Fl. China 19: 93–97. 2011.

20. DAMNACANTHUS C. F. Gaertner, Suppl. Carp. 18. 1805.

虎刺属 hu ci shu

Chen Tao (陈涛); Charlotte M. Taylor

Tetraplasia Rehder.

Shrubs, sometimes with paired infrastipular or superaxillary spines; branches sometimes with complex sympodial growth with reduced internodes and prophylls (*Damnacanthus indicus*); roots at least sometimes moniliform (i.e., nodose or "node-like constricted"). Raphides present. Leaves opposite, apparently without domatia; stipules persistent and becoming hardened or sometimes falling by fragmentation, interpetiolar or shortly united around stem, generally triangular, acute or shortly bifid to multifid. Inflorescences pseudoaxillary, superaxillary, apparently terminal, and/or paired on short shoots giving an appearance of being axillary, 1-flowered or usually cymose to fasciculate and 2–4-flowered, subsessile to apparently shortly pedunculate (i.e., borne on a leafless short shoot), bracteate with bracts usually small and glandular-fimbriate. Flowers subsessile to pedicellate and often nodding, bisexual, monomorphic or distylous. Calyx limb cupular or campanulate, 4-lobed (or 5-lobed, *D. henryi*). Corolla white to yellow or pale purple, tubular-funnelform, often leathery, inside densely pubescent in throat to throughout; tube rarely fenestrate (*D. henryi*); lobes 4 (or 5, *D. henryi*), valvate in bud. Stamens 4, inserted in upper part of corolla tube, included or exserted; filaments short; anthers dorsifixed. Ovary 4-celled (or 2-celled, *D. henryi*), ovules 1 in each cell and attached near top of septum, campylotropous; stigmas 4 (or 2, *D. henryi*), linear, included or exserted. Fruit red, drupaceous, globose to ellipsoid or oblate, fleshy, with calyx limb persistent; pyrenes 4(or 2, *D. henryi*), each with 1 seed, plano-convex, subglobose, ellipsoid, or obtusely trigonous; seeds medium-sized, subglobose to plano-convex; endosperm corneous; embryo small; radicle hypogeous.

About 13 species: China, N India, Japan, Korea, Laos, Myanmar, Vietnam; 11 species (six endemic) in China.

The morphology of *Damnacanthus* was reviewed in detail by Robbrecht et al. (Blumea 35: 307–345. 1991), who described its complex, sympodial growth pattern and variations found in different species. They considered the stems of *Damnacanthus* to be composed of sympodial units, with varying degrees of development of the individual parts in different species. The most characteristic and apparently complicated growth is found in *D. indicus*, in which each sympodial unit comprises a basal node bearing a pair of prophylls, similar to bud scales or reduced leaves; then, a developed internode; then, a node bearing a pair of normally developed foliage leaves, decussate in orientation to the prophylls; then, a node (without an intervening internode) bearing a pair of thorns, decussate in orientation to the leaves. Growth of the stem continues from one of the axillary buds of the foliage leaves, which gives the thorns the appearance of being stipular or superaxillary in position. The alternating prophylls and foliage leaves produce the characteristic heterophyllous growth of this genus. Species of *Damnacanthus* vary in the characteristic number of nodes in each sympodial unit and in the development (or not) of the thorns. Robbrecht et al. (loc. cit.) interpreted the characteristic "spines" of the genus as reduced shoot systems produced from the axillary buds subtending two undeveloped (and thus missing) leaves. They considered the characteristic 2- or 4-flowered inflorescences of *Damnacanthus* to be formed of one or two sympodial growth units, produced from one or both axils of a node bearing foliage leaves, with each of these units comprising three congested nodes, lacking separating internodes, with the basalmost nodes bearing bractlike scales and the terminal node producing a flower in each axil then stopping growth, thus comprising a 2-flowered cymule. They also noted that, although previous authors have described the ovules of *Damnacanthus* as amphitropous or pendulous, in fact the ovules are unique in the Rubiaceae in being campylotropous.

Damnacanthus is represented by at least three species in Japan (Fl. Japan 3a: 224–225. 1993), several of them apparently common and hybridizing, and its taxonomy has been rather intensively studied there and in Taiwan (e.g., Koidzumi, Acta Phytotax. Geobot. 3: 155–160. 1934), where it apparently has some medicinal use. *Damnacanthus* was revised for China by H. S. Lo (Acta Phytotax. Sin. 17(3): 104–109. 1979), then treated comprehensively by Y. Z. Ruan in FRPS (71(2): 167–176. 1999) in an essentially monographic work. Koidzumi (loc. cit.) recognized three sections within *Damnacanthus* and treated *Tetraplasia* as a separate genus, based largely on root characters, but these were not mentioned again until Y. Z. Ruan (loc. cit.: 169) recognized two sections in Chinese *Damnacanthus*, one of them under an unpublished name. The Chinese plants with spines were included in *D.* sect. *Damnacanthus*; the unarmed plants were separated by Koidzumi in *Tetraplasia* and were included by Ruan in his second, unnamed section.

Naiki and Nagamasu (J. Pl. Res. 116: 105–113. 2003; Amer. J. Bot. 91: 664–671. 2004) surveyed the breeding biology of several Japanese and Chinese species of *Damnacanthus* and found variation in breeding system among species, discovered a correlation between ploidy with breeding system but not leaf size, and reported distyly and dimorphic pollen in this genus.

1a. Branches glabrous, hispidulous, hirtellous, or puberulent when young, with spines in axils of stipules or leaves, with at least shortly developed spines at apices (these may appear to be stipule bristles if not observed carefully).
  2a. Spines 1–6 mm, persistent or deciduous when new leaves come out; leaf blade with midrib flat to impressed or thinly prominulous adaxially.
    3a. Leaf blade lanceolate or oblong-lanceolate, 4–15 cm, with or usually without microphylls (i.e., prophylls; reduced leaves), midrib flat to impressed adaxially; spines 1–2 mm; young branches and petioles puberulent or hispidulous; corollas 15–18 mm; stipules caducous ..... 2. *D. giganteus*
    3b. Leaf blade ovate, lanceolate, oblong-ovate, or oblong-lanceolate, 3–8 cm, with or without microphylls, midrib thinly prominulous adaxially; spines 2–6 mm; young branches and petioles sparsely hispidulous, puberulent, hirtellous, or glabrescent; corollas 10–15 mm; stipules

persistent at least on distalmost nodes ..... 8. *D. macrophyllus*
2b. Spines 3–25 mm, persistent; leaf blade with midrib thinly prominulous adaxially.
4a. Leaf blade lanceolate or oblong-lanceolate, 3–7.5 cm, with 5–10 pairs of secondary veins ..... 11. *D. tsaii*
4b. Leaf blade cordiform, ovate, elliptic, broadly elliptic, broadly ovate, or elliptic-ovate, 0.5–4 cm, with 2–4 pairs of secondary veins.
5a. Leaf blade 0.5–3 cm, with secondary veins 2–4 pairs; spines 3–20 mm, 1/2 or more as long as leaf blade ..... 6. *D. indicus*
5b. Leaf blade 3–4 cm, with secondary veins 3–5 pairs; spines 3–10 mm, less than 1/2 as long as leaf blade ..... 9. *D. major*
1b. Branches glabrous, without spines.
6a. Low to dwarf shrubs, 0.5–1 m tall; corolla 8–10.5 mm; Taiwan ..... 1. *D. angustifolius*
6b. Low to tall shrubs, 0.4–5 m tall; corolla 8–16 mm; mainland and Hainan.
7a. Leaf blade lanceolate-linear, apex tapered to acute or acuminate tip.
8a. Leaf blade when dry straw-yellow adaxially, olive-green abaxially, and thickly leathery, with secondary veins flat and indistinct adaxially, 6–9 pairs; calyx teeth sharply triangular ..... 3. *D. guangxiensis*
8b. Leaf blade when dry gray, gray-green, or brownish green adaxially, gray-green, brownish green, or straw-yellow abaxially, and papery, with secondary veins flat and indistinct to prominulous adaxially, 9–16 pairs; calyx teeth broadly triangular ..... 7. *D. labordei*
7b. Leaf blade lanceolate, narrowly elliptic, linear, elliptic, elliptic-ovate, elliptic-oblong, or oblong-lanceolate, apex acute to cuspidate or long but rather abruptly acuminate.
9a. Ovary 2-celled, stigmas 2; corolla lobes variably 4 or 5 ..... 5. *D. henryi*
9b. Ovary 4-celled, stigmas 4; corolla lobes regularly 4.
10a. Leaves isomorphic (i.e., prophylls not present), with blade elliptic-ovate, elliptic-oblong, or oblong-lanceolate; Hainan ..... 4. *D. hainanensis*
10b. Leaves dimorphic (i.e., regularly with prophylls), with blade linear at lower part of stem to elliptic, elliptic-oblong, or oblong-lanceolate at upper part of stem; mainland ..... 10. *D. officinarum*

1. Damnacanthus angustifolius Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 113. 1908.

台湾虎刺 tai wan hu ci

Damnacanthus angustifolius var. *altimontanus* J. C. Liao; *D. angustifolius* f. *stenophyllus* (Koidzumi) T. Yamazaki; *D. angustifolius* var. *stenophyllus* (Koidzumi) Masamune; *D. stenophyllus* (Koidzumi) Masamune; *Tetraplasia angustifolia* (Hayata) Koidzumi; *T. stenophylla* Koidzumi.

Dwarf to low shrubs, 0.5–1 m tall. Branches glabrous, without spines, when young subquadrate or usually with 8 alternately thick and thin longitudinal ridge lines, becoming 4-angled and yellow. Petiole of developed leaves 1.5–5 mm, glabrous; leaf blade drying stiffly papery, narrowly lanceolate, narrowly elliptic, linear-lanceolate, elliptic, or lanceolate-elliptic, 5–14 × 0.5–3 cm, glabrous throughout or sometimes sparsely puberulent to hispidulous adaxially, base acute to cuneate, margins flat and entire or irregularly serrulate, apex acute to acuminate; midrib thinly prominulous adaxially; secondary veins 5–9 pairs; stipules caducous, interpetiolar, triangular to spatulate, 0.5–1 mm, glabrous, acute to glandular-fimbriate. Inflorescences glabrous. Pedicels 2–5 mm. Calyx glabrous; hypanthium portion turbinate, 1.2–1.5 mm; limb ca. 1 mm, lobed for ca. 1/2; lobes triangular. Corolla white, glabrous outside; tube 6–8 mm; lobes triangular, 2–2.5 mm. Drupes oblate, ca. 4 × 6 mm. Fl. Jan–Apr, Oct, fr. Jan, Jun, Oct–Nov.

● Primary forests; 1000–2500 m. Taiwan.

Damnacanthus angustifolius var. *altimontanus* is recognized as distinct in the Kew Rubiaceae checklist (Govaerts et al., World Checkl. Rubiaceae; http://www.kew.org/wcsp/rubiaceae/; accessed on 15 Sep 2010) but was formally synonymized in the Fl. Taiwan (ed. 2, 4: 251. 1998), which is followed here.

This species was reported to be distylous by Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004). This species was reported from Guangdong by Merrill and Chun (Sunyatsenia 1(1): 80. 1930) but said to be restricted to Taiwan by Y. Z. Ruan in FRPS (71(2): 173–174. 1999); the Guangdong plants were apparently included by Ruan (loc. cit.: 174–175), followed here, as *Damnacanthus labordei*.

2. Damnacanthus giganteus (Makino) Nakai, Trees Shrubs Japan, 412. 1922.

短刺虎刺 duan ci hu ci

Damnacanthus indicus C. F. Gaertner var. *giganteus* Makino, Bot. Mag. (Tokyo) 18: 33. 1904; *D. macrophyllus* Siebold ex Miquel f. *giganteus* (Makino) T. Yamazaki; *D. macrophyllus* var. *giganteus* (Makino) Koidzumi; *D. subspinosus* Handel-Mazzetti.

Shrubs or rarely small trees, 0.5–2(–7.5) m tall. Roots moniliform. Branches usually 4-angulate or terete to flattened, dark green and sparsely hispidulous or puberulent to glabrous when young, becoming grayish yellow and glabrous, with few spines 1–2 mm and deciduous or sometimes persistent. Petiole of developed leaves 2–5 mm, sparsely puberulent to glabrous; leaf blade drying leathery, lanceolate or oblong-lanceolate, 4–14(–15) × 2–3(–5) cm, adaxially glabrous, abaxially glabrous or rarely densely puberulent along veins, base obtuse to rounded, margins flat to usually revolute and/or sometimes crisped, apex acuminate or acute; midrib flat to impressed adaxially; secondary veins 5–7 pairs; stipules caducous, interpetiolar, 1–2 mm, puberulent to glabrous, acute to bifid, thickened. Inflorescences strigillose to glabrescent. Pedicels 1–2 mm. Calyx strigillose to

puberulent; hypanthium portion turbinate, 1.2–1.5 mm; limb 1–1.5 mm, lobed for 1/4–1/2; teeth broadly triangular. Corolla white, glabrous outside; tube 13–16 mm; lobes ovate-triangular, ca. 2 mm. Drupes ca. 4 × 5–8 mm, with pedicels sometimes elongated to 3 mm. Fl. Mar–May, fr. Oct–Jan.

Sparse or dense forests or thickets; 500–1100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Yunnan, Zhejiang [Japan].

Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004) reported the breeding biology of this species as monomorphic with "pin" type flowers (i.e., with stigmas exserted and anthers included).

3. Damnacanthus guangxiensis Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 320. 1999.

广西虎刺 guang xi hu ci

Shrubs, height not noted. Branches terete, glabrous, without spines. Petiole ca. 6 mm, glabrous; leaf blade drying thickly leathery, straw-yellow adaxially, olive-green abaxially, lanceolate-linear, 13–22 × 1–2 cm, adaxially glabrous, abaxially sparsely pilosulous, base cuneate, margins entire and flat, apex acute then shortly tapered-acuminate; midrib prominent adaxially; secondary veins 6–9 pairs; stipules caducous or deciduous through fragmentation, interpetiolar, triangular, acute to glandular-fimbriate. Pedicels ca. 2 mm. Calyx glabrous; hypanthium portion cupuliform, ca. 1 mm; limb ca. 1 mm, lobed for ca. 1/2; teeth 4 or 5, narrowly triangular, acuminate. Corolla white, outside glabrous; tube ca. 8 mm, pubescent inside; lobes ovate to triangular, ca. 4 mm. Fruit unknown. Fl. winter–spring.

● Forests on mountains; ca. 1200 m. Guangxi (Lingyun).

4. Damnacanthus hainanensis (H. S. Lo) H. S. Lo ex Y. Z. Ruan, Fl. Reipubl. Popularis Sin. 71(2): 176. 1999.

海南虎刺 hai nan hu ci

Damnacanthus henryi (H. Léveillé) H. S. Lo subsp. *hainanensis* H. S. Lo, Acta Phytotax. Sin. 17(3): 108. 1979.

Shrubs, 1–4 m tall. Branches brown, angulate or ridged, glabrous, without spines. Petiole of developed leaves 2–8 mm, glabrous; leaf blade drying black, elliptic-ovate, oblong, or oblong-lanceolate, 6–11 × 2–4.5 cm, glabrous, base rounded or cuneate, margins thinly revolute, apex cuspidate; midrib prominulous adaxially; secondary veins 5–7 pairs; stipules caducous, interpetiolar, triangular. Pedicels ca. 2 mm. Calyx limb subtruncate or lobed; teeth triangular. Corolla white, outside glabrous; tube ca. 14 mm; lobes 4, ovate-lanceolate. Drupes ca. 8 mm in diam., glabrous. Fl. May, fr. Nov.

● Forests, forest margins; 800–1800 m. Hainan.

5. Damnacanthus henryi (H. Léveillé) H. S. Lo, Acta Phytotax. Sin. 17(3): 108. 1979.

云桂虎刺 yun gui hu ci

Canthium henryi H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 178. 1914; *Prismatomeris brevipes* Hutchinson; *P. henryi* (H. Léveillé) Rehder.

Shrubs or small trees, 1.5–5 m tall. Branches 4-angled to flattened, pale brown, smooth, glabrous. Petiole of developed leaves 2–5 mm, glabrous; leaf blade drying papery or leathery, lanceolate, narrowly elliptic, elliptic, or elliptic-oblong, 5–13 × 1–4 cm, glabrous, base acute or cuneate and often decurrent, margins entire and flat to usually thinly revolute, apex acute to long acuminate; midrib thinly prominulous adaxially; secondary veins 5–7 pairs; stipules caducous, interpetiolar, triangular to narrowly triangular, 1–1.5 mm, glabrous, acute. Inflorescences glabrous. Pedicels 2–3.5 mm. Calyx glabrous; hypanthium portion turbinate, 1–1.5 mm; limb ca. 0.8 mm, lobed for 2/3–3/4; lobes 4 or 5, narrowly triangular, sometimes separated by subtruncate sinuses. Corolla white or pale purple, glabrous outside; tube 9–12 mm, fenestrate at base; lobes 4 or 5, ovate-lanceolate, 3–4 mm. Drupes 5–8 mm in diam.; pyrenes 2, subglobose. Fl. Oct, fr. Dec–Feb.

● Dense forests on mountains; 1200–2500 m. Guangxi, Guizhou, Yunnan.

This species is here provisionally included in *Damnacanthus* based on its inflorescence morphology. It was reported to be distylous by Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004).

6. Damnacanthus indicus C. F. Gaertner, Suppl. Carp. 18. 1805.

虎刺 hu ci

Damnacanthus esquirolii H. Léveillé; *D. formosanus* (Nakai) Koidzumi; *D. indicus* var. *formosanus* Nakai; *D. indicus* var. *lancifolius* Makino; *D. lancifolius* (Makino) Koidzumi.

Shrubs, 0.3–1.5 m tall. Roots fleshy, moniliform. Branches densely hispidulous to hirtellous, sometimes becoming glabrescent, terete or sometimes 4-angled, with numerous persistent spines 3–20 mm. Petiole of developed leaves 0.5–3 mm, strigillose, hispidulous, or glabrescent; leaf blade drying stiffly papery to leathery and discolorous, ovate, cordiform, elliptic-ovate, elliptic, or broadly elliptic, 0.5–2(–3) × 0.5–1(–1.5) cm, adaxially glabrous, abaxially glabrous or sparsely hirtellous to strigillose along veins, base obtuse to rounded, truncate, or cordulate, sometimes oblique, margins entire and flat, apex acute; midrib thinly prominulous adaxially; secondary veins 2 or 3(or 4) pairs; stipules quickly fragmenting or caducous, interpetiolar, narrowly to broadly triangular, 0.3–1 mm, strigillose to glabrescent, acute to glandular-fimbriate. Inflorescences strigillose to hispidulous. Pedicels 0.5–8 mm. Calyx strigillose to glabrous; hypanthium portion turbinate, 1–1.5 mm; limb 0.8–2 mm, lobed for 1/4–4/5; lobes broadly triangular to narrowly triangular. Corolla white, glabrous outside; tube 7–9 mm; lobes elliptic to lanceolate-elliptic, 2.5–5 mm. Drupes 4–6 mm in diam. Fl. Mar–Jun, fr. Mar–Jan.

Sparse or dense forests on hills or mountains, rocky thickets; 100–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [N and NE India, Japan, Korea].

Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004) reported that populations they studied are either monomorphic, with only pin-type flowers, or distylous. Koidzumi (Acta Phytotax. Geobot. 3: 158. 1934) reported *Damnacanthus lancifolius* from Yunnan and treated *D. esquirolii* as a synonym of that name; these names were apparently overlooked by Y. Z. Ruan (in FRPS 71(2): 169. 1999).

7. Damnacanthus labordei (H. Léveillé) H. S. Lo, Acta Phytotax. Sin. 17(3): 107. 1979.

柳叶虎刺 liu ye hu ci

Canthium labordei H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 178. 1914; *Lasianthus labordei* (H. Léveillé) Rehder; *Prismatomeris labordei* (H. Léveillé) Merrill ex Rehder; *P. linearis* Hutchinson.

Small shrubs, 0.4–2 m tall. Roots fleshy, moniliform. Branches 4-angled to flattened and usually with a well-developed longitudinal ridge descending from stipule midrib on each side, yellow to pale brown, glabrous, without spines. Petiole of developed leaves 2–6 mm, glabrous; leaf blade drying papery, gray to brownish green adaxially, gray-green, brownish green, or straw-yellow abaxially, lanceolate to lanceolate-linear, 5–21 × 0.6–2.5 cm, glabrous or sometimes pubescent along veins adaxially, base cuneate or acute, margins entire or irregularly serrulate and flat to thinly revolute, apex tapered and acuminate with tip often flexuous; midrib thinly prominulous adaxially; secondary veins 9–16 pairs; stipules caducous, interpetiolar, triangular, 0.5–1 mm, acute to glandular-fimbriate. Inflorescences glabrous. Pedicels 2–3 mm. Calyx glabrous; hypanthium portion turbinate, ca. 1 mm; limb 0.5–1 mm, lobed for 1/4–1/2; lobes broadly triangular. Corolla white to yellow, outside glabrous; tube 5–9 mm; lobes ovate, ca. 3 mm. Drupes ca. 8 mm in diam. Fl. Feb–Mar, Oct–Dec, fr. Sep–Dec.

Sparse or dense forests or thickets; 800–1800 m. N Guangdong, N Guangxi, Guizhou, Hunan, Sichuan, Yunnan [Vietnam].

This species was reported to be distylous by Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004).

8. Damnacanthus macrophyllus Siebold ex Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 110. 1867 [*"macrophylla"*].

浙皖虎刺 zhe wan hu ci

Damnacanthus indicus C. F. Gaertner f. *macrophyllus* (Siebold ex Miquel) Makino; *D. indicus* var. *macrophyllus* (Siebold ex Miquel) Makino; *D. indicus* var. *parvispinus* Koidzumi; *D. major* Siebold & Zuccarini var. *macrophyllus* (Siebold ex Miquel) Maximowicz; *D. major* var. *parvispinus* (Koidzumi) Koidzumi; *D. major* var. *submitis* Maximowicz ex Regel; *D. moniliformis* Koidzumi; *D. minutispinus* Koidzumi; *D. shanii* K. Yao & M. B. Deng.

Shrubs, 1–2 m tall. Roots fleshy, moniliform. Branches puberulent to hispidulous, with 8 alternately thick and thin striae, with few deciduous or persistent spines 2–6 mm. Petiole of developed leaves 1–2 mm, glabrous or sparsely puberulent to puberulent or hirtellous; leaf blade drying stiffly papery, ovate to oblong-ovate, lanceolate, or oblong-lanceolate, 3–6(–8) × 1–2.5(–3) cm, adaxially glabrous, abaxially glabrous or puberulent along veins, base cuneate to rounded, margins flat to thinly revolute, apex shortly acuminate or acute; midrib thinly prominent adaxially; secondary veins 3 or 4(–7) pairs; stipules persistent, interpetiolar, triangular, 0.3–1 mm, puberulent to glabrescent, acute to glandular-multifid or -fimbriate. Inflorescences strigillose to puberulent. Pedicels 1–2 mm. Calyx strigillose to glabrescent; hypanthium portion obconic, 1.2–1.5 mm; limb 1–1.5 mm, lobed for 1/3–1/2; lobes triangular to ovate. Corolla white, outside glabrous; tube 8(–13) mm; lobes ovate-triangular, ca. 2 mm. Drupes ca. 5 mm in diam., with pedicels sometimes elongated to 5 mm. Fl. Apr–Jun, fr. Oct–Dec.

Streamsides in sparse or dense forests on mountains; 800–1000 m. Anhui, Fujian, Guangdong, Guizhou, Yunnan, Zhejiang [Japan].

Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004) reported the breeding biology of this species as monomorphic with "pin" type flowers.

"Damnacanthus subspinosus var. *salicifolius"* (M. B. Deng & K. Yao, Bull. Bot. Res., Harbin 10(4): 2. 1990) belongs here but was not validly published because two gatherings were designated as types (*Vienna Code*, Art. 37.2).

9. Damnacanthus major Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 177. 1846.

大卵叶虎刺 da luan ye hu ci

Damnacanthus indicus C. F. Gaertner f. *major* (Siebold & Zuccarini) Makino; *D. indicus* subsp. *major* (Siebold & Zuccarini) T. Yamazaki; *D. indicus* var. *major* (Siebold & Zuccarini) Makino ex Nakai.

Shrubs, 1–2 m tall. Roots fleshy, white or pale purple, moniliform. Branches densely hispidulous to hirtellous when young, sometimes becoming glabrescent, terete or sometimes 4-angled, with numerous spines 3–10 mm, persistent. Petiole of developed leaves 1–4 mm, strigillose to hirtellous; leaf blade drying papery, broadly ovate, ovate, or elliptic-ovate, 3–4 × 1.5–2 cm, adaxially glabrous, abaxially glabrous or sometimes sparsely hispidulous along veins, base obtuse or rounded, margins flat and entire, apex acute; midrib thinly prominent adaxially; secondary veins 3–5 pairs; stipules quickly fragmenting or caducous, interpetiolar, broadly triangular, 0.5–1 mm, strigillose to glabrescent, obtuse to acute. Inflorescences strigillose. Pedicels ca. 1 mm. Calyx strigillose or puberulent; hypanthium portion obconic, 1–2 mm; limb ca. 2 mm, deeply lobed; lobes narrowly to broadly triangular. Corolla white, outside glabrous; tube ca. 11 mm; lobes ovate-triangular, ca. 4 mm. Drupes 5–10 mm in diam. Fl. Apr, fr. winter.

Sparse forests and thickets on mountains; 600–700 m. Guangdong, Zhejiang [Japan, Korea].

These plants were treated as a subspecies of *Damnacanthus indicus* in the Fl. Japan (3a: 224–225. 1993) and also considered there to be restricted to Japan and Korea.

10. Damnacanthus officinarum C. C. Huang in H. S. Lo, Acta Phytotax. Sin. 17(3): 108. 1979.

四川虎刺 si chuan hu ci

Shrubs, 1–2.5 m tall. Roots fleshy, moniliform. Branches slightly flattened when young becoming terete, glabrous, without spines. Petiole of developed leaves ca. 5 mm, glabrous; leaf blade drying leathery, brown or straw-yellow adaxially, straw-yellow or olive-green abaxially, elliptic, elliptic-oblong, or oblong-lanceolate on upper part of stem, to linear on lower part of stem, 5–13(–16) × 2–4(–6) cm, glabrous, base cuneate to acute, margins entire and flat to thinly revolute, apex acute to acuminate; midrib thinly prominent adaxially; secondary veins 6–8

pairs; stipules caducous, interpetiolar, triangular, ca. 1 mm, glabrous, acute. Inflorescences glabrous. Pedicels ca. 2 mm. Calyx glabrous; hypanthium portion cupuliform, ca. 1.5 mm; limb 0.5–1 mm, undulate to lobed for ca. 1/2; lobes broadly triangular. Corolla in bud pale green, glabrous outside, 10–12 mm. Drupes 6–7 mm in diam. Fl. winter–spring, fr. Oct–Dec.

● Thickets or forests on hills; 700–900 m. Hubei, Hunan, Sichuan.

This species was reported to be distylous by Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004).

11. Damnacanthus tsaii Hu, Bull. Fan Mem. Inst. Biol. 6: 178. 1935.

西南虎刺 xi nan hu ci

Shrubs, 1–3 m tall. Branches densely hirtellous, with spines 4–25 mm, persistent. Petiole of developed leaves 1–2 mm, glabrous or pilosulous; leaf blade drying papery, lanceolate or oblong-lanceolate, 3–7.5 × 0.9–2.4 cm, adaxially glabrous, abaxially glabrous or hirtellous along veins when young, base cuneate or rounded, margins entire to irregularly serrulate and thinly revolute, apex acuminate; midrib thinly prominulous adaxially; secondary veins 5–8(–10) pairs; stipules quickly deciduous, interpetiolar, broadly triangular, usually aciculate. Pedicels ca. 2 mm. Calyx glabrous; hypanthium portion obconic, ca. 1 mm, lobed for ca. 1/2; lobes 4(or 5), triangular to subulate-triangular. Corolla white, ca. 12 mm, outside glabrous; lobes ovate-triangular. Drupes ca. 5 mm in diam. Fl. Apr, fr. winter–spring.

● Forests, forest margins, roadsides, rocky mountains; 1000–2500 m. Sichuan, Yunnan.

Naiki and Nagamasu (Amer. J. Bot. 91: 664–671. 2004) reported that all flowers of this species seen resemble the long-styled form of distylous species.

Fl. China 19: 93–97. 2011.