

9. SONNERATIA Linnaeus f., Suppl. Pl. 38, 252. 1782, nom. cons.

海桑属 hai sang shu

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*Blatti* Adanson.

Trees, evergreen, glabrous, columnar or spreading, not buttressed, surrounded by pencil-like pneumatophores arising from long, shallowly buried, horizontal roots. Leaves simple, opposite, borne in one plane, entire, leathery, apex often with a minute hydathode forming a thick mucro. Flowers 1–3 clustered at apex of ultimate, pendulous branchlets, actinomorphic, 4–8-merous, opening at night. Floral tube shallowly campanulate, at fruit maturity persistent, partly surrounding fruit or expanded and saucer-shaped with fruit fully exposed; sepals 4–8, adaxially green or red, thick, leathery. Petals red or white, lanceolate-linear, caducous, vestigial, or absent. Stamens numerous; filaments red or white; anthers reniform. Ovary superior to partly inferior, depressed, 10–20-carpellate. Fruit globose, berrylike, leathery, indehiscent, crowned by style base. Seeds numerous, embedded in foul-smelling pulp, irregularly angular or falcate; seed coat thickened, roughened, somewhat corky.  $2n = 24$ .

Nine species (including three natural hybrid species): mangrove communities from E Africa to Indo-Malesia, Australia, New Guinea, and the W Pacific islands; six species (one endemic, one introduced) in China.

Hybridization among species is reportedly common, although molecular studies on Chinese populations of *Sonneratia* × *gulngai* and *S.* × *hainanensis* concluded that these species exist only as repeatedly produced F<sub>1</sub> hybrids. No evidence of F<sub>2</sub> backcrossing or intercrossing among the hybrids led to the conclusion that *S.* × *gulngai* and *S.* × *hainanensis* should not be considered true hybrid species (see Zhou et al., Molec. Phylogen. Evol. 35: 595–601. 2005).

- 1a. Leaves narrowly elliptic to lanceolate, gradually tapering toward apex; calyx lobes 4(–6); stigma peltate, to 7 mm in diam., initially cone-shaped, spreading with age; petals absent; stamens white ..... 1. *S. apetala*
- 1b. Leaves elliptic to broadly ovate, oblong, obovate, or suborbicular; calyx lobes 5–8; stigma capitate, mostly up to 3 mm in diam.; petals present or absent; stamens red, white, or red and white.
  - 2a. Floral tubes flattened, saucer-shaped in mature fruit; mature flower buds and fruit wider than subtending persistent floral tube, mature fruit typically more than 4 cm in diam.; leaves broadly elliptic or oblong, base rounded, attenuate to petiole, apex rounded with minute mucro; petals and stamens red; sepals adaxially green or sometimes red-streaked ..... 2. *S. caseolaris*
  - 2b. Floral tubes campanulate and partially enclosing mature fruit; mature flower buds and fruit narrower than floral tube, mature fruit typically less than 4 cm in diam.; leaves various; petals and stamens white or red; sepals adaxially strongly tinged red.
    - 3a. Floral tubes finely verruculose, dull, 6-ribbed; leaves broadly ovate to suborbicular, 4–10 × 3–9 cm, base rounded or subcordate, apex rounded, without thick mucro; petals mostly absent, rarely vestigial, white; staminal filaments white ..... 3. *S. ovata*
    - 3b. Floral tubes smooth, often shiny, sometimes 6-ribbed; leaves elliptic, suborbicular, ovate, or obovate, 5–11 × 2.5–8 cm, base rounded or attenuate, apex rounded with or without thick, recurved mucro; petals present, white or red; staminal filaments white or red.
      - 4a. Leaves broadly elliptic or suborbicular, rarely broadly ovate, 6.5–8 × 6–8 cm; petals and staminal filaments white ..... 4. *S. ×hainanensis*
      - 4b. Leaves elliptic to ovate or obovate, 5–11 × 4–8 cm; petals and staminal filaments white or red.
        - 5a. Petals white, presence and number variable; staminal filaments white, sometimes pink at base; leaves adaxially pale, whitish when dry; seeds falcate ..... 5. *S. alba*
        - 5b. Petals red, always present; staminal filaments red; leaves adaxially dull green; seeds irregularly angular ..... 6. *S. ×gulngai*

1. *Sonneratia apetala* Buchanan-Hamilton in Symes, Embassy Ava, 477. 1800.

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Columnar trees to 15(–20) m tall. Pneumatophores to 1.5 m; ultimate branchlets pendulous. Petiole 5–10 mm; leaf blade narrowly elliptic to lanceolate, gradually tapering toward apex, 5–13 × 1.5–4 cm, base attenuate, apex obtuse. Flowers 4(–6)-merous in a 3–7-flowered cyme. Floral tube 1.5–2.5 cm at an-

thesis, smooth; sepals green, slightly curving around base of fruit. Petals absent. Staminal filaments white. Stigma peltate, to 7 mm wide. Fruit 1–2 × 2–2.5 cm in diam. Seeds typically U-shaped or falcate, 8–9.5 mm. Fl. May–Dec, fr. Aug–Apr.

Introduced as a fast-growing tree for reforestation of mangrove communities. Guangdong (Shenzhen), Hainan [native to Bangladesh, India, Myanmar, and Sri Lanka].

This species was introduced to China in the 1980s from Sundarbans, Bangladesh, initially to Hainan and subsequently to Shenzhen.

2. *Sonneratia caseolaris* (Linnaeus) Engler in Engler & Prantl, Nat. Pflanzenfam., Nachtr. 1: 261. 1897.

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*Rhizophora caseolaris* Linnaeus, Herb. Amboin. 13. 1754; *Sonneratia acida* Linnaeus f.; *S. evenia* Blume; *S. neglecta* Blume; *S. obovata* Blume; *S. ovalis* Korthals.

Trees, columnar, 5–20 m tall. Pneumatophores ca. 1 m, thin, pointed; ultimate branchlets pendulous, 4-angled. Petiole 2–9 mm; leaf blade elliptic to broadly elliptic or broadly oblong, 4–11 × 2–7 cm, midrib prominent with inconspicuous lateral veins, base rounded, narrowly to broadly attenuate on petiole, apex rounded with minute, thick mucro. Flowers 5–7-merous. Floral tube 2.5–3 cm at anthesis, smooth, flattened in mature fruit; sepals adaxially green, often red-streaked, 1.4–1.9 cm. Petals red, linear, 1.8–2.9 cm × 1–3 mm. Staminal filaments red, sometimes white distally. Fruit [2–]4–5 cm in diam., broader than floral tube. Seeds irregularly angular, ca. 7 mm. Fl. winter, fr. spring–summer.  $2n = 22, 24$ .

Coastal mangrove communities, tidal creeks, in muddy soil. Hainan [Cambodia, India, Indonesia, Malaysia, N New Guinea, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands].

3. *Sonneratia ovata* Backer, Bull. Jard. Bot. Buitenzorg, sér. 3, 2: 329. 1920.

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Trees, columnar, to 10(–20) m tall. Pneumatophores ca. 20 cm, thin, pointed. Petiole 5–6 mm; leaf blade broadly ovate to suborbicular, 4–10 × 3–9 cm, base broadly rounded or subcordate, apex rounded, mucro absent. Flowers mostly 6-merous. Floral tube 2–3 cm at anthesis, finely verruculose, 6-ribbed, ribs decurrent along stipitate base; sepals adaxially strongly tinged red, ca. 1.5 cm, often appressed against mature fruit. Petals generally absent, rarely vestigial, white, linear. Staminal filaments white. Fruit 3–4.5 cm in diam., ca. equal to width of floral tube. Fl. Mar–Oct, fr. Apr–Oct.  $2n = 22, 24$ .

Landward edge of mangrove swamps in brackish water and muddy soil. Hainan [Indonesia, Malaysia, New Guinea, Thailand, Vietnam].

4. *Sonneratia* × *hainanensis* W. C. Ko et al., Acta Phytotax. Sin. 23: 311. 1985, pro sp.

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Trees, 4–8 m tall. Petiole 2–7 mm; leaf blade broadly elliptic or suborbicular, rarely broadly ovate, 6.5–8 × 6–8 cm, base shortly attenuate on petiole, apex rounded or obtuse. Flowers 6-merous. Floral tube 1.2–1.5 cm, smooth, 6-ribbed; sepals adaxially red, erect to spreading, ca. 1.5 cm, partially enclosing mature fruit. Petals white, lanceolate, 2.5–3 cm × 3–4 mm. Staminal filaments white. Fruit 5–6 cm in diam., ca. equal to width of floral tube. Seeds numerous.  $2n = 22^*$ .

- Mangrove communities. NE Hainan (Wenchang).

This taxon is the natural hybrid *Sonneratia alba* × *S. ovata*.

5. *Sonneratia alba* Smith in Rees, Cycl. 33: *Sonneratia* no. 2. 1816.

*Chiratia leucantha* Montrouzier; *Sonneratia iriomotensis* Masamune; *S. mossambicensis* Klotzch.

Trees, 3–15(–30) m tall, spreading, with broad, rather lax crown. Pneumatophores 30(–100) cm, thick, blunt. Petiole 5–15 mm; leaf blade adaxially pale, elliptic to ovate or obovate, 5–11 × 4–8 cm, base rounded, apex broad, rounded, with broad recurved mucro. Flowers 5–8-merous. Floral tube shiny, 3–3.5 cm at anthesis, smooth, often 6-ribbed; sepals adaxially strongly tinged red, 1.3–2 cm, ± erect at anthesis, recurved in fruit. Petals white, linear, 1.3–2 cm × ca. 1 mm, or variably semipetalous to absent. Staminal filaments white. Fruit 2–4.5 cm in diam., ca. equal to width of floral tube. Seeds falcate. Fl. common Oct–Nov, fr. ca. Feb.  $2n = 22, 24$ .

Shallow parts of calm seas and seashores, tidal creeks. Hainan [India (including Andaman Islands), Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam; tropical E Africa (including Madagascar), N Australia, W Pacific islands, Seychelles].

**6. *Sonneratia* × *gulgai*** N. C. Duke & B. R. Jackes, *Austrobaileya* 2: 103. 1984.

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*Sonneratia paracaseolaris* W. C. Ko et al.

Trees 7–10[–25] m tall, spreading, with dense, dark green canopy. Pneumatophores ca. 80 cm, thin, pointed. Petiole 3–5 mm; leaf blade adaxially dull green, obovate, 5–9(–11) × 4–5(–6) cm, base broadly attenuate, apex acute to obtuse. Flowers 5–7-merous. Floral tube smooth, not ribbed; sepals adaxially usually strongly tinged red, 2–2.5 cm, erect at anthesis, erect to partially spreading in fruit. Petals red, linear, 4–5 cm × ca. 2 mm. Staminal filaments red. Fruit 3–5 cm in diam., ca. equal to width of floral tube. Seeds irregularly angular. Fl. Dec and Mar, fr. Mar and Aug.

Mangrove communities, where both *Sonneratia alba* and *S. caseolaris* are present, along lower to middle tidal contours. Hainan [Indonesia (NW Kalimantan), Malaysia; E Australia].

This taxon is the natural hybrid *Sonneratia alba* × *S. caseolaris*.

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