

TECTARIACEAE

三叉蕨科 san cha jue ke

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Plants terrestrial, 10–300 cm tall. Rhizome erect or ascending to creeping, short or long, stout or slender, scaly at apex; rhizome and basal stipe scales brown, linear or lanceolate, margins entire, finely toothed, or ciliate, membranous. Stipe yellow, brown, or black, scaly at base or sometimes throughout. Fronds tufted or approximate, monomorphic to strongly dimorphic, simple or pinnate to 4 times pinnate-pinnatifid, often triangular or pentagonal, usually decompound toward apices; rachises and costae usually (in most genera) covered with articulate multicellular (ctenitoid) hairs; veins free or variously anastomosing, included veinlets if present simple or forked. Sori terminal on included free veins, dorsal on veins or compital on (at intersection of) connected veins, usually orbicular, sometimes elongate, anastomosing in lines, in some species throughout abaxial surface of lamina when mature, indusiate or exindusiate; indusia if present orbicular-reniform, persistent or caducous. Spores ovoid or elliptic, monolete, perispore with winglike folds, cristate, echinate, verrucose, rugose, or spinose. $n = 10, 40, 41$.

Eight to 15 genera and ca. 300 species: pantropical; four genera and 41 species (seven endemic) in China.

The number of genera and species in this family has been in considerable flux. Molecular studies (Hasebe et al., *Amer. Fern J.* 85: 134–181. 1995) have increased our understanding of many fern families, and the placement of many uncertainly placed genera has recently become more evident. The genera *Ctenitis* (incl. *Ataxipteris*), *Dryopsis* (= *Dryopteris* sect. *Dryopsis*), and *Lastreopsis*, which were previously placed in Tectariaceae, are now known to belong to the Dryopteridaceae (Hasebe et al., loc. cit.; Smith et al., *Taxon* 55: 717. 2006; Liu et al., *Sci. China, C*, 50: 789–798. 2007) and are treated in that family in this Flora. The two families have always been difficult to separate on a morphological basis, but molecular evidence shows that Tectariaceae in its strict sense is sister to a clade uniting Polypodiaceae, Oleandraceae, and Davalliaceae. The group directly sister to Tectariaceae is Lomariopsidaceae (incl. Nephrolepidaceae), which in turn forms a sister clade to Dryopteridaceae, together forming the Eupolypods I clade (Smith et al., loc. cit.: 707).

Few molecular studies have so far addressed the Tectariaceae as a whole, and the generic delimitations are, therefore, far from established. Recent studies suggest that a number of segregate genera is deeply embedded within *Tectaria*, making it a somewhat polymorphic genus. Here, we have followed this broad concept of *Tectaria*, and included the genera *Ctenitopsis*, *Hemigramma*, and *Quercifilix*. This is admittedly a conservative approach, but it will have to suffice for the purposes of the present treatment until further studies provide a better understanding and better established delimitation of the genera within Tectariaceae.

Pleocnemia and *Pteridrys* are maintained as separate from *Tectaria* s.l. because they show sufficient molecular and morphological distinctness. *Pleocnemia* was tentatively placed in Dryopteridaceae by Liu et al. (loc. cit.), but evidence for this is scarce, and we, therefore, maintain it here in Tectariaceae following Smith et al. (loc. cit.: 718), until further data are available.

The following taxon, described from China, is excluded from the present treatment, pending further research: *Sagenia cicutaria* (Linnaeus) T. Moore var. *tenerifrons* Christ (*Bull. Acad. Int. Géogr. Bot.* 11: 257. 1902).

Ching Ren-chang, Fu Shu-hsia, Wang Chu-hao & Shing Gung-hsia. 1959. *Arthropteris*. In: Ching Ren-chang, ed., *Fl. Reipubl. Popularis Sin.* 2: 318–319; Wang Chu-hao. 1999. *Aspidiaceae* (excluding *Ctenitis* and *Lastreopsis*). In: Wu Shiewhung, ed., *Fl. Reipubl. Popularis Sin.* 6(1): 1–103; Wu Shiewhung. 1999. *Arthropteris*. In: Wu Shiewhung, ed., *Fl. Reipubl. Popularis Sin.* 6(1): 151–153.

- 1a. Plants epiphytic; rhizome long creeping; stipes articulate to a long stipelike phyllopodium 1. *Arthropteris*
1b. Plants terrestrial; rhizome shortly creeping to erect; stipes tufted, not articulate.
2a. Sinuses of lobes lacking teeth 4. *Tectaria*
2b. Each sinus between two pinna- or pinnule lobes bearing a small tooth.
3a. Veins along costae and costules anastomosing; fronds mostly 2- or 3-pinnate, cylindric glands many on abaxial surface of lamina 2. *Pleocnemia*
3b. Veins free; fronds 1-pinnate, glands absent on adaxial surface of lamina 3. *Pteridrys*

1. ARTHROPTERIS J. Smith in J. D. Hooker, *Fl. Nov.-Zel.* 2: 43. 1854.

爬树蕨属 pa shu jue shu

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Plants epiphytic, with long twining, wiry rhizomes. Rhizomes with peltate scales, with 2 rows of fronds. Fronds distant, articulate to phyllopodium; lamina pinnate; pinnae close together, subsessile. Venation free, 2 or 3 times forked. Sori orbicular, in a single

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row between costa and margin; indusia reniform; sporangia long stipitate, annulus with 10–13 thickened cells. Spores elliptic; perispore granular. $n = 41$.

About 20 species: Africa, SW to E Asia, Australia, Madagascar, Pacific islands; one species in China.

1. *Arthropteris palisotii* (Desvaux) Alston, Bol. Soc. Brot., sér. 2, 30: 6. 1956.

爬树蕨 pa shu jue

Aspidium palisotii Desvaux, Mag. Neuesten Entdeck. Gesamten Naturk. Ges. Naturf. Freunde Berlin 5: 320. 1811; *Arthropteris guinanensis* H. G. Zhou & Y. Y. Huang.

Rhizome long creeping, up to 2–3 m, ca. 2 mm in diam., covered with ovate, dark brown, fimbriate scales. Fronds 5–10 cm apart; stipe 1–2 cm; lamina lanceolate, 15–40 × 4–8.5 cm;

pinnae 30–40 pairs, alternate, 2–4 × ca. 1 cm, articulate to rachis, sessile, base asymmetrical, usually auriculate on upper side, margin undulate or crenate, apex rounded; lower pinnae shortened, deflexed; rachis densely covered with brown glandular hairs and scales abaxially, shallowly grooved adaxially. Sori nearer margin than costa; indusia brown, orbicular-reniform, glabrous.

Climbing on tree trunks or rocks in forests; 200–1100 m. Guangxi, Hainan, Taiwan, Yunnan [India, Indonesia, Japan, Malaysia, Philippines, Vietnam; Africa, Australia, Pacific islands (Polynesia)].

2. PLEOCNEMIA C. Presl, Tent. Pterid. 183. 1836.

黄腺羽蕨属 huang xian yu jue shu

Dong Shiyong (董仕勇); Maarten J. M. Christenhusz

Plants terrestrial, (60–)100–200 cm tall. Rhizome erect or rarely creeping, rhizome apex and stipe base densely covered with linear scales; scales on stipe bases narrow, 1.5–3 cm, usually twisted, their edges entire or finely toothed. Fronds clustered; stipe usually dark brown at base and light brown distally. Lamina 2-pinnate to 4-pinnatifid, ovate to subpentagonal, widest at base; basal pinnae always largest, triangular, with greatly enlarged basiscopic pinnules; distal pinnae or pinnules adnate to rachis or costae and ± decurrent at their bases, pinnae and pinnules ± deeply lobed, with a tooth in each sinus between two lobes; veins along costae anastomosing, without free veinlets within areoles; lamina papery or rarely membranous, usually glabrous on both surfaces and with cylindrical glands along costules and veins on abaxial surfaces; rachises and costae usually raised on both sides, ctenitoid hairs present on adaxial surfaces of rachises. Sori dorsal on free veins; indusia present or not; spores ellipsoid to spheroidal, perispore compressed in winglike folds or cristate with echinulations. $n = 41$.

About 20 species: tropical Asia, from NE India, SE China, throughout Malaysia and the W Pacific to Samoa; two species in China.

1a. Stipe base scales with toothed margin; sori indusiate; perispore sharply echinate 1. *P. leuzeana*
1b. Stipe base scales with entire margin; sori usually exindusiate; perispore forming winglike folds 2. *P. winitii*

1. *Pleocnemia leuzeana* (Gaudichaud) C. Presl, Tent. Pterid. 184. 1836.

台湾黄腺羽蕨 tai wan huang xian yu jue

Polypodium leuzeanum Gaudichaud, Voy. Uranie, Bot. 361. 1829; *Aspidium leuzeanum* (Gaudichaud) Kunze; *A. rufinerve* (Hayata) Hayata; *Dryopteris rufinervis* Hayata; *Pleocnemia cumingiana* C. Presl; *P. rufinervis* (Hayata) Nakai; *Tectaria leuzeana* (Gaudichaud) Copeland.

Rhizome prostrate; stipe 90–100 cm; rhizome and stipe base scales 2.5–3 cm, ca. 2 mm wide at base, margins conspicuously toothed. Lamina 3- or 4-pinnatifid, 80–90 × ca. 100 cm; basal pinnae largest, ca. 50 × 30 cm, basal basiscopic primary pinnule elongate, ca. 30 cm; pinnules of middle pinnae lobed more than 3/4 toward costules, lobes crenate at margin, sinuses between 2 lobes 3–5 mm wide, with a triangular tooth in each sinus; lamina papery, veins forming in 1 or 2 rows of costal areoles and 1 row of costular areoles, other veins free; costules and veins with yellow glandular hairs on abaxial surfaces. Sori medial, dorsal on free veins; indusia persistent; perispore densely spiny.

Forests; ca. 500 m. N Taiwan [Indonesia, Philippines; W Pacific islands].

2. *Pleocnemia winitii* Holttum, Reinwardtia 1: 181. 1951.

黄腺羽蕨 huang xian yu jue

Aspidium submembranaceum Hayata; *Pleocnemia hamata* Ching & Chu H. Wang; *P. kwangsiensis* Ching & Chu H. Wang; *P. submembranacea* (Hayata) Tagawa & K. Iwatsuki.

Rhizome prostrate; stipe (20–)60–100 cm; rhizome and basal stipe scales ca. 1.5 cm, 0.5–1 mm wide at base, margins entire. Lamina 3- or 4-pinnatifid, (50–)120–200 × (50–)100–130 cm; basal pinnae largest, 30–60 × 20–40 cm, basal basiscopic primary pinnule elongate, 20–30 cm; pinnules of middle pinnae lobed 1/2–2/3 toward costules, lobes entire or crenate at margin, sinuses between 2 lobes 1–2(–4) mm wide, with a triangular tooth in each sinus; lamina papery, veins along costae and those at base of costules anastomosing, other veins free; costules and veins with many orange cylindrical glands on abaxial surface. Sori medial, dorsal on free veins; indusia absent or rarely present and persistent; perispore having a continuous wing with some cross wings. $2n = 82^*$.

Forests; 100–1000 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [NE India, Myanmar, Thailand, Vietnam].

Pleocnemia conjugata (Blume) C. Presl (*Aspidium conjugatum* Blume) was reported from Hong Kong (Holttum, 1974) and later also

reported from Hainan (T. L. Wu et al., Fl. Guangdong 7: 248. 2006). While studying the specimens on which these reports were based, it was noticed that they belong to *P. winitii*. They were confused with *P. conjugata* due to the presence of indusia. The presence or absence of indusia

in *P. winitii* does not appear to be constant; specimens are not always exindusiate. Besides a difference in the perispore, the stipe scales are the most obvious character to distinguish between *P. winitii* (entire scales) and *P. conjugata* (conspicuously dentate scales).

3. *PTERIDRYS* C. Christensen & Ching, Bull. Fan Mem. Inst. Biol., Bot. 5: 129. 1934.

牙蕨属 ya jue shu

Dong Shiyong (董仕勇); Maarten J. M. Christenhusz

Plants terrestrial, 1–2 m tall. Rhizome creeping, ascending, or erect; rhizome apex and stipe base covered with lanceolate scales; scales brown, 0.8–1.5 cm, margins entire. Fronds close or clustered; stipe light to dark stramineous or brown. Lamina 2-pinnatifid at base, elliptic, oblong, or ovate-lanceolate, widest at or below middle; basal pair of pinnae often largest, lanceolate or broadly lanceolate, basiscopic lobes elongate or not; lateral pinnae not adnate to rachis, ± deeply lobed, with a tooth in each sinus between two lobes; veins free; lamina papery or herbaceous, both surfaces usually glabrous; rachises grooved adaxially, glabrous; costae raised on adaxial surface, glabrous or sometimes with sparse short hairs on adaxial surface. Sori terminal or dorsal on veins, medial, one line on either side of costules; indusia present, persistent or fugacious; perispore consisting of anastomosing wings. *n* = 41.

Seven species: tropical Asia, from NE India, Sri Lanka, and S China, to Indochina, Malaysia, Borneo, Indonesia, and the Pacific islands; three species (one endemic) in China.

- 1a. Basal pinnae stalked; stalks 1–4 cm; pinna lobes 3–5 cm; sori dorsal on veins, (10–)15–17 pairs on each lobe 1. *P. cnemidaria*
 1b. Basal pinnae sessile; stalks 0.1–0.4 cm; pinna lobes 2–3 cm; sori terminal on veins, 4–8 pairs on each lobe.
 2a. Basal basiscopic lobes of basal pinnae not elongate, entire; costae with short hairs on abaxial surface 2. *P. australis*
 2b. Basal basiscopic lobes of basal pinnae elongate and pinnatifid; costae glabrous on abaxial surface 3. *P. lofouensis*

1. *Pteridrys cnemidaria* (Christ) C. Christensen & Ching, Bull. Fan Mem. Inst. Biol., Bot. 5: 136. 1934.

薄叶牙蕨 bao ye ya jue

Dryopteris cnemidaria Christ, Bull. Acad. Int. Géogr. Bot. 20: 140. 1910.

Plants 1.2–1.5 m tall. Rhizome creeping or erect. Stipe stramineous, 0.6–1 m, sparsely scaly at base; rhizome and basal stipe scales appressed, lanceolate, 10–15 × 1–2 mm. Lamina 2-pinnatifid, ca. 1.2 × 0.6 m; lateral pinnae ca. 30 pairs; basal pinnae usually largest, broadly lanceolate, 25–46 × 4–10 cm, deeply lobed nearly to costae, stalks 1–4 cm, basal basiscopic lobes slightly elongate; pinna lobes 30–34 pairs, (2–)3–5 × 0.6–0.8 cm, margins ± crenate to crenate-dentate, with a sharp tooth in each sinus, apex acute; lamina papery, greenish when dry; costae glabrous; veins free, veinlets 15–18 pairs on each lobe, 2–4 times furcate. Sori dorsal on veinlets, (10–)15–17 pairs on each lobe; indusia persistent, glabrous.

Forests; 100–1300 m. Guangxi, Guizhou, Taiwan, Yunnan [India, Laos, Myanmar, Vietnam].

2. *Pteridrys australis* Ching, Bull. Fan Mem. Inst. Biol., Bot. 5: 142. 1934.

毛轴牙蕨 mao zhou ya jue

Pteridrys nigra Ching & Chu H. Wang.

Plants 0.7–1.5 m tall. Rhizome creeping. Stipe dark stramineous or brown, 0.3–0.6 m, densely scaly at base; rhizome and basal stipe scales lanceolate, 5–7 × 1–2 mm. Lamina 2-pinnatifid, 0.4–0.8 × 0.2–0.3 m; lateral pinnae 12–15 pairs;

basal pinnae longest or shortest, lanceolate, 9–27 × 3–5 cm, lobed 1/2–2/3 toward costule, stalks 1–4 mm, basal basiscopic lobes, slightly shortened, entire; pinna lobes 20–26 pairs, 1.5–2 × 0.5–0.8 cm, margins slightly serrate, with a sharp tooth in each sinus, obtuse at apex; lamina thickly papery, brown when dried; costae with short hairs on abaxial surface; veins free, veinlets 8–10 pairs on each lobe, 2- or 3-furcate. Sori terminal on veinlets, 5–7 pairs on each lobe; indusia with long hairs, fugacious.

Forests along streams; 100–700 m. Guangdong, Yunnan [Laos, Malaysia, Myanmar, Thailand, Vietnam].

3. *Pteridrys lofouensis* (Christ) C. Christensen & Ching, Bull. Fan Mem. Inst. Biol., Bot. 5: 141. 1934.

云贵牙蕨 yun gui ya jue

Dryopteris lofouensis Christ, Bull. Acad. Int. Géogr. Bot. 20: 143. 1910.

Plants 0.8–1.3 m tall. Rhizome ascending or suberect. Stipe brown, ca. 0.5 m, densely scaly at base; rhizome and basal stipe scales lanceolate, 6–8 × ca. 1 mm. Lamina 2-pinnatifid, 0.7–1 × 0.3–0.6 m; lateral pinnae ca. 15 pairs; basal pinnae usually largest, lanceolate, usually 20–25 × 3–4 cm, lobed 1/2–2/3 toward costule, stalks 1–2 mm, basal basiscopic lobes very elongate, pinnatifid; pinna lobes 20–25 pairs, 2–3 × 0.5–0.8 cm, margins slightly serrate at edge, with a sharp tooth in each sinus, obtuse at apex; lamina herbaceous or thinly papery, brown when dry; costae glabrous; veins free, veinlets 7 or 8 pairs on each lobe, 2- or 3-furcate. Sori (sub-)terminal on veinlets, 5–7 pairs on each lobe; indusia persistent, glabrous.

• Forests, scrub; ca. 1200 m. Guizhou, Yunnan.

4. TECTARIA Cavanilles, Ann. Hist. Nat. 1: 115. 1799.

叉蕨属 cha jue shu

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Bathmium C. Presl ex Link; *Cardiochlaena* Fée; *Ctenitopsis* Ching ex Tardieu & C. Christensen; *Fadyenia* Hooker; *Hemigramma* Christ; *Lenda* Koidzumi; *Podopeltis* Fée; *Quercifilix* Copeland; *Sagenia* C. Presl.

Plants terrestrial. Rhizome erect or ascending to creeping, short or long, stout or slender, scaly at apex; rhizome and basal stipe scales brown, lanceolate, margins entire or ciliate, membranous. Stipe stramineous or brown to black, scaly at base or sometimes throughout. Fronds monomorphic to strongly dimorphic, simple or pinnate to multiple times pinnate-pinnatifid, often triangular or pentagonal, pinnae and lobes usually entire, never serrate; all axes hairy with articulate multicellular hairs; veins variously anastomosing, included veinlets if present simple or forked. Sori terminal on included free veins, dorsal on veins or compital on connected veins, usually orbicular, sometimes elongate, anastomosing in lines, in some species throughout abaxial surface of lamina when mature, indusiate or exindusiate; indusia if present orbicular-reniform, persistent or caducous. Spores ovoid or elliptic, perispore verrucose, rugose, or spinose. $n = 10$, (40).

About 230 species: pantropical; 35 species (six endemic) in China.

- 1a. Fertile lamina much contracted; sporangia not forming sori but dense along veinlets.
 - 2a. Lamina glabrous; plants usually large (*Hemigramma* group) 13. *T. harlandii*
 - 2b. Lamina hairy; plants minute, fronds less than 20 cm (*Quercifilix* group) 35. *T. zeilanica*
- 1b. Fertile fronds not or only slightly contracted; sori orbicular, separate, usually indusiate.
 - 3a. Veins free or partly anastomosing, but then only those veins along costae or costules connecting, areoles without included veinlets (*Ctenitopsis* group).
 - 4a. Basiscopic pinnules or lobes of basal pinnae not elongated, often shortened.
 - 5a. Fronds bipinnate at base; veinlets anastomosing and forming obvious areoles 2. *T. chinensis*
 - 5b. Fronds bipinnatifid at base; veinlets free or occasionally anastomosing.
 - 6a. Stipes and rachises deep castaneous to dark brown, glossy; basal pinnae not shortened; sori intramarginal, indusiate 26. *T. sagenioides*
 - 6b. Stipes and rachises dark brown, dull; basal pinnae shortened; sori terminal, exindusiate 30. *T. subsageniacea*
 - 4b. Basiscopic pinnules or lobes of basal pinnae obviously elongated.
 - 7a. Plants ca. 2 m or taller; basal lamina 4-pinnatifid to 4-pinnate, 2-pinnate or 3-pinnatifid toward apices.
 - 8a. Fronds glabrescent on both surfaces, dimorphic 16. *T. ingens*
 - 8b. Fronds densely hairy on both surfaces, homomorphic 27. *T. setulosa*
 - 7b. Plants up to 1 m tall; basal lamina 3-pinnatifid to 3-pinnate, 2-pinnatifid upward.
 - 9a. Veinlets free.
 - 10a. Fronds triangular-ovate to ovate; pinnae 6–8 pairs, stipes and rachis glabrous or nearly so 6. *T. dissecta*
 - 10b. Fronds elliptic-lanceolate to elliptic; pinnae 9–12 pairs, stipes and rachis densely hairy 17. *T. kusukusensis*
 - 9b. Veinlets anastomosing and forming obvious areoles.
 - 11a. Fronds homomorphic, 3-pinnate at base; stipes stramineous or brown to castaneous, scales deep brown, concolorous 5. *T. devexa*
 - 11b. Fronds dimorphic, 2-pinnate at base; stipes stramineous, scales dark brown with a paler margin.
 - 12a. Sori only at tip of lobes 1. *T. acrocarpa*
 - 12b. Sori throughout 10. *T. fuscipes*
 - 3b. Veins fully anastomosing, areoles with included veinlets (*Tectaria* group).
 - 13a. Sori large, terminal on (included) veinlets, in 2 rows between lateral veins; indusia large, persistent.
 - 14a. Veins forming a single row of narrow areoles along pinna rachises; included veinlets simple (not forked) when present.
 - 15a. Fronds dimorphic; length of stipes up to ca. $2 \times$ length of lamina 15. *T. impressa*
 - 15b. Fronds homomorphic; length of stipes equal to or shorter than length of lamina.
 - 16a. Stipes scaly throughout 11. *T. griffithii*
 - 16b. Stipes scaly only at base.
 - 17a. Rhizome and stipe base with blunt spines; pinnae distant 24. *T. remotipinna*
 - 17b. Rhizome and stipe base without spines; pinnae closer 3. *T. coadunata*
 - 14b. Veins inconspicuous; included veinlets forked.
 - 18a. Bases of lamina decurrent; stipes broadly winged nearly to base.

- 19a. Lamina deeply pinnately lobed, oblong-ovate 4. *T. decurrens*
 19b. Lamina simple, not lobed, lanceolate 18. *T. leptophylla*
 18b. Bases of lamina not decurrent; stipes not winged.
 20a. Stipes and rachises black, glossy 8. *T. ebenina*
 20b. Stipes and rachises brown or stramineous, slightly glossy or dull.
 21a. Stipes stramineous; fronds small, deltoid-ovate, palmately 3–5-parted 29. *T. subpedata*
 21b. Stipes brown to dark brown; fronds large, ovate-lanceolate, pinnately 1–3-parted.
 22a. Stipes densely scaly throughout 7. *T. dubia*
 22b. Stipes subglabrous throughout except at base.
 23a. Pinnae 5 pairs or more; base of basal pinnae asymmetrical; middle pinnae lanceolate, ca. 3 cm wide, pinnate-lacerate 21. *T. phaeocaulis*
 23b. Pinnae 4–6 pairs; base of basal pinnae symmetrical; middle pinnae triangular, ca. 8 cm wide, pinnatipartite 34. *T. yunnanensis*
 13b. Sori small, on anastomosing veinlets, in irregular rows between lateral veins; indusium small, caducous.
 24a. Stipes winged at least at apex.
 25a. Stipes winged almost throughout, almost to base; lateral pinnae without gemmae 33. *T. vasta*
 25b. Stipes winged at apex at most up to middle; lateral pinnae gemmate or not 9. *T. fauriei*
 24b. Stipes not winged.
 26a. Lamina pinnatifid at apex, different from basisopic pairs.
 27a. Stipes and rachises castaneous to dark brown, slightly glossy 25. *T. rockii*
 27b. Stipes and rachises stramineous, dull.
 28a. Rhizome long creeping; sori well distributed over pinnae 31. *T. subtriphylla*
 28b. Rhizome short, ascending or erect; sori only near margins 12. *T. grossedentata*
 26b. Terminal pinna lanceolate or elliptic, separate, simple or trifurcate, similar to basisopic pairs.
 29a. Rhizome long creeping; pinnae never forked.
 30a. Rhizome scales dark brown; stipes hairy; terminal pinna bases cuneate; lateral pinna bases asymmetrical 14. *T. herpetocaulos*
 30b. Rhizome scales light brown; stipes glabrous; terminal pinna bases decurrent; lateral pinna bases symmetrical 32. *T. variabilis*
 29b. Rhizome short, ascending or erect; pinnae usually forked.
 31a. Lamina once pinnate (basal pinnae forked).
 32a. Base of terminal pinna rounded or cordate 22. *T. polymorpha*
 32b. Base of terminal pinna decurrent 23. *T. quinquefida*
 31b. Lamina twice pinnate.
 33a. Stipes and rachis stramineous to light brown, dull 19. *T. luchunensis*
 33b. Stipes and rachises brown or deep castaneous to black, glossy.
 34a. Stipes and rachis deep castaneous to black; sori exindusiate 28. *T. simonsii*
 34b. Stipes and rachis dark brown to deep castaneous, never black; sori indusiate 20. *T. media*

1. *Tectaria acrocarpa* (Ching) Christenhusz, Phytotaxa 10: 58. 2010.

顶囊轴脉蕨 *ding nang zhou mai jue*

Ctenitopsis acrocarpa Ching, Acta Phytotax. Sin. 19: 124. 1981.

Plants terrestrial, ca. 50 cm tall. Rhizome erect, short, 1–1.5 cm in diam., densely scaly at apex; scales dark brown with narrow paler margin, narrowly lanceolate, ca. 5 mm, membranous, entire, acuminate. Fronds clustered; stipe dark stramineous, ca. 20 cm, ca. 3 mm in diam. at base, grooved above, with sparse scales at base, glabrous upward. Lamina subdimorphic, base tripinnatifid, bipinnatipartite toward apex, sage green when dried, elliptic-lanceolate, ca. 30 × 20 cm, herbaceous, abaxially glabrous, adaxially pubescent, apex acumi-

nate; rachises stramineous, with sparse dark brown linear scales, rachises and costae densely clothed with articulate brown hairs; pinnae 7–10 pairs, subopposite, interval 2–3 cm; basal pinna pairs largest, obliquely triangular, 13–15 × 8–10 cm, acuminate, stalks ca. 1 cm, pinnatipartite incised to 3/4 toward costa, with a pair of separate large pinnules; middle pinnae lanceolate, ca. 12 × 4 cm, bases cuneate, apices acuminate, pinnatipartite to 3/4 toward costa; basal basisopic pinnules lanceolate, ca. 8 × 2 cm, bases cuneate, apices acuminate, pinnatipartite to 2/3 toward costa; lobes 8–10 pairs, interval 1–1.5 mm, falcate-oblong, 8–10 × 6–7 mm, mucronate. Veins pinnate, branches 8 or 9 pairs, simple or forked, free or forming angular areoles, conspicuous on both sides. Sori orbicular, 3 or 4 pairs terminal on veinlets at apical lobes; indusia brown, orbicular-reniform, membranous, caducous.

• Dense forests in valleys on limestone; 300–500 m. Yunnan (Hekou, Jinping, Mengzi).

2. *Tectaria chinensis* (Ching & Chu H. Wang) Christenhusz, *Phytotaxa* 10: 58. 2010.

中华轴脉蕨 *zhong hua zhou mai jue*

Ctenitopsis chinensis Ching & Chu H. Wang, *Acta Phytotax. Sin.* 19: 124. 1981.

Plants terrestrial, 60–80 cm tall. Rhizome erect, short, stout, 1–1.5 cm in diam. Stipe deep brown, 35–40 cm, grooved above, sparsely scaly; scales light brown, lanceolate, 4–6 mm, membranous, entire, acuminate at apex. Lamina bipinnatifid to pinnate toward apex, light brown when dried, triangular-ovate, 35–50 × 25–30 cm, papery, with sparse articulate off-white hairs adaxially, occasionally with lanceolate brown scales, base cuneate, apex acuminate; rachises and costae stramineous, densely clothed with articulate off-white hairs; free lateral pinnules 4–6 pairs, subopposite, interval 2–3 cm, upward; basal pinnules ovate-lanceolate, large, ca. 20 × 7–8 cm, bases cuneate, apices acuminate, stalks 0.8–1 cm, pinnatifid with a single pair of separate lobes, lobes 8–10 pairs, alternate, slightly oblique, broadly lanceolate, 5–8 × 1–1.5 cm, acuminate, basal pairs nearly free, serrate upward, interval 2–3 cm, conjoined with broad wings; middle pinnules lanceolate, 12–15 × 2.5–3 cm, bases adnate to rachis, decurrent ± beneath, apices acuminate, pinnatifid, lobes falcate-lanceolate, 1–1.5 × 0.8–1 cm, acuminate, entire. Veinlets forming 1 row of areoles along rachises and costae, veins free toward apex, raised on both surfaces. Sori orbicular, central on veinlets, in 1 or 2 rows beside main veins.

• Dense forests; 100–1200 m. Yunnan (Hekou, Xichou).

3. *Tectaria coadunata* (J. Smith) C. Christensen, *Contr. U.S. Natl. Herb.* 26: 331. 1931.

大齿叉蕨 *da chi cha jue*

Sagenia coadunata J. Smith in Hooker, *J. Bot.* 4: 184. 1841, based on *Aspidium coadunatum* Wallich ex Hooker & Greville, *Icon. Filic.* t. 202. 1831, not Kaulfuss (1824); *A. kwanonense* Hayata; *A. macrodontum* (Fée) Ching; *A. pinfaense* Christ; *Pleocnemia kwangtungensis* (Ching) Ching; *Sagenia macrodonta* Fée; *Tectaria coadunata* var. *hirsuta* Holttum; *T. coadunata* var. *minor* Holttum; *T. consimilis* Ching & Chu H. Wang; *T. junlianensis* Ching & Chu H. Wang; *T. kwangtungensis* Ching; *T. macrodonta* (Fée) C. Christensen.

Plants terrestrial, 30–100 cm tall. Rhizome shortly creeping or erect, thick, densely scaly at apex and stipe bases; scales stiff, dark brown with a light margin, lanceolate, 6–7 mm, entire. Fronds clustered; stipe stramineous to pale castaneous, glossy, 20–40 cm, glabrescent above. Lamina pinnatifid to quadripinnatifid, light green to brown when dried, deltoid, 20–40 × 20–30 cm, herbaceous to thickly papery, apex acute; rachises, costae, midribs of pinnules, and adaxial surface of lamina and segments ± hairy; hairs articulate, coarse; basal pinnae asymmetrical, oblong-subdeltoid, subopposite, up to 10–25 cm, bipinnate to tripinnatifid, long stalked, middle pinnae alternate, 10–15 cm, 5–7 pairs below deeply lobed apical pinnae,

oblong to oblong-lanceolate; pinnules of middle pinnae stalked, oblong-subtriangular, ca. 15 × 10 cm, apices acuminate, deeply lobed; secondary pinnules falcate-lanceolate, bases crenate or pinnatifid, apices rounded; segments falcate-lanceolate, entire, obtuse. Veins copiously anastomosing, with included free veinlets. Sori orbicular, at apex of included veinlets, in a single row on each side of midrib of ultimate lobes, medial indusiate; indusia rather large, brown, entire, clypeate, membranous, glabrous or hairy. $2n = 80$.

Dense forests; 500–2500 m. Guangdong, Guangxi, Guizhou, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Kashmir, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; tropical Africa, Madagascar].

Because *Tectaria coadunata* is variable in size, stipe color, and lamina shape, this has resulted in a large number of synonyms.

4. *Tectaria decurrens* (C. Presl) Copeland, *Leafl. Philipp. Bot.* 1: 234. 1907.

下延叉蕨 *xia yan cha jue*

Aspidium decurrens C. Presl, *Reliq. Haenk.* 1: 28. 1825; *A. copelandii* C. Christensen; *A. heterodon* Copeland (1905), not Schradler (1824), nor Blume (1828); *A. pteropus* Kunze; *Cardiochlaena alata* Fée; *Nephrodium decurrens* (C. Presl) Baker; *Sagenia decurrens* (C. Presl) T. Moore; *S. mammosa* T. Moore; *S. pteropus* (Kunze) T. Moore; *Tectaria peralata* Copeland; ?*T. simulans* Ching.

Plants terrestrial, 50–100 cm tall. Rhizome erect, short, thick, 1.5–2 cm in diam., densely scaly; scales stiff, brown, with pale ferruginous margins, 8–12 cm, entire, apices acute. Fronds clustered, dimorphic; stipe brown at base, stramineous upward, 35–60 cm, glabrescent above, winged nearly to base. Lamina deeply pinnately incised, deep green, oblong-ovate, 30–80 × 30–40 cm, thickly papery, both surfaces glabrous, base cuneate and long decurrent, apex acute, lobes narrowed in fertile fronds; rachises winged throughout, stramineous; costae and main veins raised abaxially; apical pinnae broadly lanceolate, 20–25 × 5–8 cm, gradually narrowing toward base, subentire or crenulate, apices caudate; lateral pinnae 3–8 pairs, opposite, ascending, broadly lanceolate, 15–20 × 3–5 cm, subentire or crenulate, apices caudate, interval 3–4 cm, narrowing toward base and adnate to rachis, sessile, usually forked in each basal pinna. Veinlets forming hexagonal areoles, cross veins not distinct, included veinlets forked. Sori large, close to main veins, located at coupling veinlets, in 2 rows between adjacent main veins; indusia up to 1.2 mm in diam., glabrous, entire, persistent. $2n = 160$.

On rocks or near streams in dense forests; below 1200 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Taiwan, Yunnan [India, Indonesia, Japan, Myanmar, Nepal, Philippines, Thailand, Vietnam].

5. *Tectaria devexa* (Kunze) Copeland, *Philipp. J. Sci., C.* 2: 415. 1907.

毛叶轴脉蕨 *mao ye zhou mai jue*

Aspidium devexum Kunze, *Bot. Zeitung* (Berlin) 6: 259. 1848; *A. intermedium* J. Smith (1857), not Willdenow (1810), nor Link (1822), nor Blume (1828); *A. membranaceum* Hooker;

Ctenitopsis devexa (Kunze) Ching & Chu H. Wang; *Pleocnemia devexa* (Kunze) Alderwerelt; *P. membranacea* (Hooker) Beddome; *Sagenia gigantea* (Blume) T. Moore var. *minor* Beddome.

Plants terrestrial, 50–70 cm tall. Rhizome erect, short, ca. 6 mm in diam., densely scaly at apex and stipe bases; scales deep brown, light glossy, lanceolate, 4–5 mm, membranous, entire, fibriform and curly at apices. Fronds clustered; stipe stramineous or brown to castaneous, 25–30 cm, 2–3 mm in diam. at base, grooved above, with sparse brown articulate hairs above, glabrous below. Lamina tripinnate-pinnatifid, bipinnatifid toward apex, green when dried, triangular, 25–40 × 20–25 cm, thinly papery, both surfaces with sparse brown articulate hairs, base subcordate, apex acuminate; rachises and main veins stramineous to brown-stramineous, densely clothed with brown articulate hairs; pinnae 3–5 pairs, subopposite, interval 1–1.5 cm; basal pinnae largest, obliquely triangular, 12–14 × 7–9 cm, stalks ca. 1 cm, bases rounded-cuneate, apices long acuminate, pinnatifid to form 2–4 pairs of separate large pinnules at base; middle pinnae lanceolate, 7–9 × 2–2.5 cm, bases cuneate and nearly symmetrical, apices long acuminate, pinnatifid to 2/3 way toward costa, often with some subseparate basicopic pinnules; basal basicopic pinnules broadly lanceolate, ca. 8 × 2 cm, bases broadly cuneate, apices long acuminate, pinnatifid to broadly winged along costa; lobes 8–15 pairs, interval 2–3 mm, upward, falcate-lanceolate, 10–15 × 4–5 mm, margin mucronate or undulate to toothed, ciliate. Anastomosing veins forming 1 row of areoles along pinna rachis and main vein, other veins free, conspicuous on both sides. Sori orbicular, terminal on veinlets, submarginal; indusia orbicular-reniform, membranous, hairy, entire, persistent.

On rocky patches in forest gaps, especially in limestone regions; 100–1000 m (in Taiwan). Chongqing, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Indonesia, Japan (Ryukyu Islands), Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands (Polynesia)].

6. *Tectaria dissecta* (G. Forster) Lellinger, Amer. Fern J. 58: 156. 1968.

薄叶轴脉蕨 bao ye zhou mai jue

Polypodium dissectum G. Forster, Fl. Ins. Austr. 81. 1786; *Aspidium membranifolium* (C. Presl) Kunze; *Ctenitis angustodissecta* (Hayata) H. Itô; *C. dissecta* (G. Forster) H. Itô; *C. sasakii* (Hayata) Ching; *C. tenuifrons* Ching; *Ctenitopsis angustodissecta* (Hayata) Ching; *C. dissecta* (G. Forster) Ching; *C. membranifolia* (C. Presl) Ching; *C. sasakii* (Hayata) Ching & Chu H. Wang; *C. subfuscipes* Tagawa; *Dryopteris angustodissecta* Hayata; *D. dissecta* (G. Forster) Kuntze; *D. sasakii* Hayata; *D. tenuifrons* Hayata (1914), not C. Christensen (1905); *Lastrea dissecta* (G. Forster) Carruthers; *Nephrodium dissectum* (G. Forster) Desvaux; *N. membranifolium* C. Presl; *Tectaria subfuscipes* (Tagawa) C. M. Kuo.

Plants terrestrial, ca. 1 m tall. Rhizome erect, short, ca. 1 cm in diam., densely scaly at apex; scales brown with narrow paler margin, glossy, lanceolate, ca. 4 mm, membranous, entire, apices acuminate. Fronds clustered; stipe deep stramineous to brown, ca. 40 cm, 4–5 mm in diam. at base, grooved above,

with sparse light brown articulate hairs, lower part clothed with brown scales similar to those of rhizome. Lamina tripinnatifid, bipinnatifid toward apex, brown when dried, triangular-ovate or elliptic-ovate, 50–60 × 30–40 cm, thinly papery, adaxially with sparse brown articulate hairs, base subcordate, apex acuminate; rachises, costae, and main veins brown, clothed with brown articulate hairs; pinnae 6–8 pairs, subopposite on lower part and alternate upward, interval ca. 2 cm; basal pair of pinnae largest, obliquely triangular, 16–20 × 12–16 cm, acuminate, stalks 8–10 mm (sessile upward), pinnatifid to forming pairs of separate large pinnules; middle pinnae lanceolate, 15–18 × 5–6 cm, bases cuneate, apices long acuminate, pinnatifid to 3/4 way toward costa, occasionally with subseparate pinnules; basal basicopic pinnules lanceolate, 10–12 × 2.5–3 cm, bases cuneate, apices acuminate, pinnatifid; lobes 10–12 pairs, interval 2–2.5 mm, light upward, oblong, 15–17 × 6–7 mm, obtuse, scalloped. Veins pinnate, free, veinlets forked. Sori orbicular, terminal on veinlets; indusia light brown, orbicular-reniform, hairy, entire, persistent.

Forests; 100–600 m. Taiwan [India; SE Asia to Polynesia].

Knapp (Ferns Fern Allies Taiwan, 221. 2011) treats *Tectaria subfuscipes* as a distinct species, distinguished by the black stipe scales, the lamina bipinnatifid to the middle with only the lowest pinnae with free pinnules (if any at all), and the rachis and costae with only a few ctenitoid hairs abaxially.

7. *Tectaria dubia* (C. B. Clarke & Baker) Ching, Sinensia 2: 23. 1931.

大叶叉蕨 da ye cha jue

Nephrodium cicutarium (Linnaeus) Baker var. *dubia* C. B. Clarke & Baker, J. Linn. Soc., Bot. 24: 417. 1888; *Aspidium dubium* (C. B. Clarke & Baker) Beddome; *Tectaria jinpingensis* Ching & Chu H. Wang.

Plants terrestrial, 1.5–2 m tall. Rhizome erect, short, stout, ca. 3 cm in diam., densely scaly at apex and stipe bases; scales stiff, dark brown, linear-lanceolate, 8–10 mm, thickly membranous, entire, apices long acuminate. Stipes clustered, dark brown to castaneous, ca. 1 m, 1–1.5 cm in diam., sparsely covered with light brown articulate hairs. Lamina tripinnatifid, dark green when dried, deltoid, ca. 1 × 1 m, papery, base slightly cordate, apex acuminate; rachises and costae dark brown, densely covered with articulate hairs; pinnae 6 pairs, oblique, opposite at base and alternate upward, interval ca. 10 cm; basal pinnae 40–50 cm, rather large, ovate-deltoid, stalks 5–6 cm, pinnules 8–10 pairs, broadly falcate-lanceolate, 20–25 cm, alternate, upward, interval 1.5–2 cm, pinnate with 1–3 separate pinnules, pinnatifid to broad wings of costae upward, segments 10–12 pairs, falcate-lanceolate, 3–5 × 0.8–1.5 cm, undulate or entire; lateral pinnae broadly lanceolate, sessile, ca. 30 cm, bases cuneate, apices long acuminate, pinnate-lacerate to lanceolate acute lobes. Veinlets forming copious subhexagonal areoles, main veins and veinlets clothed with brown articulate hairs, included veinlets forked. Sori orbicular, on anastomosing veins, irregularly arranged beside main veins; indusia brown, reniform, membranous, entire, persistent.

Near streams in dense forests; 600–1000 m. Yunnan [Bhutan, NE India, Nepal, Vietnam].

8. *Tectaria ebenina* (C. Christensen) Ching, *Sinensia* 2: 18. 1931.

黑柄叉蕨 *hei bing cha jue*

Aspidium ebeninum C. Christensen, *Bull. Acad. Int. Géogr. Bot.* 23: 138. 1913.

Plants terrestrial, ca. 1.5 m tall. Rhizome erect, short, stout, 2–3 cm in diam., scaly at apex and stipe bases; scales brown, lanceolate, 5–6 mm, entire, apices acuminate. Fronds clustered; stipe black, glossy, ca. 60 cm, ca. 1 cm in diam., upper side sparsely covered with light brown articulate hairs and glabrous beneath. Lamina tripinnate or quadripinnatifid, dark green when dried, deltoid, ca. 80 × 60 cm, thinly papery, glabrous on both sides, apex acuminate; rachises, costae, and main veins black and glossy, densely covered with light brown articulate hairs; pinnae 6 pairs, oblique, basal ones opposite and alternate upward, interval ca. 6 cm; basal pinnae rather large, deltoid, 40–50 × 25–30 cm, stalks 3–5 cm, pinnules ca. 8 pairs, broadly lanceolate, 10–20 cm, alternate, upward, sessile, lower 1 or 2 pairs separate and adnate to costae, confluent with broad wings upward, interval 1–3 cm, pinnatifid, segments 5–10 pairs, falcate-lanceolate, 3–5 × 1–1.5 cm, undulate or entire; lateral pinnae lanceolate, 12–15 cm, bases attenuate, narrowed to and adnate with rachises, apices acuminate, pinnatifid to falcate-lanceolate lobes. Veinlets copiously forming subhexagonal areoles, main veins and veinlets clothed with brown articulate hairs, included veinlets simple or forked. Sori orbicular, terminal on included veinlets, in a single row along main veins; indusia brown, reniform, membranous, entire, persistent.

Dense forests; 1300–1600 m. Guizhou, Yunnan (Malipo) [N Vietnam].

9. *Tectaria fauriei* Tagawa, *J. Jap. Bot.* 14: 102. 1938.

芽孢叉蕨 *ya bao cha jue*

Tectaria fengii Ching & Chu H. Wang; *T. gemmifera* Ching & Chu H. Wang (1981), not (Fée) Alston (1939); *T. gymnosora* Holttum; *T. hainanensis* Ching & Chu H. Wang; ?*T. simulans* Ching.

Plants 0.6–1 m tall. Rhizome erect, short, stout, 1–1.5 cm in diam., scaly at apex and stipe bases; scales (dark) brown, (linear-lanceolate or) lanceolate, 6–8 mm, thickly membranous, entire, apices long acuminate. Fronds clustered; stipe deep stramineous to brown, 40–70 cm, 4–5 mm in diam., bases densely scaly, often clothed with brown articulate hairs, glabrescent upward, winged in upper half or very narrowly nearly to base. Lamina simple or pinnatisect to odd-pinnate, green to deep green, deltoid-ovate, 30–40 × 20–30 cm, base slightly cordate, herbaceous, both surfaces glabrous; rachises and costae dark stramineous, costa raised and pubescent on abaxial surface, main veins raised abaxially, glabrous adaxially but sparsely covered with light brown articulate hairs abaxially, rachises winged throughout; terminal pinna oblanceolate or oblong, 15–18(–25) × 5–10 cm, larger than lateral ones, base attenuate, narrowed into winged rachis, entire or 3-lobed, apex acuminate to caudate; lateral pinnae 1–3 pairs, subopposite, sessile, ovate-lanceolate, 15–18 × 3–5 cm, oblique, subentire, interval 4–6

cm, bases cuneate-attenuate, apices acuminate to caudate; basal pinnae rather large, often with a gemma, often forming broadly lanceolate basispic lobes; gemmae (when present) scaly, 1 or more, axillary on both sides of lamina from base to apex; rachises and costae deep stramineous, pubescent abaxially, glabrescent adaxially. Cross veins distinct, veinlets forming inconspicuous subhexagonal areoles, included veinlets simple or forked. Sori orbicular, terminal on included veinlets or anastomosing veins, in 2 irregular rows beside lateral veins, often contiguous-confluent at maturity; indusia brown, reniform, membranous, glabrous, entire, caducous.

Dense valley forests; 100–1000 m. Hainan, Taiwan, Yunnan [India (Assam), Japan (Ryukyu Islands), Malaysia (Peninsular), Thailand, Vietnam].

The pinna shape of *Tectaria fauriei* varies greatly from lanceolate or broadly lanceolate to ovate or oblong. It usually bears one or more scaly gemma axillary on either or both sides of the lamina from the base to the apex. Ching and Chu H. Wang (*Acta Phytotax. Sin.* 9: 371. 1964) described plants without gemmae as *T. hainanensis*, but gemmae are present in the type specimen of that species.

10. *Tectaria fuscipes* (Wallich ex Beddome) C. Christensen, *Contr. U.S. Natl. Herb.* 26: 290. 1931.

黑鳞轴脉蕨 *hei lin zhou mai jue*

Aspidium fuscipes Wallich ex Beddome, *Suppl. Ferns S. Ind.* 15. 1876; *A. membranifolium* (C. Presl) Kunze var. *dimorphum* (C. B. Clarke) Christ; *Ctenitopsis fuscipes* (Wallich ex Beddome) C. Christensen; *C. glabra* Ching & Chu H. Wang; *Lastrea fuscipes* (Wallich ex Beddome) T. Moore; *Nephrodium fuscipes* (Wallich ex Beddome) C. B. Clarke; *N. membranifolium* C. Presl var. *dimorpha* C. B. Clarke.

Plants terrestrial, 40–70 cm tall. Rhizome suberect or ascending, short, 1–1.5 cm in diam., densely scaly at apex; scales dark brown with narrow paler margins, glossy, lanceolate, 7–8 mm, membranous, entire, apices fibriform. Fronds clustered, dimorphic or subdimorphic, fertile fronds taller and narrower; stipe deep stramineous, 20–30 cm, ca. 3 mm in diam. at base, grooved above, sparsely covered with articulate light brown hairs, lower part clothed with dark brown scales similar to those of rhizome, becoming shorter and narrower upward. Lamina base tripinnatifid, bipinnatifid upward, dark green when dried, elliptic-ovate, 25–40 × 15–20 cm, herbaceous, glabrous or pubescent, margins ciliate, apex acuminate; rachises stramineous, with sparse linear dark brown scales, rachises and costae densely clothed with articulate brown hairs or glabrescent abaxially; pinnae 3–10 pairs, subopposite toward base, apical ones alternate, oblique, interval 2–5 cm; basal pair of pinnae largest, obliquely triangular, 8–15 × 6–10 cm, acuminate, stalks ca. 1 cm, pinnatifid to 3/4 way toward costa, bearing a pair of separate large pinnules; middle pinnae lanceolate, 6–10 × 3–4 cm, bases cuneate, apices acuminate, pinnatifid to 3/4 way toward costa, occasionally with subseparate pinnules; basal basispic pinnules lanceolate, 6–8 × 1.5–2 cm, bases cuneate, apices acuminate, pinnatifid to 1/2 to costa; lobes 8–12 pairs, interval 1–2 mm, falcate-oblong, 7–8 × 5–6 mm, mucronate. Veins pinnate, 8 or 9 pairs, forked, free or forming angular areoles, conspicuous on both sides. Sori orbicular, 5–7 pairs ter-

minal on veinlets; indusia brown, orbicular-reniform, membranous, entire, persistent.

Forests; 100–600 m. Guangxi, Guizhou, Hainan, Taiwan, Xizang, Yunnan [N India, Indonesia, Myanmar, N Vietnam].

11. *Tectaria griffithii* (Baker) C. Christensen, Index Filic., Suppl. 3: 180. 1934.

鳞柄叉蕨 lin bing cha jue

Nephrodium griffithii Baker in Hooker & Baker, Syn. Fil. 300. 1867; *Aspidium griffithii* (Baker) Beddome; *A. malayense* Christ; *A. multicaudatum* (C. B. Clarke) Beddome; *Nephrodium multicaudatum* C. B. Clarke; *Sagenia griffithii* (Baker) Beddome; *Tectaria malayense* (Christ) Copeland; *T. multicaudata* (C. B. Clarke) Ching.

Plants terrestrial, 1–1.2 m tall. Rhizome erect, short, thick, ca. 1.5 cm in diam., densely scaly at apex and stipes; scales stiff, dark brown, linear-lanceolate, up to 2 cm, entire, apices long acuminate. Fronds clustered; stipe castaneous, glossy, up to 60 cm, 8–10 mm in diam. Lamina 2-pinnate to 3-pinnatifid, brown when dried, pentagonal, ca. 60 × 60 cm, thinly papery, both surfaces glabrous, base cordate, apex acuminate; pinnae 4 or 5 pairs, subopposite, slightly oblique; rachises and costae brown-castaneous, occasionally with linear scales on abaxial side of rachises, densely hairy adaxially, sparsely hairy abaxially; basal pinnae largest, oblique-deltoid, 20–25 × ca. 20 cm, stalks ca. 3 cm, bases asymmetrical, rounded-cuneate, apices long acuminate, basicopic pinnules obviously elongated and forming 1 pair of separate pinnules at base, pinnatifid to broadly winged along costae; middle pinnae deltoid-lanceolate, 15–20 × 10–12 cm, bases symmetrical, rounded-cuneate, apices long acuminate, pinnatifid to broadly winged along costae and forming falcate-lanceolate lobes; pinnules or lobes 8–10 pairs, interval 0.5–1 cm, sessile, basicopic pinnules largest, falcate-lanceolate, 12–14 × 4.5–5 cm, pinnatifid to 2/3; lobules 10 pairs, slightly oblique, interval ca. 2 mm, elliptic, 1.5–2 × ca. 1 cm, obtuse, entire. Veins copiously anastomosing, with narrow areoles beside rachises and costae, included veinlets simple. Sori orbicular, terminal on included veinlets, in 1 row on each side of midrib of ultimate lobes; indusia brown, large, clypeate, membranous, entire, persistent. $2n = 80$.

Valley forests; 100–800 m. Guizhou, Taiwan (Gaoxiang, Pingdong), ?Yunnan [Borneo, Cambodia, India (Assam, Sikkim), Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam].

Tectaria griffithii is listed for China here with doubt. One of us (Christenhusz) studied a single specimen from China without precise locality (*Matthew 110*, K). Y. C. Wu et al. (Bull. Dept. Biol. Sun Yatsen Univ. 3: t. 23. 1932) recorded the species from Guangxi, but the description and plates represent *Dictyocline wilfordii* (Thelypteridaceae) and not a *Tectaria*. Ching (*Sinensia* 2(2): 20. 1931) recorded the species from Guizhou (*Tatsing, Esquirol 2253*), but we have not found these specimens. The *Flora of Taiwan* does not list this species, and Holttum (*Fl. Males.*, Ser. 2, 2: 54–55. 1991) does not list it for China.

12. *Tectaria grossedentata* Ching & Chu H. Wang, Acta Phytotax. Sin. 19: 127. 1981.

粗齿叉蕨 cu chi cha jue

Plants terrestrial, 60–90 cm tall. Rhizome erect or ascen-

dant, short, stout, densely scaly at apex and stipe bases; scales dark brown, linear-lanceolate, ca. 5 mm, membranous, entire, apices capillaceous. Fronds clustered; stipe stramineous, 30–50 cm, 5–6 mm in diam. at base, grooved above, sparsely covered with light brown and articulate hairs, glabrous beneath. Lamina 2-pinnate to 2-pinnatifid at base, pinnate upward, dark green when dried, deltoid-ovate, 35–45 × 25–40 cm, papery, abaxially glabrous, adaxially hairy, base slightly cordate, apex acuminate; rachises and costae stramineous, densely hairy; lateral veins slightly flexuose, raised below, sparsely covered with light brown articulate hairs; pinnae 2 or 3 pairs, subopposite at base, alternate upward; basal pinnae largest, stalks 2.5–4 cm, deltoid, ca. 22 × 10–12 cm, pinnate with 2 or 3 separate pinnules, basal basicopic pinnules up to 12 cm, terminal pinnules 13–15 × ca. 6 cm, bases cuneate, apices long acuminate; secondary pinnae broadly falcate-lanceolate, 15–20 × 3–5 cm, stalk ca. 1 cm, bases cordate, apices long acuminate, margins coarsely sinuate to sinuate-dentate, dentation (lobes) triangular; terminal pinna hastate, up to 20 cm at apex, base cuneate to slightly decurrent, apex long acuminate, pinnatifid, basal lobes ovate-lanceolate. Veinlets forming subhexagonal areoles with cross veins, included veinlets forked, obscure adaxially, slightly raised abaxially. Sori orbicular, small, located at coupling veinlets, in irregular rows between adjacent lateral veins, near margin of lobes; indusia brown, small, clypeate, entire, persistent.

• Wet forests beside streams; sea level to ca. 400 m. Guizhou, Yunnan.

13. *Tectaria harlandii* (Hooker) C. M. Kuo, Taiwania 47: 173. 2002.

沙皮蕨 sha pi jue

Acrostichum harlandii Hooker, Sp. Fil. 5: 274. 1864; *Anapausia bonii* (Christ) Nakai; *A. harlandii* (Hooker) Nakai; *Gymnopteris bonii* Christ; *G. decurrens* Hooker; *Hemigramma decurrens* (Hooker) Copeland; *H. distinctipetiolata* Ching; *Leptochilus bonii* (Christ) C. Christensen; *L. harlandii* (Hooker) C. Christensen; *L. kanashiroi* Hayata; *Polypodium hainanense* C. Christensen.

Plants terrestrial, 30–70 cm tall. Rhizome ascending to creeping, short, 1.5–2 cm in diam., roots lignified, densely scaly at apex and stipe bases; scales brown, glossy, linear-lanceolate, up to 1 cm, membranous, margins densely ciliate, apices long acuminate. Fronds clustered, dimorphic; sterile fronds in rosettes in juvenile stage, stipe dark stramineous or brown to castaneous, slightly glossy, 10–25 cm, 3–4 mm in diam. at base, glabrous, grooved above, narrowly winged toward apex. Lamina simple, trifoliate, or odd-pinnate, dark green when dried, ovate, 20–35 × 20–25 cm, thickly papery, both surfaces glabrous, base decurrent or not, apex acuminate; rachises and costae dark stramineous, slightly grooved above, glabrous on both sides; terminal pinna larger, broadly lanceolate, ca. 20 × 5–6 cm, subsessile or with a stalk up to 1 cm, base cuneate and decurrent, apex long acuminate, entire to undulate; lateral pinnae 1–3 pairs, opposite, interval 5–6 cm, slightly oblique, subsessile, lanceolate, 15–20 × 3–4 cm, bases cuneate and decurrent and forming narrow wings, margin entire or slightly undulate, apices long acuminate. Fertile fronds elongate and narrow; stipe up to

40 cm, glabrous; lamina narrow, trifoliate or odd-pinnate, pinnae linear-lanceolate, 8–10 × ca. 2 mm, sessile, entire or undulate. Veins anastomosing forming copious areoles, included veinlets forked, raised on both sides, glabrous. Sori orbicular, anastomosing in line along areoles, throughout abaxial surface when mature, exindusiate.

On wet moss-covered rocks in forests or along streams; 100–700 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Japan (Ryukyu Islands), Vietnam].

Tectaria harlandii is commonly segregated into the genus *Hemigramma* because of its dimorphic leaves with contracted fertile fronds and linear sori that cover the entire abaxial surface of the blade when mature. Molecular evidence has shown however that this species is part of a greater *Tectaria* clade and cannot be maintained in a separate genus. The characters separating *Hemigramma* from *Tectaria* are minor and are known to occur in other species of *Tectaria* in other parts of the world.

Polypodium dimorphum Baker (Ann. Bot. 5: 477. 1891, not Link (1833), described from Hainan) probably belongs here as the isotype sheet in BM was so annotated by Ching.

14. *Tectaria herpetocaulos* Holttum, Dansk Bot. Ark. 23: 241. 1965.

思茅叉蕨 si mao cha jue

Tectaria polymorpha (Wallich ex Hooker) Copeland var. *subcuneata* Ching & Chu H. Wang; *T. simaoensis* Ching & Chu H. Wang.

Plants terrestrial, 0.8–1 m tall. Rhizome creeping, long, 0.8–1 cm in diam., scaly at apex and stipe bases; scales dark brown and light glossy, pale along margins, lanceolate, 2–3 mm, thickly membranous, subentire, apices acuminate, caducous downward. Fronds widely spaced; stipe stramineous, 30–60 cm, 4–5 mm in diam., clothed with light brown articulate hairs above, glabrescent beneath. Lamina odd-pinnate, dark green when dried, ovate to oblong, 30–45 × 25–30 cm, papery, both surfaces glabrous, margin cartilaginous; rachises, costae, and lateral veins stramineous, pubescent adaxially, glabrescent abaxially, grooved adaxially and raised abaxially; terminal pinna ovate to oblong, entire, ca. 20 × 7–9 cm, stalk 2–3 cm, base broadly cuneate, apex caudate; lateral pinnae 2–4 pairs, simple, ovate-lanceolate, 18–20 × 5–6 cm, slightly oblique, opposite, subentire, interval 2–5 cm, bases slightly asymmetrically cuneate, apices abruptly caudate; basal pinnae shortly stalked, pinnae sessile toward apices. Veinlets forming conspicuous subhexagonal areoles, raised on both sides, included veinlets simple or forked. Sori orbicular, on anastomosing veins, in irregular 4–6 rows between lateral veins; indusia brown, orbicular, membranous, glabrous, entire, caducous.

Dense forests; 600–1100 m. Yunnan [India, Malaysia, Myanmar, Thailand, Vietnam].

Tectaria herpetocaulos is very similar to *T. polymorpha* but can be easily recognized by its creeping rhizomes and abaxially glabrous laminae; its pinnae are simple and broadly rounded at the base and somewhat reminiscent of a *Cyclosorus* (Thelypteridaceae).

15. *Tectaria impressa* (Fée) Holttum, Kew Bull. 43: 483. 1988.

疣状叉蕨 you zhuang cha jue

Phlebionium impressum Fée, Mém. Foug. 5: 314. 1852; *Aspidium immersum* Hooker (1862), not Blume (1828); *A. prominens* Alderwerelt; *A. variolosum* Wallich ex Hooker; *A. zollingerianum* Beddome (1868), not Kunze (1846); *Nephrodium variolosum* (Wallich ex Hooker) Baker; *Sagenia variolata* T. Moore; *Tectaria prominens* (Alderwerelt) C. Christensen; *T. variolosa* (Wallich ex Hooker) C. Christensen.

Plants terrestrial, 40–80 cm tall. Rhizome creeping to suberect, short, stout, densely scaly at apex and stipe bases; scales stiff, brown, linear-lanceolate, 6–8 mm, membranous, ciliate, apices long acuminate. Fronds clustered, subdimorphic, fertile fronds rather tall but narrowed; stipe stramineous, 30–50 cm, throughout covered with light brown hairs. Sterile lamina bipinnatifid to tripinnatifid, deep green or brown when dried, pentagonal, 30–35 × 30–35 cm, thickly herbaceous to leathery, both surfaces pubescent; rachises and costae stramineous, densely covered with articulate hairs; terminal pinna pinnatifid, base cuneate to decurrent, apex acuminate; lateral pinnae 1–5 pairs, opposite, interval 4–6 cm, oblique; basal pinnae pinnate with 1–3 undulate or pinnatifid lobes, 15–20 cm, rather large, stalks 2–3 cm, lower lobes larger than upper ones; middle pinnae falcate-lanceolate, undulate to pinnatifid, stalks becoming shorter, oblique, 6–8 cm, apices long caudate. Veinlets forming copious subhexagonal areoles with cross veins, included veinlets simple or not, distinctly forming long areoles with arcuate veinlet beside pinna rachis and main veins. Sori orbicular, terminal on veinlets, in one row beside main veins; indusia brown, orbicular or reniform, firm, persistent.

Usually on limestone in dense forests; 100–500 m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [India, Indonesia, Laos, Malaysia, Nepal, Thailand, Vietnam].

Knapp (Ferns Fern Allies Taiwan, 961. 2011) included *Aspidium subtriphyllum* (Hooker & Arnott) Hooker f. *cuspidatopinnatum* Hayata (Icon. Pl. Formosan. 4: 189. 1914; *Aspidium cuspidatopinnatum* (Hayata) Ching; *Tectaria cuspidatopinnata* (Hayata) C. Christensen) within *T. impressa*.

16. *Tectaria ingens* (Atkinson ex C. B. Clarke) Holttum, Revis. Fl. Malaya 2: 503. 1954.

西藏轴脉蕨 xi zang zhou mai jue

Nephrodium ingens Atkinson ex C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 526. 1880; *Aspidium cadieri* Christ; *Ctenitopsis cadieri* (Christ) C. Christensen ex Tardieu & C. Christensen; *C. ingens* (Atkinson ex C. B. Clarke) Ching; *C. matthewii* (Ching) Ching; *Dryopteris dissecta* (G. Forster) Kuntze var. *ingens* (Atkinson ex C. B. Clarke) C. Christensen; *D. ingens* (Atkinson ex C. B. Clarke) Ching; *Lastrea dissecta* (G. Forster) Carruthers var. *ingens* (Atkinson ex C. B. Clarke) Beddome; *Tectaria matthewii* Ching.

Plants terrestrial, up to 3 m tall. Rhizome erect, short, stout, 1.5–2.5 cm in diam., densely scaly at apex; scales brown, (broadly lanceolate or) lanceolate, 6–9 mm, membranous, entire, apices acuminate. Fronds clustered, usually dimorphic, fertile fronds obviously narrowed; stipe dark stramineous to light brown, 30–80 cm, 5–9 mm in diam. at base, grooved above, with sparse (light) brown articulate hairs, lower part densely clothed with brown scales, similar to those of rhizome, few

upward. Lamina tripinnate to quadripinnatifid, bipinnatifid upward, green or brownish when dried, triangular-ovate, 50–120 × 40–80 cm, thinly papery to membranous, both surfaces glabrescent, adaxially sometimes with a few brown articulate hairs, base cordate, apex (long acuminate or) acuminate; rachises, costae, and main veins dark stramineous to brown, densely clothed with brown articulate hairs; pinnae 10–15 pairs, lower part subopposite, oblique, interval 2–2.5 cm; basal pinnae largest, triangular, 22–42 × 15–30 cm, stalks 2–5 cm (with shorter stalks or sessile upward), bases (rounded-cuneate or) cuneate and asymmetrical to nearly symmetrical, apices (long acuminate or) acuminate, basiscopic pinnules longer; middle pinnae elliptic-lanceolate, 20–35 × 8–20 cm, terminal pinna (rounded-cuneate or) cuneate at base, apex (long acuminate or) acuminate, largest basal basiscopic pinnules (broadly lanceolate or) lanceolate, 12–20 × 3.5–7 cm, bases obliquely cuneate, apices (long acuminate or) acuminate, bipinnate at base, bipinnatifid to broad wings beside costa upward; ultimate pinnules 10–14 pairs, alternate, interval 1.5–4 mm, light upward, sessile and adnate to pinnule rachises, pair of basal pinnae larger, lanceolate, 2.5–4 × 1–1.5 cm, mucronate, basiscopic lobes decurrent at base, pinnatifid at base, scalloped or subentire upward; lobes 5–7 pairs, interval 1–1.5 mm, oblique, falcate-triangular, 3–4 × 3–4 mm, obtuse, entire, brown articulate ciliate on margin. Veins pinnate, free or anastomosing below indenture, veinlets 5–8 pairs, simple or forked, inconspicuous above, conspicuous and with sparse brown articulate hairs below. Sori orbicular, 4–8 pairs, terminal on veinlets, in center of midrib and margin; indusia orbicular-reniform, membranous, glabrous, entire, persistent.

Forests; 1000–2500 m. Guangdong (Lianxian), Xizang [NE India, Malaysia, Vietnam].

Tectaria mathewii only differs in its smaller size and does not seem to form a separate species. It is therefore (tentatively) united here with *T. ingens*. The isotype of *T. mathewii* in K is sterile.

Holttum (Fl. Males., Ser. 2, 2: 41. 1991) wrote that this species “is perhaps the nearest existing species to a prototype for the genus.”

17. *Tectaria kusukusensis* (Hayata) Lellinger, Amer. Fern J. 58: 157. 1968.

台湾轴脉蕨 tai wan zhou mai jue

Dryopteris kusukusensis Hayata, Icon. Pl. Formosan. 4: 157. 1914; *Ctenitis kusukusensis* (Hayata) H. Itô; *Ctenitopsis hainanensis* Ching & Chu H. Wang; *C. kusukusensis* (Hayata) C. Christensen ex Tardieu & C. Christensen; *C. kusukusensis* var. *crenatolobata* Tagawa; *C. tamdaoensis* Ching; *D. membranoides* Hayata; *Thelypteris kusukusensis* (Hayata) C. M. Kuo.

Plants terrestrial, 40–100 cm tall. Rhizome erect, short, 1–1.5 cm in diam., densely scaly at apex; scales dark brown with narrow paler margin, broadly lanceolate, 4–6 mm, rigidly membranous, entire, apices acuminate. Fronds clustered; stipe dark brown to dark stramineous, 20–50 cm, 3–5 mm in diam. at base, grooved above, sparsely to densely clothed with articulate brown to light gray hairs, lower part with sparse dark brown scales like on rhizome. Lamina tripinnatifid, bipinnatifid upward, dark brown or green when dried, elliptic to elliptic-lanceolate, 30–50 × 15–25 cm, (thickly) papery, abaxially gla-

brous, adaxially with sparse caducous brown or light gray articulate hairs, base subcordate, apex long acuminate to caudate (then tail 2.5–3 cm, subentire); rachises, costae, and main veins brown to dark stramineous, densely clothed with long, brown or gray articulate hairs; pinnae 10–12 pairs, subopposite on lower part, alternate upward, interval 4–5 cm; basal pinnae largest, obliquely triangular, 10–20 × 6–15 cm, stalk 3–5 mm (sessile upward), (long) acuminate, pinnatifid to forming 1–3 pairs of separate large pinnules at base; middle pinnae (linear) lanceolate, 8–17 × 2.5–3 cm, bases cuneate, apices long acuminate to caudate, pinnatifid to 2/3–3/4 toward costa, often with subseparate pinnules below; basal basiscopic pinnules lanceolate, 4–12 × 1–2.5 cm, bases rounded-cuneate, mucronate, apices long acuminate to caudate, pinnatifid to 2/3 toward costa; lobes 8–15 pairs, interval 1–3 mm, oblique, triangular-elliptic to broadly lanceolate, 6–10 × 3–7 mm, margin mucronate, entire or undulate to toothed, ciliate. Veins pinnate, free, forked or simple, inconspicuous above, raised below. Sori orbicular, 3–8 pairs terminal on veinlets near margin, regular in 1 or 2 rows beside main veins; indusia dark brown, orbicular-reniform, membranous, glabrous, entire, persistent.

Near streams in valley forests; 100–700 m (in Taiwan). Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Vietnam].

Ctenitopsis hainanensis appears to differ from *Tectaria kusukusensis* only in its smaller stature and caudate pinna apices. It may well be an unusual population in Hainan, but one of us (Christenhusz) has not found sufficient evidence for its status as a separate species and thus refrains from making a nomen novum in *Tectaria* for this taxon.

18. *Tectaria leptophylla* (C. H. Wright) Ching, Sinensia 2: 22. 1931.

剑叶叉蕨 jian ye cha jue

Nephrodium leptophyllum C. H. Wright, Bull. Misc. Inform. Kew 1906: 11. 1906; *Aspidium leptophyllum* (C. H. Wright) C. Christensen.

Plants terrestrial, 25–40 m tall. Rhizome erect, short, ca. 1 cm in diam., scaly at apex and stipe bases; scales brown, linear-lanceolate, 3–4 mm, entire, membranous, acuminate. Fronds clustered; stipe stramineous to light brown, 2–5 cm, ca. 2 mm in diam., grooved, broadly winged nearly to base, sparsely scaly toward apex. Lamina simple, dimorphic; sterile fronds broad, fertile fronds homomorphic but taller and narrowed, 35–40 × 3–4 cm, papery, deep green when dried; main veins and lateral veins stramineous, glabrous on both sides. Veinlets forming inconspicuous subhexagonal areoles, included veinlets forked. Sori orbicular, terminal on included veinlets, in 3–5 irregular rows between lateral veins; indusia brown, orbicular, membranous, entire, persistent or revolute.

Forests; 300–400 m. Yunnan [N Vietnam].

19. *Tectaria luchunensis* S. K. Wu, Acta Phytotax. Sin. 40: 535. 2002.

绿春叉蕨 lü chun cha jue

Plants terrestrial, 60–100 cm tall. Rhizome erect, short, thick, densely scaly at apex and stipe bases; scales dark brown, linear-lanceolate, ca. 10 × 1 mm, membranous, entire. Fronds

clustered; stipe stramineous, 40–50 cm, 5–6 mm in diam. at base, grooved, pubescent throughout, densely scaly at base, sparsely scaly upward. Lamina bipinnate at base, pinnate upward, green when dried, ovate or deltoid-lanceolate, 30–55 × 20–25 cm, thinly papery, both surfaces glabrous, base cordate, apex acuminate to caudate; rachises and costae deep brown, densely clothed with brown articulate hairs above, sparsely so abaxially; pinnae 3 or 4 pairs, subopposite, interval 10–15 cm, terminal pinna 3-lobed or simple, terminal lobe oblong-lanceolate, 10–20 × 2–4 cm, undulate to pinnatifid, base cordate to cuneate, shortly stalked, lateral lobes like terminal lobe, opposite, smaller; basal pinnae largest, 15–20 × 10–20 cm, ovate-lanceolate, stalk 1–3 cm, pinnate or 3-lobed, pinnules 1 or 2 pairs, alternate or opposite, interval 1–3 cm, lanceolate or falcate-lanceolate, margins undulate to pinnatifid; middle pinnae pinnate or trifurcate to simple, stalks becoming shorter to sessile upward, margins pinnatifid to undulate, broadly lanceolate or falcate-lanceolate, 19–21 × 2–4 cm, bases cuneate, apices caudate. Lateral veins pinnate, veinlets forming subhexagonal areoles, raised on both surfaces, included veinlets simple or forked, glabrous. Sori small, orbicular, at middle of coupling veinlets, in 2 or 3 irregular rows between adjacent lateral veins, exindusiate.

- Evergreen broad-leaved forests; 800–1300 m. Yunnan (Lüchun).

20. *Tectaria media* Ching, Acta Phytotax. Sin. 8: 169. 1959.

中型叉蕨 zhong xing cha jue

Plants terrestrial, ca. 60 cm tall. Rhizome ascending or erect, short, densely scaly at apex and stipe bases; scales linear-lanceolate, 3–4 mm, thickly membranous, margins entire, apices acuminate. Fronds clustered; stipe dark brown to castaneous, glossy, 35–40 cm, 3–4 mm in diam. at base, grooved above, sparsely pubescent at base. Lamina bipinnatifid at base, pinnate upward, light brown when dried, deltoid, ca. 30 × 25 cm; terminal pinna trifurcate, ovate-deltoid, ca. 18 × 5–6 cm, papery, both surfaces glabrous, base rounded, margins lobed, apex acuminate; rachises castaneous, pubescent adaxially, glabrescent abaxially; costae castaneous at base, stramineous upward, densely hairy adaxially, glabrescent abaxially; terminal lobe ovate-lanceolate, lobed, basal lateral lobes longer, ca. 8 cm, falcate-lanceolate, opposite; lateral pinnae 2 pairs, opposite, slightly oblique, interval 2–3 cm, stalks ca. 2 cm, lateral pinnae subsessile upward; basal pinnae largest, deltoid, pinnatifid, ca. 18 × 12 cm, bases cordate, apices long acuminate, lobes falcate-lanceolate, undulate to slightly lobed; middle pinnae broadly falcate-lanceolate, ca. 15 × 3.5 cm, bases cuneate, margins undulate to slightly lobed, apices acuminate. Veinlets forming subhexagonal areoles with cross veins, raised on both surfaces, included veinlets simple or forked. Sori small, orbicular, located at coupling veinlets, in irregular rows between adjacent lateral veins; indusia small, brown, membranous, persistent.

- Dense forests; ca. 700 m. Fujian, Guangdong, Guangxi, Hainan.

21. *Tectaria phaeocaulis* (Rosenstock) C. Christensen, Index Filic., Suppl. 3: 183. 1934.

条裂叉蕨 tiao lie cha jue

Aspidium phaeocaulon Rosenstock, Hedwigia 56: 345.

1915; *Tectaria laciniata* Ching.

Plants terrestrial, 56–140 cm tall. Rhizome erect, short, thick, ca. 1.5 cm in diam., densely scaly at apex and stipe bases; scales stiff, brown with narrow paler ciliate margins, linear-lanceolate, ca. 6 mm, apices acute. Fronds clustered; stipe dark brown to castaneous, ± glossy, 30–80 cm, 4–5 mm in diam. at base, glabrescent upward. Lamina bipinnate at base, deep green when dried, oblong-ovate, 45–60 × 30–40 cm, leathery, both surfaces glabrous; costa and costules raised and pubescent on both surfaces, castaneous; main veins paler, pubescent abaxially; terminal pinna acuminate and pinnate-lacerate, basal pinnae bipinnate to tripinnatifid; lateral pinnae 5–8 pairs, broadly lanceolate, subopposite but alternate upward, ascending, 15–20 × 3–5 cm, apices caudate, pinnate-lacerate, interval 2–3 cm; basal pinnules largest, triangular-lanceolate with stalk ca. 2 cm, pinnate or bipinnate with 2 or 3 pairs of separate lobes at base and pinnatifid-lacerate at apex; middle pinnules lanceolate, cordate, pinnatifid-lacerate to lanceolate or triangular lobes. Veinlets forming subhexagonal areoles with cross veins, included veinlets forked. Sori large, terminal on included free veinlets, orbicular, in 2 irregular rows between adjacent main veins; indusia reflexed, small, pubescent, entire, persistent.

Near streams or in dense forests; below ca. 800 m. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan, Yunnan [Indonesia, Japan (Ryukyu Islands), Thailand, Vietnam].

22. *Tectaria polymorpha* (Wallich ex Hooker) Copeland, Philipp. J. Sci., C, 2: 413. 1907.

多形叉蕨 duo xing cha jue

Aspidium polymorphum Wallich ex Hooker, Sp. Fil. 4: 54. 1862; *A. nantoense* Hayata.

Plants terrestrial, 0.5–1 m tall. Rhizome erect, stout, 1.5–2 cm in diam., scaly at apex and stipe bases; scales dark brown and light glossy, pale at margins, linear-lanceolate, 6–7 mm, membranous, ciliate, apices long acuminate and curled. Fronds clustered, subdimorphic; fertile fronds rather tall, slightly narrowed; stipe stramineous, 20–60 cm, 4–5 mm in diam., grooved, glabrescent. Lamina simple or trifurcate to odd-pinnate, dark green or brown when dried, ovate to oblong, 30–60 × 25–30 cm, papery, abaxially pubescent, adaxially glabrous; rachises, costae, and lateral veins stramineous, glabrous adaxially, densely hairy abaxially, grooved adaxially and raised abaxially; terminal pinna simple or trifurcate, oblong, 18–20 cm, 7–9 cm wide at middle, entire or undulate, stalks 2–3 cm, bases slightly narrowed, rounded-cordulate, apices abruptly caudate; lateral pinnae 1–4 pairs, simple or basal pairs lobed, ovate-lanceolate, 18–20 × 6–8 cm, oblique, opposite, undulate to entire, interval 2–8 cm, bases gradually tapering, asymmetrical, cuneate, apices abruptly caudate; basal pinnae shortly stalked, sessile upward. Veinlets forming conspicuous subhexagonal areoles, raised on both sides, included veinlets forked. Sori orbicular, terminal on included veinlets or anastomosing veins, in 3–5 irregular rows between lateral veins; indusia brown, orbicular, membranous, entire, caducous.

On rocks or wet soil in forested valleys; below 100–1500 m. Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Bhutan, Cambodia, India, Indonesia, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

Tectaria polymorpha is diverse in lamina shape, varying from simple or ternate to odd-pinnate. It is similar to *T. herpetocaulos* but can be readily distinguished from that species by its erect rhizomes.

23. *Tectaria quinquefida* (Baker) Ching, *Sinensia* 2: 26. 1931.

五裂叉蕨 wu lie cha jue

Nephrodium quinquefidum Baker, *J. Bot.* 28: 265. 1890; *Aspidium esquirolii* (Christ) C. Christensen; *A. polysorum* Rosenstock; *A. quinquefidum* (Baker) Diels; *Sagenia esquirolii* Christ; *Tectaria hekouensis* Ching & Chu H. Wang.

Plants terrestrial, 60–80 cm tall. Rhizome erect, short, stout, 1–2 cm in diam., scaly at apex and stipe bases; scales dark brown, lanceolate, 5–7 mm, membranous, entire, apices long acuminate. Fronds clustered; stipe deep stramineous to brown or reddish, 25–40 cm, 3–4 mm in diam., grooved, sparsely hairy. Laminae subdimorphic, fertile fronds rather tall and slightly narrowed, odd-pinnate, brown when dried, deltoid-ovate, 20–35 × 18–30 cm, herbaceous, both surfaces glabrous; rachises and costae light brown, glabrous adaxially, pubescent and raised abaxially; terminal pinna simple or 3-lobed; middle lobes broadly lanceolate, 16–22 × 4–8 cm, bases narrowed, slightly cordulate, apices acuminate to caudate, margins undulate to dentate, stalk ca. 1.5 cm, lateral lobes falcate-lanceolate, rather small; lateral pinnae of a single pair, opposite, subsessile, ovate-lanceolate, 14–15 × 4–5 cm, slightly oblique, subtire to undulate, bases asymmetrical and cuneate, apices acuminate; gemmae present, axillary. Veinlets forming subhexagonal areoles, inconspicuous adaxially, raised and pubescent abaxially, included veinlets forked. Sori orbicular, on anastomosing veins, in irregular rows between lateral veins; indusia dark brown, reniform, membranous, entire, caducous.

Dense forests; 300–600 m. Guangxi, Guizhou, Yunnan [N Vietnam].

From Yunnan (Hekou), a form of *Tectaria quinquefida* is known without gemmae and glabrescent pinna rachises, which was described as *T. hekouensis*. These characters are a regional form that may be recognizable at the variety level.

24. *Tectaria remotipinna* Ching & Chu H. Wang, *Acta Phytotax. Sin.* 19: 129. 1981.

疏羽叉蕨 shu yu cha jue

Tectaria viridifrons Ching & Chu H. Wang [“*viridifrons*”].

Plants terrestrial, 80–90 cm tall. Rhizome erect, thick, ca. 2 cm in diam., dilated and bluntly spiny, scaly on apex and stipe bases; scales dark brown, lanceolate, ca. 6 mm, subleathery, margins entire, apices long acuminate. Fronds clustered, stipe stramineous, up to 50 cm, obviously dilated and spiny at base, grooved above. Lamina 3-pinnatifid, 2-pinnatifid upward, light brown when dried, deltoid-ovate, 40–50 × 25–30 cm, thinly papery, base slightly cordate, apex acuminate; pinnae ca. 4 pairs, opposite, interval up to 8–9 cm; rachises stramineous, glabrous on both surfaces, hairy on adaxial side of costae and midribs of pinnules, glabrous abaxially; basal pinnae largest, asymmetrically deltoid, ca. 20 × 15 cm, bases rounded-cuneate, apices acuminate, long stalked (up to 3 cm), shortly stalked upward, bipinnate to tripinnatifid, with 1 or 2 pairs of separate pinnules

at base; middle pinnae broadly lanceolate, 12–15 × 5–7 cm, bases cuneate, apices acuminate, pinnatifid to broadly winged along costa; pinnules of basal pinnae ca. 8 pairs, opposite at base, alternate toward apex, interval 1–2 cm, shortly stalked at base, sessile or adnate to costa upward, basal basiscopic pinnules larger, broadly lanceolate, 10–12 × 4–5 cm; lobes ca. 10 pairs, slightly oblique upward, interval 2–3 mm, elliptic-lanceolate, 1.5–2 × ca. 1.2 cm. Veins copiously anastomosing to hexagonal areoles, included veinlets simple if present inconspicuous and hairy adaxially and slightly raised and glabrescent abaxially, margins ciliate. Sori orbicular, terminal on included veinlets, in 1 row at each side of midrib of ultimate lobes; indusia brown, clypeate, membranous, entire, persistent. $2n = 80^*$.

• Along wet streams; ca. 1700 m. Yunnan (Jingdong, Wuliang Shan).

Tectaria remotipinna is similar to *T. coadunata* but can be easily differentiated by the blunt spines on its rhizome.

25. *Tectaria rockii* C. Christensen, *Contr. U.S. Natl. Herb.* 26: 331. 1931.

洛克叉蕨 luo ke cha jue

Tectaria burmanica Ching; *T. kweichowensis* Ching & Chu H. Wang; *T. linloensis* Ching & Chu H. Wang.

Plants terrestrial, 60–120 cm tall. Rhizome decumbent or ascending, short, densely scaly at apex and stipe bases; scales stiff, dark brown, linear-lanceolate, 10–15 mm, membranous, entire, apices long acuminate. Fronds clustered or close together; stipe glossy, 40–80 cm, 5–8 mm in diam. at base, grooved, scaly toward base, covered throughout with dark brown, articulate hairs. Lamina bipinnate to tripinnatifid, dark green when dried, deltoid-ovate, 40–60(–80) cm, thickly papery, abaxially glabrous, adaxially pubescent, base cordate, apex acuminate; rachises castaneous, costae and midribs brown to deep stramineous, densely covered with articulate hairs; terminal pinna acuminate, deltoid, ca. 20 × 15 cm, base broadly cuneate, pinnatifid or pinnate-lacerate, lobes falcate-lanceolate, subtire, apices caudate; basal pinnae bipinnate, ca. 10 × 20–30 cm, rather large, stalks 2–3 cm, bases acuminate with 2 or 3 separate lobes, lobes lanceolate, rather long beneath, undulate or pinnatifid; middle pinnae 3 or 4 pairs, lanceolate, subopposite or alternate upward, interval 8–12 cm, oblique; fertile pinnae homomorphic but smaller, stalks short below, sessile upward, pinnatifid, bases cordate, apices caudate. Veinlets forming irregular areoles, included veinlets forked, inconspicuous adaxially and raised abaxially. Sori small, orbicular, located at coupling veinlets, in irregular rows between adjacent main veins; indusia brown, orbicular, small, membranous, entire, persistent.

Limestone areas in dense forests; 700–1200 m. Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Indochina, Myanmar, Thailand, Vietnam].

Tectaria rockii is characterized by its dark brown to castaneous stipe and pinnatifid terminal pinna; however, the lateral pinnae are variable. We confirm that *T. linloensis* and *T. kweichowensis* are synonyms, the types (in PE and K) of these both representing *T. rockii*. *Tectaria*

linloensis has in the past been treated as a synonym of *T. simonsii* (Chu H. Wang, FRPS 6(1): 89. 1999; S. G. Wu, Fl. Yunnan. 21: 206. 2004), which is not correct.

26. *Tectaria sagenioides* (Mettenius) Christenhusz, Phytotaxa 10: 58. 2010.

轴脉蕨 zhou mai jue

Aspidium sagenioides Mettenius, Abh. Senckenberg. Naturf. Ges. 2: 397. 1858; *Ctenitis sagenioides* (Mettenius) Copeland; *Ctenitopsis obscura* (Hooker) C. Christensen; *C. sagenioides* (Mettenius) Ching; *C. sagenioides* var. *glabrescens* Ching & Chu H. Wang; *Dryopteris laokaiensis* C. Christensen; *D. sagenioides* (Mettenius) Kuntze; *D. sagenioides* subsp. *obscura* (Hooker) C. Christensen; *D. schizoloma* (Alderwerelt) C. Christensen; *Heterogonium sagenioides* (Mettenius) Holttum; *Lastrea melanopus* (Hooker) Beddome; *L. sagenioides* (Mettenius) T. Moore; *Nephrodium melanopus* Hooker; *N. obscurum* Hooker; *N. sagenioides* (Mettenius) Baker; *Phegopteris obscura* (Hooker) Fée ex Christ; *P. schizoloma* Alderwerelt; *Polypodium obscurum* Hooker; *P. viscosum* C. H. Wright.

Plants terrestrial, 70–80 cm tall. Rhizome erect, short, ca. 1 cm in diam., densely scaly at apex; scales brown, broadly lanceolate, 4–5 mm, membranous, margins entire, apices acuminate. Fronds clustered; stipe deep castaneous to black, glossy, 30–40 cm, grooved above, occasionally clothed with lanceolate brown scales at base, with sparse light brown articulate hairs upward. Lamina bipinnatifid, dark brown when dried, elliptic, 40–50 × 20–25 cm, herbaceous, with sparse articulate brown hairs on both surfaces or abaxially glabrescent and adaxially with a few hairs, base retuse, margins ciliate, apex acuminate; rachises deep castaneous to black, glossy, ± clothed with articulate brown hairs; costae brown at base, stramineous upward, clothed with brown, articulate hairs; lateral pinnae 12–15 pairs, subopposite or alternate upward, interval 1.5–2 cm, applanate, sessile; basal pinnae not shortened, reflexed, falcate-lanceolate, 10–12 × 4–4.5 cm, bases cuneate, apices acuminate, pinnatifid nearly to costa; lobes 12–15 pairs, undulate or serrate, basal lobes shortened, middle lobes elongate toward base of lamina, ultimate ones acuminate; upper pinnae lanceolate, 10–12 × ca. 3 cm at base, pinnatifid to 2/3, lobes ca. 15 pairs, subapplanate, interval 2–3 mm, ovate, 1.2–1.5 × 4–5 mm, obtuse, entire to undulate. Veins free, pinnate, 5 or 6 pairs, veinlets forked. Sori orbicular, terminal on veinlets, in 1 row between main veins and margin; indusia brown, orbicular-reniform. $2n = 80$.

Wet dense forests; 100–300 m. Guangxi, Hainan, Yunnan [India, Indonesia, Malaysia, Myanmar, Thailand, Vietnam].

A more glabrous form of *Tectaria sagenioides* was found in Guangxi (Jinxu) and Yunnan (Hekou), as *Ctenitopsis sagenioides* var. *glabrescens*, but this form does not merit taxonomic recognition. Holttum (Kalikasan 4: 205–231. 1975) stated that this species (the type of *Ctenitopsis*) belongs to the genus *Heterogonium* C. Presl, but no evidence is provided for this; and the species (and the related *T. subsageniacea*) fits morphologically well in *Tectaria*.

27. *Tectaria setulosa* (Baker) Holttum, Kew Bull. 43: 479. 1988.

棕毛轴脉蕨 zong mao zhou mai jue

Nephrodium setulosum Baker, J. Bot. 28: 265. 1890; *Ctenitopsis setulosa* (Baker) C. Christensen ex Tardieu & C. Christensen; *Dryopteris dissecta* (G. Forster) Kuntze var. *lepidota* Christ; *D. setulosa* (Baker) C. Christensen.

Plants terrestrial, up to 2 m tall. Rhizome erect, short, stout, ca. 2 cm in diam., densely scaly at apex; scales deep brown with paler margin, broadly lanceolate to ovate-lanceolate, 1–1.5 cm, entire, apices acuminate. Fronds clustered; stipe dark brown, 60–80 cm, ca. 1 cm in diam. at base, grooved above, densely clothed with light brown articulate hairs, lower part densely clothed with brown scales like on rhizome, narrower and sparser upward. Lamina tripinnate to quadripinnatifid, brown when dried, triangular-ovate, 100–150 × 70–80 cm, papery, abaxially glabrous, adaxially hairy, base cordate, apex long acuminate; rachises, costae, and main veins dark brown, densely clothed with brown articulate hairs; pinnae ca. 15 pairs, lower part subopposite, oblique upward, interval 2–3 cm; basal pinnae largest, obliquely triangular, 40–45 × 30–35 cm, stalks 4–5 cm (with shorter stalks upward), bases cuneate and nearly symmetrical, apices long acuminate, basisopic pinnules slightly longer; middle pinnae triangular-ovate, 35–40 × 25–30 cm, bases rounded-cuneate, apices long acuminate, basal basisopic largest pinnules broadly lanceolate, 16–20 × 7–9 cm, bases cuneate, apices long acuminate, bipinnate at base, bipinnatifid to broad wings beside costa upward; ultimate pinnules ca. 15 pairs, alternate, interval 6–8 mm, oblique, sessile and adnate to pinnule rachises, basal pair larger, lanceolate, 4–5 × 1–1.5 cm, basisopic lobes decurrent at base, apices long acuminate, pinnatifid at base, scalloped or subentire upward; lobes 8–10 pairs, interval 1–1.5 mm, oblique, falcate-ovate, 4–6 × 3–4 mm, obtuse, entire, margins ciliate with brown articulate hairs. Veins pinnate, free, veinlets 5–7 pairs, simple or forked, slightly raised and with sparse brown articulate hairs on both sides. Sori orbicular, 4–6 pairs, terminal on veinlets, near margin; indusia brown, orbicular-reniform, membranous, glabrous, entire, persistent.

Forests; 300–600 m. Guangdong, Guangxi, Yunnan [N India, Malaysia, Myanmar, Vietnam].

28. *Tectaria simonsii* (Baker) Ching, Sinensia 2: 32. 1931.

燕尾叉蕨 yan wei cha jue

Nephrodium simonsii Baker in Hooker & Baker, Syn. Fil., ed. 2, 504. 1874; *Aspidium kwarensense* Hayata; *A. longicrura* (Christ) Christ; *A. simonsii* (Baker) Beddome; *A. subtriphyllum* (Hooker & Arnott) Hooker var. *ebenosum* Nakai; *Dryomenis kwarensensis* (Hayata) Nakai; *Sagenia longicruris* Christ; *Tectaria kwarensensis* (Hayata) C. Christensen; *T. longicruris* (Christ) C. Christensen; *T. subtriphylla* (Hooker & Arnott) Copeland var. *ebenosa* (Nakai) Nemoto.

Plants terrestrial, 60–150 cm tall or more. Rhizome creeping, ascending, or erect, short, thick, densely scaly at apex and stipe bases; scales stiff, dark brown to nearly purple, 8–10 mm, linear-lanceolate, entire, apices long acuminate. Fronds clustered; stipe dark brown or castaneous to black, glossy, 40–60 cm, 4–5 mm in diam. at base, minutely brown pubescent throughout. Lamina bipinnate to tripinnatifid, deep green when dried, subpentagonal or triangular-ovate, 30–60 × 25–40 cm,

papery, both surfaces glabrous; rachises castaneous to black, pubescent, costa and costules raised abaxially, castaneous, glabrescent; terminal pinna 3-lobed or simple; terminal lobe ovate-lanceolate, entire or undulate to pinnatifid, base cordate to cuneate, lateral lobes like terminal lobe, opposite, rather small; lateral pinnules 2 or 3 pairs, opposite, interval 4–6(–10) cm, oblique; basal pinnules pinnate or bipinnatifid, 10–15 cm, rather large, stalks long; middle pinnules 3-lobed to simple, becoming sessile toward apices, entire or undulate, broadly lanceolate, 8–10 cm, bases cordate, apices caudate. Veinlets forming subhexagonal areoles with cross veins, included veinlets simple or forked. Sori small, orbicular, located at coupling veinlets, in irregular rows between adjacent main veins, exindusiate.

Dense forests; 100–1300 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [India, Japan (Ryukyu Islands), Thailand, Vietnam].

Tectaria simonsii is characterized by its castaneous to black stipe and ternate terminal pinna. We do not follow the treatment in FRPS (6(1): 89. 1999) in accepting *T. linloensis* (see *T. rockii*, p. 742) and *T. subtriphylla* var. *ebenosa*. The only differences lie in minor characters of the terminal pinna, which are variable even within the same plant.

29. *Tectaria subpedata* (Harrington) Ching, *Sinensia* 2: 23. 1931.

掌状叉蕨 zhang zhuang cha jue

Nephrodium subpedatum Harrington, *J. Linn. Soc., Bot.* 16: 30. 1877; *Aspidium morsei* (Baker) C. Christensen; *A. subpedatum* (Harrington) Diels; *N. morsei* Baker; *Sagenia subpedata* (Harrington) Nakai.

Plants terrestrial, 30–45 cm tall. Rhizome creeping to ascending, short, thick, 1–2 cm in diam., densely scaly at apex and stipe bases; scales brown, lanceolate, 4–5 mm, entire, apices long acuminate. Fronds clustered; stipe brown at base, stramineous upward, 20–30 cm, ca. 3 mm in diam., sparsely hairy. Lamina palmately 3–5-lobed, dark green when dried, deltoid-ovate, 15–20 × 12–16 cm, papery, abaxially densely hairy, adaxially glabrous, base cordate; costae and lateral veins stramineous, glabrous adaxially, densely hairy abaxially; terminal lobe elliptic-lanceolate, 15–18 × 5–7 cm, base slightly narrowed, apex long acuminate, entire or undulate to pinnatilobed; secondary pairs of lobes broadly lanceolate, 8–9 × 3–4 cm, bases not narrowed, apices long acuminate, undulate or subentire; basal lobes falcate-lanceolate, 5–6 × 2–3 cm, bases rounded-cuneate, apices long acuminate, entire. Veinlets forming subhexagonal areoles, raised on both surfaces, hairy, included veinlets forked. Sori rather large, close to lateral veins, locate at coupling veinlets of areoles, in 2 regular rows between adjacent lateral veins; indusia brown, clypeate, membranous, entire, slightly involute, persistent.

Forests on limestone. Guangxi, Taiwan [Myanmar, Vietnam].

Tectaria subpedata was treated as a synonym of *T. polymorpha* by Holttum (*Fl. Males.*, Ser. 2, 2: 87. 1991). We have not seen the type from Taiwan, but we checked the specimens from Guangxi in IBSC. These specimens are obviously different from *T. polymorpha* in the size and location of sori, and the rhizome of *T. polymorpha* is never creeping, which is usually the case in *T. subpedata*.

30. *Tectaria subsageniacea* (Christ) Christenhusz, *Phytotaxa* 10: 59. 2010.

无盖轴脉蕨 wu gai zhou mai jue

Aspidium subsageniaceum Christ, *Bull. Acad. Int. Géogr. Bot.* 16: 240. 1906; *Ctenitopsis austrosinensis* (Christ) C. Christensen & Tardieu; *C. subsageniacea* (Christ) Ching; *Dryopteris austrosinensis* Christ; *D. subsageniacea* (Christ) C. Christensen; *Heterogonium austrosinense* (Christ) Tagawa; *H. subsageniaceum* (Christ) Holttum; *Tectaria austrosinensis* (Christ) C. Christensen.

Plants terrestrial, 150–200 cm tall. Rhizome erect, short, 2–2.5 cm in diam., densely scaly at apex and stipe bases; scales dark brown, broadly lanceolate, 10–12 mm, membranous, entire, apices long acuminate. Fronds clustered; stipe deep brown, glossy, 40–50 cm, ca. 1 cm in diam. at base, grooved above, with sparse broadly lanceolate brown scales upward. Lamina brown when dried, oblong, gradually narrowed toward apex, 100–150 × 30–45 cm, herbaceous, both surfaces glabrous, margins ciliate on teeth; rachises deep brown, with sparse linear scales adaxially, densely clothed with articulate brown hairs abaxially; costae and main veins densely clothed with articulate brown hairs adaxially, glabrescent abaxially; bases subcuneate, apices acuminate, bipinnatifid; pinnules ca. 20 pairs, alternate, applanate, subsessile, linear-lanceolate, middle pinnules 18–22 × 3–4 cm, pinnatipartite to 2/3, basal 2 or 3 pairs of pinnules slightly shortened and deflexed; lobes ca. 20 pairs, subapplanate, interval 2–3 mm, falcate-oblong, 1–1.5 × 7–8 mm, entire, obtuse or mucronate. Veins pinnate, 7–9 pairs, free or connected with veinlets from costa. Sori orbicular to elliptic, at middle of veinlets, in 2 irregular rows beside main veins, exindusiate.

Limestone gaps in dense forests; 100–1500 m. Guangxi, Guizhou, Yunnan [N Vietnam].

31. *Tectaria subtriphylla* (Hooker & Arnott) Copeland, *Philipp. J. Sci.*, C, 2: 410. 1907.

三叉蕨 san cha jue

Polypodium subtriphyllum Hooker & Arnott, *Bot. Beechey Voy.* 256. 1838; *Aspidium hokutense* Hayata; *A. subtriphyllum* (Hooker & Arnott) Hooker; *Lenda subtriphylla* (Hooker & Arnott) Koidzumi; *Nephrodium subtriphyllum* (Hooker & Arnott) Baker; *Sagenia subtriphylla* (Hooker & Arnott) Beddome.

Plants terrestrial, 20–70 cm tall. Rhizome long creeping or ascendant, stout, densely scaly at apex and stipe bases; scales stiff, dark brown, linear-lanceolate, 3–4 mm, membranous, bases rounded or cordate, entire, apices long acuminate. Fronds widely spaced; stipe dark stramineous, 10–40 cm, ca. 3 mm in diam. at base, covered throughout with light brown jointed hairs. Laminae subdimorphic, fertile fronds rather tall but narrowed, pinnate to bipinnatifid at base, deep green when dried, triangular-pentagonal, 10–35 × 10–25 cm, papery, both surfaces glabrescent to densely hairy; rachises stramineous, densely covered with articulate hairs; costae and costules raised on both surfaces, pubescent abaxially; terminal pinna trifurcate or acuminate, base cordate or cuneate to decurrent, terminal lobe ovate-lanceolate, pinnatifid or pinnate-lacerate, lateral lobes

opposite, lanceolate, undulate, apices caudate; lateral pinnae 1–3 pairs, opposite, interval 1.5–3 cm, oblique; basal pinnae pinnate, ca. 15 cm, rather large, stalks 1–2 cm, lobes undulate or with orbicular segments; middle pinnae simple, becoming sessile upward, entire, undulate or with orbicular segments, broadly lanceolate, 10–12 cm, bases cordate, apices caudate. Veinlets forming subhexagonal areoles with cross veins, included veinlets forked. Sori small, orbicular, located at coupling veinlets, in irregular rows between adjacent main veins; indusia brown, reniform, small, deciduous.

Dense forests, near streams; below 700 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [India, Indonesia, Japan (Ryukyu Islands), Myanmar, Sri Lanka, Thailand, Vietnam; Pacific islands (Polynesia)].

A hairier form of *Tectaria subtriphylla* is found on limestone rocks in Hainan (Changjiang, Danxian, San Ya).

32. *Tectaria variabilis* Tardieu & Ching in Lecomte, Notul. Syst. (Paris) 5(2): 81. 1936.

多变叉蕨 duo bian cha jue

Plants terrestrial, 50–60 cm tall. Rhizome long creeping, ca. 0.5 cm in diam., scaly at apex and stipe bases; scales light brown, linear-lanceolate, 4–5 mm, membranous, entire, apices acuminate. Fronds subclustered; stipe stramineous, 30–35 cm, ca. 3 mm in diam., glabrous, not winged. Lamina simple or odd-pinnate, light brown when dried, deltoid, 20–25 × 10–15 cm, papery, both surfaces glabrous; rachises, costae, and lateral veins stramineous, glabrous, raised on both surfaces; terminal pinna lanceolate, ca. 20 × 5–10 cm, stalks ca. 2 cm, base decurrent, apex long acuminate, subentire; lateral pinnae 1 or 2 pairs, opposite, oblique, sessile, without gemmae, ovate-lanceolate, lateral pinnae 1 or 2 pairs, opposite, upward, interval 2–3 cm, stalks 3–5 mm, lanceolate, 15–17 × 2–4 cm, bases cuneate, apices caudate, entire. Veinlets forming inconspicuous subhexagonal areoles, included veinlets simple or forked. Sori orbicular, on anastomosing veins, in 2 or 3 irregular rows between lateral veins; indusia light brown, reniform, membranous, entire, persistent.

On rocks in dense forests; ca. 300 m. Hainan (Baoting) [N Vietnam].

33. *Tectaria vasta* (Blume) Copeland, Philipp. J. Sci., C, 2: 411. 1907.

翅柄叉蕨 chi bing cha jue

Aspidium vastum Blume, Enum. Pl. Javae 2: 142. 1828; *A. alatum* Hooker & Greville; *Sagenia alata* (Hooker & Greville) Beddome; *S. vasta* (Blume) T. Moore; *Tectaria decurrentialata* Ching & Chu H. Wang.

Plants terrestrial, 60–150 cm tall. Rhizome erect or suberect. Stipes clustered, densely scaly at base; scales deep stramineous to brown, dark brown, broadly lanceolate, 40–45 cm, ca. 1 cm in diam., membranous, with light brown articulate hairs, broadly winged nearly to base, entire, apices acuminate. Lamina odd-pinnatifid, deep green when dried, oblong, 30–60 × 30–35 cm, thinly herbaceous, both surfaces glabrous; rachises and costae stramineous, glabrous adaxially, slightly pu-

bescent abaxially; terminal lobe ovate-lanceolate, 25–30 × ca. 10 cm, base narrowed and decurrent to broad wings along entire rachis, apex acuminate, undulate to toothed, sessile; lateral lobes 1–4 pairs, homomorphic but smaller, opposite, oblique upward, sessile, without gemmae, broadly lanceolate, ca. 20 × 8 cm, bases narrowed and adnate to rachis, apices caudate, subentire or undulate, basal lobes lobed to form smaller lanceolate lobes. Veinlets forming conspicuous subhexagonal areoles, included veinlets forked, glabrous on both sides. Sori orbicular, on anastomosing veins, in irregular rows between lateral veins; indusia brown, orbicular, membranous, caducous.

Near streams in dense forests; 600–800 m. Yunnan (Cangyuan, Jinping, Lüchun) [N India, Indonesia, Malaysia, Thailand].

34. *Tectaria yunnanensis* (Baker) Ching, Sinensia 2: 24. 1931.

云南叉蕨 yun nan cha jue

Nephrodium yunnanense Baker, Bull. Misc. Inform. Kew 1906: 11. 1906; *Aspidium anastomosans* (Hayata) Hayata; *A. yunnanense* (Baker) Christ (1909), not Christ (1898); *Dryopteris anastomosans* Hayata; *Tectaria anastomosans* (Hayata) C. Christensen.

Plants terrestrial, 1.5–2.55 m tall. Rhizome ascending, short, stout, densely scaly at apex and stipe bases; scales stiff, dark brown to castaneous, linear-lanceolate, entire, apices long acuminate. Stipes clustered, castaneous, glossy, 60–80 cm, 0.7–0.8 cm in diam. at base, glabrous. Lamina pinnatifid, dark green when dried, deltoid, 60–80 × ca. 50 cm, papery, base broadly cuneate, apex acuminate; rachises castaneous, glabrous adaxially and pubescent abaxially, with broad wings upward, costae and midvein castaneous to brown, with brown articulate hairs on both sides; pinnae 4–6 pairs, oblique, lower pinnae opposite, upper pinnae alternate, interval 6–8 cm; basal pinnae 30–35 cm, deltoid, stalks 4–5 cm, pinnatifid to broad wings along costae, lobes 8–10 pairs, sometimes with a pair of separate lobes, sessile, falcate-lanceolate, entire or undulate, 10–12 × 3–4 cm, alternate, interval ca. 1 cm; lateral pinnae broadly lanceolate, sessile, 25–30 × 7–8 cm, bases narrowed, apices acuminate, pinnatifid to broad wings along costae and forming falcate-lanceolate acute lobes, lower lobes decurrent and adnate to rachis. Veinlets forming copious subhexagonal areoles, included veinlets forked. Sori orbicular, terminal on veinlets, regularly beside main veins, near to main veins; indusia brown, orbicular, membranous, entire, often revolute, persistent.

Near streams in dense forests; 100–1400 m. Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [NE Vietnam].

Tectaria yunnanensis is similar to *T. dubia*, but it differs in the scaliness and color of the stipes and the lamina division.

35. *Tectaria zeilanica* (Houttuyn) Sledge, Kew Bull. 27: 422. 1972.

地耳蕨 di er jue

Ophioglossum zeilanicum Houttuyn, Nat. Hist. 14: 43. 1783; *Acrostichum quercifolium* Retzius; *Gymnopteris quercifolia* (Retzius) Bernhardt; *Leptochilus zeilanicus* (Houttuyn) C. Christensen; *Quercifilix zeilanica* (Houttuyn) Copeland.

Plants terrestrial, 10–20 cm tall. Rhizome ascending to

long creeping, slender, 2–3 mm in diam., densely scaly; scales brown, glossy, lanceolate, ca. 3 mm, membranous, margins ciliate, apices fibriform. Fronds distant, interval 5–10 mm, obviously dimorphic; sterile fronds usually in rosette, not erect; stipe dark stramineous, 3–8 cm, slender, ca. 1.5 mm in diam. at base, grooved above, densely scaly at base; densely hairy throughout with long brown articulate hairs. Lamina green, triangular-ovate, 6–9 × 2.5–3.5 cm, herbaceous, hairy abaxially and along margins, base cordate to hastate, apex obtuse, undulate, trifoliolate to pinnatifid, usually with 1 pair of separate pinnae; rachises and costae stramineous, hairy; costae and main veins stramineous, glabrous adaxially, hairy abaxially; lateral pinnae opposite, applanate, sessile or shortly stalked, triangular, 1–2.5 × 1–2 cm, bases rounded cuneate to subcordate, asymmetrical, apices rounded, margins subentire or slightly undulate, sometimes bearing auricles basiscopically at base; terminal pinna oblong, base broadly cuneate, apex rounded, lobed at margins to 1/3 toward costa, lobes rounded-subdeltoid, entire. Fertile fronds erect; stipe slender, 20–25 cm, very sparsely scaly or glabrescent; lamina trifoliolate, very contracted; terminal pinna linear, 50–70 × 2–3 mm, stalk ca. 1 cm, base cuneate, apex

obtuse, margins undulate or lobed; lateral pinnae opposite, oblique, shortly stalked, linear, 10–20 × 2–3 mm, bases bearing short lobe basiscopically, apices obtuse, margins undulate. Veins anastomosing, forming copious areoles, with or without included veinlets, these simple or forked. Sori orbicular, anastomosing in line, throughout abaxial surface when mature, exindusiate.

On muddy rocks in forests, near streams, on steep banks; 100–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [S India, Indonesia, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Indian Ocean islands (Mauritius), Pacific islands (Polynesia)].

The unusual spelling "*zeilanica*" is published as such and is to be maintained. It should not be corrected into the more common "*zeylanica*" or "*ceylanica*." *Tectaria zeilanica* was previously most commonly treated as the separate monotypic genus *Quercifilix*, but molecular evidence shows that this genus is embedded within the greater *Tectaria* clade. The species is easily recognized by its small size, its coarsely crenate sterile leaves (that somewhat resemble those of *Quercus*, hence the name), and its trifoliolate, strongly contracted fertile leaves, with anastomosing sori that cover the entire lower side of the lamina when mature.