

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 spe-

cies 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 anthelminticus* 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, subequaling 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].

