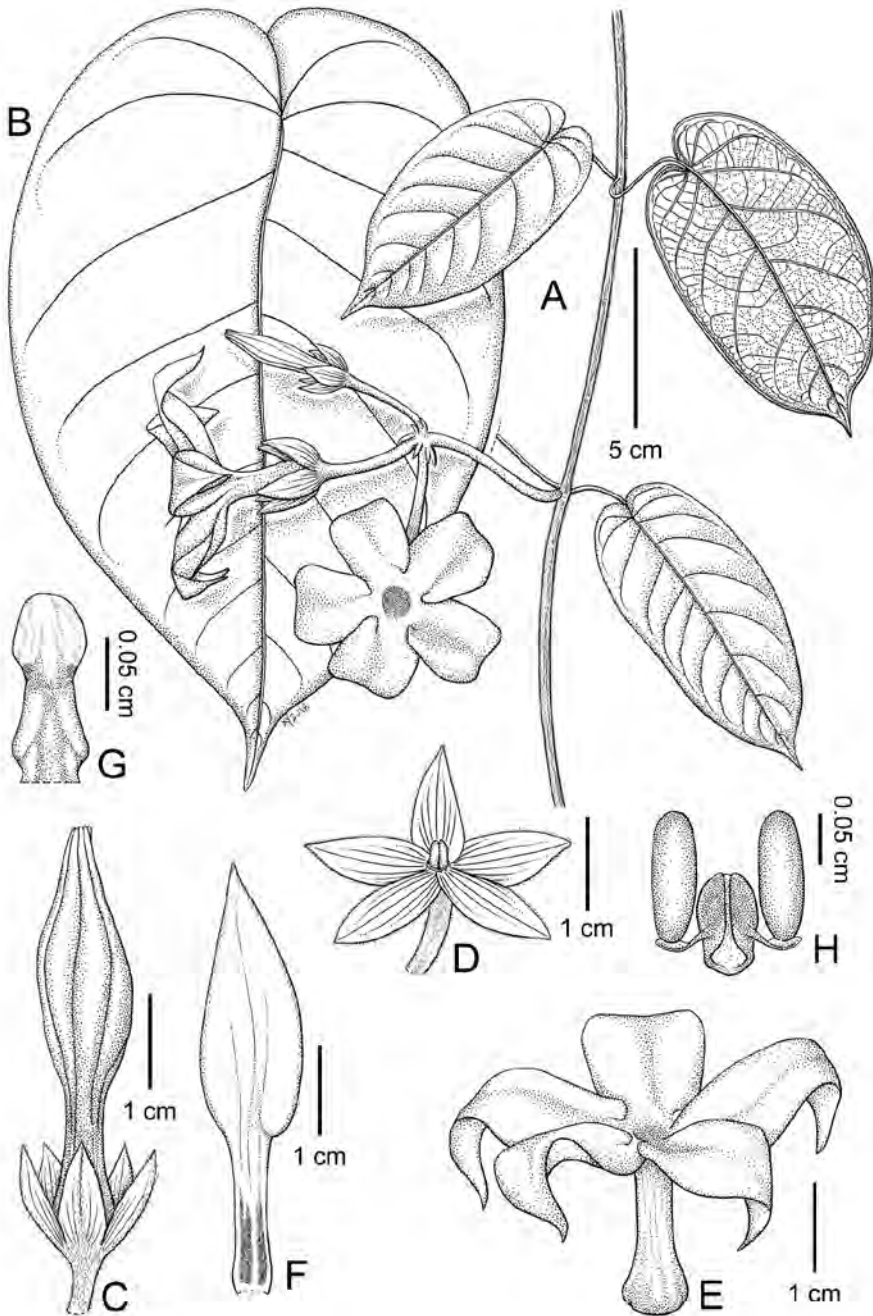


Figure 65. *Jasminanthes maingayi* (Hook.f.) Rodda. **A.** Flowering branch. **B.** A large leaf. **C.** Bud. **D.** Calyx and ovary. **E.** Open corolla. **F.** A single corolla lobe and section of corolla tube showing the arrangement of the hairs. **G.** Gynostegium lobe. **H.** Pollinarium. (A, C–H from Singapore, MacRitchie, Rodda MR691; B from Borneo, Elmer 20334. Drawn by X.Y. Loh).



Figure 66. *Jasminanthes maingayi* (Hook.f.) Rodda. **A.** Habit with leafy branches and inflorescences. **B.** Inflorescence, showing the large green calyx lobes, long tube and glossy white corolla lobes. **C.** Close up of corolla. (From Singapore, MacRitchie, Rodda MR691. Photos: M. Rodda).

Large woody twining climber, up to 10 m long, latex clear. **Leafy stems** 2–5 mm in diam., sparsely pubescent turning glabrescent when mature, older parts lenticellate; internodes (4–)10–15(–20) cm long. **Leaves:** petiole channelled above, (1–)2–2.5(–3.5) cm long, 1–2 mm in diam., sparsely pubescent; lamina elliptic to ovate, (5–)8–10(–22) × (2.5–)3.5–6(–15) cm, base cordate, apex acute to acuminate, pubescent along main and secondary veins above, elsewhere glabrous or very sparsely pubescent, underneath pubescent along main and secondary veins, elsewhere glabrous or very sparsely pubescent, venation pinnate, lateral veins 6–9(–11) each side, tertiary venation reticulate; basal colleters 5–9 at each lamina base, ovate, 0.2–0.5 mm long, 0.1–0.2 mm wide. **Inflorescences** simple racemes, up to 5-flowered; peduncle extra-axillary, 2.5–6 cm long, 1.5–2.5 mm in diam., pubescent to glabrescent; bracts narrowly lanceolate, 2–8 mm long, outside pubescent, inside glabrous; pedicels 2–4 cm long, 1–2 mm in diam., sparsely pubescent. **Flower bud** just before anthesis fusiform, 4–5.5 cm long, c. 1 cm in diam. **Calyx** lobes narrowly ovate or lanceolate, apex acute, 15–25 × 4–8 mm, outside sparsely pubescent, inside glabrous, sometimes ciliate; colleters 1–2 occurring between the lobes, oblong, 0.3–0.6 × c. 0.15 mm. **Corolla** salverform, white fading yellow; tube 16–30 mm long, 3–5 mm wide at throat, adaxially with 5 patches, 5–10 mm long, of retrorse trichomes in the lowermost part of the tube, upper part of the tube and throat glabrous or pubescent, abaxially sparsely pubescent; lobes lanceolate, 20–30 × 7–11 mm, base asymmetric, apex acuminate, outside sparsely pubescent, inside glabrous. **Gynostegium** conical, 8–9 mm tall, 4–5 mm wide, glabrous, with prominent guide rails 3–4 mm long. **Pollinia** oblong, 900–1000 mm × 250–350 µm; caudicle c. 500 µm long attached at the base of corpusculum; corpusculum ovate, 800–900 × 600–700 µm. **Anther appendages** erect, covering the style head, ovate, 3–5 × 1.5–2 mm. **Style head** umbonate, 3–4 mm long, c. 2 mm in diam. **Ovary** bi-carpellate, carpels oblong, 2–3 mm long, c. 1 mm wide at the base, glabrous or apically pubescent. **Fruit** a single follicle, c. 25 × 4 cm, glabrous. **Seeds** ovate, 1.3–1.5 cm long, 0.7–0.9 cm wide, comose at germinating end, coma 5–8 cm long.

Distribution. Peninsular Malaysia and Borneo. In Singapore it is now known only in MacRitchie (*Low et al. LYW523*, 27 Aug 2012, SING [SING0166282]; *Lua et al. SING2014-187*, 30 May 2014, SING [SING0205591]; *Rodda MR691*, 7 Jun 2014, SING [SING0266620]). It was formerly found in Changi (*Hullett 147*, July 1885, SING [SING0003975, SING0003974]).

Ecology. Across its range, it occurs in lowland primary forests and old secondary forests from sea level to 300 m.

Provisional conservation assessment. Globally Least Concern (LC) based on Rodda (*Phytotaxa* 405 (2019) 137). It is assessed here as Critically Endangered (CR/D) in Singapore as it is known from only a single locality with a few mature individuals.

28. SARCOLOBUS R.Br.

(Greek, *sarco-* = fleshy, *-lobus* = lobe; perhaps referring to the fleshy follicles)

Asclepiadeae (1810) 23; King & Gamble, *J. Asiat. Soc. Bengal*, Pt. 2, Nat. Hist. 74(2) (1908) 537; Ridley, *Fl. Malay Penins.* 2 (1923) 382; Rintz, *Blumea* 26 (1980) 65; Turner, *Gard. Bull. Singapore* 45 (1993)

44; Endress et al. in Kadereit & Bittrich (ed.), *Fam. Gen. Vasc. Pl.* 15 (2019) 335. **Type:** *Sarcolobus banksii* Schult.

Dorystephania Warb. in Perkins (ed.), *Fragm. Fl. Philipp.* 2 (1904) 123. **Type:** *Dorystephania luzonensis* Warb. (= *Sarcolobus luzonensis* (Warb.) P.I.Forst.).

Quisumbingia Merr., *Philipp. J. Sci.* 60 (1936) 33. **Type:** *Quisumbingia merrillii* (Schltr.) Merr. (= *Sarcolobus merrillii* (Schltr.) Omlor).

Large climber, terrestrial; latex clear. **Roots** fibrous, basal. **Branches** twining, glabrous. **Leaves** opposite, entire, petiolate; colleters at lamina base present, prophylls absent. **Inflorescences** simple or dichotomously branched spirally elongating racemes; peduncle extra-axillary. **Calyx** lobes free, spreading, with colleters present inside. **Corolla** campanulate-rotate; lobes dextrorse; tube campanulate to slightly reflexed, glabrous outside, pubescent inside. **Corolline corona** absent. **Stamens** inserted at the base of the corolla tube, not included within the tube, connate into a gynostegium. **Gynostegial corona** absent. **Pollinarium** with erect pollinia lacking pellucid margins. **Style head** globose, apex minutely bifid. **Ovary** glabrous. **Fruit** a single follicle, fleshy, globose, pubescent to glabrescent. **Seeds** numerous, simple, flat, ovate, not comose.

Distribution. A genus of about 12 species from northern India and Southern China through continental Southeast Asia and Malesia to Australia, the Solomon Islands and New Caledonia. In Singapore 1 native species.

Ecology. Usually found in coastal vegetation including mangroves and beaches.

Taxonomy. The genus was revised by Rintz (*Blumea* 26 (1980) 65–79) who recognised four species. Later, Forster (*Austrobaileya* 3(3) (1991) 335–360) revised the genus for Australia and Papuasias where he recognized 11 species, including *Sarcolobus secamonoides* (Schltr.) P.I.Forst., now transferred to *Marsdenia* R.Br.

Sarcolobus globosus Wall.

(Latin *globosus* = spherical; referring to the shape of the fruits)

Asiat. Res. 12 (1816) 568, pl. '*Sarcolobus globosus*'; Ridley, *J. Straits Branch Roy. Asiat. Soc.* 33 (1900) 112; Ridley, *Fl. Malay Penins.* 2 (1923) 382; King & Gamble, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 74(2) (1908) 537; Burkill, *Dict. Econ. Prod. Malay Penins.* 2 (1935) 1965; Rintz, *Blumea* 26 (1980) 73; Keng, *Concise Fl. Singapore*, vol. 1, *Gymn. Dicot.* (1990) 149; Tan et al. in Davison et al. (ed.), *Singapore Red Data Book*, ed. 2 (2008) 215; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 77, 106, 197. **Type:** *Wallich* 789, India, Sundarbans, 1815 (lectotype C [C10006837], designated by Rintz, *Blumea* 26 (1980) 73; isolectotype BM [BM001014186]). **Fig.** 67.

Sarcolobus banksii Schult. in Roemer & Schultes, *Syst. Veg.*, ed. 15 bis, 6 (1820) 58. **Type:** *Banks & Solander s.n.*, [Indonesia], Java, 'Prinses Island' [Prince's Island/Prinsen Island, now Panaitan] (lectotype BM [BM001014184], first step designated by Rintz, *Blumea* 26 (1980) 73, second step designated by Rodda, *Gard. Bull. Singapore* 71 (2019) 78; isolectotype BM [BM001014185]).

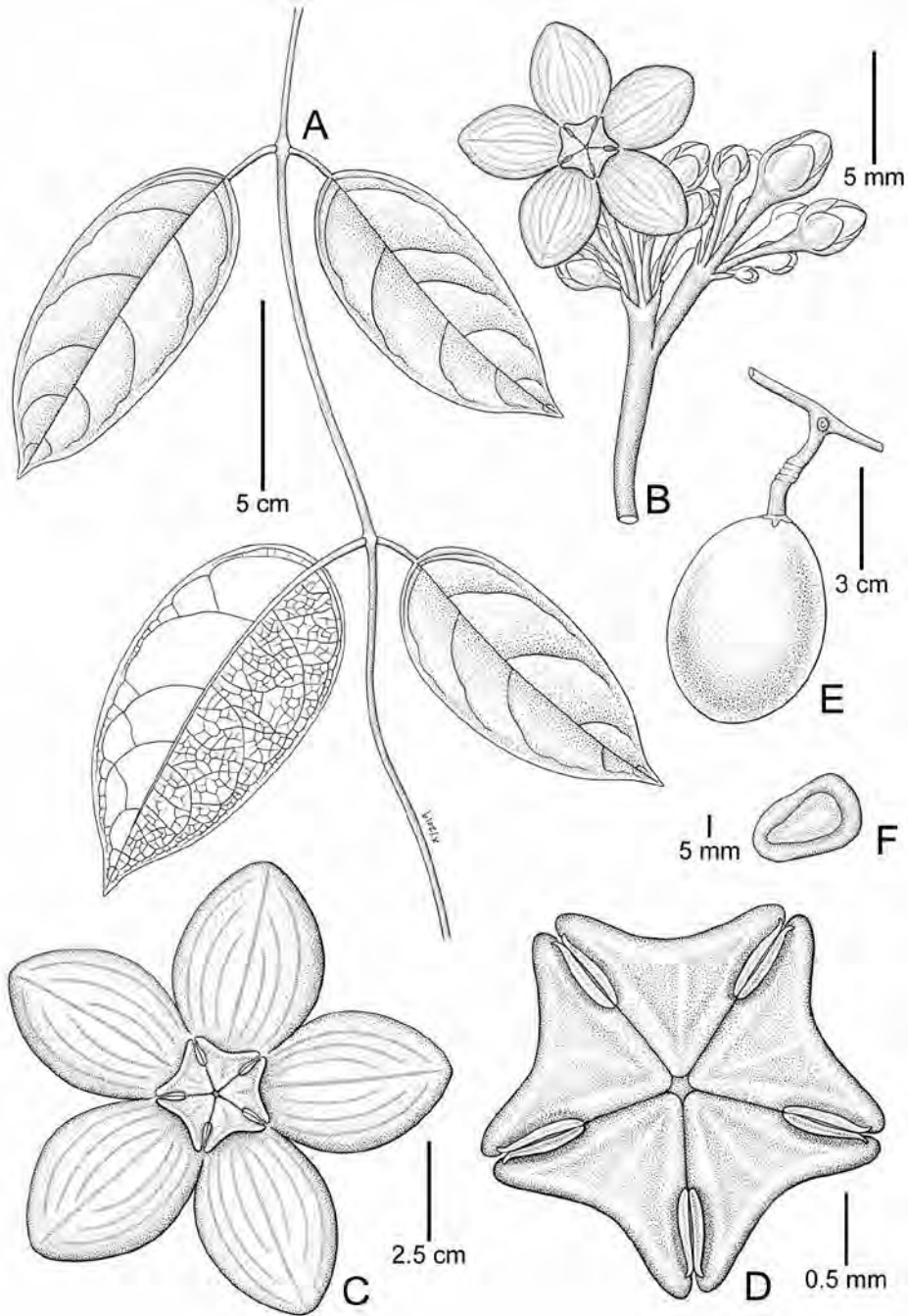


Figure 67. *Sarcolobus globosus* Wall. **A.** Habit with leafy branch and inflorescence. **B.** Inflorescence. **C.** Close up of corolla. **D.** Close up of gynostegium. **E.** Fruit. **F.** Seed. (From Peninsular Malaysia, A–D from Ridley 13485; E from Ridley 1513; F from Corner SFN25855. Drawn by X.Y. Loh).

Gymnema finlaysonii Wight, Contr. Bot. India (1834) 46; Rintz, Blumea 26 (1980) 73. **Synonym:** *Gongronema finlaysonii* (Wight) Decne. in De Candolle, Prodr. 8 (1844) 625. **Type:** *Finlayson s.n.* [EIC 8196, Asclep. 143], China or Singapore (or Thailand) (lectotype K [K000872792], designated by Rodda, Gard. Bull. Singapore 71 (2019) 76; isolectotype K [K001129203]).

Sarcolobus carinatus Griff., Not. Pl. Asiat. 4 (1854) 53, nom. illeg. non Wall. (1816); Griffith, Icon. Pl. Asiat. 4 (1854) pl. 410. **Type:** *Griffith 3773*, [Malaysia], Malacca (lectotype K [K000872794], designated by Rintz, Blumea 26 (1980) 73).

Sarcolobus narcoticus Span. ex Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 502. **Type:** [Unpublished illustration] *Spanoghe s.n.*, [Indonesia], Java, Pekalongan (L [L.2096880]).

Sarcolobus spanoghei Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 502. **Type:** [Unpublished illustration] *Spanoghe s.n.*, [Indonesia], Java, Pekalongan (L [L.2096881]).

Terrestrial climber to 5 m long with white latex in all vegetative parts. **Roots** fibrous, basal. **Stems** twining to 6 m long; leafy stems terete, up to 4 mm in diam., glabrous; internodes 5–10(–15) cm long. **Leaves:** petiole cylindrical, channelled above, 10–20 mm long, c. 1 mm in diam., glabrous or sparsely pubescent; lamina thinly coriaceous, elliptic-ovate, 5–10(–15) × (2.5–)3–6 cm, apex acute (rarely acuminate), base rounded (rarely cordate), bright mid green above, glabrous, midrib sometimes sparsely pubescent paler green underneath, glabrous, midrib sometimes sparsely pubescent, midrib raised on adaxial surface, secondary veins 3–5(–7) on each side, branching at 45–70° from midrib, tertiary venation reticulate; colleters up to 9 at each lamina base, conical or ovoid, to 0.5 mm long. **Inflorescences** spirally-elongating racemes, simple or dichotomously branched, bearing 1–5 open flowers and many buds; peduncle extra-axillary (rarely axillary), 7–20 mm long, 1–1.5 mm in diam., sparsely pubescent to glabrescent; bracts ovate or round, c. 0.5 × 0.5 mm; pedicels 7–10 mm long, c. 0.5 mm in diam., glabrous. **Calyx** lobes free, elliptic-oblong, c. 1.5–2 × 1–1.2 mm, apex rounded, ciliate; calycine colleters one at each calyx sinus, ovoid, 1.5–2 × 1.2–1.5 mm. **Corolla** campanulate-rotate, 8–14 mm in diam.; tube campanulate to slightly reflexed, 2–3 mm long, pubescent inside, outside glabrous; lobes ovate to oblong, 3–5 × 2–3 mm, apex rounded, outside greenish, glabrous, inside yellow-orange with purple dots, pubescent, margin ciliate. **Pollinia** oblong, c. 350 × 110 µm, apex rounded, base acute; corpusculum oblong, c. 300 × 100 µm; caudicles c. 600 µm long. **Anther appendages** membranous, hyaline, apically round, covering the style head, c. 1 × 0.7 mm. **Style head** globose c. 0.7 mm in diam., style head apex minutely bifid. **Ovary** ovoid, c. 1.2 mm long, c. 0.6 mm in basal diameter. **Fruit** a single follicle, fleshy, globose, c. 7 × 6 cm, pubescent to glabrescent. **Seeds** flat, ovate, 2–2.3 × 1.7–1.9 cm, without a coma.

Distribution. Northeast India, Myanmar, Thailand, Laos, Vietnam, Peninsular Malaysia, Sumatra, Java and Borneo. In Singapore it was originally rather widespread and found at Chan Chu Kang (*Ridley 6044*, 1894, BM, SING [SING0003971]), Rifle Range, Changi (*Ridley 5909*, Dec 1894, SING [SING0003966]), Serangoon (*Ridley 11640*, 1903, SING [SING0003970]), Alexandra (*Ridley 5745*, 1893, SING [SING0003967]) and Java Road (*Hullett 32*, Jan 1885, SING [SING0003972]).

Ecology. Found in mangrove forest and along the coast.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Uses. In Peninsular Malaysia, the leaves of *Sarcolobus globosus* are ground into a paste with nuts of *Aleurites* J.R.Forst. & G.Forst. This paste is then rubbed onto the joints to treat rheumatism or dengue fever. The bark and seeds contain a poisonous resin, which is used to poison animals such as dogs, wild pigs and tigers. The pericarp is eaten as a vegetable and washed in salt and water or soaked in brine.

Vernacular names. *Akar pelir kambing, buah pitis, pitis-pitis* (Malay).

29. VINCETOXICUM Wolf

(Latin, *vince-* = to overcome, *-toxicum* = poison;
referring to the supposed virtue of giving resistance to poisons)
Dog-strangling vine (English)

Gen. Pl. (1776) 130; Liède-Schumann & Meve, *Phytotaxa* 369 (2018) 131; Endress et al. in Kadereit & Bittrich (ed.), *Fam. Gen. Vasc. Pl.* 15 (2019) 378. **Type:** *Vincetoxicum hirundinaria* Medik.

Tylophora R.Br., *Prodr. Fl. Nov. Holland.* (1810) 460; King & Gamble, *J. Asiat. Soc. Bengal*, Pt. 2, *Nat. Hist.* 74(2) (1908) 551. **Type:** *Tylophora flexuosa* R.Br. (= *Vincetoxicum flexuosum* (R.Br.) Kuntze).

Belostemma Wall ex Wight, *Contr. Bot. India* (1834) 52. **Type:** *Belostemma hirsutum* Wall. ex Wight (= *Vincetoxicum belostemma* (Benth.) Kuntze).

Iphisia Wight & Arn. in Wight, *Contr. Bot. India* (1834) 52. **Type:** *Iphisia multiflora* Wight & Arn. (= *Vincetoxicum iphisia* Meve & Liède).

Pycnostelma Bunge ex Decne. in De Candolle, *Prodr.* 8 (1844) 512. **Type:** *Pycnostelma chinensis* Bunge ex Decne. (= *Vincetoxicum pycnostelma* Kitagawa).

Pentabothra Hook.f., *Fl. Brit. India* 4, fasc. 10 (1883) 18. **Type:** *Pentabothra nana* (Buch.-Ham. ex Wight) Hook.f. (= *Vincetoxicum nanum* (Buch.-Ham. ex Wight) Liède).

Ischnostemma King & Gamble, *J. Asiat. Soc. Bengal*, Pt. 2, *Nat. Hist.* 74(2) (1908) 532. **Type:** *Ischnostemma selangorica* King & Gamble (= *Vincetoxicum carnosum* (R.Br.) Benth.).

Spirella Costantin, *Fl. Indo-Chine* 4, fasc. 1 (1912) 78. **Type:** *Spirella tylophoroides* Costantin (= *Vincetoxicum tylophoroides* (Costantin) Meve & Liède).

Vincetoxicopsis Costantin, *Fl. Indo-Chine* 4, fasc. 1 (1912) 103. **Type:** *Vincetoxicopsis harmandii* Costantin (= *Vincetoxicum cambodiense* Meve & Liède).

Hoyopsis H.Lév., *Repert. Spec. Nov. Regni Veg.* 13(363–367) (1914) 262. **Type:** *Hoyopsis dielsii* H.Lév. (= *Vincetoxicum flexuosum* (R.Br.) Kuntze var. *tenuis* (Blume) Schneid et al.).

Merrillanthus Chun & Tsiang, *Sunyatsenia* 6 (1941) 105. **Type:** *Merrillanthus hainanensis* Chun & Tsiang (= *Vincetoxicum hainanense* (Chun & Tsiang) Meve et al.).

Pentastelma Tsiang & P.T.Li, Fl. Hainan. 3 (1974) 577. **Type:** *Pentastelma auritum* Tsiang & P.T.Li (= *Vincetoxicum auritum* (Y.Tsiang & P.T.Li), Meve et al.).

For additional synonyms see Liede-Schumann & Meve, Phytotaxa 369 (2018) 131.

Terrestrial climbers; latex clear. **Roots** fibrous, basal. **Branches** glabrous or very sparsely pubescent, twining. **Leaves** opposite, petiolate, lamina herbaceous, entire, ovate to lanceolate; petiole base connected by a line across the node, colleters at lamina base present, prophylls absent. **Inflorescences** compound racemes, 1–15-branched; peduncle axillary or extra-axillary. **Calyx** lobes free, spreading, with or without colleters inside. **Corolla** rotate; lobes valvate or dextrorse; tube campanulate, glabrous. **Corolline corona** absent. **Stamens** inserted at the base of the corolla tube, connate into a gynostegium. **Gynostegial corona** staminal, lobes connate to the column, narrow below the anthers with a globose base or spreading, oblong. **Pollinarium** with horizontal to erect pollinia lacking pellucid margins. **Style head** conical or globose. **Ovary** glabrous. **Fruit** a follicle, single or paired, fusiform, glabrous. **Seeds** numerous, simple, pyriform or fusiform-oblong, comose.

Distribution. A genus of more than 150 species in Europe, Africa, Asia and Oceania. It is most diverse in tropical and subtropical areas but in Europe reaches as far north as southern Sweden. In Singapore 2 native species (see also Excluded species).

Ecology. The two Singapore native species are coastal species, usually found in the back mangrove vegetation.

Taxonomy. Most of the Asian species of *Vincetoxicum* used to belong to *Tylophora*. Based on molecular evidence, *Vincetoxicum* is paraphyletic without the inclusion of *Tylophora* (Liede-Schumann et al., Taxon 61 (2012) 803–825). The necessary new combinations and new names to accommodate the species of *Tylophora* in *Vincetoxicum* were recently made by Liede-Schumann & Meve (Phytotaxa 369 (2018) 129–184).

Key to *Vincetoxicum* species

1. Inflorescence 8–12 cm long; corolla 3–6 mm diam. **1. *V. flexuosum***
- Inflorescence to 5 cm long; corolla 10–14 mm diam. **2. *V. globiferum***

1. *Vincetoxicum flexuosum* (R.Br.) Kuntze

(Latin, *flexuosus* = flexuous, bent alternately in opposite directions, zig-zagged;
likely referring to the flexible stems)

Revis. Gen. Pl. 2 (1891) 424. **Basionym:** *Tylophora flexuosa* R.Br., Prodr. Fl. Nov. Holland. (1810) 460. **Synonym:** *Hoya flexuosa* (R.Br.) Spreng., Syst. Veg. (ed. 16) 1 (1824 [‘1825’]) 843. **Type:** *Brown s.n.*, Australia, Northern Territory, Groote Eylandt, January 1803 (lectotype, BM [BM001040545], designated by Forster, Austrobaileya 3(2) (1990) 286; isolectotype CANB [CANB278897]).

Tylophora cuspidata Zipp. ex Decne., Ann. Sci. Nat., Bot., sér. 2, 9 (1838) 274. **Type:** *Zippelius 41*, Timor (holotype P [P03915142]).

Tylophora macrobotrya Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 488. **Type:** *Zollinger 486*, [Indonesia], Java (lectotype P [P03875132], designated by Liede-Schumann & Meve, Phytotaxa 369 (2018) 143).

Distribution. An extremely widespread species occurring from continental Southeast Asia continuously to Australia.

Ecology. Across its range, open forest, degraded habitats, coastal and mangrove forests, from sea level to 1700 m.

Taxonomy. Three varieties are recognised by Liede-Schumann & Meve (Phytotaxa 369 (2018) 143–145). Only *Vincetoxicum flexuosum* var. *tenuis* occurs in Singapore.

var. **tenuis** (Blume) Schneidt et al.

(Latin, *tenuis* = slender; likely referring to the thin stems)

Phytotaxa 369 (2018) 144. **Basionym:** *Tylophora tenuis* Blume, Bijdr. Fl. Ned. Ind., pt 16 (1826–1827) 1062; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 112; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 552; Ridley, Fl. Malay Penins. 2 (1923) 391. **Type:** *Blume s.n.*, [Indonesia], Java, ‘ad radices montium Javae occidentalis’ (lectotype, L [L0360073], designated by Liede-Schumann & Meve, Phytotaxa 369 (2018) 144; isoelectotypes BO [BO113112], NY [NY00318821, NY00318822]). **Fig. 68, 69.**

Asclepias tetrapetala Dennst., Schlüssel Hortus Malab. (1818) 35. **Synonym:** *Tylophora tetrapetala* (Dennst.) Suresh in Nicolson et al., Interpr. Van Rheede’s Hort. Malab. (1988) 64; Swarupanandan & Nicolson, Blumea 38(1) (1993) 234. **Type:** [Published illustration] ‘*Parparam*’ in Rheede, Hort. Malab. 9 (1689) t. 17, lectotype designated by Suresh in Nicolson et al., Interpr. Van Rheede’s Hort. Malab. (1988) 64.

Asclepias tenuissima Roxb. ex Willd. in Roemer & Schultes, Syst. Veg., ed. 15 bis, 6 (1820) 86. **Synonyms:** *Tylophora tenuissima* (Roxb. ex Willd.) Wight & Arn. in Wight, Contr. Bot. India (1834) 49; Turner, Gard. Bull. Singapore 45 (1993) 44. – *Tylophora tetrapetala* (Dennst.) Suresh var. *tenuissima* (Roxb. ex Willd.) Swarupan., Blumea 38(1) (1993) 234. **Type:** [Unpublished illustration] [India], Icones Roxburghianae no. 1383 (K), lectotype designated by Suresh in Nicolson et al., Interpr. Van Rheede’s Hort. Malab. (1988) 64.

Tylophora tenuis Blume var. *ovata* Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 489. **Type:** *Horsfield s.n.*, [Indonesia], Java, Blambangan (lectotype BM, designated by Rodda, Gard. Bull. Singapore 71 (2019) 79).

Tylophora carnosa Wall. ex Wight, Contr. Bot. India (1834) 49. **Type:** *Wight s.n.* [EIC 8200B], India, possibly from Tanjore (lectotype, K-W [K001129217], designated by Swarupanandan & Nicolson, Blumea 38(1) (1993) 233).

Tylophora polyantha Volkens, Bot. Jahrb. Syst. 31 (1902) 473. **Type:** *Volkens 134*, Caroline Islands, Yap (lectotype BO, designated by Forster, Austral. Syst. Bot. 7 (1994) 517; isolectotypes B [B 10 0009070], US [US00432877]).

Tylophora schmidtii Schltr. in Schlechter & Warburg, Repert. Spec. Nov. Regni Veg. 3 (1907) 315. **Type:** *Schmidt 727*, Thailand, Trat Province, Koh Chang Island, Klong Sanlak pet (lectotype C [C10006867], designated by Liede-Schumann & Meve, Phytotaxa 369 (2018) 144).

Tylophora perlaxa Schltr., Bot. Jahrb. Syst. 40(3, Beibl. 92) (1908) 3. **Type:** *Bäuerlen s.n.*, Papua New Guinea, Western Province, Fly River (not traced).

Hoyopsis dielsii H.Lév., Repert. Spec. Nov. Regni Veg. 13(363–367) (1914) 262. **Synonyms:** *Tylophora hoyopsis* H.Lév., Fl. Kouy-Tchéou (1914–915) 44, nom. illeg. superfl. – *Tylophora dielsii* (H.Lév.) H.H.Hu, J. Arnold Arbor. 5 (1924) 232. **Type:** *Cavalerie 1046*, China, [Guizhou], Pin-fa, fourrés, précipices (lectotype E [E00284971], designated by Liede-Schumann & Meve, Phytotaxa 369 (2018) 144; isolectotype K [K000872866]).

Tylophora flexuosa auct. non R.Br.: Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 88, 106, 231.

Terrestrial climber with clear latex in all vegetative parts. **Roots** fibrous. **Stems** twining or pendulous to 10 m long, sparsely branched; leafy stems terete, herbaceous, up to 2 mm in diam., green, glabrous or very sparsely pubescent; internodes 3–12 cm long. **Leaves:** petiole cylindrical, channelled above, 5–15 mm long, 0.5–1 mm in diam., glabrous or adaxially pubescent; lamina herbaceous, ovate to lanceolate, (2–)4–6(–10) × (0.5–)1.5–3(–4) cm, apex acuminate to acute, base rounded (rarely cuneate), mid to dark green above, glabrous with pubescent midrib and secondary veins, lighter green underneath, glabrous, midrib slightly raised on adaxial surface, secondary veins 3–7 on each side, tertiary venation obscure; colleters 2 at each lamina base, ovate or conical, 0.2–0.4 × c. 0.1 mm. **Inflorescences** paniculate racemes, 8–12 cm long, with 5–10(–15) partial inflorescences bearing 5–7 flowers, 2–3 open at a time; peduncle axillary, one per node, 10–50 mm long, c. 0.5 mm in diam., glabrescent; bracts subtending partial inflorescence triangular, 1–2 × 0.25–5 mm, sparsely pubescent; pedicels 4–8 mm long, c. 0.2 mm in diam., glabrous. **Calyx** c. 1.5 mm in diam., lobes free, broadly lanceolate to ovate, 0.5–0.8 × 0.4–0.6 mm, apex acute, outside sparsely pubescent, inside glabrous; calycine colleters 1 at each calyx lobe base sinus. **Corolla** herbaceous, rotate, 3–6 mm in diam., purple, pink or brown; tube campanulate, 0.5–1 mm long, glabrous; lobes narrowly ovate, 1.5–2 × 0.7–1.2 mm, apex rounded with a bilobed tip; lobes valvate. **Staminal corona** 0.7–1 mm in diam., 0.7–0.9 mm high; corona lobes connate to the column, narrow below the anthers with a globose base, 0.2–0.4 × 0.2–0.4 mm, greenish yellow. **Pollinia** globose, c. 100 × 80 µm; corpusculum oblong, c. 60 × 30 µm; caudicles c. 40 µm long. **Anther appendages** membranous, ovate, c. 0.25 × 0.25 mm. **Style head** globose c. 0.5 mm in diam. **Ovary** conical, 0.5–1 mm long, c. 0.2 mm in basal diameter, glabrous. **Fruit** a single (rarely paired) follicle, fusiform, 5–8 × 0.5–0.8 cm, glabrous, apex beaked. **Seeds** pyriform, 5–7 × 2–3 mm, coma 1–3 cm long.

Distribution. Thailand, Laos, Peninsular Malaysia, Borneo, Java, Sulawesi, Lesser Sunda Islands, New Guinea and the Caroline Islands. In Singapore it is found in mangrove and coastal areas such as Pulau Ubin (*Ali Ibrahim et al. SING2007-444*, Dec 2007, SING [SING0114771]), Lim Chu Kang (*Lua & Koh SING2014-380*, 25 Nov 2014, SING [SING0212435]), Sungei

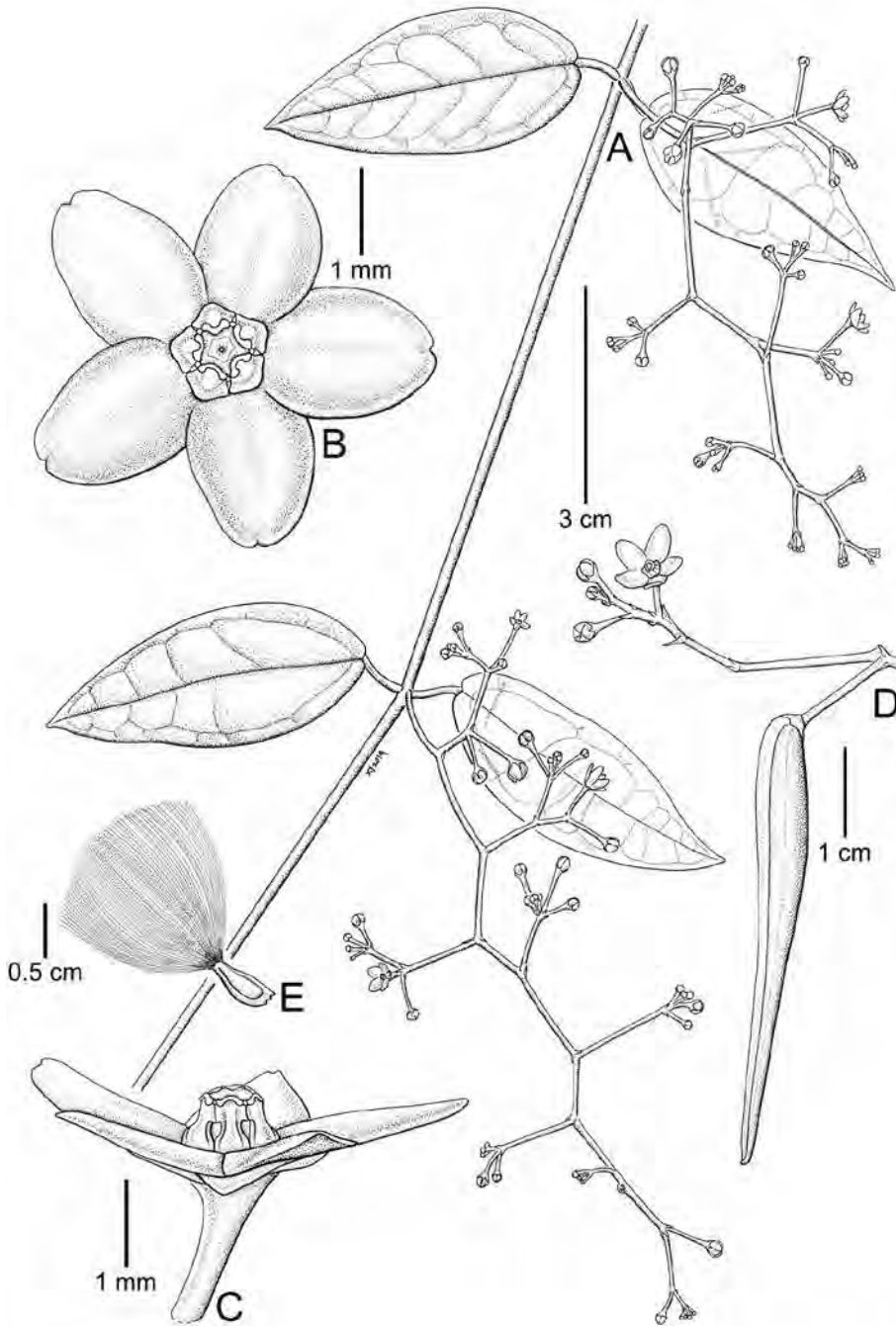


Figure 68. *Vincetoxicum flexuosum* (R.Br.) Kuntze var. *tenuis* (Blume) Schneidt et al. **A.** Flowering branch. **B.** Flower, from above. **C.** Flower, side view. **D.** Inflorescence and fruit. **E.** Seed. (From Singapore, Pulau Ubin, Rodda et al. MR1833. Drawn by X.Y. Loh).

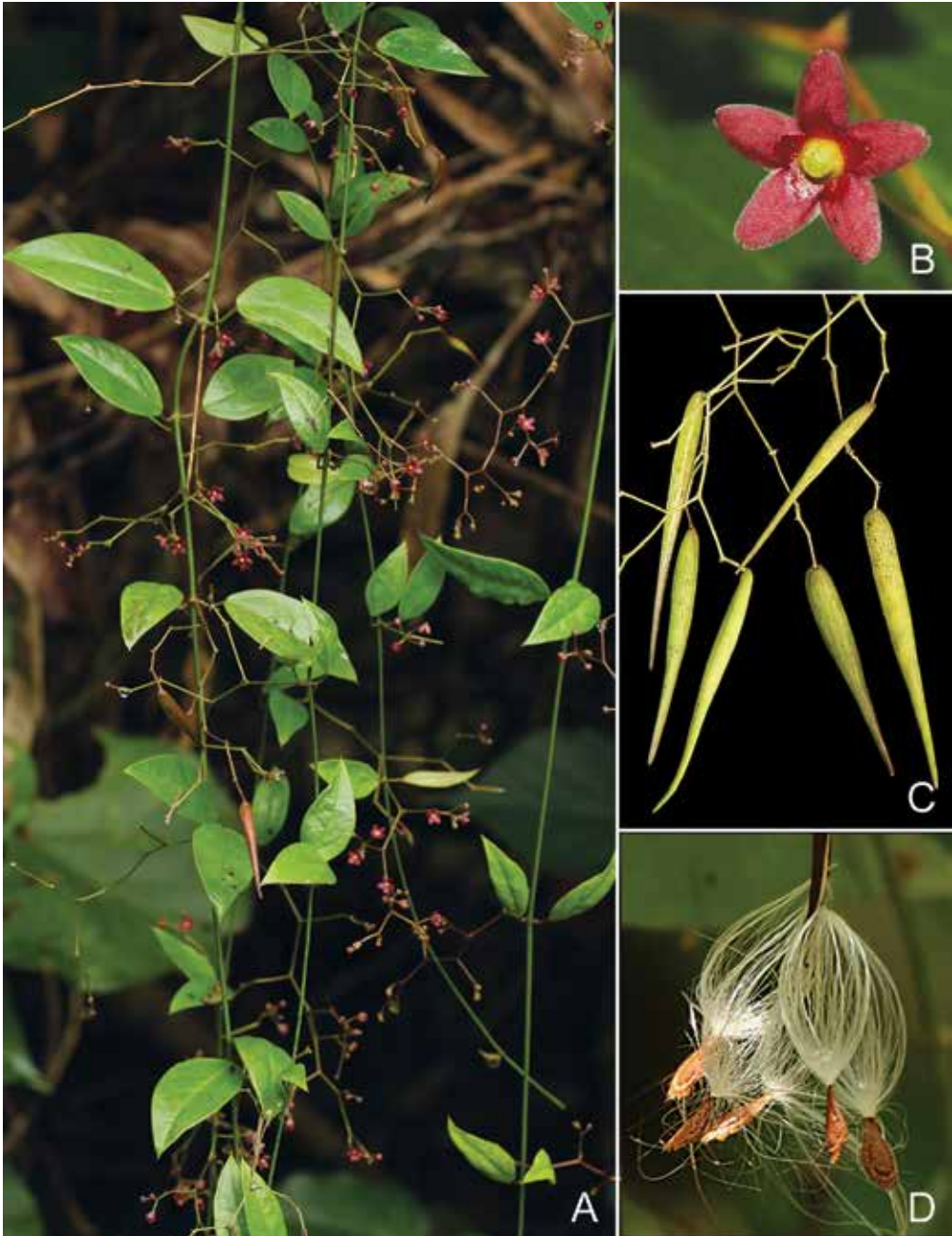


Figure 69. *Vincetoxicum flexuosum* (R.Br.) Kuntze var. *tenue* (Blume) Schneidt et al. **A.** Habit with leafy branches, inflorescences and follicles. **B.** Flower, showing the purple corolla and the small greenish yellow gynostegium. **C.** Follicles. **D.** Seeds with coma. (From Singapore, Pulau Ubin, Rodda et al. *MRI833*. Photos: M. Rodda).

Buluh (*Lai LJ65*, 6 Oct 1996, SING [SING0003980]), Seletar Wet Gap, Pulau Tekong Kechil, Pulau Sudong (*Maxwell 80-188*, 29 Aug 1980, SINU), Pulau Salu (*Teo PS54*, 2000, SINU) and Pulau Tekukor.

Ecology. A coastal species found growing along tidal rivers and in the back mangrove.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC) as it is a very widespread species. In Singapore it occurs in rather large healthy populations. However, being limited to coastal mangrove habitats it might need reassessment in the future.

Uses. In Peninsular Malaysia the leaves are crushed and applied to treat scabies.

Vernacular names. *Akar saput tunggal*, *akar selar mati*, *akar kankun janing* (Malay).

Notes. The main sterile upright twining stems have larger leaves that can be rather fleshy, while blooming stems are usually pendulous and not twining, bearing herbaceous, much smaller leaves. Two specimens (*Mhd Shah SFN40977*, Oct 1956, SING [SING0037680]; *Rodda et al. MR1834*, 5 Nov 2018, SING [SING0266623]) appear to be diseased and form very large dense branched inflorescences but the flowers do not appear to open.

2. *Vincetoxicum globiferum* (Hook.f.) Kuntze

(Latin, *globo-* = globose, *-ferum* = carrying, bearing;
referring to the prominent globose staminal corona lobes)

Revis. Gen. Pl. 2 (1891) 424. **Basionym:** *Tylophora globifera* Hook.f., Fl. Brit. India 4, fasc. 10 (1883) 41; Ridley, Fl. Malay Penins. 2 (1923) 392. **Type:** *Griffith s.n.* (EIC 3764), [Malaysia], Malacca (lectotype K [K000894970], designated by Liede-Schumann & Meve, Phytotaxa 369 (2018) 150). **Fig. 70.**

Tylophora laevis Decne. in De Candolle, Prodr. 8 (1844) 611. **Replaced synonym:** *Vincetoxicum hortulorum* Kuntze, Revis. Gen. Pl. 2 (1891) 424. **Type:** *Forman 567*, [Indonesia], West Java, Tjianten, Palabuhan Ratu (neotype K [K000895044], designated by Liede-Schumann & Meve, Phytotaxa 369 (2018) 150; isoneotypes BO, K [K000895045], L [L.2719257], SING).

Tylophora squarrosa Ridl., J. Straits Branch Roy. Asiat. Soc. 61 (1912) 30; Ridley, Fl. Malay Penins. 2 (1923) 392; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 149; Turner, Gard. Bull. Singapore 45 (1993) 44; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 88, 106, 199. **Type:** *Ridley s.n.*, Singapore, Woodlands (lectotype SING [SING0059540], designated by Liede-Schumann & Meve, Phytotaxa 369 (2018) 150).

Tylophora asthmatica auct. non Wight & Arn.: Ridley, Fl. Malay Penins. 2 (1923) 392; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 149.

Tylophora indica auct. non (Burm.f.) Merr.: Turner, Gard. Bull. Singapore 45 (1993) 44; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 88, 106, 213.

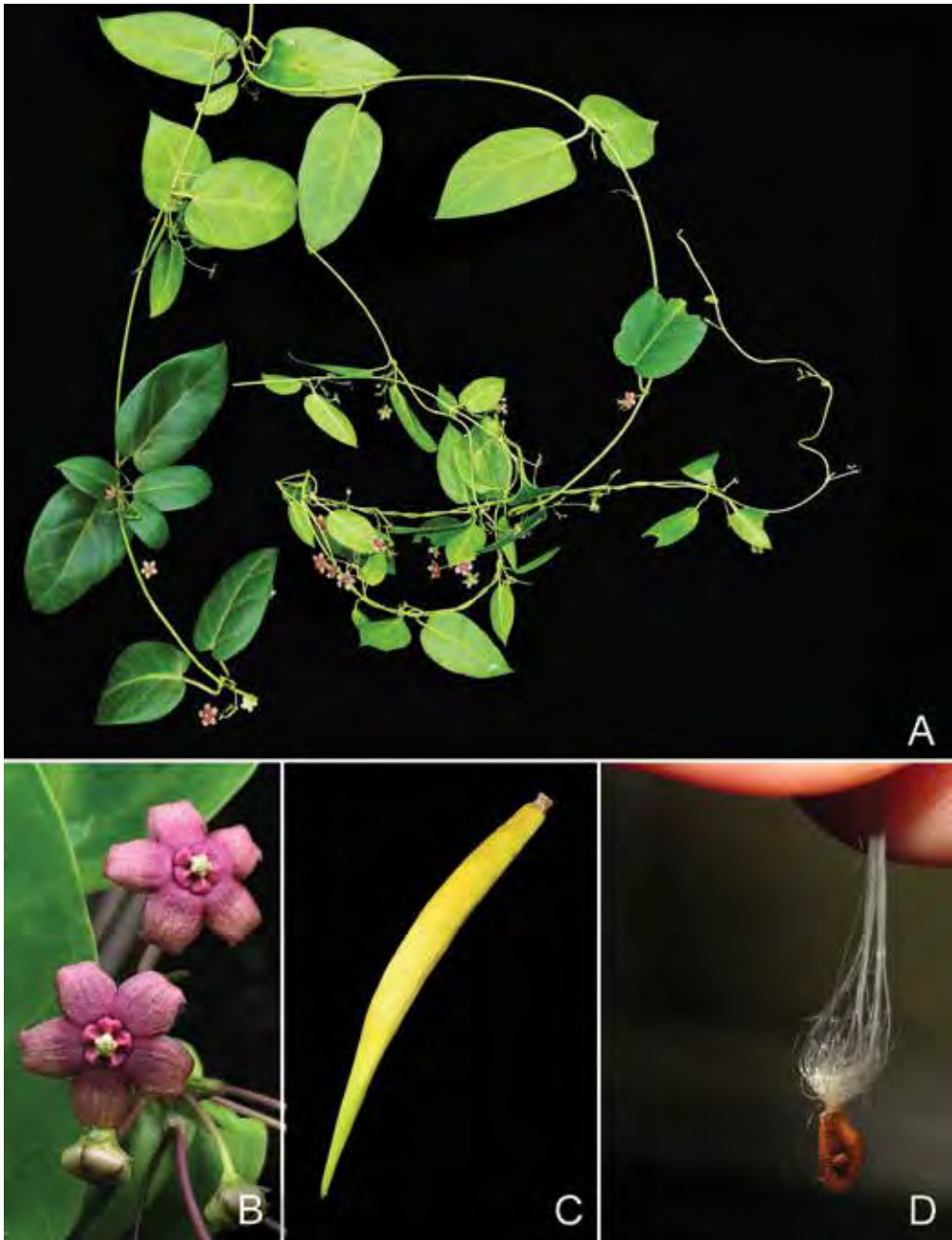


Figure 70. *Vincetoxicum globiferum* (Hook.f.) Kuntze. **A.** Fertile branch. **B.** Inflorescence with buds and open flowers. **C.** Follicle. **D.** Seed with coma. (From Singapore, Pulau Tekong, *Lua SING2017-112*. Photos: A, P.K.F. Leong; B, X.Y. Ng; C, D, R.C.J. Lim).

Terrestrial climber with clear latex in all vegetative parts. **Roots** fibrous, basal. **Stems** twining or pendulous, to 5 m long, sparsely branched; leafy stems terete, herbaceous, 3–4 mm in diam., green, glabrous; internodes (3–)8–15(–25) cm long. **Leaves:** petiole cylindrical, 5–35 mm long, 1–1.5 mm in diam., glabrous or pubescent; lamina herbaceous, ovate, 3–10(–15) × 1.5–6(–8.5) cm, apex acuminate to apiculate, base rounded to shallowly cordate, mid green above, glabrous or sparsely pubescent, lighter green underneath, glabrous, midrib slightly raised on adaxial surface, secondary veins 3–5 on each side, tertiary venation reticulate; colleters 4–5 at each lamina base, ovate or conical 0.1–0.3 × c. 0.1 mm, often visible on immature leaves only. **Inflorescences** compound racemes, 1(–2) branched to 5 cm long, with 2(–3) partial inflorescences bearing 5–10 flowers, usually 2–3 open at a time; peduncle extra-axillary, one per node, (5–)10–40 mm long, 0.5–1 mm in diam., glabrous; bracts subtending partial inflorescence lanceolate, 1–3 × 0.15–0.25 mm, glabrous; pedicels filiform, 10–25 mm long, glabrous. **Calyx** 4–5 mm in diam., lobes free, lanceolate, 1.8–2 × 0.5–1 mm, pale green, apex acuminate, outside glabrous or sparsely pubescent, inside glabrous; calycine colleters not observed. **Corolla** herbaceous, rotate, 10–14 mm in diam.; tube campanulate, 2–3 mm long, glabrous; lobes ovate, 2.5–3.5 × 2–3 mm, apex acute dull red, sparsely pubescent inside, outside glabrous; lobes valvate or dextrorse. **Staminal corona** 2.5–4 mm in diam., 1.2–1.5 mm high; corona lobes spreading, oblong or almost globose, c. 1 × 0.8 mm. **Pollinia** globose to oblong, 150–250 × 120–150 µm; corpusculum oblong c. 150 × 70 µm; caudicles c. 100 µm long. **Anther appendages** membranous, almost round c. 0.5 × 0.75 mm. **Style head** conical c. 1 mm in diam. **Ovary** conical, c. –1 mm long, c. 0.5 mm in basal diameter, glabrous. **Fruit** of paired (rarely single) follicles, fusiform, 10–12 × 1–1.3 cm glabrous, apex beaked. **Seeds** fusiform-oblong 10–15 × 3–5 mm, long comose, coma 2.5–3.5 cm long.

Distribution. Peninsular Malaysia, Sumatra, Java and Sulawesi. In Singapore it occurs on Pulau Ubin (*Ali Ibrahim et al. SING2007-451*, Dec 2007, SING [SING0114777]) and Pulau Tekong (*Lua SING2017-112*, 30 Mar 2017, SING [SING0264091, SING0264092]). In the past it was also found at Woodlands (*Ridley s.n.*, Jun 1903, SING [SING0059540]) and Changi (*Goodenough s.n.*, 1891, SING [SING0037696]).

Ecology. Growing in mangroves and along coastal vegetation.

Provisional conservation assessment. Globally Least Concern (LC) as it is a very widespread species. It is assessed here as Critically Endangered (CR/D) in Singapore as the locality of the most recent collection on Pulau Tekong (*Lua SING2017-112*, 30 Mar 2017) has since been developed and, therefore, the only extant locality is on Pulau Ubin. Cuttings from the Pulau Tekong native stock have been propagated in Singapore Botanic Gardens.

Notes. Some specimens of this taxon were earlier misidentified, resulting in erroneous reports of *Tylophora asthmatica* Wight & Arn. and *Tylophora indica* (Burm.f.) Merr. (both = *Vincetoxicum indicum* (Burm.f.) Mabb.) in Singapore.

PERIPLOCOIDEAE

Endl., Gen. Pl., fasc. 8 (1838) 587; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 309. **Type:** *Periploca* L.

Climbers, twining, terrestrial; latex coloured. **Leaves** opposite, petiolate, lamina entire, elliptic, oblong or obovate; colleters at lamina base absent, prophylls absent. **Inflorescences** cymose, dense to lax, unbranched or di- or trichotomously branching; peduncle axillary or extra-axillary; flowers 5-merous; actinomorphic. **Calyx** lobes free, spreading, with colleters inside. **Corolla** salverform or rotate; lobes dextrorse; tube shallowly campanulate or cylindrical; **Corolline corona** present. **Stamens** 5, inserted in corolla throat or at base of corolla tube, connate into a gynostegium. **Gynostegial corona** absent. **Filaments** free or only basally fused into a tube. **Anthers** 2-locular, without membranous appendages. **Pollinaria** 5 (in Singapore) with 4 erect pollinia each. **Pollen** aggregated in pollinia lacking pollinium walls (in Singapore) carried by a spoon-shaped translator. **Gynoeceum** superior, 2-carpellate and apocarpous but united into a common style; ovary unilocular, glabrous; style head ovoid or globose. **Fruit** of 2 dehiscent follicles, widely divergent, glabrous. **Seeds** numerous, simple, flattened, comose or not comose.

Approximately 33 genera and 190 species found in the Old World tropics and Australia. In Singapore 2 genera and 2 species.

30. FINLAYSONIA Wall.

(George Finlayson, 1790–1823, naturalist and surgeon
for the East India Company)

Pl. Asiat. Rar. 2 (1831) 48; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 512; Ridley, Fl. Malay Penins. 2 (1923) 373; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 315. **Type:** *Finlaysonia obovata* Wall.

Atherolepis Hook.f., Fl. Brit. India 4, fasc. 10 (1883) 8. **Type:** *Atherolepis wallichii* (Wight) Hook.f. (= *Finlaysonia wallichii* (Wight) Venter).

Hanghomia Gagnep. & Thénint, Bull. Soc. Bot. France 83 (1936) 392. **Type:** *Hanghomia marseillii* Gagnep. & Thénint (= *Finlaysonia khasiana* (Kurz) Venter).

Meladerma Kerr, Bull. Misc. Inform. Kew 1938 (1938) 445. **Type:** *Meladerma puberulum* Kerr (combination in *Finlaysonia* pending).

Stelmacrypton Baill., Bull. Mens. Soc. Linn. Paris 2 (1889) 812. **Type:** *Stelmacrypton khasianum* (Kurz) Baill. (= *Finlaysonia khasiana* (Kurz) Venter).

Terrestrial woody climbers; latex white. **Roots** fibrous, basal. **Branches** glabrous, twining. **Leaves** opposite, entire, lamina coriaceous, petiolate; colleters at lamina base absent, prophylls absent. **Inflorescences** cymose, lax, di- or trichotomously branching; peduncle

extra-axillary. **Calyx** lobes free, spreading, with colleters inside. **Corolla** salverform, 8–12 mm diam.; lobes dextrorse; tube shallowly campanulate; lobes ovate, glabrous outside, pubescent inside. **Corolline corona** present. **Stamens** inserted at base of corolla tube, connate into a gynostegium. **Gynostegial corona** absent. **Filaments** free. **Anthers** 4-locular, pollen aggregated into pyriform pollinia lacking pollinium walls; pollinia erect, carried by a spoon-shaped translator. **Style head** ovoid. **Fruit** of paired follicles, glabrous. **Seeds** numerous, simple, flattened, base pubescent, coma absent.

Distribution. A genus of 8 species in India, China, continental Southeast Asia, throughout Malesia and Australia. In Singapore 1 native species.

Ecology. A few species are adapted to grow on limestone; other species grow in mangrove forest, tidal rivers and along the coast.

Taxonomy. The inclusion of *Atherolepis*, *Hanghonia*, *Meladerma* and *Stelmacrypton* in *Finlaysonia* has been suggested based on morphology alone by Venter & Verhoeven (Ann. Missouri Bot. Gard. 88 (2001) 550–568) and by Sidney (A Taxonomic Revision of *Finlaysonia* and *Streptocaulon* (Periplocoideae; Apocynaceae). M.Sc. Thesis, University of Free State, Bloemfontein, 2012).

Finlaysonia obovata Wall.

(Latin, *obovatus* = obovate; referring to the shape of the leaves)

Pl. Asiat. Rar. 2 (1831) 48; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 513; Ridley, Fl. Malay Penins. 2 (1923) 373; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 105, 205; Ang et al., Nat. Singapore 3 (2010) 7–11. **Synonym:** *Gurua obovata* (Wall.) Buch.-Ham. ex Voigt, Hort. Suburb. Calcutt. (1845) 544, nom. illeg. superfl. **Type:** *Buchanan-Hamilton* 757, India, Sundarbans (lectotype E [E00174007], designated by Rodda, Gard. Bull. Singapore 71 (2019) 76). **Fig. 71, 72.**

Tabernaemontana cirrhosa Blanco, Fl. Filip. (1837) 115. **Type:** *Ramos & Edano 31503*, Philippines, Capiz Province, Panay (neotype K, designated by Rodda, Gard. Bull. Singapore 71 (2019) 78; isoneotype P [P04241003]).

Terrestrial glabrous climber with white latex in all vegetative parts. **Stems** erect or pendulous, to 10 m long; leafy stems terete, 2–8 mm in diam., reddish brown, older stems lenticellate; internodes (2–)5–10(–20) cm long. **Leaves:** petiole channelled above, 10–15(–25) mm long, 1–2 mm in diam., reddish green; intrapetiolar colleters absent; lamina coriaceous, obovate to elliptic, 5–12 × 2–7 cm, apex mucronulate (rarely obtuse), base cuneate or acute, mid green above, lighter green underneath, midrib raised on adaxial surface, secondary veins 5–14 on each side, branching at c. 70° from midrib, tertiary venation reticulate. **Inflorescences** cymose, lax, di- or trichotomously branching; primary peduncle axillary or sub-axillary, 10–25 mm long, c. 2 mm in diam., glabrous or sparsely pubescent, secondary peduncles 8–12(–25)

mm long, pubescent, tertiary peduncles 3–10(–15) mm long, pubescent; bracts opposite at branching point, ovate to broadly triangular, 1–2 × 1–1.5 mm, glabrous with ciliate margin; pedicels 3–5 mm long, 0.5–1 mm in diam., sparsely pubescent. **Calyx** c. 3 mm in diam., lobes free, broadly ovate or broadly triangular, 1–1.3 × 1–1.3 mm, apex round to acute, glabrous, ciliate; calycine colleters 1–2 at each calyx lobe sinus, narrowly conical, 0.2–0.3 mm long. **Corolla** rotate, 8–12 mm in diam., outside brown spotted, inside cream coloured to pale yellow to pale green; tube shallowly campanulate 1–1.5 mm long, inside long pubescent with white hairs, outside glabrous; lobes ovate, 3–5 × 2.5–3.5 mm, inside long pubescent with white hairs, margin glabrous, outside glabrous; apex rounded. **Corolline corona** with an ovoid base attached to the base of the corolla lobe, 0.5 × 0.8 mm, glabrous and filiform apex, 2–3 mm long, glabrous. **Filaments** free, inserted at base of corolla tube, 0.5–0.7 mm long, surrounding the stigma, glabrous. **Anthers** glabrous, oblong-ovate, 1–1.2 × 0.4–0.5 mm. **Pollinia** obovate, c. 250 × 150 µm, apex rounded. **Style head** on a stalked style, ovoid, 0.6–1 × 1 mm, glabrous. **Ovary** conical, 0.7–1 mm long, c. 0.5 mm in basal diameter, glabrous. **Fruit** of paired follicles, globose and recurved, ribbed, 5–7 × 2.5–3.5 cm, glabrous. **Seeds** flattened, 15–22 × 8–12 mm, margin winged, base pubescent, coma absent.

Distribution. India, continental Southeast Asia, throughout Malesia to northern Australia. In Singapore it is recorded from Pasir Panjang Road, Pasir Ris (*Chua 22/94*, 10 May 1994, SINGU), Sungei Buloh, Sungei Mandai (*Ang & Tan 31*, 17 Mar 2003, SINGU), Khatib Bongsu, Labrador (*Chang & Yang SING2010-756*, 4 May 2010, SING [SING0146671]), Pulau Ubin (*Ali Ibrahim & Tan SING2011-441*, 27 Sep 2011, SING [SING0166676]) and Pulau Tekong. Historically it has also been collected at Kranji, Geylang (*Ridley s.n.*, 21 Aug 1900, SING [SING037675]) and Mount Zion.

Ecology. A coastal species found growing along tidal rivers and in the back mangrove.

Provisional conservation assessment. Globally Vulnerable (VU A2(c)) due to habitat loss and fragmentation of the remaining populations. It is assessed here as Critically Endangered (CR/D) in Singapore because there are estimated to be fewer than 50 mature individuals and their habitat is very fragmented.

Uses. A rare Triterpene acid extracted from the leaves has shown antibacterial activity against fish pathogens (Misha & Sree, *Nat. Prod. Res.* 22 (1997) 801–807).

Vernacular name. *Pelir kambing* (Malay).

Notes. Jagtap & Singh (*Fasc. Fl. India* 24 (1999) 300) indicated that *Finlaysonia maritima* (Blume) Backer ex K. Heyne was an earlier name for *Finlaysonia obovata*. Klackenberg (*Blumea* 55 (2010) 240), however, suggested the basionym *Secamone maritima* Blume was a synonym of *Toxocarpus elmeri* Merr., but without seeing a specimen. Klackenberg (pers. comm.) has since found a specimen that can be considered original material of *Secamone maritima* and confirmed that it is not a *Finlaysonia*.

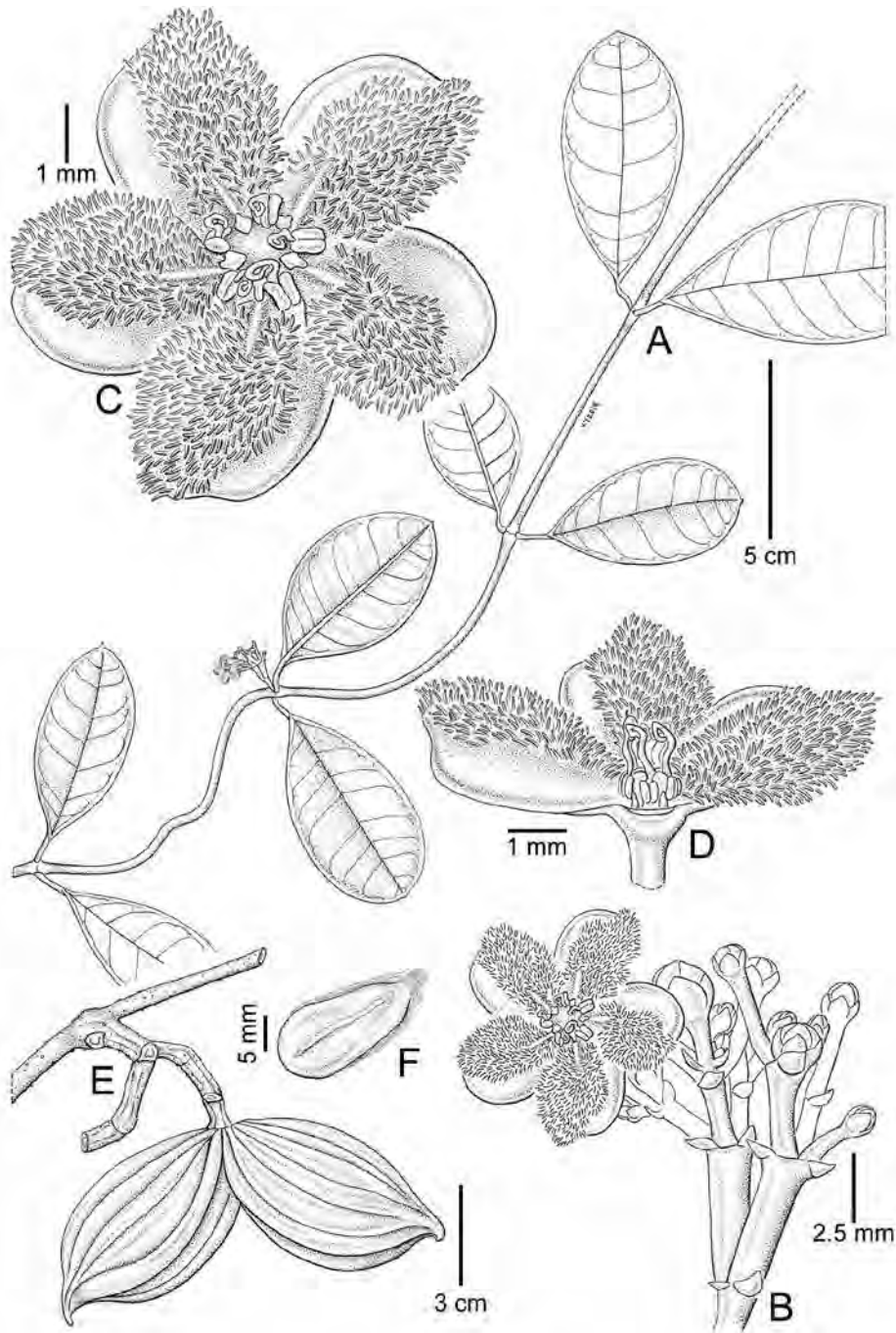


Figure 71. *Finlaysonia obovata* Wall. **A.** Flowering branch. **B.** Inflorescence. **C.** Corolla, from above. **D.** Flower, side view, with part of the corolla removed showing the corolline corona. **E.** Fruit. **F.** Seed. (From Singapore. A, B, E, F from Pulau Ubin, *Yang et al. SFY177Y*; C, D from Pasir Panjang Road, *Chew s.n.* Drawn by X.Y. Loh).



Figure 72. *Finlaysonia obovata* Wall. Leafy branch. Inset: Follicles. (From Singapore, Berlayer Creek. Photos: W.F. Ang)

31. GYMNANTHERA R.Br.

(Greek, *gymno-* = naked, Latin, *-anthera* = anther;
referring to the exposed anthers)

Prodr. Fl. Nov. Holland. (1810) 464; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 514; Ridley, Fl. Malay Penins. 2 (1923) 373; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 315. **Type:** *Gymnanthera nitida* R.Br.

Dicerolepis Blume, Mus. Bot. 1, fasc. 10 (1850) 145, fig. 24. **Type:** *Dicerolepis paludosa* Blume (= *Gymnanthera oblonga* (Burm.f.) P.S.Green).

Terrestrial woody climbers; latex white. **Roots** fibrous, basal. **Branches** glabrous or sparsely pubescent, twining. **Leaves** opposite, entire, lamina coriaceous, petiolate; prophylls absent. **Inflorescences** cymose, unbranched or dichotomously branched; peduncle axillary; flowers 5-merous. **Calyx** lobes free, spreading, with colleters inside. **Corolla** rotate, c. 2 cm diam.; lobes dextrorse; tube cylindrical, glabrous outside, inside with 5 lines of hairs running for the entire length of the tube; lobes ovate, glabrous. **Corolline corona** present. **Stamens** inserted at the corolla throat, connate into a gynostegium. **Gynostegial corona** absent. **Filaments** basally connate into a tube, apically free. **Anthers** 4-locular, pollen aggregated into oblong pollinia lacking pollinium walls, pollinia erect, fixed onto a spoon-shaped translator. **Gynoecium** 2-carpellate and apocarpous but united into a common style. **Ovary** glabrous; style head globose. **Fruit** of paired follicles, glabrous. **Seeds** numerous, simple, flattened, coma present.

Distribution. A genus of 2 species in China, continental Southeast Asia, Peninsular Malaysia, and throughout Malesia to northern Australia. In Singapore 1 native species.

Ecology. Large climbers in mangrove forest, coastal vegetation and along rivers.

***Gymnanthera oblonga* (Burm.f.) P.S.Green**

(Latin, *oblongus* = oblong; likely referring to the shape of the leaves)

Kew Bull. 47 (1992) 333; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 46, 105, 228. **Synonym:** *Jasminum oblongum* Burm.f., Fl. Ind. (1768) 6, t. 3: fig. 2. **Type:** *Garcin s.n.*, [Indonesia], Java (lectotype G [G00808966], designated by Green, Kew Bull. 47 (1992) 333). **Fig.** 73, 74.

Gymnanthera nitida R.Br., Prodr. Fl. Nov. Holland. (1810) 464. **Type:** *Brown 2869*, Australia, Queensland, Sweer's Island, island a, Gulf of Carpentaria (lectotype BM [BM000020701], first step designated by Forster, Austral. Syst. Bot. 4 (1991) 565, second step designated here; isolectotypes BM [BM000020702], CANB [CANB278899], K [K000910016, K000910017]).

Dicerolepis paludosa Blume, Mus. Bot. 1, fasc. 10 (1850) 146, fig. 24. **Synonym:** *Gymnanthera paludosa* (Blume) K.Schum. in Engler & Prantl, Nat. Pflanzenfam. 4(2) (1895) 213. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L0004309], designated by Forster, Austral. Syst. Bot. 4 (1991) 565; possible isolectotype MEL [MEL710751]).

Parechites bowringii Hance, J. Bot. 6 (1868) 299. **Synonym:** *Trachelospermum bowringii* (Hance) Hemsl., J. Linn. Soc., Bot. 26 (1889) 99. **Type:** *Bowring s.n.* [Herb. Hance 6006], China, Hong Kong (holotype BM; isotype K).

Dicerolepis pedunculata Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 466. **Synonym:** *Gymnanthera pedunculata* (Miq.) Fern.-Vill. in Naves & Fernández-Villar, Nov. App. (1880) 132. **Type:** *Zollinger s.n.*, [Indonesia], Flores (not traced).

Dicerolepis hypoleuca Miq., Fl. Ned. Ind. 2, fasc. 3 (1857) 466. **Synonym:** *Gymnanthera hypoleuca* (Miq.) Boerl., Handl. Fl. Ned. Ind. 2(2) (1899) 435. **Type:** *Zollinger s.n.*, [Indonesia], Sumbawa (not traced).

Terrestrial twining climber with white latex in all vegetative parts. **Roots** fibrous, basal. **Stems** twining or pendulous to 10 m long; leafy stems terete, 1–3 mm in diam., glabrous or very sparsely pubescent, mature stems lenticellate, glabrous; internodes (1–)5–10(–20) cm long. **Leaves:** petiole channelled above, 5–20 mm long, c. 1 mm in diam., pubescent; intrapetiolar colleters 3–5 each side, triangular, 0.3–0.5 mm long; lamina coriaceous, elliptic-oblong, 3–9 × 1–4 cm, above mid green, glabrous, underneath very pale green, glabrous or very sparsely pubescent, apex apiculate, base cuneate, midrib raised on adaxial surface, secondary veins 5–10 on each side, tertiary venation reticulate; colleters at lamina base absent. **Inflorescences** cymose, unbranched or dichotomously branched, bearing 1–2 open flowers; peduncle axillary, c. 1 mm long, c. 1 mm in diam., glabrous; bracts ovate, 1–1.5 × 0.8–1 mm, glabrous, rachis up to 8 mm long; pedicels 0.7–10 mm long, c. 0.5 mm in diam., greenish white, glabrous. **Calyx** lobes free, broadly ovate, 1.4–1.6 × 1–1.5 mm, apex acute (rarely rounded), pale green, glabrous; calycine colleters one or two at each calyx lobe sinus, bilobed, 0.2–0.3 × 0.4–0.5 mm wide. **Corolla** salver-shaped; tube cylindrical, widening at the apex, 9–14 mm long, greenish white, glabrous outside, inside glabrous apart from 5 lines of hairs running for the entire length of the tube, alternating with the corona lobes; corolla rotate, c. 2 cm in diam., glabrous, greenish white, lobes ovate, 7–10 × 4–5 mm, apex rounded, glabrous. **Corona** corolline, of 5 lobes attached at the throat of the corolla tube, ovate, 1–1.3 mm high, with linear-acuminate incurved apex. **Filament** basally connate into a tube, upper part free, adnate to stigma. **Pollinia** oblong, c. 500 µm long. **Style head** globose c. 1 mm in diam. **Ovary** globose, 1–2 mm long, c. 0.5 mm in basal diameter, glabrous. **Fruit** follicles, usually paired, divaricate, linear, 8–14 cm long, apex acuminate. **Seeds** flattened, 5–7 × 1.5–2.5 mm, coma c. 3 cm long.

Distribution. China, continental Southeast Asia, Peninsular Malaysia, and throughout Malesia to northern Australia. In Singapore it is found on Pulau Tekong (*Koh SING2012-055*, 2 Mar 2012, SING [SING0171443]), Jurong, Serangoon Island (*Lai LJ466*, 1998, SING [SING0019930]), Changi (*Lai LJ282*, 25 Nov 1997, SING [SING0008024]), Pulau Ubin (*Ali Ibrahim & Lai SING2011-488*, Nov 2011, SING [SING0182044]) and Pulau Unum (*Lua SING2010-786*, 8 Jul 2010, SING [SING0146694]).

Ecology. Seaside, mangroves and lowland swamps.

Provisional conservation assessment. Globally Vulnerable (VU A2(c)) due to habitat loss and fragmentation of the remaining populations. It is assessed here as Critically Endangered (CR/D) in Singapore because there are estimated to be fewer than 50 mature individuals and their habitat is very fragmented.

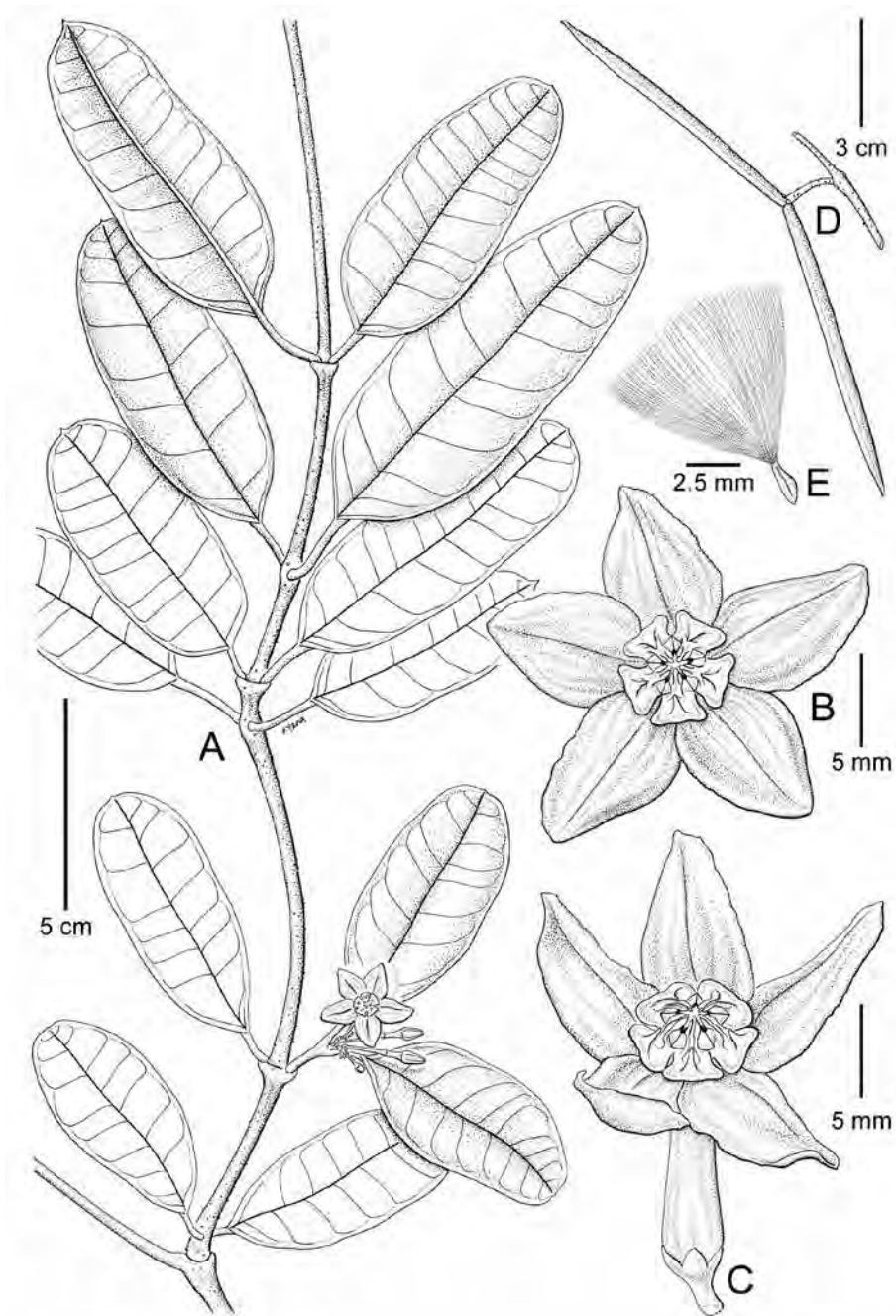


Figure 73. *Gymnanthera oblonga* (Burm.f.) P.S.Green **A.** Flowering branch. **B.** Flower, from above. **C.** Flower, side view. **D.** Fruit. **E.** Seed. (From Singapore, A from Pulau Ubin, Rodda *et al.* MR1832; B–D from Pulau Ubin, Ali Ibrahim & Lai SING2011-488; E from Pulau Unum Lua SING2010-786. Drawn by X.Y. Loh).

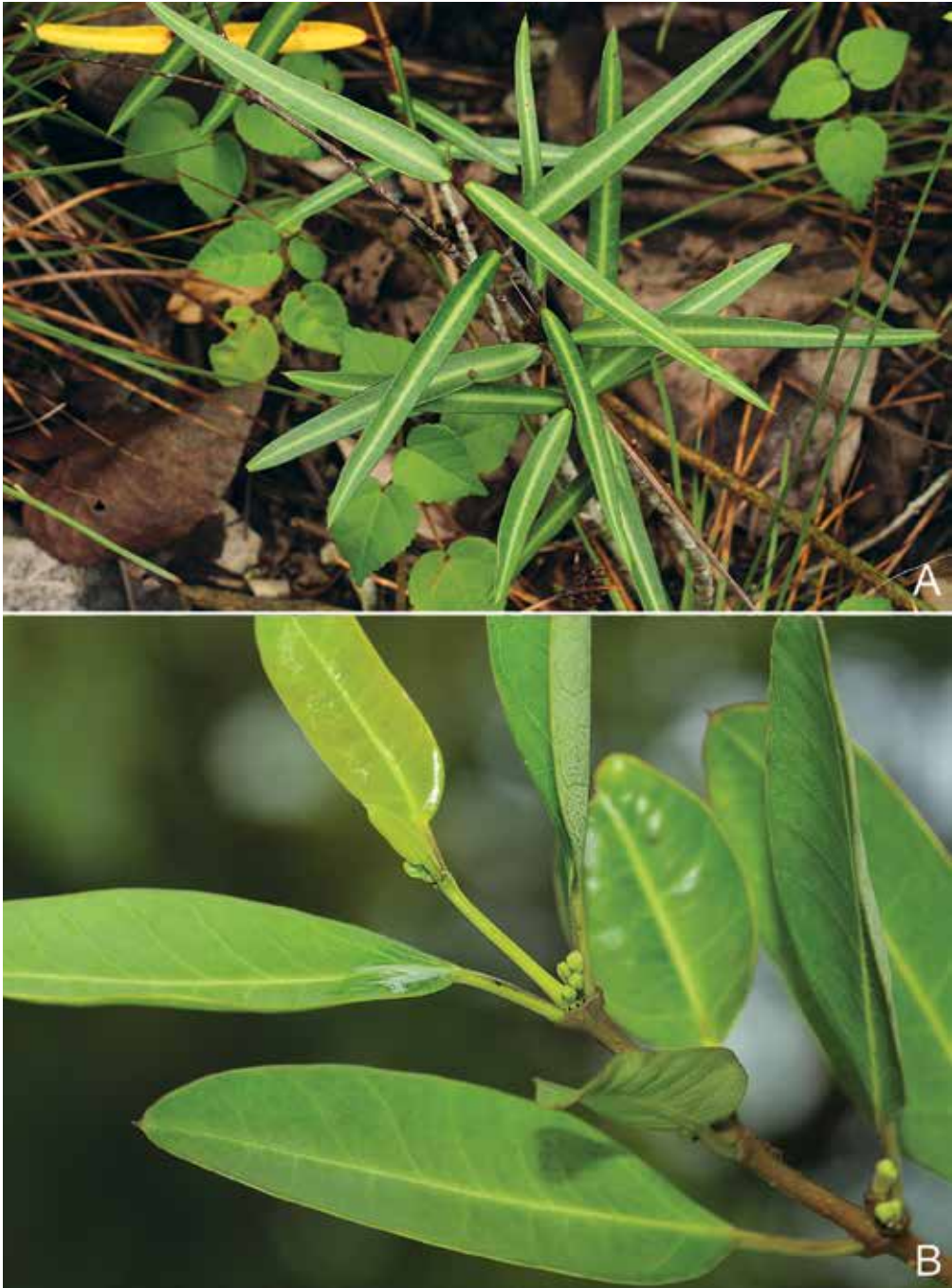


Figure 74. *Gymnanthera oblonga* (Burm.f.) P.S.Green. **A.** Leafy branch with narrowly lanceolate juvenile leaves. **B.** Leafy branch with mature leaves and buds. (From Singapore, Pulau Ubin, Rodda *et al.* MR1832. Photos: M. Rodda).

Notes. The lamina of juvenile specimens is narrowly lanceolate, 10–15 × 1–2.5 cm.

SECAMONOIDEAE

Endl., Gen. Pl., fasc. 8 (1838) 589; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 321. **Type:** *Secamone* R.Br.

Climbers, twining, terrestrial; latex coloured. **Roots** fibrous, basal. **Leaves** opposite, petiolate, lamina entire, narrowly elliptic to ovate, venation pinnate; colleters at lamina base absent, prophylls absent. **Inflorescences** racemose, dense to lax, few- to much-branched; peduncle extra-axillary; flowers 5-merous; actinomorphic. **Calyx** lobes free, spreading, generally with colleters inside. **Corolla** rotate; lobes sub-valvate in bud; tube campanulate; corolline corona present or absent. **Corolline corona** absent. **Stamens** 5 inserted at the base of the corolla tube, connate into a gynostegium. **Filaments** fused into a tube. **Anthers** 4-locular, without membranous appendages. **Pollinaria** 5 with 4 erect pollinia each. **Pollen** aggregated into pollinia surrounded by pollinium walls. **Gynostegial corona** present, staminal. **Gynoeceum** superior, 2-carpellate and apocarpous but united into a common style; ovary unilocular, glabrous; style head oblong. **Fruit** of 2 dehiscent follicles, one sometimes aborted, glabrous or pubescent. **Seeds** numerous, simple, spatulate to linear, comose.

There are approximately 7 genera and 180 species found in the Old World tropics and Australia of which 1 genus and 2 native species are in Singapore.

32. SECAMONE R.Br.

(from *squamouna*, an Arabic vernacular name
for *Secamone aegyptiaca* W.T.Aiton)

Prodr. Fl. Nov. Holland. (1810) 464; Ridley, Fl. Malay Penins. 2 (1923) 375; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 518; Klackenberg, Kew Bull. 47 (1992) 597; Endress et al. in Kadereit & Bittrich (ed.), Fam. Gen. Vasc. Pl. 15 (2019) 323. **Type:** *Secamone emetica* (Retz.) R.Br. ex Schult.

Toxocarpus Wight & Arn., Contr. Bot. India (1834) 61; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 519; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148. **Type:** *Toxocarpus kleinii* Wight & Arn. (combination in *Secamone* pending).

Genianthus Hook.f., Fl. Brit. India 4, fasc. 10 (1883) 15; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 525; Ridley, Fl. Malay Penins. 2 (1923) 377; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148. **Type:** *Genianthus laurifolius* (Roxb.) Hook.f., lectotype designated by Klackenberg, Bot. Jahrb. Syst. 117 (1995) 421 (= *Secamone laurifolia* (Hook.f.) K.Schum).

Terrestrial climbers; latex white. **Roots** fibrous, basal. **Branches** glabrous to densely puberulent, twining. **Leaves** with lamina coriaceous, petiolate; colleters at lamina base absent, prophylls

absent; **Inflorescences** racemose, dense to lax few to much branched; peduncle extra-axillary; flowers 5-merous; actinomorphic. **Calyx** lobes free, spreading, generally with colleters inside. **Corolla** rotate, 4–8 mm diam.; lobes sub-valvate or sinistrorse; tube campanulate; lobes ovate to linear, glabrous outside, glabrous or pubescent inside. **Corolline corona** present. **Stamens** connate into a gynostegium. **Gynostegial corona** staminal, lobes oblong, lunate or triangular, in 1 or 2 whorls. **Filaments** fused into a tube. **Anthers** 4-locular, pollen aggregated into pollinia, pollinia, erect. **Ovary** glabrous; style head oblong, apex bilobed or truncate. **Fruit** of 2 dehiscent follicles, one sometimes aborted, glabrous or pubescent. **Seeds** numerous, simple, spathulate to linear, comose.

Distribution. A genus of c. 140 species in tropical and subtropical Africa, Madagascar, Asia, Australia and Pacific islands. In Singapore 2 native species (see also Excluded species).

Ecology. Dry to humid, lowland to montane forests and secondary vegetation.

Taxonomy. The relationships between *Secamone*, *Genianthus* and *Toxocarpus* have not yet been elucidated. However, Klackenberg (Adansonia, sér. 3, 23 (2001) 317–335; Blumea 49 (2004) 129–133) considered the three genera congeneric based on the observation that *Secamone* in Madagascar is extremely variable and Madagascan species have characters, such as dorsiventrally compressed corona lobes and long style heads, that are also observed in *Genianthus* and *Toxocarpus*. The phylogeny published by Surveswaran et al. (Bot. J. Linn. Soc. 174 (2014) 601–619) includes one species of *Toxocarpus*, *T. wightianus* Hook & Arn., that is included within a *Secamone* clade. The broadly circumscribed *Secamone* includes c. 140 species.

Key to *Secamone* species

1. Inflorescence branched 3–5 times, to 3 cm long **1. *S. griffithii***
 Inflorescence often unbranched, 4–10 cm long **2. *S. maingayi***

1. *Secamone griffithii* (Decne.) Klack.

(William Griffith, 1810–1845, English botanist
 known for his work in India and Malaya)

Blumea 55 (2010) 239. **Basionym:** *Toxocarpus griffithii* Decne. in De Candolle, Prodr. 8 (1844) 505; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; Ridley, Fl. Malay Penins. 2 (1923) 376; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 520; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 149; Turner, Gard. Bull. Singapore 45 (1993) 44; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 216; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 87, 106, 199. **Type:** *Griffith 339*, [Myanmar], Mergui (lectotype P, designated by Klackenberg, Blumea 55 (2010) 239; isolectotypes E, K).

Slender terrestrial climber with white latex in all vegetative parts. **Stems** twining or pendulous, to 6 m long; leafy stems terete, up to 3 mm in diam., pubescent predominantly along two

lines; internodes 3–5(–15) cm long. **Leaves:** petiole channelled above, 5–8 mm long, 1–1.2 mm in diam., glabrous or pubescent; lamina coriaceous, ovate, (2–)5–8 × (1–)3–5 cm, apex cuspidate, base cuneate, above glossy bright green, glabrous, underneath creamy white, sparsely pubescent, more so along the main and secondary veins, midrib raised on adaxial surface, sunken on abaxial surface, secondary veins 4–6 on each side, branching at 50–70° from midrib; colleters at lamina base not observed. **Inflorescences** racemose, to 3 cm long, branched 3–5 times, each branch bearing up to 7 clusters of 2–3 flowers; peduncle extra-axillary, 0.5–1(–3) cm long, 0.9–1.1 mm in basal diameter, pubescent, branches (0.5–)1.5–2.5 cm long, c. 1 mm diam., pubescent; flower clusters 1.5–3 mm apart; bracts ovate, 1–1.5 × 0.5–0.8 mm, pubescent outside, ciliate; pedicels c. 1 mm long, c. 0.5 mm in diam., pubescent. **Calyx** 2–2.5 mm in diam., lobes free, ovate or oblong, 0.9–1.2 × 0.4–0.7 mm, apex rounded, outside pubescent, inside glabrous, ciliate; calycine colleters not observed. **Corolla** rotate, 5–6 mm in diam.; lobes sub-valvate to sinistrorse; tube campanulate, 1–1.5 mm long, glabrous, lobes lanceolate, 2–5 × 0.6–1 mm, inside basally pubescent, glabrous outside. **Gynostegium** c. 2 mm in diam., c. 1.5 mm high. **Staminal corona lobes** in 1 whorl, triangular, longitudinally attached to the back of anthers, apex erect, acute, incurved. **Pollinarium** not observed. **Style head** oblong, 2–3 mm long, apex bilobed. **Ovary** ovate, c. 1 mm long, 0.5–0.7 mm in basal diameter, glabrous. **Fruit** follicle, c. 30 cm long, c. 3.5 mm thick, flexuous slightly torulose, puberulous. **Seeds** linear, c. 2.5 cm long, comose, coma 2.5–3 long.

Distribution. Myanmar and Peninsular Malaysia. In Singapore it has been collected in Jurong (*Corner s.n.*, 4 Feb 1933, SING [SING0003976]) and Bukit Mandai (*Kiah s.n.*, 20 Jul 1940, SING [SING0003978]).

Ecology. Dense lowland forest.

Provisional conservation assessment. Globally Data Deficient (DD). In Singapore presumed Nationally Extinct.

Notes. All specimens examined had a damaged gynostegium and lacked fruit and seeds. The description of fruits and seed was adapted from Ridley (Fl. Malay Penins. 2 (1923) 37).

2. *Secamone maingayi* (Hook.f.) Rodda

(Alexander Carroll Maingay, 1836–1869, British surgeon, botanist and magistrate in Malacca, Peninsular Malaysia)

Gard. Bull. Singapore 71 (2019) 79. **Basionym.** *Genianthus maingayi* Hook.f., Fl. Brit. India 4, fasc. 10 (1883) 16; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111; King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 525; Ridley, Fl. Malay Penins. 2 (1923) 378; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 148; Turner, Gard. Bull. Singapore 45 (1993) 43; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 44, 105, 192. **Type:** *Maingay* 2678 [Kew Distribution 1106], Singapore (lectotype K [K000910089], designated by Klackenberg, Bot. Jahrb. Syst. 117 (1995) 452; isolectotypes K [K000910090, K000910088], L [L0004301]). **Fig. 75.**

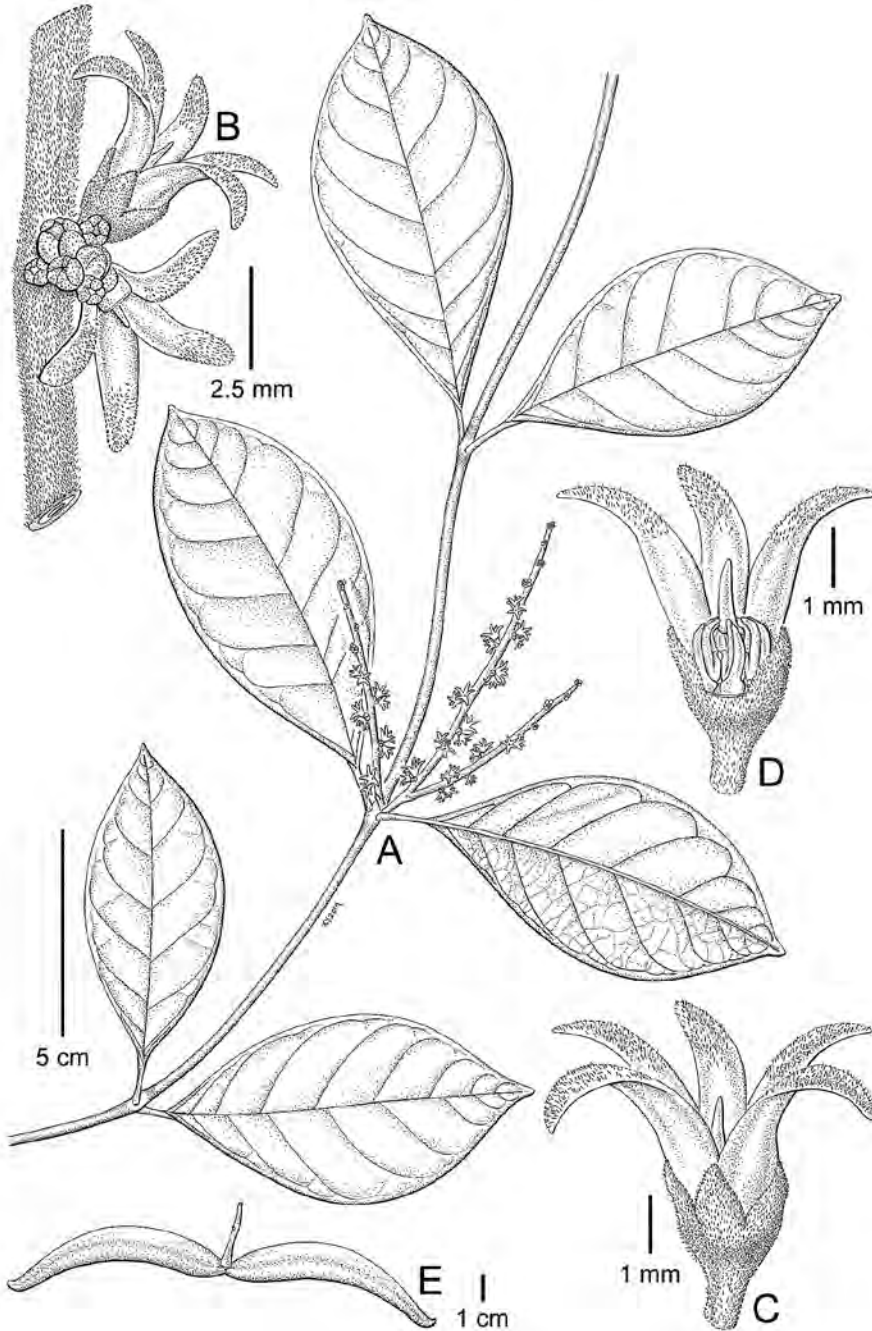


Figure 75. *Secamone maingayi* (Hook.f.) Rodda. **A.** Flowering branch. **B.** Inflorescence. **C.** Flower, side view. **D.** Flower, side view, with part of the corolla removed showing the gynostegium. **E.** Fruit. (A–D from Singapore, Bukit Mandai, *Goodenough s.n.*; E, from Peninsular Malaysia, *Chew 217*. Drawn by X.Y. Loh).

Slender terrestrial climber with white latex in all vegetative parts. **Stems** twining or pendulous, to 10 m long; leafy stems terete, up to 4 mm in diam., greyish green when young, later dark brown, lenticellate, with dense brown pubescence; internodes 5–10 cm long. **Leaves:** petiole cylindrical, slightly channelled above, (5–)10–15 mm long, 1–1.3 mm in diam., with dense brown pubescence; lamina coriaceous, obovate to oblanceolate (rarely elliptic), (3–)5–9 × 2–4 cm, apex acuminate or cuspidate (rarely acute), base cuneate, glossy mid green above, glabrous, paler green underneath, glabrescent, proximal half of the midrib with dense brown pubescence, midrib raised on adaxial surface, sunken on abaxial surface, secondary veins 4–9 on each side, branching at 45–60° from midrib; colleters at lamina base indistinct amongst the dense pubescence. **Inflorescences** racemose, 4–10 cm long, often unbranched, at most with 3 main branches each bearing up to 15 clusters of 2–3 flowers; rachis 1–1.2 mm in basal diameter, with dense brown pubescence; flower clusters 4–10 mm apart; peduncle c. 1 mm long, 1 mm wide, with dense brown pubescence; pedicels c. 1 mm long, c. 1 mm in diam., with dense brown pubescence. **Calyx** 2.5–3 mm in diam., lobes free, ovate or oblong, 0.8–1 × 0.7–1 mm, apex rounded, outside with dense brown pubescence, inside glabrous; calycine colleters one at each lobe sinus, ovoid, c. 0.15 mm long. **Corolla** rotate, c. 8 mm in diam., lobes sub-valvate; tube campanulate, c. 1 mm long, greenish white outside, glabrous, inside white, sparsely pubescent; lobes linear, 3–4.5 × 0.7–1.2 mm, white with orange margin, glabrous outside, basally white turning orange at the tips, very densely pubescent inside, apex acute or sometimes minutely bilobed. **Gynostegium** 1.5–1.8 mm in diam., 1–1.2 mm high. **Staminal corona** lobes lunated and incurved, positioned in two whorls, an outer whorl with lobes 0.8–1 mm long, apex entire, rounded, an inner whorl 0.8–1 mm long, apex minutely 4–5 lobed, slightly higher than the outer whorl. **Pollinia** erect, oblong, c. 100 µm long, free on a broad and short caudicle. **Style head** oblong, 1.3–1.8 mm long, apex minutely bilobed. **Ovary** broadly triangular, laterally flattened, 0.8–1 mm long, 0.5–0.7 mm in basal diameter, glabrous. **Fruit** follicles, usually paired, widely divaricate, fusiform, (5–)10–15 × 1–1.5 cm, pale green, covered in dense brown pubescence. **Seeds** 1–1.3 × 0.4–0.5 cm, long comose, coma 2–3 cm long.

Distribution. Peninsular Malaysia and Borneo (Sarawak). In Singapore it is now known only in Nee Soon (*Gwee SING2010-435*, 3 Mar 2010, SING [SING0144529]; *Gwee SING2010-435*, 3 Mar 2010, SING [SING0146549]). In the past it was known from Bukit Timah (*Cantley s.n.*, 15 Nov 1883, SING [SING0003933]) and Bukit Mandai (*Goodenough s.n.*, 15 Feb 1893, SING [SING0003977]).

Ecology. Primary forest, usually swamp forest, lowlands.

Provisional conservation assessment. Globally Data Deficient (DD). It is assessed here as Critically Endangered (CR/D) in Singapore as it is currently known from a single locality with fewer than 50 mature individuals.

Excluded species

Alyxia ganophylla Markgr. was recorded for Singapore by Middleton (Blumea 45 (2000) 49) but this was based on a single collection incorrectly georeferenced to Singapore and actually from Borneo.

Amphineurion marginatum (Roxb.) D.J.Middleton is known in Singapore only from a Cantley collection without precise locality (*Cantley 2634*, SING [SING0062838]). Ridley (J. Straits Branch Roy. Asiat. Soc. 33 (1900) 35) notes a general problem with locality data on Cantley's collections (see Middleton & Turner, Flora of Singapore 1 (2019) 22, 32). In addition he notes (Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 111) that he has not seen this species in Singapore (he refers to it under the synonym *Aganosma marginata* (Roxb.) G.Don). There is no other material known from Singapore and it is unlikely to have ever naturally occurred in the country.

Chilocarpus vernicosus Blume was recorded for Singapore by Markgraf (Blumea 19 (1971) 161), Turner (Gard. Bull. Singapore 45 (1993) 35), Middleton (Fl. Males., ser. 1, 18 (2007) 177), Tan et al. (in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 215) and Middleton (Fl. Penins. Malaysia, ser. 2, 2 (2011) 50). It is now clear, however, that the specimens on which this species was recorded for Singapore are of cultivated and not native or naturalised plants.

Dischidia deschampsii King & Gamble was described from a Deschamps collection from Singapore but which cannot now be traced. Ridley (Fl. Malay Penins. 2 (1923) 410) noted that he had also not seen it and that the flowers were unknown and also placed it in a 'Doubtful and Excluded Species' section.

Holarrhena curtisii King & Gamble is known in Singapore only from a Cantley collection without precise locality (*Cantley 2746*, SING [SING0037967]). This specimen is the lectotype of *Holarrhena densiflora* Ridl. (Middleton, Taxon 55 (2006) 504) as it is the only one of the syntypes that could be traced. It is now treated as a synonym of *Holarrhena curtisii*. In the protologue, Ridley (J. Straits Branch Roy. Asiat. Soc. 59 (1911) 132) noted that it could not have come from Singapore despite the label information. In Peninsular Malaysia this species does not occur further south than northern Kedah and Ridley is undoubtedly correct that this species does not occur in Singapore.

Kopsia macrophylla Hook.f. was described from a Lobb specimen supposedly from Singapore but which Ridley (Fl. Malay Penins. 2 (1923) 338) says is more likely to have been from Penang. As it is known from no other collections in Singapore it is presumed that the Lobb collection was indeed wrongly assigned to Singapore (see Middleton & Turner, Fl. Singapore 1 (2019) 32). The name was also separately misapplied by Ridley (J. Straits Branch Roy. Asiat. Soc. 33 (1900) 110) to *Kopsia singaporensis* Ridl.

Leptadenia reticulata (Retz.) Wight & Arn. was recorded for Singapore by King & Gamble (J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(2) (1908) 596) based on *Lobb 333*. Ridley (Fl. Malay Penins. 2 (1923) 410) noted that this is a mistake and the specimen is erroneously localised.

Leuconotis eugeniifolia (Wall. ex G.Don) A.DC. was recorded as occurring in Singapore by Leeuwenberg (*Syst. & Geogr. Pl.* 72 (2002) 119), Middleton (*Fl. Males.*, ser. 1, 18 (2007) 267) and Middleton (*Fl. Penins. Malaysia*, ser. 2, 2 (2011) 77) but the material on which this record is based is all from cultivated plants in Singapore Botanic Gardens.

Secamone elliptica R.Br. was recorded as occurring in Singapore by Klackenberg (*Kew Bull.* 47 (1992) 595–612) based on *Annandale 1686* (K). It was also listed as Critically Endangered in Singapore by Tan et al. (in Davison et al. (ed.), *Singapore Red Data Book*, ed. 2 (2008) 215) and Chong et al. (*Checkl. Vasc. Pl. Fl. Singapore* (2009) 78, 106, 211). No specimens of *Secamone elliptica* collected in Singapore have been traced. *Annandale 1686* (SING [SING0122494]) is from Singgora (Songkla) in southern Thailand which may have been mistaken for Singapore.

Tabernaemontana peduncularis Wall. is known from Singapore only from Cantley collections which are presumed to be wrongly localised due to the lack of any other evidence of this species occurring in Singapore.

Vincetoxicum ventricosum Kuntze was recorded (under the name *Tylophora wallichii* Hook.f.) for Singapore by King & Gamble (*J. Asiat. Soc. Bengal*, Pt. 2, Nat. Hist. 74(2) (1908) 555) based on *Wallich s.n.* [EIC 8194B]. This collection is indicated in the Wallich Catalogue as ‘Habitatio ignotae’, habitat unknown, and therefore the Singapore record is likely erroneous.