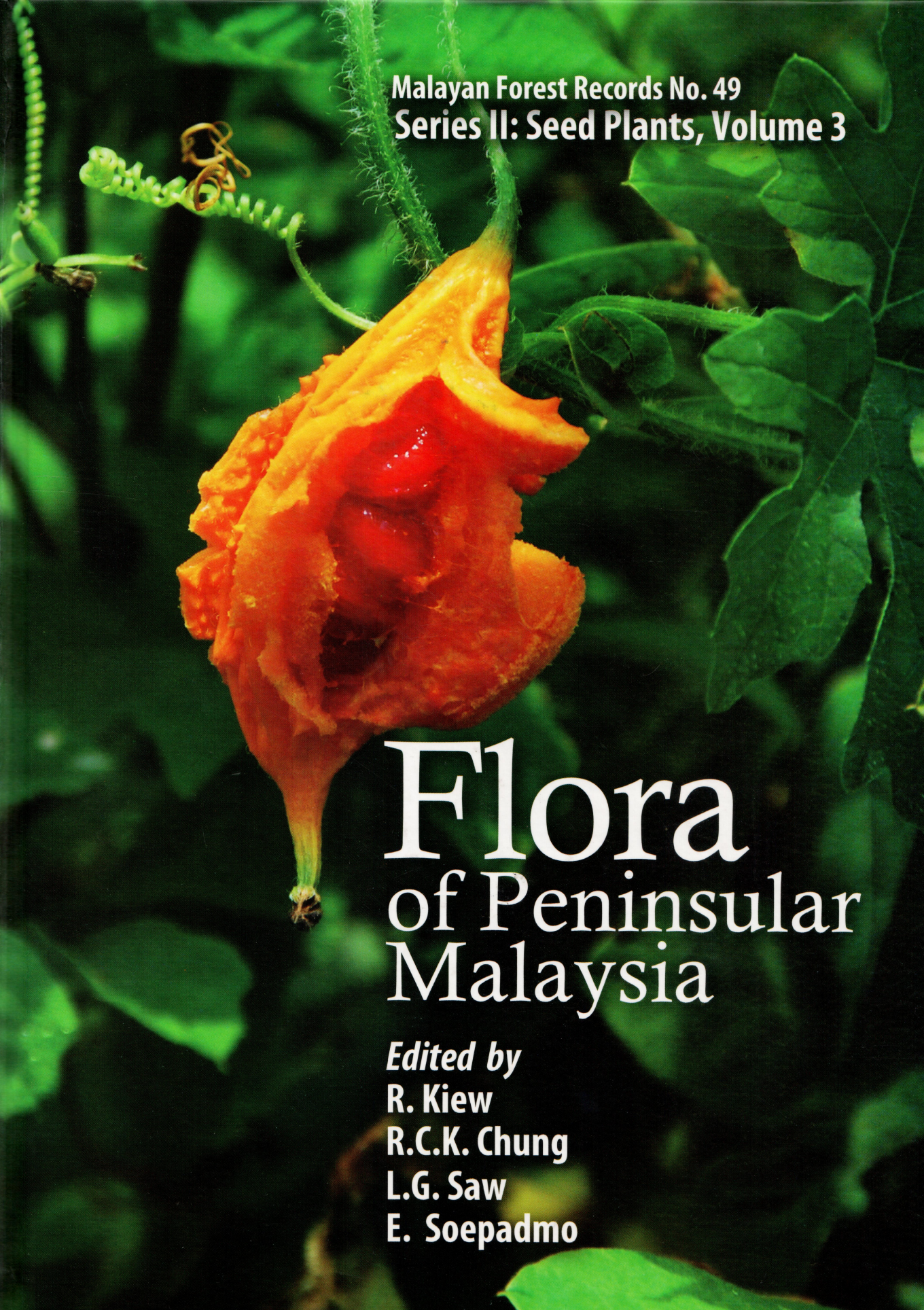

Malayan Forest Records No. 49
Series II: Seed Plants, Volume 3

# Flora of Peninsular Malaysia

*Edited by*
R. Kiew
R.C.K. Chung
L.G. Saw
E. Soepadmo

# FLORA
# OF
# PENINSULAR MALAYSIA

## Series II: Seed Plants

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**MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION**
**GOVERNMENT OF MALAYSIA**

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# CONTENTS

# OLACACEAE

**S.N. Phoon**[1]

Forest Research Institute Malaysia,
Kepong, Malaysia

Juss. *ex* R.Br. *in* Tuckey, Narr. Exped. Zaire (1818) 452; Masters, Fl. Brit. India 1 (1875) 572, *p.p.*; King, J. As. Soc. Beng. 64, 2 (1895) 94, *p.p.*; Ridley, Fl. Malay Pen. 1 (1922) 419, *p.p.*; Hutchinson, Fam. Flow. Pl. 1, 2nd ed., (1959) 329; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 63; Sleumer, Blumea 26 (1980) 145, Fl. Malesiana 1, 10 (1984) 1; Whitmore, Tr. Fl. Malaya 2 (1973) 299; Keng, Order Fam. Malay. Seed Pl., 3rd ed. (1983) 217; Corner, Wayside Tr. Malaya, 3rd ed. (1988) 600; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 271; Heywood *in* Heywood *et al.*, Flow. Pl. Fam. World (2007) 233.

Trees, shrubs, rarely climbers; some hemiparasitic (*Olax*, *Ximenia*); occasionally with tendrils (*Erythropalum*) or thorns (*Olax*, *Ximenia*). *Without* stipules. **Leaves** *spirally arranged or alternate*, *rarely distichous*, *simple*, petiolate, entire, glabrous, occasionally with finely tuberculate surfaces, penniveined, occasionally 3–5-pliveined. **Inflorescences** axillary, cymes, racemes or branched spikes, often in fascicles, rarely flowers solitary. **Flowers** bisexual, rarely unisexual (monoecious or androdioecious), homostylous, rarely heterostylous, usually *actinomorphic*, 3–7-merous; calyx small, *usually cupular*, *3–7-dentate or -lobed*, usually connate at base; petals 3–6, free or connate at base, valvate, caducous; nectary cup-like or annular (elsewhere of free glands, or rarely accrescent and eventually covering the fruit); stamens 4–15, epipetalous or occasionally episepalous, with or without a connective, anthers basifixed or dorsifixed, locules 2(–1), splitting longitudinally, staminodes rarely present; ovary *usually superior*, occasionally half inferior (elsewhere rarely inferior), *either 1-locular with 2–3*(*–7*) *ovules pendent from the apex of a central free placenta*, *or partially 3–5*(*–7*)*-locular at base*, *each locule with a single ovule hanging from the inner angle*; *style when present conical, columnar or filiform*, stigma minute, *shortly 3–5-lobed*, ovule anatropous, usually 2 or 1 integuments, or without an integument (parasitic species). **Fruit** *a drupe*; exocarp thin and fleshy; endocarp crustaceous to woody; calyx *persistent*, *occasionally expanding and accrescent with fruit and becoming fleshy* (*Erythropalum*, *Olax* and *Strombosia*) *or expanding and recurved then forming a 'skirt'* (*Harmandia*). **Seed** *1*, testa thin, endosperm *copious*, starchy and/or oily, embryo minute.

**Distribution.** Pantropical, 28 genera with about 176 species widely distributed in Africa, Asia and America. In Peninsular Malaysia represented by 8 genera and 11 species.

**Ecology.** Mostly tropical, a few subtropical, in lowland rain forest, deciduous forest or savanna. Some tropical species are root hemiparasites. In Peninsular Malaysia, Teo (Gard. Bull. Sing. 49 (1997) 7) recorded the dome-shaped haustoria of *Olax* and *Ximenia* invading both non-specific hosts and their own species (autoparasitism). For species that live in a dry sandy coastal environment, it suggests a beneficial adaptation.

[1] Present address: Australian Tropical Herbarium, James Cook University Cairns Campus, PO Box 6811, Cairns 4870, QLD, Australia.

**Taxonomy.** Using a molecular phylogenetic approach, Malécot & Nickren (Syst. Bot. 33, 1 (2008) 97) divided the family into seven clades. However, the relationship among the seven clades is not well resolved. In addition, *Harmandia* was not included in this study. These morphological and molecular phylogenetic analyses indicate that Olacaceae is paraphyletic. Mabberley (Pl. Book, 3rd ed. (2008) 318) placed *Erythropalum*, *Scorodocarpus*, *Strombosia* and some other non-Peninsular Malaysian genera into the family Erythropalaceae; and maintained *Anacolosa*, *Harmandia*, *Ochanostachys*, *Olax* and *Ximenia* in Olacaceae *s.s.* Division of Olacaceae *s.l.* at the family level seems premature as acknowledged too by Malécot & Nickren (2008). Therefore, in this account Olacaceae is treated in the wider sense as has been followed by Heywood (2008).

**Note.** Whitmore (1973), Sleumer (1984) and Lesmy (1995) describe the leaf surfaces of a few species as 'shagreened' or 'parchment-like' to indicate a finely tuberculate leaf surface.

## Key to genera

1. Slender climbing shrubs or lianas with tendrils. Leaves 3–5-pliveined. Inflorescences repeatedly dichotomous. Fruiting calyx splitting and curled backwards when mature. ..... ..... **2. Erythropalum**
   Trees, shrubs or climbers without tendrils. Leaves penniveined. Inflorescences never repeatedly dichotomous. Fruiting calyx not splitting when mature. ..... 2

2. Twigs usually thorny with axillary spines. ..... **8. Ximenia**
   Twigs not thorny, if thorny spines not axillary. ..... 3

3. Fruiting calyx enlarging and accrescent with fruit. ..... 4
   Fruiting calyx not enlarging. ..... 6

4. Flowers unisexual. Fruiting calyx with apex recurved to form an orbicular and spreading skirt. ..... **3. Harmandia**
   Flowers bisexual. Fruiting calyx enlarging and becoming cup-shaped or adnate to the fruit. ..... 5

5. Petals 3, entirely or distal half splitting and appearing to be 6 (rarely 5), puberulous outside, glabrous inside. Stamens 8, with 3 fertile stamens and 5 staminodes. ... **5. Olax**
   Petals (4–)5, not splitting, glabrous outside, hairy inside. Stamens 5, without staminodes. ..... **7. Strombosia**

6. Petals (5–)6(–7). Stamens up to 7. Nectary disc persistent, enlarging and surrounding the drupe. Ovary half inferior, base immersed into nectary disc. ..... **1. Anacolosa**
   Petals up to 5. Stamens at least 8. Nectary disc absent or when present inconspicuous in fruiting stage. Ovary superior. ..... 7

7. Plant without a strong garlic smell. Petals glabrous inside and out; filaments flat. Pericarp often tuberculate when mature. ..... **4. Ochanostachys**

All plant parts with a strong garlic smell. Petals glabrous outside, woolly inside; filaments filiform. Pericarp coarsely fibrous when mature. ..... **6. Scorodocarpus**

# 1. **ANACOLOSA** Blume

(Greek, *anakolos* = knotted; referring to the calyx-cup rim)

Mus. Bot. Lugd. Bat. 1 (1850) 250; Masters, Fl. Brit. India 1 (1875) 580; King, J. As. Soc. Beng. 64, 2 (1895) 108; Ridley, Fl. Malay Pen. 1 (1922) 424; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 65; Whitmore, Tr. Fl. Malaya 2 (1973) 300; Sleumer, Blumea 26 (1980) 146, Fl. Malesiana 1, 10 (1984) 23; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 274.

*Trees*, *treelets or shrubs*, without a strong garlic smell, *without tendrils or thorns*. **Leaves** spirally arranged; laminas *penniveined.* **Inflorescences** sessile cymes or fascicles, *never repeatedly dichotomous*. **Flowers** bisexual, homostylous; calyx cupular, shortly 3–6(–7)-dentate; petals (*5*–)*6*(–*7*), not splitting, connate at base, glabrous or rarely puberulous outside, hairy inside; stamens (*5*–)*6*(–*7*), epipetalous, filaments flat, glabrous at base, hairy at apex, connective thick, anthers minute, staminodes none; nectary disc concave below, with a keel above, 6-dentate, fleshy; ovary *half inferior*, *base immersed into nectary disc*, partially 2(–3)-locular at base, style short conical, stigma shortly 2(–3)-lobed, placentation free-central. **Fruit:** calyx *not enlarging nor splitting in the fruit*; nectary disc *persistent*, *enlarging and surrounding the drupe*; style persistent; pericarp thin and fleshy, smooth or tuberculate when mature; endocarp thin, crustaceous. **Seed:** endosperm copious, starchy and oily.

**Distribution.** About 17 species distributed in the Old World tropics — 14 in Asia, 2 in Madagascar and 1 in Africa (Mabberley, Pl. Book, 3rd ed. (2008) 41). Only *Anacolosa frutescens* is recorded in Peninsular Malaysia.

## **Anacolosa frutescens** (Blume) Blume — Fig. 1, Map 1

(Latin, *frutex* = a shrub; referring to the habit)

Mus. Bot. Lugd. Bat. 1 (1850) 251, *t.* 46; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 65; Sleumer, Blumea 26 (1980) 150, Fl. Malesiana 1, 10 (1984) 25, fig. 12–14. **Basionym:** *Stemonurus fructescens* Blume, Bijdr. Fl. Ned. Ind. (1826) 649. **Type:** *Blume 2168*, Java, Mt Salak (holotype L, barcode L0038937; isotypes L, barcodes L0038938–L0038940, P *n.v.*, U *n.v.*). **Synonym:** *Anacolosa heptandra* Maingay *ex* Mast., Fl. Brit. India 1 (1875) 581, King, J. As. Soc. Beng. 64, 2 (1895) 110, Ridley, Fl. Malay Pen. 1 (1922) 425, Whitmore, Tr. Fl. Malaya 2 (1973) 301, Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 274, fig. 1, Kochummen, Tr. Fl. Pasoh For. (1997) 368. **Type:** *Maingay 386*, Peninsular Malaysia, Melaka (holotype L, barcode L0038934; isotypes L, barcodes L0038935–L0038936, P).

Small tree to 15 m tall (in Borneo to 30 m). **Bole** straight or crooked, to 20 cm diameter; buttresses none. **Bark** grey to brown, smooth or with horizontal rings or lenticellate; inner bark brown to deep red, soft, fibrous; cambium pink; sap none; sapwood pale brown, yellowish brown or white, hard. **Crown** monopodial, deep and broadly pyramidal, bushy. **Twigs** whitish brown, 2–6 mm diameter, lenticellate; young twigs straight, smooth. **Leaves:** petioles slender, becoming stout with age, 3–15 mm long, 1–3 mm diameter, not thickened;

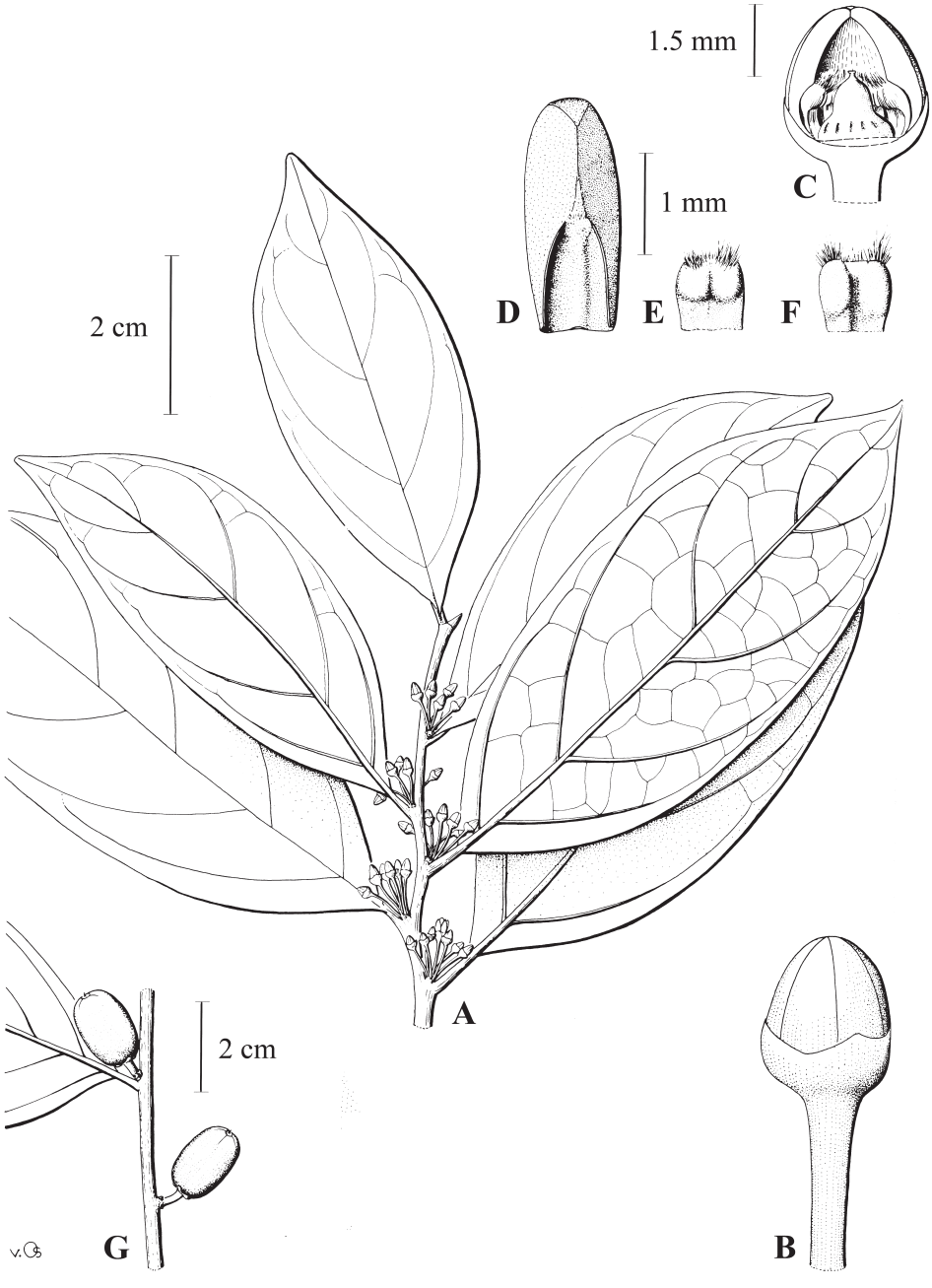
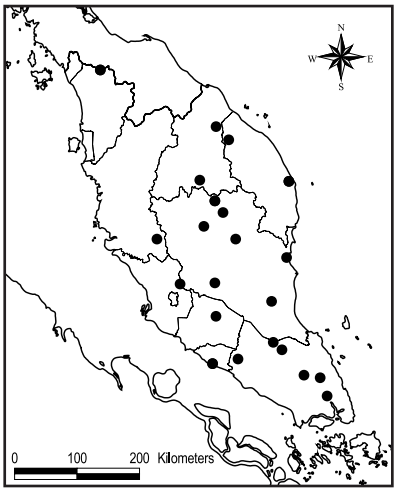



**Figure 1.** *Anacolosa frutescens.* A, habit; B, flower bud; C, flower, front part of calyx and some petals removed; D, petal, inside; E, anther, front view; F, anther, back view; G, part of fruiting twig. (Reproduced with permission from Fl. Malesiana 1, 10 (1984) 24.)

laminas elliptic to ovate, occasionally obovate, (1.5–)6–17.5(–22) × (0.6–)2.5–7(–10) cm, coriaceous and glossy when fresh, chartaceous or occasionally coriaceous when dried, *finely tuberculate above* (*more so beneath*), base narrowed, rarely rounded, margin entire, apex acuminate or acute, acumen 3–12 mm long; midrib flat or slightly sunken above, prominent beneath; lateral veins 4–7 pairs, occasionally drying crinkly, flat above, prominent beneath, looping near margin; tertiary veins reticulate, conspicuous on both surfaces. **Inflorescences** sessile cymes, *on small woody bracteolate axes*; bracts and bracteoles caducous. **Flowers** in clusters of (2–)5–15 per fascicle, white, green or greenish white; pedicels filiform, *2–5 mm long*, sparsely puberulous; buds whitish green; calyx cupular, shortly 6-dentate, 1–1.5 mm long, 1.5–2 mm diameter, sparsely puberulous; petals 6, lanceolate to ovate, inside lower part concave, upper part recurved, *c.* 3 × 2 mm, thick and fleshy, glabrous outside, hairy inside at the base of recurving part; stamens 6–7, filaments to 1 mm long, anthers ovoid, *c.* 0.5 mm long, hairy on top; nectary disc 12-grooved, 1–2 mm high, 2–3 mm diameter; ovary base immersed into nectary disc, the exposed portion *c*. 2 mm tall, *c*. 1 mm diameter, style short conical, *c.* 2 mm long, stigma shortly 2(–3)-lobed. **Fruit:** stalk slender, 1–7(–10) mm long, 1–2 mm diameter; drupes green ripening yellow, to orange, purple and finally red, obovoid, 7–23 mm long, 5–15 mm diameter, *smooth when mature*, apex truncate or minutely emarginated; style base persistent. **Seed** ovoid or globose, 4–19 mm long, 3–12 mm diameter.

**English name.** Galo nut.

**Distribution.** Recorded from India (Andaman and Nicobar Is.), Myanmar, Thailand, Sumatra, Peninsular Malaysia, W & C Java, Borneo, NE Sulawesi, Maluku and the Philippines. In Peninsular Malaysia, throughout except for Perlis and Penang.




**Map 1.** Distribution of *Anacolosa frutescens.*

**Conservation status.** Least Concern.

**Ecology.** Often on hillsides and ridges in lowland dipterocarp to hill dipterocarp forest to 650 m altitude, sometimes near streams or in swampy forest.

**Uses.** Wood is hard and heavy and can be used for house posts. The fruit pericarp (pulp) and kernel can be eaten raw, but the fruits are tastier after boiling and the kernels after roasting (Coronel, PROSEA 2 (1992) 64). Mabberley (2008) noted the galo nut is "a promising nut".

**Notes.** *Mohd Shah MS 4037*, which was collected from a wasteland near the beach in Terengganu, had unusually small leaves (1.5–3.5 × 0.6–1 cm). The exposed conditions may account for this.

# 2. **ERYTHROPALUM** Blume

(Greek, *erythro-* = red, *opalus* = opal; referring to the blue fruit that is revealed when the red sepals split open)

Bijdr. Fl. Ned. Ind. (1826) 921; Masters, Fl. Brit. India 1 (1875) 578; King, J. As. Soc. Beng. 64, 2 (1895) 129; Ridley, Fl. Malay Pen. 1 (1922) 436; Backer & Bakhuizen *f*., Fl. Java 2 (1965) 65; Sleumer, Blumea 26 (1980) 151, Fl. Malesiana 1, 10 (1984) 17.

Monotypic genus.

## **Erythropalum scandens** Blume — Fig. 2, Plate 34A, Map 2

(Latin, *scandere* = climbing; referring to the habit)

Bijdr. Fl. Ned. Ind. (1826) 922; Masters, Fl. Brit. India 1 (1875) 578; King, J. As. Soc. Beng. 64, 2 (1895) 130; Backer & Bakhuizen *f*., Fl. Java 2 (1965) 65; Ridley, Fl. Malay Pen. 1 (1922) 436; Whitmore, Tr. Fl. Malaya 2 (1973) 299; Sleumer, Blumea 26 (1980) 151, Fl. Malesiana 1, 10 (1984) 17, fig. 8. **Type:** *Blume s.n*., W Java, G. Salak (holotype L, barcode L0039042; isotypes L, barcodes L0039043–L0039045, P *n.v*.). **Synonyms:** *Erythropalum vagum* (Griff.) Mast., Fl. Brit. India 1 (1875) 578, *Modeccopsis vaga* Griff., Not. Pl. Asiat. 4 (1854) 633. **Type:** *Griffith s.n*., 17 February 1836, Myanmar, Tanintharyi [Tenasserim] (syntype P *n.v.*).

*Slender climbing shrubs or lianas*, to 10 m tall, without a strong garlic smell; thorns none. **Stems** whitish brown or green to brownish green, 2–10 mm diameter, slender, occasionally branched, lenticellate; young twigs straight. **Tendrils** *axillary*, *simple*, 1–3 mm diameter, becoming woody, thickened distally, narrowed again at tip, glabrous, smooth or lenticellate. **Leaves** spirally arranged or sub-distichous, *3*(*–5*)*-pliveined*; petioles long, slender, 8–40(–48) mm long, 1–2 mm diameter, slightly thickened and turning blackish brown at both ends; laminas ovate to broadly ovate, occasionally oblong, 6.5–18.8 × 2.5–9(–12.7) cm, chartaceous, smooth on both surfaces, base shortly cordate or truncate, margin entire, apex acuminate, acumen 2–21 mm long; midrib flat above, prominent beneath; basal veins 1 or 2 pairs, long and upwardly extending to about one-third of lamina length, rarely up to halfway; lateral veins 3–6 pairs, occasionally drying crinkly, flat above, slightly prominent beneath, obscure near margin; tertiary veins reticulate, conspicuous or slightly inconspicuous on both surfaces. **Inflorescences** cymose, *repeatedly dichotomous*, slender, 3.6–13(–19) cm long; peduncles 2.7–7.6 cm long; rachis 0.9–13.8 cm long; bracts caducous; bracteoles triangular, minute, to 1 × 1 mm, usually caducous; bracteoles lanceolate, to 1 × 1 mm, usually caducous. **Flowers** bisexual or androdioecious, homostylous; yellow to yellowish white, rarely red; pedicels filiform, 2–7(–10) mm long, glabrous; calyx cupular, shortly 4- or 5-lobed, 1–2 mm long, *c*. 1 mm diameter, glabrous; petals 5, ovate, *c*. 2 × 2 mm, thin, not splitting, connate at

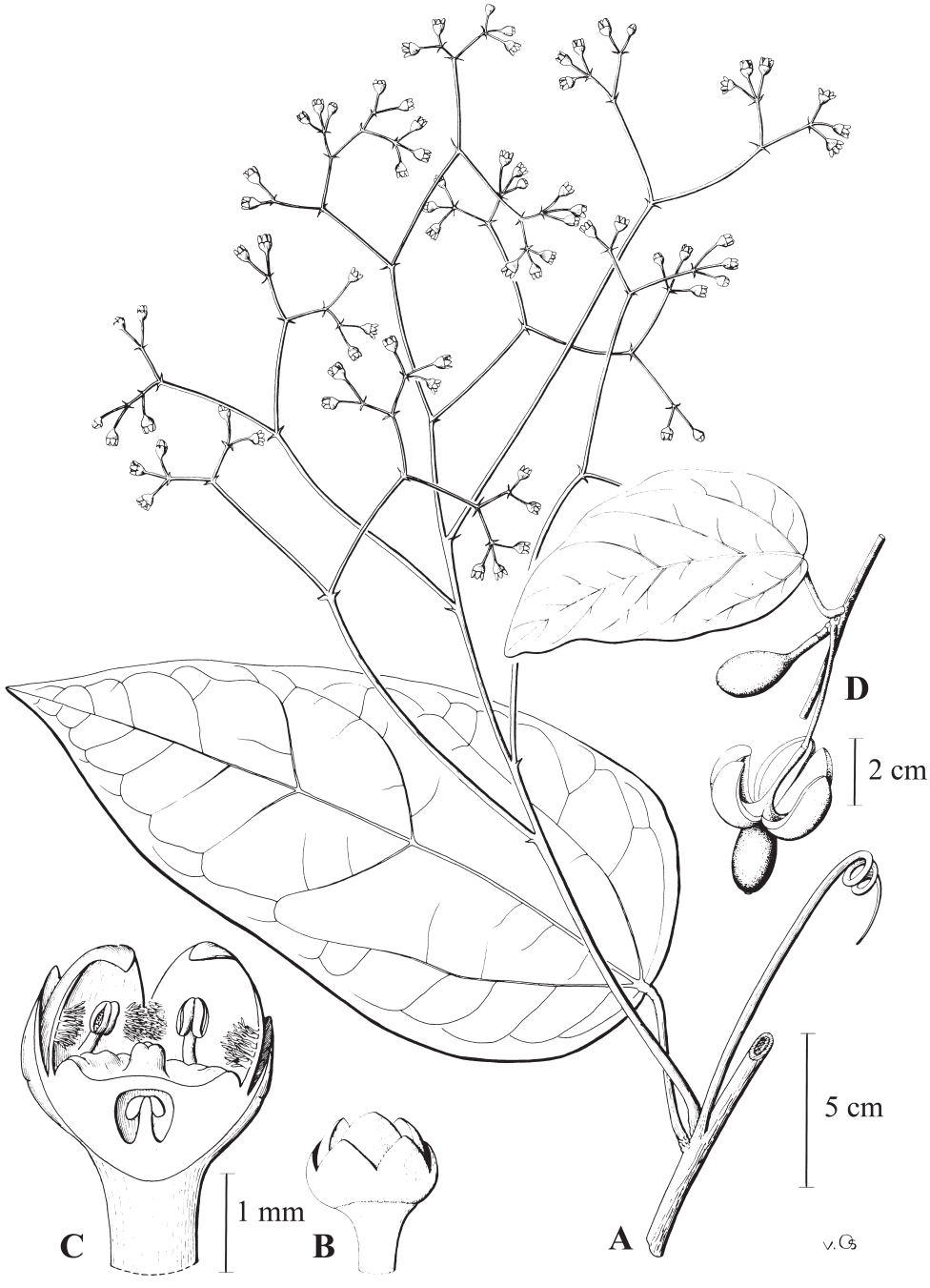
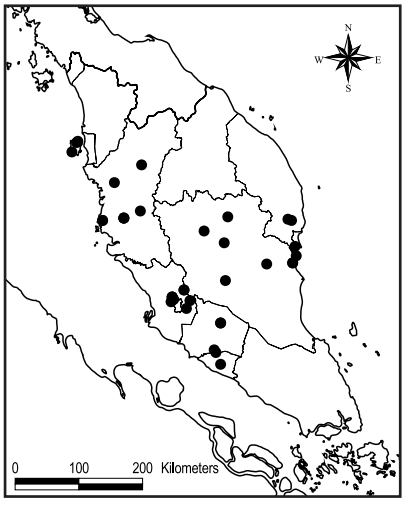



**Figure 2.** *Erythropalum scandens.* A, habit; B, flower bud; C, flower in longitudinal section; D, part of fruiting twig, one fruit dehisced. (Reproduced with permission from Fl. Malesiana 1, 10 (1984) 18.)

base, apex incurved, glabrous outside, margin of basal half with a hairy tuft inside; stamens 5, epipetalous, filaments terete, to 1 mm long, glabrous, connective thick, anthers cordate, *c.* 0.5 mm long, glabrous; staminodes none; nectary disc cupular, fleshy, yellow, 5-crenate, *c.* 1 mm high, *c*. 2 mm diameter; ovary inferior, partially 2(–3)-locular at base, conical, to 2 × 1 mm, surrounded by the fleshy flat nectary disc, style short, conical, less than 0.5 mm long, stigma minutely 3-lobed, ovules 2 or 3 per locule, placentation free-central. **Fruit:** stalk slender, thickened distally, 13–25 mm long, 1.5–2 mm diameter; calyx yellow turning orange red to deep red, enlarging and covering the drupe almost entirely, *splitting into 3–6 segments and recurved in the mature fruit*; nectary persistent but not enlarging; drupe ellipsoid or ovoid, narrowed towards base, 15–25 mm long, 7–12 mm diameter, apex rounded, style caducous, pericarp thin and fleshy, smooth when mature, green ripening purple, deep blue, purplish black or bluish black, endocarp crustaceous to woody. **Seeds** ellipsoid or ovoid, 10–21 mm long, 5–10 mm diameter, cut seed with an unpleasant smell; endosperm copious, oily.

**Vernacular names.** *Akar kulim* (preferred name), *akar tapah*, *akar senipis* (Malay); *seluang mudik*, *akar baung* (Temuan).

**Distribution.** Widespread in India (Himalayas to Assam and the Andaman Is.), Bangladesh, Myanmar, Indo-China, SW China (including Hainan), Thailand, Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Lesser Sunda Is. (Flores), N Sulawesi (Minahasa and Talaud Is.) and the Philippines. In Peninsular Malaysia, throughout except Perlis, Kedah, Kelantan and Johor.




**Map 2.** Distribution of *Erythropalum scandens.*

**Conservation status.** Least Concern.

**Ecology.** Burkill (Econ. Prod. Malay Pen. (1966) 965) noted that the species is common in lowland dipterocarp and hill dipterocarp forest to 650 m altitude, sometimes on hillsides, near streams or in secondary forest.

**Uses.** Leaves can be eaten when cooked (*Yeob 872*, Kuantan; *Gadoh KL 2136*, Kuala Pansom).

**Note.** Burkill (Econ. Prod. Malay Pen (1966) 965) also commented that the fruit is "evil-smelling".

# 3. **HARMANDIA** Pierre *ex* Baill.

(Jules Harman, 1845–1921, French colonial official)

Bull. Soc. Linn. de Paris (1889) 770; King, J. As. Soc. Beng. 64, 2 (1895) 99; Ridley, Fl. Malay Pen. 1 (1922) 421; Sleumer, Blumea 26 (1980) 153, Fl. Malesiana 1, 10 (1984) 9; Whitmore, Tr. Fl. Malaya 2 (1973) 301; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 275.

Monotypic genus.

## **Harmandia mekongensis** Pierre *ex* Baill. Fig. 3, Map 3

(Of Mekong River)

Bull. Linn. Soc. Paris 1 (1889) 770; Sleumer, Blumea 26 (1980) 153, Fl. Malesiana 1, 10 (1984) 9, fig. 2–3; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 277, fig. 2. **Type:** *Harmand 1322*, Laos, Attopeu (holotype P *n.v.*; isotypes BM *n.v.*, L, P *n.v.*). **Synonym:** *Harmandia kunstleri* King, J. As. Soc. Beng. 64, 2 (1895) 100, Ridley, Fl. Malay Pen 1 (1922) 421, Whitmore, Tr. Fl. Malaya 2 (1973) 301, fig. 1, Kochummen, Tr. Fl. Pasoh For. (1997) 368. **Type:** *King's Coll. 7896*, Peninsular Malaysia, Perak, Gopeng (lectotype CAL *n.v.*; isolectotype BM *n.v.*).

Small to medium monoecious trees to 23 m tall (in Borneo to 30 m), flowering at 6 m tall, *without a strong garlic smell*, *without tendrils or thorns*. **Bole** straight or slightly forking, to 36 cm diameter, base fluted; buttresses none. **Bark** grey-brown, scaly; inner bark white or pale yellow, granular; sap none; sapwood pale yellow to white. **Twigs** drying black, slender, 1–4(–6) mm diameter, shallowly fissured, lenticellate; young twigs slender, distinctly zig-zag. **Leaves** alternate; petioles slender, 3–7(–9) mm long, 1–1.5 mm diameter, not thickened; laminas dark green above, pale green beneath, ovate, rarely elliptic, occasionally lanceolate when young, 4–12.3 × 1.5–5 cm, coriaceous, finely tuberculate on both surfaces, base narrowed, margin recurved and wavy, apex acuminate, acumen 2–11 mm long; venation *pinnate*; midrib flat above, prominent beneath; lateral veins 5–8 pairs, often obscure on both surfaces; tertiary veins reticulate, often obscure on both surfaces. **Inflorescences** in short racemes, *never repeatedly dichotomous*, 1–1.5 cm long, *c*. 5-flowered; bracts caducous; bracteoles triangular, minute, to 0.5 × 0.5 mm, caducous. **Flowers** *unisexual*, homostylous; pedicels filiform, 0.5–1 mm long, glabrous; calyx green, cupular, *c.* 0.5 mm long, *c*. 2 mm diameter, very shortly 4-dentate, glabrous; petals green, not splitting, connate at base and forming a fleshy, glabrous urceolate tube, *c*. 1.5 mm long, *c*. 2 mm diameter; nectary disc rounded, crenulate, thin, *c*. 1 mm diameter, inconspicuous in fruit (Laos, *Harmand 1322*). **Male flowers:** petals 4; stamens 4, epipetalous, filaments glabrous, 1–1.5 mm long, connate into a tube with free anthers on top, connective thick, anthers cordate, *c*. 0.5 mm long (Laos, *Harmand 1322*); ovary rudimentary. **Female flowers:** petals 6–8; staminodial tube without anthers; ovary superior, conical, *c*. 1 mm long, completely 1-locular, style shortly conical, *c*. 0.5 mm long, stigma shortly 3-lobed (Laos, *Harmand 1322*), *c*. 0.5 mm long, ovules 2. **Fruit:** stalk slender, becoming stout with age, (14–)20–30 mm long, 2–4 mm diameter; calyx pink, *fleshy and much enlarged*, *not splitting when mature*, *apex recurved to form an orbicular and*

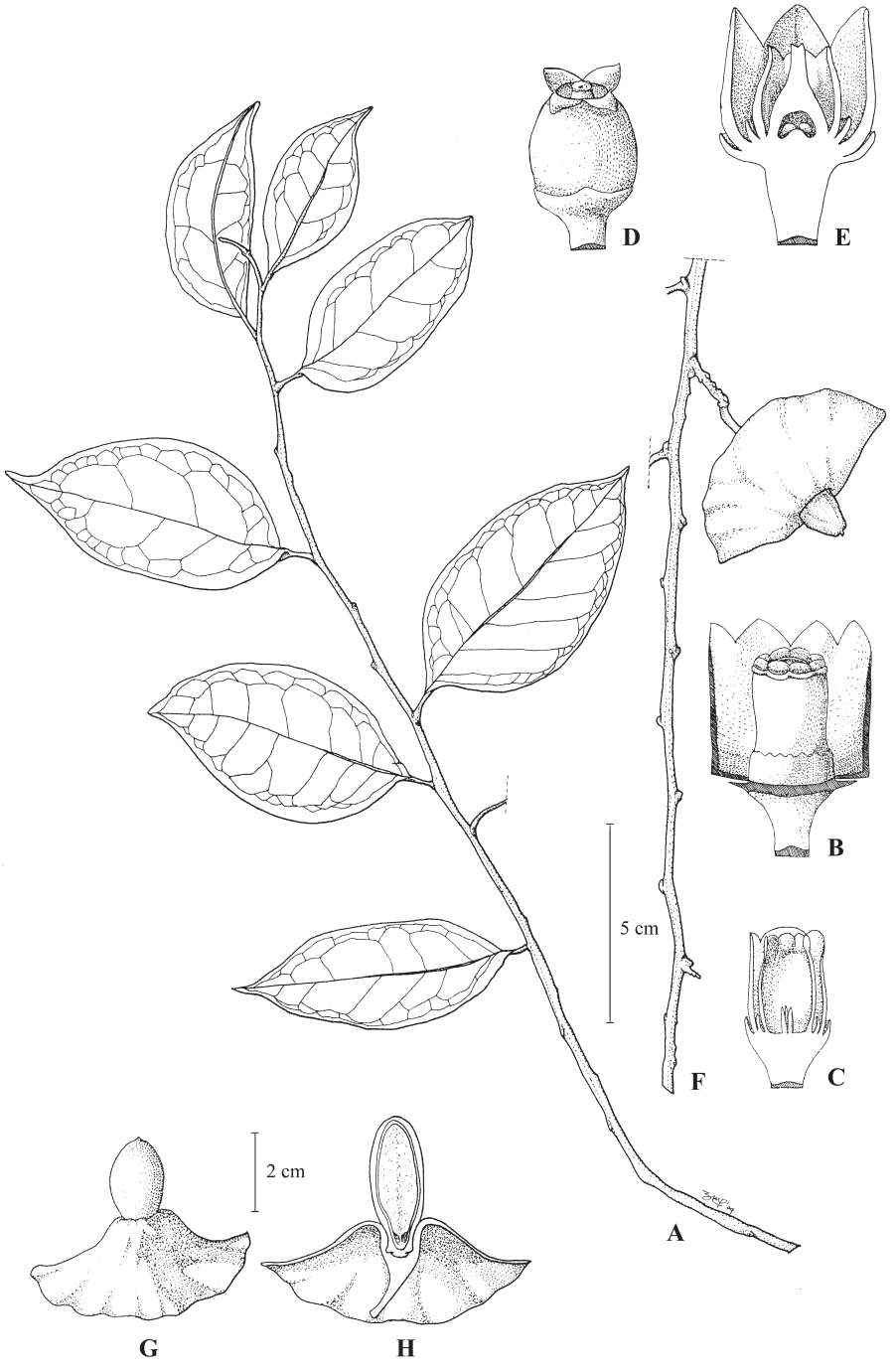
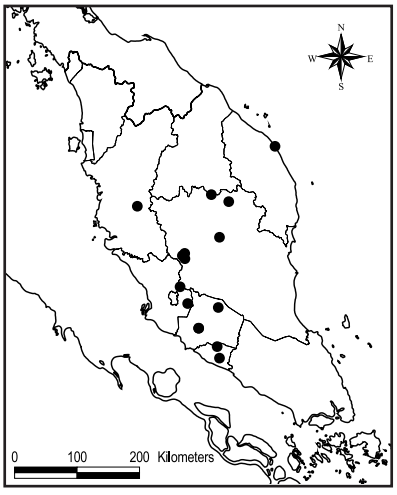



**Figure 3.** *Harmandia mekongensis*. A, leafy twig; B, male flower, with sepals and petals dissected; C, male flower in longitudinal section; D, female flower; E, female flower in longitudinal section; F, fruiting twig; G, fruit; H, fruit in longitudinal section. (A, B, F & G from *FRI 23829*, C–E from *Harmand 1322*, H from *Strugnell 16498*.)

*spreading skirt*, (3.4–)4.4–11.5 cm diameter, adnate to fruit at the base for c. 1 cm long; drupe obovoid to ellipsoid, narrowed towards base, 10–43 mm long, 10–25 mm diameter, apex rounded, style caducous, pericarp fleshy, smooth when mature, glaucous green turning to purple-black with a waxy bloom when dry, endocarp thin, woody. **Seed** oblong to ellipsoid, 7–35 mm long, 7–18 mm diameter; endosperm oily.

**Distribution.** Indo-China, Sumatra, Peninsular Malaysia and Borneo. In Peninsular Malaysia, distributed in Perak, Selangor, Negeri Sembilan, Melaka, Terengganu and Pahang.




**Map 3.** Distribution of *Harmandia mekongensis.*

**Conservation status.** Least Concern.

**Ecology.** Lowland to ridges in lowland dipterocarp forest to hill dipterocarp forest at 650 m altitude. Also found in seasonal freshwater swamp (Pasoh FR, Negeri Sembilan). Flowers rarely collected (the flower description above is taken from a specimen from Laos).

# 4. **OCHANOSTACHYS** Mast.

(Greek, *okanon* = shield strap, *stachus* = spike; referring to the inflorescences)

Fl. Brit. India 1 (1875) 576; King, J. As. Soc. Beng. 64, 2 (1895) 100; Ridley, Fl. Malay Pen. 1 (1922) 422; Whitmore, Tr. Fl. Malaya 2 (1973) 302; Sleumer, Blumea 26 (1980) 153, Fl. Malesiana 1, 10 (1984) 12; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 277.

Monotypic genus.

## **Ochanostachys amentacea** Mast. Fig. 4, Plate 35D, Map 4

(Latin, *amentum* = a catkin; referring to the inflorescence)

Fl. Brit. India 1 (1875) 577; King, J. As. Soc. Beng. 64, 2 (1895) 100; Ridley, Fl. Malay Pen. 1 (1922) 422, fig. 42, Bull. Misc. Inform. Kew (1931) 35; Whitmore, Tr. Fl. Malaya 2 (1973) 302; Sleumer, Blumea

26 (1980) 153, Fl. Malesiana 1, 10 (1984) 12, fig. 5–6; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 278, fig. 3; Kochummen, Tr. Fl. Pasoh For. (1997) 369. **Type:** *Maingay 384*, Peninsular Malaysia, Melaka (holotype K, barcode K000501138; isolectotypes K, barcodes K000501139–K000501140), P *n.v.*).

Small to very big tree to 50 m tall, flowering at 5 m tall, *without a strong garlic smell*, *without tendrils or thorns*. **Bole** straight or fluted, to 80 cm diameter; usually with short buttresses, to 46 cm tall, 10 cm thick. **Bark** shedding off into thin, irregular scales, exposing pale brown patches with a purplish tinge, giving a dippled appearance, or smooth; inner bark yellowish to orange brown, soft, firmly fibrous; latex milky white, in tiny droplets, sticky and slow appearing; sapwood brownish yellow, hard. **Crown** dense, conical, silvery with drooping leaves. **Twigs** to 10 mm diameter, flaky, rough or lenticellate; young twigs 2–6 mm diameter, straight, smooth. **Leaves** spirally arranged; petioles slender, (7–) 10–25(–35) mm long, 1–2(–3) mm diameter, thickened and darker towards apex; laminas dark green and glossy above, light green beneath, elliptic or broadly elliptic, occasionally ovate, broadly ovate or obovate, (3.5–)6–18.5(–22) × (2.2–)3.2–8.5(–10) cm, subcoriaceous or chartaceous, finely tuberculate and with blackish dots on both surfaces, base narrowed or rounded, margin entire, apex acuminate, acumen (2–)3–17(–30) mm long; venation *pinnate*; midrib sunken or flat above, prominent beneath; lateral veins (3–)4–7 pairs, flat above, prominent beneath, obscure near margin; tertiary veins scalariform, flat above, prominent beneath. **Inflorescences** racemes or spikes, simple, occasionally branched, *never repeatedly dichotomous*, (1.8–)3–12.4 cm long; bracts caducous; bracteoles small, ovate, to *c*. 1 × 1 mm. **Flowers** bisexual, homostylous, in opposite well-spaced clusters, subsessile or with filiform and puberulous pedicels to 1 mm long; calyx green, cupular, 1–1.5 mm long, *c*. 2 mm diameter, shortly 4- or 5-dentate, puberulous, margin minutely ciliate; petals white, greenish white or green, rarely yellow, (3–)4(–5), ovate or elliptic, 2–3 × 1–1.5 mm, not splitting, slightly connate at base, *glabrous outside*, scarcely hairy inside, margin minutely ciliate; stamens *12–15* with 2–3 per petal, epipetalous, filaments flat, narrowed towards tip, to 2 mm long, glabrous, connective none, anthers light brown, *c.* 0.5 mm long, staminodes none; nectary disc flat, *c.* 2 mm diameter, fleshy, *inconspicuous* (*hardly visible in the fruit*); ovary *superior*, partially (2–)3(–4)-locular at base, broadly conical, vertically striate, *c*. 2 × 2 mm, style short terete, stigma minutely 3-lobed; ovule 1 per locule, placentation basal. **Fruit** pendulous on a slender stalk; stalk (1.5–)2–3(–8) mm long, 2–3 mm diameter; drupe green ripening yellow, ellipsoid to obovoid, narrowed at base, 15–33 mm long, 13–30 mm diameter, often tuberculate, occasionally with white creamy sap, apex rounded, style caducous; pericarp thin, *often tuberculate when mature*, endocarp woody; calyx *not enlarging*, *nor splitting when mature*. **Seed** globose or subglobose, 10–27.5 mm long, 10–27 mm diameter; endosperm starchy, with few oily droplets.

**Vernacular name.** *Petaling* (Malay).

**Distribution.** Sumatra (including Bangka), Peninsular Malaysia, Singapore and Borneo. In Peninsular Malaysia, throughout except Perlis.

**Conservation status.** Least Concern.

**Ecology.** Common but scattered; usually in well-drained lowland dipterocarp forest, sometimes in hill dipterocarp forest up to 900 m altitude, in both primary and disturbed forest.

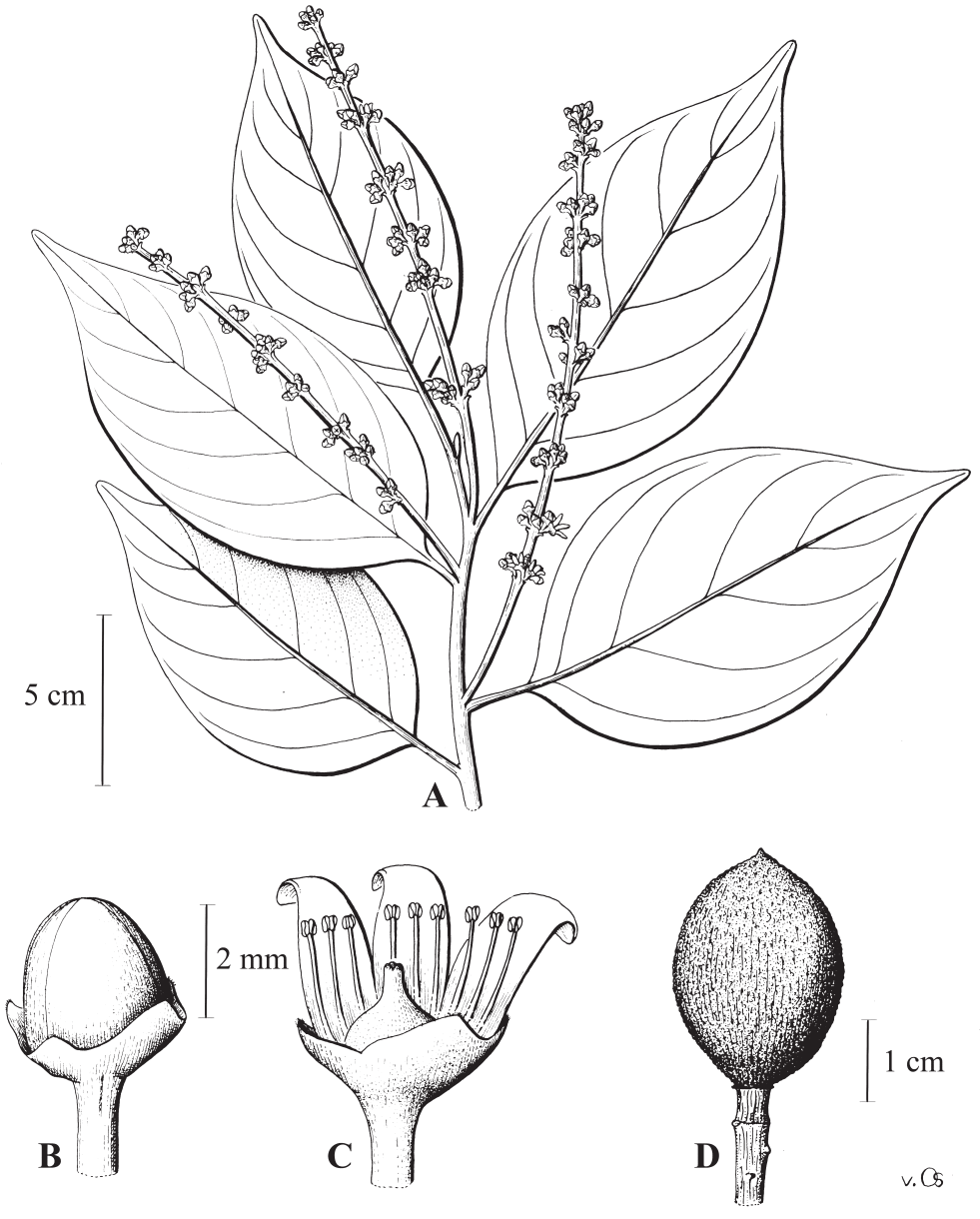
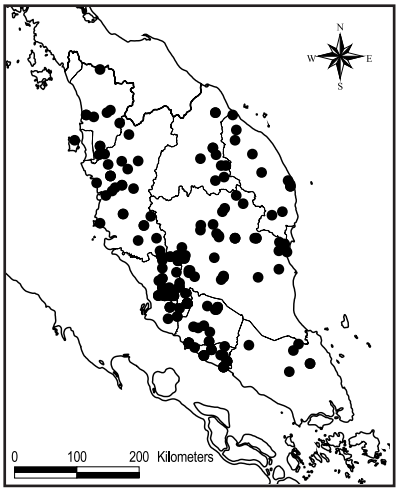



**Figure 4.** *Ochanostachys amentacea.* A, habit; B, flower bud; C, flower, with 2 petals removed; D, fruit. (Reproduced with permission from Fl. Malesiana 1, 10 (1984) 13.)




**Map 4.** Distribution of *Ochanostachys amentacea*.

**Uses.** Foxworthy (Malay. For. Rec. 3 (1927) 120) recorded the timber as hard, heavy and with fine texture that could provide durable construction usage such as house building, furniture and indoor work. However, Whitmore (1973) commented that *Ochanostachys amentacea* is little used due to its scattered occurrence. Boer *et al.* (PROSEA 5, 2 (1995) 367) reported that in its original habitat, it takes 150 years to grow to 50 cm diameter, and 200 years to reach 60 cm diameter; while in a plantation trial, trees grew to 21 m tall after 33 years.

Burkill (Econ. Prod. Malay Pen. (1966) 1595) recorded that a decoction of bark is used medicinally against fever and after childbirth. Rheumatic fever is treated by applying a paste of the roots with bark of *Koompassia* Maingay (Leguminosae) or by a bath prepared by using *Ochanostachys amentacea* leaves together with *Koompassia* bark and coriander (*Coriandrum sativum* L.) seed.

The Temuan people eat the fruits (*Gadoh KL 916*) while the Batek eat both the fruits and seeds after cooking or roasted (*Stone & Mahmud Sidek 12465*).

**Note.** It flowers and fruits throughout the year, rarely with both flowers and fruits on the same tree, but mast fruiting years have been observed. The seeds are most probably dispersed by monkeys or birds (Boer *et al*., PROSEA 5, 2 (1995) 367).

## 5. **OLAX** L.

(Latin, *olacis* = smelling; referring to the bad smell of some species in the family)

Sp. Pl. (1753) 34; Masters, Fl. Brit. India 1 (1875) 574; King, J. As. Soc. Beng. 64, 2 (1895) 98; Ridley, Fl. Malay Pen. 1 (1922) 420; Backer & Bakhuizen *f*., Fl. Java 2 (1965) 64; Sleumer, Blumea 26 (1980) 154, Fl. Malesiana 1, 10 (1984) 6.

*Trees or climbing shrubs*, without a strong garlic smell; thorns *occasionally present*, *but not from the axils*; *tendrils none.* **Leaves** spirally arranged, sometimes distichous; laminas *penniveined.* **Inflorescences:** racemes, panicles or spikes, *never repeatedly dichotomous*, or flowers rarely solitary. **Flowers** *bisexual*, homo- or hetero-stylous; calyx cupular, obscurely

4–5-dentate; petals *3*, *entirely or distal half splitting and appearing to be 6* (*rarely 5*), free or connate in pairs, *puberulous outside*, *glabrous inside*; stamens *8*, epipetalous; fertile stamens *3*, filaments flat or terete, glabrous, connective none, anthers minute; staminodes *5*, filaments terete, narrowed towards tip, glabrous; nectary disc concave, 4–5-dentate, fleshy; ovary superior, completely 1-locular or partially 3-locular at base, style terete, stigma shortly 3-lobed, placentation free-central. **Fruit:** calyx *enlarging*, *becoming cup-shaped or almost entirely covering the fruit*, *not splitting when mature*; nectary disc persistent, not enlarging; style persistent; pericarp thin, spongy, smooth or tuberculate when mature; endocarp stony. **Seed:** endosperm oily.

**Distribution.** About 40 species in the Old World tropics, with only 2 species recorded in Malesia (including Peninsular Malaysia), Australia and as far as the Pacific.

**Ecology.** Usually found in dry vegetation types. Root parasitism seems common (Sleumer, 1984).

## Key to Olax species

Twigs when young sparsely red pubescent, never thorny. Flowers with flat filaments not entirely adnate to the petals. Calyx ovate or elliptic and almost entirely covering the fruit. Fruit stalks slender, *c*. 1 mm diameter. Fruits at least 18 mm long, 11 mm diameter. Seed at least 15 mm long, 13 mm diameter. ..... **1. O. imbricata**

Twigs glabrous, often thorny. Flowers with terete filaments entirely adnate to the petals. Fruit stalks stout, *c.* 2 mm diameter. Calyx cup-shaped and covering about ¾ of the fruit. Fruits to 12 mm long, 10 mm diameter. Seed to 9 mm long, 7 mm diameter. ..... **2. O. scandens**

### 1. **Olax imbricata** Roxb. Fig. 5A–F, Map 5

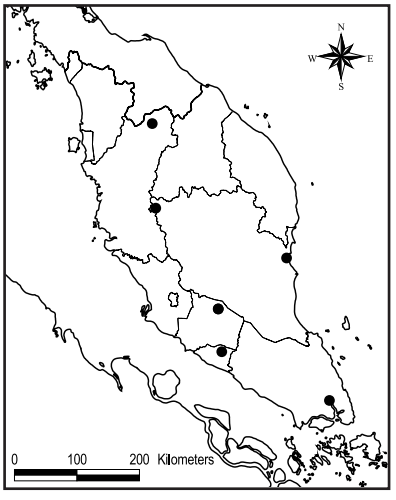
(Latin, *imbricare* = having adjacent edges overlapping; referring to the flower)

Hort. Beng. (1814) 5, *nom. nud*., Fl. Ind. 1 (1820) 169; Miquel, Fl. Ind. Bat. 1, 1 (1856) 785; Masters, Fl. Brit. India 1 (1875) 575; King, J. As. Soc. Beng. 64, 2 (1895) 98; Ridley, Fl. Malay Pen. 1 (1922) 421; Backer & Bakhuizen *f*., Fl. Java 2 (1965) 64; Sleumer, Blumea 26 (1980) 156, Fl. Malesiana 1, 10 (1984) 8. **Type:** *Roxburgh s.n.*, Bangladesh [Bengal], Chittagong (holotype CAL *n.v.*; isotype BM *n.v.*). **Synonyms:** *Olax wightiana* Wall. *ex* Wight & Arn., Prodr. 1 (1834) 89, Masters, Fl. Brit. India 1 (1875) 575. **Type:** *Wall. Cat. 6779* (= *Herb. Wight 424*), India, W Peninsula, Courtallum (holotype K; isotype P); *Olax merguensis* Planch. *ex* Mast., Fl. Brit. India 1 (1875) 576 *p.p.* **Type:** *Helfer 662* (*798*), Myanmar, Tanintharyi [Tenasserim], Mergui (K, P).

Climbing shrub *without thorns*. **Bark** finely lenticellate. **Twigs** to 8 mm diameter, shallowly fissured, lenticellate, glabrescent; young twigs straight, smooth, *sparsely red pubescent.* **Leaves:** petioles slender, 3–8 mm long, 1.5–2(–3) mm diameter, glabrous, not thickened, shallowly grooved above when old; laminas ovate or elliptic, 6.1–16 × 2.6–5.4 cm, coriaceous, glossy above, base rounded or cuneate, margin entire, apex acute or shortly acuminate, acumen 2–5(–10) mm long; midrib sunken or flat above, prominent beneath; lateral veins 6–9 pairs, flat above, prominent beneath; tertiary veins slightly inconspicuous. **Inflorescences** racemes, (5–)10–15 mm long, usually branched, many-flowered, sparsely pubescent; bracts

caducous; bracteoles ovate, concave, *c*. 1 × 1 mm, margin ciliate, apex truncate. **Flowers** homostylous; pedicels filiform, 1–2 mm long; calyx cupular, obscurely 4- or 5-dentate, *c*. 2 mm long, 1–2 mm diameter, puberulous; petals 3, splitting entirely and appearing to be 5 or 6, white, oblong, 6–12 × *c*. 2 mm, sparsely hairy inside; fertile stamens 3, filaments *flat*, *2–3 mm long*, *not entirely adnate to the petals*, anthers oblong, *c*. 2 mm long, glabrous; staminodes 5, filament terete, narrowed towards tip, *c*. 6–8 mm long, glabrous; nectary disc concave, 4- or 5-dentate, minute, inconspicuous; ovary bottle-shaped, *c.* 2 × 2 mm, style terete, *c*. 3 mm long, stigma shortly 3-lobed, ovules 3. **Fruit:** stalk *slender*, 1–2 mm long, *c*. *1 mm diameter*; calyx orange, *ovate or elliptic*, enlarging and *almost entirely covering the fruit*, apex rounded; drupe brown, ovoid or ellipsoid, *18–20 mm long*, *11–15 mm diameter*, apex rounded. **Seed** ovoid or ellipsoid, *15–24 mm long*, *13–20 mm diameter.*

**Distribution.** India (including Andaman and Nicobar Is.), Sri Lanka, Myanmar, Thailand, S China (Hainan), Taiwan (Lan Yu Is. [Botel Tobago]), Sumatra, Peninsular Malaysia, Java (including Madura), Borneo, Sulawesi (including Kabaena and Buton Is.), the Philippines (including Sulu Archipelago), Lesser Sunda Is. (Flores, Sumbawa, Alor, Timor), Maluku (Tanimbar and Kei Is.), New Guinea, Micronesia and the Solomon Is. In Peninsular Malaysia widespread, but rarely collected. It is recorded from Perak, Negeri Sembilan, Melaka, Pahang and Johor.




**Map 5.** Distribution of *Olax imbricata.*

**Conservation status.** Near Threatened.

**Ecology.** Usually found in lowland dipterocarp forest up to 200 m altitude, also in vegetation along rocky coastal areas, rarely in montane forest (Cameron Highlands, Pahang).

**Uses.** Fruit is edible (Verheij & Coronel, PROSEA 2 (1992) 349).

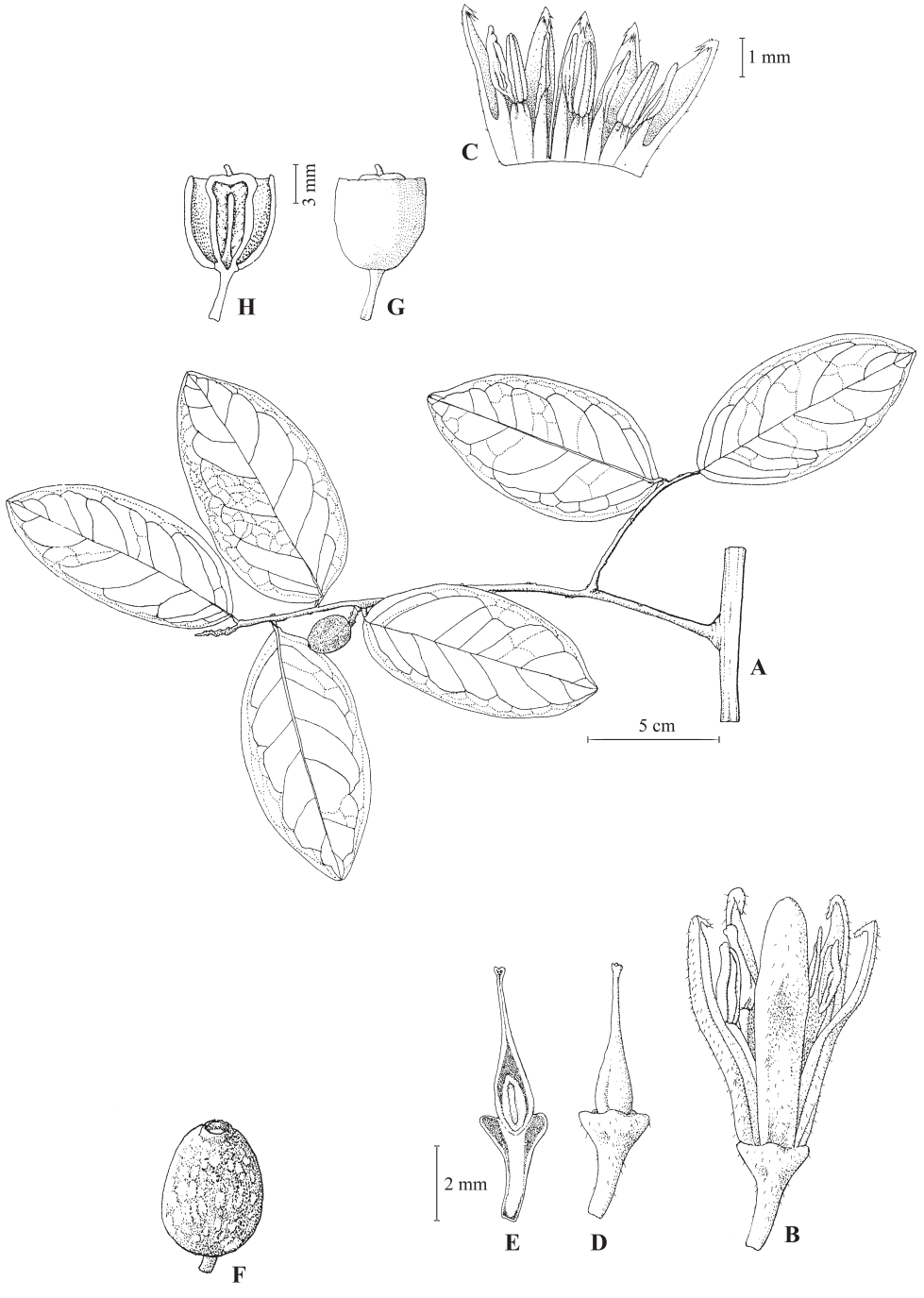



**Figure 5.** *Olax imbricata.* A, habit; B, flower; C, flower with corolla opened up; D, carpel with calyx and pedicel; E, carpel with calyx and pedicel in longitudinal section; F, fruit. *Olax scandens.* G, fruit; H, fruit in longitudinal section. (A & F from *Gardette EG 2200*, B–E from *SAN 127072*, G & H from *Gardette EG 1686*.)

## 2. **Olax scandens** Roxb. Fig. 5 G–H, Map 6

(Latin, *scandent-* = climb; referring to the climbing habit)

Pl. Corom. 2 (1798) 2, *t*. 102; Miquel, Fl. Ind. Bat. 1, 1 (1856) 785; Masters, Fl. Brit. India 1 (1875) 575; Ridley, Fl. Malay Pen. 1 (1922) 421; Backer & Bakhuizen *f*., Fl. Java 2 (1965) 64; Whitmore, Tr. Fl. Malaya 2 (1973) 300; Sleumer, Blumea 26 (1980) 157, Fl. Malesiana 1, 10 (1984) 7, fig. 1. **Type:** *Roxburgh s.n*., India (holotype BM *n.v*.).

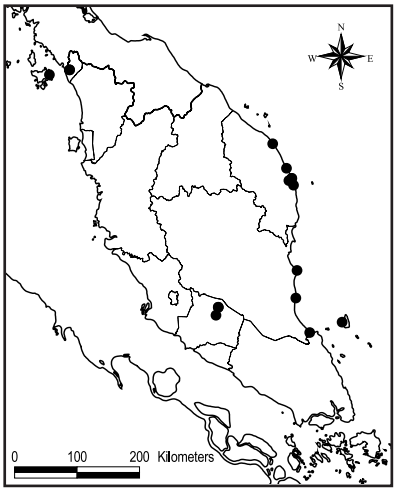
Climbing shrub, hemiparasitic, scandent branches pendulous, *often thorny*, on old wood long and curved like a rhinoceros horn. **Bark** orange, shallowly fissured or finely lenticellate. **Twigs** to 6 mm diameter, *glabrous*; young twigs straight. **Leaves** almost distichous; petioles slender, 4–12 mm long, 1–2 mm diameter, coppery puberulous, not thickened, when old not grooved above; laminas glossy green when fresh, dark to yellowish green when dry, ovate or oblong, (2.4–)3.7–18 × 1.8–7.5 cm, chartaceous to thinly coriaceous, base rounded, occasionally narrowed, margin entire, apex acute, occasionally shortly acuminate, acumen 3–15 mm long; midrib flat above, prominent beneath; lateral veins 5–8 pairs, flat above, prominent beneath; tertiary veins inconspicuous. **Inflorescences** racemes, 6–17 mm long, puberulous; bracts caducous; bracteoles ovate, concave, *c*. 1 × 1 mm, margin ciliate, apex truncate. **Flowers** heterostylous, in clusters of 2 or 3, white, occasionally cream-yellow or yellow, fragrant; pedicels filiform, 1–2 mm long, puberulous; calyx cupular, minutely 4- or 5-dentate, to 1 mm long, 2 mm diameter, puberulous, apex truncate; petals 3, splitting entirely or halfway, appearing to be 6, oblong, 3–6(–7) × 1–2 mm, puberulous outside, glabrous inside, apex incurved; stamens 8; fertile stamens 3, filaments *terete*, *c*. 2 mm long, *entirely adnate to the petals*, anthers oblong, *c*. 2 mm long, glabrous; staminodes 5, filaments terete, narrowed towards tip, *c*. 5 mm long; ovary bottle-shaped, *c.* 1 × 1 mm, long styles 5–6.5 mm long, short styles 1.5–3 mm long, stigma shortly 3-lobed, ovules 3. **Fruits:** subsessile or with *stout* stalk to 3 mm long, *2 mm diameter*; calyx membranous, *cup-shaped*, *covering about ¾ of the fruit*, 5–10 mm long, 6–11 mm diameter, apex truncate; drupes green turning orange or flesh-coloured to yellow, broadly ellipsoid or subglobose, smooth, *7–12 mm long*, *5–10 mm diameter*, apex rounded. **Seed** ellipsoid or subglobose, *4–9 mm long*, *3–7 mm diameter.*

**Distribution.** India (W Himalayas), Sri Lanka, Myanmar, Indo-China, Thailand, Peninsular Malaysia, Java (including Kangean Is. and Madura) and Lesser Sunda Is. (Bali). In Peninsular Malaysia widespread, but not common, recorded from Perlis, Kedah (Pulau Langkawi), Negeri Sembilan, Terengganu and Pahang (including Pulau Tioman).

**Conservation status.** Near Threatened.

**Ecology.** Usually found in open coastal or sandy areas and beach forest, rarely in lowland dipterocarp forest to 120 m altitude.

**Note.** Teo (Gard. Bull. Sing. 49 (1997) 7) recorded root parasitism in the Peninsular Malaysian *Olax scandens*, which is non-host specific and infects even its own roots (autoparasitism).




**Map 6.** Distribution of *Olax scandens.*

# 6. **SCORODOCARPUS** Becc.

(Greek, *skorodon* = garlic, *karpos* = fruit; referring to the strong garlic smell of the fruit)

Nuov. Giorn. Bot. Ital. 9 (1877) 274; King, J. As. Soc. Beng. 64, 2 (1895) 107; Ridley, Fl. Malay Pen. 1 (1922) 424; Whitmore, Tr. Fl. Malaya 2 (1973) 303; Sleumer, Blumea 26 (1980) 160, Fl. Malesiana 1, 10 (1984) 15, fig. 7; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 278.

Monotypic genus.

## **Scorodocarpus borneensis** (Baill.) Becc. Fig. 6, Plate 35A–B, Map 7

(Of Borneo)

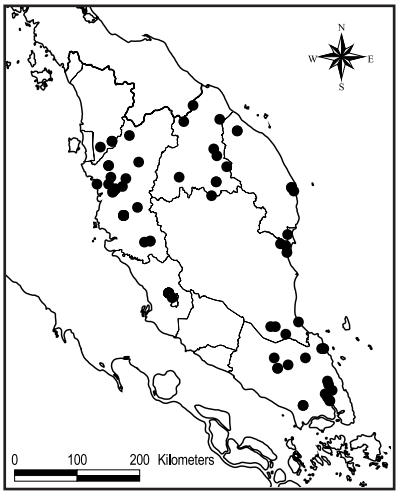
Nuov. Giorn. Bot. Ital. 9 (1877) 274, *t.* 11, fig. 12–17; King, J. As. Soc. Beng. 64, 2 (1895) 108; Ridley, Fl. Malay Pen. 1 (1922) 424; Whitmore, Tr. Fl. Malaya 2 (1973) 303, fig. 3; Sleumer, Blumea 26 (1980) 160, Fl. Malesiana 1, 10 (1984) 15, fig. 6–7; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 281, fig. 4; Chua, PROSEA 5, 3 (1998) 514. **Basionym:** *Ximenia borneensis* Baill., Adansonia 11 (1874) 271, fig. 7. **Type:** *Beccari PB 1581*, Borneo, Sarawak, Mt Matang (holotype FI *n.v.*; isotypes P, W *n.v.*).

Medium to very big tree to 55 m tall, *all parts with a strong garlic smell*, *without tendrils or thorns*. **Bole** straight or crooked, to 122 cm diameter; buttresses sometimes present, small, to 45 cm tall, 7 cm thick. **Bark** light grey to red or brown, fissured or slightly scaly; inner bark deep red or purplish red or brownish red to pink, mottled, soft, occasionally with yellow fibres; cambium yellow or white; sap none; sapwood pink, orange, yellowish brown or white, hard. **Crown** dense, rounded, small but occasionally big. **Twigs** to 10 mm diameter, rough; young twigs straight, 2–6 mm diameter, smooth. **Leaves** spirally arranged; petioles slender, becoming stout with age, 10–21(–33) mm long, 1–3 mm diameter, distally weakly thickened; laminas elliptic to broadly elliptic, occasionally ovate or broadly ovate, rarely obovate, 6.5–28.5 × 2.7–10.9 cm, chartaceous to coriaceous, smooth on both surfaces, glossy above, base narrowed or rounded, margin entire, apex strongly acuminate, acumen (2–)6–21

mm long; venation *pinnate*; midrib flat or sunken above, prominent beneath; lateral veins 5–8 pairs, prominent on both surfaces (more so beneath); tertiary veins scalariform, slightly inconspicuous above, prominent beneath. **Inflorescences:** short racemes, in clusters of 2 or 3 flowers, *never repeatedly dichotomous*, (0.7–)2–5 cm long, rusty to grey puberulous; bracts and bracteoles caducous, or flowers solitary. **Flowers** bisexual, homostylous; pedicels slender, 1–3 mm long, puberulous; calyx cupular, shortly 4–5-dentate, *c*. 1 mm long, 2–3 mm diameter, puberulous; petals white, 4–5, not splitting, connate at the base, glabrous outside, woolly inside, narrowly oblong, 4–10 × 1–2 mm diameter, apex reflexed; stamens *8–10* with 2 per petal, epipetalous, filaments terete, to 1 mm long, glabrous, connective none, anthers yellow, oblong, 3–4 mm long; staminodes none; nectary *none*; ovary *superior*, partially 3–4-locular at base, green, conical, *c*. 1 × 1 mm, style white, 4–9 mm, stigma shortly 3–4-lobed, ovule 1 per locule, placentation free-central. **Fruit:** stalk stout, 9–22 mm long, 5–8 mm diameter; drupe obovoid, ellipsoid or globose, 4–6.8 cm long, 4–5 cm diameter, apex rounded, style caducous; green or glaucous when young, occasionally with longitudinal brownish purple stripes; ripening brown; calyx *not enlarging*, *nor splitting when mature*; pericarp smooth, thin and fleshy, coarsely fibrous when mature; endocarp woody, smooth. **Seed** subglobose, 1.6–5 cm long, 1.4–3 cm diameter; endosperm starchy, containing tannin.

**Vernacular names.** *Kulim* (preferred name), *bawang hutan* (Malay).

**Distribution.** Peninsular Thailand, Sumatra (including Lingga Is.), Peninsular Malaysia, Singapore and Borneo. In Peninsular Malaysia, throughout except Perlis, Penang, Negeri Sembilan and Melaka.




**Map 7.** Distribution of *Scorodocarpus borneensis.*

**Conservation status.** Least Concern.

**Ecology.** Common but scattered, in lowland dipterocarp forest usually on hill sides, sometimes by streams, to 600(–900) m altitude, rarely in upper hill dipterocarp forest.

**Uses.** Foxworthy (Malay. For. Rec. 3 (1927) 121) considered the tree produces a first class timber, which is heavy and hard. It smells of garlic when fresh and peppery

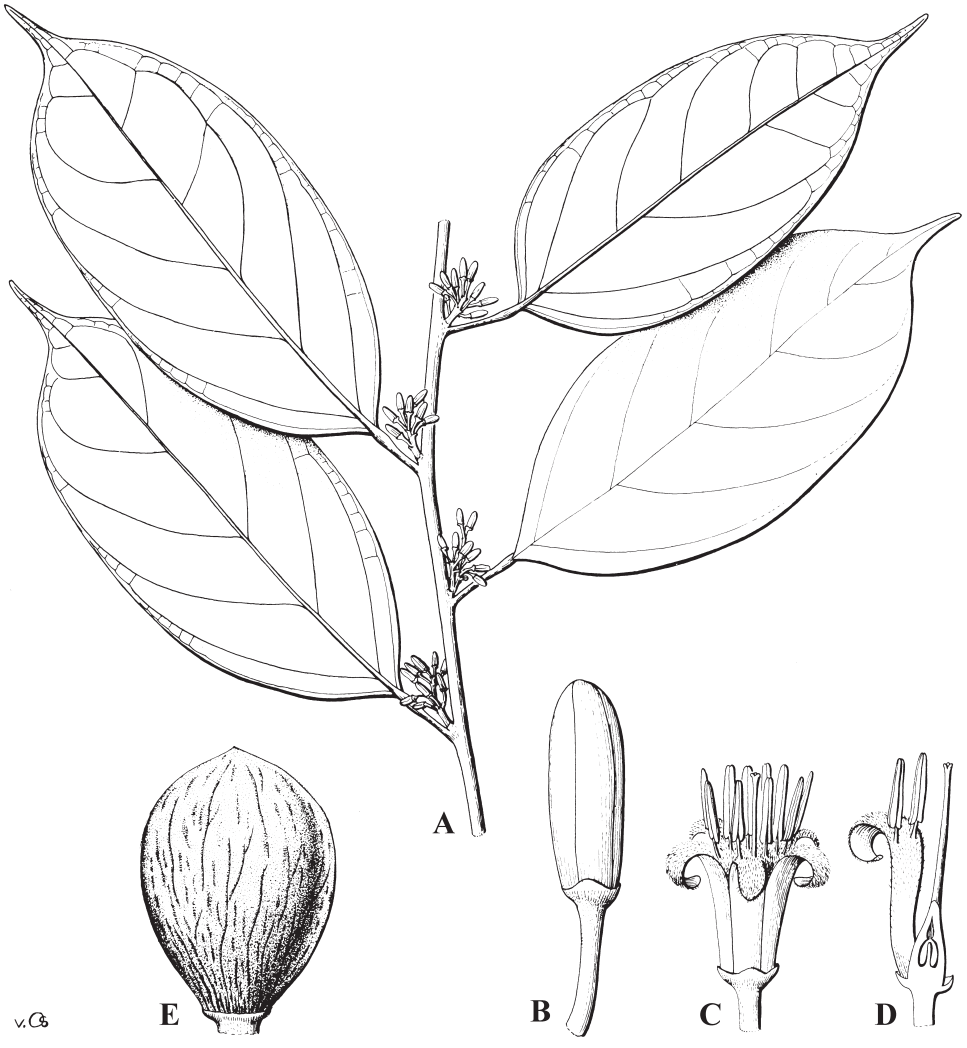



**Figure 6.** *Scorodocarpus borneensis*. A, habit; B, flower bud; C, flower; D, flower in longitudinal section and with 4 petals removed; E, Fruit. (Reproduced with permission from Fl. Malesiana 1, 10 (1984) 16.)

when dry. However, the timber is not durable when in contact with soil. Chua (PROSEA 5, 3 (1998) 514) recorded the timber is used locally for construction, boat keels, posts, agricultural implements and sleepers on temporary railway lines.

The fruits can be used as a substitute for garlic and Sleumer (1984) reported the seeds are edible and taste of onion. Chua (1998) mentioned the fruit extract contains antimicrobial activity. Burkill (Econ. Prod. Malay Pen. (1966) 1605) recorded the fruit shell (woody endocarp) was used for boxes and humming-tops, while an infusion of fruits and bark was used as an antidote for the poison of the ipoh tree, *Antiaris toxicaria* Lesch., by the Jahai in Kelantan.

**Note.** The tree emits a strong garlic smell even without cutting or wounding.

# 7. **STROMBOSIA** Blume

(Greek, *strombos* = conical or pear-shaped;
referring to the pear-shape of the immature fruits)

Bijdr. Fl. Ned. Ind. (1826) 1154; Masters, Fl. Brit. India 1 (1875) 579; King, J. As. Soc. Beng. 64, 2 (1895) 102; Ridley, Fl. Malay Pen. 1 (1922) 425; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 64; Whitmore, Tr. Fl. Malaya 2 (1973) 305; Sleumer, Blumea 26 (1980) 163, Fl. Malesiana 1, 10 (1984) 19; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 283.

*Trees or shrubs*, without a strong garlic smell, *without tendrils or thorns*. **Leaves** spirally arranged; laminas *penniveined*. **Inflorescences** in short cymes or fascicles, *never repeatedly dichotomous*, or flowers rarely solitary. **Flowers** *bisexual*, homostylous; calyx cupular, deeply or shortly 4–5-lobed; petals (*4–*)*5*, *not splitting*, free, *glabrous outside*, *hairy inside*; stamens *5*, epipetalous, filaments flat, hairy, connective none, anthers large, staminodes *none*; nectary disc circular, (3–)5-dentate, fleshy; ovary superior becoming half inferior by becoming immersed in the enlarged fleshy nectary disc, partially 3–5-locular at base, style short to filiform elongate, stigma shortly 3–5(–6)-lobed, placentation free-central. **Fruits:** calyx *enlarging and adnate to the drupe*, *not splitting when mature*; style persistent; pericarp thin and fleshy, endocarp crustaceous or woody. **Seeds:** endosperm oily.

**Distribution.** About 13–14 species with the centre of distribution in Africa (*c.* 10 species) and the rest in Sri Lanka, S India, Myanmar, Sumatra, Peninsular Malaysia, Borneo, Java, the Philippines and Maluku. Two species occur in Peninsular Malaysia.

## Key to Strombosia species

Petioles not thickened. Calyx deeply lobed, slightly connate at the base, enlarging and almost entirely covering the drupe. Drupe apex rounded. ..... **1. S. ceylanica**

Petioles thickened in the distal half. Calyx cupular, shortly-lobed, not enlarging but adnate to about ¾ of the drupe. Drupe apex truncate. ..... **2. S. javanica**

## 1. **Strombosia ceylanica** Gardner
(Of Ceylon = Sri Lanka)

Calc. J. Nat. Hist. 6 (1845) 350; Masters, Fl. Brit. India 1 (1875) 579; Backer & Bakhuizen *f*., Fl. Java 2 (1965) 65; Sleumer, Blumea 26 (1980) 165, Fl. Malesiana 1, 10 (1984) 22, fig. 9a–c, 11; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 284; Kochummen, Tr. Fl. Pasoh For. (1997) 369 (as *S. ceilanica*). **Type:** *Gardner s.n*., Sri Lanka, Hantane (holotype K, barcode K000501145; isotypes BM *n.v.*, K, barcode K000501146). **Synonyms:** *Strombosia multiflora* King, J. As. Soc. Beng. 64, 2 (1895) 102, Ridley, Fl. Malay Pen. 1 (1922) 425, Whitmore, Tr. Fl. Malaya 2 (1973) 306, Gard. Bull. Sing. 26 (1973) 285; *Strombosia rotundifolia* King, J. As. Soc. Beng. 64, 2 (1895) 103, Ridley, Fl. Malay Pen. 1 (1922) 425. **Type:** *King's Coll. 7824*, Peninsular Malaysia, Perak, Batang Padang District (lectotype CAL; isolectotypes BM *n.v*., K); *Anacolosa maingayi* Mast., Fl. Brit. India 1 (1875) 580, *Strombosia maingayi* (Mast.) Whitmore, Tr. Fl. Malaya 2 (1973) 306, Gard. Bull. Sing. 26 (1973) 285. **Type:** *Maingay 1019*, Singapore (holotype K; isotype P *n.v*.).

Tree or shrub. **Bole** straight. **Young twigs** distinctly zig-zag. **Leaves:** petioles *not thickened*; lamina base narrowed or rounded, margin entire, apex acuminate or acute; tertiary veins scalariform. **Inflorescences** cymes, fascicles; bracts and bracteoles caducous. **Flowers:** pedicels filiform, glabrous; calyx in (4–)5-*deep-lobed*, *slightly connate at base*, each lobe ovate, to 1 × 1 mm, margin minutely toothed; petals 5, glabrous outside, hairy (except for base) inside; stamens (4–)5; nectary present; style terete, stigma minute. **Fruit:** calyx *enlarging and covering the drupe almost entirely*; drupe smooth, apex *rounded*. **Seeds** subglobose, *c*. 10 mm long, *c*. 11 mm diameter.

**Distribution.** Widespread from SW India, Sri Lanka to Sumatra, Peninsular Malaysia, Singapore, Anambas Is., Java and Borneo.

**Taxonomy.** The large-leaved form mentioned by Sleumer (1984) and described by Whitmore (1973) as *Strombosia* sp. A is here treated as a distinct variety, *Strombosia ceylanica* var. *macrophylla.*

### Key to varieties

Leaves to 19 × 8 cm, finely tuberculate on both surfaces or at least beneath, lateral veins 5–8 pairs. ..... **1a. var. ceylanica**

Leaves at least 23 × 9 cm, smooth on both surfaces, lateral veins 9–12 pairs. ..... ..... **1b. var. macrophylla**

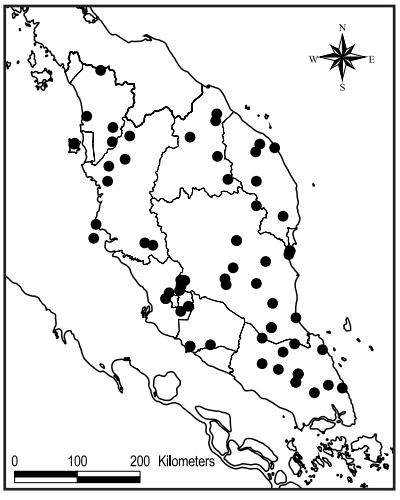
### 1a. **var. ceylanica** Map 8

Usually small to medium tree (21 m tall), occasionally big tree to 36 m tall; buttresses numerous, steep to equal, thin to thick. **Bole** occasionally slightly tapering at base, to 60 cm diameter. **Bark** pinkish to purplish brown, finely scaly, peeling off in scroll-shaped patches or scales; inner bark cream with orange flecks, soft; cambium purple; sapwood pale brown, hard. **Crown** dense and spreading or thin with few small branches at top. **Twigs** lenticellate and tuberculate. **Leaves:** petioles slender, 5–15(–19) mm long, 1–2(2.5) mm

diameter; laminas ovate or elliptic, *5–16*(*–19*) × *2.4–8 cm*, thickly coriaceous, rarely thinly coriaceous, *tuberculate both surfaces* (more so beneath), apex acuminate or acute, acumen 2–10(–15) mm long; midrib flat above, prominent beneath; lateral veins *5–8 pairs*, obscure above, conspicuous beneath; tertiary veins slightly obscure above, prominent beneath. **Inflorescences** in fascicles of 2–4 flowers or flowers solitary; peduncles 3–7 mm long. **Flowers** white or cream, occasionally green; pedicels 0.5–2.5 mm long; calyx in (4–)5-deep-lobed; petals oblong, 3–5 × *c*. 1 mm; stamens (4–)5, filaments flat, to 1 mm long, hairy, anthers ovate, *c*. 1 mm long; nectary disc shallowly 5-crenate, *c.* 1 mm tall, *c*. 2 mm diameter; ovary base immersed in the enlarged nectary disc, the exposed portion *c.* 2 × 2 mm, style 1–3.5 mm long, ovule 1 per locule. **Fruits:** stalks stout, to 10 mm long, 2–4 mm diameter; drupe green (in Borneo pink to purple), ovoid, ellipsoid or obovoid, 7–22 mm long, 1–19 mm diameter; style persistent, tiny. **Seeds** subglobose, *c*. 10 mm long, *c.* 11 mm diameter.

**Vernacular names.** *Kamap*, *petaling gajah* (Malay).

**Distribution.** SW India, Sri Lanka to Sumatra, Peninsular Malaysia, Singapore, Anambas Is., Java and Borneo. Common and widespread throughout Peninsular Malaysia except for Perlis and Melaka.




**Map 8.** Distribution of *Strombosia ceylanica* var. *ceylanica.*

**Conservation status.** Least Concern.

**Ecology.** Locally common, but not abundant, usually on well-drained soil, on flat land, hillsides and the lower slopes of ridges in lowland dipterocarp forest to 500 m altitude, sometimes in hill dipterocarp forest to 800 m altitude, also in coastal and swamp forest.

**Uses.** Foxworthy (Malay. For. Rec. 1 (1921) 97) recorded the timber as very hard, heavy to very heavy, very fine grained and durable. Alonzo (PROSEA 5, 3 (1998) 540) reported the timber is generally used for temporary construction and wood products, e.g. flooring and pallets.

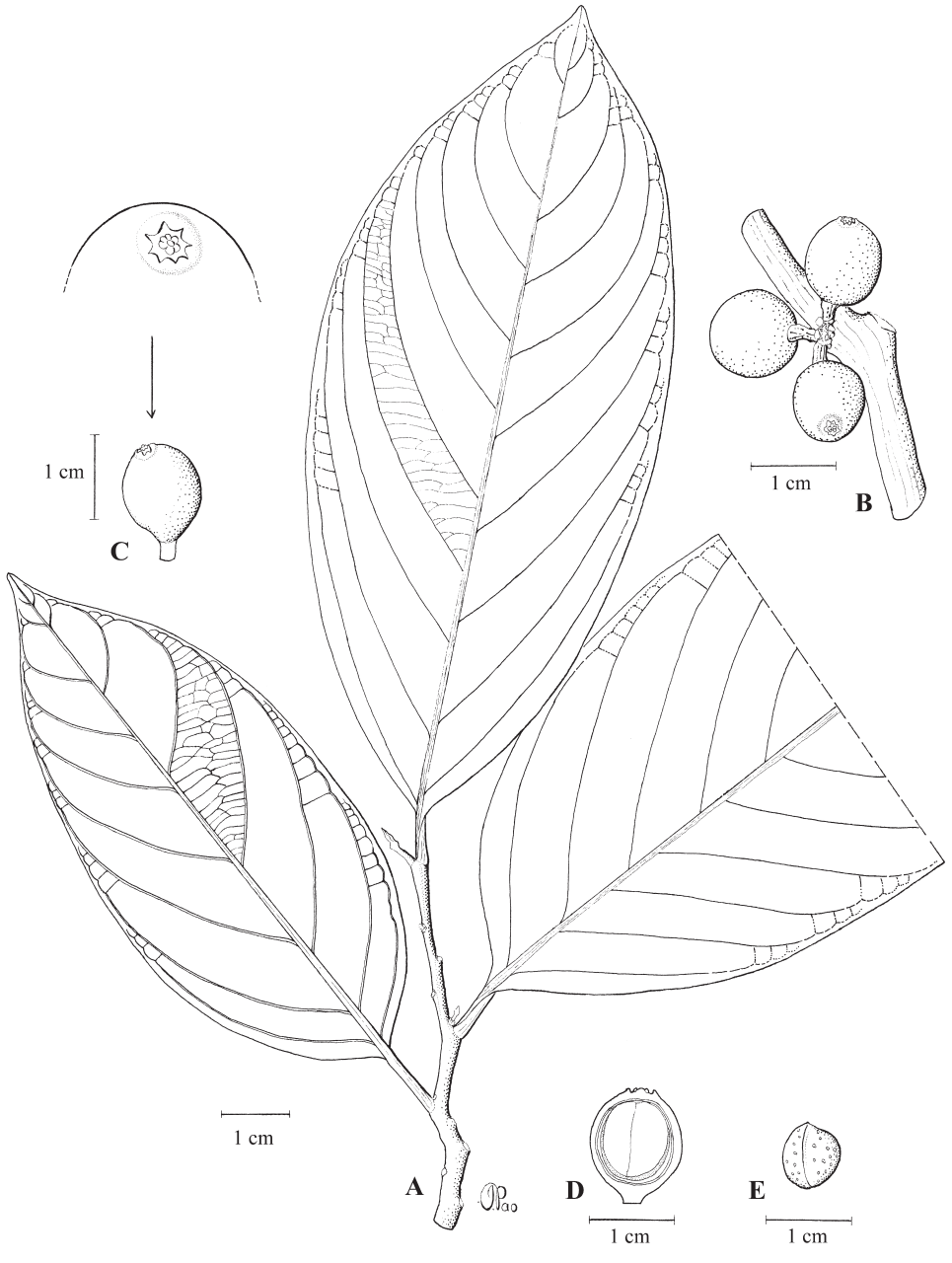



**Figure 7.** *Strombosia ceylanica* var. *macrophylla.* A, leafy twig; B, infructescence; C, fruit and persistent calyx; D, fruit in longitudinal section; E, seed. (All from *Mohd. Shah* & *Mohd. Noor MS 1954*.)

## 1b. **var. macrophylla** S.N.Phoon Fig. 7, Map 9

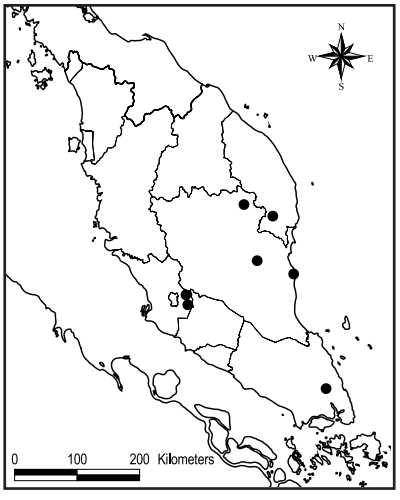
(Greek, *makros* = large, *phullon* = leaf; referring to the large leaves)

Kew Bull. (in press). **Synonym:** *Strombosia* sp. A, Whitmore, Tr. Fl. Malaya 2 (1973) 307. **Proposed type:** *Mohd. Shah MS 1954*, Peninsular Malaysia, Pahang, Taman Negara, Ulu Sg. Sepia, Kuala Aur (holotype KEP; isotype SING).

Shrub or small tree to 3 m tall. **Bole** to 17 mm diameter. **Twigs** to 6 mm diameter, finely lenticellate, usually drying yellowish brown. **Leaves:** petioles stout, 11–22 mm long, 2–5 mm diameter, tuberculate; laminas obovate to broadly elliptic, *23–35 × 9–14.5 cm*, glossy when fresh, papery to subcoriaceous when dry, *smooth on both surfaces*, drying yellowish green, apex acuminate or acute, acumen 7–15 mm long; midrib minutely prominent above, prominent and sharp beneath; lateral veins *9–12 pairs*, prominent both surfaces (more so beneath); tertiary veins inconspicuous or flat above, prominent beneath. **Inflorescences** sessile; bracteoles 2, orbicular, deeply concave, to 0.5 × 0.5 mm, with red lepidote scales, denser towards apex, usually caducous. **Flower buds** green, ovoid, *c*. 1 × 1 mm; calyx deeply 5-lobed; petals lanceolate; stamens 5, filaments filiform, anthers oblong; nectary disc present; ovary superior, globular. **Mature flowers** unknown. **Fruit** sessile or with a slightly stout stalk to 4 mm long, 2 mm diameter; drupe green ripening red, globose, *c.* 13 mm long, 13 mm diamater, style caducous; endocarp thin, woody. **Seeds** globose, 8–10 mm long, 8–10 mm diameter.

**Vernacular name.** *Kayu tongkong* (Temuan).

**Distribution.** Peninsular Malaysia and Borneo (Sarawak). In Peninsular Malaysia recorded in Selangor, Terengganu, Pahang and Johor.




**Map 9.** Distribution of *Strombosia ceylanica* var. *macrophylla*.

**Conservation status.** Near Threatened.

**Ecology.** Lowland dipterocarp forest to 200 m altitude, on hill slopes, flat land or riversides.

## 2. **Strombosia javanica** Blume Plate 35C, Map 10

(Of Java)

Bijdr. Fl. Ned. Ind. (1826) 1155, Mus. Bot. Lugd. Bat. 1 (1850) 251, *t.* 47; Masters, Fl. Brit. India 1 (1875) 579; King, J. As. Soc. Beng. 64, 2 (1895) 590; Ridley, Fl. Malay Pen. 1 (1922) 425; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 65; Whitmore, Tr. Fl. Malaya 2 (1973) 306, fig. 4; Sleumer, Blumea 26 (1980) 164, Fl. Malesiana 1, 10 (1984) 21, fig. 9d–e, 10; Lesmy, Tr. Fl. Sabah & Sarawak 1 (1995) 283, fig. 5; Kochummen, Tr. Fl. Pasoh For. (1997) 369. **Type:** *Blume s.n.*, W Java, Mt Salak (holotype L, barcode L0038904; isotypes K, L, barcodes L0038905–L0038911, P, barcode P00754938).

Medium to big tree to 36 m tall. **Bole** straight or fluted, to 61 cm diameter; buttresses to 60 cm tall. **Bark** pinkish to purplish brown, fissured; inner bark pink; sapwood pale brown, hard. **Twigs** coarsely lenticellate, fissured or scaly; young twigs distinctly zig-zag, finely lenticellate or smooth. **Leaves:** petioles slender, 6–15(–18) mm long, 1–2 mm diameter, *distal half thickened*; laminas ovate to elliptic, occasionally lanceolate or broadly elliptic, *5–14 × 2.7–6.6 cm*, chartaceous, smooth above, *finely tuberculate beneath*, base narrowed or rounded, margin entire, apex acuminate or acute, acumen 2–8(–10) mm long; midrib flat above, prominent above; lateral veins *5–7 pairs*, flat above, prominent beneath; tertiary veins inconspicuous or flat above, prominent beneath. **Inflorescences** in fascicles of 3–7 flowers or flowers solitary; peduncles 5–10 mm long, puberulous; bracts and bracteoles caduous. **Flowers:** pedicels filiform, 5–10 mm long, puberulous; calyx *cupular*, *shortly* 4–5-*lobed*, to 1 mm long, *c*. 3 mm diameter, glabrous; petals 5, white to greenish white, lanceolate, *8–10 × 2–3 mm*, glabrous outside, densely hairy inside; stamens 5, filaments flat, 1–2 mm long, hairy, anthers oblong, 1–1.5 mm long; nectary disc deeply 5-crenate, 1–1.5 mm diameter, 0.5–1 mm high; ovary base immersed in the enlarged nectary disc, the exposed portion 1–3 mm long, 1–1.5 mm diameter, style terete 4–10 mm, ovule 1 per locule. **Fruit:** sessile or with a stout stalk to 7 mm long, 1–3 mm diameter; calyx *cup-shaped*, *adnate to about ¾ of the drupe*; drupes green ripening yellowish green, cream or yellow, glaucous when fresh, ellipsoid or obovoid, 5–22 × 2–17 mm, smooth, apex *truncate*; style persistent and forming a hard beak. **Seed** ellipsoid or obovoid, 3–18 mm long, 1–13 mm diameter.

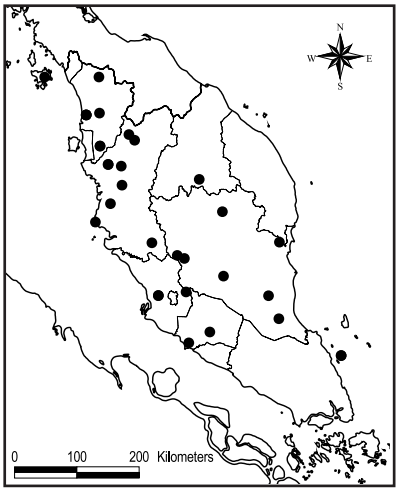
**Vernacular name.** *Dedali* (preferred name), *dedali badak*, *bayan* (Malay).

**Distribution.** Myanmar (Tenasserim), S Thailand, Sumatra (including Nias Is.), Peninsular Malaysia, Singapore, W Java, Borneo and Natuna Is. In Peninsular Malaysia, common and widespread except for Perlis, Penang, Melaka and Terengganu.

**Conservation status.** Least Concern.

**Ecology.** Usually found in lowland dipterocarp forest to 300 m altitude, occasionally in lower montane forest to 1500 m altitude.

**Uses.** Foxworthy (Malay. For. Rec. 8 (1930) 13) recorded the timber as soft to medium hard and light to moderately heavy. The wood is moderately durable, but while maintaining its shape it is hard to polish. Generally used for utility purposes, construction and wood products. Leaves can be eaten raw or cooked as a vegetable (*Gadoh KL 2209*), and are reported to taste of groundnuts (Burkill, Econ. Prod. Malay Pen. (1966) 1605).




**Map 10.** Distribution of *Strombosia javanica.*

**Note.** The fruits of *Strombosia javanica* are dispersed by short-nosed fruit bats (*Cynopterus brachyotis*). Below a bat roost in the Forest Research Institute Malaysia, Kepong, a large quantity of seeds was deposited in bat dung whenever this species was fruiting.

# 8. **XIMENIA** L.

(Francisco Ximenez, 1666–1729, a Spanish apothecary)

Sp. Pl. (1753) 1193; Miquel, Fl. Ind. Bat. 1, 1 (1856) 786; Masters, Fl. Brit. India 1 (1875) 574; King, J. As. Soc. Beng. 64, 2 (1895) 107; Ridley, Fl. Malay Pen. 1 (1922) 423; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 64; Sleumer, Blumea 26 (1980) 166, Fl. Malesiana 1, 10 (1984) 10; Corner, Wayside Tr. Malaya, 3rd ed. (1988) 600.

*Shrubs or treelets*, without a strong garlic smell, *without tendrils*; *thorns in the leaf axils.* **Leaves** spirally arranged; laminas *penniveined*. **Inflorescences** racemes or cymes, occasionally fascicles or umbellate, *never repeatedly dichotomous*, flowers rarely solitary. **Flowers** bisexual (elsewhere rarely unisexual), homostylous; calyx cupular, shortly 3–4(–5)-dentate; petals 4, not splitting, free, glabrous outside, hairy inside; stamens 8, alternately epipetalous and episepalous, filaments filiform, sigmoid near apex, glabrous, connective thick, anthers large, staminodes none; nectary disc none; ovary superior, partially (3–)4-locular at base, style filiform, stigma small and capitate, inconspicuously lobed, placentation basal. **Fruit:** calyx not enlarged, *nor splitting when mature*; pericarp thin and fleshy; endocarp crustaceous to woody. **Seed:** endosperm oily.

**Distribution.** About 8 species distributed in the subtropical and tropical countries, in Peninsular Malaysia 1 species.

**Ecology.** Usually in lowland forest, along seashore thickets and in dry vegetation types.

## **Ximenia americana** L.
(Of America)

Sp. Pl. (1735) 1193; Masters, Fl. Brit. India 1 (1875) 574; King, J. As. Soc. Beng. 64, 2 (1895) 107; Ridley, Fl. Malay Pen. 1 (1922) 424; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 64; Whitmore, Tr. Fl. Malaya 2 (1973) 300; Sleumer, Blumea 26 (1980) 166, Fl. Malesiana 1, 10 (1984) 11, fig 4; Corner, Wayside Tr. Malaya, 3rd ed. (1988) 600. **Type:** *Hort. Cliffort. 483*, tropical America (holotype BM *n.v.*). **Synonym:** *Ximenia subscandens* Griff., Not. Pl. Asiat. 4 (1854) 691, *t.* 644, fig. 3. **Type:** *Griffith s.n.*, Peninsular Malaysia, Melaka, Tg. Kling [Cling] (K). According to Sleumer (1980) possibly represented by *Griffith 824* (K, L, P).

**Distribution.** Pantropical and subtropical countries in America, Africa, India (including Andaman Is.), Sri Lanka, Myanmar, Indo-China, Thailand, S China (Hainan), Sumatra, Peninsular Malaysia, Singapore, Java, Borneo, N Sulawesi, Maluku, Lesser Sunda Is. (Flores, Timor), the Philippines, NW New Guinea, New Britain, Solomon Is., NE Australia and the Pacific.

**Taxonomy.** DeFilipps (Trans. Illinois State Acad. Sc. 62 (1969) 350) recognised three varieties, of which var. *argentinensis* DeFilipps occurs in Argentina, Paraguay and Bolivia, var. *microphylla* Welwitsch *ex* Oliver is endemic to Africa; and var. *americana* which occurs in both the New and Old Worlds and is the variety found in Peninsular Malaysia.

**Note.** Guppy (Plant Seeds and Currents W Indies (1917) 252) and Ridley (The Dispersal of Plants Throughout the World (1930) 265) recorded that the fleshy fruits are eaten and so dispersed by birds, while the seeds that float in water are secondarily dispersed by sea or water currents.

### **var. americana** Fig. 8, Map 11

Climbing shrub or small low branching tree to 3 m tall, hemiparasitic. **Bole** to 12 cm diameter. **Twigs** 3–6 mm diameter, lenticellate, young twigs straight; thorns 2–23 mm long. **Leaves:** petioles slender, 4–10 mm long, 1–1.5 mm diameter; laminas yellowish green turning brownish black, broadly elliptic to ovate, 2.2–6.8 × 1.8–3.5 cm, coriaceous when fresh, chartaceous when dry, *not glaucous*, smooth on both surfaces, base narrowed, margin entire, apex acute, rounded or emarginate, occasionally toothed; midrib flat above, prominent beneath; lateral veins (3–)5–6 pairs, flat above, prominent beneath; tertiary veins reticulate, usually inconspicuous on both surfaces. **Inflorescences** *umbellate-racemose*, in clusters of 3–9 flowers per fascicle, 2–16(–22) mm long; peduncles 7–10 mm long; bracts caducous; bracteoles minute, to 1 × 1 mm, usually caducous. **Flowers** white or greenish white, fragrant; pedicels filiform, 3–7.5 mm long, sparsely puberulous; calyx cupular, shortly 3–4(–5)-dentate, to 0.5 mm long, 1 mm diameter, margin *minutely ciliate*; petals green outside, yellow inside, lanceolate, 5–6(–8) × 1–2 mm, glabrous outside, white hairy inside; stamens 8, filaments filiform, sigmoid near apex, 2–2.5 mm long, anthers oblong, 3.5–4 mm long, glabrous; ovary bottle-shaped, *c.* 4 × 2 mm, style filiform, *c.* 2 mm long, stigma small capitate, ovule 1 in each locule. **Fruit:** stalks slender, 3–6 mm long, 1–1.5 mm diameter; drupes green turning yellow, then ripening white, obovoid, oblong or ovoid, 11–22 mm long, 8–17 mm diameter, apex rounded; style occasionally persistent. **Seed** globose to subglobose, 4–6 mm long, 4–8 mm diameter.

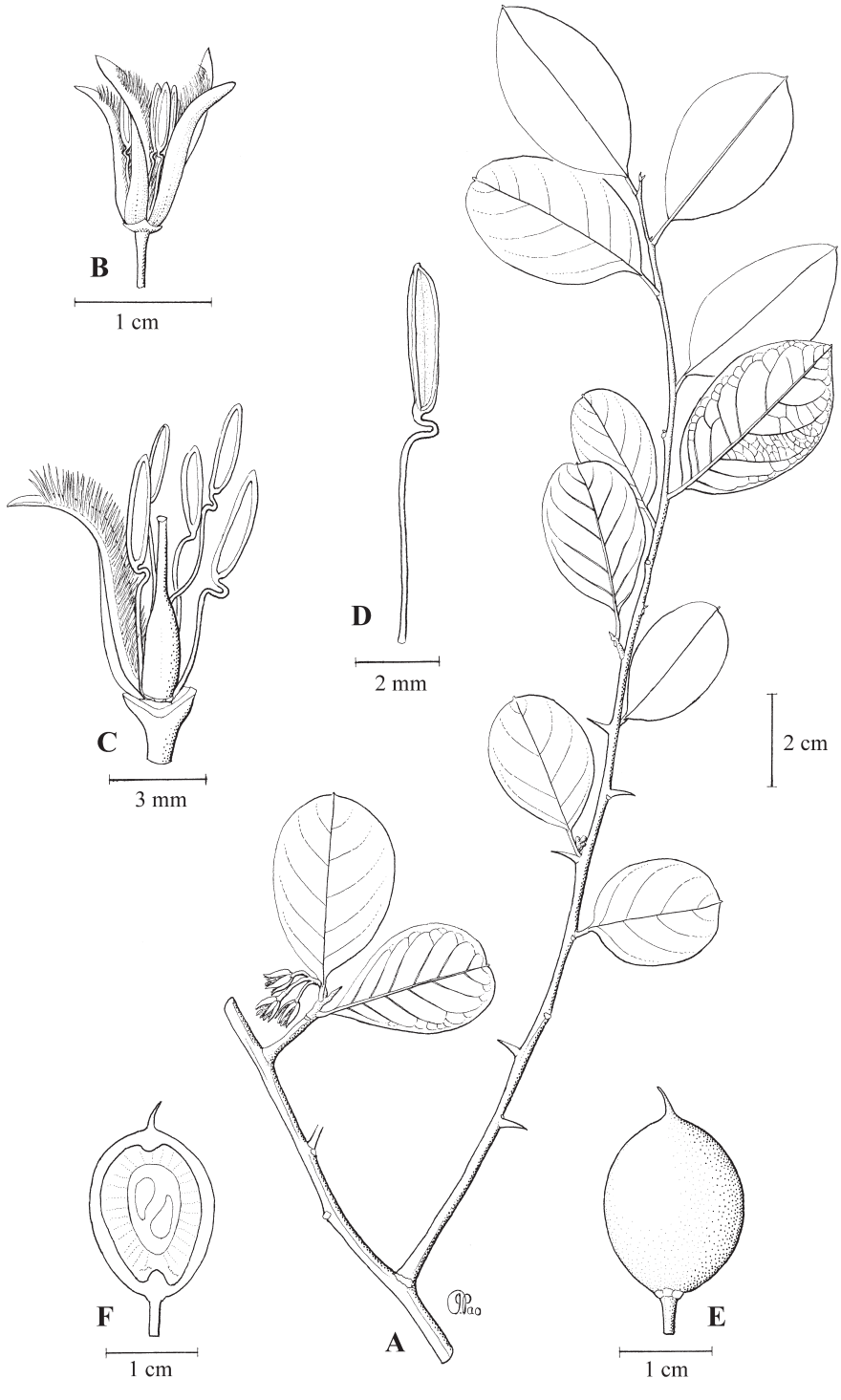
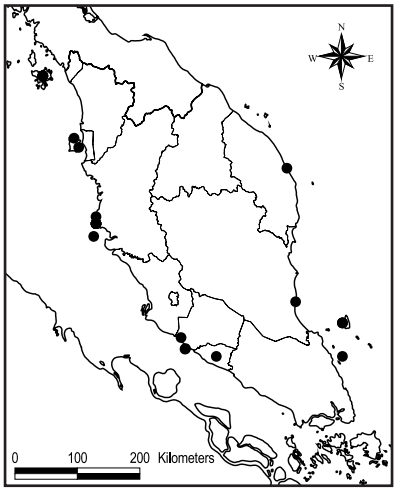



**Figure 8.** *Ximenia americana* var. *americana.* A, habit; B, flower; C, flower with 3 petals and 3 stamens removed; D, stamen; E, fruit; F, fruit in longitudinal section. (All from *FRI 34062*.)

**Vernacular name.** *Bedara laut* (Malay).

**English name.** Hog plum.

**Distribution.** America, Africa, India (including Andaman Is.), Sri Lanka, Myanmar, Indo-China, Thailand, S China (Hainan), Sumatra, Peninsular Malaysia, Singapore, Java, Borneo, N Sulawesi, Maluku, Lesser Sunda Is. (Flores, Timor), the Philippines, NW New Guinea, New Britain, Solomon Is., NE Australia and the Pacific. In Peninsular Malaysia, in Penang, Kedah (Pulau Langkawi), Perak, Negeri Sembilan, Melaka, Terengganu, Pahang (including Pulau Tioman) and Johor.




**Map 11.** Distribution of *Ximenia americana* var. *americana.*

**Conservation status.** Vulnerable B2b(ii & iii). Its habitat on sandy beaches is not included in the network of Totally Protected Areas.

**Ecology.** Elsewhere it grows in dry savannah but in Malaysia it usually occurs in the *Barringtonia* formation of beach forest behind the beach or on stony ground or in coastal dipterocarp forest, where its parasitic roots are advantageous in this nutrient poor habitat. It is evergreen in Peninsular Malaysia, but elsewhere it is reported to be deciduous. Teo (Gard. Bull. Sing. 49 (1997) 7–13) recorded it as a root parasite that is non-host specific and infects even its own roots (autoparasitism).

**Uses.** The timber is hard and heavy, with a pleasant scent when fresh (Burkill, Econ. Prod. Malay Pen. (1966) 2315). It is not sufficiently common in Malaysia, but elsewhere it is used as a substitute for white sandalwoods, *Heisteria*, *Minquartia* and *Scorodocarpus* species (Verhelj & Coronel, PROSEA 2 (1992) 349; Heywood, 2007).

The succulent pulp is edible but tastes very sour (*Whitmore FRI 3003*) or like sour apples (Burkill, 1966) or acid plums (Corner, 1988). Although the nuts are edible, they are purgative when taken in larger amounts (Burkill, 1966).

**Note.** Leaves of this species are very variable in shape, size and texture.

# PLATES

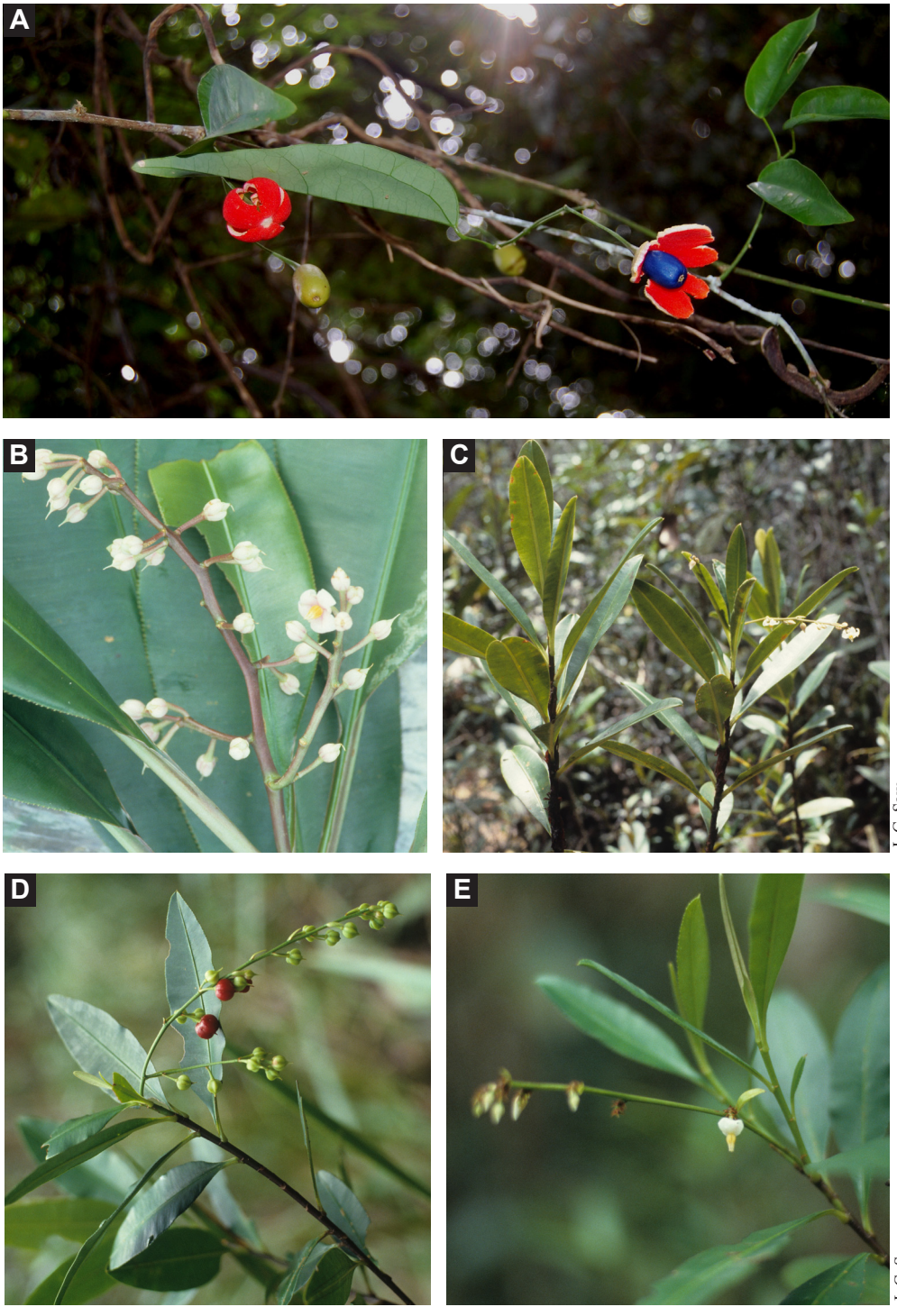



**Plate 34.** Olacaceae. A, *Erythropalum scandens.* Ochnaceae. B, *Euthemis leucocarpa*; C–E, *Euthemis minor.*

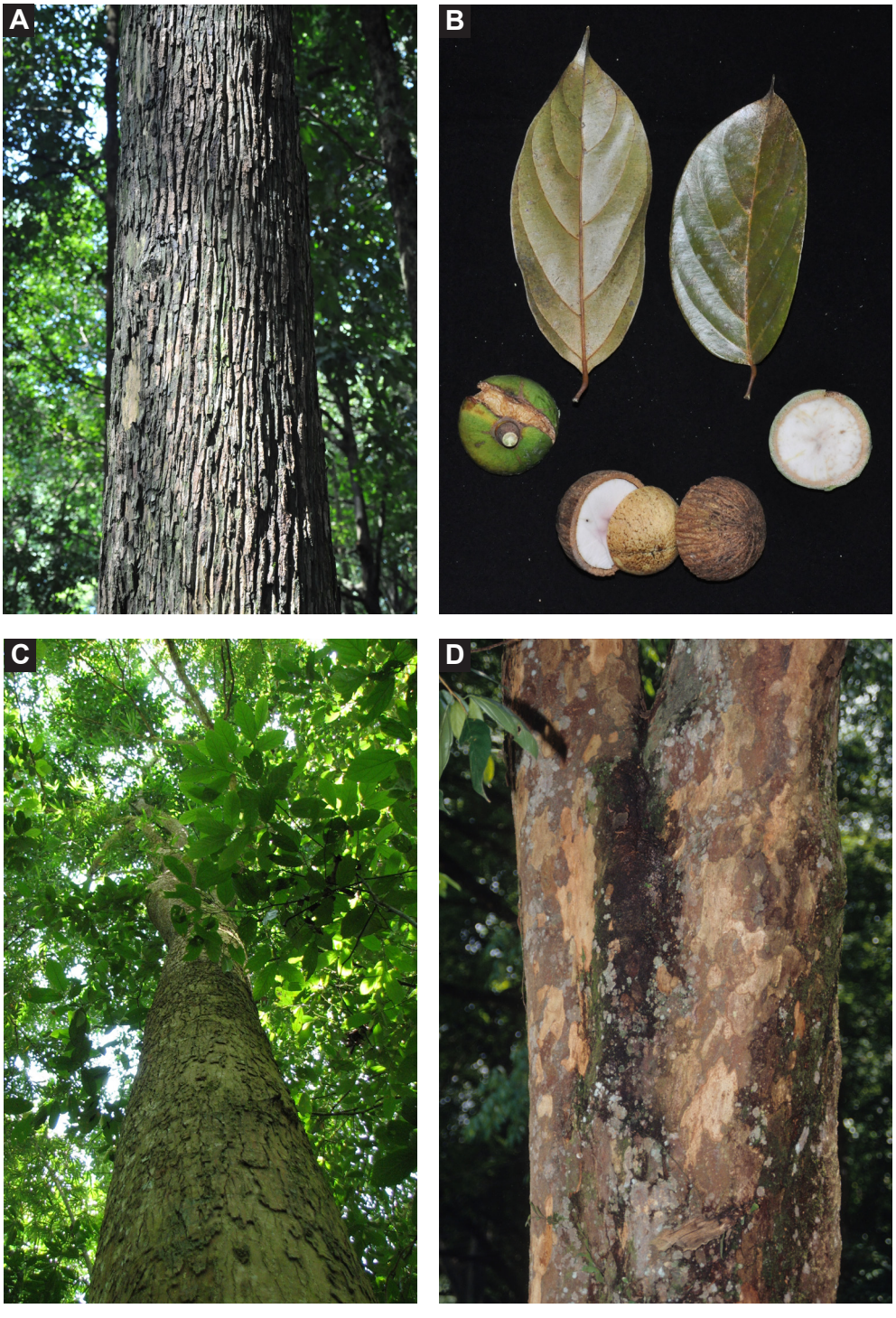



**Plate 35.** Olacaceae. A–B, *Scorodocarpus borneensis*; C, *Strombosia javanica*; D, *Ochanostachys amentacea*.

# Flora of Peninsular Malaysia

The Flora of Peninsular Malaysia Series II provides revisions for seed plant families that occur in Peninsular Malaysia. Volume 3 includes revisions of one gymnosperm family (Cycadaceae) and 9 families of dicotyledons, namely Chrysobalanaceae, Cleomaceae, Cucurbitaceae, Juglandaceae, Lecythidaceae, Magnoliaceae, Nepenthaceae, Ochnaceae and Olacaceae. Conservation status and distribution maps are provided for 123 indigenous species of these 10 family accounts. Representative species are illustrated by botanical plates and colour photographs.

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