

## FLACOURTIACEAE

大风子科 da feng zi ke

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Trees or shrubs, hermaphroditic, monoecious, dioecious, or polygamous, evergreen or deciduous; trunk, branches, and branchlets sometimes spiny; hairs simple, rarely T-shaped or stellate. Leaves simple, usually alternate, rarely opposite or verticillate, sometimes crowded at apices of branches; stipules usually small and caducous, sometimes larger, leaflike and persistent, rarely absent; petiole generally present, sometimes with apex 2-glandular and/or with additional glands along petiole length; leaf blade usually pinnate-veined, sometimes 3–5-veined from base or palmate-veined, with or without pellucid dots or lines, sometimes with a pair of glands at junction of blade and petiole, margin entire or toothed, teeth glandular or not. Inflorescences axillary, terminal, or cauliflorous, of various forms: racemose, spicate, cymose, corymbose, or paniculate, sometimes flowers fasciculate, or solitary; pedicels often articulate; bracts and bracteoles usually small to minute. Flowers radially symmetric, bisexual or unisexual, hypogynous, perigynous, or epigynous; perianth cyclic, rarely spiral, in unisexual flowers remnants of opposite sex present or absent. Sepals imbricate or valvate, rarely spathaceous, mostly (2 or)3–6, rarely more, usually free or connate at base only, sometimes partly united into a tube, caducous or persistent, rarely accrescent. Petals 3–8, rarely more, often isomerous and alternating with sepals, free, imbricate or valvate, rarely contorted, similar to sepals or not, sometimes with a fleshy adaxial basal scale, or petals absent. Disk present, entire, lobed, or comprised of free or connate disk glands, these extrastaminal, interstaminal, or intrastaminal (bisexual or staminate flowers), or extragynoecial (pistillate flowers), or disk absent. Stamens 1 to many (ca. 100), 1- or many seriate, sometimes in epipetalous bundles, or on margin of cupular disk or rim of calyx tube; filaments free, rarely united into a column; anthers 2-thecate, usually longitudinally dehiscent, rarely opening by terminal pores, connective sometimes shortly projected or glandular. Ovary superior or semi-inferior, 1-loculed, with 2–9 parietal placentas, rarely incompletely 2–9(or more)-celled by placentas protruding deeply into locule; ovules 2 or more on each placenta, orthotropous, anatropous, or hemi-anatropous; styles isomerous with placentas, free or partly to completely united, rarely absent, stigmas small or large, capitate to flattened and branched. Fruit capsular or baccate, rarely a drupe, pericarp mostly smooth, sometimes winged or bristly. Seeds 1 to many, with or without a fleshy sometimes brightly colored sarcotesta and/or aril, sometimes with long hairs, or broadly winged; endosperm usually copious and fleshy; embryo straight or curved; cotyledons usually broad, often cordate.

About 87 genera and ca. 900 species: mostly in tropical and subtropical regions, some extending into the temperate zone; 12 genera (one endemic) and 39 species (nine endemic) in China; four additional species (all endemic) are poorly known (see *Homalium*).

*Ahernia glandulosa* Merrill (Philipp. J. Sci. 4: 295. 1909), described from the Philippines, reportedly occurs in Hainan, but the present authors have seen no specimens from the Flora area. *Flacourtia cavalieriei* H. Léveillé (Repert. Spec. Nov. Regni Veg. 9: 457. 1911) and *Xylosma dunniana* H. Léveillé (loc. cit.: 455) were both described from Guizhou. After studying specimens at K from the type gathering (*Cavalerie 3327* and *Cavalerie 1151*, respectively), it is not clear where they belong, and for the time being they must be regarded as species incertae sedis. *Erythrospermum hypoleucum* Oliver is the basionym of *Celastrus hypoleucus* (Oliver) Warburg ex Loesener in the Celastraceae (see Fl. China 11). *Oncoba spinosa* Forsskal and *Dovyalis hebecarpa* (Gardner) Warburg are occasionally cultivated.

In some treatments, where the genera of Flacourtiaceae are completely transferred to other families, and Flacourtiaceae is treated as a synonym of Salicaceae sensu lato, Chinese genera have been reclassified as follows: two genera (*Hydnocarpus* and *Gynocardia*) moved to Achariaceae sensu lato, all others to Salicaceae sensu lato (Chase et al., Kew. Bull. 57: 141–181. 2002).

Lai Shushen. 1999. Flacourtiaceae. In: Ku Tsuechih, ed., Fl. Reipubl. Popularis Sin. 52(1): 1–80.

### Key to genera based on material in flower

In flower, especially in staminate flower, *Xylosma* and *Flacourtia* are difficult to distinguish at genus level. In China, the two genera together include eight species. For identification, take material through keys to both genera; a combination of leaf size, leaf shape, sepal number and indumentum, and style/stigma form helps distinguish species in either genus.

#### 1a. Petals present.

- 2a. Calyx tube present, obconic, adnate to ovary for lower 1/2–2/3 (i.e., flowers epigynous), with free sepal lobes and petals spreading from rim, ovary semi-inferior, lower 2/3 or more enclosed in adnate calyx tube ..... 11. *Homalium*
- 2b. Calyx tube absent, calyx not adnate to ovary (i.e., flowers hypogynous), sepals free or partly fused, sometimes completely fused in bud, ovary when present free.
  - 3a. Flowers always bisexual; petals and sepals similar; petals ca. 4 mm or less, adaxial basal scale absent; disk glands present, small, in an extrastaminal row; stamens longer than sepals; style 1 ..... 3. *Scolopia*
  - 3b. Flowers unisexual or bisexual; petals and sepals distinct; petals ca. 5 mm or more, with scale at least 1/4 as long as petal attached to inside at base; disk glands absent; stamens shorter than or equal to petals; styles 3–6.

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- 4a. Sepals in bud completely fused, calyx closed or with a small circular opening at apex, later shortly 3–5-truncate lobed, sometimes splitting more regularly to 3–5 sepals; stamens ca. 100 (staminate flowers); styles 5, stigmas small, cordate or peltate, erect or reflexed (pistillate flowers) ..... 2. *Gynocardia*
- 4b. Sepals in bud imbricate, free or connate at base only; stamens 5–30 (staminate flowers); styles 3–6, or nearly absent, stigmas conspicuous, broadly flattened, usually reflexed (pistillate flowers) ..... 1. *Hydnocarpus*
- 1b. Petals absent.
- 5a. Flowers bisexual, disk cuplike (cup sometimes very shallow), adnate to inside of calyx (but not adnate to ovary), with oblong to narrowly triangular hairy disk lobes in same row as stamens and alternating with them, lobes ca. 1/2 as long as stamen filaments ..... 12. *Casearia*
- 5b. Flowers unisexual, rarely bisexual, disk not cuplike nor with lobes alternating with stamens, nor adnate to inside calyx; instead disk a small fleshy annulus or comprising small, free or connate, fleshy glands, these in an extrastaminal (staminate and bisexual flowers) or extra-gynoecial (pistillate flowers) row, or disk consisting of free glands among stamen or staminode bases, or disk and disk glands completely absent.
- 6a. Sepals valvate, disk glands absent.
- 7a. Leaves pinnate-veined ..... 10. *Itoa*
- 7b. Leaves 3–5-veined from base.
- 8a. Inflorescence more than 30-flowered, very densely pale-grayish tomentose throughout, indumentum obscuring rachis surface, bracts to 4 mm; sepals 4–5 mm, thickish in texture ..... 8. *Poliothyrsis*
- 8b. Inflorescence less than 20-flowered, pubescent to tomentose but indumentum not obscuring rachis surface, bracts 5–30 mm; sepals more than 10 mm, papery ..... 9. *Carrierea*
- 6b. Sepals imbricate; disk glands present, extrastaminal, extragynoecial, or among stamen or staminode bases.
- 9a. Leaves broadly ovate, base cordate or less often broadly rounded, petiole 6–12 cm or more, often with 1 or 2 large glands in lower half; sepals 5–6 mm, outside densely pubescent, hairs yellowish brown when dry ..... 7. *Idesia*
- 9b. Leaves not as above, petiole usually less than 4 cm, if longer then without glands in lower half; sepals less than 4 mm, outside glabrous or only sparsely pubescent, hairs not yellowish when dry.
- 10a. Flowers usually in terminal panicles 6–12 cm (sometimes shorter); stamen or staminode filaments with long hairs in lower half; disk glands free among filament bases ..... 6. *Bennettiodendron*
- 10b. Flowers in short racemes or cymes to 5 cm, these axillary or terminating short lateral branches; stamen or staminode filaments glabrous, or with short hairs in lower half; disk annular or comprised of connate or free glands, in an extragynoecial or extrastaminal row, not dispersed among stamen or staminode bases ..... 4. *Flacourtia* or 5. *Xylosma*

### Key to genera based on material in fruit

Flacourtiaceae in fruit are neither easily nor practically accommodated in a dichotomous key. We have therefore used a combination of key couplets and spot characters, including characters that can be very useful but are not always present (e.g., style characters).

The single species of *Poliothyrsis*, *P. sinensis*, has capsules 2–3 cm and a seed completely encircled by a membranous wing. By these characters it can be distinguished easily from *Carrierea calycina*, which has larger capsules 3–7 cm and a seed with a wing at one end only. *Poliothyrsis sinensis* and the second species of *Carrierea*, *C. dunniana*, are more difficult to differentiate because both have similar capsules of about the same size. The dense, white rachis indumentum of *P. sinensis* can be a useful character. Leaves of *P. sinensis* and *C. dunniana* are quite similar, at least in dried material.

- 1a. Mature fruit enclosed for 2/3–3/4 of its length by persistent adnate perianth, sepals and petals persistent at calyx tube rim, fruit small, capsular (less than 12 mm) ..... 11. *Homalium*
- 1b. Mature fruit not at all enclosed by persistent perianth, fruit type and size various.
- 2a. Fruit a dehiscent ovoid or fusiform capsule, splitting from apex and base into narrow fusiform valves attached only by woody placental strands, outer tomentose layer sometimes dehiscent, locule filled with vertically arranged winged seeds; disk characters, although often present and useful with experience, are not relied upon heavily here as they are difficult to observe, and can be confused with perianth scars.
- 3a. Leaves pinnate-veined, lateral veins 10–26 pairs ..... 10. *Itoa*
- 3b. Leaves 3–5-veined from base, lateral veins 4–6 pairs.
- 4a. Seed completely encircled by wing ..... 8. *Poliothyrsis*
- 4b. Seed with wing at one end only ..... 9. *Carrierea*
- 2b. Fruit not as above.
- 5a. Mature fruit large, 4–12 cm in diam., seed embedded in pulp.
- 6a. Fruit arising from tubercles on stems, older branches, and trunks; pericarp glabrous, grayish; dried mature leaves grayish green ..... 2. *Gynocardia*
- 6b. Fruit not arising from tubercles on stems, older branches, and trunks; in *H. annamensis* and *H. hainanensis* fruit tomentose or velutinous, distinguishable from *Gynocardia* on that basis; in

- H. anthelminthicus* fruit is finally glabrous, usually darkish brown in dried state, dried mature leaves reddish brown ..... 1. *Hydnocarpus*
- 5b. Mature fruit small to medium sized (3–30 mm in length or diam.).
- 7a. Fruit a drupe containing pyrenes; in dried state 10–30 mm, often longitudinally angled at maturity and squarish or rectangular in longitudinal section, with a flattish apex; styles 4–7, persistent at apex, free or partly to completely fused ..... 4. *Flacourtia*
- 7b. Fruit not as above: try using character combinations below:

**3. Scolopia:** spines sometimes present; fruiting racemes axillary or terminal, short, 0.5–6 cm, these sometimes reduced almost to fascicles; fruit baccate, in dried state ca. 10 mm in diam. or less; sepal, petal, and stamen remnants usually present at base of fruit (flowers bisexual, petalous), persistent style column 3–5 mm.

**5. Xylosma:** spines sometimes present; fruiting racemes, panicles, or fascicles axillary, to 5 cm; fruit baccate, in dried state to ca. 7 mm in diam.; sepals persistent or not, petal remnants always absent, stamen remnants usually absent (flowers apetalous, usually unisexual, very rarely bisexual), persistent style column 0–1.5 mm.

**6. Bennettiodendron:** unarmed; panicles 6–12(–20) cm; fruit baccate, in dried state to 10 mm in diam., perianth caducous; stamens usually absent (flowers usually unisexual); pedicels to 1 cm, often conspicuously warted by very prominent lenticels; leaves narrowly to broadly elliptic, elliptic-oblong, or obovate, bases acute or obtuse cuneate, pinnate-veined; petioles never with glands in lower half.

**7. Idesia:** unarmed; fruiting panicles (sometimes racemelike) 20–30 cm; fruit baccate, in dried state to 10 mm in diam.; leaves broadly ovate, bases cordate or broadly rounded, 3–5-veined from base; petioles sometimes with glands in lower half.

**12. Casearia:** unarmed; leaves sometimes pellucid-punctate; fruiting glomerules axillary (infructescence axis absent); fruit capsular, though fleshy and berrylike before dehiscence, in dried state 8–30 mm, typically longitudinally (2 or)3-angled, less often smooth, dehiscing finally by (2 or)3 valves, hairy disk lobes and stamens often persistent at base.

## 1. HYDNOCARPUS Gaertner, Fruct. Sem. Pl. 1: 288. 1788.

大风子属 da feng zi shu

*Taraktogenos* Hasskarl.

Trees, rarely shrubs, dioecious, rarely monoecious or polygamous. Leaves alternate; stipules small, usually early caducous; petiole usually present, often thickened at apex; leaf blade leathery, pinnate-veined, margin entire or toothed. Flowers hypogynous, in axillary, ± branched cymes, these sometimes very short or reduced to fascicles or to a solitary flower, or rarely flowers in long racemelike panicles from trunk or older branches; bracts small to minute, sometimes persistent; pedicels articulate. Sepals (3 or)4 or 5(or 7–11), imbricate, free or slightly joined at base, concave, becoming reflexed, caducous. Petals 4 or 5(–14), free or slightly joined at base, each with a thick and usually hairy scale inside at base. Disk and disk glands absent. Staminate flowers: stamens 5 to many (more than 100); filaments free, sometimes very short; anthers oblong to ovate-cordate, longitudinally dehiscent, connective often dilated; pistillode present or absent. Pistillate flowers: staminodes 5 to many, resembling stamens but anthers mostly reduced or absent; ovary superior, 1-loculed, placentas 3–6, each with several ovules; styles 3–6, short, or nearly absent; stigmas flattened, usually reflexed. Fruit baccate, globose, or ovoid, rarely elongate; pericarp thick and hard, or thin and brittle, exocarp fibrous or not, mesocarp light yellow, usually very hard, endocarp soft. Seeds several to many, angular-ovoid, packed in pulp; testa hard, striate; aril membranous; endosperm oily; cotyledons large and broad, leaflike, compressed-flat or folded.

About 40 species: tropical Asia; three species in China.

In Chinese species: flowers to ca. 20 together in fascicles or cymes; stamens 5 to ca. 25; mature fruit globose.

*Hydnocarpus kurzii* (King) Warburg (in Engler & Prantl, Nat. Pflanzenfam. 3(6a): 21. 1893; *Taraktogenos kurzii* King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 59: 123. 1890), described from Myanmar, was recorded as native to S Yunnan by Lai (FRPS 52(1): 9. 1999), although the present authors have seen no material.

According to Fl. Yunnan. (6: 254. 1995), *Hydnocarpus alpinus* Wight is cultivated in S Yunnan.

### Key to material in flower

- 1a. Sepals 5; petals 5, narrowly ovate-oblong, 12–15 mm; stamens 5 ..... 3. *H. anthelminthicus*
- 1b. Sepals 4; petals 4 or (7 or)8, orbicular or reniform-ovate, less than 8 mm; stamens 15–30.
- 2a. Petals 4 or (7 or)8; inflorescence 2- or 3-flowered; leaves 17–35 × 7–12 cm, abaxially hairy ..... 1. *H. annamensis*
- 2b. Petals 4; inflorescence 15–20-flowered; leaves 9–18 × 3–6 cm, abaxially glabrous ..... 2. *H. hainanensis*

### Key to (dried) material in fruit

- 1a. Leaves abaxially hairy; pericarp cross-section with radially striate layer ..... 1. *H. annamensis*

- 1b. Leaves abaxially glabrous; pericarp cross-section without radially striate layer.  
 2a. Leaves typically 2–3 × as long as wide, usually greenish when dried; young and mature fruit pale to dark brown or yellowish tomentose, 4–5 cm in diam. .... 2. *H. hainanensis*  
 2b. Leaves typically 3–4(–5) × as long as wide, usually drying reddish brown; young fruit darkish brown velutinous, finally glabrous, 8–12 cm in diam. .... 3. *H. anthelminthicus*

**1. *Hydnocarpus annamensis*** (Gagnepain) Lescot & Sleumer, Fl. Cambodge Laos Vietnam 11: 10. 1970.

大叶龙角 da ye long jiao

*Taraktogenos annamensis* Gagnepain in Lecomte, Fl. Indo-Chine, Suppl. 1: 206. 1939; *Hydnocarpus merrillianus* H. L. Li (1943), not Sleumer (1938); *T. merrilliana* C. Y. Wu.

Trees, evergreen, 8–25 m tall; bark gray-brown; branchlets terete, gray-brown or reddish tomentose; winter buds ovoid-globose, scales brown tomentose outside. Petiole 1–2.5 cm, brown tomentose; leaf blade green abaxially, deep green adaxially, obovate, elliptic-oblong, or oblong-lanceolate, 17–35 × 7–12 cm, thinly leathery, abaxially sparsely hairy or hairy only along veins, adaxially shiny and glabrous, midvein raised on both sides, lateral veins 5–10 pairs, reticulate veins conspicuous, base broadly acute, cuneate, asymmetric, margin entire, apex obtuse, contracting abruptly to a short acumen. Inflorescence axillary; flowers solitary, or 2 or 3 together in cymes 1–2 cm; rachis pubescent. Pedicels 3–5 mm, together with peduncles densely brown tomentose. Staminate flowers deep green; sepals 4 or 5, orbicular, 5–6 mm, outside yellowish tomentose, inside glabrous; petals 4 or 5, suborbicular, outer petals 4–5 mm, inner ones smaller, both sides (excl. scale) glabrous, margin ± fimbriate; scale 3–3.5 mm, apex hairy and fimbriate; stamens many (ca. 25); filaments 4–5 mm, hairy; anthers globose or subcordate, apex ± acute; pistillode absent. Pistillate flowers greenish, ca. 1.5 cm in diam.; sepals 4, oblong, 6–7 mm, outside densely rusty tomentose, inside glabrous, margin ciliate; petals 8, suborbicular, inner ones smaller, outer ones larger, both sides (excl. scale) glabrous, margin ± fimbriate; scales as for staminate flowers; staminodes 8; ovary ovoid-orbicular, slightly 8-angled, densely pubescent, styles nearly absent, stigmas 4 or 5. Berry subglobose, 4–6 cm in diam., reddish or brownish tomentose interspersed with longer stiffer bristles, stigmas persistent, pericarp cross-section with radially striate layer. Seeds numerous. Fl. Apr–May, fr. Jan–Dec.

Moist mountain slopes, thickets along streams; 200–600 m. S Guangxi, S Yunnan [Vietnam].

Li and Feng (in Fu & Jin, China Pl. Red Data Book 1: 308–309. 1992, as *Taraktogenos annamensis*) gave the conservation status of this species as rare, i.e., not in imminent danger of extinction but with very limited or scattered distribution. The 2006 IUCN Red List of Threatened Species (www.iucnredlist.org, at 19 January 2007, as *T. annamensis*) gave the status as vulnerable (VU A1cd). In China the species has suffered catastrophic damage due to clearance for agriculture, and the fruits are often harvested for their medicinal value.

Treatments disagree with respect to petal number in the male flower. Wu (Acta Phytotax. Sin. 6: 226. 1957) recorded 4 or 5 petals, which agrees with material seen for the present treatment. Lescot (Fl. Cambodge Laos Vietnam 11: 10. 1970) recorded (7 or)8 petals.

**2. *Hydnocarpus hainanensis*** (Merrill) Sleumer, Bot. Jahrb. Syst. 69: 15. 1938.

海南大风子 hai nan da feng zi

*Taraktogenos hainanensis* Merrill, Philipp. J. Sci. 23: 255. 1923.

Trees, evergreen, 6–12 m tall; bark gray-brown; branchlets terete, glabrous. Petiole 1–1.5 cm, glabrous or initially sparsely appressed-pubescent, glabrescent; leaf blade usually oblong, less often elliptic, narrowly ovate, or slightly obovate, 9–18 × 3–6 cm, 2–3 × as long as wide, thinly leathery, both surfaces glabrous, lateral veins 7 or 8 pairs, reticulate veins conspicuous, base acute to obtuse or rounded, cuneate, margin irregularly repand, serrulate or serrate, teeth sometimes sharply acute, leaf apex acute to obtuse, usually gradually or abruptly acuminate, acumen to ca. 2 cm. Inflorescence axillary or subterminal, 1.5–2.5 cm; flowers unisexual, 15–20 in much condensed (especially staminate flowers) shortly pedunculate cymes. Pedicels 8–15 mm, initially with sparse, short, appressed hairs, soon glabrous. Sepals 4, free, elliptic or orbicular, 5–6 × ca. 4 mm, both sides glabrous or outside sparsely appressed-hairy. Petals 4, free, reniform-ovate, 2–3 × 3–4 mm, both sides (excl. scale) glabrous, margin ciliate; scale ca. 1/2 as long as petal, irregularly 4–6-dentate, villous. Staminate flowers: stamens ca. 12; filaments ca. 1.5 mm, stout at base, sparsely hairy, hairs rather long, drying white; anthers sagittate, 1.5–2.5 mm; reduced ovary absent. Pistillate flowers: staminodes ca. 15, stamenlike but with anthers reduced, indumentum as for fertile stamens; ovary ovoid-ellipsoid, very densely yellowish brown pubescent, hairs closely appressed; placentas 5; ovules many; styles absent; stigmas 3 or 4, joined at base, flattened-deltoid, ca. 5 mm, bifid with each branch apex irregularly toothed or lobed, abaxially densely hairy at base, hairs as for ovary, adaxially glabrous. Berry globose, 4–5 cm in diam., densely pale to dark brown or yellowish tomentose, sometimes yellowish; pericarp leathery, exocarp not fibrous, stalk 6–7 mm, stout. Seeds ca. 20, ovoid, ca. 2.5 × 1.5–2 cm. Fl. Apr–May, fr. Jun–Aug.

Evergreen broad-leaved forests; 300–1800 m. Guangxi, Guizhou, Hainan, S Yunnan [Vietnam].

E (in Fu & Jin, China Pl. Red Data Book 1: 306–307. 1992) gave the conservation status of this species as vulnerable. The 2006 IUCN Red List of Threatened Species (www.iucnredlist.org, at 19 January 2007) also gave the status as vulnerable (VU A1cd). In China the species is under threat from habitat loss and harvesting of the timber (hard, heavy, compact, durable, and decay-resistant) and the fruit (the seeds have a relatively high component of chaulmoogric oil, locally important for the treatment of skin conditions). Natural regeneration is poor.

**3. *Hydnocarpus anthelminthicus*** Pierre in Lanessan, Pl. Util. Col. Franç. 303. 1886 [“*anthelminticus*”].

泰国大风子 tai guo da feng zi

Trees, less often shrubs, evergreen, 7–20(–30) m tall; trunk strictly straight, bark gray-brown; branchlets stout, slightly enlarged at nodes. Petiole 5–15 mm, glabrous; leaf blade green

when fresh, often drying reddish brown, lanceolate, ovate-lanceolate or oblong, (7–)10–20(–30) × 3–8 cm, typically 3–4(–5) × as long as wide, thinly leathery, both surfaces glabrous, lateral veins 8–10 pairs, reticulate veins dense, conspicuous, base usually rounded, rarely obtuse-cuneate, oblique, margin entire, apex variable, acute to obtuse or rounded, often with a short acumen 3–10 mm. Inflorescences axillary, flowers 2 or 3 in often abbreviated false cymes or racemes to 1 cm, or flowers solitary (mostly pistillate flowers). Flowers mostly unisexual, yellowish or pinkish green, fragrant. Pedicels slender, to 2 cm, longer in fruit, yellowish stellate-tomentose. Sepals 5, united at base, ovate, narrowly oblong, or obovate, 8–9 mm, outside densely yellowish stellate-tomentose, inside appressed pubescent, apex obtuse. Petals 5, becoming reflexed, nearly free, yellowish pink, narrowly ovate-oblong, 12–15 mm, both sides (excl. scale) and margin glabrous or with a few scattered hairs; scales free except at extreme base, linear, subequalling petals, both sides glabrescent to glabrous, margin ciliate. Staminate

flowers: stamens 5; filaments ca. 3 mm, dilated at base, tapering toward apex, glabrous; anthers sagittate, ca. 4 mm, connective dilated; pistillode columnar, small, hairy. Pistillate flowers: pedicels tomentose; staminodes 5, similar to anthers but filaments ca. 1.5 mm, with or without anthers; ovary ovoid or obovoid, red-brown setaceous, drying yellowish; placentas 5; ovules 10–15; styles short, hairy; stigmas 5, reflexed, connate, forming a cap at apex of ovary, beneath setaceous like ovary, upper surface glabrous, margin crenate. Berry globose, 8–12 cm in diam.; stalk stout, pericarp orange-brown when fresh, when dried densely blackish hairy at first, gradually glabrescent, finally dark brown with numerous minute white dots, verrucose, scaly; exocarp not fibrous, inner layers woody, thin, crisp when dry. Seeds many, 30–50(–100), 1.5–2.2 × 1–1.7 cm. Fl. Sep, fr. Nov–Jun of next year.

Rain forests or evergreen broad-leaved forests; 300–1300 m. Guangxi, Yunnan; cultivated in Guangxi, Hainan, and Taiwan [Cambodia, Thailand, Vietnam].

## 2. GYNOCARDIA R. Brown in Roxburgh, Pl. Coromandel 3: 95. 1820.

马蛋果属 ma dan guo shu

*Chaulmoogra* Roxburgh; *Chilmoria* Buchanan-Hamilton.

Trees, dioecious. Leaves alternate; stipules caducous, not seen; petiole present; leaf blade leathery, pinnate-veined, margin entire. Flowers hypogynous, solitary or few in axillary bracteate corymbs (staminate flowers), or in corymbose clusters arising from tubercles on stems and older branches (staminate or pistillate flowers), pedicellate; pedicels articulate, bracteolate; buds globose. Calyx closed in bud, later cupular, subtruncate, 5-dentate or shallowly 3–5-lobed, finally sometimes with 3–5 irregular or orbicular sepals. Petals 5, united at base, fleshy, each with a scale inside at base. Disk and disk glands absent. Staminate flowers: stamens many (ca. 100); filaments free, filiform; anthers basifixed, linear-sagittate, small; pistillode absent. Pistillate flowers: staminodes 10–15; ovary superior, 1-loculed, placentas 5, each with numerous ovules; styles 5, free, columnar; stigmas cordate or peltate, small. Fruit baccate, pericarp thick, woody. Seeds immersed in pulp, numerous, testa thick, crisp; endosperm oily, fleshy; cotyledons compressed-flat.

One species: Asia.

**1. *Gynocardia odorata*** R. Brown in Roxburgh, Pl. Coromandel 3: 95. 1820.

马蛋果 ma dan guo

*Chaulmoogra odorata* Roxburgh; *Chilmoria dodecandra* Buchanan-Hamilton.

Trees, evergreen, to 30 m tall; twig tips and branchlets glabrous; bark brown, not flaking; branchlets terete; winter buds ovoid-orbicular. Petiole 1–3 cm, usually glabrous, sometimes sparsely appressed puberulous; leaf blade greenish abaxially, deep green adaxially, nearly concolored when dry, oblong-elliptic, rarely ovate-oblong or obovate-oblong, 13–20 × 5–10 cm, leathery, lateral veins 4–8 pairs, conspicuous abaxially, reticulate veins parallel, margin entire, slightly uneven, base rounded or acute-cuneate, apex rounded, contracting abruptly to a short narrow acumen. Pedicels 2.5–5 cm, sparsely appressed hairy or

glabrous. Staminate flowers 3–4 cm in diam., fragrant; calyx lobes ca. 7 mm, obtuse to rounded, outside glabrous or with short, sparse, appressed hairs; petals yellowish green, oblong or slightly obovate, 1.5–2 cm, glabrous, apex obtuse; epipetalous scale oblong or ovate, ca. 6 × 4 mm, densely ciliate, apex obtuse; stamens ca. 1 cm, filaments villous, anthers ca. 5 mm. Pistillate flowers larger than staminate flowers; petals ca. 2.5 cm; staminodes 10–15, villous; styles short, slender; stigmas peltate or cordate. Berry yellowish brown, globose, (5–)8–12 cm in diam.; pericarp grayish, ca. 5 mm thick, woody, rugose, glabrous. Seeds numerous, variable in shape and size, usually obovoid to ellipsoid, 2.5–3 cm, hilar region large, silvery gray. Fl. Jan–Feb, fr. Jun–Aug.

Moist sparse forests of mountain valleys; 800–1000 m. SE Xizang (Médog), SE Yunnan [Bangladesh, Bhutan, India, Myanmar, Nepal].

## 3. SCOLOPIA Schreber, Gen. Pl. 1: 335. 1789, nom. cons.

菊柞属 ce zhong shu

*Ambilla* Adanson; *Phoberos* Loureiro.

Shrubs or small trees, often spinose on trunk and branches. Leaves alternate; stipules small, caducous; usually petiolate; leaf blade leathery, pinnate-veined, sometimes 3-veined from base, with or without a pair of marginal glands at junction of petiole apex

and base of blade, margin entire or toothed, each tooth with a small marginal gland. Flowers bisexual (usually), hypogynous, small, arranged in terminal or axillary bracteate racemes, sometimes in axillary fascicles or solitary; pedicels articulate at base. Sepals 4–6, imbricate, slightly united at base; calyx often opening early in bud to reveal closely packed anther tips and slightly exerted style. Petals isomerous with and similar to sepals, alternating with them, free or joined at base only. Disk extrastaminal, composed of a single row of 8–10, orange, short, thick glands, or rarely disk absent. Stamens many, exerted; filaments free, filiform, inserted on receptacle; anthers small, versatile, longitudinally dehiscent, connective sometimes produced beyond thecae into a triangular or oblong (in dried material), glabrous or hairy appendage. Ovary superior, sessile, 1-loculed, with 2–4 placentas, each with few ovules; style 1, entire; stigma capitate, entire, or very shortly 2–4-lobed. Berry fleshy, drying blackish, with persistent perianth and stamens at base, and long slender persistent style conspicuous at apex. Seeds (1 or)2 or 3(–20).

About 40 species: tropical and subtropical regions of the E hemisphere; four species in China.

In Chinese species: leaf not conspicuously 3-veined from base, basal 1 or 2 pairs of lateral veins high ascending but weaker than midvein, both surfaces of leaf blade glabrous; stamens glabrous, anther connectives produced beyond thecae; disk glands present; receptacle hairy; ovary, style, and fruit glabrous; seeds 1–6.

Herbarium material of *Scolopia* can be difficult to identify to species; a study of fresh flowers and fruit might provide characters to improve the following key.

- 1a. Leaves with a pair of glands at junction of leaf base and petiole apex, these much larger than any elsewhere along leaf margin ..... 1. *S. chinensis*
- 1b. Leaves without a pair of glands at junction of leaf base and petiole apex, although sometimes with small glands on leaf margin some distance from petiole apex, these a similar size or only slightly larger than elsewhere along leaf margin.
- 2a. Leaf blade 1.5–4 cm, abaxially vein reticulation often sparse or obscure (even at  $\times 10$  mag.), apex acute to rounded, never acuminate nor apiculate; petiole usually puberulous (view at  $\times 20$  mag.) ..... 3. *S. buxifolia*
- 2b. Leaf blade 3–9 cm, both surfaces with vein reticulation clear, not sparse, apex various; petiole glabrous (view at  $\times 20$  mag.).
- 3a. Leaf apex acuminate, acumen 0.5–2 cm; mature berry reddish; plants of Fujian, Guangdong, Guangxi, Hainan, Yunnan [and Vietnam] ..... 2. *S. saeva*
- 3b. Leaf apex acute to rounded, sometimes slightly acuminate, acumen ca. 0.5 cm or less; mature berry green or greenish black; plants of Fujian and Taiwan ..... 4. *S. oldhamii*

**1. *Scolopia chinensis*** (Loureiro) Clos, Ann. Sci. Nat., Bot., sér. 4, 8: 249. 1857.

薊柊 ce zhong

*Phoberos chinensis* Loureiro, Fl. Cochinch. 1: 318. 1790; *P. cochinchinensis* Loureiro; *Scolopia siamensis* Warburg.

Shrubs or small trees, evergreen, 2–6 m tall; bark grayish; twig tips puberulous (viewed at  $\times 20$  mag.), branchlets glabrous, branches and branchlets often spiny; spines simple, 1–5 cm. Petiole short, 3–5 mm, puberulous; leaf blade elliptic to oblong-elliptic, 4–7  $\times$  2–4 cm, leathery, both surfaces glabrous, lateral veins 4–6 pairs, slender, basal 1 or 2 pairs high ascending, reticulate veins clear on both surfaces (at  $\times 10$  mag. or less), not sparse, base broadly acute to subrounded, margin entire to serrulate, with a pair of glands at junction of blade and petiole, glands much larger than those elsewhere on margin, apex broadly acute to rounded, tip apiculate or with a very short blunt acumen 1–2 mm. Racemes axillary or terminal, 2–6 cm, puberulous. Pedicels 4–10 mm, puberulous. Flowers yellowish, ca. 4 mm in diam. Sepals 4 or 5(–7), ovate-triangular, 1–1.5 mm, abaxially pubescent, margin ciliate. Petals obovate-oblong, 1.5–2 mm, to 1.5  $\times$  as long as sepals, outside sparsely pubescent to subglabrous, margin ciliate. Disk glands 10, fleshy. Stamens ca. 5 mm; anthers globose, connective with conspicuous appendage at apex, appendage ca. as long as connective, usually with 1 to few hairs at tip. Ovary ovoid; placentas 2 or 3, each with 2 pendulous ovules; style ca. 2 mm in young flowers, soon to 5 mm; stigma minutely lobed. Berry brownish red, dark

purple, or black, orbicular-globose, (5–)8–10 mm in diam. Seeds (2–)4–6. Fl. Jun–Sep, fr. Oct–Apr of following year.

Sparse forests and thickets in hilly regions at low elevations, among rocks near coast; 50–400 m. Fujian, Guangdong, Guangxi, Hainan [Laos, Thailand, Vietnam; cultivated and/or naturalized in India, Malaysia, Sri Lanka].

*Scolopia crenata* (Wight) Clos was treated as a synonym of *S. chinensis* in FRPS (52(1): 16. 1999). However, *S. crenata* is, in fact, a different species that is distributed in India and the Andaman Islands.

**2. *Scolopia saeva*** (Hance) Hance, Ann. Sci. Nat., Bot., sér. 4, 18: 217. 1862.

广东薊柊 guang dong ce zhong

*Phoberos saevus* Hance, Ann. Sci. Nat., Bot., sér. 4, 3: 825. 1852; *Scolopia cinnamomifolia* Gagnepain; *S. henryi* Sleumer.

Shrubs or small trees, evergreen, 4–8(–10) m tall; bark grayish, not flaking; trunk spiny; spines simple or compound, to 11 cm; twig tips puberulous (view at  $\times 20$  mag.), early glabrescent, branchlets glabrous. Petiole 5–10 mm, glabrous; leaf blade ovate, elliptic, or elliptic-lanceolate, 5–8  $\times$  2–5 cm, leathery, adaxially shiny, both surfaces glabrous, lateral veins 3–5 pairs, slender, basal 2 pairs high ascending, reticulate veins clear on both surfaces (at  $\times 10$  mag.), not sparse, base mostly acute, cuneate or sides concave, sometimes attenuate, margin subentire to remotely and shallowly repand-serrate, glands at

junction of blade and petiole absent, apex acuminate, acumen 0.5–2 cm. Racemes axillary or terminal, 2–5 cm, usually ca. 1/2 × to as long as leaves, puberulous. Pedicels 5–10 mm, puberulous though appearing glabrous (view at × 20 mag., even then hairs sometimes scarcely visible). Flowers whitish green. Sepals 4 or 5, ovate, 1.2–1.5 mm, outside glabrous or sparsely hairy toward base, margin ciliate. Petals obovate-oblong, 1.5–2 mm, outside glabrous, margin ciliate. Disk glands 4 or 5(–710). Stamens ca. 6 mm; anthers ovoid, connective with appendage at apex, glabrous or glabrescent. Ovary ovoid; placentas 2 or 3, each with 1 or 2 ovules; style 3–5 mm, stigma minutely lobed. Berry reddish, obovoid-orbicular, 6–8 mm. Seeds 1 or 2, ovoid-oblong, angled. Fl. May–Oct, fr. Aug–Apr of following year.

Dry plains, mixed forests in mountains; 400–1500 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

**3. *Scolopia buxifolia*** Gagnepain, Bull. Soc. Bot. France 55: 524. 1908.

黄杨叶薊柎 huang yang ye ce zhong

*Scolopia hainanensis* Sleumer; *S. nana* Gagnepain.

Shrubs or small trees, evergreen, 2–8 m tall; twig tips puberulous (view at × 20 mag.); branchlets short, glabrous, spiny. Petiole short, ca. 3 mm, puberulous (view at × 20 mag.); leaf blade elliptic to obovate, 1.5–4 × 0.7–2 cm, leathery, both surfaces glabrous, adaxially shiny, lateral veins 2–5 pairs, slightly raised on both surfaces, basal pair high ascending, reticulate veins sparse and/or obscure on both surfaces, especially abaxially (at × 10 mag.), base acute-cuneate or more rarely rounded, extreme base usually slightly rounded, margin entire or inconspicuously remotely serrulate, often slightly revolute, glands at junction of blade and petiole absent, apex broadly acute to rounded, never acuminate nor apiculate. Racemes usually axillary in upper part of branchlets, few flowered, to 3 cm, sometimes extremely short, puberulous (view at × 20 mag.). Pedicels 5–11 mm, pubescent or glabrous. Flowers white. Sepals 4, rarely 5, ovate, 1–1.5 mm, outside glabrous, margin ciliate. Petals 1.5–2 mm, ovate-oblong, obovate-oblong, or nearly orbicular,

outside glabrous, margin ciliate. Disk glands 8. Stamens 3–5 mm, glabrous or minutely and sparsely hairy; anthers small, connective with glabrous or glabrescent appendage. Ovary ovoid; placentas 3, each with 1 or 2(–?4) ovules; style 3–5 mm, stigma triangular-ovoid. Berry red at maturity, globose, 5–10 mm in diam. Seeds 3–6. Fl. Jun–Sep, fr. Jun–Oct.

Sandy places along seashores, dry sandy gentle slopes, thickets; low elevations. Guangxi, Hainan [Thailand, Vietnam].

**4. *Scolopia oldhamii*** Hance, Ann. Sci. Nat., Bot., sér. 5, 5: 206. 1866.

台湾薊柎 tai wan ce zhong

Shrubs or small trees, evergreen, 3–6 m tall; bark gray-brown, smooth, not flaking, spotted; twig tips and young branchlets puberulous, older branchlets glabrous, branches spiny when young, unarmed when old. Petiole short, 2–6 mm, glabrous; leaf blade ovate, narrowly elliptic, ovate-lanceolate, or broadly obovate, 3–9 × 1.5–4 cm, subleathery to leathery, both surfaces glabrous, midvein raised abaxially, impressed adaxially, lateral veins 4–6 pairs, basal 1 or 2 pairs high ascending, reticulate veins raised on both sides, clear, not sparse, base usually acute-cuneate or with sides slightly concave, less often obtuse-cuneate, margin entire or shallowly and remotely serrulate, glands at junction of blade and petiole absent, apex broadly acute to rounded, sometimes shortly acuminate, acumen ca. 5 mm or less, extreme tip blunt. Racemes axillary or terminal, few flowered, to 4 cm, sometimes very short, minutely puberulous (view at × 20 mag.). Pedicels 3–4 mm, to 1 cm in fruit, minutely puberulous or glabrous. Flowers yellowish to white, 6–8 mm in diam. Sepals 5–6, ovate or oblong, 1.5–2 mm, outside glabrous, margin ciliate. Petals obovate, 2.5–3 mm, outside glabrous, margin ciliate. Disk glands 10–15. Stamens 4–5 mm, anther connective appendage glabrous or glabrescent. Ovary globose; style 3–5 mm; stigma minutely lobed. Berry green to blackish green when mature, globose, 7–9 mm in diam. Seeds 4 or 5. Fl. Aug–Sep, fr. Nov–May of following year.

Mountains, plains, sunny roadsides, roadside thickets, jungle margins, seashores; below 400 m. Fujian, Taiwan [Japan (Ryukyu Islands)].

#### 4. FLACOURTIA Commerson ex L'Héritier, Stirp. Nov. 3: 59. 1786.

刺篱木属 ci li mu shu

*Stigmarota* Loureiro.

Trees or shrubs, dioecious or hermaphroditic, rarely polygamous, usually spiny. Leaves alternate, petiolate; stipules small, early caducous; leaf blade pinnate-veined, sometimes 3–5-veined from base, margin glandular-toothed, rarely entire. Inflorescences axillary, or terminal on abbreviated lateral twigs, usually short, lax, racemose, or in form of small paniculate or umbel-like clusters. Flowers hypogynous, unisexual or bisexual, small; pedicels articulate. Sepals 4–7, imbricate, slightly connate at base, green, small. Petals absent. Disk fleshy, entire or comprised of distinct glands. Staminate flowers: stamens many, exerted, filaments free, filiform; anthers ellipsoid, small, versatile, longitudinally dehiscent, connective not projected beyond thecae; disk extrastaminal; abortive ovary much reduced or absent. Pistillate flowers: disk surrounding base of ovary; ovary superior, globose, ovoid, or bottle-shaped, incompletely 2–8-loculed by false septa; placentas 2-ovuled; styles isomerous with placentas, free or united, columnar; stigmas slightly dilated, flattened, reniform, recurved; staminodes usually absent. Fruit a berrylike indehiscent drupe with pyrenes 2 × as many as styles, globose, in dried material characteristically longitudinally angled, squarish or rectangular in longitudinal cross-section, with flattish apex and base, contracted or not at equator, disk persistent at base, style or stigma remnants persistent at apex. Seeds ellipsoid, compressed.

Between 15 and 17 species: tropical Africa and Asia; five species (one endemic) in China.

In Chinese species: plants usually dioecious; stamens (10–)15–30(–50), number apparently variable within each species.

*Flacourtia* species are often cultivated and harvested for fruit, medicinal use, or wood.

Male flowers of *Flacourtia* are easily confused with those of *Xylosma*; female flowers of the two genera are easily distinguished by style and stigma morphology, young fruits by style morphology and internal structure.

### Key to material with female flowers or fruit

- 1a. Abaxial surface of leaf softly and densely pubescent throughout ..... 5. *F. mollis*  
 1b. Abaxial surface of leaf glabrous or sparsely hairy.  
 2a. Styles completely united to form a distinct column with stigmas slightly spreading at apex ..... 1. *F. jangomas*  
 2b. Styles free, or joined only at base.  
 3a. Styles free, arranged in a ring, becoming well-spaced as fruit develops; leaves ovate-oblong, elliptic-oblong, or oblong-lanceolate, 6–16 × 4–7 cm ..... 2. *F. rukam*  
 3b. Styles joined at base, remaining so in fruit; leaves obovate, oblong-obovate, elliptic, or elliptic-lanceolate, 2–10 × 1.5–6 cm.  
 4a. Leaves 2–4 × 1.5–3 cm, obovate or oblong-obovate; fruit 8–10 mm in diam. .... 3. *F. indica*  
 4b. Leaves 4–10 × 2.5–6 cm, elliptic to elliptic-lanceolate; fruit 15–25 mm in diam. .... 4. *F. ramontchi*

### Identification of material with male flowers

*Flacourtia mollis* can be recognized by its leaf indumentum, and *F. indica* (as defined here) by its leaf size and shape. The remaining three species are much more difficult, at least from herbarium material, as staminate flowers seem to offer no useful characters; leaves on flowering specimens are often young, and therefore, generally small, and in all three species the leaf shape and size is variable, with character states overlapping between the species. *Flacourtia jangomas* usually has ovate to ovate-elliptic or more rarely ovate-lanceolate leaves, and *F. ramontchi* elliptic leaves, but all of these shapes seem to occur also in *F. rukam*. Most flora keys rely heavily on style characters to distinguish species. Staminate herbarium material might easily be misidentified. A molecular study based on fertile material could help resolve this problem.

### 1. *Flacourtia jangomas* (Loureiro) Raeuschel, Nomencl. Bot., ed. 3, 290. 1797.

云南刺篱木 *yun nan ci li mu*

*Stigmarota jangomas* Loureiro, Fl. Cochinch. 2: 634. 1790; *Flacourtia cataphracta* Roxburgh ex Willdenow.

Large shrubs or small trees, 5–10 m tall, deciduous; trunk and older branches usually unarmed, young branches with simple or divaricate spines; bark yellow-brown, reddish brown, or light brown, flaky; young branches smooth, glabrous or sparsely pubescent, lenticellate. Petiole 4–8 mm, pubescent or glabrescent; leaf blade dark green abaxially, shiny adaxially, in fresh state pinkish to reddish or orange-brown when young, narrowly ovate, ovate-elliptic, or ovate-oblong, rarely oblong-lanceolate or (slightly) obovate-lanceolate, 7–14 × 2–5 cm, thinly leathery to papery, both surfaces practically glabrous, any hairs present very short, midvein slightly raised on both surfaces, lateral veins 3–6 pairs, conspicuous adaxially, base acute, obtuse, or rounded, margin entire or serrate to crenate, apex obtuse or gradually tapering to narrowly acuminate, rarely more abruptly acuminate. Inflorescences axillary, racemose; rachis 0.5–2 cm, puberulous. Pedicels 5–10(–15) mm, very slender, minutely and sparsely puberulous or glabrous; bracts ovate, 0.5–1 mm, outside glabrous or sparsely hairy, inside pubescent, margin entire, ciliate. Flowers appearing with or before young leaves, white to greenish, honey-scented. Sepals 4 or 5, ca. 2 mm, ovate-triangular, apex obtuse, outside practically glabrous, inside pubescent, margin ciliate, hairs very short, often barely visible in female flowers. Staminate flowers: stamen filaments 2–3 mm, glabrous. Pistillate flowers: ovary bottle-shaped to

globose, 2–3 mm; styles 4–6, united into a distinct column ca. 1 mm, not or slightly free at their apices; stigmas slightly reniform, dilated, recurved. Fruit brownish red or purple, finally blackish, subglobose, fleshy, 1.5–2.5 cm in diam., in dried material sometimes constricted at equator, style column persistent. Seeds 4 or 5(–10). Fl. Apr–May, fr. May–Oct.

• Mountain rain forests, evergreen broad-leaved forests; 700–800 m. W Guangxi, S Hainan, S Yunnan.

According to Sleumer (Fl. Males., ser. 1, 5(1): 73. 1954), *Flacourtia jangomas* is not known in the wild state. The species is cultivated around villages, and naturalized from them, throughout tropical regions, especially in E Africa and tropical Asia.

*Morse 498* (K), from Guangxi, determined as “cf. *Flacourtia jangomas*” by Sleumer (determination slip dated 1954 on herbarium sheet), has pubescent stamen filaments. The leaves are small, ovate to narrowly elliptic, and possibly young. The specimen might represent immature *F. ramontchi*.

### 2. *Flacourtia rukam* Zollinger & Moritzi, Syst. Verz. 2: 33. 1846.

大叶刺篱木 *da ye ci li mu*

Trees, 5–15 m tall; bark gray-brown, not flaky; when young with simple or branched thorns to 10 cm on trunk and branches (thornless in cultivated forms); branchlets terete, glabrous to densely pubescent when young. Petiole 4–8 mm, glabrous or pubescent, hairs spreading; young leaves flaccid, drooping, rose-red to brown; mature leaves ovate-oblong, elliptic-oblong, or oblong-lanceolate, 6–16 × 4–7 cm, subleathery, both surfaces glabrous or minutely puberulous, in older leaves hairs mostly confined to midveins and lateral veins, midvein raised



and sometimes prominent abaxially, impressed adaxially, lateral veins 5–11 pairs, base obtuse to rounded, less often acute, margin serrulate, serrate, or dentate, teeth obtuse, apex gradually to abruptly acuminate, acumen 0.5–2 cm, tip obtuse. Inflorescences axillary, racemose, 0.5–1 cm, puberulous; bracts ovate, ca. 1 mm, pubescent. Pedicels 3–4 mm, puberulous to pubescent, hairs  $\pm$  appressed, short. Flowers yellowish green, scentless. Sepals (3 or)4 or 5(or 6), ovate, 1–1.5 mm, both surfaces pubescent, outside sparsely pubescent, inside more densely so, margin ciliate, apex acute or obtuse. Staminate flowers: stamen filaments 3–4 mm, glabrous; disk orange-red to yellowish. Pistillate flowers: ovary bottle-shaped; placentas 4–6(–8); styles 4–6(–8), free, divergent, 0.7–1.5 mm; stigmas recurved, slightly dilated, reniform; staminodes (reduced stamens) or developed stamens (?functional) occasionally present. Fruit light green, pink, purplish, or dark red, globose, 2–2.5 cm in diam., 4–7-angled in dried state, persistent styles well-spaced, set in a circle at fruit apex. Seeds ca. 12. Fl. Apr–May, fr. Jun–Oct.

Evergreen broad-leaved forests; below 2000 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [India, Indonesia, Malaysia, Thailand, Vietnam, both wild and cultivated].

**3. *Flacourtia indica*** (N. L. Burman) Merrill, Interpr. Herb. Amboin. 377. 1917.

刺篱木 ci li mu

*Gmelina indica* N. L. Burman, Fl. Indica, 132. 1768; *Flacourtia parvifolia* Merrill.

Shrubs or small trees, 2–4 m tall, deciduous; bark gray-yellow, fissured, flaky; old branches usually not spiny; young branches with axillary, simple spines; branchlets puberulous or subglabrous. Petiole red, short, 3–5 mm, puberulous; leaf blade greenish abaxially, deep green adaxially, rose red when young, obovate to oblong-obovate, 2–4  $\times$  1.5–3 cm, thickly papery, abaxially glabrous or sparsely pubescent, hairs spreading and short, adaxially glabrous, midvein raised abaxially, flat adaxially, lateral veins 5–7 pairs, reticulate veins conspicuous, base mostly acute to obtuse, margin serrulate above middle, apex rounded, sometimes retuse. Inflorescences axillary or terminating short lateral twigs, racemose, short; rachis 0.5–2 cm, puberulous. Pedicels 3–5 mm, puberulous, hairs spreading. Sepals 5 or 6, ovate, ca. 1.5 mm, outside glabrous or with a few scattered short hairs, inside sparsely to densely pubescent, margin white ciliate in dried material, apex obtuse. Staminate flowers: stamen filaments 2–2.5 mm, pubescent or less often glabrous. Pistillate flowers: ovary globose, placentas 5 or 6; styles 5 or 6, united only at base, radiating, 1–2 mm, slender. Fruit dull to blackish red, globose, 8–10 mm in diam., longitudinally 5- or 6-angled, styles persistent. Seeds 5 or 6. Fl. Jan–Mar, fr. Mar–Jul.

Broad-leaved forests; sea level to 1400 m. Fujian, Guangdong, Guangxi, Hainan [widespread and cultivated in tropical and subtropical regions of Africa, Asia, and the Pacific islands].

The taxonomy of *Flacourtia indica* is complex. Some authors have treated the species in a broad sense, and include in synonymy not only *F. ramontchi* (see below) but also several other entities found across tropical Asia and Africa. For an introduction to the problem, see Matthew (Fl. Tamilnadu Carnatic 3(1): 59–61. 1983), Mitra (in Sharma

et al., Fl. India 2: 402–403. 1993), Sleumer (Fl. Males., ser. 1, 5(1): 76–77. 1954), and Verdcourt (in Dassanayake & Clayton, Rev. Handb. Fl. Ceylon 10: 222–224. 1996). Some of the taxonomic confusion might be due to a loss of significant field characters during the preparation of herbarium material (Verdcourt, loc. cit.). In the present account, *F. ramontchi* is treated as a separate species because, on the evidence of herbarium material at PE, it seems to be a distinct and recognizable entity within China. Descriptions of *F. ramontchi* vary; for example, compare that below with Matthew (loc. cit.).

**4. *Flacourtia ramontchi*** L'Héritier, Stirp. Nov. 3: 59. 1786.

大果刺篱木 da guo ci li mu

Trees, to 20 m tall; bark gray-brown; flowering and fruiting branches usually not spiny; branchlets puberulous or subglabrous. Petiole 4–8 mm, usually glabrous, rarely sparsely puberulous; leaf blade greenish abaxially, deep green and shiny adaxially, broadly elliptic, elliptic, or elliptic-lanceolate, 4–10  $\times$  2.5–6 cm, papery, both surfaces glabrous, midvein raised abaxially, lateral veins 4–6 pairs, reticulate veins conspicuous, base cuneate, margin serrate, apex obtuse or acute, rarely retuse. Inflorescences terminal or axillary, racemose, 1–2 cm, puberulous. Sepals 5 or 6, ovate, ca. 1.5 mm, outside glabrous, inside puberulous, margin ciliate, apex obtuse. Staminate flowers: disk entire or shallowly lobed. Pistillate flowers: disk entire; ovary globose; placentas 5 or 6, each with 2 ovules; styles 5 or 6, free; stigmas 2-lobed. Fruit globose, 1.5–2.5 cm in diam., not longitudinally angled, with persistent styles. Seeds 4–6. Fl. Apr–May, fr. Jun–Oct.  $2n = 22$ .

Evergreen broad-leaved forests; 200–1700 m. Guangxi, Guizhou, Yunnan [India, Malaysia, Philippines, Sri Lanka, Vietnam; Africa].

See taxonomic note under *Flacourtia indica*.

**5. *Flacourtia mollis*** J. D. Hooker & Thomson, Fl. Brit. India 1: 192. 1872.

毛叶刺篱木 mao ye ci li mu

Small trees or shrubs, 3–4 m (?or more) tall, apparently unarmed; branchlets  $\pm$  rusty pubescent, hairs spreading, rather long. Petiole 5–10 mm, stoutish, densely hairy, hairs spreading, brownish, straight, long (0.5–1 mm); leaf blade ovate to ovate-elliptic, 11–18  $\times$  4.5–7.5 cm, thickly papery, abaxially softly pubescent throughout, soft to the touch, hairs spreading and long (0.5–1 mm), adaxially glabrous except near petiole apex, midvein impressed above, lateral veins 4–6 pairs, prominent abaxially, base broadly acute to rounded, margin shallowly serrate to serrulate, entire toward base, apex obtuse, contracting to a narrow acumen 1–2 cm, extreme tip obtuse. Inflorescences mostly axillary, racemose with axis ca. 1 cm, or reduced to glomerules or fascicles; rachises densely hairy, appearing nearly bristly at  $\times 10$  mag., hairs spreading, ca. 0.5 mm; bracts ovate to lanceolate, 1–2 mm, both surfaces sparsely bristly. Pedicels ca. 1 mm in pistillate flowers, ca. 3 mm in staminate flowers (few specimens seen), bristly. Sepals 4–6, ovate, 1–1.5 mm, unequal in size, both sides and margin sparsely bristly, or adaxially nearly glabrous, apex acute. Staminate flowers: stamen filaments 3–4 mm, glabrous. Pistillate flowers: ovary bottle-shaped, 1.5–2 mm, glabrous; styles connate into a short column ca. 0.5 mm; stigmas 4–6, radiating, recurved, flattened-

reniform. Dried fruit oblong-polygonal to obovoid-polygonal, to ca. 1 cm (?immature), longitudinally angled.

Mountain forests; 1000–1700 m. Yunnan [Myanmar].

*Flacourtia mollis* is sometimes misidentified as the Indian en-

demic *F. montana* J. Graham. The two species can be distinguished by the abaxial indumentum of the leaf: in *F. mollis*, it is softly hairy throughout; in *F. montana*, it is sparsely hairy only along the midvein and lateral veins. Gatherings of *F. mollis* seem scarce; more material is required to confirm and improve the above description.

## 5. XYLOSMA G. Forster, Fl. Ins. Austr. 72. 1786, nom. cons.

柞木属 zuo mu shu

*Apactis* Thunberg; *Hisingera* Hellenius; *Myroxylon* J. R. Forster & G. Forster (1775), not Linnaeus f. (1782), nom. cons.

Shrubs or small trees, usually dioecious, rarely polygamous; trunk and branches usually spiny. Leaves alternate, stipulate, usually petiolate; leaf blade pinnate-veined, margin serrate, rarely entire, teeth glandular. Flowers hypogynous, small, in axillary fascicles, short racemes, or panicles, rudiments of opposite sex usually absent; bracts small, persistent or caducous; pedicels articulate at base. Sepals 4 or 5, imbricate, free or connate at base only. Petals absent. Disk extrastaminal, or in female flowers extragynoecial, comprised of several small closely set or connate glands (usually in staminate flowers) or annular (often in pistillate flowers). Staminate flowers: stamens ca. 10 to many, exserted; filaments free, filiform; anthers small, basifixed, sometimes apiculate by extension of connective. Pistillate flowers: ovary superior, 1-loculed; placentas 2(–6), each with 2 to many ovules; styles 2 or 3(or 4), often very short, joined in lower part only or completely joined to form a single style column, or styles absent; stigmas semilunate to U-shaped. Berry small, ca. 1 cm or less, pericarp thinly leathery, blackish when dried; disk and calyx often persistent at base; styles and/or stigmas persistent at apex. Seeds few.

About 100 species: tropical and subtropical regions, rarely extending to warm-temperate regions; three species in China.

The gender of the name *Xylosma* is feminine; see Art. 62.2(b) of the *Vienna Code*.

In Chinese species: stamens 10–20, filaments glabrous; ovary glabrous; berry red or black when fresh. See notes on identification under *Flacourtia*.

Differentiation between fruiting material of *Xylosma controversa* and *X. longifolia* can be difficult when the calyx is absent (caducous) and the critical sepal indumentum character therefore unavailable. Ranges of other character states (e.g., leaf size, shape, lateral vein number) overlap, and lateral veins are difficult to count in dried material, especially toward the leaf apex. Characters used previously, for example dried leaf color, leaf shininess, leaf base shape, and style length, are not reliable. For some fruiting material examined for the Flora (at K), identification of *X. controversa* has been based solely on the absence of the calyx. Further study is required to test the strength of this character and, ideally, provide additional ones.

- 1a. Leaves broadly ovate or ovate to elliptic-ovate, 4–8 × 2.5–4 cm; lateral veins 3 or 4(or 5) pairs; seed sheath with dark striations ..... 1. *X. congesta*
- 1b. Leaves oblong, oblong-lanceolate, lanceolate, or elliptic, 5–10(–18) × 2–7 cm; lateral veins more than 5 pairs; seed sheath without dark striations.
- 2a. Leaves elliptic to oblong, lateral veins 5 or 6(or 7) pairs; inflorescence lax, 1.5–3(–5) cm, paniculate or racemose-paniculate, often yellow puberulous; sepals pubescent inside, margin entire, ciliate; calyx deciduous in fruit ..... 2. *X. controversa*
- 2b. Leaves elliptic to oblong-lanceolate, lateral veins (6 or) 7–11 pairs; inflorescence usually dense, often very short, 0.5–2 cm, racemose or condensed paniculate (as clusters of short racemes from a single axil), usually glabrous or puberulous; sepals glabrous inside, margin entire to erose, glabrous; calyx persistent in fruit ..... 3. *X. longifolia*

1. ***Xylosma congesta*** (Loureiro) Merrill, Philipp. J. Sci. 15: 247. 1920 [“*congestum*,” “1919”].

柞木 zuo mu

*Croton congestus* Loureiro, Fl. Cochinch. 2: 582. 1790 [“*congestum*”]; *Apactis japonica* Thunberg; *Casearia subrhombica* Hance; *Flacourtia chinensis* Clos; *F. japonica* Walpers; *Hisingera japonica* Siebold & Zuccarini, nom. illeg. superfl.; *H. racemosa* Siebold & Zuccarini; *Myroxylon japonicum* (Thunberg) Makino; *M. racemosum* (Siebold & Zuccarini) Kuntze; *Xylosma apactis* Koidzumi, nom. illeg. superfl.; *X. congesta* var. *caudata* S. S. Lai; *X. congesta* var. *pubescens* (Rehder & E. H. Wilson) Chun; *X. japonica* A. Gray, nom. illeg. superfl.; *X. japonica* var. *pubescens* (Rehder & E. H. Wilson) C. Y. Chang; *X. racemosa* (Siebold & Zuc-

carini) Miquel; *X. racemosa* var. *caudata* (S. S. Lai) S. S. Lai; *X. racemosa* var. *glaucescens* Franchet; *X. racemosa* var. *pubescens* Rehder & E. H. Wilson; *X. senticosa* Hance.

Shrubs or small trees, evergreen, 4–15 m tall; bark brown-gray; branches spiny when young, unarmed when old, glabrous or puberulous. Stipules subulate, minute, ca. 0.3 mm, glabrous, in dried material dark brown or blackish, caducous or persistent for some time; petiole short, 2–5 mm, glabrous to quite densely pubescent with spreading hairs; leaf blade broadly ovate to ovate-elliptic, 3–8 × 2.5–3.5 cm, leathery, often glaucous below, both surfaces glabrous, or scarcely pubescent along veins below, lateral veins 3 or 4(or 5) pairs, base usually obtuse to rounded, less often acute, margin serrate, apex acute, tip usually acuminate, acumen 5–10 mm. Inflorescence axillary, racemose,

short, 0.5–2 cm; rachis densely pubescent, hairs spreading, short; flowers yellowish. Pedicels very short, 1–3 mm in flower and fruit, pubescent. Bracts ovate to narrowly lanceolate, 1–2.5 mm, abaxially pubescent, ciliate, caducous or persistent. Sepals 4–6, broadly ovate with rounded apex, or orbicular, 1–2 mm, outside ± pubescent, inside glabrous, ciliate. Staminate flowers: stamen filaments long, eventually extending to ca. 3 mm; anthers ellipsoid, minute, ca. 0.2 mm, connective usually not projected beyond thecae; disk consisting of several, small, glabrous, closely set or connate glands. Pistillate flowers: disk annular, undulate; ovary ovoid, ca. 4.5 mm; placentas 2; styles 2, very short (to 0.5 mm) to nearly absent, joined in basal half. Berry dark red to black (black when dried), globose, 4–5 mm in diam.; calyx and disk persistent at least while fruit attached to plant; styles persistent. Seeds 2 or 3, reddish brown when dry, ovoid, flattened on one side by mutual pressure, 4–5 mm, completely covered in a thin membranous darkly streaked sheath. Fl. Jul–Nov, fr. Aug–Dec.

Forest margins, thickets on hills, plains, surrounding villages; 500–1100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [India (rare), Japan, Korea].

The varieties *Xylosma racemosa* var. *glaucescens* and *X. racemosa* var. *pubescens* are not upheld here. The characters used to distinguish them, glaucescence of the leaves, or hairiness of branchlets and petioles and venation of the abaxial leaf surface, were found to vary continuously throughout the species.

For *Xylosma senticosum* only three specimens (including the type) were available. Of these, *Hance 7437* (type; K) and a specimen numbered “9204” (collector illegible; K) were collected from Victoria Peak, Hong Kong. The third specimen, *Ford 579* (K), possibly a cultivated specimen, is also annotated “Victoria Peak.” Between them, the specimens bear staminate or structurally bisexual flowers. All are similar to *X. congesta* but differ in the following combination of characteristics: leaves very small (1.5–3 cm), flowers sometimes structurally bisexual, sepals glabrous outside (margin ciliate), pedicel above the articulation glabrous, lower part of pedicel and inflorescence rachis glabrous or sparsely hairy, anther with connective projected as a fleshy, triangular appendage. After one of us (Yang) examined extensive gatherings of *Xylosma* from Hong Kong at PE, the inclusion of *X. senticosum* Hance within *X. congesta* was recommended.

**2. *Xylosma controversa*** Clos, Ann. Sci. Nat., Bot., sér. 4, 8: 231. 1857.

南岭柞木 *nan ling zuo mu*

Shrubs or small trees, evergreen, 4–10 m tall; young stems often spiny, bark gray-brown; branchlets terete, glabrous or puberulous. Stipules subulate or triangular, minute, ca. 0.2 mm, glabrous, in dried material dark brown or blackish, caducous or persistent for some time; petiole 5–10 mm, glabrous or pubescent; leaf blade elliptic to oblong-elliptic, 5–10(–18) × 3–7 cm, thickly papery to leathery, both surfaces glabrous, or abaxially spreading pubescent, midvein raised abaxially, impressed or flat adaxially, lateral veins 5 or 6 (or 7) pairs, arched-ascending, especially basal pairs, conspicuous on both sides, base acute to slightly attenuate, margin serrate, apex acute or acuminate, acumen 5–10 mm. Inflorescence axillary, paniculate, often with very short branches and then racemelike, lax; rachis 1.5–5 cm,

puberulous to pubescent with spreading yellowish hairs, sometimes glabrescent. Pedicels 2–3 mm, puberulous to pubescent; bracts ovate to lanceolate, 1–3 mm, both surfaces pubescent, persistent or caducous. Flowers numerous, greenish white, 3–4 mm in diam. Sepals 4, ovate-orbicular, (1–)2–2.5(–3) mm, often unequal in size, outside pubescent with short semispreading hairs, or nearly glabrous, inside densely hairy, hairs semi-spreading, white, long; sepal margin ciliate. Staminate flowers: stamens with filaments ca. 2 mm, anthers ellipsoid, ca. 0.5 mm; disk glands small, close set. Pistillate flowers: ovary ovoid-globose, ca. 2 mm; disk annular or few lobed; placentas 2, each with 2 or 3 ovules; styles 2 (or ?), usually completely joined to form a single style column (0.5–)1(–1.5) mm. Fruit reported as red, drying black, globose, 3–5 mm in diam. Seeds 2–8, mid to darker brown when dried, ovoid, flattened at least on one side by mutual compression, 4–5 mm, completely enclosed in a thin sheath, sheath without dark streaks. Fl. Apr–May, fr. Aug–Sep.

Evergreen broad-leaved forests, forest margins; low elevations. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan [India, Malaysia, Nepal, Vietnam].

- 1a. Leaf blades abaxially and branchlets  
glabrous ..... 2a. var. *controversa*  
1b. Leaf blades abaxially along veins and  
branchlets puberulous ..... 2b. var. *pubescens*

**2a. *Xylosma controversa* var. *controversa***

南岭柞木(原变种) *nan ling zuo mu* (*yuan bian zhong*)

Leaf blades abaxially and branchlets glabrous.

Evergreen broad-leaved forests, forest margins; low elevations. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan [India, Malaysia, Nepal, Vietnam].

“*Xylosma controversum* var. *glabrum*” [sic] (S. S. Lai, Bull. Bot. Res., Harbin 14: 224. 1994) belongs here but was not validly published under Art. 37.2 of the *Vienna Code* because two gatherings were indicated as types: *Q. H. Lu 324* (IBG) and *L. Deng [L. Teng] 1492* (IBSC), the type status of the former being indicated by the text “Typus: in (IBG) et (INSC)” [sic].

**2b. *Xylosma controversa* var. *pubescens*** Q. E. Yang, var. nov.

毛叶南岭柞木 *mao ye nan ling zuo mu*

Type: China. Guangdong: Yangshan Xian, in rocky, shady places under dense forests, alt. 500 m, *L. Teng 1675* (holotype, PE).

*A* var. *controversa ramulis et foliis subtus ad venas puberulis differt.*

Abaxial surfaces of leaf blades along veins and branchlets puberulous.

• Evergreen broad-leaved forests, forest margins; low elevations. Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan.

**3. *Xylosma longifolia*** Clos, Ann. Sci. Nat., Bot., sér. 4, 8: 231. 1857.

长叶柞木 *chang ye zuo mu*

*Xylosma congesta* (Loureiro) Merrill var. *kwangtungensis*

F. P. Metcalf; *X. racemosa* (Siebold & Zuccarini) Miquel var. *kwangtungensis* (F. P. Metcalf) Rehder.

Shrubs or small trees, evergreen, 4–7 m tall; bark gray-brown; branchlets spiny, glabrous. Stipules not seen; petiole 5–8 mm, glabrous; leaf blade narrowly elliptic, oblong-elliptic, oblong-lanceolate, or narrowly obovate, 4–15(–20) × (2–)2.5–5(–7) cm, leathery, both surfaces glabrous, lateral veins (6 or)7–11 pairs, raised on both surfaces, base acute, cuneate, very rarely obtuse, margin serrate, apex acuminate, acumen 1–2 cm. Inflorescence of short racemes or reduced panicles borne singly or in condensed clusters in leaf axils; rachis 0.5–2 cm, glabrous or puberulous; bracts ovate (staminate flowers) to lanceolate (pistillate flowers), small, 0.5–1 mm, glabrous or sparsely puberulous. Flowers greenish, 2.5–3.5 mm in diam. Pedicels 1–2 mm, slender, puberulous. Sepals 4 or 5, persistent, ovate or lanceolate, 1–2 mm, abaxially glabrous or sparsely puberulous with spreading hairs, adaxially glabrous, margin entire to erose

(× 10 mag.), glabrous. Staminate flowers: stamen filaments eventually ca. 3 mm; anthers ellipsoid, minute, ca. 0.3 mm; disk glands small, ± connate. Pistillate flowers: disk annular or few lobed, ovary ovoid, ca. 2 mm; placentas 2 or 3, each with 2 or 3 ovules; styles 2 or 3, very short, 0.5–0.8 mm or less, partly or completely joined. Berry reported as red when ripe, drying black, globose, 4–6 mm in diam.; calyx, disk, and style persistent. Seeds 4 or 5, brown when dried, ca. 4 mm, ovoid, flattened on one or more sides by mutual compression, completely enclosed in a thin sheath, sheath without dark streaks. Fl. Apr–May, fr. Jun–Oct.

Mountain forests; 1000–1600 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Yunnan [India, Laos, Nepal, Thailand, Vietnam].

"*Xylosma fascicuflorum*" [sic] (S. S. Lai, Bull. Bot. Res., Harbin 14: 224. 1994) belongs here but was not validly published under Art. 37.2 of the *Vienna Code* because two gatherings were indicated as types (*B. Y. Qiu 50405* and *M. G. Li [M. K. Li] 697*).

## 6. BENNETTIODENDRON Merrill, J. Arnold Arbor. 8: 10. 1927.

山桂花属 shan gui hua shu

*Bennettia* Miquel, Fl. Ned. Ind. 1(2): 105. 1858, not Gray (1821), nor R. Brown (1852), nor *Bennetia* Rafinesque (1830).

Shrubs or small trees, reportedly dioecious, young shoots with a perular bud, perular bracts persistent. Leaves alternate, uppermost often clustered at apices of branches; stipulate; petiole mostly elongate, shorter in upper leaves, with a pair of glands at apex only or glands completely absent; leaf blade pinnate-veined, sometimes 3–5-veined from base with lateral veins much weaker than midvein, margin ± coarsely glandular-serrate. Flowers hypogynous, small, unisexual, rarely at least structurally bisexual, in axillary or terminal, paniculate, rarely corymblike or racemelike inflorescences; bracts and bracteoles small, caducous; pedicels articulate. Sepals 3(–5), imbricate, free or joined at base only, small, ciliate, caducous, rarely persistent. Petals absent. Disk glands present, small, dispersed among stamen or staminode bases. Staminate flowers: stamens many; filaments free, filiform, pubescent with long hairs in lower half, rarely glabrous; anthers elliptic, small, dorsifixed, versatile; disk glands many, set between the stamen filament bases, small, short, fleshy, glabrous; abortive ovary small, with 3 short styles. Pistillate flowers: staminodes many, like the stamens but smaller and sterile, filaments less than 1/2 as long as those of staminate flowers, pubescent at base; disk glands many, small, truncate, set between staminode bases; ovary superior, incompletely 3-loculed; placentas 3, each with 2 or 3 ovules; styles 2–4, not or scarcely joined at base, divergent, slender, each dilated at apex into a flattened irregularly branched or lobed stigma, caducous. Berry globose, small, rather dry; style caducous or basal part persistent; pericarp thin, brittle when dried. Seeds 1(–4), yellowish when fresh, blackish when dry, shiny; testa slightly reticulate.

Two or three species: Asia; one species in China.

Fan (J. S. W. Forest. Coll. 15(3): 27. 1995) recorded *Bennetioidendron cordatum* Merrill from S Guangxi. The only specimen cited by him, *X. R. Liang 69814*, has leaves not obviously cordate at base, and can be safely referred to *B. leprosipes*. In *B. cordatum*, a species occurring in Vietnam, the leaves are obviously cordate at base.

### 1. *Bennetioidendron leprosipes* (Clos) Merrill, J. Arnold Arbor. 8: 11. 1927.

山桂花 shan gui hua

*Xylosma leprosipes* Clos, Ann. Sci. Nat., Bot., sér. 4, 8: 230. 1857; *Bennettia leprosipes* (Clos) Koorders; *B. longipes* Oliver; *Bennetioidendron brevipes* Merrill; *B. brevipes* var. *margopatens* S. S. Lai ["*margopatense*"]; *B. brevipes* var. *shangsiense* (X. X. Chen & J. Y. Luo) S. S. Lai; *B. lanceolatum* H. L. Li; *B. leprosipes* var. *ellipticum* S. S. Lai; *B. leprosipes* var. *pilosum* G. S. Fan & Y. C. Hsu; *B. leprosipes* var. *rugosifolium* S. S. Lai; *B. longipes* (Oliver) Merrill; *B. macrophyllum* C. Y. Wu ex S. S. Lai; *B. macrophyllum* var. *pilosum* (G. S. Fan & Y. C. Hsu) S. S. Lai; *B. shangsiense* X. X. Chen & J. Y. Luo; *B. simaoense* G. S. Fan; *B. subracemosum* C. Y. Wu; *Myroxylon leprosipes* (Clos) Kuntze.

Shrubs or small trees, evergreen, 2–6(–15) m tall; bark gray-brown, fetid, not flaking; branchlets terete, densely gray-brown puberulous, later glabrescent or subglabrous. Petiole 0.3–6 cm, rarely to 10 cm, brown puberulous, gradually glabrescent, with or without 2 glands at apex; leaf blade mostly narrowly to broadly elliptic, elliptic-oblong, or obovate, usually (5–)10–23 × 4–7.5 cm, papery or thinly papery, both surfaces glabrous, or puberulous along veins abaxially, hairs spreading and very short, midvein raised on both sides, lateral veins 7–9 pairs including 1 or 2 pairs from base, base usually acute-cuneate, less often obtuse-cuneate, rarely rounded, margin sparsely obtusely serrate, apex obtuse, contracting quite abruptly to an acumen to 2 cm. Inflorescence terminal, paniculate, 6–12(–20) × ca. 4.5 cm, many flowered (at least 20–30, usually more), initially densely brown puberulous, glabrescent, with age at least pistillate inflorescence rachises

becoming pale brown or grayish and conspicuously densely pustular-lenticellate; bracts and bracteoles narrowly triangular, ca. 1 mm, pubescent. Flowers unisexual or apparently structurally bisexual, sordid-white or greenish yellow, scented. Pedicels 3–5 mm, to 1 cm in fruit. Staminate flowers: sepals broadly elliptic-ovate, 3–3.5 mm, texture thin, both surfaces sparsely pubescent to nearly glabrous, margin ciliate; stamens slightly exerted, light yellow, drying brown, filaments 3–4 mm, pubescent, hairs spreading, white when dried, long; anthers oblong; disk glands purplish when fresh. Pistillate flowers: sepals as in staminate flowers but ca. 1/2 as long; staminodes many, similar to stamens but usually only 1/2 as long; disk glands small, truncate, among staminode bases; ovary yellowish green to orange in fresh state, ovoid, somewhat collapsed and coarsely wrinkled in dried material, ca. 4 mm, placentas 2–4-ovuled; styles 3 or 4, sordid-white when fresh, filiform, ca. 1 mm, gla-

brous; stigmas ca. 0.3 mm. Berry red when mature, drying black, globose, 6–9 mm in diam., pericarp thin, brittle when dry. Seeds 1 or 2, globose, (semiglobose when 2 present), 3–4 mm in diam. Fl. Mar–Apr, fr. May–Nov.

Evergreen broad-leaved forests; 400–1800 m. Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Yunnan [Bangladesh, India, Indonesia (Java, Sumatra), Myanmar, Thailand].

*Bennettiodendron leprosipes* is a highly polymorphic species in leaf shape, petiole length, inflorescence length, and fruit size.

“*Bennettiodendron macrophyllum* var. *obovatum*” (S. S. Lai, Bull. Bot. Res., Harbin 14: 227. 1994) belongs here but was not validly published under Art. 37.2 of the *Vienna Code* because two gatherings were indicated as types (*Longgang Expedition 10755* and *J. Y. Luo & Q. R. Lai 8014*).

## 7. *IDESIA* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 10: 485. 1866, nom. cons., not Scopoli (1777).

山桐子属 shan tong zi shu

*Cathaya* Ohwi; *Polycarpa* Linden ex Carrière (1868), not Linnaeus (1759), nor *Polycarpaea* Lamarck (1792).

Trees, deciduous, dioecious. Leaves alternate; stipules small, caducous; petiole elongate, with two sessile discoid or shortly cylindrical glands at apex, sometimes with additional glands along petiole length; leaf blade palmately 3–5-veined from base, glandular-toothed. Flowers hypogynous, unisexual, many, in terminal and axillary pendulous panicles, these sometimes racemelike; bracts caducous; pedicels articulate. Sepals (3–)5(or 6), imbricate, free or joined only at base, caducous. Petals absent. Disk glands present. Staminate flowers: stamens many, inserted on disk, ca. as long as sepals; filaments free, slender, softly hairy; anthers elliptic, longitudinally dehiscent, basifixed; disk lobes many, small, set among stamen bases; reduced ovary present. Pistillate flowers: staminodes many, surrounding ovary base, resembling stamens but smaller and sterile; disk lobes many, small, set among staminode bases; ovary superior, 1-loculed, with (3–)5(or 6) placentas; ovules many; styles (3–)5(or 6), ± erect, cylindrical, connate at base, apex dilated to form a nearly peltate, flattened, subcircular (actually U-shaped) stigma. Fruit a berry; pericarp thin. Seeds many.

One species: China, Japan, Korea.

“*Idesia fargesii*” and “*I. polycarpa* var. *fargesii*” are not treated here because no protologues could be traced and neither name is included in the International Plant Names Index ([www.ipni.org](http://www.ipni.org)). The taxon is represented at K by four sheets: *Farges* 76 (two sheets), Sichuan, annotated “*Idesia polycarpa* var. *fargesii* Franch.”; *Farges s.n.*, same locality, annotated “*Idesia fargesii* Oliver”; and *Cavalerie* 2981, Guizhou, annotated “*Idesia fargesii* Franch.” All are duplicates from P. No significant differences were found between this material and *I. polycarpa*. Among the *Farges* specimens, all leaves are glued abaxial surface down; abaxial leaf surfaces of the *Cavalerie* sheet are more or less glabrous.

**1. *Idesia polycarpa*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 10: 485. 1866.

山桐子 shan tong zi

Trees, 8–21 m tall; bark grayish, not flaking; branchlets sparsely pubescent or glabrous. Petiole reddish, usually long, (4–)5–15 cm or more, glabrous, base slightly dilated; leaf blade deep green adaxially, broadly ovate, (6–)8–16(–20) × (4–)7–15(–20) cm, thinly leathery, abaxially pruinose, with a small dense patch of hairs at extreme base, elsewhere glabrous, sparsely hairy along veins or pubescent throughout, hairs (except in basal patch) mostly spreading, short, drying whitish or yellowish; adaxially usually glabrous, rarely sparsely hairy along midvein and main veins or throughout, lateral veins ca. 6 pairs, blade usually 5(–7)-veined from base, base cordate, often deeply so, less often rounded, margin serrate, usually coarsely so, apex gradually or more abruptly acuminate. Panicles (13–)20–30 cm; rachis sparsely to more densely pubescent. Flowers unisexual, yellowish green; pedicels 1–1.5 cm, densely pubescent, hairs appressed, yellowish brown, short; bracts lanceolate, 3–10 mm, reducing in size toward apex of rachis, papery, toothed or lobed.

Staminate flowers: slightly larger than pistillate ones, 1.2–1.6 cm in diam.; sepals 5–6 × 2–3 mm, ovate to elliptic or slightly obovate, both surfaces densely pubescent, hairs yellowish brown, appressed, short; stamens 5–6 mm; filaments pubescent in lower half, hairs crisped, white when dry; disk glands globose to truncate, small, glabrous. Pistillate flowers: ca. 9 mm in diam.; sepals as in staminate flowers but slightly smaller, 4–5 × ca. 2.5 mm; disk glands globose to truncate, small; ovary superior, globose, glabrous; styles 5 or 6, 0.5–2 mm, joined at base; stigmas 0.5–1 mm in diam. Berry purple-red or orange-red when mature, drying blackish, globose, 8–10 mm in diam., apical scar left by styles pale, circular, flat, small, 0.5–1 mm in diam.; pericarp thin, brittle when dry; stalk 0.6–2 cm. Seeds drying reddish brown or purplish brown, broadly ovoid, 2–3 mm, completely enclosed in a thin, translucent membrane. Fl. Apr–May, fr. Oct–Nov.

Deciduous broad-leaved forests, needle-leaved and broad-leaved mixed forests; 400–3000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Yunnan, Taiwan, Zhejiang [Japan, Korea].

*Idesia polycarpa* is grown as an ornamental.

- 1a. Leaf blade abaxially glabrous (except at extreme base), or sparsely hairy only along main veins ..... 1a. var. *polycarpa*  
 1b. Leaf blade abaxially pubescent throughout.  
 2a. Petiole 2–3 cm, leaf blade 6–7 × 4–5 cm ..... 1c. var. *fujianensis*  
 2b. Petiole ca. 4 cm or longer, leaf blade ca. 8 cm or longer ..... 1b. var. *vestita*

**1a. *Idesia polycarpa* var. *polycarpa***

山桐子(原变种) shan tong zi (yuan bian zhong)

*Cathayaia polycarpa* (Maximowicz) Ohwi; *Idesia polycarpa* var. *intermedia* Pampanini; *I. polycarpa* var. *latifolia* Diels; *Polycarpa maximowiczii* Linden ex Carrière.

Leaf blade abaxially glabrous (except at extreme base), or sparsely hairy only along main veins.

Deciduous broad-leaved forests, needle-leaved and broad-leaved mixed forests; 400–2500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Taiwan, Zhejiang [Japan, Korea].

**1b. *Idesia polycarpa* var. *vestita*** Diels, Bot. Jahrb. Syst. 39: 478. 1900.

毛叶山桐子 mao ye shan tong zi

Petiole ca. 4 cm or longer; leaf blade ca. 8 cm or longer, abaxially softly pubescent throughout.

Deciduous broad-leaved forests; 900–3000 m. Fujian, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Yunnan, Zhejiang [Japan].

“*Idesia polycarpa* var. *longicarpa*” (S. S. Lai, Bull. Bot. Res., Harbin 14: 227. 1994) belongs here but was not validly published under Art. 37.2 of the *Vienna Code* because three gatherings were indicated as types (S. S. Lai et al. 20, S. C. Zhang 8, and P. X. Tan [P. C. Tam] 59730).

**1c. *Idesia polycarpa* var. *fujianensis*** (G. S. Fan) S. S. Lai, Fl. Reipubl. Popularis Sin. 52(1): 58. 1999.

福建山桐子 fu jian shan tong zi

*Idesia fujianensis* G. S. Fan, J. S. W. Forest. Coll. 5(3): 30. 1995.

Petiole 2–3 cm; leaf blade 6–7 × 4–5 cm. Infructescence 8–10 cm. Branchlets, petioles, leaf blades abaxially, peduncles, and fruiting pedicels densely yellowish pubescent.

- Forests; ca. 900 m. Fujian.

*Idesia polycarpa* var. *fujianensis* is possibly a small form of *I. polycarpa* var. *vestita*. Material was not seen by the present authors.

## 8. POLIOTHYRSIS Oliver, Hooker’s Icon. Pl. 19: t. 1885. 1889.

山拐枣属 shan guai zao shu

Trees, monoecious, deciduous. Leaves alternate; stipules not seen; petiole usually with a single or pair of small, rounded glands at apex on adaxial surface, sometimes with additional glands along distal half of petiole; leaf blade palmately 3–5-veined at base, margin glandular-serrate. Flowers hypogynous, unisexual, in terminal or rarely axillary many flowered panicles, pistillate flowers in upper part of inflorescence, staminate ones in lower part; bracts present; pedicels articulate. Sepals 5, valvate, nearly free, texture rather thick. Petals absent. Disk glands absent. Staminate flowers: stamens many, free, shorter than sepals; anthers ellipsoid or transverse-ellipsoid, connective much dilated, curved, bringing both locules to face in same direction (toward periphery of flower); abortive ovary very small. Pistillate flowers: staminodes many, surrounding ovary base, resembling small stamens; ovary superior, 1-loculed; placenta 3 or 4, filiform, finally woody, persistent; ovules numerous; styles 3, narrowly cylindrical, joined in basal 1/3, with free distal parts strongly reflexed against ovary; stigmas flattened, triangular, lobed. Capsule narrowly ovoid, 3-valvate; outer layer of pericarp thin, dehiscent; inner layer thin, woody, persistent; valves characteristically splitting from apex and base and remaining attached by persistent woody placental strips; styles caducous. Seeds many, arranged vertically, compressed-flat, winged; wing flat, papery, completely encircling seed, seed proper less than 1/2 as long as wing.

- One species: China.

**1. *Poliothyrsis sinensis*** Oliver, Hooker’s Icon. Pl. 19: t. 1885. 1889.

山拐枣 shan guai zao

Trees, 7–15 m tall; bark gray-brown; branchlets gray, twig tips at first pubescent with short, spreading, crisped hairs, later glabrous. Petiole 2–6 cm, initially pubescent, glabrescent; leaf blade greenish abaxially, deep green and shiny adaxially, ovate or ovate-oblong, sometimes ovate-cordate, 8–18 × 4–10 cm, thickly papery, abaxially densely pubescent at first with hairs rather long (0.5–1 mm) and semiappressed, glabrescent, adaxially pubescent along veins, midvein and lateral veins prominent abaxially, lateral veins 5 or 6 pairs, second basal pair high ascending, base rounded or cordate, margin serrate, apex acute or

obtuse and contracting gradually to a short acumen. Panicle 10–20 cm; rachis very densely pale grayish tomentose throughout, indumentum often completely obscuring rachis surface. Pedicels 2–3 mm in staminate flowers, 4–6 in pistillate flowers; bracts lanceolate, to 4 mm, very early caducous; bracteoles similar but much smaller, 1–1.5 mm. Sepals ovate, 4–5 mm, midvein prominent on outside, outside densely grayish tomentose, inside glabrous except for densely tomentose margin, margin thickened, apex acute. Staminate flowers: stamens unequal in length, longest ca. 1 mm; filaments glabrous; anthers ca. 0.3 mm. Pistillate flowers: ovary ovoid, longitudinally ridged, densely tomentose; styles 1–3 mm, tomentose; stigmas large, 1–2 mm, ± bifurcate, branch tips dilated, flattened, lobed, adaxially glabrous, drying blackish. Capsule ovoid, tomentose, in-

dividual valves acutely fusiform, 2–3 cm, ca. 1 cm in diam. Seeds compressed-flat, each surrounded and enclosed by a ± elliptic or oblong wing 5–10 mm, seed proper small, less than 1/2 as long as wing. Fl. Jun–Jul, fr. May–Sep.

• Evergreen and deciduous broad-leaved mixed forests, deciduous broad-leaved forests on mountain slopes or at foot of mountains; 400–

1500 m. Anhui, Fujian, S Gansu, Guangdong, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, NE Yunnan, Zhejiang.

“*Poliothyrsis sinensis* f. *subglabra*” (S. S. Lai, Bull. Bot. Res., Harbin 14: 228. 1994) belongs here but was not validly published under Art. 37.2 of the *Vienna Code* because three gatherings were indicated as types (S. S. Lai 7001, H. L. Zhang & Y. R. Zeng 27133, and S. S. Lai 062).

## 9. CARRIEREA Franchet, Rev. Hort. (Paris) 68: 498. 1896.

山羊角树属 shan yang jiao shu shu

Trees, dioecious (?sometimes monoecious), deciduous; stipules minute, very early caducous. Leaves alternate; petiole elongate, sometimes with glands at apex or along length; leaf blade pinnate-veined, 3-veined from base, margin obtusely glandular-serrate. Flowers hypogynous, unisexual, in terminal or axillary, few flowered panicles or racemes; bracts present; pedicels articulate, with a pair of ± persistent bracteoles just below articulation. Sepals 5, nearly free, valvate, ovate, with base often appearing strongly cordate when sepals erect, papery, inside with glands at base near margin, margins conspicuously conduplicate. Petals absent. Disk glands absent. Staminate flowers: stamens many, free, inserted on slightly domed receptacle; filaments filiform; anthers oblong or ellipsoid, connective usually curved, bringing both locules to face in same direction (toward periphery of flower); abortive ovary very small. Pistillate flowers: smaller than staminate flowers; staminodes many, surrounding ovary base, resembling stamens but reduced; ovary 1-loculed; placentas 3 or 4, filiform, finally woody, persistent; ovules numerous; styles 3 or 4, very short; stigmas erect, spreading or strongly reflexed against ovary, flattened, irregularly 3-lobed. Capsule fusiform or narrowly ovoid, large, 3-valvate, outer layer of pericarp thin, dehiscent, inner layer thin, woody, persistent, valves characteristically splitting from apex and base and remaining attached by persistent woody placental strips; styles caducous. Seeds many, arranged vertically, compressed-flat, winged; wing flat, papery, not encircling seed, instead extending from one end only; seed proper small.

Two species: China, Vietnam; two species (one endemic) in China.

In fruit, forms of *Carrierea calycina* with smaller capsules can be difficult to distinguish from *C. dunniana*. The leaf length-to-width ratio can be helpful.

- 1a. Sepals 1.5–2 cm, base cordate; bracts 10–30 mm, bracteoles 4–8 mm; capsule 3–7 cm ..... 1. *C. calycina*  
 1b. Sepals 0.5–1 cm, base cuneate or only slightly cordate; bracts 5–7 mm, bracteoles 2.5–5 mm; capsule 2.5–4 cm ..... 2. *C. dunniana*

**1. *Carrierea calycina*** Franchet, Rev. Hort. (Paris) 68: 498. 1896.

山羊角树 shan yang jiao shu

*Carrierea rehderiana* Sleumer.

Trees, 12–16 m tall; bark black-brown; branchlets grayish, glabrous. Petiole (2.5–)3–7 cm, pubescent or glabrous; leaf blade greenish abaxially, deep green adaxially, variable in shape, ovate-oblong, oblong, or slightly obovate, less often elliptic, (8–)9–14 × 4–6 cm, mostly 1.7–2.2 × as long as broad, thinly leathery, both surfaces glabrous or abaxially sparsely tomentose along veins, 3-veined at base, lateral veins 4 or 5 pairs, base rounded to cordate, margin remotely serrate, often coarsely so, apex obtuse, contracting abruptly to a short acumen to 1(–2) cm, or more rarely leaf apex acute. Inflorescence terminal, to ca. 10-flowered, 5–10 cm including flowers, pubescent to tomentose; bracts lanceolate to narrowly ellipsoid, 1–3 cm, papery, both surfaces sparsely to densely appressed hairy; flowers sweetly scented. Pedicels 1.2–3 cm, 2-bracteolate near middle; bracteoles opposite, narrowly oblong, 4–8 mm, papery, pubescent, glandular along margin toward base, ± persistent. Sepals broadly ovate, 1.5–2 cm, in older flowers longer and narrower, both sides yellowish tomentose, inside more densely so, base cordate when sepal erect, apex obtuse. Staminate flowers: stamens with filaments unequal in length, longest 1–1.5

cm, glabrous; anthers narrowly ellipsoid, 1–1.2 mm. Pistillate flowers: staminodes like stamens but much reduced; ovary oblong-ovoid, densely yellowish appressed-pubescent; placentas 3 or 4; styles 3 or 4, 0.5–1 mm, ± connate, densely pubescent as ovary, stigmas erect to reflexed, drying black, flattened, triangular, 2–3 mm, irregularly lobed, glabrous or abaxially pubescent. Capsule fusiform, slightly curved, 3–8 cm, tomentose; seed including wing 1–1.5 cm; wing oblong-obovate, asymmetric; seed proper ca. 5 mm. Fl. May–Jun, fr. Jul–Oct.

• Forests, forest margins; 1300–1600 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Yunnan.

The type specimen of *Carrierea calycina* (Cavalerie 2925) at K includes both staminate and pistillate flowers. *Carrierea rehderiana* is here a new synonym of *C. calycina*.

**2. *Carrierea dunniana*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 9: 458. 1911.

贵州嘉丽树 gui zhou jia li shu

Trees, 5–10 m tall; bark gray-brown; branchlets grayish, glabrous. Petiole 1–3 cm, slender, glabrous; leaf blade greenish abaxially, deep green adaxially, ovate to oblong, 7–12 × 3–5.5 cm, 2.2–2.8 × as long as broad (based on a small sample), thinly leathery, abaxially glabrous or sparsely tomentose along veins, adaxially glabrous, palmately 3-veined from base, lateral veins 4 or 5 pairs, base rounded, margin remotely

serrate, apex broadly acute, contracting gradually or more abruptly to an acumen 1–2 cm. Inflorescence terminal, to ca. 10 cm, 8–15-flowered; rachis pubescent to tomentose, hairs spreading to semiappressed, whitish, short; bracts ovate, 5–7 mm, papery, both surfaces sparsely appressed hairy, with one or two small glands on margin at base, apex rounded. Pedicels 1.5–1.8 cm, 2(or 4)-bracteolate near middle; bracteoles similar to bracts, opposite or subopposite, broadly oblong, ovate, or elliptic, 2.5–5 mm, both surfaces sparsely appressed pubescent, scarcely or not glandular at margin near base. Sepals obovate to elliptic, 5–10 mm, both sides yellowish tomentose, base not or only slightly cordate when sepal erect, apex obtuse. Staminate flowers: stamens with filaments unequal, longest 3–5 mm, glabrous; anthers ca. 0.5 mm; pistillode very small.

Pistillate flowers: staminodes like stamens but much reduced; ovary ovoid, ca. 4 mm, very densely yellowish pubescent, placentas 3; styles 3, very short (0.5–1 mm), connate at least at base to form a thick column, densely pubescent as ovary; stigmas strongly reflexed, drying black, 2–3 mm, flattened, narrowly triangular, bifurcate in distal half with branches irregularly lobed at apex, abaxially sparsely hairy, adaxially glabrous. Capsule fusiform, 2.5–4 cm. Fl. May–Jun, fr. Aug–Oct.

Broad-leaved forests, forest margins on mountain slopes; 1500–1700 m. Guangdong, Guangxi, Guizhou, Yunnan [N Vietnam].

The type specimen of *Carrierea dunniana* (Cavalerie 3001, Guizhou) at K includes both pistillate and staminate flowers.

## 10. ITOA Hemsley, Hooker's Icon. Pl. 27: t. 2688. 1901.

梔子皮属 zhi zi pi shu

*Mesaulosperma* Slooten.

Trees, dioecious (or ?monoecious), evergreen. Leaves usually alternate, sometimes subopposite; stipules early caducous; petiole long, without glands at apex nor along length; leaf blade pinnate-veined, lateral veins closely set, mostly 1(–2) cm apart, margin glandular-serrate or glandular-crenate, sometimes minutely so. Flowers unisexual, hypogynous; staminate flowers in erect, terminal panicles; pistillate flowers 1 to few in short terminal or axillary racemes; bracts present; bracteoles 1 pair per pedicel, usually caducous. Pedicels not obviously articulate in dried material. Sepals appearing 3- or 4-merous in bud, in fact to 5-merous at anthesis, nearly free, valvate, ovate, with base appearing ± cordate when sepal erect, texture rather thick, margins slightly conduplicate. Petals absent. Disk glands absent. Staminate flowers: stamens many; filaments free, filiform; anthers ellipsoid to oblong, basifixed, connective usually curved, bringing both locules to face in same direction (toward periphery of flower); abortive ovary present. Pistillate flowers: ovary superior, 1-loculed; placentas 6–8, rarely 5, filiform, finally woody, persistent; ovules numerous; styles 6–8, very short, connate, forming a short longitudinally ribbed column; stigmatic branches (4–)6–8, spreading or strongly reflexed against ovary, irregularly palmately lobed; staminodes many, extragynoecial, like stamens but very much reduced. Capsule ovoid or ellipsoid, large, woody, tomentose, outer layer probably finally dehiscent; valves (5 or)6–8, fusiform, splitting from apex and base and remaining attached by woody persistent placental strips; styles caducous. Seeds many, arranged vertically in capsule, winged; wing broad, flat, thin, triangular, squarish or rectangular, completely surrounding seed; seed proper small.

Two species: Asia; one species in China.

*Itoa* has been reported as dioecious (e.g., Sleumer, Flora Males., ser. 1, 5(1): 12. 1954) but might also be monoecious. *Hoogland 5079*, a specimen of *I. stapfii* (Koorders) Sleumer from New Guinea, has a short raceme bearing a pistillate flower with young fruit developing, and a staminate flower with pollen-bearing anthers. In dried specimens of *Itoa* seen for the present account, the majority of flowers were in bud; those dissected contained stamenlike structures that may be stamens or staminodes.

**1. *Itoa orientalis*** Hemsley, Hooker's Icon. Pl. 27: t. 2688. 1901.

梔子皮 zhi zi pi

Trees, 8–12 m tall; bark gray; twig tips densely pubescent, branchlets finally glabrous. Leaves usually alternate, sometimes subopposite or clustered at apices of branches; petiole 2–6 cm, pubescent with short spreading hairs or glabrous; leaf blade greenish abaxially, deep green adaxially, narrowly to broadly elliptic, oblong-elliptic, or ovate, large, 13–40 × 6–18 cm, thinly leathery, abaxially densely pubescent with hairs rather long (ca. 0.5 mm) and spreading, or glabrous, adaxially initially pubescent, especially along midvein and main veins, finally glabrous, midvein raised abaxially, slightly impressed adaxially, lateral veins 10–26 pairs, base obtuse to rounded, margin serrate to serrulate, teeth obtuse, leaf apex usually obtuse to rounded, contracting abruptly to a short acumen, or apiculate, rarely

acute. Inflorescences paniculate or racemose; rachises, pedicels, and abaxial surfaces of bracts densely pubescent to tomentose, hairs spreading, brownish when dry, short; bracts lanceolate, 5–6 mm. Flowers unisexual. Sepals 3 or 4, triangular-ovate, 0.6–1.5 cm, outside tomentose, hairs yellowish when dry. Staminate flowers: arranged in erect terminal pubescent panicles 4–8(–15) cm; stamens 120–160, 3–6 mm, glabrous; filaments ca. 5 mm; anthers oblong, ca. 1 mm. Pistillate flowers: solitary at apices of branches; ovary globose; styles (4–)6–8, very short; stigmas (4–)6–8, ca. 1 cm, palmately branched; branches irregularly lobed, flattened, tortuous, shortly pubescent beneath, glabrous above. Capsule ovoid, to 9 × 6 cm, densely orange-yellow or reddish tomentose (drying brown), glabrescent, (5–)6–8-valvate. Seeds including wing ca. 2 cm, dark to light brown when dry, seed proper small. Fl. May–Jun, fr. Sep–Oct.

Evergreen broad-leaved forests; 500–1700 m. Guangxi, Guizhou, Hainan, Sichuan, Yunnan [Vietnam].



- 1a. Branchlets, petioles, and leaf blades  
abaxially puberulous ..... 1a. var. *orientalis* Evergreen broad-leaved forests; 500–1400 m. Guangxi, Guizhou,  
Hainan, Sichuan, Yunnan [Vietnam].
- 1b. Branchlets, petioles, and leaf blades  
abaxially glabrous ..... 1b. var. *glabrescens* **1b. *Itoa orientalis* var. *glabrescens*** C. Y. Wu ex G. S. Fan, J.  
Wuhan Bot. Res. 8(2): 133. 1990.
- 1a. *Itoa orientalis* var. *orientalis***  
光叶梔子皮 *guang ye zhi zi pi*  
梔子皮(原变种) *zhi zi pi* (yuan bian zhong)  
*Carrierea vieillardii* Gagnepain; *Mesaulosperma vieil-*  
*lardii* (Gagnepain) Slooten.  
Branchlets, petioles, and leaf blades abaxially puberulous.  
Branchlets, petioles, and leaf blades abaxially glabrous. Fl.  
Mar–Jun, fr. Jul–Dec.  
• Evergreen broad-leaved forests in mountains; 500–1700 m.  
Guangxi, Guizhou, Yunnan.

## 11. HOMALIUM Jacquin, Enum. Syst. Pl. 5, 24. 1760.

天料木属 *tian liao mu shu*

*Astranthus* Loureiro; *Blakwellia* Commerson ex Jussieu (1789), not Scopoli (1777), nor Lamarck (1785); *Pierrea* Hance (1877), not F. Heim (1891), nom. cons.

Trees or shrubs. Leaves alternate, rarely opposite or verticillate; stipules caducous; usually petiolate; leaf blade pinnate-veined, margin with glandular teeth, rarely entire. Flowers bisexual, epigynous, small, in terminal or axillary, many flowered racemes or panicles, inserted singly along rachis, or in sessile to shortly pedunculate fascicles; bracts small, caducous or persistent; pedicels slender in flower, articulate at or above middle. Sepals and/or petals often accrescent after anthesis. Calyx tube obconic, adnate to lower 2/3 of ovary and later to lower 2/3 of capsule; sepals (4 or) 5–8(–12), spreading, linear, oblong, or obovate-spatulate, persistent. Petals inserted at rim of calyx tube, usually isomerous with and similar to sepals, alternating with them. Disk glands 1 opposite each sepal, rarely more or fewer, small, fleshy, ± globose and hairy. Stamens inserted singly or in groups before each petal, alternating with disk glands and inserted between them, usually finally overtopping perianth; filaments free, filiform; anthers subglobose, small, dorsifixed. Ovary semi-inferior, only upper conic part free above adnate calyx tube, 1-loculed; placentas 2–6(–8), with (1–)3–7 ovules near apex of each placenta; styles 2–5(–7), filiform, free or united in lower 1/3 or less, free parts divergent, usually finally overtopping perianth; stigmas capitate to punctiform, small. Capsule obconic, small, for most of its length enclosed in adnate calyx tube and persistent perianth segments, leathery, apex 2–8-valvate; styles ± persistent. Seeds 1 to few.

Between 180 and 200 species: tropical regions of both hemispheres; ten species (six endemic) in China; four additional species (all endemic) are poorly known.

In Chinese species: disk glands 1 or 2 opposite each sepal; stamens 1 opposite each petal; capsules to 7 mm.

Much uncertainty remains in the taxonomy of Chinese *Homalium*. Further gatherings and detailed study are recommended to establish reliable diagnostic characters (especially comparing the perianth in flower and fruit) and a stronger taxonomic framework. Where possible, descriptions of taxa in this account have been extended to include detail of perianth indumentum, which can be a useful character at species level. Sepal and petal lengths (both absolute and relative) are sometimes less useful, because of their accrescent nature. Inflorescence type (panicle vs. raceme) needs to be used with caution: apparent racemes sometimes have lateral branches although these are very short (to ca. 5 mm); false panicles occur when the leaves subtending all axillary racemes on a lateral branch are lost.

See also the four inadequately known species briefly described at the end of *Homalium*.

- 1a. Inflorescence paniculate.
- 2a. Leaves 17–19 × 5–7 cm, hairs on calyx tube spreading ..... 2. *H. kwangsiense*
- 2b. Leaves 3–14 × 1–6 cm, hairs on calyx tube spreading or appressed.
- 3a. Leaf acumen more than 10 mm, usually much longer(–30 mm), adaxial surface of leaf drying blackish brown, shiny; hairs on calyx tube appressed ..... 10. *H. phanerophlebium*
- 3b. Leaf acumen less than 8 mm, or absent, adaxial surface of leaf not drying blackish brown, nor shiny; hairs on calyx tube spreading or appressed.
- 4a. Leaf blade narrowly elliptic, narrowly oblong-elliptic, or slightly oblanceolate, 1–3 cm wide, usually 3–4 × as long as wide, petiole 2–5 mm, lateral veins 4–6 pairs ..... 1. *H. stenophyllum*
- 4b. Leaf blade elliptic or obovate, sometimes broadly so, 3–6 cm wide, usually ca. 2 × as long as wide, petiole 4–15 mm, lateral veins 5–8 pairs ..... 3. *H. paniculiflorum*
- 1b. Inflorescence racemelike.
- 5a. Flowers small, to 3.5 mm from base of calyx tube to tip of longest perianth segment ..... 5. *H. ceylanicum*
- 5b. Flowers ca. 4 mm or more from base of calyx tube to tip of longest perianth segment.
- 6a. Abaxial surface of leaf sparsely to densely hairy throughout, hairs long (ca. 0.5 mm), spreading, yellowish, especially dense in young leaves, abaxial surface of older leaves soft and velutinous to touch ..... 7. *H. mollissimum*
- 6b. Abaxial surface of leaf with hairs on midvein and lateral veins only, or completely glabrous, or soon becoming so.

- 7a. Petioles 8–15 mm, leaves with acumen ca. 10 mm or more, blade drying blackish brown; hairs on calyx tube appressed ..... 10. *H. phanerophlebium*
- 7b. Character combination not as above; petioles ca. 6 mm or less; hairs on calyx tube appressed or spreading.
- 8a. Leaves narrowly elliptic or narrowly elliptic-oblong, 2–3 cm wide, 3–4 × as long as wide ..... 9. *H. sabiifolium*
- 8b. Leaves elliptic, oblong-elliptic, or obovate-elliptic, 3–7 cm wide, ca. 2 × as long as wide.
- 9a. Petals broadly spatulate, 2–3 mm wide across broadest part, apex broadly obtuse ..... 4. *H. kainantense*
- 9b. Petals oblanceolate linear to narrowly spatulate, 1–1.5 mm wide across broadest part, apex acute to narrowly obtuse.
- 10a. Twig tips and petioles hairy ..... 6. *H. cochinchinense*
- 10b. Twig tips and petioles glabrous ..... 8. *H. breviraemosum*

**1. *Homalium stenophyllum*** Merrill & Chun, Sunyatsenia 2: 287. 1935.

海南天料木 hai nan tian liao mu

Trees, rarely shrubs, to 18 m tall; bark grayish or brownish gray, not flaking; young branchlets hairy; old branches terete, glabrous. Stipules minute, subulate, glabrous, early caducous; petiole 2–5 mm, hairy when young, gradually glabrescent; leaf blade narrowly elliptic, narrowly oblong-elliptic, or slightly oblanceolate, usually 3–4 × as long as wide, 4–10 × 1–3 cm, thinly leathery, both surfaces glabrous, sometimes abaxially fasciculate-hairy in vein axils, lateral veins 4–6 pairs, reticulate veins slightly conspicuous, base narrowly to broadly cuneate, margin shallowly serrate to subentire, slightly revolute, apex acute to shortly acuminate, rarely obtuse, acumen to 6 mm, usually shorter, extreme tip blunt. Inflorescence terminal or axillary, paniculate, 4–8(–12) cm; rachis pubescent, hairs spreading; lower bracts resembling small leaves, upper bracts linear, lanceolate, or narrowly oblanceolate, 2–3 mm, glabrous except for ciliate margin. Pedicels 1.5–2 mm, articulate near middle, pubescent, hairs spreading. Flowers numerous, inserted along rachis singly or in fascicles, white, 8- or 9-merous, ca. 5 mm in diam., to 8 mm in diam. at fruiting stage. Calyx tube (1–)1.5–2 mm, smooth or longitudinally ribbed, outside pubescent, hairs spreading, long; sepals drying white, 2.5–3 mm, linear to linear-spatulate, both sides glabrous, margin densely ciliate, cilia longer than 1/2 width of sepal, apex acute to obtuse, often mucronate. Petals narrowly elliptic or linear-oblanceolate, 3–4 mm, slightly longer and wider than sepals, both sides glabrous, margin densely ciliate, cilia as for sepals, apex slightly obtuse. Disk glands ca. 0.5 mm in diam., pubescent. Stamens 8 or 9(or 10); filaments 3–4.5 mm, finally overtopping perianth, hairy, hairs spreading, white, long. Free part of ovary sparsely hairy, hairs spreading, white, long; styles 3 or 4, ca. 2.5 mm, joined in basal part to form a thick column, sparsely hairy in lower part; placentas 3 or 4, each with 2–4 ovules. Capsule ca. 3.5 mm. Fl. May–Dec, fr. Dec–Jan of following year.

• Mountain forests, also on rocks along streams; 500–1000 m. Hainan.

*Lau 3225* (A), collected from Hainan, is not referable to *Homalium stenophyllum*; see inadequately known “species A” below. Also from Hainan, *A. Chun & Tso 43732* (A, K) looks rather different from most other specimens; perhaps the inflorescences are at a younger stage.

**2. *Homalium kwangsiense*** How & Ko, Acta Bot. Sin. 8: 35. 1959.

广西天料木 guang xi tian liao mu

Trees, to 15 m tall; bark not flaking; branchlets terete, striate, dull-yellowish pubescent. Petiole 2–3 mm, stout, densely dark brown pubescent; leaf blade black-brown when dry, ovate-elliptic or ovate-oblong, 17–19 × 5–6 cm, thinly leathery, abaxially sparsely crisped-pubescent, more densely so along midvein and lateral veins, adaxially papillose-pubescent, midvein prominent abaxially, flat adaxially, lateral veins 9–11 pairs, conspicuously anastomosing near margin, base broadly cuneate to slightly obtuse, margin crenulate-serrate, teeth apices fasciculate-hairy, leaf apex long acuminate, acumen 8–12 mm, straight or falcate. Inflorescence axillary, paniculate, 10–13 cm; rachis densely pubescent, hairs spreading, dull yellowish. Pedicels 2–4 mm, articulate at middle, sparsely pubescent, hairs spreading, dull-yellowish. Flowers numerous, inserted singly on rachis or less often 2–4-fasciculate, creamy-white, 8- or 9-merous, 6–7 mm in diam. Calyx tube ca. 2 mm, conspicuously longitudinally canaliculate, sparsely pubescent, hairs spreading, dull-yellowish, long; sepals linear-lanceolate, 3.5–4 mm, margin long ciliate, apex mucronate. Petals linear-oblanceolate, ca. as long as sepals but broader, apex mucronate. Disk glands squarish, pubescent. Stamen filaments 4–5 mm, soon overtopping perianth, sparsely hairy in lower part, hairs spreading, long. Free part of ovary densely pubescent, hairs spreading, yellowish, long; styles 3 or 4, 4–7 mm, indumentum as for ovary; placentas 3(or 4), each with 3–5 pendulous ovules. Capsule ca. 4 mm. Fl. Aug–Sep, fr. Sep–Dec.

• Shaded places in forests; low elevations. Guangxi.

**3. *Homalium paniculiflorum*** How & Ko, Acta Bot. Sin. 8: 36. 1959.

广南天料木 guang nan tian liao mu

Trees or shrubs, 8–12 m tall; bark gray or black-gray, not flaking; branchlets black-brown, terete, densely pubescent when young, soon glabrescent, irregularly angled. Stipules not seen, possibly early caducous; petiole 4–15 mm, pubescent; leaf blade elliptic or obovate, sometimes broadly so, excluding acumen usually ca. 2 × as long as wide, 6–10 × 3–6 cm, papery, both surfaces glabrous, or abaxially barbate in vein axils, midvein and lateral veins raised on both surfaces, lateral veins 5–8 pairs, base generally broadly acute to rounded, margin serrate, teeth obtuse, leaf apex obtuse to rounded, contracting abruptly to a short acumen to ca. 5 mm. Inflorescence terminal or axillary, paniculate, 9–11 cm; rachis densely pubescent, hairs appressed, short; bracts ovate, 1–3 mm, pubescent, early caducous. Pedicels 2–3.5 mm, articulate above middle, densely pubescent, hairs appressed, short. Flowers numerous, inserted

along rachises singly or in fascicles of 2–4, yellowish, fragrant, 8-merous, 4–6 mm in diam. Calyx tube 2–2.5 mm, ca. 1 mm in diam., pubescent, hairs appressed, mostly much shorter than those of sepal and petal margins; sepals linear-oblong, 2–3 × ca. 0.5 mm, apex acute, both surfaces hairy, sparsely so on outside, hairs white, long (ca. 0.5 mm), appressed, especially on outside, less so on inside; sepal margin densely ciliate, hairs spreading, white, longer than 1/2 width of sepal. Petals narrowly oblong, 2.5–3.5 × ca. 0.5 mm, slightly longer and broader than sepals, indumentum of both surfaces and margin similar to sepals, apex obtuse. Disk glands ca. 0.5 mm in diam., hairy. Stamens 4–5 mm, finally overtopping perianth, glabrous or with a few long hairs in lower part. Free part of ovary hairy, hairs spreading, white, long; styles (2 or)3, 2.5–3 mm, free nearly to base, sparsely hairy in lower half, hairs spreading; placentas 3, each with 4 or 5 ovules. Capsule 6–7 mm, 1.5–2 mm in diam. Fl. Jun–Dec, fr. Dec–Feb of following year.

• Dense or thin forests, thickets along streams, dry or moist gentle slopes, sandy or clay soil, seashores; (sea level to)100–400 m. Guangdong, Hainan.

**4. *Homalium kainantense*** Masamune, Trans. Nat. Hist. Soc. Taiwan 33: 169. 1943.

阔瓣天料木 *kuo ban tian liao mu*

*Homalium brevisepalum* How & Ko.

Trees, 10–12 m tall; branchlets purple-brown or black-brown, terete, twig tips at first minutely whitish puberulous (view at × 10 mag.), glabrescent. Stipules linear-oblong, to ca. 4 mm, papery, minutely puberulous, early caducous; petiole very short, ca. 1.5 mm, rarely to 3 mm, stout, very sparsely puberulous; leaf blade elliptic, oblong-elliptic, or obovate-elliptic, 7–13 × 4–6 cm, papery or subleathery, both surfaces initially densely and minutely puberulous (almost imperceptibly, view at × 20 mag.) with spreading hairs, becoming glabrous or with a few minute hairs remaining along veins (view at × 20 mag.), midvein and lateral veins raised abaxially, flat adaxially, lateral veins 6 or 7 pairs, reticulate veins inconspicuous, base acute, cuneate, margin serrate, teeth obtuse, apex broadly acute to obtuse, contracting to an acumen 5–10 mm. Inflorescence axillary, racemelike, 7–12 cm, sometimes with very short branches less than 5 mm; rachis pubescent, hairs spreading, whitish, short; bracts not seen. Pedicels ca. 3 mm, articulate near apex, pubescent, hairs spreading, short. Flowers numerous, 2–4-fasciculate along rachis, white, 5–7-merous, ca. 1.2 cm in diam., fragrant. Calyx tube narrowly obconic, 3–4 mm, sparsely puberulous, hairs whitish, semiappressed, short; sepals linear-lanceolate, 1.5–2 mm, outside sparsely pubescent, hairs appressed and short, margin ciliate with short (0.1–0.2 mm) appressed hairs, apex acute or obtuse. Petals ca. 5 × 2–3 mm, broadly spatulate, conspicuously veined, outside glabrous, inside with a few semispreading short hairs toward base, margin ciliate, hairs spreading and short (ca. 0.2 mm), apex obtuse. Disk glands ca. 1 mm wide, sides sparsely hairy, apex flat, glabrous. Stamen filaments ca. 6 mm, longer than or equal to petals, with a few hairs scattered in lower part. Free part of ovary sparsely hairy, hairs spreading, whitish, short (ca. 0.2 mm); styles 3, free nearly

to base, ca. 4 mm, hairy in lower part, hairs as for ovary; placentas 3, each with 2 or 3 ovules. Capsules (not seen) probably 6–8 mm. Fl. Aug–Dec, fr. Sep–Mar of following year.

• Mixed forests and thickets; low elevations. Guangdong, Guangxi, Hainan.

**5. *Homalium ceylanicum*** (Gardner) Benth, J. Linn. Soc., Bot. 4: 35. 1859 [“*zeylanicum*”].

斯里兰卡天料木 *si li lan ka tian liao mu*

*Blackwellia ceylanica* Gardner, Calcutta J. Nat. Hist. 7: 452. 1847; *Homalium balansae* Gagnepain; *H. bhamoense* Cubitt & W. W. Smith; *H. ceylanicum* var. *laoticum* (Gagnepain) G. S. Fan; *H. hainanense* Gagnepain; *H. laoticum* Gagnepain; *H. laoticum* var. *glabratum* C. Y. Wu.

Trees, 6–30(–40) m tall, buttressed; bark smooth to coarse; branchlets brown, angular to terete, puberulous to glabrous. Stipules linear-lanceolate, 1.5–3 mm, glabrous or glabrescent, early caducous; petiole 5–12 mm, glabrous or finely hairy; leaf blade variable in shape and size, elliptic to oblong, rarely obovate, excluding acumen 1.5–2.5(–3) × as long as broad, 6–18(–20) × 2.5–8(–9) cm, thinly leathery to thickly papery, abaxially pubescent with appressed short hairs or glabrous, adaxially glabrous or ± glabrescent, midvein raised abaxially, flat or impressed adaxially, lateral veins 7–10 pairs, raised abaxially, base acute with concave sides, acute-cuneate, or subrounded, margin serrate-crenate to practically entire, teeth apices obtuse, leaf apex acute to rounded, contracting (sometimes very abruptly) to an acumen to 1 cm. Inflorescence axillary, racemose, pendulous, 5–20(–30) cm; rachis sparsely to very densely, pale grayish brown shortly pubescent; bracts narrowly triangular, minute, to ca. 2 mm, papery, sparsely hairy, caducous. Pedicels 1–3 mm, articulate at or above middle, densely puberulous to appressed shortly pubescent. Flowers numerous, in fascicles of 3 to ca. 20, sometimes very crowded along rachis, reddish or whitish, 4–6-merous, 2.5–3 mm in diam. at anthesis, fragrant. Calyx tube 0.5–1.5 mm, sparsely to densely pubescent, hairs whitish, appressed, short (0.1–0.2 mm); sepals linear-oblong or spatulate, 0.5–2 × 0.3–0.5 mm, apex acute, indumentum outside as for calyx tube, inside slightly denser, margin densely ciliate, hairs spreading, whitish, length less than 1/2 to 1 × sepal width. Petals whitish or pinkish, ovate-oblong or spatulate, 0.8–2 × ca. 0.6 mm, both surfaces densely appressed whitish pubescent, sometimes more so than sepals, margin densely white-ciliate, apex obtuse. Disk glands truncate at apex, hairy. Stamens 4–6; filaments 2–3 mm, glabrous; anthers ca. 0.4 mm. Free part of ovary gray pubescent; placentas 4–6, each with 3–6 ovules; styles 4–6, free nearly to base, 1–2 mm, sparsely hairy at base; stigmas capitate to slightly peltate. Mature fruit not seen. Fl. Jan–Nov, fr. Feb–Dec.

Sparse or dense forests of mountain valleys, forest margins, rain forests, evergreen broad-leaved forests, along streams, in forested ravines, on gentle slopes; 400–1200 m. Guangdong, Guangxi, Hainan, Hunan, Jiangxi, SE Xizang, S Yunnan [Bangladesh, India, Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

*Homalium ceylanicum* is cultivated for ornament, and its wood is used commercially. Yu (in Fu & Jin, China Pl. Red Data Book 1: 304–

305. 1992) gave *H. laoticum* var. *glabratum* as an accepted taxon and categorized it as vulnerable. They noted it as a rare and valuable timber tree, with small, scattered populations under threat from felling and bush fires. Natural regeneration is poor and seed set is low (despite prolific flowering).

*Homalium ceylanicum* is treated here in a wide sense as a highly polymorphic species within which various elements show intergrading variation in indumentum, leaf size, and raceme length. Indian floras recognize also *H. ceylanicum* subsp. *minutiflorum* (Kurz) Mitra, with *H. ciliatum* N. Mukherjee in synonymy. Wu Zhengyi (pers. comm., 2005) recommended recognition of *H. bhamoense* at species level, with a new species to accommodate plants from Xizang. Resolution of the *H. ceylanicum* complex requires a study across its entire range. Material with mature fruit is apparently scarce. Verdcourt (in Dassanayake & Clayton, Rev. Handb. Fl. Ceylon 10: 219. 1996) recommended a field study to investigate fruit production.

**6. *Homalium cochinchinense*** (Loureiro) Druce, Rep. Bot. Exch. Club. Brit. Isles 4: 628. 1917.

天料木 tian liao mu

*Astranthus cochinchinensis* Loureiro, Fl. Cochinch. 1: 222. 1790; *Blackwellia fagifolia* Lindley; *B. padiflora* Lindley; *Homalium cochinchinense* var. *pseudopaniculatum* (Yamamoto) Li; *H. dignum* Gagnepain; *H. fagifolium* (Lindley) Benth.; *H. fagifolium* var. *pseudopaniculatum* Yamamoto.

Shrubs or small trees, 2–10 m tall; bark gray-brown or purple-brown; branchlets terete, densely yellowish pubescent when young, gradually glabrescent. Stipules linear to narrowly obovate, to 8 mm, papery, hairy; petiole 2–3 mm (rarely to 6 mm), yellowish pubescent; leaf blade broadly elliptic, elliptic-oblong, or obovate, ca. 2 × as long as wide, 6–15 × 3–8 cm, thickly papery, both surfaces pubescent along midvein and lateral veins, midvein raised abaxially, impressed adaxially, lateral veins 7–9 pairs, anastomosing near margin, conspicuous on both surfaces, margin obtusely serrate, serrate-crenate, or dentate, sometimes minutely so, remotely toothed to entire toward leaf base, base acute, sometimes broadly so, usually cuneate, extreme base sometimes rounded, apex variable, acute to shortly acuminate (acumen to ca. 10 mm) or not. Inflorescence racemelike, (5–)8–15 cm, sometimes with very short branches less than 5 mm; rachis pubescent, hairs spreading; bracts linear to lanceolate, 1–4 mm, papery, pubescent, early caducous. Pedicels 2–3 mm, articulate above middle, densely pubescent, hairs spreading, yellowish. Flowers numerous, inserted along rachis singly or few together in sessile to very shortly pedunculate fascicles, whitish, 7- or 8-merous, 6–9 mm in diam., fragrance-free (once recorded). Calyx tube 2–3 mm, longitudinally ribbed, sparsely pubescent, hairs spreading or semispreading, white, mostly shorter than hairs of sepal and petal apex margins; sepals linear to narrowly oblanceolate, 2–4 × 0.3–0.5 mm, membranous, with conspicuous midvein, outside subglabrous to sparsely hairy, inside sparsely hairy, hairs on both surfaces appressed or spreading, white, shorter and generally weaker than those on margins; sepal margin ciliate, hairs spreading, white, ca. as long as 1/2 sepal width; sepal apex acute, often apiculate. Petals 2–4.5 mm × 1–1.5 mm, narrowly oblanceolate-linear to narrowly spatulate, midvein and lateral veins conspicu-

ous, indumentum on both surfaces and margin as for sepals, hairs at petal apex 0.5–0.7 mm, ca. 1/2 as long as petal width. Disk glands pubescent, hairs white, straight, long. Stamens 6–9; filaments 3–4 mm, sparsely hairy in lower half, hairs spreading, white, long. Free part of ovary densely hairy, hairs spreading, white, straight, long; styles usually 3, ca. 3 mm, hairy in lower 1/3, hairs as for ovary; placentas 3, each with 2–4 ovules. Capsule 5–6 mm, subglabrous. Fl. Feb–Nov, fr. Sep–Dec.

Broad-leaved forests in mountains; 400–1200 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Taiwan [Vietnam].

See also inadequately known “species D” (*Liang 63511* (K) and *Liang 63788* (K), from Hainan), below.

**7. *Homalium mollissimum*** Merrill, Lingnan Sci. J. 14: 39. 1935.

毛天料木 mao tian liao mu

Shrubs or small trees, 6–7 m tall; bark gray or gray-brown; branchlets terete, densely pubescent, hairs spreading, yellowish. Stipules sometimes persistent, 5–10 mm, linear, narrowly elliptic, or obovate, pubescent with long white hairs, margin toothed or erose; petiole 2–5 mm, densely pubescent; leaf blade elliptic or oblong-elliptic, rarely oblong or obovate, ca. 2 × as long as wide, 5–11 × 2.5–5 cm, leathery, both surfaces sparsely to densely yellow pubescent throughout, midvein and lateral veins raised abaxially, flat adaxially, lateral veins 6–8 pairs, base acute to rounded, margin remotely shallowly serrate, apex acute to shortly acuminate, acumen to ca. 7 mm. Inflorescence terminal or axillary, racemose, 4–8 cm; rachis densely pubescent, hairs spreading, yellowish white, long; bracts narrowly lanceolate to linear, 1–4 mm, papery, margin entire, toothed, or erose, pubescent, hairs spreading, white, long. Pedicels 2–3 mm, articulate above middle, densely pubescent, hairs spreading, yellowish, long. Flowers numerous, inserted along rachis singly or in pairs, white, 7- or 8-merous, 4–6 mm in diam. Calyx tube ca. 2 mm, conspicuously longitudinally ribbed, outside densely pubescent, hairs mostly as long as those on sepal and petal margins, spreading, yellowish; sepals linear or oblanceolate-linear, 3–5 × 1–1.5 mm, apex usually acute, both surfaces sparsely pubescent, hairs spreading, white, long; sepal margin densely ciliate, hairs spreading, white, long. Petals oblanceolate, slightly longer than sepals, apex acute or obtuse, both surfaces sparsely pubescent, hairs spreading, white, long; margin densely ciliate, hairs spreading, long, to 1.5–2 mm at petal apex. Disk glands minute. Stamens 7 or 8; filaments ca. equal to or overtopping petals, with long spreading hairs in lower part. Free part of ovary pubescent, hairs spreading, white, straight, ca. 1 mm or more; styles 3 or 4, ca. 3 mm, ca. 2 × longer at fruiting stage, hairy except for distal 1/4, hairs as for ovary; placentas 3 or 4, each with 3 or 4 ovules. Capsule 5–7 mm. Fl. Jun–Dec, fr. Jul–Jan of following year.

Mountain forests, thickets, on dry, rocky, clay or sandy soil, gentle slopes; low elevations. Hainan [N Vietnam].

*Taam 286* (A, K), collected from Guangdong, might not be referable to *Homalium mollissimum*; see inadequately known “species B” below.

**8. *Homalium breviracemosum*** How & Ko, Acta Bot. Sin. 8(1): 40. 1959.

短穗天料木 duan sui tian liao mu

Shrubs, 1.5–2.5 m tall, glabrous throughout except for inflorescence; bark thin; branchlets black-brown, terete, slender, densely and irregularly striate. Petiole purple-black, very short, ca. 1 mm; leaf blade elliptic-oblong or obovate-oblong, (5–)7–9(–11) × 3.5–4.5 cm, thinly papery, midvein and lateral veins raised abaxially, slightly raised adaxially, lateral veins 4–6 pairs, anastomosing along margin, base slightly obtuse, margin sparsely crenulate, apex shortly acuminate or acute. Inflorescence axillary, racemose, 4–5 cm; rachis puberulous. Pedicels filiform, ca. 2 mm, articulate near apex, spreading pubescent. Flowers numerous, solitary or rarely 2-fasciculate along rachis, white, 6- or 7-merous. Calyx tube narrowly obconic, 3–3.5 mm, longitudinally canaliculate, spreading pubescent; sepals oblanceolate-linear, 3–3.5 × ca. 0.6 mm, conspicuously 3-veined, outside subglabrous, inside pubescent, margin ciliate, apex mucronate. Petals oblanceolate-linear, 4–4.5 × 1–1.5 mm, conspicuously 3-veined, outside subglabrous, inside pubescent, hairs spreading and long, margin ciliate, apex slightly obtuse or acute. Disk glands nearly square, hairy. Stamen filaments ca. 4 mm. Styles 3, glabrous or nearly so; placentas 3, each with 4 ovules. Fl. Aug–May, fr. Feb–Nov.

- Sparse forest margins; low elevations. Guangdong, Guangxi.

Of the present authors, Yang considers *Homalium breviracemosum* to be a synonym of *H. cochinchinense*; Zmarzty has seen no material of *H. breviracemosum*.

**9. *Homalium sabiifolium*** How & Ko, Acta Bot. Sin. 8(1): 43. 1959 [*“sabiæfolium”*].

窄叶天料木 zhai ye tian liao mu

Shrubs, 2–3 m tall; bark gray-brown, not flaking; branchlets terete, pubescent when young, glabrescent, hairs whitish, semiappressed. Stipules linear, nearly filiform, 1.5–2 mm, hairy, early caducous; petiole short, ca. 2 mm, pubescent, swollen; leaf blade narrowly elliptic, rarely narrowly elliptic-oblong, ca. 3 × as long as wide, 8–10 × 2–3 cm, leathery, both surfaces usually glabrous, adaxially sometimes hairy along midvein and in vein axils, midvein raised abaxially, flat adaxially, lateral veins 6–8 pairs, base acute, margin shallowly obtusely serrate, apex acute or tapering to an acuminate tip 1–1.5 cm. Inflorescence terminal or axillary, racemose, 4–6 cm; upper bracts linear to lanceolate, 1.5–2 mm, papery, pubescent, hairs semiappressed. Pedicels 2–3 mm, articulate at middle, pubescent, hairs semiappressed. Flowers numerous, inserted along rachis singly or in pairs, (8–)10-merous, 6–8 mm in diam. Calyx tube 2–3 mm, longitudinally ribbed, pubescent, hairs whitish, appressed, short, ca. 0.2 mm; sepals 2–3 × ca. 0.5 mm, linear or linear-lanceolate, both sides sparsely pubescent, hairs appressed, margin ciliate, hairs spreading or semispreading, mostly longer than those on calyx tube; sepal apex mucronate. Petals subequal to sepals in size, or longer (to ca. 4 mm) and broader as fruit develops, outside sparsely appressed hairy, inside with hairs denser, longer, more closely appressed, margin ciliate, hairs spreading, white,

straight, to ca. 0.5 mm. Disk glands ca. 0.5 mm in diam. Stamens 3–5 mm, overtopping perianth, sparsely pubescent except in upper 1/3, hairs spreading. Free part of ovary sparsely pubescent throughout, hairs spreading, white, long; styles 4, ca. 4 mm, joined in basal 1/4 to form a short column, hairy except in distal 1/3, hairs spreading, white, long; placentas 3, each with 3 or 4 ovules. Fl. Oct–Feb of following year, fr. Mar–Nov.

- Sparse forests of mountain valleys; ca. 500 m. Guangxi.

**10. *Homalium phanerophlebium*** How & Ko, Acta Bot. Sin. 8(1): 44. 1959.

显脉天料木 xian mai tian liao mu

*Homalium phanerophlebium* var. *obovatifolium* S. S. Lai.

Trees, 8–10 m tall; bark gray to grayish brown; branchlets terete, initially pubescent with short curved (in dry material) hairs, soon glabrescent, markedly lenticellate. Stipules not seen, scars present; petiole 8–15 mm, pubescent with short curved hairs or practically glabrous; leaf blade drying blackish brown, elliptic-oblong or ovate-oblong, (3–)7–14 × (2–)3–5.5 cm, 2–3.5 × as long as wide, both surfaces glabrous, midvein and lateral veins slightly raised abaxially, adaxially flat, lateral veins 5–7 pairs, base acute, obtuse, or rounded, suboblique, margin remotely serrulate, appearing nearly entire, slightly revolute in dried state, apex usually obtuse, contracting gradually or abruptly to a narrow acumen 10–30 mm, extreme tip generally blunt, less often leaf apex acute. Inflorescence terminal or axillary, racemose or paniculate, 7–15 cm; rachis pubescent, hairs semi-spreading, curved, short; bracts ca. 1.5 mm, very narrow, glabrous or pubescent. Pedicels 1.5–2.5 mm, longer in fruit, articulate near middle, pubescent, below articulation hairs semi-spreading, curved, short, above articulation generally straighter and more appressed. Flowers numerous, inserted along rachis singly or in fascicles of 2–4, fragrant; (5 or)6 or 7(or 8)-merous, at anthesis 3–4 mm, to 6 mm in fruit (excluding styles). Calyx tube 1–1.5 mm at anthesis, sparsely pubescent with closely appressed hairs 0.1–0.2 mm, initially smooth, later becoming longitudinally ridged; sepals linear-oblong to narrowly obovate, ca. 2 × 0.4 mm at anthesis, both surfaces glabrous or with a few closely appressed hairs, margin ciliate, hairs straight, often appressed, 0.1–0.2 mm; sepal apex acute or rounded. Petals oblanceolate, slightly longer and wider than sepals, both surfaces glabrous except for sparse spreading hairs near base, margin ciliate, hairs spreading, ca. 0.3 mm, longer than hairs on sepal margin, shorter than 1/2 width of petal; petal apex obtuse, apiculate. Stamen filaments ca. 3.5 mm, glabrous except for long, spreading hairs toward base. Disk glands sparsely pubescent, hairs spreading, long. Free part of ovary pubescent, hairs spreading, long, similar to those on disk glands and petal margins; styles 2 or 3(or 4), free, 3–4 mm, glabrous or with a few spreading hairs near base; placentas 2 or 3(or 4), each with 3 or 4 ovules. Capsule excluding perianth segments 4–5 mm. Fl. Oct–Nov, fr. Dec–Feb of following year.

- Mixed woods and thickets. Guangdong, Hainan [Vietnam].

The specimen *S. K. Lau 5436* (A), from Hainan, is not referable to *Homalium phanerophlebium*; see inadequately known “species C” below.

**Inadequately known species**

The following are informal descriptions, for use in identification only. No publication of new names nor typification is intended.

**11. Homalium “species A”** Hainan, *Lau 3225* (A).

Twig tips puberulous. Petiole ca. 0.5 cm, glabrous; leaf blade drying reddish brown, ovate, 3–6 × 1.5–2 cm, both surfaces glabrous, base obtuse to rounded, margin shallowly serrate-crenate, apex broadly acute, contracting or tapering to a blunt acumen to ca. 1 cm. Inflorescence axillary, paniculate, ca. 3 cm, slender; rachis with short, rather dense, spreading hairs. Flowers small, 3–4 mm excluding exerted stamens and styles, 7- or 8-merous. Calyx tube ca. 1 mm, glabrous or with short, appressed hairs; sepals linear oblong, 2–3 mm, outside glabrous or with a few appressed hairs on midvein, margin shortly ciliate. Petals ca. as long as sepals or longer, oblanceolate, indumentum as for sepals though margin cilia longer. Stamen filaments with long, sparse, spreading hairs in lower half. Free part of ovary and lower part of styles with indumentum as for stamens; styles 4, joined in lower part.

• Thickets on sandy soil, rocky dry steep slopes, described on herbarium label as “fairly common.” Hainan.

This species was previously identified as *Homalium stenophyllum*. The specimen is also annotated “*Homalium laui* Merr. n. sp.” (an unpublished name) and “Merr. & Metc. [?] sp. nov.”

**12. Homalium “species B”** Guangdong, *Taam 286* (A, K).

Twig tips very densely hairy, hairs spreading, yellowish. Petiole short, densely hairy; leaf blade drying distinctly reddish brown, elliptic to slightly obovate, 4–7 × 3–4 mm, abaxially similar with additional hairs sparsely scattered throughout blade, adaxially densely hairy on midvein and lateral veins, base obtuse, margin serrate except entire near base, apex widely acute to obtuse, contracting abruptly to a short acumen 3–4 mm. Inflorescence axillary, probably racemose though panicle-like through loss of subtending leaves, 5–7 cm; rachis very densely hairy, hairs spreading, yellowish; flowers nearly sessile, inserted singly on rachis or 2 to few together in rather congested fascicles, absent from basal 1/3 of rachis, ca. 7-merous, 2.5–5 mm excluding exerted stamens and styles, fetid. Calyx tube 1.5–2 mm, indumentum rather dense, hairs spreading, white; sepals 1–2 mm, narrowly oblong to slightly oblanceolate, adaxially with hairs more appressed than those on calyx tube, margin with long white cilia. Petals ca. as long as sepals though wider and more spatulate, indumentum as for sepals. Disk glands shortly and broadly obconic, small, ca. 0.3 mm in diam., pubescent with spreading long white hairs. Stamens with sparse, spreading long hairs in lower half. Free part of ovary densely hairy, hairs semispreading, long. Styles 3, free nearly to base, hairy in lower half, hairs as for ovary.

• Thickets, described on herbarium label as “rare.” Guangdong.

This species is very similar to *Homalium mollissimum* but the hairs on the perianth are shorter and the sepal apex is obtuse. The specimen at A is annotated “*Homalium villosinervium* Merr. & Metc. sp. nov.” (an unpublished name) and “type!”

**13. Homalium “species C”** Hainan, *Lau 5436* (A).

Twig tips pubescent, hairs spreading. Petiole 5–10 mm, initially sparsely appressed hairy, glabrescent; leaf blade narrowly ovate to oblong, 6–13 × 2.5–4 cm, both surfaces glabrous, base broadly obtuse to rounded, margin slightly serrate to nearly entire, apex widely acute to slightly obtuse, contracting to a blunt acumen to ca. 1 cm. Inflorescence axillary, 7–10 cm, racemelike though with very short lateral branches less than 5 mm; rachis with sparse spreading hairs. Flowers 6–8 mm (at this length possibly becoming accrescent in fruit), 6- or 7-merous. Calyx tube ca. 2 mm, with long semiappressed hairs; sepals 2–2.5 mm, narrowly oblong to lanceolate, with sparse, appressed hairs, margin long ciliate. Petals longer than sepals, or becoming so, indumentum as for sepals. Stamen filaments sparsely hairy in lower 1/2 to 2/3, hairs spreading, long. Disk glands obconic, small, ca. 0.2 mm in diam., pubescent with long spreading whitish hairs. Styles 4, joined in lower half, free part of ovary and basal 2/3 of styles with indumentum as for stamen filaments.

• Forests, on rocky sandy soil, dry steep slopes, described on label as “rare.” Hainan.

This species was previously determined as *Homalium phanero-plebium*, also annotated “*Homalium*, Merr. & Metc. sp. nov.” and, by C. Y. Wu (in 1990), “Holotype of *H. heterosemma* Merr. sp. nov. ined.” The leaves are similar to those of *H. phanero-plebium* but the perianth indumentum is different.

**14. Homalium “species D”** Hainan, *Liang 63511* (K) and *Liang 63788* (K).

Branchlets practically glabrous. Petiole 8–10 mm, glabrous; leaf blade elliptic to oblong-elliptic, 6–12 × 3–5 cm, both surfaces glabrous, lateral veins ca. 4 or 5 pairs, high ascending, base broadly acute, slightly oblique, margin serrate, teeth obtuse, leaf apex broadly acute, contracting gradually or more abruptly to an acumen ca. 1 cm. Inflorescence axillary (and ?terminal), paniculate, 7–13 cm; rachis with semiappressed to spreading hairs. Flowers 3–4 mm excluding exerted stamens, ca. 6- or 7-merous. Calyx tube 8–10 mm, with appressed hairs; sepals linear-oblong, ca. 2 mm, outside glabrous, inside with a few long, appressed hairs, margin long ciliate. Petals narrowly oblong-obovate, slightly longer and broader than sepals, indumentum as for sepals. Stamen filaments with a few long hairs toward base. Ovary, disk glands, and lower part of styles with long straight hairs; styles 3, joined in basal part.

• Mountain forests. Hainan.

This species was previously determined by Sleumer (determination slip dated 1953 on herbarium sheet) as *Homalium cochinchinense* but has paniculate inflorescences, glabrous petioles, and appressed hairs on the calyx tube. It is similar to *H. paniculiflorum* but has lateral veins fewer, more spaced, and higher ascending.

**12. CASEARIA** Jacquin, Enum. Syst. Pl. 4, 21. 1760.

脚骨脆属 jiao gu cui shu

*Antigona* Vellozo; *Athenaea* Schreber (1789), not Adanson (1763); *Vareca* Gaertner.

Shrubs or small trees. Leaves alternate, usually petiolate; stipules usually small, caducous, rarely larger and/or persistent; leaf blade usually pinnate-veined, sometimes 3-veined from base, often with pellucid glandular dots and lines throughout (view at  $10 \times$  against light), margin entire or toothed. Flowers perigynous, bisexual, small, usually clustered in axillary, few- to many flowered, sessile or shortly pedunculate fascicles, rarely solitary or in small cymes; bracts papery or scalelike, generally ovate, small, congested at fascicle base to form a persistent cushion; pedicels usually present, articulate, rarely flowers practically sessile. Sepals 4 or 5, imbricate, joined in basal part to form a shallow or deeper cup, free above, cup never adnate to ovary. Petals absent. Disk cuplike, adnate to inside of calyx tube, free from ovary, rim lobed; lobes triangular, oblong, or clavate, usually hairy, either in same row as and alternating with stamens, or in an intrastaminal row. Stamens (6-)8-10(-12); filaments inserted on rim of disk cup. Ovary superior, 1-loculed; placentas 2-4, each with several ovules; style 1, entire or distally 3-branched, sometimes very short; stigma capitate, 3-lobed when style is entire. Capsule fleshy to leathery, globose, ellipsoid or 3-angled when fresh, mostly 6-ribbed when dry, (2 or)3(or 4)-valvate, dehiscent valves often naviculate; sepals, stamen filaments, disk, and disk lobes generally persistent at capsule base, style remnant often persistent at apex. Seeds several, ovoid or obovoid, arillate, aril completely covering seed, membranous or fleshy, often brightly colored, soft, partly fimbriate.

About 180 species: tropical and subtropical regions of Africa, Asia, Australia, North and South America, and the Pacific islands; seven species in China.

In Chinese species: flowers in axillary glomerules; disk lobes in same row as stamens; style entire; capsule fleshy.

More gatherings are needed for the genus from China, Myanmar, India, Laos, Thailand, and Vietnam, from which more accurate, detailed, and standardized descriptions and keys can be drawn. Chinese material of *Casearia kurzii*, *C. tardieuae*, and *C. velutina* seems particularly scarce. Between some species, the flowers and fruit offer few diagnostic characters. The following key is tentative.

- 1a. Stipules narrowly lanceolate or linear-lanceolate, 1.5-10 mm.
  - 2a. Stipules narrowly lanceolate, 5-10 mm, early caducous, on young growth leaving a large conspicuous pale brown scar; leaves with 10-14 pairs of lateral veins; in dried material pellucid dots and streaks throughout leaf blade usually clearly visible at  $\times 10$  mag. without holding leaf up to light, reddish brown, contrasting sharply against color of leaf; leaves glabrous or glabrescent below ..... 5. *C. graveolens*
  - 2b. Stipules linear-lanceolate, 1.5-3 mm, persistent for some time; leaves with 5-8 pairs of lateral veins; in dried material pellucid dots and streaks throughout leaf blade not clearly visible at  $\times 10$  mag. without holding leaf up to light, nor reddish brown, nor contrasting sharply against color of leaf; leaves usually pubescent beneath, less often glabrous ..... 1. *C. flexuosa*
- 1b. Stipules broadly triangular or broadly ovate, minute, 1-2 mm.
  - 3a. Abaxial surfaces of mature leaves pubescent, at least along midvein and lateral veins.
    - 4a. Pedicels 2-4 mm in flower, 5-6 mm in fruit ..... 2. *C. velutina*
    - 4b. Pedicels 5-8 mm in flower, ca. 10 mm in fruit ..... 3. *C. kurzii*
  - 3b. Abaxial surfaces of mature leaves glabrous.
    - 5a. Leaves leathery ..... 4. *C. tardieuae*
    - 5b. Leaves papery to membranous.
      - 6a. Terminal bud, pedicel, and calyx hairy, stamen filaments usually hairy (rarely nearly glabrous); capsule slightly to not at all ridged, pericarp veined, vesicled, vesicles black and shiny in cross-section (subglabrous *C. kurzii* var. *gracilis* might also key out here) ..... 6. *C. glomerata*
      - 6b. Terminal bud hairy or glabrous, pedicel, calyx, and stamen filaments usually glabrous (rarely puberulous); capsule usually strongly ridged, pericarp veined but not conspicuously vesicled ..... 7. *C. membranacea*

**1. *Casearia flexuosa*** Craib, Bull. Misc. Inform. Kew 1911: 54. 1911.

云南脚骨脆 yun nan jiao gu cui

*Casearia yunnanensis* How & Ko.

Shrubs or small trees, 1-4 m tall; terminal bud, twig tips, and branchlets pubescent or glabrescent, hairs  $\pm$  spreading. Stipules linear-lanceolate, 1.5-3 mm, papery, with a few appressed to spreading hairs, persistent or caducous; petiole 3-10 mm, pubescent, hairs spreading, short; leaf blade variable in shape and size, narrowly elliptic, oblong-elliptic, or obovate, 3.5-15  $\times$  1-5 cm, thinly membranous, abaxially sparsely puberulous, at least along main veins, rarely glabrous, adaxially glabrous or subglabrous, midvein raised abaxially, lateral veins 5-8 pairs, base

acute, obtuse, or slightly rounded, cuneate or not, margin finely serrulate, teeth narrow, extended to a fine point, leaf apex acute, sometimes broadly so, tapering or contracting more abruptly to an acumen ca. 1 cm, extreme tip usually acute, mucronate. Flowers usually few in axillary subsessile glomerules, greenish white. Pedicels ca. 1 mm in flower, ca. 5 mm in fruit, articulate at base; bracts ovate, ca. 2 mm, abaxially glabrous or with a few hairs. Sepals 4 or 5, oblong or obovate-oblong, 2-3 mm, outside usually glabrous, less often sparsely shortly hairy in upper half, inside sparsely pubescent, hairs semispreading, short, margin shortly ciliate. Stamens 8; filaments ca. 1 mm, pubescent; anthers ovoid-oblong, 0.5-0.7 mm, with acute apex and connective sometimes extended, glabrous. Disk lobes nearly as long as stamen filament, narrowly triangular, adaxially glabrous, mar-

gin ciliate, hairs long, white when dry. Ovary narrowly ovoid, ca. 1 mm or less, sparsely hairy to nearly glabrous below, hairy above; style short, 0.5–1 mm, hairy; stigma globose, 3-lobed, glabrous. Capsule green or yellow, broadly ellipsoid to globose, ca. 1.5 × 1 cm, 3- or 4-angled, fleshy, dried pericarp thin, usually splitting into 3 broadly elliptic valves, outside pale brown, finely longitudinally ribbed and horizontally wrinkled, reddish brown vesicles often visible below surface, inner surface pale yellowish; valves 3, broadly obovate, slightly naviculate. Seeds 3–8, variously reported as white or red when fresh, pale brown when dry, 6–7 mm, ovoid, surface smooth, completely or partially covered by a thin, fleshy, partly fimbriate, yellowish white aril. Fl. Apr, fr. Apr–May.

Thickets, forests; 100–700 m. Guangxi, Yunnan [Laos, Thailand, Vietnam].

## 2. *Casearia velutina* Blume, Mus. Bot. 1: 253. 1851.

毛叶脚骨脆 mao ye jiao gu cui

*Casearia balansae* Gagnepain; *C. balansae* var. *cuneifolia* Gagnepain; *C. balansae* var. *subglabra* S. Y. Bao; *C. petelotii* Merrill; *C. villilimba* Merrill.

Trees or shrubs, to 10 m tall; terminal bud densely pubescent, twig tips and branchlets densely to sparsely pubescent, hairs spreading, yellowish brown. Stipules broadly triangular-ovate, minute, ca. 1 mm, densely appressed pubescent, caducous early or later; petiole 5–15 mm, densely to sparsely pubescent, hairs spreading; leaf blade often drying blackish green or blackish brown, variable in shape and size, elliptic to oblong, rarely ovate, 7–20 × 4–8 cm, thickly papery, initially pubescent on both sides, very densely so beneath, both sides becoming more sparsely hairy or glabrous except for midvein and main veins, hairs semispreading to appressed, yellowish, long (0.5–1 mm); leaf lateral veins 8–12 pairs, base acute to rounded, sides convex to concave, often oblique, margin serrulate, apex acute to obtuse, contracting to an acumen of ca. 1 cm or less. Flowers (1 to) few to many in axillary sessile or subsessile glomerules. Pedicels 2–4 mm, extending to 5–6 mm in fruit, articulate, sparsely pubescent, hairs semiappressed; bracts ovate, ca. 1 mm or less, outside pubescent. Sepals 5, ovate, hooded, 2–3 mm, outside pubescent, hairs as for pedicels, apex acute or obtuse. Stamens 8, rarely 5–7; filament ca. 1.5 mm, puberulous throughout; anthers ovoid, ca. 0.4 mm. Disk lobes narrowly oblong, ca. 2/3 as long as filament, glabrous adaxially except at tip, abaxially pubescent at tip and margin. Ovary conic, very sparsely puberulous, hairs semiappressed; style short, 0.5–1 mm, glabrous; stigma globose, 3-lobed. Capsule broadly ellipsoid, to ca. 1.2 cm, fleshy, when dry pericarp blackish, with dense shallow warts, with fine longitudinal ridges marking valve margins, black shiny vesicles absent. Seeds ca. 8, when dry pale yellowish brown, ca. 5 mm, smooth, enveloped in a thin, fleshy, pale yellow partly fimbriate aril. Fl. Feb–Dec, fr. Apr–Jun.

Evergreen broad-leaved forests; 100–1800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Yunnan [Indonesia (Java, Sumatra), Laos, Malaysia, Thailand, Vietnam].

*Casearia velutina* is treated here as a polymorphic species particu-

larly variable in leaf shape, size, and indumentum. Lescot (Fl. Cambodge Laos Vietnam 11: 51. 1970) and Lai (FRPS 52(1): 71. 1999) recognized *C. balansae* as a separate species, with *C. petelotii* and *C. villimba* in synonymy. Sleumer (Blumea 30: 217–250. 1985) treated *C. balansae* as a synonym of *C. velutina*. The group requires further gatherings and a distribution-wide study.

## 3. *Casearia kurzii* C. B. Clarke in J. D. Hooker, Fl. Brit. India 2: 594. 1879.

印度脚骨脆 yin du jiao gu cui

Trees, small, 5–12 m tall; terminal buds densely appressed hairy (except stipules), twig tips, branchlets sparsely pubescent, hairs spreading. Stipules broadly triangular-ovate, minute, ca. 1 mm, papery, sparsely to densely appressed pubescent, ciliate, very early caducous, stipule scar sometimes increasing in size with age and becoming conspicuous; petiole 5–15 mm, pubescent, often sparsely so, hairs spreading, yellowish; leaf blade lanceolate or oblong-lanceolate, rarely oblong-elliptic, 9–21 × 4–8 cm, papery, abaxially pubescent throughout or sparsely pubescent only along midvein and lateral veins with spreading, yellowish or pale brown hairs, rarely subglabrous, adaxially glabrous or with a few hairs toward base, lateral veins 8–11 pairs, base rounded to cordate, often inequilateral, margin shallowly serrate, crenate, or subentire, apex acute or contracting rather gradually to an acumen to ca. 1.5 cm. Flowers few in axillary sessile glomerules, whitish, small. Pedicels 5–8 mm in flower, ca. 1 cm in fruit, articulate at base, pubescent, hairs spreading, yellowish; bracts ovate, 0.5–0.7 mm, papery, pubescent, ciliate. Sepals 5, ovate, 2–3 mm, outside pubescent except toward margin, hairs appressed to spreading and yellowish, inside glabrous or with few hairs, margin nearly glabrous. Disk lobes narrowly oblong, 1/2–3/4 as long as filament, densely hairy at apex, hairs drying white, long. Stamens 7 or 8; filaments pubescent, ca. 0.7 mm; anthers ovoid, ca. 0.5 mm, apex obtuse to apiculate, connective hairy. Ovary ovoid, 1–2 mm, practically glabrous; style short; ca. 0.5 mm, glabrous, stigma discoid, enlarged. Capsule 1–1.5 cm, obovoid to ellipsoid, fleshy, when dry outer surface blackish brown, densely and shallowly warty, at least in young fruit, pericarp with many ellipsoid inclusions, in dried material these black, shiny, conspicuous in pericarp cross-section. Seeds several, drying pale brown, ovoid, ca. 5 mm, surface smooth, enveloped by a thin, fleshy, partly fimbriate, pale yellowish aril. Fl. Jul–Aug, fr. Oct–Mar of next year.

Rain forests in moist valleys, evergreen broad-leaved forests; 500–1500 m. Yunnan [Bangladesh, India, N Myanmar].

- 1a. Leaf blade abaxially densely puberulous ..... 3a. var. *kurzii*  
 1b. Leaf blade abaxially subglabrous, or sparsely puberulous only along midvein and lateral veins ..... 3b. var. *gracilis*

### 3a. *Casearia kurzii* var. *kurzii*

印度脚骨脆(原变种) yin du jiao gu cui (yuan bian zhong)

Leaf blade abaxially densely puberulous.

Rain forests in moist valleys; 500–1200 m. Yunnan [India, N Myanmar].



**3b. *Casearia kurzii* var. *gracilis*** S. Y. Bao, Acta Bot. Yunnan. 5: 376. 1983.

细柄脚骨脆 xi bing jiao gu cui

Leaf blade abaxially subglabrous, or sparsely puberulous only along midvein and lateral veins. Fl. Mar–Apr, fr. Aug–Sep.

- Evergreen broad-leaved forests; 1300–1500 m. Yunnan.

**4. *Casearia tardieuae*** Lescot & Sleumer, Adansonia, sér. 2, 10: 293. 1970

石生脚骨脆 shi sheng jiao gu cui

*Casearia calciphila* C. Y. Wu & Y. C. Huang ex S. Y. Bao.

Trees, to 12 m tall; branches with bark brown to greenish gray, young branches wrinkled, older ones flaky, branchlets glabrous. Stipules triangular, ca. 2 mm, glabrous except for ciliate margin, apex acute, early caducous; petiole 8–13 mm, robust, completely glabrous; leaf blade pale green, elliptic, ovate-oblong, or oblong, 8–13 × 3.5–6 cm, leathery to thickly leathery, both surfaces completely glabrous, midvein prominent below, lateral veins 6–8 pairs, arching upward, finely marked on both surfaces, base acutely attenuate, asymmetric, margin undulate to repand-dentate, apex shortly acute-acuminate. Flowers few in sessile axillary glomerules, small. Pedicels ca. 3 mm, glabrous; bracts ovate, ca. 0.8 mm, abaxially glabrescent, adaxially glabrous. Sepals 5, ovate, 3.5–4.5 mm, leathery, glabrous except for sparsely ciliate margin. Stamens 8; filaments sparsely pubescent, glabrescent or glabrous, ca. 2 mm; anthers oblong-ellipsoid. Disk lobes oblong, hairy at apex. Ovary conic, 2–3 mm, hairy toward apex; style very short to nearly absent, ca. 0.5 mm, glabrous; stigma capitate. Capsule ellipsoid, 2.5–3.5 mm, fleshy, verrucose. Seeds many, whitish, ovoid, completely enveloped in partly fimbriate aril. Fl. Dec–Mar of next year, fr. Mar–Nov.

Mixed forests; 1000–1600 m. Yunnan [Vietnam].

Material of *Casearia tardieuae* was not seen by present authors.

**5. *Casearia graveolens*** Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 107. 1852.

香味脚骨脆 xiang wei jiao gu cui

*Casearia graveolens* var. *lintsangensis* S. Y. Bao.

Trees, 10–15 m tall; terminal buds, twig tips, and branchlets glabrous. Stipules narrowly lanceolate, 5–10 mm, papery, glabrous, early caducous, on young growth leaving a large conspicuous pale brown scar; petiole 1–1.2 cm, glabrous; leaf blade broadly elliptic to elliptic-oblong, 6–15 × 4–8 cm, papery, abaxially glabrous or glabrescent, adaxially glabrous, densely set with irregularly shaped, reddish brown pellucid dots and streaks, in dried material these clearly visible at × 10 mag. without holding leaf up to light, lateral veins 10–14 pairs, arching upward, base rounded or broadly obtuse, margin shallowly serrate, crenate, very rarely repand, apex variable, broadly acute, obtuse or rounded, often contacting gradually or abruptly to a short acumen to ca. 1 cm. Flowers in few- to many

flowered axillary glomerules, greenish, fetid. Pedicels 3–6 mm, articulate near base, pubescent with short semispreading hairs, more densely so below articulation; bracts ovate, ca. 2 mm, outermost bracts densely appressed hairy, striate. Sepals 5, ovate to ovate-oblong, ca. 4 mm, outside pubescent, more densely so toward base, or glabrescent, hairs semispreading and short, inside sparsely hairy, margin practically glabrous, not ciliate. Stamens 8; filaments sparsely pubescent, ca. 1.5 mm; anthers oblong, ca. 0.5 mm, connective glabrous. Disk lobes oblong, ca. 1/2 as long as stamen filaments, pubescent throughout, hairs white when dry, long. Ovary ovoid, ca. 1.5 mm, pubescent in upper half, hairs spreading; style short, hairy in lower part, stigma capitate. Capsule orange-yellow when ripe, dark reddish or blackish brown and strongly longitudinally ribbed when dried, ellipsoid-oblong, ca. 2 cm, fleshy, pericarp densely and shallowly warty, veined, cross-section and inner surface without shiny black vesicles, valves narrowly naviculate in dried state. Seeds several, when dry pale yellowish brown, ovoid, ca. 4 mm, surface smooth, enclosed in a thin, fleshy, partly fimbriate pale yellowish brown aril. Fl. Mar–Apr, fr. Sep–Nov.

Forests; 500–1800 m. Yunnan [Bangladesh, Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Pakistan, Thailand, Vietnam].

**6. *Casearia glomerata*** Roxburgh, Fl. Ind., ed. 1832, 2: 419. 1832.

球花脚骨脆 qiu hua jiao gu cui

*Casearia glomerata* f. *pubinervis* How & Ko; *C. merrillii* Hayata.

Trees or shrubs, 4–10 m tall; terminal buds densely pubescent, hairs semiappressed, twig tips and young branches puberulous, hairs spreading, older branches glabrous. Stipules ovate, small, ca. 1 mm, adaxially sparsely appressed hairy, ciliate, apex acute, early caducous; petiole 8–12 mm, sparsely puberulous to practically glabrous; leaf blade variable in shape, elliptic, lanceolate, or oblong, less often ovate, 7–12(–17) × 3–5(–6.5) cm, thickly papery, sparsely puberulous when young, soon glabrous on both surfaces, lateral veins 7 or 8 pairs, arching upward, conspicuous on both surfaces, base obtuse or rounded, more rarely acute, often asymmetric, margin serrulate or crenulate to nearly entire, apex acute to obtuse, less often rounded, often contracting gradually or more abruptly to a short acumen to 1 cm. Pedicels 4–5 mm in flower, 7–10 mm in mature fruit, articulate near base, pubescent, hairs semiappressed; bracts broadly ovate or triangular, ca. 1 mm, abaxially semiappressed hairy, or at least with a hairy median band. Flowers 10–15 or more in axillary glomerules, yellowish, small. Sepals 5, broadly elliptic, obovate, or oblong-obovate, 2–3 mm, outside sparsely pubescent except toward margin, hairs semiappressed, inside glabrous or rarely sparsely hairy, margin minutely ciliate to nearly glabrous. Stamens 8–10; filaments 1–2 mm, pubescent; anthers suborbicular, ca. 0.3 mm. Disk lobes oblong, ca. 1/2 as long as anthers, adaxially glabrous, apex densely hairy, hairs white, rather long. Ovary ovoid, glabrous or sparsely hairy; style short, glabrous; stigma capitate. Capsule ca. 1.5 cm, reported as ovoid-subglobose when fresh, bright yellow when ripe, ellipsoid, oblong-ellipsoid, or obovoid when dried, leathery, usually not or

only scarcely ridged, 2- or 3-valved, dark reddish or blackish brown, in dried material pericarp conspicuously veined, densely and shallowly warty with few to many ellipsoid inclusions, the latter blackish and shiny in pericarp cross-section. Seeds several, pale brown when dry, ovoid, ca. 5 mm, enveloped by a thin, fleshy, partly fimbriate, pale yellowish aril. Fl. Apr–Dec, fr. Jan–Dec.

Sparse forests in mountains; low elevations. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Xizang, Yunnan [Bhutan, India, Nepal, Vietnam].

“*Casearia membranacea* f. *nigrescens*” (S. S. Lai, Bull. Bot. Res., Harbin 14: 229. 1994) belongs here but was not validly published under Art. 37.2 of the *Vienna Code* because two gatherings were indicated as types (S. Q. Chen [S. H. Chun] 11697 and S. Q. Chen [S. H. Chun] 13372).

For Indian and Chinese material of *Casearia glomerata*, the combination of hairy terminal bud, pedicel, calyx, and stamen filament, and obovoid fruit with veined, vesicled, unridged pericarp seems to hold, although rarely the stamens are nearly glabrous and the fruit slightly ridged. The species can be difficult to differentiate from *C. membranacea*, in which the terminal bud is hairy or glabrous, the pedicel, calyx and stamen filaments usually glabrous but sometimes hairy, and the capsule usually strongly ridged and veined but not conspicuously vesicled. Sleumer in *The Flacourtiaceae of Thailand* (Blumea 30: 217–250. 1985) refers to a widespread “*Casearia glomerata* Roxburgh complex” that includes *C. aequilateralis*, *C. annamensis* (Gagnepain) Lescot & Sleumer, *C. membranacea*, and *C. pseudoglomerata* Sleumer. *Casearia merrilli*, described from Taiwan, is here a new synonym of *C. glomerata*.

#### 7. *Casearia membranacea* Hance, J. Bot. 6: 113. 1868.

膜叶脚骨脆 mo ye jiao gu cui

*Casearia aequilateralis* Merrill.

Trees or shrubs, 4–18 m tall; terminal buds glabrous or hairy, twig tips and branchlets usually glabrous. Stipules ovate, small, ca. 1 mm, abaxially sparsely appressed hairy, ciliate,

apex acute, early caducous; petiole 6–12 mm, pubescent at first, soon glabrous or subglabrous; leaf blade variable in size, shape, and texture, often elliptic or oblong, sometimes ovate-oblong or obovate, 5–12(–14) × 2.5–5(–6) cm, papery, sometimes thinly so, or slightly leathery, both surfaces glabrous, lateral veins 5–7(–10) pairs, arching upward, base mostly acute to obtuse, sometimes cuneate, attenuate, nearly rounded or asymmetric, margin serrulate, crenulate or nearly entire, apex broadly acute to rounded, contracting gradually or more usually abruptly to a short acumen to 1 cm. Pedicels 5–6 mm in flower, to ca. 9 mm in fruit, articulate at base, usually glabrous, rarely sparsely puberulous; bracts broadly ovate or triangular, ca. 2 mm, abaxially hairy, at least along median line. Flowers few to many in axillary glomerules, small. Sepals 5, broadly elliptic, obovate, or obovate-oblong, ca. 2.5 mm, both sides usually glabrous, outside rarely sparsely puberulous. Stamens 8–10; filaments usually glabrous, rarely puberulous, 1–2 mm; anthers ovoid-ellipsoid. Disk lobes oblong or triangular, ca. 1/2 as long as anthers, adaxially glabrous, apex densely hairy, hairs white or reddish, long. Ovary conic, glabrous, rarely puberulous; style short; stigma capitate. Capsule 1–1.5(–4) cm, ellipsoid to oblong, leathery, in dried material usually strongly angled or ridged, pericarp sometimes veined but not vesicular-warty; seeds several, pale brown when dry, 4–5 mm, enveloped by a thin, fleshy, partly fimbriate, pale yellowish aril. Fl. Apr–Jan, fr. following May–Jan.

Forests in mountains; low elevations. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Vietnam].

In FRPS (52(1): 78. 1999), the name *Casearia virescens* Pierre ex Gagnepain was misapplied to this species.

*Casearia membranacea* is easily confused with *C. glomerata*; see notes under that species.

*Wang* 39266, collected from Pingnan, Guangxi, has unusually large leaves (10–14 × 5–6 cm) and capsules (3–4 cm).