

THE FLACOURTIACEAE OF THAILAND

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SUMMARY

A revision of the Flacourtiaceae known from Thailand, comprising 11 genera and a total of 40 species, 2 of which in *Homalium*, and 1 in *Casearia* are new to science. Keys to genera and species, full descriptions of all taxa, and an enumeration of the collections concerned are given.

INTRODUCTION

Of most of the countries of Southeast Asia and Malesia local treatments of the Flacourtiaceae with adequate descriptions have been published in the last decennia. For Thailand, however, only an account of the Flacourtiaceous genera and species exists by Craib, Fl. Siam. En. 1 (1925) 93; *ibid.*, Samydaceae (1931) 735, and a critical approach is much needed.

The present work is based on previous publications on Flacourtiaceae of the East, and on herbarium specimens deposited in the herbaria of Aarhus (AAU), Bangkok (BKF), London (BM), Kew (K), and Leiden (L), revised by me in the last 30 years. Descriptions have been given only for the species, as generic descriptions can be easily found in my treatment of the family in *Flora Malesiana* I, 5 (1954), and elsewhere. Synonyms based on specimens from countries outside Thailand are not mentioned in general.

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KEY TO THE GENERA

- 1a. Ovary semi-inferior. (Fruit a small dry capsule. Flowers bisexual; sepals and petals present) 1. *Homalium*
- b. Ovary superior. (Fruit a berry, drupe, or capsule. Flowers uni- or bisexual) 2
- 2a. Perianth consisting of sepals and petals (thus in two whorls) 3
- b. Perianth consisting of sepals only (thus in one whorl) 7

- 3 a. Petals each with a basal appendage inside. Style 0 4
 b. Petals without a basal inner appendage. Style distinct 6
 4 a. Filaments free 5
 b. Filaments normally connate into a column 4. *Ryparosa*
 5 a. Calyx of free imbricate sepals 2. *Hydnocarpus*
 b. Calyx spathaceous, the sepals closed in bud, disrupting irregularly from the apex 3. *Scaphocalyx*
 6 a. Flowers bisexual 5. *Scolopia*
 b. Flowers unisexual 6. *Hemiscolopia*
 7 a. Flowers in large panicles, unisexual. Fruit a berry with 3 styles 7. *Bennettiodendron*
 b. Flowers in spikes, short racemes, or fascicles 8
 8 a. Fruit a drupe, 2–6-celled 8. *Flacourtia*
 b. Fruit a capsule or berry 9
 9 a. Flowers in spikes. Fruit capsular 9. *Osmelia*
 b. Flowers in short racemes or fascicles. Fruit a berry 10
 10 a. Flowers in short racemes, usually unisexual. Branchlets usually with axillary thorns 10. *Xylosma*
 b. Flowers in fascicles, bisexual. Branchlets unarmed 11. *Casearia*

1. HOMALIUM Jacq.

KEY TO THE SPECIES

- 1 a. Stamens solitary before each petal 2
 b. Stamens 2 or more before each petal 5
 2 a. Styles as long as or surpassing the sepals and/or petals. (Flowers arranged in fascicles along the rhachis. Petals at anthesis 1–1.5, in fruit c. 2 mm) 1. *H. ceylanicum* s.l.
 b. Styles relatively short, i.e. hardly or not exerted from the sepals or petals . . . 3
 3 a. Leaves glabrous. (Flowers fascicled and pedicelled, arranged to spike-like racemes) 2. *H. longifolium*
 b. Leaves more or less persistently hairy beneath 4
 4 a. Leaves softly and shortly yellowish-tomentose, finally somewhat glabrescent underneath except midrib and nerves; petiole stoutish, (1–)2–3(–5) mm. Flowers few-fascicled, sessile, arranged to spikes 3. *H. tomentosum*
 b. Leaves persistently grayish-tomentulose underneath; petiole slender, 7–8 mm. Flowers solitary, arranged to panicles 4. *H. peninsulare*
 5 a. Stamens (usually in pairs) inserted strictly between the disk-like glands, i.e. at the very base of each petal though free from them. Sepals slightly or not accrescent after anthesis 6
 b. Stamens partly inserted on the lower part of the petals 9

- 6 a. Stamens constantly 2 before each petal, one behind the other. (Petals strongly ciliate) 7
 b. Stamens at least partly in fascicles of 3 or 4 (–5, –7, very rarely more) 8
 7 a. Leaves glabrous or practically so; domatia obscure. Petals practically glabrous on both faces. Filaments set with spreading hairs 5. *H. protectum*
 b. Leaves softly pubescent on both faces, maybe tardily glabrescent except midrib and lateral nerves, domatiigerous. Petals hirsute on both faces. Filaments glabrous 6. *H. dasyanthum*
 8 a. Calyx tube narrow-turbinate, about twice as long as sepals or petals in defloration or fruiting stage 7. *H. caryophyllaceum*
 b. Calyx tube as long as or shorter than sepals or petals in defloration or fruiting stage 8. *H. undulatum*
 9 a. Bracts on inflorescence obovate-flabelliform, persistent, 5–6 mm diam. Pedicels 2–3 mm 9. *H. dictyoneurum*
 b. Bracts lanceolate-oblong or narrowly ovate, caducous or sometimes subsistent, 4–8 by 2–3 mm 10
 10 a. Flowers subsessile 10. *H. glabriflorum*
 b. Flowers distinctly pedicellate 11. *H. grandiflorum* var. *grandiflorum*

1. *Homalium ceylanicum* (Gardn.) Benth.

H. ceylanicum (Gardn.) Benth., J. Proc. Linn. Soc. Bot. 4 (1860) 35, 'zeylanicum' s. lat.; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 81. – *Blackwellia ceylanica* Gardn., Calc. J. Nat. Hist. 7 (1847) 452.

H. laoticum Gagnep., Not. Syst. 3 (1914) 249; Fl. Gén. Indoch. 2 (1921) 1006; Craib, Fl. Siam. En. 1 (1931) 741.

H. bhamoense Cubbitt & W.W. Smith, Rec. Bot. Surv. India 6 (1914) 36.

H. minutiflorum auct., non Kurz; Craib, Kew Bull. Misc. Inf. (1911/12) 55; Contr. Fl. Siam, Aberdeen Univ. Studies (1912) 92; Fl. Siam. En. 1 (1931) 741.

H. crenulatum Geddes, Kew Bull. (1928) 238; Craib, Fl. Siam. En. 1 (1931) 738.

Tree 6–15(–30) m tall; trunk erect; bark brown to gray, smooth or rough. Leaves persistent, elliptic to ovate-elliptic, apex usually shortly abruptly acuminate, base attenuate, very base narrowed to the petiole, subcoriaceous, usually glabrous, sometimes short-hairy at midrib and nerves beneath, rather coarsely serrate-dentate, 6–12(–16) by 3.5–7 cm, lateral nerves 6–8(–10) pairs, reticulation fine and prominent beneath; petiole 5–12 mm. Spike-like racemes axillary, solitary; rhachis slender, 15–30 cm, the 4–6-merous flowers greenish, cream or white, with a strong smell, fascicled, ± interruptedly arranged along the rhachis, glabrous to all over tomentellous; pedicels (very) slender, (1–)2 mm. Sepals and petals linear-oblong to subspathulate, obtuse, subglabrous to tomentellous on both faces, ciliate, c. 1.5 mm at anthesis, c. 2 mm in fruit. Calyx tube turbinate, 1–2 mm. Filaments glabrous. Styles 4–6, exceeding the sepals and petals, erect to divergent.

Distribution. Widespread and variable in India, Ceylon (type), Burma, Indochina, Thailand, SW. China incl. Hainan.

Northern. Chiang Mai: Doi Sutep, Kerr 1138; Doi Chieng Dao, Phernchit 1145, Smitinand 3312; Me Wang, Winit 1392; Pang Tawn, Put 3826, 3861. – Northeastern. Udon Thani: Loei Wang Sapung, Kerr 8780 (type *H. crenulatum*, BM, K). – Southwestern. Kanchanaburi: Khao Yai to Khao Ngi Yai, van Beusekom & Phengkklai 409.

Ecology. In evergreen or mixed deciduous forest, 200–700(–1200) m.

2. *Homalium longifolium* Benth.

H. longifolium Benth., J. Proc. Linn. Soc. Bot. 4 (1860) 35; Craib, Fl. Siam. En. 1 (1931) 741; Sleum., Fl. Males. I, 5 (1954) 55; Whitm., Tree Fl. Malaya 2 (1973) 146, f. 5.

Tree 6–10(–40) m, up till 120 cm girth; bole rather slender, sometimes fluted; outer bark brown to gray, smooth, becoming scaly; inner bark orange-brown. Leaves lanceolate to oblong-lanceolate, or elliptic, apex shortly acuminate, base narrowed, (sub)coriaceous, lead-coloured above, brown beneath when dry, glabrous, entire to shallowly crenulate, 7–12(–17) by 3–5 cm, nerves 7–9(–10) pairs spreading, curved, distinct beneath only, reticulation dense, slightly raised beneath; petiole 0.5–1 cm. Racemes solitary, pendulous, spike-like, slender, 8–15(–22) cm, covered with a minute whitish tomentum, more densely so at edge of sepals and petals. Flowers white or yellowish, the sepals maybe suffused with red, 5–6-merous, in clusters of 2–5 rather interruptedly disposed along the rhachis; pedicels 1–1.5 mm. Calyx tube turbinate, short. Sepals oblong, 1.5–2 mm, hardly accrescent in fruit. Petals similar to the sepals, but a little narrower. Filaments glabrous. Styles 4 or 5, short, recurved.

Distribution. Peninsular Thailand, Malay Peninsula (type).

Peninsular. Narathiwat: Waeng, Sangkhachand & Nimanong 1235.

Ecology. In evergreen forest, locally common, 60–650 m, at low elevations.

Uses. Wood said to be very hard, used for constructions.

3. *Homalium tomentosum* (Vent.) Benth.

H. tomentosum (Vent.) Benth., J. Proc. Linn. Soc. Bot. 4 (1860) 34; Craib, Fl. Siam. En. 1 (1931) 742; Sleum., Fl. Males. I, 5 (1954) 52, f. 21 & 22. – *Blackwellia tomentosa* Vent., Choix (1803) 57, t. 57.

Deciduous tree, (5–)20–40 m tall; bole well-shaped, to 40 cm diam., buttressed; branches horizontal; innovations tomentose; bark thin, smooth, green under the whitish-grayish peeling epidermis. Leaves obovate to obovate-oblong, subsessile, apex rounded-obtuse or apiculate, cuneate towards the base, though very base rounded, subcoriaceous, shallowly and distantly glandular-crenate, softly tomentose, finally glabrescent above, (7–)10–15(–25) by 4–7(–13) cm, nerves strongly parallel, c. 12 pairs. Flowers small, greenish-yellowish, with a disagreeable smell, 5–6-merous, in 2–3(–5)-flowered glomerules spirally arranged along the stout yellowish-tomentose and pendulous rhachis 10–35 cm long. Calyx tube conical, tomentose. Sepals and petals linear-oblong, woolly, c. 1.5 mm. Filaments glabrous. Styles 2 or 3.

Distribution. India, Burma, Indochina, Thailand, W. Malesia (type).

Northern. Phitsanulok: Nakawn Tai, Kerr 5837. — Central. Saraburi: Sam Lan, Maxwell 74-565. — Southwestern. Kanchanaburi: Khao Buing, C.P. et al. 2973; Kanuyu, Kostermans 1196; Say Yok, Larsen 8817, Put 1823. Ratchaburi: Ratburi, Marcan 1759. — Southeastern. Chanthaburi: Tamun Chantabun, Kerr 9700.

Ecology. In mixed (deciduous) forest with bamboo, not rarely on calcareous soil and often on periodically dry ground, sometimes leafless for a few months in a dry period, at low elevations (rarely up to 700 m), locally common.

Uses. Wood hard, heavy, but not durable.

Vernacular names. Chang puak luang (Chiangmai), kha nang (or neng) in SW. Thailand.

4. *Homalium peninsulare* Sleum., *spec. nov.*

Arbor usque ad 10 m alta, trunco usque ad 30 cm diam. Ramuli sat graciles, 2–3 mm diam., in partibus novellis griseo-tomentelli, inferne glabrescentes. Folia oblonga usque ovato-oblonga, apice breviter attenuata vel subacuminata, ipso apice subacuta vel obtusata, basi late attenuata vel plerumque rotundata, firme chartacea, in sicco supra cinerascens-olivacea costaque excepta glabra et subnitida, subtus pallide brunnea et per totam faciem breviter griseo-velutina, tactu mollia, grosse glanduloso-crenata, 7–12 cm longa, 3–5.5 cm lata, costa nervisque supra sat planis, subtus bene prominentibus, lateralibus 8–10-paribus interque sese subparallelis et parum curvatis, reticulo venarum et venularum utrinque bene visibili; petioli tomentelli, 7–8 mm longi, 1.5–2 mm crassi. Paniculae axillares suberecti, graciles, 15–20 cm longi, interrupte sat densiflori, omnino griseo-tomentelli, ramis lateralibus 1–5 cm longis, pedunculo 3–5 cm longo. Flores 9–10-meri, sat parvi, pedicellis brevissimis. Calycis tubus turbiniformis, indistincte longitudinaliter costulatus, c. 2.5 mm longus. Sepala et petala subaequalia, anguste spathulata, extus dense, intus laxius brevipubescentia, ciliata, sub anthesi c. 2 mm longa, 0.2(–0.3) mm lata, maturitate haud cognita. Stamina ante petala unica; filamenta gracillima, basi laxepilosa, c. 0.3 mm longa. Glandulae minutae, velutinae. Ovarii caput conicum, dense pilosum; styli 3 breves, recurvati, basi pilosuli, c. 0.3 mm longi.

Apparently related to *H. nepalense* Wall., but the leaves densely short-hairy, and the flowers subsessile.

Peninsular. Surat Thani: on top of Khao Phra Rahu, limestone ridge at km 44 of the road from Surat to Takuapa, 300 m, fl. whitish, 22-9-1963, *T. Smitinand & H. Sleumer 1228* (L, type; A, BKF, BO, C, G, K, P, SING, iso).

5. *Homalium protectum* Sleum., *spec. nov.*

H. dasyanthum auct., non (Turcz.) Warb.; Craib, Fl. Siam. En. 1 (1931) 739, p. p. minore.

Arbor gracilis usque ad 10 m alta. Ramuli novelli citissime corticati. Folia obovato-elliptica usque elliptica, apice breviter obtuse subacuminata, interdum obtusa et

rotundata, basi in petiolum subcuneato-attenuata, subcoriacea, in sicco sordide griseo-brunnescentia et opaca, glabra sed subtus interdum sat obscure domatiigera, leviter subserrato-crenata, 6–9(–13) cm longa, 3–5(–6) cm lata, costa supra leviter, nervis parce vel vix depressis, subtus bene prominentibus, nervis lateralibus 5–7-pari-bus subrecte arcuato-ascendentibus, venis utrinque elevatulis vel planis, venulis sat obscuris; petioli glabri, 4–5 mm longi, c. 1 mm crassi. Racemi ex axillis superioribus 2–4 orti, ascendentes, graciles, solitarii, laxiflori, omnino flavescenti-tomentosuli, 7–9(–12) cm longi. Flores albido-virescentes, secus rhachem distanter dispositi, generaliter solitarii, interdum 2 vel 3 subfasciculati, (5–)6–7(–8)-meri; pedicelli graciles sub anthesi fructuque 2–3 mm longi, bracteolis subulatis brevibus caducis fulti. Calycis tubus iam sub anthesi elongatus quasi in pedicellum protractus, sicut rhachis et pedicelli dense pilosus. Sepala anguste oblonga, c. 1.3 mm longa, 0.5 mm lata, ciliata, sed in facie glabra, sub fructu usque ad 3 mm accrescentia. Petala anguste obovato-oblonga, distincte nervulosa, tenerrima, ciliata, ceterum glabra, 2.5–3 mm longa, 1 mm lata, sub fructu 5 mm longa, 1.5 mm lata. Stamina normaliter ante quodque petalum duo, rariter pro parte singula, cum glandulis pilosis alternantia, sub anthesi bene exserta; antherae minutae; styli 3 vel 4, graciles, elongati, erecti, sub fructu c. 4 mm longi.

Close to *H. dasyanthum* (Turcz.) Warb., but differing by the characters mentioned in the key.

Northeastern. Udon Thani: Sakon, Wanawn, Kerr 8508. – Southeastern. Prachin Buri: Hao Suwat Falls, Khao Yai, 650 m, Larsen 10716. – Eastern. Nakhon Ratchasima (border with Prachinburi): Khao Yai National Park, 1100 m, Phengklai 561, Smitinand 7475; *ibid.*, Khao Khieo, 1100 m, fl. 7-1963, Larsen 10650; *ibid.*, Khao Khieo, 1300 m, fr. 8-1963, *T. Smitinand & H. Sleumer 8336* (L, type; BKF, iso). – Southwestern. Ratchaburi: Bangtapan, Put 1428.

6. *Homalium dasyanthum* (Turcz.) Warb.

H. dasyanthum (Turcz.) Warb. in E. & P., Nat. Pfl. Fam. ed. 1, III, 6a (1893) 36; Craib, Fl. Siam. En. 1 (1931) 739, p. p. maiore; Sleum., Fl. Males. I, 5 (1954) 56, f. 25d & e; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 93, pl. X, 11–18; Whitm., Tree Fl. Malaya 2 (1973) 145. – *Blackwellia dasyantha* Turcz., Bull. Soc. Nat. Moscou 36 (1863) 610.

Tree 4–12 (rarely –30) m tall; trunk 10–20 (rarely –70) cm diam.; young parts softly tawny-pubescent; bark thin, grayish, smooth to rugose, slipping off in bands. Leaves ovate- or obovate-oblong, shortly and bluntly acuminate, narrowed to the rounded or subcordate base, sometimes inequilateral, thin-chartaceous, subentire to coarsely (5 mm) crenate, younger ones sparsely pubescent on both faces, sometimes more densely pubescent to tomentose especially on midrib and nerves beneath, at maturity ± glabrescent but subpersistently pubescent on midrib and nerves, rarely entirely glabrescent, domatiigerous, 5–12 by 3–5.5 cm, nerves 5–7 pairs spreading, slightly curved, little prominent beneath, veins rather obscure; petiole tawny-tomentose, 4–5 mm. Racemes spiciform, solitary, slender, 8–12 cm, all over softly tawny-tomentose. Flowers (9–)10–12-merous, greenish-yellow or white, scented, in spaced

± whorled 2–4-flowered fascicles along the rhachis; pedicels 2–3 mm. Calyx tube obconical, c. 3 mm. Sepals triangular-linear, subacute, 2 mm. Petals oblong-obovate, spreading, hirsute or covered with tawny spreading hairs especially at apex, 2.5–3 by 1.2 mm. Filaments glabrous. Styles c. 5.

Distribution. Indochina, Lower Burma (type), Peninsular Thailand, Malay Peninsula.

Peninsular. Chumphon: Kaw Wieng, Kerr 11380. Ranong: Haniff 366; Tungsong, Khao Chem, Rabil 113. Surat Thani: Kaw Pangan, Put 767; Kaw Samui, Kerr 12544, Put 1276, 1321; Tung Luang, Kerr 12513. Phangnga: Kao Katakam, Kerr 18509; Pulau Panjii, Haniff & Nur 4065. Krabi: Kerr 18838; Kaw Pu, Kerr 18952, 18967. Phuket: Pa Klok, Niyondham et al. 194; Thalang, van Beusekom & Phengkklai 660. Nakhon Si Thammarat: Kao Lawng, Thaworn 1020. Trang: Kunstler 1393. Satun: Adang Island, Kerr 14087, 14150; Dong Chueak Chang, Smitinand 7174; Kao Kwang (Kuan Po), Kerr 13783; Rawei, Ridley 15744; Thung Nui, Suvanakoses 1642. Songkhla: Anandale 1671, Gwynne-Vaughan 367, Kerr 15118; Kao Keo, Kerr 15921; Kuan Nieng, Kerr 14269; Wang Yai, Kerr 14769.

Ecology. In evergreen or mixed deciduous forest, also on limestone hills, often along stream, at low elevations close to the coast.

Vernacular names. Pha uek, khaok kwang.

7. *Homalium caryophyllaceum* (Zoll. & Mor.) Benth.

H. caryophyllaceum (Zoll. & Mor.) Benth., J. Proc. Linn. Soc. Bot. 4 (1860) 38; Craib, Fl. Siam. En. 1 (1931) 738; Sleum., Fl. Males. I, 5 (1954) 58, f. 25a–c; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 97, pl. X, 1–10; Whitm., Tree Fl. Malaya 2 (1973) 145, in key. – *Blackwellia caryophyllacea* Zoll. & Mor., Syst. Verz. (1846) 33.

Tree, 4–10(–15) m tall, sometimes shrub; bark gray, smooth. Leaves elliptic to elliptic-oblong, rarely ovate-oblong, shortly obtusely acuminate, base broadly cuneate to almost rounded, (sub)coriaceous, shining, entire or slightly coarsely crenate-serrate, glabrous or sparsely pubescent beneath, 7–16(–19) by (3–)4–7(–10) cm, nerves 7 or 8 pairs curved-ascending and anastomosing, prominent beneath, reticulation distinct especially beneath; petiole 2–3(–5) mm. Racemes simple or rarely 2- or 3-branched above the base, rather stiff, all over sparsely pubescent, 7–10(–15) cm. Flowers 5–6-merous, subsessile, solitary, or in fascicles of 2–5, white, red-brown when dry, slightly scented. Calyx tube elongate, (4–)5–6 mm. Sepals oblong-ovate, 2.5 mm. Petals similar to the sepals but slightly longer and more densely grayish-tomentulose. Stamens in fascicles of 3 or 4; filaments glabrous. Styles 4–5(–7), hardly or not exerted.

Distribution. Indochina, Thailand, Malay Peninsula, and in Malesia (type), E to Celebes.

Northeastern. Kalasin: Sela Phum, Smitinand 11659. – Southeastern. Trat: Dee 116. – Peninsular. Surat Thani: Na Sarn, Thaworn 463. Nakhon Si Thammarat: Kuan Krot, Vanpruk 716; Patalung, Vanpruk 762. Songkhla: Kuan Nieng, Kerr 14661.

Ecology. Scattered in dry evergreen forest at low elevations.

Vernacular names. Neng; phlom kod (Trat).

8. *Homalium undulatum* King

H. undulatum King, J. As. Soc. Beng. 67, ii (1898) 23; Sleum., Fl. Males. I, 5 (1954) 61; Whitm., Tree Fl. Malaya 2 (1973) 145, in key.

H. verruculosum Craib, Kew Bull. (1928) 239; Fl. Siam. En. 1 (1931) 742.

Tree, 10–20 (rarely –30) m tall; bark brown. Leaves elliptic to oblong-elliptic, rarely oblanceolate, shortly obtusely acuminate, base narrowed and sometimes unequal, subcoriaceous, shining above, shallowly crenate, 6–10 by (2.5–)4–5 cm, nerves 8–10 pairs, little prominent, reticulation of veins and veinlets finely raised on both faces; petiole 3–5(–7) mm. Panicles 7–10 cm, composed of several racemes (the lower ones from the uppermost leaf-axils); rhachis slender, sparsely hairy. Flowers 5–6-merous, greenish-yellow with a silvery tinge, tomentulose, laxly arranged along rhachis; pedicels slender, 4–5(–8) mm. Calyx tube infundibuliform, 2 mm at anthesis. Sepals lanceolate, obtuse, 4 by 1.5 mm, gray-tomentulose on both faces. Petals obovate, tomentulose, 5 by 3 mm, somewhat accrescent after anthesis. Stamens 4 or 5 before each petal; filaments pubescent below, glabrous above. Styles 3, rather short.

Distribution. Thailand, Malay Peninsula (type).

Peninsular. Surat Thani: Takanawan, Kerr 12330 (type of *H. verruculosum*, BM, K); Yan-yao, Kerr 18233. Krabi: Nong Khon, Sangkhachand 1012. Nakhon Si Thammarat: Kao Kai Charng, Plerchit 528; Tungsong, Kao Chem, Rabil 105; Lan Saka, Khao Kai Chang, Suvanakoses 528.

Ecology. In evergreen forest, at low elevations (to 400 m), locally common.

Vernacular names. Daeng khao (Plerchit 528), neng (Rabil 105).

9. *Homalium dictyoneurum* (Hance) Warb.

H. dictyoneurum (Hance) Warb. in E. & P., Nat. Pfl. Fam. ed. 1, III, 6a (1893) 36; Craib, Fl. Siam. En. 1 (1931) 740; Sleum., Fl. Males. I, 5 (1958) 565 (Addenda); Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 92; Whitm., Tree Fl. Malaya 2 (1973) 146, f. 4a. – *Pierrea dictyoneura* Hance, J. Bot. 15 (1877) 339.

Tree 15–36 m tall, with small steep buttresses; bark yellowish-brown to grayish-blackish, smooth. Leaves ovate-oblong, obtusely acuminate, base broadly attenuate to rounded, coriaceous, glabrous, shining, olivaceous when dry, 10–18 by 4–7(–9) cm, entire, nerves 8–10 pairs, curved, prominent on both faces as is the midrib, veins transverse, reticulation finely prominent on both faces; petiole stout, 1–1.5 cm. Racemes spiciform, often condensed to panicles, rather robust, all over fulvous-tomentulose, 15–20 cm. Flowers 9–10-merous, greenish-white, spaced along rhachis, with several persistent obovate-fan-shaped basal bracts 5–6 mm diam.; pedicels 2–3 mm. Calyx tube obconical, 3 mm. Sepals linear, c. 8 by 2 mm initially, much accrescent and becoming chartaceous in later stages, finally oblong-subspathulate and 15–18 by 3–4(–5) mm. Petals oblong, subacute, velutinous, 5–6 by 2 mm at first, finally accrescent to c. 10 by 3 mm. Stamens 6, more or less in pairs at and somewhat above

the base of each petal, furthermore 2 or 3 between each gland; filaments patently hairy. Styles 5–7.

Distribution. Indochina (type), Thailand, Malay Peninsula.

Southeastern. Chanthaburi: Krat, Bunchuai 4, Kerr 17648; Takum, Kerr 17860.

Ecology. In evergreen forest, sometimes on limestone, locally common, at low elevations.

10. *Homalium glabrifolium* Geddes

H. glabrifolium Geddes, Kew Bull. (1928) 238; Craib, Fl. Siam. En. 1 (1931) 740.

Tree 4–6 m tall. Leaves ovate-lanceolate to -oblong, apex gradually attenuate or obtusely acuminate, base cuneate and distinctly narrowed to the petiole, glabrous, gray-olivaceous when dry, shining, entire, 6.5–10 by 2.5–4 cm, nerves 9 or 10 pairs, prominent on both faces as is the dense reticulation; petiole 8–10 mm. Racemes sub-erect, rather slender, minutely pubescent. Flowers 7-merous, sessile, whitish-yellowish, scented, scattered along the rachis. Calyx tube short, gray-tomentellous, c. 1.5 mm. Sepals oblong, veined, short-pubescent, at anthesis c. 3 by 1.5 mm, becoming sub-spathulate and accrescent to 5–6 by 1.5 mm. Petals ovate-lanceolate, pubescent, 2.5 by 1.5 mm, accrescent to 5–6 by 2 mm. Stamens 6, of which 5 at and on the base of each petal, and one between the glands; filaments glabrous. Styles 3–5.

Distribution. Southwestern Thailand, only known from the Upper Kwa Noi River basin.

Southwestern. Kanchanaburi: Wangka, Kerr 10475 (K, type); Tripagodas pass, Kasin 183, 183a.

Ecology. On limestone rocks, 200–280 m.

11. *Homalium grandiflorum* Benth.

H. grandiflorum Benth., J. Proc. Linn. Soc. Bot. 4 (1860) 36; Craib, Fl. Siam. En. 1 (1931) 741; Sleum., Fl. Males. I, 5 (1954) 62; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 91; Whitm., Tree Fl. Malaya 2 (1973) 146, f. 4b.

H. damrongianum Craib, Kew Bull. (1915) 429; Fl. Siam. En. 1 (1931) 739.

var. *grandiflorum*

Buttressed tree 10–20(–30) m tall; outer bark pinkish gray to grayish-brown, inner one dark orange. Leaves ovate-elliptic to elliptic-oblong, shortly obtusely acuminate, base narrowed to the petiole or rounded, red in flush, gray-olivaceous when dry, glabrous, shining, rather coriaceous, (sub)entire, (7–)10–15 (sometimes –37) by 3–7(–10, sometimes –15) cm, nerves 7–12(–14) pairs, reticulation distinct on both faces; petiole stout, 4–6(–15) mm. Racemes simple or sometimes short-branched, 5–10(–20) cm, with the flowers scattered along the rather slender hairy rachis. Flowers mostly solitary, (5–)6–8(–9)-merous, yellowish, scented; bracts

lanceolate-oblong, glabrescent, 4–5 mm, caducous. Calyx tube turbinate, tomentose, 3 mm at anthesis, accrescent to 6 mm in fruit. Sepals oblong, subacute, 5–6 mm at anthesis, becoming stellately spreading and accrescent to 10–16 by 4 mm, nerved and glabrescent. Petals triangular-oblong, 3–4 mm, otherwise similar to the sepals, accrescent to 8 mm, finally curved over the ovary. Stamens (4–)6–12 before each petal, of which 1–3 between the disk glands; filaments hairy. Styles 5–8, short.

Distribution. Indochina, Thailand, Lower Burma, Malay Peninsula (type), W. Malesia.

Northern. Lamphun: Me Kaw, Winit 199. Lampang: Me Saloi, Winit 1272; Pang Pue and Pa Hin, Kerr 3168 (K, type of *H. damrongianum*). Phrae: Vat Chom Sawan, BKF 54. Phitsanulok: Nakawn Tai, Kerr 5878, 8896. Nakhon Sawan: Me Ping Rapids, Kerr 2954. – North-eastern. Phetchabun: Chon Den, Kerr 20400; Wang Tada, Kerr 20374. – Eastern. Chaiyaphum: Nawng Bua Deng, Kerr 20298. – Southwestern. Kanchanaburi: Kanburi, Kerr 10600; Sai Yok, Sangkhanachand 812.

Ecology. In evergreen and deciduous forest, also in dry dipterocarp forest, locally common, at low elevations.

Uses. Wood hard, difficult to work, used for constructions.

2. HYDNOCARPUS Gaertn.

KEY TO THE SPECIES

- 1a. Petals 4, 8, or 10–12(–13). Sepals 4, 5, or 7–10(–11). Stamens more than 5 2
 b. Petals 5. Sepals 5. Stamens 5. (Fruit globose, the exocarp formed by compact stone-cell groups) 6
- 2a. Petals 4. Leaves serrate or shallowly crenate. (Fruit globose, the thin exocarp formed by compact stone-cell groups) 1. *H. ilicifolia*
 b. Petals 8–12(–13). Leaves (sub)entire. Exocarp thick, fibrous-cancelled 3
- 3a. Fruit narrowly ovoid-ellipsoid, attenuate at both ends, apex markedly beaked
 2. *H. wrayi*
 b. Fruit globose, or ovoid-conical, not beaked properly 4
- 4a. Filaments glabrous. Leaves pubescent initially
 3. *H. macrocarpa* subsp. *burmanica*
 b. Filaments densely hairy. Leaves (sub)glabrous from the beginning 5
- 5a. Fruit globose 4. *H. kurzii* subsp. *australis*
 b. Fruit ovoid-conical 4. *H. kurzii* var. *conica*
- 6a. Leaves \pm distinctly subserrate-crenate. Anthers subquadrangular, the cells divergent or separated from each other by the thickened connective. (Inflorescence supra-axillary for 3–5 mm. Stipules persistent for a long time. Fruit globose, subapiculate, 2.5–3.5 cm diam.) 5. *H. nana*
 b. Leaves \pm entire. Anthers oblong to cordate-oblong, the cells parallel, connate, connective neither thickened nor dilated 7

7a. Leaves ovate-lanceolate or ovate-oblong, base markedly inequilateral, olivaceous when dry above, nerves 8–10 pairs. Fruit globose, (8–)10–12 cm diam.

6. *H. anthelminthica*

b. Leaves elliptic-oblong or oblong, base \pm equilateral, red-brown when dry, nerves 6–7(–8) pairs. Fruit globose or depressedly so, (4–)5–6.5 cm diam.

7. *H. castanea*

1. *Hydnocarpus ilicifolia* King

H. ilicifolia King, Ann. Roy. Bot. Gard. Calc. 5 (1896) 130, t. 151; Ridley, J. Str. Br. Roy. As. Soc. 59 (1911) 72; Craib, Fl. Siam. En. 1 (1925) 96; Sleum., Fl. Males. I, 5 (1954) 19; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 16, pl. II, 1–7; Whitm., Tree Fl. Malaya 2 (1973) 149, in key.

H. serrata (Pierre) Warb. in E. & P., Nat. Pfl. Fam. ed. 1, III, 6a (1893) 21; Craib, Fl. Siam. En. 1 (1925) 98.

Dioecious tree (5–)10–35 m tall, sometimes bushy; trunk smooth; outer bark gray, 0.5 cm thick, inner one yellowish. Leaves oblong or lanceolately so, rather variable in shape and size, apex attenuate or subacuminate, base cuneate to almost rounded, (sub)coriaceous, glabrous, remotely dentate or serrate, rarely subentire, (7.5–)9–16 by 3–6(–7.5) cm, nerves 7–10 pairs, prominent on both faces as is the distinct reticulation; petiole 0.6–1.5 cm. Cymes corymbose, few-flowered, all over appressedly rusty-pubescent; peduncle c. 1.5 cm, and the 2 or 3 branches 0.5–1 cm; pedicels 5–6 mm. Flowers whitish to greenish-yellowish, scented. Sepals almost rounded, 4 mm. Petals oblong, apex truncate and ciliate, subglabrous outside, with a subquadrangular scale inside half their length. Male: stamens 14–20; filaments short, pubescent. Female: staminodes c. 15. Ovary with 4 radiate truncate stigmas. Fruit globose, rusty to blackish-brownish velvety, 4–5(–8) cm diam.; exocarp 0.2 mm; stony mesocarp 1–1.2 mm.

Distribution. Indochina, Thailand, Malay Peninsula (type).

Northern. Phrae: Hui Pong Kalong, Vanpruk 351; Me Kawn, Winit 1668. Phitsanulok: Nakawn Tai, Kerr 5851; Utaradit, Kerr 5889; Tung Salaeng Luang, Larsen et al. 623. Nakhon Sawan: Kerr 6017, 6017a, 6017b; Ban Takli, Marcan 1109. – Northeastern. Udorn Thani: Udawn, Kerr 8595, 8595a. – Eastern. Chaiyaphum: Dat Don, Larsen et al. 31764. Nakhon Ratchasima: van Beusekom et al. 3337, R.M. King 5527; Khao Yai Nat. Park, Larsen et al. 3275; Nangrawng, van Steenis 19575. – Central. Saraburi: Menam Sak, Kerr 7045; Sam Lan, Muang, Geesink et al. 6778, 6802, Maxwell 76-3; Phu Khae, Smitinand 1542, 1544. – Southwestern. Uthai Thani: Ban Rai, Sangkhachand 1000. Ratchaburi: Pran, Pierre 2784 (P, type of *Taraktogenos serrata* Pierre ex Gagnep.). Prachuap Khiri Khan: van Beusekom & Santisuk 2723, 2750, Kerr 11006, 13510; Nam Tok, Shimizu et al. 7732. – Southeastern. Kanchanaburi: Kin Sayok, Kostermans 1007. Prachinburi: Nawng Kaw, Collins 631; Sriracha, Collins 112, 228. Chonburi: Canburi, Pong Nam Rawn, Dee Bumpheng 1071; Soi Dao, Sangkhachand 6. Chantaburi: Kow Kieo, Maxwell 74-1107. Trat: Dan Chumpon, Kerr 17637. – Peninsular. Surat Thani: Promdej et al. 260; Ban Na, Kerr 19339; Kaw Samui, Kerr 12595; Kaw Tao, Kerr 11126. Nakhon Si Thammarat: Kao Luang, Geesink & Santisuk 5478. Phattalung: Kao Oktala, Kerr 15342. Phuket: Ao Sane beach, Niyomdham et al. 268. Trang: Kao Wang, Rabil 344. Pattani: Bachaw, Kerr 7156; Banang Sta, Kerr 7156a. Narathiwat: Bacho, Kiah SF 24303, Sangkhachand 160. Satun: Koh Terutao, Geesink et al. 7305.

Ecology. In wet or dry evergreen, rarely deciduous forest, also secondary forest, on rocky limestone or occasionally on granite boulders, from sealevel to c. 800 m, locally common.

Vernacular names. Hua kang, kanbua, k(r)abao, k. klak, k. ling, krabin.

2. *Hydnocarpus wrayi* King

H. wrayi King, J. As. Soc. Beng. 59, ii (1890) 121; Sleum., Fl. Males. I, 5 (1954) 22; Whitm., Tree Fl. Malaya 2 (1973) 149, in key.

H. calvipetala Craib, Kew Bull. (1928) 234; Sleum., Fl. Males. I, 5 (1954) 30.

Taraktogenos calvipetala Kerr, The Record, Techn. & Sc. (Bangkok) Suppl. 7 (1930) 13.

Dioecious tree, (8–)10–15(–21) m tall; branchlets pubescent initially. Leaves elliptic-oblong to oblong, apex shortly cuspidate, base broadly cuneate to almost rounded, slightly inequilateral, (sub)coriaceous, firm, entire, glabrous and somewhat shining above, short-pubescent mainly on midrib and lateral nerves beneath, drying pale to mid-brown, (12–)20–25 by (5–)8–12.5 cm, lateral nerves 8–9(–10) pairs steeply ascending, veins distantly transverse and reticulate; petiole stout, 1–1.5(–2) cm. Flowers white or greenish, the male in few-flowered short-peduncled cymes; pedicels c. 4 mm. Sepals 4 (or 5), subrotundate, pubescent or glabrescent outside, c. 6 mm diam. Petals (7–)8(–10), broadly oblong, glabrous, ciliolate, 4 mm; scales thick, erose, hirsute. Stamens 15–17; filaments glabrous. Female flowers solitary or in twos; pedicels 7 mm. Sepals, petals and scales as in male flowers. Ovary fulvous-velvety; stigmas 5, large, dilatate. Fruit narrowly ovoid-elliptic, attenuate at both ends, apex markedly beaked, fulvous-velvety, in the dry state often longitudinally sulcate, 7–8(–10) by 4–5.5 cm; pericarp (exocarp and mesocarp) fibrous-cancelled, 3(–5) mm thick.

Distribution. Southern Thailand, Malay Peninsula (type).

Peninsular. Ranong: La-Un, Kerr 16518. Surat Thani: Langsuan, Ban Krage, Kerr 11994 (K, type of *H. calvipetala*). Pattani: Bukit Nan, Toh Moh, Lakshnakara 629. Narathiwat: Sungei Kolok, Nikom Waeng, Larsen & Larsen 33024.

Ecology. In evergreen forest, on hillsides, at low elevations.

3. *Hydnocarpus macrocarpa* (Bedd.) Warb.

subsp. *burmanica* Sleum.

H. macrocarpa subsp. *burmanica* Sleum., Bot. Jahrb. 69 (1938) 29; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 22.

Dioecious tree, 15–20(–30) m tall; bark gray. Branchlets velutinous. Leaves oblong, shortly and rather abruptly acutely acuminate, base cuneate to obtuse, distinctly inequilateral, coriaceous, covered with a fulvous strigose indument on midrib and nerves mainly beneath, glabrescent with age, entire, (15–)20–30 by (5–)6.5–

8(-11) cm, nerves 8-9(-10) pairs, prominent as is the midrib beneath, veins transverse, reticulation coarse, slightly raised beneath; petiole swollen distally, 1.5-2(-3) cm. Flowers white, fragrant, the male ones in short few-flowered cymes from young branchlets, all over rufous-ferruginous-velutinous; peduncle very short; pedicels 6-8 mm. Sepals 4, orbicular, 8(-10) mm diam. Petals 12 (or 13), suborbicular to obovate-oblong, glabrous, ciliate, 6-7 by 4 mm, the basal scale fleshy, rufous-pilose, irregularly 3-lobed, attaining c. $\frac{1}{2}$ - $\frac{3}{4}$ the length of the petals. Stamens (40-)50-60 (-70); filaments glabrous. Female flowers from older parts of the branchlets; cymes few-flowered, the flowers slightly larger than in the male ones. Ovary fuscous-tomentose. Fruit globose, brown, early glabrescent and becoming rugose, 12-15 cm diam.; exocarp fibrose, 1(-1.5) cm thick; mesocarp woody, 2-3 mm thick. Seeds c. 50, compact, variously angled, up to 3.5 by 2 cm.

Distribution. Upper Burma (type), Lower Burma, Southern Thailand, South Vietnam.

Southwestern. Kanchanaburi: Khao Yai, E of Sangkhla, van Beusekom & Phengkai 297. - Peninsular. Ranong: Kao Pawta, Chongdong, Kerr 16817; *ibid.*, Luang Keo, Kerr 16893, 16894; between Kampuan and Kapur, Smitinand 4165.

Ecology. Scattered in evergreen forest at elevations up to 900 m.

4. *Hydnocarpus kurzii* (King) Warb.

subsp. *australis* Sleum.

H. kurzii subsp. *australis* Sleum., Bot. Jahrb. 69 (1938) 23; Fl. Males. I, 5 (1954) 21; Whitm., Tree Fl. Malaya 2 (1973) 150, in key. - *Taraktogenos kurzii* auct., non King s. str.; Craib, Fl. Siam. En. 1 (1925) 97.

Dioecious tree, 8-20(-30) m tall; bark smooth. Branchlets fulvous-pubescent at tips. Leaves lanceolate-oblong, shortly rather suddenly subacuminate, base cuneate, equilateral, subcoriaceous, entire, glabrous, olivaceous when dry, somewhat shining, 15-22(-32) by 4-6.5(-8) cm, nerves 7-8(-9) pairs, other intercalary ones \pm distinct, suberect, veins transverse, reticulation prominent beneath; petiole thickened at apex, 1.2-1.6 cm. Cymes short, 5-7(-9)-flowered, all over rather densely fulvous-substrigose-pubescent; peduncle 0.4-1.5 cm; pedicels 0.5-1 cm. Flowers whitish, with unpleasant odour. Male: sepals 4, ovate-rotundate, 5 by 4 mm. Petals 8, broadly ovate, ciliate, 4 mm, the basal scales fleshy, ciliate, c. 2 mm. Stamens (15-)18-25(-30); filaments densely hairy. Female flowers in few-flowered cymes; pedicels 1.5 cm. Sepals and petals a little larger than in the male ones. Staminodes 10-16. Ovary fulvous-tomentose. Fruit globose, rugose, laxly to rather densely covered with dark brown lenticel-like rounded tubercles and brownish hairy dots, (5-)8-10 cm diam.; exocarp fibrose-cancellate, 3-4(-6) mm thick; peduncle thick, 0.6-1.5 cm. Seeds angular-ovoid, 3 by 1.5 cm.

Distribution. Lower Burma (type), Thailand, Malay Peninsula.

Northern. Nan: Hui Sala, Kerr 5076. Lamphun: Me Peng, Winit 1931. Phrae: van Beusekom et al. 4629. Tak: Doi Pae Poe, Hansen & Smitinand 12928; Huai Krasa, Hansen & Smitinand 12966, 12994. – Peninsular. Phangna: Nop Pring, Kerr 18538. Nakhon Si Thammarat: Chawng, Tawon 981; Kao Luang, van Beusekom & Phengkklai 900. Phattalung: Kao Soi Dao, Kerr 19219. Pattani: Kao Kala Kiri, Kerr 15038.

Ecology. Scattered in evergreen forest, 600–1800 m.

var. conica Craib

H. kurzii var. *conica* Craib, Fl. Siam. En. 1 (1925) 97; Sleum., Bot. Jahrb. 69 (1938) 23.

Fruit ovoid, apex conical.

Distribution. Only known from Thailand, not recollected yet.

Northern. Nan: Pu Huat, Kerr 4990 (K, type).

Ecology. In evergreen forest, c. 1600 m.

5. *Hydnocarpus nana* King

H. nana King, J. As. Soc. Beng. 59, ii (1890) 118; Sleum., Fl. Males. I, 5 (1954) 24; Whitm., Tree Fl. Malaya 2 (1973) 149, in key.

Dioecious bush or pole-like treelet, to 6 m tall; stem to 7 cm diam.; bark blackish-gray; branchlets rusty-pilose. Leaves subovate- to lanceolate-oblong, elongately acuminate and slightly curved at apex, cuneate to rounded at the markedly inequilateral base, chartaceous to subcoriaceous, serrulate (c. 1 mm), rusty-pubescent at midrib and nerves mainly beneath, sometimes almost entirely glabrescent with age, 6.5–12.5 by 2–4(–6) cm, nerves 5–8 pairs, curved-ascending and looping near edge, mostly prominent beneath as is the midrib, veins \pm transverse, reticulation lax to obscure; petiole 3–5(–8) mm; stipules subovate-lanceolate, acute, 5–7 mm, finally caducous. Inflorescences supra-axillary for 2–3 mm, male ones in 2-branched racemes; peduncle c. 5 mm, flowering branches each with 3 or 4 biseriolate white flowers; pedicel very slender, c. 3 mm. Sepals roundish, subglabrous, 2 mm. Petals oblong, sericeous outside, 1.5 mm; scales oblong, 0.7 mm, white-villous. Stamens 5; filaments hairy. Female flowers solitary; pedicels 10 mm. Sepals and petals as in the male flowers. Ovary yellowish-tomentose. Fruit globose, somewhat apiculate or depressed, minutely rugose, greenish-brownish velvety, (2.5–)3–4 cm diam.; stony exocarp thin, brittle, c. 0.5 mm. Seeds 2–4, plano-convex, 1–1.2 cm long.

Distribution. Southern Thailand, Malay Peninsula (type).

Peninsular. Phangnga: Takua Pa, van Beusekom & Phengkklai 724. Ranong: Khlong Naka, Geesink et al. 7384; Kao Po Ta Luang, Kaew, Niyomdham et al. 338.

Ecology. In light evergreen, also secondary or disturbed wet forest, on sandstone hillsides, at low elevations.

6. *Hydnocarpus anthelminthica* Pierre ex Lanessan

H. anthelminthica Pierre ex Lanessan [Pl. Util. Colon. Franç. (1896) 303] ap. Gagnep., Bull. Soc. Bot. Fr. 55 (1908) 523; Craib, Fl. Siam. En. 1 (1925) 95; Sleum., Bot. Jahrb. 69 (1938) 44; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 20, pl. I, 8–10.

Dioecious tree, 10–20(–30) m tall; outer bark lenticellate, grayish-black, inner one brown. Leaves ovate-lanceolate to -oblong, sometimes elongately so, apex gradually long-attenuate, base cuneate to rounded-obtuse, usually markedly inequilateral, coriaceous, glabrous, lead-coloured above, paler or yellowish beneath when dry, flush red, entire, 10–30 by 3–7 cm, nerves 8–10 pairs, curved-ascending, prominent mainly beneath as is the dense reticulation; petiole swollen distally, 1.2–1.5 cm. Cymes 2–3-branched, few-flowered; pedicels 1.5–3 cm. Flowers white, or greenish, scented. Male: sepals 5, ovate, pubescent on both faces, 8–9 mm. Petals ovate-oblong, glabrous, purplish, 1.2–1.4 cm; scales linear, almost as long as petals, ciliate, apex villose. Stamens 5; filaments glabrous. Female: sepals and petals as in the male; staminodia 5, fusiform. Ovary rufous-tomentose. Fruit globose, sometimes shortly umbonate distally, brownish-tomentulose and minutely verruculose, 8–12 cm diam.; seeds 30–50(–100), ovoid-compressed, 1.5–1.8 by 1–1.5 cm; exocarp 0.2 mm; mesocarp yellowish, very hard, 1.5–2 mm.

Distribution. Indochine (type), Thailand, also cultivated.

Northern. Chiang Mai: cultivated, Kerr 2924, 3264, Rock 1548, Winit 328. Nan: Doi Puka, Kerr 4951. Phitsanulok: Petchabun, Kerr 5683, 5720. Nakhon Sawan: Paknampo, cult., Kerr 3909. – Northeastern. Udon Thani: Nakawn Panom, Kerr 8416. Maha Sarakhan: Kosum Phisai, Smitinand 10443. – Eastern. Nakhon Ratchasima: Korat, Rock 497. – Central. Phra Nakhon: Bangkok, cult., Marcan 279, Rock 1189. Saraburi: Menam Sak, Kerr s.n. – Southeastern. Trat: Baw Rai, border with Cambodia, Kerr 9501; Kao Sabap, Kerr 18025. – Peninsular. Surat Thani: Pak Sai, Kerr 12494. Phuket: Ko Talibong, Hansen & Smitinand 12206. Satun: Khuan Kalong, Smitinand 7138.

Ecology. In evergreen forest, locally common along riverbank, at elevations up to 1300 m.

Uses. Wood brown, close-grained.

Vernacular names. K(r)abao, kalong.

7. *Hydnocarpus castanea* Hook. f. & Thoms.

H. castanea Hook. f. & Thoms., Fl. Br. India 1 (1872) 197; Craib, Fl. Siam. En. 1 (1925) 96; Sleum., Fl. Males. I, 5 (1954) 26; Whitm., Tree Fl. Malaya 2 (1973) 150, f. 6.

var. *castanea*

Dioecious tree, (10–)15–20(–30) m tall; bark pale whitish-gray or brownish-reddish, smooth to scaly. Leaves elliptic-oblong or oblong, apex attenuate to rather abruptly acuminate, base rounded, somewhat inequilateral, coriaceous, entire, often shining, drying chestnut-brown, (13–)17–30(–35) by (5–)6.5–8(–12) cm, nerves 6–7(–8) pairs, curved-ascending, prominent especially beneath, reticulation dense,

slightly though distinctly raised beneath; petiole stout, thickened at both ends, 1.5–2 cm; stipules caducous, leaving pale scars. Flowers white, sweet-scented, in few-flowered shortly peduncled cymes or in fascicles, all over rusty-pubescent; pedicels slender, 1–2.5 cm. Male: sepals obovate, 6–7 by 4–5 mm, tomentulose inside. Petals narrow-oblong, 8–11 by 3 mm, glabrous; scales linear, 7 by 1.5 mm, hairy distally. Stamens 5; filaments glabrous. Female: few per inflorescence, the sepals and petals similar to those in the male ones, but slightly longer. Ovary yellowish-tomentose. Fruit globose or depressedly so, smooth or minutely rugose towards maturity, rather scurfy, ochre-velvety, finally glabrescent, (4–)6–8 cm diam. Seeds 20–30, variously angled, 2.5–3.3 by 1.8–2.5 cm; mesocarp stony, 2–4(–8) mm; peduncle 2 by 1 cm.

Distribution. Tenasserim, Southern Thailand, Malay Peninsula (type), Sumatra, Borneo (Sarawak).

Southeastern. Chanthaburi: Doi Soi Dao, Geesink et al. 6695. – Peninsular. Surat Thani: King Panom, Kerr 18324. Nakhon Si Thammarat: Chawng, Thawon 731. Phattalung: Chawng, Kiah SF 24386, Sorensen et al. 678. Trang: Kao Chong, Maxwell 75-855, Phusomsaeng & Pinnin 63, Shimizu et al. 27461. Satun: Kuan P, Kerr 13822. Pattani: Betong, Kerr 7627; Klawng Wa, Kraburi, Kerr 16314.

Ecology. In evergreen forests, on hillsides, often along riverbanks, locally common, at low elevations.

Note. *Hydnocarpus curtisii* King, cited by Craib, Fl. Siam. En. 1 (1925) 96, does not occur in Thailand.

3. SCAPHOCALYX Ridley

Scaphocalyx spathacea Ridley

S. spathacea Ridley, J. Bot. 58 (1920) 149; Sleum., Fl. Males. I, 5 (1954) 35, f. 11 a–j; Whitm., Tree Fl. Malaya 2 (1973) 159, f. 11.

S. parviflora Ridley, J. Bot. 58 (1920) 149; Sleum., Fl. Males. I, 5 (1954) 35, f. 11 k–i.

Slender tree, 3–8(–15) m, or occasionally shrub c. 3 m tall, either dioecious or possibly protogynous and monoecious. Leaves elliptic to elliptic-oblong, apex shortly rather abruptly acuminate, base cuneate, equilateral and triplinerved at base, (sub)-coriaceous, glabrous, entire or subundulate, 15–20(–25) by 5–8.5 cm, intramarginal nerve very distinct, anastomosing with numerous lateral nerves which are ladder-like and spaced for 5–10 mm, all nerves prominent beneath, reticulation lax, less obvious; petiole stout, wrinkled both lengthwise and transversely in dry specimens, 10–15 mm. Flowers mostly in clusters on short woody knobs behind leaves, a few in leaf-axils, on pedicels to 3 cm. Calyx membranaceous, a closed spatha in bud, opening by splitting and folding back. Petals (4–)5(–7), oblong-lanceolate, bright yellow, becoming purplish when dry, with a strong penetrating scent with a slight overtone of cyanide, 1.5 cm, each petal with a basal narrow-triangular scale c. 5 mm in the

male, shorter in the female flowers. Male: stamens 5 or 6; filaments hairy. Female: staminodes 5 or 6; ovary hairy, with 3 or 4 spoon-like stigmas. Fruit roundish, or oblong and constricted in the middle, green to whitish, becoming brown when dry, velvety, finely warty, 2.5–5 cm diam.; pericarp 0.6 mm. Seeds 6–7(–10), packed in a yellowish juicy pulp, each with a greenish aril which exudes a milky juice, 1–1.5 by 0.6–0.8 cm.

Distribution. Southernmost Thailand, Malay Peninsula (type), Sumatra (Tapauli), and Borneo (Berouw). Monotypic.

Peninsular. Narathiwat: Waeng, Sangkhachand et al. 1079 (BKF 52001).

Ecology. Scattered in evergreen forest, on hillsides, often near stream, at low elevations.

4. RYPAROSA Bl.

KEY TO THE SPECIES

1a. Male and/or female inflorescences cauline, i.e. from distinct tubercles of the stem or old big branches, or both cauline and axillary. Leaves (24–)37–70 by (8–)13.5–17 cm, with 8–10(–12) pairs of lateral nerves. Fruit transverse-oblong, retuse at apex, glabrescent, minutely verrucose, 2 by 3 cm

1. *R. inconstans*

b. Male and female inflorescences axillary, i.e. always from the leaf-axils of young foliate or already defoliate branches. Leaves 12–22 by (3–)3.5–7 cm, with 4–5(–6) pairs of lateral nerves. Fruit globose or ovoid-subglobose, initially with a rusty tomentum which soon peels off, leaving the fruit glabrescent, minutely rugose and with whitish tubercles, 2–3 by 3–2 cm 2. *R. acuminata*

1. *Ryparosa inconstans* Craib

R. inconstans Craib, Kew Bull. (1926) 154; Sleum., Fl. Males. I, 5 (1954) 43.

Dioecious tree, 8–20 m tall. Branchlets appressed-ferruginous-pubescent when young, early glabrescent. Leaves oblong-oblong-elliptic, acuminate, submucronate at the very apex, cuneate to rounded at base, subcoriaceous, finely rusty-hairy beneath initially, early glabrescent, (24–)37–70 by (8–)13.5–17 cm, nerves 8–10(–12) pairs, little prominent above, more so beneath, conspicuously anastomosing at the edge, veins reticulate-prominent on both faces; petiole thick, to 7.5 cm long. Male flowers not known. Female racemes from branches, to 40 cm long, rhachis appressedly ferruginous-pubescent; pedicels 3–4 mm. Calyx lobes deltoid, obtuse, ferruginous-puberulous outside, 3.5 by 3 mm. Petals oblong, dorsally appressed-ferruginous-pubescent, inside sparsely hairy, 3 by 2 mm; scales hirsute, 2 mm. Ovary subglobose, attenuate at base, ferruginous-hirsute; stigmas 2 (rarely 3),

subsessile. Fruit transverse-oblong, retuse, c. 2 cm long, to 3 cm diam., initially rusty-brownish, verrucose, glabrescent, with 2 distant stigmas.

Distribution. Thailand, endemic, not recollected yet.

Peninsular. Pattani: Bachaw, fr., Kerr 7179 (K, type).

Ecology. In rain forest, 50–500 m. Fr. Dec.

Note. Close to *R. acuminata*, and possibly conspecific.

2. *Ryparosa acuminata* Merr.

R. acuminata Merr., Philip. J. Sc. 11 (March 1916) Bot. 100; Sleum., Fl. Males. I, 5 (1954) 48; Whitm., Tree Fl. Malaya 2 (1973) 159, in key.

R. wallichii Ridley, J. Str. Br. Roy. As. Soc. 73 (July 1916) 139; Sleum., Fl. Males. I, 5 (1954) 44.

Dioecious tree, 8–12(–20) m, rarely a large shrub. Branchlets at tips with a dense, dark rusty appressed-hirsute tomentum which conceals more or less the sparse pallid elongate-elliptic lenticels; older parts early glabrescent and covered with a thin whitish cork. Leaves oblong or lanceolate-oblong, apex shortly acutely acuminate, base cuneate, subcoriaceous, olivaceous, glabrous and shining above, dull and paler beneath, grayish- or yellowish-pruinose when dry, with scattered appressed hairs on the upper surface or practically glabrous there, laxly hairy on the undersurface, more densely so on midrib and nerves (the hairs spreading or mostly more or less appressed), 12–20(–22) by (3–)4–6(–8) cm, midrib slightly impressed above, strongly raised beneath, nerves suberect-ascending, (4–)5(–6) pairs, usually flat above, prominent beneath, reticulation rather dense and slightly raised mainly beneath; petiole densely rusty-hairy, later glabrescent at least at one side, (1.5–)2–3(–5) cm by (1–)1.5–2 mm, much thickened distally. Racemes axillary, spike-like, the male slender, 10–25(–30) cm, the female shorter and stoutish, all over covered with a dark rusty hirsute tomentum; pedicels c. 2 mm. Male: calyx light green or cream, the 3 lobes ovate-elliptic, appressed-ferruginous-hirsute outside, c. 2.5 mm. Petals 5, rather membranaceous, oblong-subacuminate, 2.5 by 1.2 mm; scale ovate, yellowish-villous, c. 1.2 mm. Female: ovary globose, ferruginous-tomentose, with 2 stigmas close together. Fruit ovoid-subglobose, initially pale rusty-tomentulose, glabrescent, finally glabrous, minutely rugose, with white tubercles or dots, 2–3 by 3–2 cm, with 2 much spaced stigmas; peduncle 2 mm. Seeds 2 or 3.

Distribution. Southeastern Thailand, Malay Peninsula, Borneo (type).

Southeastern. Chanthaburi: Kao Saming, Krat, fr., Kerr 17878 (BM, K, L); Kao Ma Kam, Chantabun, Lakshnakara 557, fr. (K, L). – Peninsular. Chumphon: Ta San, Kerr 16282. Trang: Kao Chong, Geesink et al. 7200.

Ecology. In mixed or evergreen, also gallery forest, at low elevations.

Vernacular name. Slod dong.

5. SCOLOPIA Schreb.

KEY TO THE SPECIES

- 1a. Leaves (all or at least most of them on the same branchlet) with 2 distinct orange (drying blackish) secretory glands at the very base of the lamina, or at the apex of the petiole 2
- b. Leaves without such a distinct basal gland, at most sometimes with one or two small glands on descending dentation on the leaf margin near the insertion of the petiole 4
- 2a. Extrastaminal disk glands absent. (Leaves with 4–6 pairs of lateral nerves, the basal pair sometimes markedly curved-ascending). Berry 1.5–2.5 cm
1. *S. spinosa*
- b. Extrastaminal disk glands distinct 3
- 3a. Leaves ovate or ovate-elliptic to lanceolate, tapering to an acute apex; nerves 6–8 pairs, a little or not prominent beneath. Rhachis and pedicels coarsely rusty-tomentose 2. *S. macrophylla*
- b. Leaves elliptic to orbicular- or oblong-elliptic, apex shortly subacuminate or rounded; nerves 3–5(–6) pairs, slightly though distinctly prominent beneath. Rhachis and pedicels patently puberulous 3. *S. chinensis*
- 4a. Leaves elliptic-lanceolate or lanceolate, (6–)9–12 by 3–4.5 cm; nerves 5–6 (–8) pairs. Racemes 2–3 (very rarely –6)-flowered; rhachis to 1 cm 4. *S. lucida*
- b. Leaves elliptic to obovate, *Buxus*-like, 1.5–4(–5) by (0.5–)1–2 cm; nerves 2–3(–5) pairs. Racemes few-flowered; rhachis 1.5–2 cm 5. *S. buxifolia*

1. *Scolopia spinosa* (Roxb.) Warb.

S. spinosa (Roxb.) Warb. in E. & P., Nat. Pfl. Fam. ed. 1, III, 6a (1893) 29; Craib, Fl. Siam. En. 1 (1925) 94; Sleum., Fl. Males. I, 5 (1954) 10, f. 2 & 3; Dansk Bot. Ark. 27 (1969) 89; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 27; Sleum., Blumea 20 (1972) 31; Whitm., Tree Fl. Malaya 2 (1973) 160. – *Ludia spinosa* Roxb., Fl. Ind. ed. Carey 2 (1832) 507.

Tree (3–)6–15(–27) m tall, rarely shrub; trunk unarmed; bark gray or brownish, smooth; young stems and suckers armed with branched spines, young twigs not rarely with axillary simple thorns. Leaves ovate to oblong-ovate, acuminate, tip bluntish, base cuneate to almost rounded, (sub)coriaceous, glabrous, subentire to remotely crenate, with a basal pair of rather thick glands, 7–18 by 3–8 cm, nerves 4–6 pairs (the basal pair usually markedly curved-ascending), reticulation fine, mostly slightly raised on both faces; petiole 6–12 mm. Racemes lax-flowered, densely gray- to yellowish-pubescent all over, 2–4.5(–8) cm; pedicels 6–11 mm. Flowers sordid-white, 5–6(–7)-merous. Sepals ovate, 2.4(–4) mm. Petals ovate-lanceolate, 3(–4.5) mm. Receptacle hairy. Disk glands absent. Ovary ovoid; style 4–6 mm. Berry ellipsoid to

ovoid-ellipsoid, often apiculate or mammillate, 1.5–2.5 cm diam., greenish to purplish, black when dry, with 6(–20) red and bitter seeds; pericarp coriaceous, 1–2 mm.

Distribution. Burma, Nicobar Islands, Thailand, Indochina, W. Malesia to Borneo and the Philippines; cult. (type).

Northern. Lampang: Winit 1511. – Southeastern. Prachin Buri: Sriracha, Collins 1795, 1804, 1977; Chanthaburi: Makam, Kerr 9577. Trad: Ko Chang, Charoenphol et al. 4992. – Peninsular. Chumphon: Ban Pak Klawng, Kerr 11394. Surat Thani: Kaw Samui, Kerr 15698, Smitinand 3933; Yanyao, Kerr 18196. Phuket: Ban Kawp Kep, Kerr 13354; Kao Yao Yai, Hansen & Smitinand 12405, 12407. Nakhon Si Thammarat: Khao Luang, Sanan 302. Satun: Terutao: Curtis s.n.

Ecology. In mixed and secondary forest, also in teak and other deciduous forest, often on calcareous soil, to 1200 m.

2. *Scolopia macrophylla* (W. & A.) Clos

S. macrophylla (W. & A.) Clos, Ann. Sc. Nat. IV, 8 (1857) 253; Sleum., Blumea 20 (1972) 35; Whitm., Tree Fl. Malaya 2 (1973) 161, in key. – *Phoberos macrophylla* W. & A., Prod. (1843) 30.

S. rhinantha Clos, Ann. Sc. Nat. IV, 8 (1857) 252; Craib, Fl. Siam. En. 1 (1925) 93, incl. var. *siamensis* Craib, Kew Bull. (1922) 235; Fl. Siam. En. 1 (1925) 94.

Shrub or small tree, 2–6(–12) m tall; trunk often contorted, with spirally arranged simple spines 2.5–7.5 cm; bark smooth, brown, becoming grayish with age. Leaves ovate or ovate-elliptic to lanceolate, tapering to the acute apex, base mostly rounded, often slightly unequal, thin-coriaceous, glabrous, shining, shallowly to rather deeply crenate, (5–)6–12(–16) by (2.5–)4–6(–8) cm, nerves 6–8(–10) pairs, slightly or not prominent, reticulation dense, a little though markedly raised on both faces; petiole with 2 blackish glands at the top of the upper side, 6–10(–18) mm. Racemes 15–20-flowered, coarsely ferruginous-tomentose, 3–10 cm. Flowers greenish white, scented, 4–5(–6)-merous; pedicels 4–6(–10) mm. Sepals and petals equal to each other, ovate-lanceolate, the former ferruginous-tomentose, the latter ciliate but otherwise glabrous outside, 3(–4) mm. Receptacle hairy. Disk glands 8(–12). Ovary glabrous; style 4–5 mm. Berry ovoid, orange to dark red, becoming blackish when dry, juicy, bitter, c. 2 by 0.8 cm, with (1 or) 2–6 seeds.

Distribution. Indochina, Thailand, Malay Peninsula and W. Malesia, E. to Borneo; cult. (type).

Central. Phra Nakhon: Bangkok, Kerr 3751, 4292 (BM, K, type of *S. rhinantha* var. *siamensis*). 7933, 9346, Marcan 704, E. Smith 263, 336. – Southeastern. Trat: Ban Saphan Hin, Murata et al. T-17594. – Peninsular. Krabi: Kerr 18869. Phattalung: Annandale 1824, SF 1824, Vanpruk 759.

Ecology. On humid or marshy soil back of mangrove forest and by creeks, along marsh in teak forest, at low to medium (–900 m) altitudes, sometimes locally frequent.

3. *Scolopia chinensis* (Lour.) Clos

S. chinensis (Lour.) Clos, Ann. Sc. Nat. IV, 8 (1857) 249; Craib, Fl. Siam. En. 1 (1925) 93; Sleum., Blumea 20 (1972) 36. — *Phoberos chinensis* Lour., Fl. Cochinch. (1790) 318.
S. siamensis Warb. in Fedde, Repert. 16 (1919) 255.

Shrub or tree, 1–5 m tall; branches and branchlets usually with strong simple spines (1–6 cm); bark gray to brownish. Leaves elliptic to orbiculate or oblong-elliptic, apex shortly obtusely acuminate to almost rounded, base widely cuneate to rounded, with 2 distinct basal glands, coriaceous, glabrous, shining above, entire to subserrate, 3–7(–10) by 2–5 cm, nerves 3–5(–7) pairs slightly prominent beneath, reticulation dense and finely though markedly raised on both faces; petiole 3–5(–8) mm. Racemes few-flowered, often more or less paniced at the top of the branchlets, patently gray-tomentellous or -puberulous, 2–3(–6) cm; pedicels 4–6(–10) mm. Flowers white-yellowish, (5–)6(–7)-merous. Sepals ovate, tomentulose dorsally, 1.5–2 mm. Petals ovate, subglabrous, ciliolate, 2.5–3 mm. Receptacle hairy. Disk glands (5–)10. Ovary glabrous; style 2–3 mm. Berry ellipsoid to subglobular, 6–8(–10) mm diam., containing 4 or 5 seeds.

Distribution. Indochina (type), Thailand, S. & SE. China.

Southeastern. Chanthaburi: Lem Dan, Schmidt 488 (B, type of *S. siamensis*, lost; C, iso).

Ecology. In shrubberies, at low altitudes.

4. *Scolopia lucida* Wall. ex Kurz

S. lucida Wall. ex Kurz, For. Fl. Br. Burma 1 (1877) 73; Sleum., Blumea 20 (1972) 42.

Shrub or tree to 8 m tall; trunk armed with branched spines. Leaves elliptic-lanceolate or lanceolate, acuminate, often a little falcate, tip blunt, base cuneate, slightly unequal, coriaceous, glabrous, shining, rather thickly glandular-subseriate-crenulate all along the somewhat revolute edge (showing no proper basal glands), (6–)9–12(–16) by 3–4.5(–6) cm, nerves 5–6(–8) pairs slightly prominent on both faces as is the rather dense reticulation; petiole 8–12 mm. Racemes laxly 2–5-flowered, minutely puberulous; rhachis 1–1.5 cm; pedicels stoutish, 4–5 mm. Flowers pale yellow, 5-merous. Sepals and petals ovate, ± glabrous dorsally, ciliolate, 2.5–3 mm. Receptacle laxly hairy. Disk lobes 8–10. Ovary glabrous; style 3 mm. Berry ellipsoid-obovoid, apiculate, c. 1.2 cm, on peduncle 6 mm.

Distribution. Burma (Tenasserim, type), Southern Thailand.

Peninsular. Ranong; Nam Chut, Kerr 11719. Phangnga: Nai Chong, Geesink & Santisuk 5278.

Ecology. In scrub or disturbed evergreen forest, on limestone, at low elevations.

5. *Scolopia buxifolia* Gagnep.

S. buxifolia Gagnep., Bull. Soc. Bot. Fr. 55 (1908) 524; Sleum., Blumea 20 (1972) 43.

Shrub or tree to 8 m tall. Branchlets short, divaricate, with axillary spines to 6 cm, tips puberulous. Leaves *Buxus*-like, elliptic to obovate, apex rounded or emarginate, base broadly obtusely cuneate to rounded, subcoriaceous, glabrous, entire, the edge often slightly revolute, 1.5–4(–5) by (0.5–)1–2 cm, nerves 2–3(–5) pairs slightly raised on both faces as is the rather dense reticulation; petiole 1.5–3 mm. Racemes few-flowered, puberulous; rhachis 1.5–2 cm; pedicels 5–7(–11) mm. Flowers white, 4- or 5-merous. Sepals and petals ovate-oblong, subglabrous, ciliolate, 1.8–2 mm. Receptacle hairy. Disk glands 6–8. Ovary glabrous; style 3–5 mm. Berry ovoid, red, of a bitter taste, 0.5–1 cm diam., with 3–6 seeds.

Distribution. Indochina (type), Thailand, South China (Hainan).

Peninsular. Nakhon Si Thammarat: Kaw Samui, Kerr 15694.

Ecology. On hills close to the seashore, on sandy soil.

6. HEMISCOLOPIA v. Slooten

Hemiscolopia trimera (Boerl.) v. Slooten

H. trimera (Boerl.) v. Slooten, Bull. Jard. Bot. Btzg III, 7 (1925) 343, f. 9; Sleum., Fl. Males. I, 5 (1954) 65 & Addenda (1958) 566; Dansk Bot. Ark. 27 (1969) 89; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 74, pl. VII, 9–13; Whitm., Tree Fl. Malaya 2 (1973) 144. – *Scolopia trimera* Boerl., Cat. Hort. Bot. Bog. 1 (1899) 53.

Dioecious tree, (2–)3–8(–12) m tall, occasionally with simple spines 2.5–3.5 cm, buttressed with age. Leaves oblong, apex shortly attenuate, base rounded to subtruncate, coriaceous, shining, flush purple, drying brown, (10–)16–32 by (5–)6–12 cm, remotely glandular-suberrate-crenate (1 mm), with 2 or 4 basal glands near the apex of the petiole, nerves (7–)8–10 (rarely –14) pairs, curved-ascending, prominent beneath, veins numerous, ± transverse and slightly raised; petiole stout, rugose, 0.5–1 cm. Flowers 3–8 per compact axillary fascicle-like racemes, sordid-white, reddish inside; peduncle very short; pedicels 2–5 mm. Male: perianth segments (4–)6, ovate to suborbicular, glabrous, ciliate, (3–)4–5 by 3.5–5 mm. Disk fleshy, many-lobed. Stamens numerous. Rudiment of ovary present. Female: perianth segments as in the male flowers. Staminodes present. Ovary glabrous; style 3–4 mm. Berry ovoid to obpyriform, attenuate at apex, leathery, green, 2–2.5 by 1.5 cm; seeds 10–15(–20), oblongoid, irregularly angular, 6–8 mm, no aril.

Distribution. Indochina, Southern Thailand, Malay Peninsula, Sumatra, Banka (type), W. Java.

Peninsular. Surat Thani: Prinseng, Kerr 12489. Phuket: Ko Phu, Hansen & Smitinand 12319. Nakhon Si Thammarat: Suan anno 1927, Thaworn 927 (BKF 15918). Narathiwat: Waeng, Smitinand 10963.

Ecology. In evergreen, often coastal forest, both on limestone rock or sandy soil, at altitudes to 300 m, apparently rare.

7. BENNETTIODENDRON Merr.

Bennettiodendron leprosipes (Clos) Merr.

B. leprosipes (Clos) Merr., J. Arn. Arbor. 8 (1927) 11; Sleum., Fl. Males. I, 5 (1954) 64. — *Xylosma leprosipes* Clos, Ann. Sc. Nat. IV, 8 (1857) 230.

Dioecious shrub or tree, 3–7(–15) m tall; bark gray, fetid. Leaves arranged in distant groups or pseudowhorls, obovate-oblong or oblong-elliptic, apex obtusely acuminate, base attenuate, very base obtuse, subcoriaceous, a little shining above, drying lead-coloured, coarsely and more or less irregularly glandular-serrate, (8.5–)10–18 (rarely –35) by (3.5–)4–7.5(–14) cm, tri- or subquintuplinerved from the base, with c. 5 pairs of additional lateral nerves, veins firmly reticulated on both faces; petiole (0.4–)1.5–4 (rarely –8) cm, sometimes with 2 glands at apex. Panicles puberulent, but finally glabrous, (5–)10–20 cm. Flowers dirty white or greenish yellow, scented; pedicels 3–4(–5) mm, thickened under the fruit, more or less densely set with thick scale-like subtriangular or oblong tubercled lenticels as are branchlets, rhachis and petioles. Male: sepals ovate-suborbicular, 3–4 mm. Stamens numerous. Disk lobes purple. Female: sepals and staminodes about half as long as in the male flowers. Ovary trigonous, glabrous; styles 3. Berry globose, red to yellowish red at maturity, shining, 6–9 mm diam.; seeds several, blackish, 3–4 mm diam.

Distribution. Assam, Burma, South China, Thailand, Sumatra, Java (type).

Northeastern. Loei: Dong Pak Chom, Dong Glom, van Beusekom & Phengkklai 3124.

Ecology. In dry evergreen forest at c. 350 m altitude.

8. FLACOURTIA L'Hér.

KEY TO THE SPECIES

- 1a. Styles connate into a column c. 1 mm long; stigma radiate, ± flattened, obtuse, (very) short. Leaves shining, slenderly petioled 1. *F. jangomas*
- b. Styles connate at the very base only, or completely free 2
- 2a. Styles free and spaced in a circle on top of the fruit, erect. Filaments generally glabrous. Leaves usually coarsely crenate 2. *F. rukam*
- b. Styles connate at the base and central on top of the fruit, ± reflexed. Filaments generally pubescent. Leaves usually moderately crenate 3. *F. indica* s. lat.

1. *Flacourtia jangomas* (Lour.) Räsichel

F. jangomas (Lour.) Räsichel, Nomencl. Bot. ed. 3 (1797) 290; Sleum., Fl. Males. I, 5 (1954) 72, f. 30a–d; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 36, pl. IV, 1–5. – *Stigmatrota jangomas* Lour., Fl. Cochinch. (1790) 634.

F. cataphracta Roxb. ex Willd., Sp. Pl. 4 (1806) 830; Craib, Fl. Siam. En. 1 (1925) 94.

Dioecious deciduous tree, 6–15(–20) m tall; trunk and branches usually thornless in old trees, but rather densely set with simple or branched woody thorns when younger; bark light brown to pinkish-gray, flaking into thin lamels. Leaves narrow-ovate to ovate-oblong, rarely ovate-lanceolate, long-obtuse-acuminate, broadly cuneate to rounded at base, thin-chartaceous, glabrous, shining above, flush pinkish, subserrate-crenate, (5–)7–11 by (2–)3–5.5 cm; petiole 6–8 mm. Racemes subcorymbose, few-flowered, glabrous, 1–1.5(–3) cm. Flowers greenish, fragrant of honey, before or with the young foliage; pedicels slender, 0.5–1.5 cm. Sepals 4(–5), ovate, pubescent on both faces, 2 mm. Disk fleshy, entire or slightly lobed, white to yellow-orange. Male: stamens numerous; filaments glabrous. Female: ovary flask-shaped to subglobose, with 4–6 styles connate to a central column (1 mm), each style bearing a dilatate, bilobed and recurved stigma. Fruit subglobose, dull brownish red or purple, finally blackish, with greenish-yellow pulp, 1.5–2.5 cm diam., tipped with the single short style-column with 4–6 minute stigma-points; seeds 4–5(–10), flat.

Distribution. Apparently originally from SE. Asia (E. Bengal–Assam–Upper Burma), widely cultivated in India, SE. Asia, Malesia and E. Africa.

Northern. Chiang Mai: Bo Luang, Geesink et al. 5784. – Northeastern. Loei: Phu Luang, Bunchuai 1686. – Eastern. Nakhon Rachasima: Kao Lem, Kerr 9977. – Central. Bangkok: Kerr s.n. – Southwestern. Kanchanaburi: Amphoe Sangkhlaburi, Sangkhachand 1447; Kim Sayok, Kostermans 1308. Ratchaburi: Baw Re, Put 204. Prachuap Khiri Khan: Bang Son, Put 1457. – Southeastern. Chon Buri: Sriracha, Pra Chedi Mountain, Maxwell 76-351. – Peninsular. Surat Thani: Thakham, Smitinand 2944; Koh Pangang, Geesink et al. 7757. Nakhon Si Thammarat: Chawang, Thaworn 790.

Ecology. In dry evergreen forest, also secondary and disturbed dipterocarp forest; frequently cultivated for the fruits.

Vernacular name. Takop tai (Bangkok).

2. *Flacourtia rukam* Zoll. & Mor.

F. rukam Zoll. & Mor., Syst. Verz. (1846) 33; Sleum., Fl. Males. I, 5 (1954) 73, f. 31; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 39, pl. IV, 6–10; Whitm., Tree Fl. Malaya 2 (1973) 144, f. 3.

Tree 5–15(–20) m tall; trunk and old branches usually crooked, gnarled and furrowed, branched near the base, when young with strong woody simple or branched thorns to 10 cm on trunk and branches, but occasionally (cultivated forms) thornless especially when old; bark brown to grayish, smooth. Leaves ovate-oblong or elliptic to oblong-lanceolate, gradually tapering to the long obtuse tip, base cuneate to rounded, puberulous on both faces on midrib and nerves, or glabrous, usually shining

above, paler green below (flush rose-red or brown, flaccid, drooping), drying blackish brown, rather coarsely toothed, (6.5–)10–15(–18) by (3–)4–7(–9) cm, nerves 5–7(–8, –12) pairs, curved-ascending, veins more or less transverse, reticulation rather dense and distinct; petiole 5–8 mm. Flowers greenish-yellow, in few-flowered, short, finely pubescent racemes; pedicels 3–4 mm. Sepals (3–)4(–6), ovate-acuminate, laxly pubescent on both faces, 2 mm. Male: disk lobes 8, fleshy, orange to yellow-white. Stamens numerous; filaments glabrous, 3–4 mm. Female: stamens only occasionally present, and reduced in size. Ovary flask-shaped, with 4–6(–8) free, suberect styles with a small indistinctly bilobed stigma. Fruit globose or depressedly so, rarely obovoid, 2–2.5 cm diam., 4–7-sulcate or -angular when dry, light green to pink or purplish-green to dark red, pulp whitish, crowned by 4–6(–8) small, peg-like spaced styles set in a circle; peduncle 5–8 mm.

Distribution. Widely distributed, but scattered, both wild and cultivated all over Malesia (mainly W. Malesia, type from Java), apparently rare in southernmost Thailand; not native elsewhere.

Peninsular. Nakhon Si Thammarat: Thung Song, Geesink & Santisuk 5367. Trang: Khao Pap Pa, Larsen & Larsen 33259.

Ecology. In primary and secondary mixed evergreen and deciduous forest, at low elevations.

Uses. Cultivated for the edible fruits.

3. *Flacourtia indica* (Burm. f.) Merr.

F. indica (Burm. f.) Merr., Interpr. Rumph. Herb. Amb. (1917) 377; Sleum., Fl. Males. I, 5 (1954) 76, f. 30 h, i; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 41, pl. IV, 11–15. – *Gmelina indica* Burm. f., Fl. Ind. (1768) 132, t. 39, f. 5.

F. ramontchi L'Hér., Stirp. Nov. 3 (1786) 59, t. 30 & 30B.

F. sepiaria Roxb., Pl. Corom. 1 (1796) 48, t. 68; Craib, Fl. Siam. En. 1 (1925) 94.

F. thorelii Gagnep., Bull. Soc. Bot. Fr. 55 (1908) 522; Craib, Fl. Siam. En. 1 (1925) 95.

F. lenis Craib, Kew Bull. (1916) 259; Fl. Siam. En. 1 (1925) 94.

Deciduous, polymorphous bush or small tree (to 15 m); trunk and big branches set with branched thorns, though older ones often unarmed; younger branches with axillary simple thorns; bark grayish-buff, rather fissured and flaky. Leaves set in clusters on the branches of the previous year, or spaced along vigorous shoots, variable in form, size, texture and indument, mostly narrow and obovate, blunt, base cuneate, coarsely and rather deeply crenate, sometimes elliptic, membranous to coriaceous, glabrous to softly tomentose, flush rose-red, 2–4(–8) by 1.5–3(–5) cm, nerves 4–6 pairs, reticulation slight; petiole 3–5(–11) mm. Racemes few-flowered, short, puberulous, axillary or terminating short lateral 3–4-leaved twigs (these sometimes reduced to very short leafless shoots bearing several lanceolate bracts at the base, or transformed into woody thorns); pedicels 3–5(–7) mm. Sepals (4–)5–6(–7), ovate, obtuse, subglabrous outside, hairy inside, 1.5 mm. Male: disk slightly lobulate. Stamens numerous; filaments hairy at base. Female: disk (sub)entire. Ovary subglobular,

slightly attenuate distally, with 5–6(–7) radiate thick terete 1 mm long styles each with a subbilobed stigma, a little or not connate at the base. Fruit globose to ellipsoid, 0.8–1(–1.3) cm diam., ripening dull to blackish red, rather translucent, with 5–6(–7) short styles radiating from a short rather thickened common stalk-like base; seeds 5–8.

Distribution. Widespread and cultivated in (sub)tropical Africa, India (type), SE. Asia, and in Polynesia.

Northern. Mae Hong Son: Payap, Ban Me Ta, Kerr 562a. Chiang Mai: Bo Luang, Sorensen et al. 7015; Doi Sutep, Kerr 562, 1700 (type of *F. lenis*, K), 5254. Chiang Rai: Muang Pan, Kerr 5120, 5120A. Lampang: Maharat, Pre, Vanpruk 144, 422, 455. Tak: van Beusekom & Phengklai 1072, 3226, King 5476. Nakhon Sawan: Kerr 5984; Raheng, Ban Tak, Kerr 2969. – **North-eastern.** Loei: Suvanakoses 1378; Wang Saphung, Bunpheng 636. Kon Kaen: Chumphae, Smitinand 4485, Sorensen 2187. Nakon Phanom: Ban Wan, Mukdahan, Lakshnakara 951. – **Eastern.** Chaiyaphum: Knig Ban Yang, Kerr 20282, 20282A. Nakhon Ratchasima: Smitinand 4469; Korat, Sorensen et al. 2160; Ban Chum Leng, Noe 239. – **Central.** Suphan Buri: Nang Buat, Kerr 6995. Bangkok, Kerr 4312. – **Southwestern.** Kanchanaburi: Kamphaeng, Sorensen et al. 3610; Kanburi, Kerr 10612; Wangkanai, Kerr 12828; Wangka, Kerr 10444. Petchaburi: Ta Duang, Kerr 20371. Prachuap Khiri Khan: Kan Kradae, Put 2289. – **Southeastern.** Prachinburi: Sriracha, Kerr 4182. Chonburi: Pong Nam Rawn, Smitinand 3168. Chanthaburi: Chonburi, Phengnaren 205; Kow Kieo, Maxwell 75-407; Ma Kawn, Lakshnakara 494. – **Peninsular.** Surat Thani: Ta Kanawn, Kerr 12313. Nakhon Si Thammarat: Ban Tawn, Kerr 15376.

Ecology. In evergreen or deciduous forest, to 650 m altitude.

Uses. Frequently cultivated for the edible but rather astringent fruit.

Note. *Flacourtia indica* is accepted here in a wide sense including its forms with deciduous and more obovate leaves described by Roxburgh as *F. sepiaria*.

9. OSMELIA Thw.

Osmelia maingayi King

O. maingayi King, J. As. Soc. Beng. 67, ii (1898) 19; Sleum., Fl. Males. I, 5 (1954) 78; Whitm., Tree Fl. Malaya 2 (1973) 153, f. 8.

Dioecious shrub or tree, 5–8 (rarely –20) m tall; branchlets slender, minutely tawny-tomentose. Leaves oblong or elliptic-oblong, shortly ± abruptly acuminate, base cuneate to subrotundate, membranous, entire or obscurely crenulate, light green, upper surface glabrous except the hairy midrib, lower surface rather densely covered with spreading yellowish or olivaceous soft hairs especially on midrib and nerves, the latter still pubescent in old, elsewhere glabrescent leaves, 10–20(–25) by (4.5–)5.5–8 cm, nerves (6–)8–10 pairs, suberect, veins transverse, reticulation little prominent; petiole rusty-pilose, 0.6–1.8 cm; stipules lanceolate, 1 cm, soon dropping. Panicles terminal (mostly the male ones, these longer than the leaves), 7–15(–40) cm, or axillary (mostly the female ones, these shorter than the leaves), all spiciform and slender. Flowers spaced, small, yellowish-rose. Calyx lobes nearly rounded, pubescent, c. 1.2 mm. Male: stamens 8 in two rows; staminodes broad, yellowish.

Female: staminodes shorter than calyx lobes. Ovary oblongoid, yellowish-tomentose, 2 mm; styles 3. Capsule oblongoid, narrowed at apex and base, manifestly 3-ridged and finally splitting along these ridges, yellowish-tomentose, said to be velvety red with silvery tinge and corrugate when fresh, (1.2–)1.5–2 cm; seeds ellipsoid, 7–8 mm, with fleshy red or yellow aril.

Distribution. Southern Thailand, Malay Peninsula (type), Sumatra, Borneo (Sabah).

Peninsular. Phattalung: Chawng (= probably Chaung Thanon, 7°29'–100°13'), Kiah SF 24394 (K). Trang: Thale Songhong, Nalampoon s.n. (BKF 40465); Khao Chong, Phusomsaeng 369.

Ecology. In evergreen forest at low elevations; close to *O. philippina* (Turcz.) Benth., which is widely distributed in Malasia.

10. XYLOSMA G. Forst.

KEY TO THE SPECIES

- 1a. Leaves subovate-oblong or oblong-oblancheolate, short-acuminate, subcoriaceous, nerves 5(–7) pairs, the basal pair high-ascending, veins transverse. Inflorescence glabrous 1. *X. brachystachys*
 b. Leaves lanceolate or linear-oblong, long-acuminate, coriaceous, nerves 7–10(–12) pairs, the basal pair short, veins coarsely reticulate 2. *X. longifolium*

1. *Xylosma brachystachys* Craib

X. brachystachys Craib, Kew Bull. (1912) 145; Fl. Siam. En. 1 (1925) 95; Gagnep., Fl. Gén. I.-C. Suppl. 1 (1939) 210.

Diocious shrub; branchlets with short axillary slender spines to 2 cm, slender, pale, glabrous, laxly lenticellate. Leaves subovate-oblong to oblong-lanceolate, shortly subcaudately acuminate, base broadly attenuate or generally rounded, subcoriaceous, greenish-brownish on both faces when dry, glabrous, shining, rather shallowly subserrate-crenate, 7–13(–15) by 3–5 cm, nerves 5(–7) pairs, curved, the basal pair high-ascending, veins numerous, transverse, rather close together, slightly raised mainly above; petiole 4–5(–6) mm. Racemes subfasciculate, quite glabrous, 1–1.3 cm; pedicels 1.5–2 mm. Sepals 5, ovate-acuminate, light yellow, 1.2 mm. Male: stamens numerous, slightly exerted. Disk crenulate. Female: ovary subglobose; style short; stigmas 2. Disk annular. Fruit globular, c. 3 mm diam.; style hardly 1 mm.

Distribution. Thailand, apparently endemic.

Northern. Chiang Mai: Doi Sutep, Kerr 1821 (type, K), 3213; Doi Chieng Dao, Plernchit 1173; *ibid.*, Muang Kawng, Kerr 5533, 5533a. – Southwestern. Prachuap Khiri Khan: Hui Yang, Put 3284. – Peninsular. Phangnga: Khao Bo Ngu Luam, Takua Thung, Shimizu et al. T-8072.

Ecology. In evergreen forest, often by stream, locally common, (90–)660–1200 m. Vernacular name. Nam-kan-pá (Chiangmai).

2. *Xylosma longifolium* Clos

X. longifolium Clos, Ann. Sc. Nat. IV, 8 (1857) 231; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 71, pl. VII, 5–8.

Dioecious tree, (4–)7–15 m tall; trunk usually set with robust thorns; branches slender; bark gray, covered with orbicular ochre lenticels. Leaves lanceolate or linear-oblong, long-acuminate, tip bluntish, base cuneate, coriaceous, glabrous, shining and often lead-coloured above, brownish beneath when dry, coarsely serrate-crenate, (4–)9–15 by (2–)2.5–4(–5) cm, nerves 7–10(–12) pairs, curved-ascending, prominent beneath, veins forming a rather coarse reticulation and raised beneath only; petiole 5–10 mm. Racemes 2–3 per axil, dense-flowered, often fascicle-like, 1.5–2.5 cm, minutely puberulous or glabrescent; pedicels slender, 5–12 mm. Sepals (4–)5–7, ovate, slightly erose, ciliolate, otherwise glabrous, greenish-yellow, 1.5–2 mm. Disk orange, formed by several ± connate glands. Male: stamens numerous, much exserted; filaments filiform, glabrous, 3–4 mm. Female: disk annular. Ovary globular; style short; stigmas 2, obscurely 2–3-lobulate. Fruit globular, c. 4 mm diam.; seeds 4 or 5.

Distribution. India (type), Indochina, Thailand, SW. China.

Northern. Mae Hong Son: Om Koi to Om Haet, Hansen et al. 10848. – Eastern. Chaiyaphum: Nam Phrom, van Beusekom et al. 4104.

Ecology. In evergreen or gallery forest by stream, on sandstone, 600–900 m.

11. CASEARIA Jacq.

KEY TO THE SPECIES

- 1a. Stipules subsistent in the uppermost 2 or 3 leaf-axils (linear-lanceolate, pubescent, 2–4 mm. Leaves thin, sharply dentate, initially pubescent. Fruit c. 1.5 by 1 cm, smooth) **1. *C. flexuosa***
- b. Stipules early caducous (usually small, rarely to 4 mm, or rudimentary) **2**
- 2a. Leaves distinctly (prominently) and densely reticulate on both faces **3**
- b. Leaves indistinctly or not reticulate **4**
- 3a. Fruit relatively large, (3.5–)5–7(–9) by 3–3.5(–5) cm. Leaves persistent, coriaceous; petiole robust, striate in the upper, wrinkled in the lower half **2. *C. flavovirens***
- b. Fruit relatively small, (1.5–)1.8(–2.5) by 1(–1.5) cm. Leaves deciduous, thin-chartaceous for a long time, finally subcoriaceous; petiole slender, smooth **3. *C. graveolens***
- 4a. Fruit relatively large, boldly trigonous, (2.5–)3.5–5 by 1.5–2 cm, its surface smooth in the dry state **5**
- b. Fruit relatively small, hardly or not trigonous, 1–1.5 by 0.8–1 cm, its surface verruculose in the dry state **6**

- 5a. Leaves more or less persistently pubescent 4. *C. grewiifolia* var. *grewiifolia*
 b. Leaves early glabrescent or practically glabrous 4. *C. grewiifolia* var. *gelonioides*
 6a. Leaves glabrous, base \pm equilateral 5. *C. pseudoglomerata*
 b. Leaves persistently soft-pubescent to tomentulose at least beneath along midrib
 and nerves, the hairs there spreading, base more or less inequilateral 6. *C. velutina*

1. *Casearia flexuosa* Craib

C. flexuosa Craib, Kew Bull. (1911) 54; Contr. Fl. Siam, Aberdeen Univ. Studies 57 (1912) 91; Fl. Siam. En. 1 (1931) 735; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 48, pl. V, 9–16.
C. yunnanensis How & Ko, Acta Bot. Sin. 8 (1959) 28, f. 1 & phot. 1, ex descr. & icon.

Shrub or treelet, 0.5–2(–4) m tall. Branchlets slender, terete, pale, minutely patently shortly yellowish-pubescent. Leaves oblong or oblong-lanceolate, sometimes elliptic-oblong, subfalcate-acuminate, tip bluntish, base cuneate to the petiole, membranous to thin-chartaceous, greenish-yellowish when dry, patently yellowish-hairy on both faces initially, glabrescent mainly above, the midrib and nerves excepted, usually laxly pellucid-punctate, hardly -striate, regularly sharply dentate (0.5–1 mm), 3.5–13(–15) by 1–5 cm, nerves 5–8(–10) pairs, arcuate-ascending, confluent along the edge, slightly raised, veins rather obscure; petiole hairy, 3–5(–7) mm; stipules linear-lanceolate, subsistent, 2–4 mm. Flowers greenish. Glomerules axillary, few-flowered, initially hairy in all parts, glabrescent; pedicels to 1 mm; bracts ovate, 2 mm. Sepals 4 or 5, obovate-oblong, ciliate, 2–3 mm. Stamens (7–)8(–10); filaments hairy; anthers apiculate. Disk lobes oblong, hirsute. Ovary conical, pubescent; style thick, 0.5–1 mm; stigma capitate. Fruit ellipsoid, smooth also when dry, 3–4-angular, yellow, fleshy, c. 1.5 by 1 cm. Seeds 3–8, ovoid, whitish, with reddish laciniate aril.

Distribution. Indochina, Thailand (type), SW. China.

Northern. Chiang Mai: Doi Sutep, Kerr 694 (type, K; iso, BM, P), 994bis; Mae Klang to Sop. Aep, Murata et al. 15481; Chiang Rai: Winit 1145. Lampang: Me Pak, Winit 1451; Me Yom, Winit 1697. Phitsanulok: Puh Mieng, Larsen et al. 1103; Tung Salaeng Luang, Larsen et al. 466. – Northeastern. Loei: Dan Sai, Kerr 8815; Phu Paek, van Beusekom & Phengkklai 2965; Phu Krading, Wang Sa-Phung, Dee 966. Khon Kaen: Chumphae, Dong Lan, Sorensen & Hansen 6106, Smitinand 4911. Nakhon Phanom: Dawn Tan, Kerr 21513. – Eastern. Nakhon Ratchasima: Katok, Kerr 8149; Lat Bua Kao, Put 4327; Pak Thong Chai, Kao Pha Yom, Phengnaren 476. – Central. Saraburi: Sam Lan, Maxwell 75-335. – Southeastern. Chonburi: Chedi Mountain, Kow Kieo, Maxwell 75-638.

Ecology. In dry semi-evergreen or mixed deciduous forest, open thickets, in rocky bamboo scrub, also on sandstone tables, (75–)100–500(–720) m. Close to *C. kurzii* Clarke.

2. *Casearia flavovirens* Bl.

C. flavovirens Bl., Mus. Bot. Lugd. Bat. 1 (1850) 254, t. 50; Sleumer, Fl. Males. I, 5 (1954) 100, f. 37; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 54; Whitm., Tree Fl. Malaya 2 (1973) 140.
C. pallida Craib, Kew Bull. (1930) 406; Fl. Siam. En. 1 (1931) 738; Sleumer, Fl. Males. I, 5 (1954) 98.

Tree, 7–20(–30) m tall, glabrous; bark smooth, gray-brown. Leaves persistent, elliptic-oblong or lanceolate, apex short- to long-acuminate, base more or less inequilateral, cuneate to rounded, rarely subcordate, coriaceous, entire or weakly toothed, glabrous, shining especially above, olivaceous-yellowish (sometimes darker) when dry, rather sparsely pellucid-punctate and -striate, 12–22(–25) by 5–8(–10) cm, midrib very prominent beneath, nerves 12–16 pairs, curved-ascending, raised mainly beneath, veins \pm transverse and veinlets densely reticulate and prominent on both faces; petiole robust, striate in the upper, wrinkled in the lower half, 1–1.5(–2) cm; stipules triangular, blunt, 2 mm, early caducous. Fascicles many-flowered, normally axillary, but occasionally from leafless nodes. Flowers fragrant, greenish to whitish or yellowish; bracts minute, scarious, numerous, pubescent; pedicels slender, glabrous, 1–1.5 cm. Sepals ovate, glabrous, reflexed during anthesis, c. 5 mm. Stamens 10; filaments subglabrous, 3–4 mm. Staminodes hirsute. Ovary narrow-ovoid, densely hairy; style glabrescent, 2 mm; stigma capitate. Fruit ellipsoid, with 3 strong longitudinal ribs, i.e. the edges of the juicy valves, which become coriaceous when drying, smooth, orange to yellow or reddish-orange at full maturity, (3.5–)5–7(–9) by 3–3.5(–5) cm; peduncle 1.2–1.5 by 0.2 cm. Seeds numerous, ovoid, white, 5–6 mm, the laciniate aril red.

Distribution. Indochina (S. Vietnam), Thailand, Malay Peninsula, Sumatra, Java (type), Bali.

Northern. Chiang Mai: Doi Chieng Dao, van Beusekom & Phengkklai 1331. – Northeastern. Loei: Kao Krading, Kerr 8648. – Eastern. Chaiyaphum: Nam Phrom, Smitinand 11683. – Southeastern. Chonburi: Chantaburi, North Soy Dow Mountain, Bong Nam Rawn, Maxwell 75-494. – Southwestern. Kanchanaburi: Kwa Noi River basin, near Wangka, Kostermans 5, 90. – Peninsular. Krabi: Nawng Le, Kerr 18634. Songkhla: Prakawp, Kerr 15855 (type of *C. pallida*, K).

Ecology. Scattered in evergreen forest, on rocky limestone hill or sandy loam soil; low country to 1500 m.

Vernacular name. Teng wa lak (Karien). Fruit said to be poisonous.

3. *Casearia graveolens* Dalzell

C. graveolens Dalzell in Hook., J. Bot. 4 (1852) 107; Craib, Fl. Siam. En. 1 (1931) 736; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 56.

Deciduous tree, 6–10 m tall. Branchlets angular at tips, older parts terete, glabrous. Leaves broadly elliptic to oblong-elliptic, apex short-acuminate or attenuate, sometimes blunt, base unequal, broadly cuneate to rounded or even subcordate, thin-chartaceous, becoming subcoriaceous when old, shining mainly above, glabrous, green-olivaceous to pale (sometimes dark) brown when dry, subdensely pellucid-punctate and -striate, edge crenate (0.5 mm) to undulate, 6.5–9(–16) by 4–6(–8) cm, nerves 8–10(–12) pairs, widely curved-ascending, a little raised on both faces, reticulation of veins and veinlets dense, finely though distinctly prominent on both faces or mainly beneath; petiole slender, smooth, 10–12 mm; stipules linear, acute,

membranous, glabrous, 2–4 mm, early caducous. Flowers greenish, with disagreeable scent, collected to globose dense-flowered glomerules 4–6 mm diam. mostly from leafless axils; bracts numerous, triangular-ovate, hairy, 1.5–2 mm; pedicels stoutish, pubescent or glabrescent, (3–)4(–6) mm. Sepals ovate, c. 4 by 2 mm, pubescent outside, or glabrescent. Stamens 8; filaments laxly pubescent. Staminodes hirsute. Ovary oblongoid, laxly pubescent on top; style very short; stigma capitate. Fruit oblongoid-ellipsoid, subtrigonus, the 3 valves thickened, finely verruculose all over especially when dry, fleshy, yellow-green, glabrous except the apex, (1.5–)1.8(–2.5) by 1(–1.5) cm. Seeds numerous, ovoid-subglobular, c. 5 by 3 mm, yellow to brownish; aril laciniate, purple.

Distribution. India (type), Indochina, Thailand.

Northern. Chiang Mai: Doi Sutep, Kerr 3208. Nan: Nam Heng, Winit 1752. – North-eastern. Udon Thani: Loi, Dan Sai, Kerr 8886. Phetchabun: Lom Kao, Smitinand 2628. – Central. Saraburi: Sam Lan forest, Maxwell 74-325, 75-156, 75-157. – Southeastern. Chonburi: Kow Kieo, Maxwell 75-242.

Ecology. In rocky deciduous hardwood forest, at low elevations to 600 m.

5. *Casearia grewiifolia* Vent.

C. grewiifolia Vent., Choix (1803) 48; Craib, Contr. Fl. Siam, Aberdeen Univ. Studies 57 (1912) 91; Fl. Siam. En. 1 (1931) 736; Sleum., Fl. Males. I, 5 (1954) 93, f. 36; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 58, pl. V, 17–23; Whitm., Tree Fl. Malaya 2 (1973) 140, 142, f. 1.

C. kerrii Craib, Kew Bull. (1911) 55; Contr. Fl. Siam, Aberdeen Univ. Studies 57 (1912) 91; Gagnep., Fl. Gén. I.-C. 2 (1921) 1002; Craib, Fl. Siam. En. 1 (1931) 737.

C. oblonga Craib, Kew Bull. (1930) 405; Fl. Siam. En. 1 (1931) 738.

var. *grewiifolia*

Shrub or tree, 2–20 m tall, buttressed when old; bark rather rough, whitish to gray or pale brown. Branchlets velutinous. Leaves variable in shape, usually oblong, sometimes ovate-oblong, short-acuminate (1–2 cm), tip obtuse, base more or less distinctly inequilateral, cuneate on one side, rounded on the other, sometimes subtruncate or subcordate, firmly chartaceous, olivaceous or brownish when dry, paler beneath, glabrous above, the midrib excepted, rusty to yellowish-tomentose or -velutinous beneath, often glabrescent with age, shallowly to coarsely crenate, densely pellucid-punctate and -striate especially in young leaves, 8–10(–16) by (3–)3.5–6(–8) cm, nerves (8–)10–12 pairs, little curved-ascending and subparallel to each other, raised mainly beneath, veins more or less transverse, finer reticulation visible but slightly prominent or rather obscure; petiole pubescent, 6–10(–12) mm; stipules triangular, robust, 1.5 mm, early caducous. Flowers white, green or yellowish, often galled, the calyx lobes and pedicels then stoutish and enlarged. Fascicles usually many-flowered, but sometimes reduced to few flowers or even to a single flower, often in the axils of fallen leaves; bracts numerous, pubescent, to 1 mm in diam.; pedicels rather slender, 5–6(–8) mm. Sepals ovate, appressed-hairy mainly outside,

2–3 mm. Stamens normally 8, rarely 10, slightly alternately inequilong; filaments subglabrous, 1.5 mm. Staminodes oblong, thick, tomentose, 1 mm. Ovary ovoid, hairy upwards. Fruit compressed-ellipsoid, coriaceous, boldly trigonous when dry, smooth, yellow, of a bitter taste, (2.5–)3.5–5 by 1.5–2 cm at full maturity; seeds numerous, angular, c. 5 mm; aril red orange, lacinate.

Distribution. Burma, Indochina, Thailand, Malay Peninsula, Malesia (type from Java).

Northern. Chiang Mai: Bo Luang, Geesink et al. 5785; Chiangmai, Kerr 580 (type of *C. kerrii*, K), 580bis. Lamphun: Me Li, Winit 198. Lampang: Muang Lawng, Winit 1598; Palat, Kerr 3186; Pre, Vanpruk 150. Phitsanulok: Pamak, Kerr 8915; Utaradit, Kerr 5883. Nakhon Sawan: King 5429, 5430. – Northeastern. Loei: Srithan, Suvanakoses 1422. Khon Kaen: W of Khawnkaen, Smitinand 4483. – Eastern. Ubon Ratchathani: Ubon, Kerr 8342. – Central. Bangkok: Collins 33, 549, Marcan 2090, Kerr 6753. – Southwestern. Kanchanaburi: King 5508; Kanburi, Kostermans 1188, 1296, Put 119; Kao Pu Maklai, Phengkklai et al. 4279; Kritee-Meung Chah, Geesink & Phengkklai 6184. Ratchaburi: Petchaburi, Marcan 642; Ratburi, Kerr s.n., Marcan 1784. Prachuap Khiri Khan: Hua Hin, Marcan 343; Cha Am, Marcan 1646, 1648, Put 276. – Southeastern. Chanthaburi: Kao Ploi Wen, Kerr 18061. Chon Buri: Pattaiya Bot. Garden, van Beusekom & Smitinand 2268; Sriracha, Collins 885, 917, 1503. – Peninsular. Chumphon: Siep Yuan, Kerr 16246 (type of *C. oblonga*, K).

Ecology. In (often disturbed) dry dipterocarp forest, also in secondary forest and in dry thickets, on clayey soil or limestone, from sealevel up to c. 1000 m.

Vernacular names. Klui, pha sam (Loei), pi sua luang.

var. *gelonioides* (Bl.) Sleum.

C. grewiifolia Vent. var. *gelonioides* (Bl.) Sleum., Fl. Males. I, 6 (1972) 944. – *C. hexagona* Decne var. *gelonioides* Bl., Mus. Bot. Lugd. Bat. 1 (1850) 225.

C. grewiifolia Vent. var. *deglabrata* Koord. & Valet., Bijdr. Booms. Java 1 (1894) 174; Sleum., Fl. Males. I, 5 (1954) 95; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 60.

C. calva Craib, Kew Bull. (1930) 405; Fl. Siam. En. 1 (1931) 735.

Differs from var. *grewiifolia* by a pronounced glabrescence in all parts, and apparently occurring together with it in many places.

Distribution. Indochina, Thailand, Malesia (type from Timor), Melanesia.

Northern. Chiang Mai: Chawn Tawng, Kerr 5365 (type of *C. calva*, K); Doi Chieng Dao, Khant Chai 75, Geesink et al. 5649, 5664. Chiang Rai: Doi Thung, Geesink et al. 8260. Sukothai: Khao Luang, Kerr 5939. – Southeastern. Rayong: Ban Pe, Put 2718; Koh Samal Isl., van Beusekom & Santisuk 3236.

Ecology. In (often disturbed) dry evergreen forest, from sealevel to c. 1600 m.

5. *Casearia pseudoglomerata* Sleum., *spec. nov.*

Frutex magnus. Ramuli graciles, glabri. Folia persistentia, oblonga usque lanceolato-oblonga, apicem versus sensim attenuata, ipso apice saepius subcurvato obtusiuscula vel subacuta, basi in petiolum cuneata, subinaequilateralia, chartacea, glabra, in sicco utrinque olivaceo-viridia, subnitentia, striis – vix vel haud punctis – pellucidis

induta, integra, 10–13 cm longa, 3–5 cm lata, nervis lateralibus 6–7-paribus curvato-ascendentibus praeter marginem excurrentibus subtus tantum paullo elevatis, venis numerosis transversis cum venulis rete sat densum praecipue subtus prominulum formantibus; petioli 6–10 mm longi, 0.5–1 mm crassi; stipulae subuliformes, subglabrae, c. 3 mm longae, vix 1 mm latae, cito caducae. Flores 1–3 ex axillis foliorum enascentes; bracteolae ovato-acuminatae numerosiores, parvae, laxe pilosae, glomerulos formantes, 1–1.5 mm longae. Pedicelli vix 1 mm longi, glabri. Sepala ovata, membranacea, glabra, 1.5–2 mm longa. Stamina 8; filamenta gracillima, (sub)glabra, 1.5 mm longa; antherae suborbiculares, minutae, haud apiculatae. Staminodia 8, subdeltoideo-rectangulares, inferne laxe, apice dense pilosa. Ovarium elongato-ovoideum, glabrum; stigma capitatum. Fructus maturus globosus, carnosus, luteo-aurantiacus, nitens, in sicco minute et dense verruculosus, glaber, c. 8 mm diam. Semina 1–3, globosa, c. 2.5 mm diam.; arillus membranaceus, laciniatus. Pedunculus glaber, c. 1 mm longus.

Peninsular. Phuket, Khao Chiang Khrod and Khao Khu Thalang, in wet evergreen forest, to 200 m alt., defl. & fr. mat. 7 May 1968, *van Beusekom & Phengkklai 609* (type, L; iso AAU, BKF, C).

Note. This apparently new species belongs to the widespread *Casearia glomerata* Roxb. complex, as do *C. aequilateralis* Merr., *C. membranacea* Hance, *C. annamensis* (Gagnep.) Lescot & Sleum., and others, all with rather small (mostly ellipsoid) verruculose fruits. To this complex may belong a specimen collected by *Larsen & Larsen 33464* (AAU, L) in Peninsular Thailand: Ranong, 10° N–98°35' E; bearing only flowers (with 4 stamens), and no fruits; it cannot be named with certainty.

6. *Casearia velutina* Bl.

C. velutina Bl., Mus. Bot. Lugd. Bat. 1 (1850) 253; Sleum., Fl. Males. I, 5 (1954) 91 & Addenda (1958) 566.

C. balansae Gagnep., Not. Syst. 3 (1914) 243, incl. var. *cuneifolia* Gagnep., l.c. 244; Lescot, Fl. Camb., Laos & Vietnam no. 11 (1970) 51, pl. V, 1–8, & syn.

Shrub or tree, 1.5–5(–10) m tall; branches weak; branchlets angular and densely short-hairy to velvety at tips, glabrescent; bark brownish-reddish. Leaves elliptic or elliptic-oblong, rarely ovately so, apex shortly and bluntly attenuate, or obtuse, base rounded to broadly cuneate, more or less distinctly inequilateral, obscurely to more distinctly serrate or dented, thinly to firmly chartaceous, even subcoriaceous at full age, olivaceous-brown when dry, subdensely pellucid-punctate and -lineate, glabrous and a little shining above, yellowish-olivaceous-pubescent to -tomentose all over the undersurface at least initially, the hairs on midrib and nerves there persistent, spreading horizontally, (7–)10–20 by (4–)5–8 cm, nerves 8–12(–13) pairs, widely curved-ascending, usually somewhat impressed above in dry specimens, prominent beneath, reticulation of veins and veinlets finely raised mainly above; petiole rather slender, (5–)8–10 mm; stipules thick, triangular, tomentose outside, 2 mm, early caducous. Flowers white to greenish. Glomerules 4–5 mm diam., few- to many-

flowered from foliate axils; bracts small, hairy; pedicels slender, 2(–4) mm. Sepals 5, ovate, laxly to densely hairy outside, glabrescent inside, (2–)3 by 1.5–2 mm. Stamens (5–)8; filaments short-pubescent. Staminodes linear-oblong, hirsute at apex. Ovary conical, laxly hairy; style 1.5 mm; stigma capitate. Fruit oblongoid-ellipsoid, fleshy, essentially glabrous, finally yellowish and split to 2 valves, densely verruculose all over when dry, 1.5–2 by 1.2–1.5 cm, on slender peduncle 5–7 mm; seeds numerous, pyriform, 6 by 4 mm; aril laciniate.

Distribution. Indochina, Thailand, S. China, Malay Peninsula, Sumatra, and Java (type).

Southeastern. Chon Buri: Kow Kieo, Siricha Dist., fr., Maxwell 76-20. – Peninsular. Ranong: Naka, 10 m, fr., Kerr 16848; Takua Pa, Kopah-Jangan hill, 9-2-1917, Haniff & Nur SF 2099 (SING).

Ecology. In open evergreen forest, to 800 m alt.

DOUBTFUL SPECIES

Casearia zeylanica (Gaertn.) Thw.

C. zeylanica (Gaertn.) Thw., En. Pl. Zeyl. (1858) 19; Alston in Trimen, Handb. Fl. Zeyl. 6 (1931) 131. – *Vareca zeylanica* Gaertn., Fruct. (1788) 290, t. 60.

This species was described by Gaertner from fruits he received from Herb. Lugd.-Bat. The original collection, *Koenig 117 (Carpol. coll. 1340)* is still preserved there. A label (parchment) added to the fruits says 'walwareka-otti' (which is the Ceylonese name of the species) on one side, and bears the date of 17.5.1779 on the other side. At that time, Koenig, on his trip to Malacca and Thailand, collected on various small islands off the coast of Phuket in Peninsular Thailand.

The fruits are conspecific with recently collected ones from Ceylon. No such material is known to have been collected in Peninsular Thailand yet, and it is doubtful whether the original fruits were collected in Ceylon or in Thailand.