

PTERIDACEAE

凤尾蕨科 feng wei jue ke

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Plants mostly terrestrial or epilithic, some epiphytic, rarely aquatic (*Ceratopteris*), small to large. Rhizomes erect, ascending, or creeping, siphonostelic, solenostelic, or dictyostelic, usually scaly, rarely with bristles; scales brown or black, sometimes clathrate and iridescent, lanceolate to cordate, sometimes peltate, margin usually entire. Fronds mostly monomorphic, less often dimorphic or subdimorphic, clustered to widely scattered, not articulate; stipe well defined, dark, often glossy, to ill defined and green, terete or adaxially grooved, glabrous, hairy, or scaly, with 1–4 vascular bundles (or to many in *Ceratopteris*) near base, combining distally; lamina entire or 1–4-pinnate to 5-pinnate-pinnatifid, less often digitate, pedate, or 1–3 dichotomous with pedate branches; ultimate pinnules often stalked, sometimes articulate, herbaceous, papery, or leathery, more rarely membranous or fleshy; veins free or anastomosing, if anastomosing then areoles without free included veinlets. Sori mostly confluent along veins or marginal commissures, sometimes immersed in grooves, less often discrete on vein tips or on recurved membranous marginal lobe (false indusium), sometimes acrostichoid or rarely forming a narrow longitudinal band between midrib and margin (*Taenitis*); true indusium absent, marginal sori often protected by false indusium formed from revolute lamina margin. Sporangia usually long stalked, annulus vertical or rarely oblique, interrupted by stalk. Spores mostly brown, yellowish, or colorless, mostly tetrahedral-globose and trilete, rarely ellipsoid and monolete, smooth or ornamented, sometimes with an equatorial flange. Mostly $x = 29, 30$.

About 50 genera and 950 species: subcosmopolitan, but most numerous in tropics and arid regions; 20 genera and 233 species (89 endemic, one introduced) in five subfamilies in China.

Ching Ren-chang, Fu Shu-hsia, Wang Chu-hao & Shing Gung-hsia. 1959. *Taenitis*. In: Ching Ren-chang, ed., *Fl. Reipubl. Popularis Sin.* 2: 279–280; Lin Youxing. 1990. Adiantaceae and Parkeriaceae. In: Ching Renchang & Shing Kunghsia, eds., *Fl. Reipubl. Popularis Sin.* 3(1): 173–216, 274–278; Shing Kunghsia. 1990. Acrostichaceae and Hemionitidaceae. In: Ching Renchang & Shing Kunghsia, eds., *Fl. Reipubl. Popularis Sin.* 3(1): 92–94, 216–274, 279; Shing Kunghsia & Wu Sukung. 1990. Sinopteridaceae (excluding *Cheilosoria* and *Notholaena*). In: Ching Renchang & Shing Kunghsia, eds., *Fl. Reipubl. Popularis Sin.* 3(1): 97–173; Wu Shiewhung. 1990. Pteridaceae (excluding *Histiopteris*). In: Ching Renchang & Shing Kunghsia, eds., *Fl. Reipubl. Popularis Sin.* 3(1): 10–89; Zhang Xian-chun. 1999. Antrophyaceae and Vittariaceae. In: Chu Wei-ming, ed., *Fl. Reipubl. Popularis Sin.* 3(2): 1–31.

1a. Sporangia along veins or over most of abaxial surface of lamina.

2a. Lamina simple, entire.

3a. Plants terrestrial; base of lamina cordate or hastate, stipe clearly differentiated 15. *Parahemionitis*

3b. Plants epiphytic or epilithic; base of lamina tapered, merging gradually into poorly differentiated stipe.

4a. Fronds obovate to oblanceolate, widest above middle, rarely linear, costa absent or only at lower part; sori multiseriate along veins, in grooves along veins on abaxial surface of lamina, rarely one row on each side; spores monolete 18. *Antrophyum*

4b. Fronds filiform to linear or ribbonlike, rarely lanceolate, costa distinct up to apex or upper part; sori biseriate or uniseriate, in marginal or submarginal grooves, rarely superficial, or along costa; spores trilete or monolete.

5a. Sori biseriate in marginal or submarginal grooves, rarely superficial; spores monolete 19. *Haplopteris*

5b. Sori uniseriate, 1–3 along costa or on lateral veins, immersed; spores trilete 20. *Monogramma*

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- 2b. Lamina 1–3-pinnate.
- 6a. Lamina with white or yellow farina on abaxial surface 8. *Pityrogramma*
- 6b. Lamina lacking white or yellow farina on abaxial surface.
- 7a. Stipe distally densely villous; plants of dry situations 16. *Paragymnopteris*
- 7b. Stipe distally glabrous; plants of mesic to wet situations.
- 8a. Fronds to 15 cm; plants annual, usually with persistent gametophyte at base 6. *Anogramma*
- 8b. Fronds 30 to >100 cm; plants perennial, without persistent gametophyte.
- 9a. Veins free or rarely anastomosing near costa, then free; sori borne along veins; inland forests at up to 2800(–3600) m 1. *Coniogramme*
- 9b. Veins anastomosing; sporangia scattered on whole of abaxial lamina surface; coastal areas below 100 m, often in mangrove swamps 3. *Acrostichum*
- 1b. Sporangia in discrete sori, usually near lamina margin.
- 10a. Plants succulent, aquatic 4. *Ceratopteris*
- 10b. Plants terrestrial, epiphytic, or epilithic, not succulent.
- 11a. Rhizome covered with bristles; sori linear and forming a narrow longitudinal band between midrib and margin 7. *Taenitis*
- 11b. Rhizome covered with scales; sori borne at ends of veins or on a marginal commissure.
- 12a. Lamina with white or yellow farina on abaxial surface 14. *Aleuritopteris*
- 12b. Lamina lacking white or yellow farina on abaxial surface at maturity (sometimes farinose when young).
- 13a. Pinnules obviously stalked, often articulate (rarely frond reduced to single orbicular to reniform pinnule); stipe and rachis slender, glossy black or reddish brown.
- 14a. Sporangia protected by reflexed marginal lobes; veins pinnate, often obscure; pinnules mostly hastate to ovate-hastate 12. *Pellaea*
- 14b. Sporangia borne on reflexed marginal lobes; veins simple or dichotomously forked, often radiate, pinnule without costule; pinnules ovate, flabellate, orbicular-flabellate, or dimidiate 17. *Adiantum*
- 13b. Pinnules sessile or obscurely stalked, never articulate, often pinnatifid; stipe and rachis often not dark and glossy.
- 15a. Lamina pentagonal in outline (i.e., proximal basiscopic pinnules of basal pinnae enlarged).
- 16a. Sori borne at vein tips, rounded, separate (confluent when mature); rhizome scales brown or dark brown, concolorous or with narrow lighter brownish margins 14. *Aleuritopteris*
- 16b. Sori borne along marginal commissural vein, linear; rhizome scales bicolored, with black and thick central band, broad brownish and membranous margins.
- 17a. Rhizomes long creeping; fronds mostly widely spaced 10. *Calciphilopteris*
- 17b. Rhizomes short, erect or ascending; fronds clustered 11. *Doryopteris*
- 15b. Lamina lanceolate, oblong-lanceolate, or oblong-triangular to deltoid-lanceolate or deltoid-ovate in outline.
- 18a. Ultimate segments or lobes 1–2 mm wide.
- 19a. Fertile fronds 4–7 cm; rhizome usually short, often erect, with clustered fronds (rhizome long creeping, with widely spaced fronds in *Cryptogramma stelleri*) 2. *Cryptogramma*
- 19b. Fertile fronds (7–)15–60 cm; rhizome often long creeping, with widely spaced fronds 9. *Onychium*
- 18b. Ultimate segments or lobes larger, usually more than 5 mm wide.
- 20a. Sporangia continuous along most of length of pinnae along commissural vein; pinnae entire or pectinately divided into segments, sometimes asymmetrical 5. *Pteris*
- 20b. Sporangia in discrete sori at veins tips at least when young, sometimes later confluent; pinnae pinnatifid, variously shaped but symmetrical and not pectinate.
- 21a. Lamina margins not or only slightly reflexed, indusia absent; lamina with dense, yellow to brownish, long hairs abaxially 13. *Cheilanthes*
- 21b. Lamina margins reflexed and modified, forming scarious false indusia; lamina glabrous or relatively sparsely hairy (in a few species also glandular and/or scaly) abaxially.

- 22a. Scales of rhizome lanceolate or linear-lanceolate, usually black or dark brown, with an entire margin 13. *Cheilanthes*
 22b. Scales of rhizome ovate-lanceolate, brown, semihyaline, with a sparsely serrate margin 14. *Aleuritopteris*

1. Subfam. CRYPTOGRAMMOIDEAE

珠蕨亚科 zhu jue ya ke

Zhang Gangmin (张钢民); Tom A. Ranker, Edward R. Alverson, Jordan S. Metzgar

Plants terrestrial or on rocks, small (*Cryptogramma*) or large (*Coniogramme*). Rhizomes erect or creeping, scaly; scales colorless or brownish. Fronds monomorphic (*Coniogramme*) or dimorphic (*Cryptogramma*), distant, closely spaced, or clustered; stipe usually straw-colored, with a vascular bundle near base, adaxially sulcate; lamina 1- or 2-imparipinnate, with an odd terminal segment, or 2–4-pinnate. Veins free or rarely anastomosing near midrib, vein tips enlarged forming hydathodes. Sori along veins, exindusiate; or sori borne at vein tips, covered by a modified marginal indusium. Spores tetrahedral-globose, with prominent angles. $x = 30$.

Three genera and ca. 40 species: worldwide; two genera and 25 species (11 endemic) in China.

1. CONIOGRAMME Fée, Mém. Foug. 5: 167. 1852, nom. cons.

凤了蕨属 feng liao jue shu

Zhang Gangmin (张钢民); Tom A. Ranker

Dictyogramme Fée, nom. rej.

Plants terrestrial. Rhizomes decumbent or creeping, sparsely scaly; scales brown, lanceolate, margin entire. Fronds monomorphic, distant or closely spaced; stipe straw-colored or with brown spots, or chestnut-brown, glabrous distally, with a single U-shaped vascular bundle; lamina 1- or 2-imparipinnate, rarely trifoliate or 3-pinnate, sometimes entire in juvenile plants, usually herbaceous to papery, glabrous or with hairs on one or both surfaces. Pinnae usually ca. 5 pairs, stalked; in 1-pinnate species terminal pinna same as lateral pinnae; if 2-pinnate then only proximal pinnae imparipinnate or trifoliate (occasionally basal pair only bifurcate), and terminal pinna same as terminal pinnules of proximal pinnae. Pinnules (or distal simple pinnae) lanceolate or oblong-lanceolate, base rounded to cuneate, rarely cordate, margin entire or serrate. Veins free or rarely anastomosing near midrib, then free, vein tips enlarged forming hydathodes. Indusia absent. Sori along veins, intermixed with short, hairy paraphyses. Spores tetrahedral, plain. $x = 30$.

About 25–30 species: Africa, E and SE Asia, North America; 22 species (11 endemic) in China.

Morphologically, the species in the genus *Coniogramme* are poorly differentiated. Intermediate individuals exist in some groups, increasing the difficulty of discriminating species. On Emei Shan of Sichuan Province, juvenile plants of some species have simple, lanceolate, or trifoliate to 1-pinnate fronds, and only after several years of development are the fronds 2- or 3-pinnate. The stipe color is also variable, even in the same plant; some stipes are entirely green, and others have brownish purple spots abaxially. The following characters generally seem to be stable: glabrous or hairy lamina surfaces, hair form (jointed hairs or seta), lamina margin (entire or serrate), and the shape and location of the hydathodes (far from the tooth at lamina margin, extending into the teeth, or even fusing with the cartilaginous tooth margin). Further fieldwork and cytological study of the genus are still needed.

The fiddlehead of the species of *Coniogramme* is an edible vegetable, and the rhizome is known to store starch.

- 1a. Veins anastomosing to form at least some areoles on each side of midrib.
 2a. Veins anastomosing regularly to form 1 or 2(or 3) continuous rows of areoles on each side of midrib 22. *C. japonica*
 2b. Veins anastomosing irregularly to form 1 discontinuous row of areoles on each side of midrib, occasionally with only 1 or 2 areoles on each side.
 3a. Veins forming a discontinuous row of areoles on each side of midrib; stipe straw-colored 21. *C. wilsonii*
 3b. Veins forming only 1 or 2 areoles on each side of midrib; stipe chestnut-colored.
 4a. Pinnules lanceolate, broadest at base, base rounded; hydathodes linear; Yunnan 19. *C. fauriei*
 4b. Pinnules elliptic, broadest at middle, base cuneate; hydathodes shortly clavate; Fujian, Guizhou, Hunan, Jiangxi, Zhejiang 20. *C. jinggangshanensis*
 1b. Veins all free.
 5a. Margins of pinnules entire or at most undulate (*C. fraxinea* s.l.).
 6a. Hydathodes extending to cartilaginous lamina margin, margins often undulate and revolute when dry 4. *C. merrillii*
 6b. Hydathodes spindle-shaped, not extending to lamina margin.
 7a. Base of pinnules rounded or slightly cordate 1. *C. petelotii*
 7b. Base of pinnules cuneate or rounded-cuneate.

- 8a. Stipe and rachis abaxially straw-colored 2. *C. fraxinea*
 8b. Stipe and rachis abaxially reddish purple 3. *C. rubicaulis*
- 5b. Margins of pinnules serrate or with irregular short obtuse teeth.
 9a. Hydathodes usually not extending to base of marginal tooth.
 10a. Lamina 1-pinnate; stipe and rachis usually dark brown to purplish black 5. *C. robusta*
 10b. Lamina 2-pinnate; stipe and rachis straw-colored.
 11a. Pinnules abaxially shortly hairy, apex caudate 6. *C. serrulata*
 11b. Pinnules abaxially glabrous, apex acuminate 7. *C. venusta*
- 9b. Hydathodes extending into marginal tooth or to tooth base.
 12a. Pinnules abaxially papillose, each papilla tipped with a short and stiff hair 8. *C. rosthornii*
 12b. Pinnules abaxially not papillose, glabrous or pubescent with hairs curved and flat.
 13a. Lamina 3-pinnate in mature plants, lowermost pinnae 2-pinnate.
 14a. Lamina with middle pinnules broadly lanceolate, widest at base, at ca. 90° to costae 9. *C. procera*
 14b. Lamina with middle pinnules narrowly oblong-lanceolate, sides subparallel;
 pinnules oblique 10. *C. affinis*
- 13b. Lamina 1- or 2-pinnate, lowermost pinnae simple pinnules or pinnate, never 2-pinnate.
 15a. Pinnules lanceolate or oblanceolate; hydathodes extending into teeth and close to
 or fusing with tooth margin.
 16a. Pinnules lanceolate or oblanceolate, base narrowly cuneate, apex abruptly
 caudate; hydathodes fusing with cartilaginous tooth margin 17. *C. pubescens*
 16b. Pinnules lanceolate, base rounded to rounded-cuneate, apex long acuminate
 or caudate-acuminate; hydathodes extending into teeth or close to tooth margin.
 17a. Teeth of pinnule margin dense, sharp, and fine; hydathodes slightly
 thicker than veins, extending to tips of teeth and fused with teeth 10. *C. affinis*
 17b. Teeth of pinnule margin coarse, spreading; hydathodes twice as thick as
 veins, extending into teeth or close to tooth margin 18. *C. intermedia*
- 15b. Pinnules often broadly lanceolate to oblong; hydathodes extending to tooth base
 or slightly into teeth.
 18a. Pinnules abaxially glabrous.
 19a. Pinnules ovate or ovate-oblong; hydathodes extending slightly into teeth 13. *C. ovata*
 19b. Pinnules broadly lanceolate; hydathodes extending to tooth base.
 20a. Pinnules straight 11. *C. emeiensis*
 20b. Pinnules arcuate or falcate 12. *C. falcipinna*
- 18b. Pinnules abaxially hairy.
 21a. Stipe and rachis reddish purple 14. *C. sinensis*
 21b. Stipe and rachis straw-colored or purplish brown proximally.
 22a. Pinnules adaxially with short and sunken jointed hairs 15. *C. suprapilosa*
 22b. Pinnules adaxially glabrous 16. *C. caudiformis*

1. *Coniogramme petelotii* Tardieu, Bull. Mus. Natl. Hist. Nat., sér. 2, 5: 334. 1933.

心基凤了蕨 xin ji feng liao jue

Coniogramme subcordata Ching, Bull. Fan Mem. Inst. Biol. 2: 213. 1931, not Copeland (1910), nor Maxon (1913).

Plants 30–50 cm tall. Rhizomes long creeping; scales brownish, narrowly lanceolate. Fronds closely spaced; stipe straw-colored, 10–40 cm × 2–4 mm; lamina dark green, ovate or narrowly ovate, nearly as long as stipe, 10–25 cm wide, trifoliolate or 1-pinnate, thinly papery or herbaceous when dry, both surfaces glabrous or nearly so. Lateral pinnae 2–5 pairs, oblong or oblong-lanceolate, 16–28 × 5–7 cm, with stalks 3–5 mm, base slightly cordate or broadly rounded, margin entire, apex shortly caudate; terminal pinna larger than lateral ones, with long stalk ca. 4 cm. Veins distinct abaxially, lateral veins 2-forked, oblique; hydathodes spindle-shaped, far from lamina margin. Sori extending to 2/3–3/4 of veins.

Rock cliffs in dense forests; 700–1400 m. Yunnan [Vietnam].

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 135. 2008) included *Coniogramme petelotii* within the following species, *C. fraxinea*.

2. *Coniogramme fraxinea* (D. Don) Fée ex Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 262. 1899.

全缘凤了蕨 quan yuan feng liao jue

Diplazium fraxineum D. Don, Prodr. Fl. Nepal. 12. 1825; *Coniogramme caudata* Ching; *C. fraxinea* f. *connexa* Ching; *C. gigantea* Ching; *C. javanica* (Blume) Fée; *Gymnogramma fraxinea* (D. Don) Beddome; *G. javanica* Blume; *Neurogramma fraxinea* (D. Don) Christ; *Syngramma fraxinea* (D. Don) Beddome.

Plants up to 2.5 m tall. Rhizomes stout, shortly creeping; scales dark brown, narrowly lanceolate. Fronds scattered; stipe straw-colored, 90–100 × 0.5–1 cm; lamina narrowly ovate or ovate-oblong, 80–150 × 40–50 cm, pinnate or sometimes 2-pinnate, papery, thin, both surfaces glabrous or sometimes with sparse short hairs abaxially. Pinnae 6–12 pairs; basal pair sim-

ple or pinnate, pinnules broadly lanceolate, broadly oblanceolate, or oblong-lanceolate, stalked, base cuneate to rounded, margin entire or occasionally undulate with narrow, colorless, membranous side, apex abruptly caudate. Veins distinct on both surfaces, 2-forked; hydathodes much enlarged, spindle-shaped, not extending to lamina margin. Sori extending to 2/3–4/5 of veins.

Evergreen forests; 800–2000 m. Taiwan, SE Xizang (Médog), Yunnan [India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Vietnam].

3. *Coniogramme rubicaulis* Ching in K. H. Shing, Acta Bot. Yunnan. 3: 219. 1981.

紫杆凤了蕨 *zi gan feng liao jue*

Plants up to 1.5 m tall. Stipe reddish purple, 60–70 × ca. 1 cm, with sparse dark brown, broadly lanceolate scales proximally, glabrous distally, rounded abaxially, grooved adaxially; lamina brownish green when dry, ovate-deltoid, 80–90 × ca. 40 cm, 2-pinnate, herbaceous, thin, both surfaces glabrous; rachis and part of costae reddish purple. Pinnae 8–10 pairs; proximal pinnae ca. 30 × 12–15 cm, with stalks 3–3.5 cm. Pinnules 3–5 pairs, ovate-lanceolate, basal pair 8–10 × ca. 3.5 cm, sessile, slightly decurrent, base broadly rounded, apex acuminate or caudate-acuminate; terminal pinnule ca. 15 × 3.5–5 cm, long stalked, stalk 2–3 cm, base rounded-cuneate, apex caudate-acuminate. Simple pinnae and pinnules entire along margins. Veins distinct, 2-forked; hydathodes much enlarged, not extending to lamina margin. Sori extending to 3/4 of veins.

- Forests in deep valleys; below 800 m. N Guangxi.

Coniogramme rubicaulis resembles *C. fraxinea* but differs by its reddish purple (not straw-colored) stipe and rachis. More research is needed to clarify their relationship.

4. *Coniogramme merrillii* Ching, Sinensia 1: 49. 1930.

海南凤了蕨 *hai nan feng liao jue*

Coniogramme fraxinea (D. Don) Diels var. *coriacea* Merrill; *C. lanceolata* Ching.

Plants up to 1 m tall. Rhizomes decumbent, stout; scales broadly lanceolate. Stipe straw-colored or dark straw-colored, 20–50 cm × 3–8 mm, abaxially rounded, adaxially grooved; lamina ovate-oblong, 50–70 × 30–40 cm, 1-pinnate (sometimes basal pair of pinnae bifurcate), papery or thickly leathery when dry, both surfaces glabrous or sparsely pubescent abaxially. Pinnae 5–8 pairs, broadly lanceolate, broadly oblanceolate, or oblong, 20–35 × 3–5 cm, stalked, base cuneate or rounded-cuneate, margin entire, with cartilaginous sides, often undulate and revolute when dry, apex acuminate or caudate-acuminate. Veins distinct, 2-forked; hydathodes much enlarged, extending to cartilaginous lamina margin. Sori extending nearly to vein tips.

Forests in valleys; below 1400 m. Hainan, W Yunnan [NE India, Indonesia, Nepal, Philippines].

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 135. 2008) included *Coniogramme merrillii* and *C. lanceolata* within *C. fraxinea*.

5. *Coniogramme robusta* (Christ) Christ, Bull. Acad. Int. Géogr. Bot. 19: 175. 1909.

黑轴凤了蕨 *hei zhou feng liao jue*

Plants 50–80 cm tall. Rhizomes creeping, 3–5 mm in diam.; scales brown, lanceolate. Fronds scattered; stipe purplish black, lustrous, 25–40 cm × 2–3 mm, abaxially rounded, adaxially grooved; lamina oblong or broadly ovate, nearly as long as stipe, 15–40 cm wide, 1-pinnate, herbaceous or papery when dry, both surfaces glabrous; rachis and costae purplish black, brown, or straw-colored abaxially, usually lustrous. Pinnae 2–4 pairs, nearly of same shape and size, oblong or oblong-lanceolate, shortly stalked, base rounded or rounded-cuneate, somewhat unequal, margin with short and obtuse teeth, cartilaginous, apex acuminate-caudate to caudate; terminal pinna slightly larger than lateral pinnae. Veins 1- or 2-forked; hydathodes clavate or ovate, not extending to tooth base. Sori extending to bases of hydathodes.

- Forests in valleys, shaded places by roadsides; 600–1500 m. Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan.

- 1a. Rachis and costae purplish black abaxially 5a. var. *robusta*
- 1b. Rachis and costae brown or straw-colored.
 - 2a. Stipe, rachis, and costae straw-colored abaxially 5b. var. *repundula*
 - 2b. Stipe and rachis brown; costae straw-colored or sometimes brown proximally 5c. var. *splendens*

5a. *Coniogramme robusta* var. *robusta*

黑轴凤了蕨(原变种) *hei zhou feng liao jue* (yuan bian zhong)

Gymnogramma javanica Blume var. *robusta* Christ, Bull. Acad. Int. Géogr. Bot. 11: 202. 1902; *Coniogramme neorobusta* Ching & K. H. Shing; *C. pseudorobusta* Ching & K. H. Shing.

Stipe, rachis, and costae purplish black abaxially.

- Forests in valleys; 700–1000 m. Guangxi, Guizhou, Hunan.

5b. *Coniogramme robusta* var. *repundula* Ching & K. H. Shing, var. **nov.**

黄轴凤了蕨 *huang zhou feng liao jue*

Type: China. Jiangxi: without locality, *Xiong Yao-guo* 06276 (holotype, PE).

Validating Latin diagnosis: that of “*Coniogramme robusta* var. *repundula* Ching et Shing” (Ching & K. H. Shing, Fl. Reipubl. Popularis Sin. 3(1): 279. 1990).

Stipe, rachis, and costae straw-colored abaxially.

- Valleys, shaded places by roadsides; below 800 m. Guizhou (Duyun), Jiangxi.

This name was not validly published by Ching and K. H. Shing in 1990 because the herbarium in which the type is conserved was not specified (*Melbourne Code*, Art. 40.7).

5c. *Coniogramme robusta* var. *splendens* Ching & K. H. Shing in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 17. 1999.

棕轴凤了蕨 *zong zhou feng liao jue*

Stipe and rachis brown; costae straw-colored or sometimes brown (at proximal portion) abaxially.

• Forests; 600–1500 m. Guangdong (Ruyuan), Guizhou, Jiangxi (Wugong Shan), Sichuan (Pingshan).

This name was not validly published by Ching and K. H. Shing in FRPS (3(1): 279. 1990) because the herbarium in which the type is conserved was not specified (*Melbourne Code*, Art. 40.7).

6. *Coniogramme serrulata* (Blume) Fée, *Mém. Foug.* 5: 167. 1852.

澜沧凤了蕨 lan cang feng liao jue

Gymnogramma serrulata Blume, *Enum. Pl. Javae* 2: 113. 1828; *Coniogramme fraxinea* (D. Don) Diels var. *serrulata* (Blume) Alderwerelt; *C. lancangensis* Ching & K. H. Shing.

Plants up to 1 m tall. Rhizomes decumbent, stout and fleshy; scales grayish brown, narrowly lanceolate. Fronds scattered; stipe straw-colored with purple spots, 60–75 cm × ca. 5 mm, abaxially rounded, adaxially grooved; lamina abaxially grayish green, adaxially green, broadly ovate-lanceolate, 55–70 × 22–36 cm, 2-pinnate, herbaceous and wrinkled when dry, abaxially pubescent, adaxially glabrous. Lateral pinnae 5–7 pairs; proximal 1 or 2 pairs of pinnae oblong, 30–35 × ca. 20 cm, with stalks ca. 3 cm, pinnate; medial pinnae trifoliolate or bifurcate, distal pinnae simple. Pinnules lanceolate or oblanceolate, ca. 14 × 3–3.5 cm, stalked (distal ones sessile), base cuneate, apex long caudate (narrowed tip 2–4 cm), margin obviously with sparse short teeth. Veins distinct abaxially, 1- or 2-forked; hydathodes spindle-shaped, far from base of teeth. Sori extending to 2/3 of veins.

Forests; 900–1300 m. SW Yunnan [NE India, Indonesia, Nepal, Philippines].

“*Coniogramme lantsangensis*” in FRPS (3(1): 242. 1990) is an orthographic error for *C. lancangensis*.

7. *Coniogramme venusta* Ching, *Acta Bot. Yunnan.* 3: 222. 1981.

美丽凤了蕨 mei li feng liao jue

Plants 0.7–1.2 m tall. Stipe light straw-colored, 30–50 cm × 1.5–3 mm; lamina deltoid-oblong or oblong, 45–65 × ca. 25 cm, 2-pinnate, herbaceous when dry, both surfaces glabrous. Lateral pinnae 4–7 pairs, basal pair largest, ovate-deltoid, 20–30 × 10–14 cm, with stalk 1.5–3 cm, trifoliolate or pinnate; upper pairs trifoliolate or simple; third pair of pinnae lanceolate, 16–22 × 2.5–3 cm, shortly stalked, base rounded or rounded-cuneate, margin with sparse, short, blunt teeth, apex caudate-acuminate or somewhat acute; terminal pinna larger than adjacent pinnae, often divided with a small segment at base. Pinnules of basal pinnae 1–3 pairs, basal basiscopic pinnule longer, lanceolate, somewhat arcuate, 10–15 × 1.5–2.5 cm, base rounded-cuneate, margin with sparse short teeth, apex caudate-acuminate; terminal pinnule largest. Veins 2-forked; hydathodes spindle-shaped, not extending to base of teeth. Sori extending to 3/4 of veins.

• Mixed woodlands by streams; 1600–2000 m. Yunnan.

Coniogramme venusta is similar to *C. intermedia* var. *glabra*, but its hydathodes are spindle-shaped and do not extend into the teeth.

8. *Coniogramme rosthornii* Hieronymus, *Hedwigia* 57: 307. 1916 [“*rosthorni*”].

乳头凤了蕨 ru tou feng liao jue

Coniogramme rubescens Ching & K. H. Shing; *C. taipai-shanensis* Ching & Y. T. Hsieh.

Plants 60–140 cm tall. Rhizomes long creeping, ca. 5 mm in diam.; scales brown, lanceolate. Fronds widely spaced; stipe straw-colored to reddish purple, 40–85 cm × 2.5–5 mm; lamina abaxially greenish, adaxially brownish green, narrowly ovate or ovate-deltoid, as long as stipe or shorter, 18–26 cm wide, 2-pinnate, herbaceous when dry, abaxially densely papillose, with a short and stiff hair on each papilla, adaxially glabrous or sometimes with a few jointed hairs. Lateral pinnae 3–6 pairs, basal pair of pinnae largest, oblong-lanceolate to broadly ovate, stalked, pinnate; lateral pinnules 1–3 pairs, lanceolate to broadly lanceolate, 6–15 × 1.5–3.5 cm, base rounded-cuneate or subrounded, margin with short, spreading deltoid teeth, apex acuminate or caudate-acuminate. Medial pinnae as terminal pinnule, lanceolate or narrowly lanceolate, 10–20 × 2–4.5 cm, shortly stalked, base rounded-cuneate, margin sharply serrate, apex long acuminate. Veins free; hydathodes slightly thickened, linear, extending to bases of teeth or slightly into teeth. Sori extending nearly to pinna margin.

Forests, rock crevices; 1000–3000 m. Gansu, Guizhou, Henan, Hubei, Shaanxi, Sichuan, Yunnan [Vietnam].

9. *Coniogramme procera* Fée, *Mem. Soc. Sci. Nat. Strasbourg* 6(1): 22. 1865.

直角凤了蕨 zhi jiao feng liao jue

Coniogramme parvipinnula Hayata.

Plants up to 1.8 m tall. Stipe grayish brown proximally, straw-colored distally, 60–90 × 0.5–1 cm; lamina abaxially grayish green, adaxially brownish green, narrowly ovate or ovate-oblong, 60–100 × 40–60 cm, 2-pinnate (sometimes 3-pinnate), papery when dry, both surfaces glabrous; rachis straw-colored or abaxially purple. Pinnae 10–15 pairs; proximal pairs oblong-lanceolate, 30–50 × 15–30 cm, with stalks 2–3 cm, pinnate or sometimes 2-pinnate; pinnules 10–13 pairs, at ca. 90° to costae, proximal pinnules lanceolate, 8–12 × 2–2.5 cm, base rounded-truncate or truncate (sometimes slightly cordate), apex caudate or acuminate; distal pinnules gradually reduced; terminal pinnule larger than adjacent pinnules, base unequal. Supra-medial pinnae smaller, with few pairs of pinnules. Distal pinnae simple, margins serrate, teeth broad, slightly ascending. Hydathodes slender, extending into teeth or only to base of teeth. Sori extending to 1/2–2/3 of veins.

Streamsides in woodlands; 1400–3600 m. Taiwan (Jiayi), S Xizang, NW Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

10. *Coniogramme affinis* (C. Presl) Hieronymus, *Hedwigia* 57: 297. 1916.

尖齿凤了蕨 jian chi feng liao jue

Gymnogramma affinis C. Presl, Tent. Pterid. 218. 1836; *Coniogramme affinis* var. *pilosa* H. S. Kung; *C. argutiserrata* Ching & K. H. Shing.

Plants 60–120 cm tall. Stipe straw-colored, or sometimes brown proximally, 30–70 cm × 3–7 mm; lamina brownish green, narrowly ovate or ovate-oblong, 25–85 × 15–50 cm, 2-pinnate, or 3-pinnate at base (rarely 1-pinnate), thinly herbaceous when dry, both surfaces glabrous or rarely hairy abaxially. Pinnae 5–8 pairs, basal pair ovate or narrowly ovate, 20–35 × 12–20 cm, with stalks 2–3 cm, pinnate (or 2-pinnate with ultimate pinnules 1 or 2 pairs); lateral pinnules 3–6 pairs, lanceolate, 8–15 × 1.5–3 cm, shortly stalked or sessile, base cuneate, rounded-cuneate, or subtruncate, somewhat unequal, apex long acuminate or caudate-acuminate; terminal pinnule larger than lateral pinnules, sometimes bifid. Pinnae of second pair pinnate or trifoliolate. Distal pinnae simple and shortened, lanceolate or broadly lanceolate, 10–17 × 2–3 cm, margins somewhat irregularly serrate, teeth fine and sharp, cartilaginous. Hydathodes slightly thickened, extending to tips of teeth and fused with teeth. Sori extending to 2/3 of veins.

Forests; 1600–3600 m. Chongqing, Gansu, Heilongjiang, Henan, Liaoning, Shaanxi, Sichuan, Xizang, Yunnan [India, Myanmar, Nepal].

11. *Coniogramme emeiensis* Ching & K. H. Shing, Acta Bot. Yunnan. 3: 223. 1981.

峨眉凤了蕨 e mei feng liao jue

Coniogramme crenatoserrata Ching & K. H. Shing; *C. emeiensis* var. *lancipinna* Ching & K. H. Shing; *C. emeiensis* var. *salicifolia* Ching & K. H. Shing; *C. longissima* Ching & H. S. Kung; *C. nanchuanensis* Ching & K. H. Shing; *C. xingrenensis* Ching & K. H. Shing.

Plants up to 1.5 m tall. Rhizomes decumbent, short, stout; scales dark brown, lanceolate. Fronds closely spaced; stipe straw-colored to chestnut-brown, 40–90 cm × 4–5 mm; lamina broadly ovate-oblong, 30–70 × 20–40 cm, 2-pinnate, herbaceous when dry, sometimes with irregular yellow stripes along veins, both surfaces glabrous. Pinnae 6–10 pairs, basal 1–3 pairs of pinnae largest, subovate or ovate-lanceolate, 15–35 × 10–20 cm, stalked, pinnate; upper pairs trifoliolate or simple. Pinnules broadly lanceolate, 7–15 × 1.5–3 cm, base cuneate or rounded-cuneate, margin with coarse teeth, apex caudate-acuminate or long acuminate. Veins 1- or 2-forked; hydathodes clavate, extending to base of teeth but not into teeth.

• Broad-leaved forests or shaded places by roadsides; 600–1800 m. Chongqing, Guangdong, Guangxi, Guizhou, Hubei, Sichuan, Yunnan, Zhejiang.

The simple pinnae of *Coniogramme emeiensis* sometimes vary in length, width, and base shape. This species can be separated from *C. intermedia* by the clavate hydathodes, which extend only to the tooth base (not into the teeth).

12. *Coniogramme falcipinna* Ching & K. H. Shing, Acta Bot. Yunnan. 3: 224. 1981.

镰羽凤了蕨 lian yu feng liao jue

Coniogramme falcipinna var. *pilocostata* P. S. Wang & X.

Y. Wang; *C. latipinna* Ching & K. H. Shing; *C. sichuanensis* H. S. Kung.

Plants up to 1 m tall. Rhizomes decumbent, ca. 4 mm in diam.; scales brown, lanceolate. Fronds closely spaced; stipe straw-colored with brown spots, 35–60 cm × 2–4 mm, glabrous; lamina green or with yellow stripes along veins, ovate-lanceolate or ovate-oblong, 35–50 × 18–22 cm, pinnate or proximal 1 or 2 pairs of pinnae trifoliolate or bifurcate, herbaceous when dry, both surfaces glabrous. Pinnae 4–8 pairs; medial pinnae broadly lanceolate, somewhat arcuate, 12–17 × 3–4 cm, shortly stalked, base rounded or rounded-cuneate, margin with coarse, ascending teeth, apex caudate-acuminate; distal pinnae similar to medial ones but gradually reduced, sessile; terminal pinna larger than adjacent pinnae, long stalked or bifid at base. Veins distinct, 1- or 2-forked; hydathodes clavate, extending to base of teeth. Sori extending to 2/3–3/4 of veins.

• Forests; 1000–1800 m. Chongqing, Sichuan, Zhejiang.

The broadly lanceolate and somewhat falcate simple pinnae, the rough, ascending teeth along pinna margins, and the hydathodes extending to the base of the teeth distinguish *Coniogramme falcipinna* from *C. intermedia*.

13. *Coniogramme ovata* S. K. Wu, Acta Bot. Yunnan. 3: 230. 1981.

卵羽凤了蕨 luan yu feng liao jue

Plants ca. 80 cm tall. Stipe straw-colored, 28–32 cm × 3–4 mm; lamina brownish green, ovate-oblong, ca. 45 × 18–20 cm, 2-pinnate, herbaceous when dry, both surfaces glabrous. Lateral pinnae ca. 7 pairs, basal pair larger, ovate-deltoid, ca. 16 × 8–10 cm, with stalks ca. 1 cm, trifoliolate; lateral pinnules ovate, ca. 8 × 3–3.5 cm, sessile, base rounded-cuneate, apex shortly caudate; terminal pinnule much larger than lateral pinnules, base bifid, with stalk ca. 1 cm. Pinnae of second pair bifurcate. Distal pinnae simple, elliptic or ovate-oblong, 10–12 × 3.5–4 cm, shortly stalked or sessile, base rounded-cuneate, apex caudate. Terminal pinna larger than adjacent pinnae, 5–5.5 cm wide, base unequal; pinna and pinnule margins serrate; teeth rough, deltoid, ascending. Hydathodes clavate, somewhat extending into teeth. Sori extending to 1/2–2/3 of veins.

• On rocks in broad-leaved forests; below 1400 m. Yunnan (Yanjin).

14. *Coniogramme sinensis* Ching, Fl. Tsinling. 2: 210. 1974.

紫柄凤了蕨 zi bing feng liao jue

Plants 60–90 cm tall. Stipe reddish purple, 30–45 cm × 3–4 mm, lustrous; scales brownish, lanceolate; lamina oblong-ovate, 30–45 × 16–26 cm, 2-pinnate, herbaceous when dry, abaxially sparsely pilose, adaxially glabrous; rachis reddish purple. Pinnae 4 or 5 pairs, basal pair largest, oblong, 15–25 × 7–15 cm, stalks 2–3 cm, pinnate; lateral pinnules 2 or 3 pairs, broadly lanceolate or oblong-lanceolate, stalked or sessile, base rounded, apex caudate-acuminate; terminal pinnule larger, with stalk ca. 1 cm. Second pair of pinnae trifoliolate, bifurcate, or simple. Third pair of pinnae lanceolate, 15–20 × 2.5–3.8 cm, base rounded, apex caudate-acuminate. Margins of pinnae and pinnules with fine, ascending teeth. Hydathodes slightly

thickened, linear, extending to bases of teeth or slightly into teeth. Sori extending to 3/4 of veins.

• Forests or thickets; 400–1600 m. Gansu, Henan, Shaanxi, Sichuan, Zhejiang.

15. *Coniogramme suprapilosa* Ching, Fl. Tsinling. 2: 209. 1974.

上毛凤了蕨 *shang mao feng liao jue*

Plants 45–60 cm tall. Stipe straw-colored to light chestnut-colored, 25–30 cm × ca. 2.5 mm, lustrous; scales dark brown, lanceolate; lamina abaxially grayish green, adaxially brownish green, broadly ovate, nearly as long as wide, 23–28 cm, 2-pinnate, herbaceous when dry, abaxially pilose, adaxially sparsely pilose along costae and costules, strigose between veins (hairs sunken, leaving small pits on lamina when shed); rachis straw-colored or with occasional brown spots abaxially. Pinnae 2 or 3 (or 4) pairs, basal pair larger than adjacent ones, deltoid-ovate, 15–19 × 8–14 cm; distal pinnae simple (rarely second pair bifurcate), gradually somewhat reduced; second pair of pinnae oblong or oblong-lanceolate, 15–20 × 3–4 cm, base rounded or rounded-cuneate, somewhat unequal, apex abruptly caudate-acuminate. Pinnules 8–15 × 2–3 cm, shortly stalked, base rounded, apex caudate-acuminate. Margins of pinnae and pinnules serrate, teeth sharp and deltoid. Veins free; hydathodes slightly thickened, extending to base of teeth. Sori extending to 3 mm from pinna margin.

• Forests or thickets in valleys; 1400–1900 m. Chongqing (Chengkou), Shaanxi, Yunnan (Daguan).

16. *Coniogramme caudiformis* Ching & K. H. Shing, Acta Bot. Yunnan. 3: 233. 1981.

尾尖凤了蕨 *wei jian feng liao jue*

Plants 70–100 cm tall. Stipe straw-colored, or purplish brown proximally, 30–55 cm × 3–4 mm; lamina dull green, ovate-oblong, 40–50 × 20–25 cm, 2-pinnate, herbaceous when dry, abaxially pilose, adaxially glabrous. Pinnae 4–7 pairs, basal pair largest, with stalks 1–1.5 cm, pinnate; lateral pinnules 1 or 2 pairs, lanceolate to oblong-lanceolate, 6–12 × 2–3 cm, shortly stalked, base subrounded, apex caudate; terminal pinnule oblong or oblong-lanceolate, as medial pinnae in shape and size, 15–20 × 3–4 cm. Pinnae of second pair trifoliate or bifurcate, other pinnae simple and gradually shortened distally. Terminal pinna larger than adjacent ones. Pinna and pinnule margins densely and sharply serrate. Hydathodes clavate, slightly extending into teeth.

• Forests; 800–1800 m. Sichuan, Zhejiang.

17. *Coniogramme pubescens* Hieronymus, Hedwigia 57: 314. 1916.

骨齿凤了蕨 *gu chi feng liao jue*

Coniogramme caudata Ching var. *salwinensis* Ching & K. H. Shing; *C. spinulosa* (Christ) Hieronymus; *Gymnogramma javanica* Blume var. *spinulosa* Christ.

Plants 60–80 cm tall. Stipe straw-colored, 30–45 cm × 3–4 mm; lamina brownish green, ovate-oblong or narrowly ovate,

30–40 × 20–30 cm, usually 1-pinnate (rarely basal pair of pinnae bifurcate or trifoliate), thickly papery when dry, abaxially densely hairy or sometimes glabrous, hairs gray or grayish brown and short, adaxially glabrous. Pinnae 2–4 pairs, basal pair lanceolate or oblanceolate, 15–22 × 2–4 cm, stalked (stalks 1–1.5 cm), base narrowly cuneate, margin serrate with fine cartilaginous sides, apex abruptly caudate to caudate-acuminate; distal pairs of pinnae as basal ones but slightly reduced, shortly stalked. Hydathodes extending to and fused with cartilaginous sides of teeth. Sori extending nearly to pinna margins.

Streamsides in mixed forests; 1600–3300 m. SE Xizang, W Yunnan [India, Myanmar, Nepal].

18. *Coniogramme intermedia* Hieronymus, Hedwigia 57: 301. 1916.

普通凤了蕨 *pu tong feng liao jue*

Plants 60–120 cm tall. Stipe straw-colored, or with brownish spots, 24–60 cm × 2–3 mm; lamina dull green, ovate-deltoid or ovate-oblong, as long as stipe or shorter, 15–25 cm wide, 2-pinnate, herbaceous to papery when dry, both surfaces glabrous or pilose abaxially. Lateral pinnae 3–9 pairs, basal pair largest, deltoid-oblong, 18–28 × 8–17 cm, stalks 1–2.5 cm, pinnate; lateral pinnules 1–3 pairs, lanceolate, 6–12 × 1.4–2 cm, shortly stalked, base rounded to rounded-cuneate, apex long acuminate or caudate-acuminate; terminal pinnule much larger than lateral pinnules, base very unequal, frequently bifid. Pinnae of second pair trifoliate or simple (rarely pinnate). Simple pinnae lanceolate, 12–18 × 2–3 cm, shortly stalked to sessile, base rounded-cuneate, somewhat unequal, apex long acuminate or caudate-acuminate; terminal pinna often bifid at base; pinna and pinnule margins serrate. Veins 1- or 2-forked; hydathodes linear, extending into teeth or rarely into tooth margin. Sori extending close to lamina margin.

Forests, grasslands, streamsides; 300–2800 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Ningxia, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, Korea, Nepal, Pakistan, Russia, Vietnam].

Populations of *Coniogramme intermedia* represent two taxa treated here as varieties: one is hairy on the abaxial lamina surface, and the other is glabrous on both surfaces. Hieronymus did not designate a type when he published the species. Indian scholars Dixit and Das (Proc. Ind. Acad. Sci. 88(B): II. 263. 1979) chose the duplicate of *Meebold 2587*, a hairy lamina specimen, as the lectotype of var. *intermedia*.

1a. Lamina abaxially pilose 18a. var. *intermedia*
1b. Lamina abaxially glabrous 18b. var. *glabra*

18a. *Coniogramme intermedia* var. *intermedia*

普通凤了蕨(原变种) *pu tong feng liao jue* (*yuan bian zhong*)

Coniogramme guangdongensis Ching; *C. intermedia* var. *pulchra* Ching & K. H. Shing; *C. intermedia* f. *striata* H. G. Zhou; *C. intermedia* f. *villosa* (Ching) Sa. Kurata; *C. intermedia* var. *villosa* Ching; *C. latibasis* Ching; *C. maxima* Ching & K. H. Shing; *C. simillima* Ching [“*simileima*”].

Lamina abaxially pilose.

Forests, grasslands, streamsides. Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang [India, Japan, Korea].

18b. *Coniogramme intermedia* var. *glabra* Ching, Icon. Filic. Sin. 3: t. 143. 1935.

无毛凤了蕨 wu mao feng liao jue

Coniogramme guizhouensis Ching & K. H. Shing; *C. taipeiensis* Ching; *C. taiwanensis* Ching.

Lamina abaxially glabrous.

Forests; 300–2800 m. Fujian, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jilin, Liaoning, Ningxia, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, Korea, Nepal, Pakistan, Russia, Vietnam].

19. *Coniogramme fauriei* Hieronymus, Hedwigia 57: 320. 1916.

单网凤了蕨 dan wang feng liao jue

Coniogramme simplicior Ching; *C. simplicior* f. *concinna* H. G. Zhou.

Rhizomes decumbent, stout; scales dark brown, lanceolate. Stipe chestnut-colored, ca. 35 cm × 3 mm; lamina brownish green, ovate-deltoid or ovate-oblong, as long as stipe, 18–20 cm wide, pinnate, herbaceous when dry, abaxially brown pilose, adaxially glabrous. Lateral pinnae ca. 5 pairs, basal pair largest, lanceolate, 14–18 × ca. 2.5 cm, stalks ca. 1 cm, base unequal, basiscopically divided, small segment 6–9 cm, apex caudate-acuminate; other pinnae simple, somewhat shortened distally, shortly stalked or sessile; pinnae of second pair broadly lanceolate, 13–16 × 2.5–3 cm, base broadly rounded, margin serrate, teeth sharp, ascending, apex caudate-acuminate; terminal pinna larger than adjacent ones, base bifid. Veins 1- or 2-forked, occasionally connected forming 1 or 2 areoles; hydathodes linear, only extending to tooth base. Sori extending to 2/3 of veins.

Forests; below 2300 m. W Yunnan [Korea].

Coniogramme fauriei is very similar to *C. wilsonii* but differs by its veins occasionally connected and forming 1 or 2 areoles.

20. *Coniogramme jinggangshanensis* Ching & K. H. Shing, Acta Bot. Yunnan. 3: 238. 1981.

井岗山凤了蕨 jing gang shan feng liao jue

Stipe brownish purple, ca. 70 cm × 5 mm; lamina dull green when dry, ovate-oblong, somewhat longer than stipe, ca. 30 cm wide, 2-pinnate, herbaceous, both surfaces glabrous; rachis brownish purple abaxially, brown adaxially. Lateral pinnae ca. 8 pairs, basal pair largest, ovate-deltoid, ca. 35 × 15 cm, stalks ca. 3 cm, pinnate; lateral pinnules 3 pairs, well separated, lanceolate, ca. 15 × 2 cm, base broadly cuneate, apex long acuminate; terminal pinnule much longer than lateral ones, as medial pinnae in shape and size. Pinnae of second pair trifoliate. Medial pinnae simple, linear-lanceolate, ca. 25 × 3 cm, stalks ca. 1 cm, base broadly cuneate, apex long acuminate; distal pinnae gradually shortened. Terminal pinna larger than adjacent ones. Pinna and pinnule margins serrate, teeth shallow, incised.

Veins 1- or 2-forked, occasionally connected forming 1 or 2 areoles; hydathodes extending to tooth base. Sori extending close to lamina margin.

• Evergreen forests by streams or in ravines; 500–1300 m. Fujian, Guizhou, Hunan, Jiangxi, Zhejiang.

Coniogramme jinggangshanensis looks much like *C. intermedia* and *C. japonica*. It differs from the former by its larger stature (to 1.5 m tall), the stout teeth of the pinna margin, and the hydathodes reaching only to the tooth bases; it differs from the latter by the pinnae somewhat linear-lanceolate and the veins not forming 2 or 3 rows of areoles along each side of the midrib.

“*Coniogramme tsinggangshanensis*” (Ching, Fl. Fujian. 1: 90. 1985) belongs here but is a nomen nudum and was not therefore validly published (*Melbourne Code*, Art. 38.1(a)).

21. *Coniogramme wilsonii* Hieronymus, Hedwigia 57: 321. 1916.

疏网凤了蕨 shu wang feng liao jue

Stipe straw-colored or dull straw-colored, ca. 40 cm × 3–5 mm; lamina abaxially grayish green, adaxially brownish green, ovate-deltoid or ovate-oblong, 28–50 × 20–25 cm, 2-pinnate, herbaceous when dry, both surfaces glabrous. Lateral pinnae 3–5 pairs, basal pair largest, deltoid-ovate, 18–25 × 10–15 cm, stalks ca. 1.5 cm, pinnate; lateral pinnules 1–3 pairs, lanceolate, 8–12 × 2–2.5 cm, shortly stalked or adnate to costa, base unequal, somewhat cordate or rounded-cuneate, apex caudate-acuminate; terminal pinnule much larger, as medial pinnae in shape and size. Medial pinnae simple, 15–20 × 2–3 cm. Pinna and pinnule margins serrate, teeth sparse and shallow. Veins free except forming a few discontinuous areoles along each side of costae; hydathodes linear, not extending to tooth base. Sori extending close to lamina margin.

• Forests; 1000–1600 m. Gansu, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan.

Coniogramme wilsonii resembles *C. japonica*, but it differs in its pinnules with unequal and somewhat cordate bases and its areoles fewer and discontinuous along the midribs.

22. *Coniogramme japonica* (Thunberg) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 262. 1899.

凤了蕨 feng liao jue

Hemionitis japonica Thunberg in Murray, Syst. Veg., ed. 14, 932. May–Jun 1784; *Coniogramme ankangensis* Ching & Y. P. Hsu; *C. centrochinensis* Ching; *C. gracilis* Ogata; *C. japonica* subsp. *gracilis* (Ogata) Nakaike; *C. japonica* var. *gracilis* (Ogata) Tagawa; *Dictyogramme japonica* (Thunberg) Fée; *Gymnogramma japonica* (Thunberg) Desvoux; *Notogramme japonica* (Thunberg) C. Presl.

Stipe straw-colored or chestnut-brown, 30–50 cm × 3–5 mm; lamina oblong-deltoid or ovate-deltoid, 20–40 cm wide, 2-pinnate, papery or herbaceous when dry, both surfaces glabrous. Lateral pinnae usually 3–5 pairs, basal pair largest, ovate-deltoid, 20–35 × 10–15 cm, stalks 1–2 cm, pinnate (occasionally bifurcate); lateral pinnules 1–3 pairs, lanceolate or broadly lanceolate, 8–15 × 1.5–3.5 cm, stalked or distal pinnules sessile, base cuneate, rounded, or rarely cordate, apex acuminate, long

acuminate, or shortly caudate; terminal pinnule broadly lanceolate, 20–28 × 2.5–4 cm, usually attenuate toward base. Pinnae of second pair trifoliolate, bifurcate, or simple; simple pinnae as terminal pinnule. Pinna or pinnule margins serrate, teeth sparse and short. Veins anastomosing to form 1–3 rows of areoles along each side of midrib, then free to margin; hydathodes

spindle-shaped, extending below base of teeth. Sori extending nearly to lamina margin.

Forests, shaded wet soil in ravines; 100–2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, S Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan (including Ryukyu Islands), Korea].

2. CRYPTOGRAMMA R. Brown in Franklin, Narr. Journey Polar Sea, 767. 1823.

珠蕨属 zhu jue shu

Zhang Gangmin (张钢民); Edward R. Alverson, Jordan S. Metzgar

Plants small, usually on rocks. Rhizomes short, erect or ascending with dictyostele, or occasionally long creeping with siphonostele; scales colorless or brownish, thin. Fronds strongly dimorphic, clustered or rarely scattered, sterile fronds shorter than fertile ones; stipe dark brown proximally, light brown to straw-colored distally, grooved adaxially, scaly. Sterile fronds: lamina broadly ovate or oblong, 2–4-pinnate, membranous to leathery, glabrous. Fertile fronds: lamina 2- or 3-pinnate. Ultimate segments of sterile lamina ovate, spatulate, elliptic, or fan-shaped; fertile segments linear or elongate oblong. Veins free, pinnately branched, simple or forked distally; hydathodes often sunken below surface on dried specimens. False indusia broad, clearly marginal, continuous, making a single fertile segment podlike. Sori borne at vein tips, orbicular or elliptic, confluent when mature. Spores yellow, tetrahedral, trilete, verrucose. $x = 30$.

About ten species: temperate and subtropical alpine regions, Asia, Europe, North and South America; three species in China.

Plants of *Cryptogramma* resemble those of *Onychium* but are smaller, strongly dimorphic, and have fertile fronds markedly taller than sterile fronds. There is not a commissural vein connecting veinlet tips, so the sori are borne at veinlet tips and become confluent only when mature.

- 1a. Rhizomes slender and creeping; fronds sparse and scattered; sterile lamina 1- or 2-pinnate, herbaceous to membranous, thin; hydathodes absent 1. *C. stelleri*
 1b. Rhizomes stout and erect; fronds densely tufted; sterile lamina 3- or 4-pinnate, papery or somewhat leathery, obscure; hydathodes present and conspicuous.
 2a. Sterile lamina 3-pinnate-pinnatifid, ultimate segments triangular, with an acute apex 2. *C. brunoniana*
 2b. Sterile lamina 4-pinnate-pinnatifid, ultimate segments linear, with a rounded apex 3. *C. raddeana*

1. *Cryptogramma stelleri* (S. G. Gmelin) Prantl in Engler, Bot. Jahrb. Syst. 3: 413. 1882.

稀叶珠蕨 xi ye zhu jue

Pteris stelleri S. G. Gmelin, Novi Comment. Acad. Sci. Imp. Petrop. 12: 519. 1768; *Allosorus gracilis* (Michaux) C. Presl; *A. stelleri* (S. G. Gmelin) Ruprecht; *Cheilanthes gracilis* (Michaux) Kaulfuss; *Pellaea gracilis* (Michaux) Hooker; *P. stelleri* (S. G. Gmelin) Baker; *Pteris gracilis* Michaux.

Rhizomes slender, long creeping; scales light brown, lanceolate or ovate-lanceolate. Fronds scattered along rhizomes; stipe brownish straw-colored, glabrous, stipe of sterile frond 3–8 cm, that of fertile frond 6–12 cm. Sterile fronds: lamina yellowish green, ovate or ovate-oblong, 3–6 × 1.5–3 cm, 1- or 2-pinnate, herbaceous to membranous, glabrous on both surfaces, apex obtuse; hydathodes poorly developed or absent. Fertile fronds: lamina broadly lanceolate or oblong, 4–8 × 1.8–4 cm, 2-pinnate. Sterile pinnae 3 or 4 pairs, subrounded, margins entire or slightly undulate, apex obtuse. Fertile pinnae 4 or 5 pairs, shortly stalked or sessile, basal pair largest, 1-pinnate. Pinnules 1 or 2 pairs, anadromous, broadly lanceolate, shortly stalked or sessile, base cuneate, apex acute or obtuse. Sori borne at vein tips, discrete, often confluent at maturity. False indusia pale green, membranous, margins somewhat irregular, not reaching to main vein.

Rock crevices in *Abies* or *Rhododendron* woodlands; 1700–4200 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xinjiang,

SE Xizang, NW Yunnan [Afghanistan, Bhutan, India, Japan, Kashmir, Nepal, Russia; North America].

2. *Cryptogramma brunoniana* Wallich ex Hooker & Greville, Icon. Filic. 2: t. 158. 1829.

高山珠蕨 gao shan zhu jue

Cryptogramma crispa (Linnaeus) R. Brown ex Hooker var. *brunoniana* (Wallich ex Hooker & Greville) Hooker & Baker; *C. crispa* f. *indica* Hooker; *C. emeiensis* Ching & K. H. Shing; *C. shensiensis* Ching; *Phorolobus brunonianus* (Wallich ex Hooker & Greville) Fée.

Rhizomes stout and erect; scales brown, lanceolate, membranous. Fronds tufted; stipe straw-colored, sparsely scaly proximally, stipe of sterile frond 4–5 cm, that of fertile frond 7–16 cm. Sterile fronds: lamina broadly ovate or ovate-deltoid, 3–4 × 1.5–4 cm, 3- or 4-pinnate, herbaceous; hydathodes spindle-shaped, slightly sunken below frond surface on dried specimens. Fertile fronds: lamina ovate or ovate-oblong, 4–8 × 1.5–3.5 cm, finely 3-pinnate to 3-pinnate-pinnatifid. Sterile pinnae 6 or 7 pairs, basal pair largest, ovate, 1.6–2.2 × 1.2–1.7 cm. Ultimate sterile segments deltoid or oblong, apex acute, one veinlet in each segment. Ultimate fertile segments linear at first, elliptic when mature, 3–5 × 1–2 mm, apex obtuse, or sometimes acute. Sori borne near vein tips, somewhat rounded, confluent and spreading over abaxial surface of fertile lamina at maturity. False indusia brown, linear, margins entire.

Rock crevices; 3300–3700 m. Sichuan, Taiwan, NW Yunnan [Bhutan, N India, Japan, Nepal].

Cryptogramma brunoniana has been treated as a variety of *C. crispa* (Linnaeus) R. Brown ex Hooker from Europe and Asia, but an analysis of chloroplast and nuclear DNA variation shows that the two species are only distantly related (Metzgar, unpubl. data).

3. *Cryptogramma raddeana* Fomin, *Izv. Kievsk. Bot. Sada* 10: 3. 1929.

珠蕨 zhu jue

Allosorus raddeanus (Fomin) Ching; *Cryptogramma brunoniana* Wallich ex Hooker & Greville var. *raddeana* (Fomin) Fraser-Jenkins; *C. brunoniana* var. *sinensis* (Christ) G. M. Zhang; *C. crispa* (Linnaeus) R. Brown ex Hooker var. *sinensis* Christ.

Rhizomes stout and erect; scales brown, lanceolate, membranous. Fronds tufted; stipe straw-colored, sparsely scaly proximally, stipe of sterile frond shorter, 4–5 cm, that of fertile frond 7–16 cm. Sterile fronds: lamina brownish green when dry, broadly ovate, 3–5 × 1.5–2 cm, 4-pinnate-pinnatifid, papery, glabrous on both surfaces; hydathodes obovate and not sunken below frond surface on dried specimens. Fertile fronds: lamina

ovate or ovate-oblong, 4–6 × 1.5–3.5 cm, finely 3-pinnate to 3-pinnate-pinnatifid. Sterile pinnae 6 or 7 pairs, basal pair largest, ovate, 1.6–2.2 × 1.2–1.7 cm. Ultimate sterile segments linear or spatulate, apex rounded, one veinlet in each segment. Ultimate fertile segments linear at first, elliptic when mature, 3–5 × 1–2 mm, apex obtuse. Sori confluent and spreading over abaxial surface of fertile frond when mature. False indusia brown, linear, margins entire.

On rocks; 2600–4600 m. W Hubei, Shaanxi, NW and W Sichuan, Xizang, NW Yunnan [NW Nepal, Russia].

Cryptogramma raddeana has been treated as a variety or subspecies of *C. brunoniana*, but plastid DNA data resolve each of the two taxa as well-supported clades that are reciprocally monophyletic to one another and have a level of genetic differentiation similar to other interspecific divergences in the genus (Metzgar, unpubl. data). They also differ in slight but consistent morphological differences (e.g., lamina dissection, pinnule shape). Combined, this suggests that they are distinct though closely related species. Perceived intergradation between related taxa in *Cryptogramma* can be due either to formation of sterile hybrids (Alverson, Biosyst. Parsley-Ferns, MS thesis, Oregon State University, 1989) or to the presence of fronds that are developmentally intermediate between sterile and fertile fronds, which obscure the differences between taxa in frond dissection and segment shape (Hultén, Fl. Aleutian Islands. 397pp. 1937).

2. Subfam. CERATOPTERIDOIDEAE

水蕨亚科 shui jue ya ke

Lin Youxing (林尤兴), Dong Shiyong (董仕勇); A. Michele Funston, Shigeo Masuyama

Plants terrestrial or aquatic. Rhizome creeping or erect, dictyostelic, sometimes with additional vascular bundles, sometimes with thick roots, apex scaly; scales brownish hyaline to black. Fronds dimorphic; stipe green, semicylindrical, glabrous or sparsely scaly; lamina simple or pinnate, thinly herbaceous, thickly papery to thickly leathery, or fleshy. Veins anastomosing, without included free veinlets. Fertile fronds normally taller, with smaller pinnae. Sori borne at vein tips, covered by a false indusium, or sporangia acrostichoid and scattered on whole of abaxial surface; paraphyses present, capitate. Spores trilete, tetrahedral-globose, with fine, parallel ridgelike ornamentations or perispore papillate to tuberculate, without an equatorial flange. $x = 13(39), 30$.

Two genera and ca. ten species: tropics and subtropics; two genera and four species in China.

3. ACROSTICHUM Linnaeus, Sp. Pl. 2: 1067. 1753.

鹵蕨属 lu jue shu

Dong Shiyong (董仕勇); A. Michele Funston

Chrysodium Fée.

Plants terrestrial or in coastal swamps. Rhizome stout, creeping or erect, dictyostelic with additional strands; scales dark brown to black, large, broadly lanceolate, entire. Fronds clustered or approximate; stipe stout, glabrous; lamina 1-pinnate with distinct terminal pinna; pinnae stalked, tongue-shaped to narrowly oblong, thickly papery to thickly leathery or fleshy, entire, apex obtuse to acuminate; veins anastomosing, without included free veinlets. Fertile pinnae distal on frond or most or all of lamina fertile, slightly smaller. Sporangia scattered on whole of abaxial surface; paraphyses capitate, apex lobed and multicellular. Spores tetrahedral-globose, perispore papillate to tuberculate, with rodlets or sparse strands. $x = 30$.

Three species: pantropical; two species in China.

- 1a. Sterile pinnae rounded to retuse and shortly mucronate at apex 1. *A. aureum*
 1b. Sterile pinnae narrowly acuminate at apex 2. *A. speciosum*

1. *Acrostichum aureum* Linnaeus, Sp. Pl. 2: 1069. 1753.

(Linnaeus) Mettenius; *C. inaequale* (Willdenow) Fée; *C. vulgare* Fée.

鹵蕨 lu jue

Acrostichum inaequale Willdenow; *Chrysodium aureum*

Plants 1–2 m tall. Rhizome erect; scales dark brown to black, broadly lanceolate, 1–2[–4] × 0.2–0.6[–2] cm. Stipe

straw-colored to pale castaneous, 10–70[–100] cm, 0.5–1 cm in diam., glabrous upward; lamina 40–50[–300] × 20–40 cm, lateral pinnae to 5–12 pairs; sterile pinnae narrowly oblong, (10–) 15–35[–80] × 1.8–5.5[–8] cm, with stalk 0.5–1.5 cm, thickly leathery, both surfaces glabrous, base cuneate to rounded, margin entire and cartilaginous, apex rounded to retuse and shortly mucronate; costae strongly raised abaxially, flat or slightly grooved adaxially; veins raised abaxially, hardly visible adaxially, closely spaced, copiously anastomosing to form irregular areoles. Fertile pinnae distal on frond, like sterile pinnae but slightly smaller. $n = 30, 120$.

Coastal areas, often in mangrove swamps; near sea level to 100 m. Guangdong, Guangxi, Hainan, Taiwan (Hualian, Pingdong), Yunnan [pantropical].

2. *Acrostichum speciosum* Willdenow, Sp. Pl. 5: 117. 1810.

尖叶卤蕨 *jian ye lu jue*

Plants 1–1.5 m tall. Rhizome scales dark brown to black, broadly lanceolate, ca. 1 × 0.2–0.3 cm. Stipe straw-colored, 30–40 cm, 0.3–0.5 cm in diam., glabrous; lamina 35–50 × 20–30 cm; lateral pinnae to 5–8 pairs; sterile pinnae lanceolate, (8–) 15–20 × 2–2.5 cm, with stalk 0.5–1 cm, thickly leathery, both surfaces glabrous, base narrowly cuneate, margin entire and cartilaginous, apex narrowly acuminate; costae strongly raised abaxially, flat or slightly grooved adaxially; veins raised abaxially, hardly visible adaxially, closely spaced, anastomosing. Fertile pinnae distal on frond, like sterile pinnae but somewhat abruptly attenuate and shortly caudate.

Mangrove swamps; near sea level. Hainan (Wenchang) [Malaysia, Thailand, Vietnam; tropical Asia, Australia].

4. CERATOPTERIS Brongniart, Bull. Sci. Soc. Philom. Paris 8: 186. 1822.

水蕨属 *shui jue shu*

Lin Youxing (林尤兴); Shigeo Masuyama

Furcaria Desvaux; *Parkeria* Hooker; *Teleozoma* R. Brown.

Plants annual, juicy, aquatic. Rhizome erect, short, with thick roots, dictyostelic, with scales at apex; scales broadly ovate or cordate to peltate, entire, thin, brownish hyaline. Fronds clustered, dimorphic; stipe green, ± expanded, semicylindrical, fleshy, smooth, with sparse scales, with many longitudinal ridges on surface and many small vascular bundles inside. Sterile lamina green, ovate- to lanceolate-triangular, thinly herbaceous, simple or pinnate; ultimate lobe broadly lanceolate or loriform, entire, acute at apex; veins anastomosing; gemmae occasionally formed in axils of pinnae, brownish, small, ovate, resulting in juveniles through asexual propagation. Fertile lamina similar in morphology to sterile lamina but normally taller, divided more deeply and finely; ultimate lobe reflexed toward costa to enclose sori, green when young and brownish when old, linear to siliquiform; rachis green, with longitudinal ridges, deplanate when dry. Sori attached along costa, narrowly linear, covered with reflexed margin of lobe. Sporangium large, subsessile; annulus broad, vertical, consisting of 0–70 incrassate cells; trilete mark obvious or not. Spores 16 or 32 per sporangium, large, tetrahedral, trilete, with fine, parallel ridgelike ornamentations. $x = 13(39)$.

Four to seven species: tropics and subtropics; two species in China.

The young fronds are used as a vegetable. In China, the rhizomes and fronds are used medicinally for treating fetal toxins and phlegm buildup.

Both species of *Ceratopteris* in China have shown significant declines in their distributions and are regarded as endangered. This is due to the loss of suitable aquatic habitats and decline in water quality of those that do survive (Y. H. Dong et al., Amer. Fern J. 102: 136–146. 2012).

- 1a. Plants rooting in silt; sterile frond varied in form, pinnate to 3-pinnate, tall or short depending on environment; stipe 3–30 cm, ca. 1 cm in diam., base unexpanded; fertile fronds taller than sterile ones, lamina oblong or ovate-triangular 1. *C. thalictroides*
 1b. Plants usually floating; sterile frond simple to pinnatifid to pinnate, broadly triangular; stipe 5–8 cm, 1–3 cm in diam., base much expanded; fertile fronds not taller than sterile ones, lamina broadly triangular 2. *C. pteridoides*

1. *Ceratopteris thalictroides* (Linnaeus) Brongniart, Bull. Sci. Soc. Philom. Paris 8: 186. 1822.

水蕨 *shui jue*

Acrostichum thalictroides Linnaeus, Sp. Pl. 2: 1070. 1753; *A. siliquosum* Linnaeus; *Ceratopteris siliquosa* (Linnaeus) Copeland; *Ellobocarpus oleraceus* Kaulfuss; *Furcaria thalictroides* (Linnaeus) Desvaux; *Pteris siliquosa* (Linnaeus) P. Beauvois; *P. thalictroides* (Linnaeus) Swartz (1800), not Muhlenberg (1793); *Teleozoma thalictroides* (Linnaeus) R. Brown ex H. Richards.

Plants green, 5–70 cm tall, juicy and soft. Rhizome erect, short. Fronds clustered and dimorphic. Sterile fronds: stipe

green, semicylindrical, 3–30 cm, ca. 1 cm in diam. or less, fleshy, not expanded, sparsely scaly; lamina erect or floating when young, ovate to lanceolate, 6–30 × 3–15 cm, base rounded-cuneate, apex acuminate, 2–4-pinnate; pinnae 5–8 pairs, alternate; lower 1 or 2 pairs larger, ovate to oblong, up to 10(–35) × 7 cm, base subrounded to subtruncate, apex acute to acuminate, 1–3-pinnate; pinnules 2–5 pairs, alternate, stalk short and with narrow wings on both sides, blade broadly ovate or ovate-triangular, up to 4 × 3 cm, deeply divided, base rounded-truncate, apex obtuse to acuminate; ultimate lobe linear-oblong or linear-lanceolate, up to 2 × 0.5 cm, entire, base decurrent along rachis forming broad wing, apex obtuse to acute; upper pair of pinnae similar in shape to basal pair of pinnae but gradually smaller. Fertile fronds: stipe same as in sterile

fronds; lamina oblong or ovate-triangular, 15–40 × 10–22 cm, base rounded-cuneate or rounded-truncate, 2- or 3-pinnate, apex acuminate; pinna 3–8 pairs, alternate, lower 1 or 2 pairs of pinnae larger, ovate or narrowly triangular, up to 14 × 6 cm, stalked; ultimate lobe linear to siliquiform, 1–4 × ca. 0.2 cm, margin thin, strongly reflexed toward costa, like false indusium, apex acuminate. Veins anastomosing. Lamina softly herbaceous, green when young and brownish when old, glabrous; rachis and costa same color as stipe, smooth. Sporangia attached to veinlets on both sides of main vein, covered with reflexed margin of lobe, brown, with 30–70 annulus cells, with 32 spores inside. Spores tetrahedral, more than 100 μm in diam., with granular perine and thick exospore forming rich parallel ridges on surface. $2n = 154, 156$ (tetraploid).

Ponds, ditches, rice fields, taro patches, usually rooting. Anhui, Fujian, Guangdong, Guangxi, Guizhou (Liping), Hainan, Hubei, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Central, North, and South America, Madagascar, Pacific islands, West Indies].

2. *Ceratopteris pteridoides* (Hooker) Hieronymus, Bot. Jahrb. Syst. 34: 561. 1905 [*“pteroides”*].

粗梗水蕨 cu geng shui jue

Parkeria pteridoides Hooker, Exot. Fl. 2: t. 147. 1825; *Ceratopteris parkeria* J. Smith, nom. illeg. superfl.

Plants usually floating, 20–30 cm tall. Stipe, rachis, and costa of lower pinnae all obviously expanded toward base, base of stipe narrowly cuneate, covered with roots. Fronds dimorphic. Sterile fronds green, smooth; stipe semicylindrical, 5–8 cm, ca. 1.5 cm in diam.; lamina ovate-triangular, simple and deeply divided, sometimes opposite-pinnate; lobes triangular to broadly loriform. Fertile fronds green when young and brownish when old, smooth; stipe 5–8 cm, 1–3 cm in diam.; lamina broadly triangular, 15–25 cm, 2–4-pinnate; ultimate lobe linear or siliquiform, 2–6 × ca. 0.2 cm, margin thin, strongly reflexed toward main vein to cover sori, apex acuminate. Sporangia attached to veinlets on both sides of main vein, covered with reflexed margin of lobe, brown, with 0–40 annulus cells, with 32 spores inside. Spore tetrahedral, below 100 μm in diam., with few parallel ridges. $2n = 78$ (diploid).

Marshes, ponds, ditches, usually floating on water. Anhui, Hubei, Jiangsu, Jiangxi, Shandong [Bangladesh, India, Vietnam; Central, North, and South America].

3. Subfam. PTERIDOIDEAE

凤尾蕨亚科 feng wei jue ya ke

Liao Wenbo (廖文波), Ding Mingyan (丁明艳), Wu Zhaohong (吴兆洪 Wu Shiew-hung), Zhang Gangmin (张钢民), Dong Shiyong (董仕勇); Jefferson Prado, Michael G. Gilbert, George Yatskievych, Tom A. Ranker

Plants terrestrial, small, medium-sized, or large. Rhizome erect or ascending, rarely long creeping, with solenostele or dictyostele, scaly, or rarely covered with bristles (*Taenitis*). Fronds monomorphic, rarely dimorphic or subdimorphic; stipe often straw-colored, seldom castaneous-reddish or brown, glabrous, rarely hispid or scaly; lamina 1-pinnate or 2–5-pinnate-pinnatifid, or rarely digitate or pedate, occasionally simple or 3-forked, oblong or ovate-triangular, rarely pentagonal in outline, herbaceous, papery, or leathery, mostly glabrous, rarely with white or yellow farina abaxially; venation free or rarely areolate, veinlets not included in areoles. Sori submarginal, linear, on a vascular commissure joining apices of veins, with linear, membranous indusia, or sori borne along veins, or rarely forming a narrow longitudinal band between midrib and margin and exindusiate (*Taenitis*); spores trilete, hyaline, usually with an equatorial flange.

About 14 genera and 350 species: tropics and subtropics, especially in tropical America; five genera and 90 species (37 endemic, one introduced) in China.

5. *PTERIS* Linnaeus, Sp. Pl. 2: 1073. 1753.

凤尾蕨属 feng wei jue shu

Liao Wenbo (廖文波), Ding Mingyan (丁明艳), Wu Zhaohong (吴兆洪 Wu Shiew-hung); Jefferson Prado, Michael G. Gilbert

Plants terrestrial. Rhizome erect or ascending (rarely short or prostrate), vascular system a complex solenostele or dictyostele, scaly; scales brown, narrowly lanceolate or linear, membranous, firm. Fronds clustered; stipe deeply grooved adaxially, with one vascular bundle V-shaped in cross section; fronds mostly 1- or 2-pinnate, rarely 3-pinnate (*Pteris cryptogrammoides*), pedate, or sometimes 3-forked, pinnae entire or pectinately divided into segments, sometimes asymmetrical; basal pinnae often with 1 (or more) pinnule near base on basisopic side, this similar to main part of pinna but smaller; apical pinnae similar to lateral pinnae; costa or midvein deeply grooved adaxially, often with awns on base of each costa; venation free or areolate, veins simple or 2-forked, if areolate then with regular rows of narrow areoles along costa (sometimes also along segment costules), a few species with veinlike heterocells (false veins) below epidermis (*P. cadieri*, *P. grevilleana*, *P. multifida*, etc.); lamina herbaceous or papery when dried, sometimes subleathery, glabrous or rarely pubescent. Sori linear, along margin, except at base or basal sinus and apex, with paraphyses; annulus consisting of 16–34 incrassate cells; spores trilete (a few species with monoete spores), gray or black, surfaces scabrous or verrucose. $x = 29$.

About 250 species: distributed in tropical and subtropical areas, southward to New Zealand, Australia, and South Africa, north to Japan and North America; 78 species (35 endemic) in three sections in China.

Of the 78 Chinese species of *Pteris*, most occur mainly in S and SW China, with a few species in E China south of the Qin Ling.

Apomixis is frequent in *Pteris*; the gametophytes bud off embryos without fertilization.

Pteris natiensis Tagawa (J. Jap. Bot. 14: 109. 1938) has been recorded in China (Fl. Zhejiang 1: 86. 1986), but Japanese authors consider this species to be endemic to Japan.

Five uncertain taxa, not included in the following keys, are listed at the end of the account.

Key to sections

- 1a. Venation areolate, veins \pm anastomosing along costules; segments without cartilaginous margins; veins forming 1 or more series of areoles along costa (sometimes along midvein); costa with spines along adaxial groove (species nos. 70–78) 3. *P.* sect. *Campteria*
- 1b. Venation free.
 - 2a. Fronds often dimorphic or subdimorphic; pinnae/pinnules entire, with cartilaginous margins, basal pair(s) sometimes forked near base, but never pectinately divided; sterile margins often acutely serrate, rarely entire; costae without spines, grooves not erose (species nos. 1–35) 1. *P.* sect. *Pteris*
 - 2b. Fronds monomorphic; pinnae/pinnules pectinately divided or lobed on at least one side, basal pair(s) of pinna often with 1–3 (or 4) pinnules near base on basiscopic side; segments lanceolate or \pm oblong-falcate, often obtuse or acute, without cartilaginous margins, entire or rarely serrate; adaxial grooves of costae with spines or erose margins (species nos. 36–69) 2. *P.* sect. *Quadriauricula*

Key to *Pteris* sect. *Pteris*

- 1a. Fronds simple, digitate, or pedate with pinnae clustered at apex of stipe and no discernable main rachis.
- 2a. Fronds digitate or subdigitate, with 5–7 (–9) pinnae clustered at apex of stipe and no discernable rachis.
 - 3a. Margins of sterile pinnae entire 3. *P. stenophylla*
 - 3b. Margins of sterile pinnae serrate.
 - 4a. Mature fronds monomorphic or nearly so.
 - 5a. Stipes castaneous, sometimes margins slightly straw-colored; sterile pinna margins coarsely and acutely serrate 18. *P. plumbea*
 - 5b. Stipes straw-colored, brownish at base; sterile pinna margins finely serrate.
 - 6a. Rhizome long creeping or procumbent; plants 15–40 cm tall; stipes 15–30 cm; pinnae mostly 5–7, digitate 7. *P. dactylina*
 - 6b. Rhizome erect or ascending; plants 5–15 cm tall; lateral pinnae often one pair and each forked.
 - 7a. Terminal pinna linear or linear-lanceolate, acuminate at apex; lateral pinnae each 2 or 3 (or 4)-forked into linear-lanceolate pinnules 9. *P. gallinopes*
 - 7b. Terminal pinna ovate-lanceolate, obtuse at apex; lateral pinnae oblong-obovate, each at base on basiscopic side with an almost freely divided lobe 35. *P. xiaoyingiae*
 - 4b. Mature fronds distinctly dimorphic.
 - 8a. Lamina with many false veins between true veins; Taiwan 22. *P. kidoi*
 - 8b. Lamina without false veins.
 - 9a. Fertile pinnules 3–5 mm wide; Taiwan 21. *P. ryukyuensis*
 - 9b. Fertile pinnules 5–12 mm wide.
 - 10a. Margins of rhizome scales sparsely ciliate; widespread but not recorded from Hainan 19. *P. cretica*
 - 10b. Margins of rhizome scales entire; Hainan 6. *P. morii*
- 2b. Fronds simple or 2- or 3-pinnulate.
 - 11a. Base of lamina cordate 32. *P. liboensis*
 - 11b. Base of lamina tapered, cuneate or subobtusate.
 - 12a. Fronds always simple; Hainan 34. *P. changjiangensis*
 - 12b. Sterile fronds 3-pinnulate, sometimes also simple.
 - 13a. Plants often with both simple and 3-forked fronds; Yunnan.
 - 14a. Fertile fronds simple or 3-forked; fronds (or pinnae) lanceolate or linear-lanceolate, up to 15 cm; sterile fronds simple or 2-forked; fronds (or pinnae) lanceolate, adaxially without pale green band along costa; SE Yunnan 1. *P. pseudopellucida*
 - 14b. Fertile fronds simple, narrowly linear, up to 50 cm; sterile fronds 3-forked, pinnae linear, adaxially with distinct pale green band along costa; S Yunnan 2. *P. undulatipinna*
 - 13b. Fronds always 3-pinnulate, never simple.
 - 15a. Terminal pinna sessile or subsessile.
 - 16a. Pinnae broadly lanceolate or lateral pair subovate, 1–2 cm wide.
 - 17a. Plants 10–25 (–40) cm tall; pinnae often 5–8 cm; terminal pinna acuminate (sometimes shortly acuminate); lateral pinnae never lobed 12. *P. deltodon*

- 17b. Plants 4–6.5(–7) cm tall; pinnae often 1.5–2.5(–3.1) cm; terminal pinna obtuse at apex; each lateral pinna at base with or without a basiscopic lobe 35. *P. xiaoyingiae*
- 16b. Pinnae linear, 0.3–1 cm wide.
- 18a. Pinna margin entire or slightly undulate; Xizang 3. *P. stenophylla*
- 18b. Pinna margin finely toothed or with undulate teeth.
- 19a. Pinna margin finely undulate toothed, veinlets ca. 28 per cm; Taiwan 4. *P. confertinervia*
- 19b. Pinna margin denticulate, veinlets ca. 10 per cm 7. *P. dactylina*
- 15b. Terminal pinna stalked, stalk 1–2(–3) cm.
- 20a. Fronds dimorphic; pinnae 2.5–3.5 cm wide.
- 21a. Fronds obviously dimorphic; sterile lamina with lateral pinnae falcate-ovate to lanceolate, simple; fertile lamina with lateral pinnae simple or forked, linear in outline, caudate toward apex *P. sanduensis* (see 12. *P. deltodon*)
- 21b. Fronds not obviously dimorphic, with ovate-oblong lateral pinnae, simple in both sterile and fertile fronds.
- 22a. Sterile pinnae 2.5–3 cm wide, margins crenulate; terminal pinna of fertile frond subsessile; Hainan 5. *P. crassiuscula*
- 22b. Sterile pinnae ca. 3.5 cm wide, margins sparsely serrate; terminal pinna of fertile frond long stalked; Guangdong 33. *P. nanlingensis*
- 20b. Fronds monomorphic; pinnae up to 2 cm wide.
- 23a. Terminal pinna broadly lanceolate 12. *P. deltodon*
- 23b. Terminal pinna lanceolate.
- 24a. Pinna margins coarsely and acutely serrate; lateral pinnae as long as terminal pinna; rhizome erect, ca. 6 mm thick 13. *P. olivacea*
- 24b. Pinna margins serrate only on upper portion, lower parts entire; lateral pinnae shorter than terminal pinna; rhizome prostrate, ca. 3 mm thick 14. *P. baksuensis*
- 1b. Fronds 1(–3)-pinnate, lateral pinnae 2 pairs or more, sometimes forked.
- 25a. Fronds 3-pinnate; pinnules 20 or more, 0.5–1.3 cm 30. *P. cryptogrammoides*
- 25b. Fronds 1(or 2)-pinnate; pinnules mostly much more than 5 cm, if less then fronds 1-pinnate, pinnules fewer than 10.
- 26a. Lateral pinnae not forked (basal fertile pinnae occasionally with single basiscopic pinnule).
- 27a. Lateral pinnae often 30–40 pairs, shorter gradually downward 28. *P. vittata*
- 27b. Lateral pinnae less than 16 pairs, not gradually reduced downward.
- 28a. Margins of sterile pinnae entire, ± undulate.
- 29a. Pinnae shiny and smooth adaxially, pinna margins distinctly pleated 25. *P. venusta*
- 29b. Pinnae not shiny or smooth adaxially, pinna margins slightly undulate.
- 30a. Pinnae glabrous 26. *P. insignis*
- 30b. Pinnae basal parts and costa sparsely softly hairy 27. *P. menglaensis*
- 28b. Margins of sterile pinnae dentate or serrate.
- 31a. Sterile pinnae ovate or oblong-lanceolate, margins with rough and acute teeth 12. *P. deltodon*
- 31b. Sterile pinnae narrowly linear or linear-lanceolate to lanceolate, margins finely dentate or serrate.
- 32a. Lamina with many false veins between true veins; Taiwan 22. *P. kidoi*
- 32b. Lamina without false veins.
- 33a. Sterile pinnae narrowly linear, often 2–4 mm wide 10. *P. henryi*
- 33b. Sterile pinnae broadly linear-lanceolate to lanceolate, 9–35 mm wide.
- 34a. Sterile pinnae linear-lanceolate, margins with fine undulate teeth; veinlets very closely spaced, ca. 28 per cm 4. *P. confertinervia*
- 34b. Sterile pinnae lanceolate, margins finely dentate; veinlets fewer.
- 35a. Median sterile pinnae 4–6 × ca. 1 cm 29. *P. ensiformis*
- 35b. Median sterile pinnae 9–23 × 1.5–3.5 cm.
- 36a. Stipe glabrous; pinnule margins obtusely serrate.
- 37a. Fronds herbaceous; Hainan 6. *P. morii*
- 37b. Fronds papery; Yunnan 19. *P. cretica*
- 36b. Sterile stipe scaly; pinnule often with conspicuous pale central band, margins irregularly dentate; Taiwan.
- 38a. Pinnule often with conspicuous pale central band; fertile pinnules ca. 15 mm wide 20. *P. nipponica*
- 38b. Pinnule uniformly green; fertile pinnules 3–5 mm wide 21. *P. ryukyuensis*
- 26b. Lateral pinnae forked or basiscopically branched.
- 39a. Lateral pinnae often with 1–3 basiscopic branches, lowest pair (or basal pairs) often with 2 or 3 branches or subpinnate.

- 40a. Lateral pinnae forked; ultimate pinnules of sterile fronds linear, apically long acuminate.
- 41a. Stipe and rachis light straw-colored, glabrous or ± rough 10. *P. henryi*
- 41b. Stipe and rachis chestnut-brownish, rough, sometimes glabrous 11. *P. actiniopteroides*
- 40b. Lateral pinnae (especially sterile frond) subpinnate; pinnules of sterile fronds or segments broadly lanceolate or oblong, obtuse, or linear-lanceolate, apically acuminate.
- 42a. Apical pinnae decurrent at base forming thin wings along rachises; sterile pinnules linear-lanceolate, apically acuminate 31. *P. multifida*
- 42b. Apical pinnae not decurrent on rachises; sterile pinnules broadly lanceolate or oblong, apically obtuse, sometimes acute 29. *P. ensiformis*
- 39b. Basal pinnae with 1 or 2 basiscopic branches, occasionally second and third pairs with basiscopic branches (rarely to fifth pair).
- 43a. Fronds with 2 pairs of lateral pinnae.
- 44a. Sterile pinnae 2–4(–8) mm wide, margins with narrow, acute teeth.
- 45a. Fertile fronds longer than sterile fronds; lamina hard papery when dry 8. *P. angustipinna*
- 45b. Fertile fronds as long as sterile fronds; lamina hard herbaceous when dry.
- 46a. Stipe and rachis slightly straw-colored, glabrous or ± rough 10. *P. henryi*
- 46b. Stipe and rachis castaneous-brownish, sometimes glabrous or rough 11. *P. actiniopteroides*
- 44b. Sterile pinnae 10–20 mm wide.
- 47a. Margins of sterile pinnae slightly serrate; Hainan 6. *P. morii*
- 47b. Margins of sterile pinnae densely and sharply serrate.
- 48a. Stipe and rachis castaneous, midvein brown near base; E and S China 18. *P. plumbea*
- 48b. Stipe up to basal part of lamina straw-colored, basal part of midvein abaxially slightly brown-straw-colored or straw-colored.
- 49a. Pinnae narrowly lanceolate, ca. 1 cm wide, shortly acuminate, basal pair with stalk ca. 1 cm 15. *P. quinquefoliata*
- 49b. Pinnae lanceolate to broadly lanceolate, acuminate, basal pair sessile or subsessile 16. *P. guangdongensis*
- 43b. Fronds with more than 3 pairs of lateral pinnae, rarely only 3 pairs.
- 50a. Pinna margins entire.
- 51a. Pinnae shiny and smooth, margins distinctly pleated 25. *P. venusta*
- 51b. Pinnae not shiny or smooth, margins slightly undulate.
- 52a. Apical pinnae with stipes, not decurrent at base; lateral pinnae 6–14 pairs, pinnae fertile only on upper portion, lower pinnae sterile and stalked 26. *P. insignis*
- 52b. Apical pinnae decurrent along rachis; lateral pinnae 3 pairs, basal pair sessile, second and third pairs of pinnae with decurrent base along rachis 24. *P. longipinna*
- 50b. Pinna margins ± serrate.
- 53a. Apical 2 or 3 pairs or more of lateral pinnae long decurrent at base, forming thin wings along rachises 31. *P. multifida*
- 53b. Apical pinnae 3-forked or sometimes adjacent pair of lateral pinnae ± decurrent, rarely not decurrent.
- 54a. Fronds monomorphic, sometimes subdimorphic.
- 55a. Pinnules linear, ca. 3 mm wide; fronds monomorphic, sometimes slightly dimorphic.
- 56a. Stipe and rachis light straw-colored, smooth or ± rough 10. *P. henryi*
- 56b. Stipe and rachis castaneous-brownish, rough or sometimes glabrous 11. *P. actiniopteroides*
- 55b. Pinnules lanceolate to oblong-lanceolate, 1.5–2 cm wide; fronds monomorphic.
- 57a. Pinnae lanceolate or broadly lanceolate, apically acuminate, basal pinna pair sessile or nearly so; Guangdong 16. *P. guangdongensis*
- 57b. Pinnae oblong-lanceolate, apically obtuse, basal pinna pair stalked; Guangxi 17. *P. hui*
- 54b. Fronds conspicuously dimorphic.
- 58a. Lamina herbaceous; Guangdong and Hainan.
- 59a. Median sterile pinnae 9–23 × 1.5–2.5 cm 6. *P. morii*
- 59b. Median sterile pinnae 4–6 × ca. 1 cm 29. *P. ensiformis*
- 58b. Lamina papery to slightly leathery; E to SW China, not in Hainan.
- 60a. Plants 50–70 cm; sterile pinnae narrowly lanceolate or lanceolate, 1–2 cm wide, papery when dry; stipe always smooth 19. *P. cretica*
- 60b. Plants up to 1.5 m; sterile pinnae lanceolate to oblong-lanceolate, 2–5 cm wide, slightly leathery when dry; stipe sometimes with distal part verrucose-tuberculate 23. *P. esquirolii*

Key to *Pteris* sect. *Quadriauricula*

- 1a. Frond 3-partite; lateral divisions same shape as terminal one but smaller (*P. ser. Longipedes* Ching).
- 2a. Lateral pinnae 12–20 per rachis 67. *P. longipes*

- 2b. Lateral pinnae 4–6 per rachis 68. *P. paucipinnula*
- 1b. Frond pinnate (*P. ser. Quadriaurita* Ching).
- 3a. Fronds dimorphic 44. *P. cadieri*
- 3b. Fronds monomorphic.
- 4a. Pinnae entire; frond with 2 or 3 pairs of lateral pinnae 69. *P. quadristipitis*
- 4b. Pinnae pectinately divided; frond usually with 4 or more pairs of lateral pinnae (sometimes fewer in *P. aspericaulis*).
- 5a. Lateral pinnae asymmetrical along costa, lobes shorter and/or fewer, sometimes almost absent, on acroscopic side.
- 6a. Basiscopic side of costa with 0–3 segments, acroscopic side with 3–6 segments; segments 3.5–6 × ca. 0.6 cm, lowermost sometimes with secondary lobes so pinna 2-pinnatifid 43. *P. formosana*
- 6b. Basiscopic side of costa regularly pectinately lobed, acroscopic side with fewer and smaller segments, sometimes almost entire.
- 7a. Stipe straw-colored or dark straw-colored; costa with finely toothed protuberances or short spines along groove.
- 8a. Plants often to 1.5(–2) m; lamina segments distinctly decurrent at base 39. *P. malipoensis*
- 8b. Plants 0.8–1 m; lamina segments separate, basiscopic not distinctly decurrent at base 41. *P. inaequalis*
- 7b. Stipe castaneous-red or dark castaneous; costa with erose margin along adaxial groove.
- 9a. Plants often 1–1.5 m; rhizome scales with paler margins 38. *P. dissitifolia*
- 9b. Plants often 0.3–0.8 m; rhizome scales uniformly blackish brown.
- 10a. Segments distant, almost entirely restricted to basiscopic side, acroscopic side entire or with very few shorter segments, distinctly decurrent at base; veins of sterile frond ending at base of shortly acuminate teeth 37. *P. semipinnata*
- 10b. Segments closely spaced, on both sides with acroscopic segments only slightly shorter than basiscopic segments, not distinctly decurrent at base; veins of sterile frond ending within long acuminate teeth 36. *P. dispar*
- 5b. Lateral pinnae (at least of sterile fronds) symmetrical along costa with acroscopic side as wide as basiscopic side.
- 11a. Basal pinnae similar to upper pinnae, without any basiscopic branches.
- 12a. Abaxial surface of costa, costule, and segments glabrous
- 13a. Lateral pinnae 5–10 pairs; stipe, rachis, and costae green 40. *P. terminalis*
- 13b. Lateral pinnae 2–5 pairs; stipe, rachis, and costae often purple 49. *P. aspericaulis*
- 12b. Abaxial surface of costa with coarse hairs; costules and abaxial surface of segments ± hairy.
- 14a. Pinna segments 8–12 pairs restricted to basal half of pinna, pinna apex linear, more than half as long as pinna 46. *P. heteromorpha*
- 14b. Pinna segments 15–20 pairs distributed along most of length of pinna, pinna apex shorter than lower segments 47. *P. decrescens*
- 11b. Basal pinnae with one or more basiscopic branches near their bases.
- 15a. Lamina with narrow lines (false veins) between veins 45. *P. grevilleana*
- 15b. Lamina without lines between veins.
- 16a. Margins of sterile segments serrate 42. *P. amoena*
- 16b. Margins of sterile segments entire, sometimes slightly undulate.
- 17a. Two veins from adjacent segments reaching base of incision of pinnae, forming an acute triangle, sometimes forming areoles; pinnae often pinnatifid 66. *P. arisanensis*
- 17b. Two veins from adjacent segments reaching incision of pinnae, forming a short obtuse triangle; pinnae pinnate or deeply pinnatisect.
- 18a. Segment apex mucronate.
- 19a. Costae abaxially coarsely hairy; midvein and abaxial surface of segments ± hairy 48. *P. longipinnula*
- 19b. Costae smooth or rough.
- 20a. Lower vein of basal pair of veins of segment near to costa and subparallel to costa; basal pinnae with ca. 2 cm stalk 52. *P. splendida*
- 20b. Lower vein of basal pair of veins of segment oblique, not parallel to costa; basal pinnae sessile or subsessile.
- 21a. Stipe grayish brown, rough-surfaced; lamina very rigid, drying gray-green; spines along costae adpressed and inconspicuous 50. *P. scabrigens*
- 21b. Stipe green, straw-colored, or partly ± purple; lamina papery to herbaceous, not drying gray-green; spines along costae ± patent.
- 22a. Stipe, rachis, and costae all green 48. *P. longipinnula*
- 22b. Stipe, rachis, and costae straw-colored or partly ± purple.

- 23a. Stipe as long as lamina; lamina oblong-ovate; indusia purple or straw-colored 49. *P. aspericaulis*
 23b. Stipe ca. 2 × as long as lamina; lamina ovate-triangular, 3-forked; indusia yellowish 51. *P. caiyangheensis*
- 18b. Segment apex not mucronate.
 24a. Pinnae abaxially with short or flakelike hairs.
 25a. Pinnae abaxially with flakelike hairs (especially along costa); costa blue-green; segment costules with needlelike spines 61. *P. viridissima*
 25b. Pinnae abaxially sparsely shortly pubescent on basiscopic side; costa straw-colored, sometimes light purple; segment costules with flat spines.
 26a. Segments acute, adaxially sparsely shortly hairy; costules adaxially with thin acute spines 62. *P. hirsutissima*
 26b. Segments obtuse, adaxially glabrous; costules adaxially without spines 60. *P. puberula*
- 24b. Pinnae abaxially glabrous.
 27a. Lamina subleathery when dry; costae with soft flat spines adaxially 63. *P. subquinata*
 27b. Lamina papery or herbaceous when dry; costae with distinct, needlelike or obovate spines.
 28a. Fronds with (9–)11–16 pairs of pinnae, basal pinnae often each with (2 or)3 or 4 basiscopic branches 53. *P. setulosocostulata*
 28b. Fronds with (3–)5–9 pairs of pinnae, basal pinnae each with 1 or 2 basiscopic branches.
 29a. Pinnae divided to costa; stipe reddish brown.
 30a. Stipe glossy, scales expanded at base 64. *P. bella*
 30b. Stipe not glossy, muricate, scales not expanded at base 65. *P. scabristipes*
- 29b. Pinnae pinnatifid; stipe mainly straw-colored.
 31a. Plants more than 1.3 m tall; lateral pinnae ca. 35 cm, median pinnule segments 35–55 × 7–9 mm 59. *P. majestica*
 31b. Plants 0.5–1 m tall; lateral pinnae 12–23 cm, median pinnule segments 10–16 × 4–5 mm.
 32a. Lateral pinnae oblique upward.
 33a. Lateral pinnae widest at base (triangular) or oblong 55. *P. oshimensis*
 33b. Lateral pinnae widest at their middle 56. *P. fauriei*
 32b. Lateral pinnae spreading or oblique.
 34a. Lateral pinnae triangular (widest at base) or oblong in outline 54. *P. kiuschiensis*
 34b. Lateral pinnae often widest at their middle.
 35a. Median pinnae 17–23 × 4–6.5 cm; segments not narrowed to apex, linear, obtuse, ca. 1 mm apart 58. *P. obtusiloba*
 35b. Median pinnae 5–16 × 2–3.2 cm; segments narrowed to apex, linear-lanceolate, 2–4(–7) mm apart.
 36a. Stipe 43–65 cm, sparsely scaly; lateral pinnae 5–7 pairs 57. *P. angustipinnula*
 36b. Stipe 10–42 cm, glabrous; lateral pinnae 1 or 2(–14) pairs 49. *P. aspericaulis*

Key to *Pteris* sect. *Campteria*

- 1a. Lamina pinnate; basal pair of pinnae each with 1 (sometimes 2) basiscopic pinnules.
 2a. Stipe straw-colored to pale green; lamina hard papery 70. *P. biaurita*
 2b. Stipe chestnut; lamina herbaceous.
 3a. Costa wings to 5–6 mm wide on both sides; segments 6–9 mm wide 71. *P. maclurei*
 3b. Costa wings ca. 3 mm wide; segments 4–6 mm wide 72. *P. maclurioides*
- 1b. Lamina 3-partite to pedate, divided into 3 or more branches, each branch pinnate; basal pair of pinnae not branched on basiscopic side.
 4a. Areoles along costules of segments as well as along costa; stipe and rachis straw-colored or light brown.
 5a. Segments 2.5–7 cm, 7–12 mm apart 77. *P. finotii*
 5b. Segments 1–3 cm, 2–5 mm apart 78. *P. tripartita*
- 4b. Areoles restricted to along main costa, absent from segments; veins above areoles all free (sometimes basal veins of segment forming areoles); stipe and rachis straw-colored or red or brown-red.
 6a. Stipe and rachis straw-colored; segments 30–40 × ca. 3 mm, 5–8 mm apart; Taiwan 76. *P. taiwanensis*
 6b. Stipe and rachis red or brown-red, or rachis rarely straw-colored; segments 10–25 × ca. 4 mm, up to 4 mm apart.
 7a. Stipe and rachis with purple-brownish bristles 74. *P. wallichiana*
 7b. Stipe and base of rachis glabrous (sometimes stipes slightly hairy).

- 8a. Lamina abaxially with red-brown bristles 74. *P. austrosinica*
 8b. Lamina abaxially subglabrous.
 9a. Lateral pinnules 20–25 × ca. 4.5 cm; segments 2–4 mm apart 75. *P. occidentalisinica*
 9b. Lateral pinnules 11–20(–25) × 2–2.5(–3.5) cm; segments 1–2 mm apart 73. *P. wallichiana*

1. *Pteris* sect. *Pteris*

凤尾蕨组 feng wei jue zu

Thelypteris Adanson (Jul–Aug 1763), not Schmidel (18 Oct 1763, nom. cons.).

Plants small or medium-sized (0.05–1.5 m tall). Fronds often dimorphic or subdimorphic, pedate, digitate, or imparipinnate, seldom simple; pinnae or basal pinnae pair (sometimes few pairs) forked, never pectinate or pinnate; pinnae often narrowly linear or lanceolate, acuminate, with cartilaginous margins, sterile pinnae or sterile margins serrulate, seldom entire, costae or midveins adaxially erose; venation free. Sori linear, along segment margins, absent at apex and sinuses; indusia gray-brown or brown, linear, membranous, persistent.

Old World tropics and subtropics, Pacific islands; 35 species (20 endemic) in China.

It has not been possible to obtain a reliable estimate of the sizes of the sections within *Pteris* because there are no accounts consistent across the entire range.

Some species are calciphilous and can be found on limestone and walls.

1. *Pteris pseudopellucida* Ching, Lingnan Sci. J. 15: 395. 1936.

单叶凤尾蕨 dan ye feng wei jue

Pteris pellucida C. Presl f. *simplex* Hooker; *P. subsimplex* Ching.

Plants 30–40 cm tall. Rhizome erect, short, ca. 1.5 cm in diam., scaly at growing tips. Fronds dimorphic, simple or 2- or 3-forked; stipe straw-colored to light brown, slightly lustrous, 15–20 cm × ca. 2 mm, glabrous. Sterile fronds: lamina (or pinnae) lanceolate, ca. 20 × 2.5–3 cm, base broadly cuneate or subobtusate, margin subcartilaginous, undulate, serrate upward, apically shortly serrulate, apex acuminate. Fertile fronds (or pinnae) linear-lanceolate, ca. 20 × 1–2 cm, entire, apex sterile, slightly serrulate. Lamina pale green, papery when dried, glabrous; midvein straw-colored, convex abaxially; veins simple or 2-forked.

Common in ravines, bamboo forests; 100–200 m. SE Yunnan (Hekou) [N Vietnam (Lao Cai)].

2. *Pteris undulatifinna* Ching, Acta Bot. Austro Sin. 1: 3. 1983.

波叶凤尾蕨 bo ye feng wei jue

Plants 40–60 cm tall. Rhizome erect, short, ca. 1 cm in diam., scaly at growing tips. Fronds dimorphic; stipe light straw-colored, 15–20 cm × ca. 1.5 mm. Sterile fronds: lamina linear, up to 40 × ca. 1 cm, base sterile and slightly undulate, apex caudate and slightly serrulate. Fertile fronds 3-forked, terminal pinnae linear, 25–30 × 1–1.5 cm, basally cuneate, sessile, separate, margin entire at base, revolute, spreading serrate upward, apex long acuminate; lateral pinnae as apical pinna but shorter, somewhat falcate. Lamina pale green, thinly papery when dried, glabrous with black longitudinal striation ca. 4 mm wide on both sides along midvein; midvein light straw-colored, abaxially convex; veins simple or 2-forked.

- Bamboo forests; ca. 900 m. S Yunnan (Mengla).

3. *Pteris stenophylla* Wallich ex Hooker & Greville, Icon. Filic. 2: t. 130. 1829.

狭羽凤尾蕨 xia yu feng wei jue

Pteris cretica Linnaeus var. *stenophylla* (Wallich ex Hooker & Greville) Baker; *P. pellucida* C. Presl var. *stenophylla* (Wallich ex Hooker & Greville) C. B. Clarke.

Plants ca. 50 cm tall. Rhizome ascending, ca. 6 mm in diam. Fronds subdimorphic, clustered; stipe straw-colored, 30–35 cm × ca. 1.5 mm, glabrous; lamina digitate, pinnae 3–5, clustered at stipe apex, linear-lanceolate, up to 20 cm × 8–10 mm (sterile fronds wider than fertile fronds), base cuneate, margin entire and cartilaginous, apex long acuminate; lamina gray-green, papery when dried, glabrous; midvein straw-colored, convex adaxially; veins simple, rarely 2-forked.

Among dry rocks in open forests; 2500–3000 m. SE Xizang (Himalaya) [Bhutan, N India, Nepal].

4. *Pteris confertinervia* Ching, Acta Bot. Austro Sin. 1: 4. 1983.

密脉凤尾蕨 mi mai feng wei jue

Plants ca. 35 cm tall. Rhizome erect, short, apically scaly. Fronds submonomorphic, clustered; stipe light-brown, slender, ca. 1 mm in diam., glabrous. Sterile fronds: stipe up to 8 cm, lamina similar to those of fertile fronds in shape but shorter, or sometimes with more lateral pinna pairs, apical pinna decurrent on lateral pinnae forming a wing. Fertile fronds: stipe up to 13 cm; lamina pedate, connate at base; terminal pinna linear-lanceolate, ca. 25 × 0.9 cm, margin densely undulate-denticulate at base of pinnae, apex long acuminate; lateral pinnae similar but shorter. Lamina light brown-green, slightly lustrous, herbaceous when dried; midvein convex on both sides; veins closely spaced, ca. 28 per cm.

- Taiwan (Taibei).

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pterido-

phytes, 101. 2008) regarded *Pteris confertinervia* as a synonym of *P. cretica* var. *cretica*. Reviewer Ralf Knapp indicates that there is a need to reinvestigate the identity of the plants commonly identified in Taiwan as *P. cretica* subsp. *cretica*.

5. *Pteris crassiuscula* Ching & Chu H. Wang, Acta Phytotax. Sin. 8: 142. 1959.

厚叶凤尾蕨 hou ye feng wei jue

Plants ca. 50 cm tall. Rhizome erect, short, ca. 1 mm in diam., apex with brownish black scales. Fronds dimorphic. Sterile fronds: stipe straw-colored, light brown, or castaneous-brown, slightly lustrous, 10–25 cm × 1–2 mm, glabrous; lamina 3-pinnulate, terminal pinna lanceolate, 20–25 × 2.5–3 cm, basally narrowly cuneate, somewhat decurrent, shortly stalked (1–5 mm), margin cartilaginous and slightly serrate, apex acuminate and serrate; lateral pinnae as terminal pinnae but shorter and sessile. Fertile fronds: stipe up to 45 cm; lamina oblong, 25–30 cm, 1-pinnate; pinnae 2 pairs per frond, subsessile, decumbent, ca. 5 cm apart, narrowly linear, 20–25 cm × ca. 5 mm. Lamina pale green or brown-green, leathery when dried, firm, both surfaces glabrous; midvein straw-colored or castaneous-brown, abaxially convex, veins conspicuous, simple or 2-forked from base.

- Forests along valleys; ca. 700 m. Hainan (Baoting, Diaolu Shan).

6. *Pteris morii* Masamune, Trans. Nat. Hist. Soc. Formosa 32: 342. 1942.

琼南凤尾蕨 qiong nan feng wei jue

Plants 50–70 cm tall. Rhizome erect, short, 1–1.5 cm in diam., apex with black-brown, entire scales. Fronds clustered, dimorphic; stipe pale straw-colored or castaneous, 30–45 cm × ca. 2 mm, firm, glabrous. Sterile fronds: lamina 1-pinnate, triangular-ovate in outline; pinnae 2–4 pairs, sometimes digitate, basal 1 or 2 pairs often forked, opposite, slightly decumbent, shortly stalked, remainder sessile, simple, narrowly lanceolate, 9–23 × 1.5–2.5 cm, base narrowly cuneate, margins cartilaginous and obtusely serrate, apex acuminate or acute and serrate. Fertile fronds: pinnae 2–5 pairs, basal pair often 2-forked, lower ones stalked (3–5 mm), upper ones sessile, linear, sometimes linear-lanceolate, 20–25 × 0.8–1 cm, sterile margins serrulate. Lamina pale green, thickly leathery when dried, glabrous, sterile pinnae sometimes with gray lines along midvein adaxially, midvein abaxially convex, straw-colored, veins abaxially conspicuous, simple or forked.

- Dense forests along valleys; near sea level to 900 m. Hainan.

7. *Pteris dactylina* Hooker, Sp. Fil. 2: 160. 1858.

指叶凤尾蕨 zhi ye feng wei jue

Plants 20–40 cm tall. Rhizome prostrate, short, ca. 3 mm in diam., apex scaly. Fronds clustered, dimorphic; sterile fronds as long as fertile fronds; stipe straw-colored, brown at base, slightly lustrous, slender, 15–30 cm × ca. 1 mm, smooth or rarely scabrous; lamina digitate, pinnae (3–)5–7, basal pairs nearly 3-forked, rarely or apical pinnae 2- or 3-forked, clustered; terminal pinna narrowly linear, 8–10(–15) × (0.2–)0.3–0.4(–0.8) cm, sessile or shortly stalked, base cuneate, not de-

current, apex acuminate; lateral pinnae similar, shorter, somewhat falcate, sessile, margins denticulate, midvein straw-colored, glabrous, abaxially convex, adaxially grooved; veins conspicuous, separate, straight, parallel to each other, slightly oblique, simple or rarely forked from base; fertile pinnae similar but margins subentire, serrulate only at apex; lamina gray-green, firmly herbaceous when dried, both surfaces glabrous. Indusia linear, pallid, membranous, subentire.

1800–2700 m (in Taiwan). Guizhou (Fanjing Shan), Sichuan, Taiwan, SE Xizang, Yunnan [Bhutan, NE India, Nepal].

Pteris pseudodactylina Ching & S. K. Wu (Fl. Xizang. 1: 66–68. 1983) from SE Xizang is closely related, differing by the wider sterile pinnae, ca. 1 cm wide, with larger cartilaginous marginal teeth and fertile fronds with the 3 central pinnae decurrent at base.

Pteris gracillima Ching & S. K. Wu (Fl. Xizang. 1: 65–66. 1983) from SE Xizang is also closely related. It is described as a more delicate plant, 13–28 cm tall, with 3-pinnulate fronds, the pinnae 8–22 × ca. 0.4 cm, with the lateral pinnae much shorter than the terminal pinna, and the margins of the sterile pinnae undulate or sinuate, not toothed. *Pteris stenophylla* is also rather similar to *P. gracillima* but has pinnae more equal in length and ca. 1 cm wide.

8. *Pteris angustipinna* Tagawa, Acta Phytotax. Geobot. 4: 203. 1935.

细叶凤尾蕨 xi ye feng wei jue

Plants 20–40 cm tall. Rhizome and base of stipes scaly; scales castaneous-brown, linear or subulate-linear, ca. 3 mm, entire, basally sparsely glandular pubescent. Fronds somewhat dimorphic. Sterile fronds: stipe straw-colored, light brown at base, slightly scabrous, glabrous, adaxially grooved, 3–10 cm; lamina digitate or rarely pinnate (2 pairs of lateral pinnae); terminal pinna linear, 10–17 cm × 2–3(–5) mm, base shortly cuneate, shortly stalked or sessile, margins serrulate, apex acuminate; lateral pinnae narrower, 5–10 cm, sessile or shortly stalked; basal pinnae pair sometimes forked. Fertile fronds: stipe 5–17 cm; lamina pinnate (2 pairs of lateral pinnae); terminal pinna linear, 10–27 cm × 2–4 mm, stalked (3–15 mm); lateral pinnae shorter; basal pair sometimes forked, sterile margins serrulate. Lamina thinly papery when dried; veins conspicuous, simple or forked.

- On rocks in forests, very rare; 2000–2600 m. Taiwan.

9. *Pteris gallinopes* Ching, Acta Bot. Austro Sin. 1: 4. 1983.

鸡爪凤尾蕨 ji zhua feng wei jue

Plants small, 10–20 m tall. Rhizome erect, short, ca. 1 cm in diam., apex with black scales. Fronds clustered, monomorphic; stipe straw-colored, light brown at base, opaque, 6–10 cm × ca. 1 mm, glabrous, adaxially shallowly grooved; lamina digitate, 4–6 × 4–7 cm; pinnae 5(–9), clustered at apex of stipe, linear, 3–7 cm × 3–4 mm, middle ones slightly longer, stalked (2–4 mm), base cuneate, margins of sterile fronds slightly serrate, fertile fronds entire, apex acuminate and slightly serrulate; lateral pinnae similar but smaller and slightly falcate, apically acuminate or mucronate. Lamina gray-green, herbaceous when dried, glabrous; midvein prominent on both sides, straw-colored to pale green, glabrous; veins conspicuous, separate, parallel to each other, ca. 1.5 mm apart, oblique, simple or forked. Sori

absent at segment base and apex; indusia gray-brown, linear, thinly membranous, entire.

- Limestone crevices within forests; 800–1700 m. Guizhou (Anshun, Duyun), Hubei (Hefeng), Sichuan (Baoping, Emei Shan, Leshan), Yunnan.

10. *Pteris henryi* Christ, Bull. Herb. Boissier 6: 957. 1898.

狭叶凤尾蕨 xia ye feng wei jue

Plants 30–50 cm tall. Rhizome ascending, short, ca. 1 cm in diam., apex with brownish black scales. Fronds clustered, monomorphic or somewhat dimorphic; sterile fronds shorter than fertile fronds; stipe light straw-colored, 15–20 cm (stipes of sterile fronds shorter), 1–2 mm in diam., smooth or ± rough, glabrous, angulate; lamina 1-pinnate, oblong-ovate in outline, 20–30 × 10–15 cm; pinnae (2–)4–6 pairs, opposite, 5–7 cm apart near base of frond, very decumbent, basal pair shortly stalked, often 3- or 4-forked; upper pairs sessile, often 2–4-forked, seldom simple; terminal pinna 2- or 3-forked, rarely simple and shortly stalked; pinnules linear, 10–20 × (0.2–)0.3–0.4 cm (sterile segments broader), base broadly cuneate and slightly oblique, sterile margins slightly serrulate, fertile margins entire, apex long acuminate. Lamina gray-green, papery when dried, glabrous on both surfaces; midvein prominent on both sides, pale straw-colored; veins conspicuous, slightly inflexed, spreading, simple or forked. Sori narrowly linear; indusia brown, linear, membranous, entire.

- Limestone crevices; 400–2300 m. Guangxi (Lengyun, Leye), Guizhou, SW Henan (Xichuan), S Shaanxi, Sichuan (Chongqing, Leibo), Yunnan.

11. *Pteris actinopteroides* Christ, Bull. Herb. Boissier 7: 6. 1899.

猪鬃凤尾蕨 zhu zong feng wei jue

Pteris cretica Linnaeus var. *melanocaulis* Baker.

Plants 5–30(–60) cm tall. Rhizome erect, short, 1–1.5 cm in diam., apex with black-brown, entire scales. Fronds many, clustered, monomorphic or somewhat dimorphic, sterile fronds shorter than fertile fronds; stipe erect or spreading, castaneous-brown, 3–6(–20) cm (stipes of sterile fronds shorter), 0.5–1 mm in diam., scabrous or occasionally smooth; sterile lamina 1-pinnate (juvenile plants digitate), oblong-ovate or broadly triangular in outline; lateral pinnae 1 or 2 pairs, opposite, slightly decumbent, 2-forked or basal pair 3-forked, base of apical 3-forked, pinnae not or slightly decrescent; pinnules narrowly linear, often ca. 10 cm × 4–5 mm, base cuneate, margins serrate, apex long acuminate; fertile fronds: lateral pinnae often 2–4 pairs, opposite, 2–4 cm apart, slightly decumbent, basal pair 2–4-forked and shortly stalked, gradually simpler upward and sessile, base of 3-forked terminal pinna slightly or not decurrent; pinnules/segments narrowly linear, often 10–18 cm × 2–3 mm, base cuneate, margins serrulate toward apex only, apex long acuminate. Lamina pale green, thinly papery when dried, glabrous; midvein convex on both sides, light straw-colored, sometimes castaneous-brown at base; veins conspicuous on both sides, ca. 1 mm apart, slightly oblique, simple or forked. Sori absent at segment apices; indusia slightly broad, pallid, thinly membranous, entire.

- Limestone crevices; 600–2000 m. Chongqing, SE Gansu (Wenxian), N Guangxi (Luocheng, Yishan), Guizhou, N Henan (Huixian), Hubei (Yichang), S Shaanxi (Xixiang), Sichuan, Yunnan.

Pteris actinopteroides is a xeric and calciphilous plant.

12. *Pteris deltodon* Baker, J. Bot. 26: 226. 1888.

岩凤尾蕨 yan feng wei jue

Pteris nana Christ; *P. trifoliata* Christ (1899), not Fée (1857).

Plants 15–25 cm tall. Rhizome erect, short, ca. 1 cm in diam., apex with black-brown scales. Fronds clustered, sub-monomorphic; stipe brown at base, upper part straw-colored, slightly lustrous, 10–20 cm × 1–2 mm; sterile lamina similar to fertile lamina in shape but shorter and wider, terminal pinnae oblong-lanceolate, lateral pinnae ovate, margins serrate except at base; fertile lamina pinnate, ovate to triangular-ovate, 10–20 × 4–7 cm; pinnae 3–5; terminal pinna broadly lanceolate, 5–8 × 1.2–2 cm wide, sessile or shortly stalked, base broadly cuneate, sterile margins triangular-serrate toward apex, remainder entire, apex acuminate; lateral pinnae smaller, opposite, decumbent, falcate, sessile, base obtuse and oblique, apex mucronate. Lamina light brown, papery when dried, glabrous on both surfaces; costae straw-colored, abaxially convex; veins conspicuous, simple or forked. $n = 53$, $2n = 106$.

On dark and slightly dry limestone, common in limestone soils in SW China; 300–2500 m. SW Guangxi (Longsheng), Guizhou (Anlong, Duyun, Pingtang), Sichuan, Taiwan, Yunnan (Guangnan, Maguan, Pingbian), Zhejiang [Japan (Ryukyu Islands), Laos, Vietnam].

Pteris sanduensis X. Y. Wang & P. S. Wang (Pterid. Fl. Guizhou, 598–599. 2001) was compared in the protologue to *P. deltodon* and *P. crassiuscula* where it was separated by the dimorphic fronds, the sterile fronds with terminal pinna 8–11 × 7–8 cm.

13. *Pteris olivacea* Ching, Acta Bot. Austro Sin. 1: 5. 1983.

长羽凤尾蕨 chang yu feng wei jue

Plants 25–30 cm tall. Rhizome erect, short, ca. 6 mm in diam., apex with dark brown scales. Fronds clustered, monomorphic; stipe 12–14 cm × 1.5–2 mm; lamina 3-pinnulate; lateral pinnae/pinnules 1 pair, opposite, decumbent, lanceolate, somewhat falcate, stalked (ca. 2 mm), ca. 12 × 1.5 cm, basally asymmetrical, margins mostly entire, upper 1/3 of sterile pinnules serrate, apex long acuminate; terminal pinna similar in shape but longer, long stalked (1.5–3.5 cm), base symmetrically cuneate; lamina brown-green, thinly papery when dried, both surfaces glabrous; costae straw-colored, glabrous, grooved adaxially; veins inconspicuous, oblique, parallel, ca. 1.5 mm apart, simple or forked.

- Under scrub by valleys; 1100–1300 m. SE Yunnan (Daweishan, Pingbian).

14. *Pteris baksaensis* Ching, Acta Phytotax. Sin. 9: 348. 1964.

白沙凤尾蕨 bai sha feng wei jue

Plants ca. 40 cm tall. Rhizome prostrate, ca. 3 mm in diam., apex with brown, linear-lanceolate scales. Fronds spaced, monomorphic; stipe brown at base, apically straw-colored, ca. 25 cm (stipes of sterile fronds shorter), glabrous,

adaxially grooved; lamina digitate, pinnae 3, ca. 20 cm, middle part 6–10 cm; lateral pinnae sessile, opposite, very decumbent, lanceolate, subfalcate, ca. 1.2 cm wide, base slightly oblique, broadly cuneate, margins cartilaginous, sterile fronds entire at base, finely and acutely serrate toward apex, apex acuminate; terminal pinna similar, narrowly lanceolate, up to 22 × ca. 1.4 cm, base symmetrical, cuneate, stalked (1–1.5 cm); lamina gray-green, papery when dried, costae with pallid vertical stripes on both sides on adaxial surface, both surfaces glabrous; costae straw-colored, glabrous, adaxially grooved; veins inconspicuous, dense, parallel, oblique, 1- or 2-forked.

- Forests. Hainan (Baisha).

15. *Pteris quinquefoliata* (Copeland) Ching, Fl. Reipubl. Popularis Sin. 3(1): 24. 1990.

五叶凤尾蕨 wu ye feng wei jue

Pteris nana Christ var. *quinquefoliata* Copeland, Philipp. J. Sci., C, 3: 282. 1908.

Plants ca. 25 cm tall. Rhizome not seen. Fronds clustered, monomorphic; stipe straw-colored, slender, ca. 15 cm; lamina pinnate or digitate, ca. 10 × 10 cm; lateral pinnae often 2 pairs, opposite, oblique, basal pair shortly stalked, 2-forked, second lateral pinnae equal in shape to apical pinnae but shorter, basal pinnule oblong-lanceolate, ca. 3 cm, slightly reflexed; terminal pinna longest, shortly stalked (ca. 1 cm), lanceolate, ca. 8 × 1 cm, base cuneate, margins entire below apex, apex mucronate and acute, serrate; lamina papery when dried, both surfaces glabrous; midvein adaxially brown-straw-colored, convex; veins simple or 2-forked at base.

- On limestone. N Guangdong (Lianxian).

16. *Pteris guangdongensis* Ching, Acta Bot. Austro Sin. 1: 5. 1983.

广东凤尾蕨 guang dong feng wei jue

Plants 30–50 cm tall. Rhizome not seen. Fronds clustered, monomorphic; stipe brown at base, apex and rachis straw-colored, slightly lustrous, 20–35 cm × ca. 2 mm, apex compressed, glabrous; lamina 1-pinnate, ovate in outline, 20–25 × 10–15 cm; pinnae 2–6 pairs, opposite, sessile or basal pair subsessile, decumbent; lateral pinnae similar to terminal pinnae in shape, but shorter, sometimes broadly lanceolate to oblong-lanceolate, basal pair 2-forked, sterile pinna tips acutely serrate, margins of sterile pinnae slightly irregularly and acutely serrate, fertile pinnae entire; terminal pinna largest, ± connate with nearest lateral pair of pinnae, lanceolate, 10–15 × 2–2.5 cm, base not or only slightly decurrent, broadly cuneate, margin entire, apex acuminate; lamina brown-green, thinly leathery when dried, matte, glabrous on both surfaces, with scales on axil of pinnae, scales black-brownish, linear; midvein abaxially convex, straw-colored; veins conspicuous and convex on both sides, simple or forked.

- On rocks; ca. 800 m. Guangdong (Wengyuan, Yangchun, Yunfu).

17. *Pteris hui* Ching, Sinensia 1: 9. 1929.

胡氏凤尾蕨 hu shi feng wei jue

Plants ca. 25 cm tall. Rhizome erect, short, apex with black-brown scales. Fronds clustered, monomorphic; stipe straw-colored, 6–17 cm × ca. 2 mm, as long as rachis, glabrous; lamina 1(or 2)-pinnate, broadly ovate, 5–10 × 10–12 cm; lateral pinnae 1 or 2 pairs, opposite, stalked, basal pair largest, with 2 or 3 pinnules; middle pinnule largest, oblong-lanceolate to oblong-ovate, 3.5–6 × 1.5–2 cm, stalked (5–10 mm), base broadly cuneate, sterile margins serrate, apex obtuse; upper pair of lateral pinnae simple, similar to middle pinnule of basal pair; terminal pinna up to 8–9 cm; lamina pale green, subleathery when dried; midvein abaxially convex, light brown-straw-colored; veins 2-forked.

- Limestone crevices; ca. 700 m. NW Guangxi (Fengshan).

18. *Pteris plumbea* Christ, Notul. Syst. (Paris) 1: 49. 1909.

栗柄凤尾蕨 li bing feng wei jue

Pteris plumbea var. *sintenensis* Masamune.

Plants 25–35 cm tall. Rhizome erect or slightly oblique, apex with black or brown scales. Fronds clustered, submonomorphic; stipe castaneous, 4-angled, 10–20 cm × 1–2 mm; rachis similar (sometimes straw-colored when young), margin sometimes straw-colored, shiny, glabrous; lamina (mature) monomorphic, 1-pinnate, oblong or ovate-oblong in outline, 20–25 × 10–15 cm; pinnae often 2 pairs, opposite, decumbent; basal pinnae often with 2 or 3 pinnules; lateral pinnules much shorter, uppermost one often adnate to apical pinna, base ± decrescent; upper lateral pinnae usually simple, sessile, base not decurrent, margins cartilaginous, sterile parts serrate, fertile parts entire; terminal pinna linear-lanceolate, 10–15 × 0.8–1 cm, base broadly cuneate, slightly oblique, apex acuminate; lamina gray-green or adaxially brown, herbaceous when dried, glabrous; midvein biconvex, veins conspicuous, simple or forked.

Limestone crevices within open forests; 200–700 m. Fujian (Xianxialing), Guangdong, Guangxi, Guizhou (Dushan, Libo, Wanshan), S Hunan (Yizhang), SW Jiangsu (Jiangning), W Jiangxi (Pingxiang), Taiwan, Zhejiang (Jinhua, Leqing) [Cambodia, India (Assam), Japan (Ryukyu Islands), Philippines, Thailand, N Vietnam].

19. *Pteris cretica* Linnaeus, Mant. Pl. 1: 130. 1767.

欧洲凤尾蕨 ou zhou feng wei jue

Rhizome creeping or ascending, ca. 1 cm in diam., apex with black-brown scales. Fronds clustered, dimorphic or subdimorphic; stipe straw-colored, sometimes brown, seldom castaneous, 10–45 cm. Sterile fronds: stipe shorter, ca. 2 mm in diam., glabrous; lamina 1-pinnate or sometimes digitate, ovate in outline, 10–30[–40] × 6–20[–35] cm; pinnae (2 or)3–5(–7) pairs, often opposite, decumbent, basal pinnae each with 2(or 3) pinnules, shortly stalked, upper pinnae narrowly lanceolate or lanceolate, sometimes with basisopic lobe, 10–18(–24) × 1–1.5(–3) cm, sessile, base broadly cuneate, margin white cartilaginous and serrate, apex acuminate. Fertile fronds longer: stipe 30–45 cm; pinnae 3–5(–8) pairs, opposite or upper alternate, decumbent, basal pinnae with (1 or)2(or 3) pinnules, shortly stalked (2–5 mm); upper pinnae linear, sometimes with lateral pinnule, 12–25 × 0.5–1.2 cm, sessile, base broadly cuneate, terminal pinna 3-lobed, base decurrent. Lamina green or

gray-green, papery when dried, glabrous; midvein abaxially extremely convex, straw-colored, glabrous; veins conspicuous on both surfaces, distant, oblique, simple or forked at base. $2n = 58^*$, 59 , 87^* .

400–3200 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, SW Henan, Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, W Zhejiang [Bhutan, Cambodia, India, Japan, Kashmir, Laos, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Africa, SW Asia, Europe, Pacific islands (Fiji, Hawaii)].

The species as a whole occurs widely throughout the tropics and subtropics. It is frequently cultivated and escapes, obscuring the natural distribution.

Two varieties are usually recognized. The correct placement of *Pteris cretica* var. *sylvatica* X. Y. Wang & P. S. Wang (Guizhou Sci. 12(2): 54. 1994) is uncertain.

- 1a. Stipe straw-colored, surface smooth; sterile pinna margins flat and straight, teeth small and regularly angled; plants usually on calcareous substrates 19a. var. *cretica*
 1b. Stipe often brown, surface scabrous; sterile pinna margins undulate, teeth longer and at rather irregular angles; plants on more acidic substrates 19b. var. *laeta*

19a. *Pteris cretica* var. *cretica*

欧洲凤尾蕨(原变种) ou zhou feng wei jue (yuan bian zhong)

Pteris cretica var. *intermedia* (Christ) C. Christensen; *P. cretica* var. *nervosa* (Thunberg) Ching & S. H. Wu; *P. cretica* var. *subserulata* Christ; *P. nervosa* Thunberg; *P. pentaphylla* Willdenow; *P. serrulata* Forsskål var. *intermedia* Christ; *P. sichuanensis* H. S. Kuang; *P. xichouensis* W. M. Chu & Z. R. He.

Stipe straw-colored, surface smooth. Pinna base broadly cuneate, decurrent or not, sterile margins serrate and often rough and acute, apex acuminate and acutely serrate.

Among shrubs on limestone terrain; 400–3200 m. Anhui, Chongqing, Fujian (Nanping), Guangdong (Lianxian), Guangxi, Guizhou, SW Henan (Jigong Shan, Neixiang, Zhenping), Hubei, Hunan, Jiangxi (Jianggangshan, Lushan), S Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, W Zhejiang (Shouchang) [Cambodia, India, Japan, Laos, Nepal, Philippines, Sri Lanka, Vietnam; Pacific islands (Fiji, Hawaii)].

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 101. 2008) is followed in including Chinese material previously named as *Pteris cretica* var. *nervosa* (more correctly var. *intermedia*) within var. *cretica*.

Pteris xichouensis and *P. sichuanensis* are probably best regarded as somewhat depauperate forms of this species with mostly strictly 1-pinnate fronds with entire, unbranched pinnae (the basal pinnae occasionally forked in *P. sichuanensis*).

Pteris dangiana X. Y. Wang & P. S. Wang (Pterid. Fl. Guizhou, 581–582. 2001) appears to be another member of the *P. cretica* complex. It was likened to *P. guangdongensis* in the protologue, but that species has monomorphic fronds.

19b. *Pteris cretica* var. *laeta* (Wallich ex Ettingshausen) C. Christensen & Tardieu, Notul. Syst. (Paris) 6: 137. 1937.

粗糙凤尾蕨 cu cao feng wei jue

Pteris laeta Wallich ex Ettingshausen, Farnkr. Jetztw. 96. 1864; *P. cretica* var. *cartiligidens* Christ; *P. cretica* subsp. *laeta* (Wallich ex Ettingshausen) Fraser-Jenkins; *P. cretica* var. *rosthornii* Diels; *P. plumbea* Y. C. Wu, K. K. Wong & Pong (1932), not Christ (1909).

Stipe often brown, surface scabrous. Pinna base narrowly cuneate, decurrent, margins undulate, apex long acute.

Acidic soils in valleys; 900–2600 m. Fujian, Guangdong (Ruyuan), Guangxi, Guizhou (Kaili), Jiangxi (Huanggangshan, Tonggushan), Sichuan (Emei Shan, Ya'an), SE Xizang, Yunnan [Bhutan, Cambodia, N India, Nepal, Vietnam].

Pteris cretica var. *laeta* is taller and stronger than var. *cretica*. It is an apomictic triploid.

Pteris pellucidifolia Hayata, described from Taiwan (Icon. Pl. Formosan. 6, Suppl. (Gen. Ind. Fl. Formos.): 114. 1917), is most closely related to *P. cretica* but differs by having 6–8 pairs of lateral pinnae to 2 cm wide and with the lower 1–3 pairs branched. W. C. Shieh (Fl. Taiwan, ed. 2, 1: 231. 1994) indicates that it also occurs in “Indo-China” and SW China. Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 100. 2008) regarded *P. pellucidifolia* as a synonym of *P. cretica* var. *laeta*. However, Knapp (Ferns Fern Allies Taiwan, 478. 2011) maintained that the two are not closely related.

20. *Pteris nipponica* W. C. Shieh, Bot. Mag. (Tokyo) 79: 285. 1966.

日本凤尾蕨 ri ben feng wei jue

Plants medium-sized, evergreen. Rhizome shortly creeping. Fronds closely spaced; scales linear, brown, margins entire. Fronds subdimorphic. Sterile fronds: stipe glabrous, straw-colored, brownish at base, 10–30 cm, scaly; lamina pinnate or subpedate, basal pinnae sometimes with a basisopic lobe or pinnule; lateral pinnae 1–3 pairs, linear-oblong, 10–20 × 1.5–3.5 cm, glabrous, margin irregularly dentate, apex acute; terminal pinna distinct. Fertile fronds: stipe 14–50 cm; lateral pinnae linear, somewhat falcate, 20–30 × ca. 1.5 cm, shortly stalked. Lamina green, thickly papery to papery, sterile pinnules often with broad adaxial central white stripe. $3n = 87$.

Exposed on walls; ca. 1200 m. C Taiwan [Japan, S Korea].

Plants of this species were originally treated as a cultivar of *Pteris cretica* by Japanese botanists. See discussions in Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 100. 2008) and in Knapp (Ferns Fern Allies Taiwan, 477. 2011) regarding the close relationship between *P. nipponica* and the *P. cretica* group.

21. *Pteris ryukyuensis* Tagawa, Acta Phytotax. Geobot. 4: 204. 1935.

琉球凤尾蕨 liu qiu feng wei jue

Plants small to medium-sized, evergreen. Rhizome ascending, short; scales small, narrow, blackish brown. Fronds dimorphic. Sterile fronds: stipes straw-colored to tinted brown, lower portion ± polished brown, dark at base, scaly; lateral pinnae commonly one pair, sometimes forked, 1–1.5 cm wide; apical pinnae twice as long as lateral ones, margin irregularly dentate, apex moderately acute. Fertile fronds twice as tall as sterile ones, ca. 30 cm tall; stipes much longer than laminae; lateral pinnae 1 or 2 pairs, lowest one sometimes forked, 3–5 mm wide. $n = 58$.

Along trails or on walls in village areas or on forest floor in lowlands; near sea level to 600 m. Taiwan [Japan, Philippines].

22. *Pteris kidoi* Kurata, J. Geobot. 13: 8. 1964.

城户氏凤尾蕨 cheng hu shi feng wei jue

Plants small, evergreen. Rhizome ascending, short; scales small, dark brown. Fronds dimorphic. Sterile fronds: stipe straw-colored, brown at base, 2.5–8 cm, with linear dark brownish scales; lamina digitate to imparipinnate; lateral pinnae (0 or) 1 or 2(or 3) pairs, (4–)7–17 × 0.1–1.4 cm, margin dentate; terminal pinna 7–20 × 0.7–1.4 cm; false veinlets distinct and rather dense. Fertile fronds taller; stipe 8–22 cm; lamina 7–20 cm; lateral pinnae 1–3 pairs; lowest pinnae often forked, to 15 × 0.4–0.7 cm; terminal pinna linear, up to 22 × 0.2–0.5 cm; lamina with many false veins in mesophyll between true veins. $2n = 58$.

Crevices in limestone rock faces; 300–900 m. Taiwan, ?Zhejiang [Japan].

23. *Pteris esquirolii* Christ, Notul. Syst. (Paris) 1: 50. 1909.

阔叶凤尾蕨 kuo ye feng wei jue

Plants robust, 1–1.5 m tall. Rhizome erect, short, robust, 2–3 cm in diam., woody, with black-brown scales. Fronds clustered, dimorphic; stipe dark straw-colored, sometimes reddish brown, shiny, 60–90 cm (stipes of sterile fronds shorter), 4–6 mm in diam., firm, glabrous, surfaces smooth or ± rough. Sterile fronds: lamina 1-pinnate, 25–30 × ca. 20 cm; rachis straw-colored, adaxially grooved; pinnae 3 or 4(–6) pairs, decumbent, subopposite, basal pairs 4–5 cm apart, basal pair each shortly stalked and with a basiscopic lobe, upper pinnae sessile, simple, lanceolate to oblong-lanceolate, 15–28 × 2–5 cm, base broadly cuneate, margins cartilaginous, entire except for dentate to serrate apex, apex acuminate or tapering. Fertile fronds: lamina 1-pinnate 40–50 × ca. 35 cm; pinnae 5 or 6 pairs, opposite, decumbent, basal 2 or 3 pairs 5–6 cm apart, often with basiscopic lobes, shortly stalked (4–8 mm), upper pinnae sessile, linear, up to 30 × 1–1.3 cm, base cuneate, margin entire, apex acuminate; terminal pinna 3-lobed, base decurrent; midvein extremely convex adaxially, straw-colored, sometimes brownish. Lamina pale green, thinly leathery when dried, glabrous, veins conspicuous on both sides, straight, parallel, subspreading (sterile pinnae slightly decumbent), simple or forked.

Among rocks in dense forests; 800–1500 m. Fujian, Guangdong, Guangxi, Guizhou, N Hunan, Sichuan, Yunnan [N Vietnam].

According to Ralf Knapp (pers. comm.), material from Taiwan currently identified as *Pteris pellucidifolia* sensu C. M. Kuo (Taiwania 30: 5–99. 1985) might be conspecific with *P. esquirolii*. For further discussion of *P. pellucidifolia*, see above under *P. cretica* var. *laeta* (p. 191).

- 1a. Stipe of fertile frond smooth 23a. var. *esquirolii*
 1b. Stipe of fertile frond rough, distal part
 sparsely verrucose-tuberculate 23b. var. *muricatulata*

23a. *Pteris esquirolii* var. *esquirolii*

阔叶凤尾蕨(原变种) kuo ye feng wei jue (yuan bian zhong)

Stipe of fertile frond smooth.

Among rocks in dense forests; 800–1500 m. Fujian, Guangdong (Lechang, Ruyuan, Xinyi), Guangxi (Longjin), Guizhou, Sichuan (Emei Shan), Yunnan [N Vietnam].

23b. *Pteris esquirolii* var. *muricatulata* (Ching) Ching & S. H. Wu, Fl. Reipubl. Popularis Sin. 3(1): 31. 1990.

刺柄凤尾蕨 ci bing feng wei jue

Pteris muricatulata Ching, Bull. Fan Mem. Inst. Biol., Bot. 10: 173. 1940.

Sterile fronds not seen. Stipe of fertile frond rough, distal part sparsely verrucose-tuberculate.

- N Hunan.

This plant is perhaps a different species, but since we did not see the sterile fronds, we are treating it here as a variety.

24. *Pteris longipinna* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30: 444. 1911.

长叶凤尾蕨 chang ye feng wei jue

Plants 60–90 cm tall. Sterile fronds: stipe dark brown like costae, 30–50 cm × ca. 3 mm, robust, glabrous; lamina 1-pinnate, ovate in outline, ca. 40 × 15 cm; lateral pinnae 3 or 4 pairs, opposite, basal pairs ca. 4 cm apart, extremely oblique, narrowly linear, 24–27 × ca. 1 cm, sessile, often slightly decurrent at base forming thin wings on basiscopic side, margin entire or slightly undulate, apex long acuminate (apical fertile parts 6–8 cm); basal 1 or 2 pinna pairs pinnate; terminal pinna with 2 or 3 pinnules, decurrent to lower pair of lateral pinnae at base; midvein raised abaxially, dark straw-colored or dark brown; veins approximate, spreading, simple or 2-forked.

- Rock crevices; 700–1500 m. Taiwan.

25. *Pteris venusta* Kunze, Bot. Zeitung (Berlin) 6: 195. 1848.

爪哇凤尾蕨 zhao wa feng wei jue

Pteris matsudai Masamune.

Plants 50–80 cm tall. Rhizome erect, short, robust, 1.5–2 cm in diam., apex with brown scales. Fronds clustered; stipe straw-colored, seldom brown or castaneous, slightly lustrous, 30–50 cm × 3–4 mm, glabrous, basal part scaly, scales caducous; lamina 1-pinnate, oblong-ovate, 35–45 × 25–30 cm; pinnae (3 or) 4–6 pairs, opposite, decumbent, linear-lanceolate, 15–20 × 2–3.2 cm, basally broadly cuneate, margin entire, slightly undulate, obviously reflexed, and cartilaginous, apex long caudate; basal pair shortly stalked, middle pairs sessile, upper pairs often connate with rachis and ± decurrent to form narrow wings; terminal pinna with 3 pinnules, not decurrent or slightly decurrent at base; basal pinnae not shortened, lowest 1 or 2 pairs often with basiscopic pinnule; lamina gray-green, thinly herbaceous when dried, glabrous, shiny especially adaxially, smooth; midvein abaxially convex, light straw-colored; veins slender, contiguous, slightly raised on both surfaces, often simple or rarely forked at base.

Acidic soils in open forests; 800–1500 m. ?SW Taiwan (Gao-xiong), Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, N Myanmar, Nepal, Thailand, Vietnam].

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 103. 2008) and Knapp (Ferns Fern Allies Taiwan, 368. 2011) treated *Pteris venusta* as a synonym of *P. pellucida* C. Presl.

26. *Pteris insignis* Mettenius ex Kuhn, J. Bot. 1868: 269. 1868.

全缘凤尾蕨 quan yuan feng wei jue

Pteris indochinensis Christ; *P. platysora* Baker.

Plants 1–1.5 m tall. Rhizome ascending, robust, ca. 3 cm in diam., woody, apex with black-brown scales. Fronds clustered; stipe dark straw-colored and slightly lustrous, castaneous-brown near base, firm, 60–90 × 0.5–0.7 cm, sparsely scaly; scales brownish black, caducous; lamina 1-pinnate, ovate-oblong in outline, 50–80 × 20–30 cm; pinnae 6–14 pairs, opposite or sometimes subopposite, decumbent, linear-lanceolate, 16–20 cm, base cuneate, margin entire, slightly undulate, and cartilaginous, apex acuminate; lower pairs of pinnae sterile, ca. 2.5 cm wide, stalk ca. 1 cm; pinnae 4–6 cm apart, basal pair sometimes with a short lateral pinna; upper pinnae fertile, 1–1.5 cm wide, shortly stalked; veins conspicuous, midvein abaxially convex, dark straw-colored, veins oblique, prominent on both surfaces, sparse, simple or forked at base; lamina gray-green to brown-green, without luster, thinly papery when dried, glabrous; rachises light brown. Indusia pallid or gray-brown, linear, entire.

Dense forests along valleys or streams; 200–800 m. Fujian, Guangdong, Guangxi, Guizhou (Dushan, Jiangkou), Hainan (Lingshui), Hunan (Jiangyong, Qianyang, Yizhang), Jiangxi, Yunnan (Honghe), S Zhejiang (Taishun) [Malaysia, Vietnam].

27. *Pteris menglaensis* Ching, Acta Bot. Austro Sin. 1: 6. 1983.

勐腊凤尾蕨 meng la feng wei jue

Plants ca. 60 cm tall. Rhizome erect, short, apex densely clothed with brown scales. Stipe firm, straw-colored, ca. 27 cm × 2 mm, glabrous; lamina 1-pinnate, oblong in outline, up to 30 × ca. 15 cm; pinnae 4 or 5 pairs, subalternate, decumbent, linear-lanceolate, basal pair up to 17 × 1–1.3 cm, stalked (ca. 1 cm), base rounded-cuneate, margins entire and cartilaginous, apex acuminate; upper two pairs of pinnae with base cuneate, connate with rachis, not decrescent, stalked; midvein prominent abaxially, straw-colored; veins dense, simple or 2-forked; lamina blue-green, papery when dried, abaxially sparsely hairy near midvein.

- Open forests; ca. 700 m. S Yunnan (Mengla).

28. *Pteris vittata* Linnaeus, Sp. Pl. 2: 1074. 1753.

蜈蚣草 wu gong cao

Pteris vittata f. *crinata* Ching.

Plants (20–)30–100(–150) cm tall. Rhizome erect, short and robust, 2–2.5 cm in diam., woody, apex densely clothed with yellow-brown scales. Fronds clustered; stipe firm, dark straw-colored or light brown, 10–30 cm or larger, 3–4 mm in diam., densely scaly when young, scales like those of rhizome, sparse; rachis straw-colored, sparsely scaly; lamina 1-pinnate, oblanceolate-oblong in outline, 20–90 × 5–25 cm or larger; lateral pinnae up to 40 pairs, alternate or sometimes subopposite; lower pinnae 3–4 cm apart, decumbent, sessile, not connate with rachises, progressively shorter toward base, basal pair

auriculiform, middle pinnae longest, narrowly linear, 6–15 × 0.5–1 cm, base slightly expanded and cordate, both sides slightly auriculiform, upper ones larger and overlapping rachis; pinnae 1–1.5 cm apart, sterile margin minutely and evenly serrate, not cartilaginous, apex acuminate; midvein prominent abaxially and light straw-colored; veins slender, contiguous, oblique, simple or forked; terminal pinna similar to lateral pinnae in shape. Lamina pale green, opaque, thinly leathery, glabrous.

Calcareous soils, on limestone, also on stone and on walls; below ca. 2000 m. Anhui, Fujian, SE Gansu (Kangxian), Guangdong, Guangxi, Guizhou, SW Henan, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [widely distributed in tropics and subtropics of the Old World].

Plants of *Pteris vittata* are very different in shape and size, varying according to their habitats.

29. *Pteris ensiformis* N. L. Burman, Fl. Indica, 230. 1768.

剑叶凤尾蕨 jian ye feng wei jue

Plants 30–50 cm tall. Rhizome ascending or prostrate, slender, 4–5 mm in diam., apex with black-brown scales. Fronds dense, dimorphic; sterile fronds 1.5–2(–3) cm apart, shorter than fertile fronds; stipe and rachis straw-colored, slightly lustrous, stipe 10–30 cm (stipes of sterile fronds shorter), 1.5–2 mm in diam., glabrescent; lamina oblong-ovate, 10–25 × 5–15 cm, pinnate to bipinnate; pinnae 2–6 pairs, opposite, slightly decumbent, upper ones sessile, lower pairs shortly stalked; sterile fronds often pinnate, triangular in outline, 2.5–3.5(–8) × 1.5–2.5(–8) cm, acuminate; pinnules (1 or)2 or 3 pairs, opposite, contiguous, sessile, decumbent, oblong-oblanceolate to broadly lanceolate, basally decurrent and entire, upward and apices with acute teeth, apex obtuse; pinnae of fertile fronds distant (basal pairs 5–7 cm apart), 1–3-forked, middle fork longest, apical pinnae not decurrent at base, basal two pairs sometimes pinnate; pinnules 2 or 3(or 4) pairs, decumbent, narrowly linear, basally decurrent, margins entire except at apices, sterile parts with dense teeth, apically acuminate; midvein straw-colored, adaxially prominent; veins dense, often forked; lamina gray-green to brown-green, sometimes with nearly white bands along each side of midvein, herbaceous when dried, glabrous. *n* = 58.

Wet acidic soils beneath forests, streamsides; 100–1000 m. Chongqing, Fujian, Guangdong, Guangxi, SW Guizhou, Hainan, S Jiangxi, Sichuan, Taiwan, S Yunnan, S Zhejiang [Bhutan, Cambodia, N India, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands (Fiji, Polynesia)].

- 1a. Pinnae with a ± white band along each side of midvein 29b. var. *victoriae*
- 1b. Pinna midveins lacking off-white bands.
 - 2a. Basal pinnae each with 2 or 3 pinnules, second and third (to fifth) pairs with 2 pinnules; middle sterile lateral pinnae narrowly lanceolate, 4–6 × ca. 1 cm; fronds often 1-pinnate, or ± bipinnate at base 29c. var. *merrillii*
 - 2b. Basal pinna pair or lateral pinnae often with 2–4 pinnules, lowest pair (or basal pairs) often 3- or 4-forked or subpinnate.

- 3a. Fertile pinnae apically not forked, (or 2- or 3-forked); fronds bipinnate, pinnae 3–6 pairs, 2.5–3.5(–8) cm 29a. var. *ensiformis*
- 3b. Fertile pinnae apically 1- or 2-forked, pinnae 2–3 cm, spreading 29d. var. *furcans*

29a. *Pteris ensiformis* var. *ensiformis*

剑叶凤尾蕨(原变种) jian ye feng wei jue (yuan bian zhong)

Pteris crenata Swartz; *P. serrulata* Forsskål var. *obtusata* Christ; *P. stricta* Poiret.

Pinnae bipinnate, 3–6 pairs, 2.5–3.5(–8) cm, fertile pinnae often 2- or 3-forked.

Wet acidic soils beneath forests, streamsides; 100–1000 m. Chongqing, Fujian, Guangdong, Guangxi, SW Guizhou (Anlong), Hainan (Nanshanling, Sanya), S Jiangxi, Sichuan (Emei Shan, Ya'an), Taiwan, S Yunnan, S Zhejiang (Pingyang) [Cambodia, N India, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Sri Lanka, Vietnam; Australia, Pacific islands (Fiji, Polynesia)].

The plants are indicators of acidic soils, with a pH of 4.5–5.0.

29b. *Pteris ensiformis* var. *victoriae* Baker, Gard. Chron., ser. 3, 7: 756. 1890.

白羽凤尾蕨 bai yu feng wei jue

Middle pinnae with pallid off-white bands on both sides of midvein.

Forests; ca. 300 m. Hainan (Nanshanling, Sanya) [N India, Malaysia, Myanmar, Sri Lanka].

29c. *Pteris ensiformis* var. *merrillii* (C. Christensen ex Ching) S. H. Wu, Fl. Reipubl. Popularis Sin. 3(1): 39. 1990.

少羽凤尾蕨 shao yu feng wei jue

Pteris merrillii C. Christensen ex Ching, Acta Phytotax. Sin. 9: 348. 1964 [“*merrilli*”].

Fronds simple, often 1-pinnate or more divided, or bipinnate at base; pinnae 2–4 pairs, basal pair simple or 2- or 3-forked, sometimes pinnate; sterile fronds: margins of pinnae or pinnules serrate, apex of pinnae obtuse, acute, or acuminate; middle pinnae narrowly lanceolate, 4–6 × ca. 1 cm.

• Forests. Guangdong (Zhujiang Estuary and adjacent islands), Guangxi (Guiping, Lingui, Tengxian), Hainan.

29d. *Pteris ensiformis* var. *furcans* Ching, Acta Bot. Austro Sin. 1: 6. 1983.

叉羽凤尾蕨 cha yu feng wei jue

Fertile pinnae apically 1- or 2-forked, segments 2–3 cm, spreading.

• Among rocks on slopes; ca. 400 m. Chongqing.

30. *Pteris cryptogrammoides* Ching, Acta Bot. Austro Sin. 1: 7. 1983.

珠叶凤尾蕨 zhu ye feng wei jue

Plants short, 10–15 cm tall. Rhizome erect, short, 3–4 mm

in diam., apex with light brown scales. Fronds dimorphic; stipe light straw-colored, slender, 6–8 cm (stipes of sterile fronds shorter), less than 1 mm in diam., glabrous; sterile fronds slightly shorter than fertile fronds, pinnules similar in shape but wider, margins with acute teeth; fertile fronds: lamina 2- or 3-pinnate, triangular in outline, 5–10 × 3–5 cm; pinnae ca. 7 pairs, alternate or subopposite, basal pairs ca. 2.5 cm apart, spreading, bipinnate, narrowly ovate, ca. 4 × 2 cm, stalked (ca. 6 mm); pinnules ca. 3 pairs, slightly ascending; ultimate pinnules oblong-lanceolate, 0.7–0.9 × 0.2–0.25 cm, base broadly cuneate, margin entire, apex obtuse; upper pinnae simpler, sessile; midvein conspicuous, pale green, veins not conspicuous, simple or forked; lamina pale green, herbaceous when dried, glabrous; rachises and costae pale green and with narrow wings.

• Fujian (Xiamen).

31. *Pteris multifida* Poiret in Lamarck, Encycl. 5: 714. 1804.

井栏边草 jing lan bian cao

Pteris serrulata Linnaeus f. (1782), not Forsskål (1775).

Plants 30–45 cm tall. Rhizome erect, short, 1–1.5 cm in diam., apex with black-brown scales. Fronds many, clustered, distinctly dimorphic. Sterile fronds: stipe straw-colored or dark brown with straw-colored margins, slightly lustrous, 15–25 cm × 1.5–2 mm, glabrous; lamina 1-pinnate, ovate-oblong in outline, 20–40 × 15–20 cm; pinnae often 3 pairs, opposite, ascending, linear-lanceolate, 8–15 × 0.6–1 cm, sessile, base acuminate, margins cartilaginous, with irregular acute teeth, basal pinna often forked, with 1 or 2 basal lobes, sometimes subpinnate, upper pinnae decurrent at base to form wings along rachis 3–5 mm wide, attenuate at base of rachis; terminal pinna 3-forked. Fertile fronds: stipe long, pinnae 4–6 pairs, linear, 10–15 × 0.4–0.7 cm, sterile margins serrate, remainder entire, basal pair subpinnate, with stipe ca. 1 cm, others sessile, basal 2 or 3 pairs often 2- or 3-forked, upper pairs with base long decurrent along rachis to form wings 3–4 mm wide; midvein prominent on both sides, straw-colored; veins conspicuous, sparse, simple or forked, sometimes both surfaces with short raised false veins parallel to veins. Lamina pale green, herbaceous when dried, glabrous throughout; rachises straw-colored, slightly lustrous. $2n = 116$.

On walls or on limestone; below ca. 1000 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hebei (Beidaihe), Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi (Qinling), Shandong (Laoshan, Lushan, Taishan), Sichuan, Taiwan, Zhejiang [Japan (including Ryukyu Islands), S Korea, Philippines, Thailand, Vietnam].

The type of *Pteris multifida* is from a cultivated plant at the Botanical Garden in Paris. The hybrid between *P. multifida* and *P. ryukyuensis* is known from Taiwan and has been named *P. ×namegatae* Kurata (see Knapp, Ferns Fern Allies Taiwan, 369–370, 477. 2011).

The authors have not seen material of *Pteris multifida* f. *serrulata* R. H. Miao (Acta Sci. Nat. Univ. Sunyatseni 36: 115. 1997).

32. *Pteris liboensis* P. S. Wang, Acta Bot. Yunnan. 9: 398. 1987.
荔波凤尾蕨 li bo feng wei jue

Plants 30–40 cm tall. Rhizome erect, short, scaly at growing tips; scales thick, black, lanceolate-subulate. Fronds

clustered, apparently monomorphic; stipe straw-colored, thin, 18–22 cm × 1–1.5 mm, glabrous; lamina simple, less often 3-lobed or pinnate, linear-lanceolate, ca. 15 × 3–4 cm, base cordate, margins basally and apically sterile, cartilaginous with acute teeth, median part fertile and entire, apex ± acuminate; veins forked, subspreading, conspicuous on both surfaces; lamina green-brownish, thinly papery, both surfaces glabrous. Sori continuous, gray, firm, entire; spores triangular, with irregular tubercles.

- Forests; ca. 1000 m. Guangxi (Napo), S Guizhou (Libo).

33. *Pteris nanlingensis* R. H. Miao, Acta Sci. Nat. Univ. Sunyatseni 36: 114. 1997.

南岭凤尾蕨 nan ling feng wei jue

Plants perennial, up to 76 cm tall. Rhizome short, thick, decumbent, ca. 1 cm in diam. Fronds dimorphic, clustered. Sterile fronds: stipe straw-colored, light-brown at base, 20–24 cm × ca. 1 mm, glabrous, adaxially grooved; lamina 3-lobed, or apical pinnae forked into 2 pairs of pinnules, 15–20 cm; lateral pinnules similar to terminal pinnule but shorter, basal stalk ca. 2 mm, margins cartilaginous, slightly reflexed, with small acute, sparse teeth, entire near base, apex acuminate; terminal pinnule lanceolate, ca. 18 × 3.2 cm, basally slightly cuneate, basal stalk 2.4–2.6 cm. Fertile fronds pinnate, lateral pinnae 2 pairs; terminal pinna linear, 19.5–22 cm × 8–10 mm, basal stalk ca. 2 cm; lateral pinnules slightly short, stalked (5–8 mm); upper pair sessile, sterile margins with acute teeth; midvein straw-colored or light brownish, thinly grooved adaxially, raised abaxially; veins conspicuous, simple or forked. Lamina gray-green, subleathery or leathery, glabrous. Sori linear, along with margin, only apices sterile; indusia gray-green, linear, membranous, subentire.

- Guangdong (Ruyuan).

34. *Pteris changjiangensis* X. L. Zheng & F. W. Xing, Ann. Bot. Fenn. 47: 156. 2010.

昌江凤尾蕨 chang jiang feng wei jue

Plants 20–30 cm tall. Rhizome ascending, tenuous, ca. 3 cm × 2–4 mm, densely scaly; scales dark brown, glossy, linear-lanceolate or lanceolate, 1–2 mm, entire. Fronds monomorphic;

stipe rufous-straw-colored in lower part, light green upward, 5–15 cm, base distinctly scaly, nitid, adaxially grooved; lamina simple, lanceolate, 10–20 × 0.8–1.2 cm, base attenuate, margins narrow, cartilaginous, subentire and repand at base, serrulate above, apex acuminate; costa straw-colored, abaxially prominent, smooth; veins conspicuous, straight, parallel, simple and bifurcate; lamina grass-green when dried, thinly papery, glabrous. Sori brown, on margin of upper lamina except for apex; indusium light gray, narrow, membranous, entire.

- On surface of ground and rocks; 400–800 m. Hainan (Changjiang).

35. *Pteris xiaoyingiae* H. He & Li Bing Zhang, Syst. Bot. 35: 696. 2010 [*“xiaoyingae”*].

筱英凤尾蕨 xiao ying feng wei jue

Plants 4–6.5(–7) cm tall. Rhizome ascending, ca. 1.2 cm × 3.1–4 mm, apex sparsely scaly; scales subulate, dark brown. Fronds dispersedly distichous; stipe 2.5–4(–5.5) cm, 0.4–0.6 mm in diam. at middle, adaxially grooved, smooth and glabrous above base, sparsely scaly; lamina 3–5-foliolate, most often ± pedate in outline, 2–2.5 × 2.5–4 cm; pinnae 3, digitately arranged; terminal pinna largest, ovate-lanceolate, 1.5–2.5(–3.1) × 1–1.4 cm, sessile or occasionally stalked (ca. 4 mm), base cuneate and sometimes decurrent, apex blunt; lateral pinnae opposite, oblong-obovate, 1–1.5 × 0.7–1 cm, sessile or stalked (1–1.5 mm), base cuneate or basiscopically broadly cuneate, apex rounded or blunt; usually each lateral pinna with an almost free basal basiscopic lobe, lobes mostly oblong-obovate, apex rounded or blunt; margin of pinnae and lobes entire on cuneate bases, with teeth upward on sterile pinnae and 3- or 4-toothed on each side above sori on fertile pinnae; teeth deltoid or dentate, with cartilaginous tip but not aristate; lateral veins free, spreading or slightly ascending, distinct abaxially and merely conspicuous adaxially, simple or 1(or 2) times 2-forked, almost reaching cartilaginous margins; lamina thickly papery to leathery in texture, both surfaces glabrous. Sori marginal on both sides of fertile pinna from 3–5 mm above base to 4–5 mm below apex, linear; indusia gray, ca. 0.8 mm wide, membranous, entire on margin.

- Limestone walls at openings of dry karst caves. N Guangxi, S Guizhou (Libo).

2. *Pteris* sect. *Quadriauricula* Ching, Acta Bot. Austro Sin. 1: 2. 1983.

籠形凤尾蕨组 bi xing feng wei jue zu

Plants often medium-sized (0.2–2 m tall). Rhizome often short, sometimes long, erect or decumbent. Fronds monomorphic, seldom dimorphic, lamina 2-pinnatipartite (often 3-pinnatipartite at base); pinnae/pinnules regularly pectinately divided nearly to costae, lower pinnae often with 1 or more pinnules near base on basiscopic side, these similar in shape to main part of pinnae but smaller; segments lanceolate or ± oblong-falcate, apices obtuse or acute, margins entire, rarely minutely toothed, usually not cartilaginous; costae with spines along groove (often ± with spines along midrib) or ± praemorse; veins free, 2-forked, or rarely 2-pinnate. Sori linear; indusia gray-brown or brown, linear, membranous, entire, persistent.

Mainly distributed in the tropics and subtropics; 34 species (11 endemic) in China.

36. *Pteris dispar* Kunze, Bot. Zeitung (Berlin) 6: 539. 1848.

刺齿半边旗 ci chi ban bian qi

Pteris semipinnata Linnaeus var. *dispar* (Kunze) Hooker & Baker; *P. taiwaniana* Masamune & Suzuki.

Plants 30–80 cm tall. Rhizome ascending, 7–10 mm in diam., apex of rhizome and base of stipe with brownish black scales, scale apices ciliate and slightly curly. Fronds clustered (10–15), subdimorphic; stipe chestnut-colored, shiny, 15–40 cm × ca. 2 mm, rachis similar; lamina 2-pinnatipartite or

at one side deeply bipinnate-lobed, ovate-oblong in outline, 25–40 × 15–20 cm; lateral pinnae 5–8 pairs, similar to terminal pinna in shape, opposite or subopposite, decumbent, basal pair 6–12 × 2.5–4 cm, shortly stalked, base oblique, divided nearly to costae on both or basicopic side, apex caudate-acuminate; segments as in terminal pinna but basicopic lobes slightly longer than acroscopic lobes, and lobe nearest base on basicopic side longest, inclined, sometimes basal 1 or 2 segments developing into pinnule pectinately lobed on basicopic side; terminal pinna pectinately partite nearly to costa, lanceolate in outline, 12–18 × 2–3 cm, base rounded, apex acuminate; segments 12–15 pairs, opposite, spreading, contiguous, broadly lanceolate or linear-lanceolate, somewhat falcate, 10–20 × 3–5 mm, base basicopically not decurrent or slightly decurrent, margins of sterile fronds with long acute spinelike teeth, apex obtuse or sometimes acute; costae abaxially convex, chestnut at base, distally straw-colored, grooved adaxially, grooves with thin raised edges (minutely and irregularly toothed); veins conspicuous, decumbent, 2-forked, veinlets reaching cartilaginous point of teeth; lamina green or pale green, herbaceous when dried, glabrous. $2n = 58, 116$.

Open forests along valleys; 300–1000 m. S Anhui (Qimen), Chongqing, Fujian, Guangdong, Guangxi (Lingui, Tengxian), Guizhou, Henan, Hubei (Jiugongshan), Hunan, S Jiangsu (Yixing), Jiangxi, Sichuan (Emei Shan, Luxian), Taiwan, Zhejiang [Japan, Korea, Malaysia, Philippines, ?Thailand, Vietnam].

De Vol (Ferns East Centr. China, Notes Bot. Chin. Mus. Heude No. 7, 109, 1945) included material of *Pteris dispar* within his concept of *P. semipinnata*.

37. *Pteris semipinnata* Linnaeus, Sp. Pl. 2: 1076. 1753.

半边旗 ban bian qi

Plants 35–80(–120) cm tall. Rhizome long creeping, 1–1.5 cm in diam., apex with blackish brown scales; scales also at base of stipes. Fronds clustered, submonomorphic; stipe 15–55 × 1.5–3 cm, stipe and rachis castaneous-reddish, shiny, glabrous; lamina pinnate, oblong-lanceolate in outline, 15–40(–60) × 6–15(–18) cm, at one side deeply bipinnate-lobed; lateral pinnae 4–7 pairs, opposite or subalternate, spreading, basal pairs shortly stalked; upper ones sessile; lamina half-triangular and slightly falcate, 5–10(–18) × 4–7 cm, basicopic side pectinately lobed nearly to costa, acroscopic side reduced to subentire wing to 6 mm wide, base oblique, basicopic side decurrent, apex caudate-acuminate; basicopic segments 3–6 or more, falcate-lanceolate, basal part longest, 1.5–4(–8.5) × 0.3–0.6(–1.1) cm, basally margins of sterile segments acutely serrate, fertile segments entire except for with 1 spine or 2 or 3 acute teeth near apex, apex mucronate or obtuse; terminal pinna pectinately divided almost to rachis, broadly lanceolate to narrowly triangular in outline, 10–18 × 3–10 cm, apex caudate; segments 6–12 pairs, opposite, spreading, 3–5 mm apart, falcate-lanceolate, 2.5–5 × 0.6–1 cm, upper ones gradually reduced, basicopic obtriangular wing decrescent to next pair of pinnae along costule, apex shortly acuminate; costae prominent abaxially, chestnut adaxially, distally straw-colored, grooved adaxially, grooves with thin, minutely and irregularly toothed, raised edges. Veins conspicuous, decumbent, 2-forked or bipinnate-forked, veinlets reaching base of teeth; lamina gray-green,

herbaceous when dried, glabrous. $2n = 116$.

Acidic soil in open forests, by streams or rocks; below ca. 900 m. Fujian, Guangdong, Guangxi, S Guizhou (Ceheng, Sandu), Hunan, S Jiangxi (Anyuan, Xunwu), Sichuan (Leshan), Taiwan, S Yunnan [Bhutan, N India, Indonesia (Borneo), Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

Pteris semipinnata is different from *P. dispar* in shape and distribution. The former is primarily distributed in tropical areas, while *P. dispar* is primarily distributed in subtropical and northern tropical areas. Both are in Fujian and Taiwan, but any intersecting types have not been seen.

38. *Pteris dissitifolia* Baker, J. Bot. 28: 263. 1890.

疏羽半边旗 shu yu ban bian qi

Pteris semipinnata Linnaeus var. *dissitifolia* (Baker) C. Christensen & Tardieu.

Plants 1–1.5 m tall. Rhizome ascending or erect, 1–1.5 cm in diam., apex and stipes basally densely clothed with scales; scales median brownish black, light brown to gray at margins, without luster, linear-lanceolate, ca. 2 mm in diam., subentire, apex long acuminate. Fronds clustered; stipe castaneous-brown, adaxially sorrel-red, sometimes nearly brownish, shiny, 40–80 cm × 4–5 mm, glabrous, adaxially grooved; rachises castaneous-brown; lamina 2-pinnatipartite on both sides or either side, ovate-oblong in outline, 35–50 × 25–30 cm; lateral pinnae 5–8 pairs, opposite or subopposite, basal pairs 6–8 cm apart, stalked (1–3 mm), upper sessile, decumbent, pinnae oblong-lanceolate, 15–25 × 4–6 cm, base oblique, apex tapering; basal 1 or 2 pairs of pinnae often pinnatipartite on both sides; basal pair of pinnae often with a pinnule near base on basicopic side; median pinnae often pinnatipartite on basicopic side, entire on acroscopic side or only pinnatipartite on upper parts; upper pinnae pinnatipartite on basicopic side, entire on acroscopic side; segments lanceolate, 4–12 × 1–1.3 cm, gradually shorter upward, acuminate; basal segments on basicopic side longest, basally decrescent to a broad wing, sterile margins slightly serrate; terminal pinna pinnatipartite, divided nearly to costa, triangular-ovate in outline, ca. 15 × 10–12 cm, base broadly cuneate, somewhat decurrent, apex acuminate; segments 8–10 pairs, alternate or subopposite, ca. 1 cm apart, decumbent, falcate-lanceolate, 6–8 × 0.6–0.8 cm, gradually shorter upward, base conspicuously decrescent, with interrupted broad wing along costules, apex mucronate; costae prominent abaxially, straw-colored at apex, castaneous-brown downward, adaxially grooved, grooves with thin raised pale gray edges (minutely and irregularly toothed); veins conspicuous on both sides, sparse, decumbent, often 1- or 2-forked; lamina pale green, firmly herbaceous when dried, glabrous.

Sparse shaded forests; 100–300 m. Guangdong, Hainan (Baoting), S Yunnan (Hekou, Xishuangbanna) [Laos, N Vietnam].

Lu and Yang (Taiwania 50: 137–165, 2005) reported *Pteris dissitifolia* as a new species for Taiwan, but Knapp (Ferns Fern Allies Taiwan, 478, 2011) noted that there is no apparent delimitation between this and *P. semipinnata* in Taiwan.

39. *Pteris malipoensis* Ching, Acta Bot. Austro Sin. 1: 7. 1983.

大羽半边旗 da yu ban bian qi

Plants up to 2 m tall. Rhizome prostrate, firm, ca. 1 cm in diam., woody. Stipe castaneous-brown at base, opaque, ca. 100 cm × 4 mm, firm, glabrous; lamina 2-pinnatipartite on either side, oblong-ovate; pinnae alternate, decumbent, sessile, basal pairs ca. 11 cm apart, falcate, narrowly triangular, ca. 40 × 15 cm, base oblique, apex long caudate; pinnae entire on acroscopic margin and apical 1/4–1/3 of basiscopic margin, deeply lobed on rest of basiscopic margin, with 6–8 gradually shorter segments; segments linear-lanceolate, basal ones ca. 13 × 1.8 cm, up to 2 cm apart, base oblique, sterile margins serrate, apex acuminate; veins distinct on both surfaces, spreading, sparse, 1- or 2-forked; lamina pale green, herbaceous when dried, glabrous; costae and rachises straw-colored, grooved on adaxial side, with few spines on raised edges.

• Mixed forests; 1200–1500 m. Hunan (Tongdao), SE Yunnan (Malipo).

Pteris malipoensis is represented by larger plants, is rare, and is similar to *P. semipinnata*, but the former has stipes robust, straw-colored, basal pinnae up to 40 cm, segments at base ca. 13 × 1.8 cm, pale green when dried.

40. *Pteris terminalis* Wallich ex J. Agardh, Recens. Spec. Pter. 20. 1839.

溪边凤尾蕨 xi bian feng wei jue

Pteris excelsa Gaudichaud (1829), not Blume (1828); *P. excelsissima* Hayata; *P. inaequalis* Baker var. *aequata* (Miquel) Tagawa; *P. kleiniana* Christ (1896), not *Campteria kleiniana* C. Presl (1836); *P. longipinnula* Franchet & Savatier (1876), not Wallich ex J. Agardh (1839); *P. semipinnata* Linnaeus var. *aequata* Miquel.

Plants up to 180 cm tall. Rhizome erect, short, robust, to 2 cm in diam., woody, apex with black-brown scales. Fronds clustered; stipe dark brown, upper part straw-colored, slightly lustrous, firm, robust, 70–90 cm × 6–10 mm, glabrous; rachis straw-colored, adaxially grooved; lamina 2-pinnatipartite, broadly triangular, 60–120 or more × 40–90 cm; lateral pinnae 5–10 pairs, alternate or subopposite, basal pairs 10–15 cm apart, shortly stalked, spreading, similar to terminal pinna, basal pair largest, more than 40 cm, sometimes forked at base, upper pinnae smaller, sessile; terminal pinna pectinately divided to nearly to costa, broadly lanceolate-oblong in outline, 20–30 cm or larger × 7–12 cm, attenuate toward apex, apex acuminate and caudate; segments 20–25 pairs, alternate, subspreading, falcate-lanceolate, 3.5–8(–10) × 0.6–1 cm, base slightly expanded, basiscopic side decurrent, sterile margins of apical fronds slightly serrate, apex acuminate; costae abaxially convex, straw-colored, glabrous, adaxially shallowly grooved, with thick spines along groove; veins abaxially conspicuous, sparse, decumbent, often 2-forked; lamina often pale green, herbaceous when dried, glabrous, base of pinnae rarely pubescent abaxially. $2n = 58, 87$.

Open forests, scrub; 600–2700 m. Chongqing, Guangdong (Lechang, Yingde), Guangxi (Guilin, Lingui, Xiuren), Guizhou (Yinjiang, Zunyi), Hubei (Badong), Hunan (Qianyang, Yongshun), Jiangxi (Lushan, Xiushui), Sichuan, Taiwan, Xizang (Cuona, Zayü), Yunnan, Zhejiang [N India, Japan (Honshu, Kyushu, Shikoku), S Korea, Laos, Malaysia, Nepal, Pakistan, Philippines, Vietnam; Pacific islands (Fiji, Hawaii)].

This taxon has usually been treated as *Pteris excelsa* on the incorrect assumption that the name was validated in 1827. However, it must be treated as a later homonym and the next available name, *P. terminalis*, used (Fraser-Jenkins, Taxon. Revis. Indian Subcontinental Pteridophytes, 416–417. 2008).

41. *Pteris inaequalis* Baker, J. Bot. 13: 199. 1875.

中华凤尾蕨 zhong hua feng wei jue

Pteris excelsa Blume var. *inaequalis* (Baker) S. H. Wu; *P. excelsa* var. *simplicior* (Tagawa) W. C. Shieh; *P. inaequalis* var. *simplicior* Tagawa; *P. sinensis* Ching.

Plants 40–100 cm tall. Rhizome prostrate, apex with brown, lanceolate scales. Fronds monomorphic; stipe straw-colored or brownish straw-colored, 26–46 cm; lamina 2-pinnatipartite, ovate to oblong-lanceolate in outline, 34–42 × 10–32 cm, base rounded or rounded-cuneate, apex caudate; lateral pinnae 3–6 pairs, opposite, oblique, sessile or subsessile, basiscopic pectinately lobed, acroscopically entire or few lobed, narrowly triangular in outline, falcate and ascending, apex long caudate; basal pair of pinnae 10–22 × 5–11 cm, basiscopic 2–7 segments falcate-lanceolate, basal one largest, 3–10 × 0.7–1.5 cm, sterile margins dentate, apex obtuse or tapering; upper pinnae sometimes entire, linear; terminal pinna larger, triangular-ovate, pectinately divided; lamina herbaceous, glabrous; grooves of rachis and costa with short spines; midvein abaxially protuberant; veins abaxially conspicuous, adaxially inconspicuous; lateral veins oblique, forked or simple.

Forests, streamsides, limestone caves; 400–1400 m. Fujian (Chong'an), Guangdong (Lechang), Guangxi (Longsheng, Xiuren), Guizhou, Jiangxi (Jinggangshan, Tonggu), Sichuan (Dechang, Emei Shan, Hechuan), Yunnan (Kunming, Mengzi), Zhejiang (Longquan) [India, Japan].

Pteris sinensis was proposed as a replacement name for *P. inaequalis* Baker in the belief that this was a later homonym of *P. inaequalis* C. Presl (Tent. Pterid. 145. 1836). However, Presl's name is a nomen nudum and was not therefore validly published (*Melbourne Code*, Art. 38.1(a)). Baker's name is therefore legitimate and the correct name for this taxon.

42. *Pteris amoena* Blume, Enum. Pl. Javae 2: 210. 1828.

红秆凤尾蕨 hong gan feng wei jue

Pteris tokioi Masamune.

Plants 80–150 cm tall. Rhizome 1–1.5 cm in diam. Stipe basally castaneous-brown, upper part, rachis, and lower parts of costae sorrel-red, shiny, stipe 45–80 cm, 3–5 mm in diam., glabrous; lamina 2- or 3-pinnatipartite, ovate in outline, 35–65 × 30–40 cm; lateral pinnae 4–8 pairs, subopposite, decumbent, basal pair sometimes 2-pinnatipartite, shortly stalked; upper pinnae sessile, pectinately divided, lanceolate in outline, 25–30 × ca. 5 cm, base rounded-cuneate and slightly oblique, apex acute, caudate for 3–5 cm; terminal pinna similar but wider and stalked (3–4 cm), basal pair of pinnae often with a basiscopic pinnule near base, similar in shape to main part of pinna but smaller; segments 25–30 pairs, alternate, 3–4 mm apart, sinuses wide and rounded, slightly decumbent, subfalcate, lanceolate, 2.5–4 × 0.5–0.7 cm, base slightly expanded and decurrent, sterile margins densely serrulate, apex obtuse or mu-

cronate, basal segments of pinnae slightly shorter and more widely spaced, basally decrescent to costules; costae prominent abaxially, adaxially straw-colored, shiny, glabrous, adaxially grooved, with spines along groove and bases of midribs; veins conspicuous, oblique, apical pairs of veins simple, remainder 2-forked, basal basicopic ones from costae, others arising from midribs.

Hainan (Changjiang), Taiwan, SE Xizang (Médog), Yunnan (Guangnan, Xishuangbanna), Zhejiang (Cangnan) [India, Indonesia, Myanmar].

43. *Pteris formosana* Baker, J. Bot. 23: 103. 1885.

美丽凤尾蕨 *mei li feng wei jue*

Pteris decurrentipinnulata Bonaparte; *P. takeoi* Hayata.

Plants 70–100 cm tall. Rhizome prostrate, ca. 1 cm in diam.; scales yellowish brown to pale brown, linear to lanceolate, to 1.5 cm, entire. Fronds clustered; stipe reddish brown, shiny, 30–70 cm × 3–4 mm, glabrous; rachis castaneous, shiny, grooved adaxially; lamina 2-pinnatipartite, ovate-triangular in outline, 45–60(–100) × ca. 30 cm; lower lateral pinnae 5 or 6 pairs, opposite, 5–7 cm apart, pinnae 1(or 2)-pinnatisect, decumbent, oblong-lanceolate in outline, 12–18 × 5–7 cm, shortly stalked, base decrescent, apex narrowly lanceolate-caudate; pinnae anisomerous: basicopic side with 0–3 segments toward its apex, acroscopic side with 3–6 pectinately arranged segments; segments lanceolate, somewhat falcate, 35–60 × ca. 6 mm, ca. 4 mm apart, decumbent, base slightly narrowed, basicopically decurrent, margins entire, apex long acute to acuminate; costae grooved adaxially, grooves with pallid thin raised edges; veins oblique, forked; distal lateral pinnae alternate, 3–5 each side, decumbent, lanceolate, 8–10 × 0.8–1 cm, sessile; terminal pinna pinnatifid, ca. 16 × 6 cm; lamina pale green, firmly herbaceous when dried, glabrous. $2n = 58$.

Wet shaded cliffs, often along streams or waterfalls; 600–2500 m. Taiwan [Japan (Ryukyu Islands)].

44. *Pteris cadieri* Christ, J. Bot. 19: 72. 1905.

条纹凤尾蕨 *tiao wen feng wei jue*

Plants 30–40 cm tall. Rhizome erect, short, 0.5–1 cm in diam., apex with black-brown scales. Fronds clustered (10–20), distinctly dimorphic; stipe castaneous-brown, upward straw-colored, or sometimes dark straw-colored, shiny, 15–25 cm; rachis castaneous-brown, shiny, adaxially grooved with pale straw-colored, narrowly winged margins; sterile fronds: stipe shorter, ca. 1 mm in diam., glabrous, apex with thin narrow green wings; lamina 2-pinnatipartite, 3-forked, ovate-triangular in outline, 10–15 × 6–8 cm; lateral pinnae 1 pair, next to apical pinnae, falcate-triangular, 4–6 × 3–4 cm, both sides or basicopically with 3–5 pectinate lobes (sometimes at base basicopically only with 1 lobe), basal basicopic one largest, simple or ± pectinate; terminal pinna largest, broadly lanceolate, 10–15 × 3–4 cm, sessile, base cuneate, middle sometimes with 4–8 pairs of pectinately arranged segments, margins acutely dentate, apex acuminate; segments oblong, somewhat falcate, 10–15 × 6–8 mm, contiguous, apex obtuse; fertile fronds 1- or 2-pinnate or sometimes subdigitate, pinnae linear, margins

entire or slightly undulate, sterile margins serrate, apex acuminate; midvein abaxially convex, shallowly grooved and with spines, pale straw-colored; veins conspicuous on both surfaces, oblique, often forked, with irregular short raised false veins between veins. Lamina pale green, herbaceous when dried, glabrous. $3n = 87$.

Forests, on wet rocks near creeks; 200–700 m. Fujian, Guangdong, Guangxi, NE and SE Guizhou, Hainan, Jiangxi, Taiwan [Japan (Ryukyu Islands), N Vietnam].

- 1a. Fertile fronds 1-pinnate or sometimes subdigitate, basally decrescent to costae bearing narrow wings; pinna margins entire or slightly undulate, rarely with a few lobes, lateral pinnae 1 or 2 pairs, opposite, spreading, sessile, same as apical pinnae in shape but shorter, basal basicopically decurrent, basal pair often 2-forked 44a. var. *cadieri*
 1b. Fertile fronds 1- or 2-pinnate; pinna margins rounded-undulate, or with lobes along rachis or pinnatipartite .. 44b. var. *hainanensis*

44a. *Pteris cadieri* var. *cadieri*

条纹凤尾蕨(原变种) *tiao wen feng wei jue* (yuan bian zhong)

Pteris dimorpha Copeland; *P. grevilleana* Wallich var. *diffusa* Y. C. Wu, K. K. Wong & Pong.

Fertile fronds: lamina 1-pinnate or sometimes subdigitate, basally decrescent to costae bearing narrow wings; pinnae linear, 8–12 × 0.6–1 cm, margins entire or slightly undulate, rarely with a few lobes, apex acuminate; lateral pinnae 1 or 2 pairs, opposite, spreading, sessile, same as terminal pinna in shape but shorter, basally basicopic side decurrent, basal pair often 2-forked.

Forests, near creeks, among wet rocks; 200–500 m. Fujian (Minhou, Nanjing), Guangdong, Guangxi, NE and SE Guizhou, Taiwan [Japan (Ryukyu Islands), N Vietnam].

44b. *Pteris cadieri* var. *hainanensis* (Ching) S. H. Wu, Fl. Reipubl. Popularis Sin. 3(1): 54. 1990.

海南凤尾蕨 *hai nan feng wei jue*

Pteris hainanensis Ching, Acta Phytotax. Sin. 8: 166. 1959.

Fertile fronds: lamina 1- or 2-pinnate; pinnae rounded-undulate at margin, or with lobes along rachis, or pinnatipartite.

• Forests; 300–700 m. Guangdong (Gaoyao, Wengyuan), Guangxi (Longjin, Yaoshan), Hainan (Baoting, Ledong).

45. *Pteris grevilleana* Wallich ex J. Agardh, Recens. Spec. Pter. 23. 1839.

林下凤尾蕨 *lin xia feng wei jue*

Plants 20–45 cm tall. Rhizome erect, short, 0.5–1 cm in diam., apex with black-brown scales. Fronds clustered (10–15 per plant), monomorphic; stipes of fertile fronds ca. 2 × as long as those of sterile fronds, castaneous-brown, shiny, 20–30 cm × 1–1.5 mm, glabrous, with narrow wings apically; rachis similar,

adaxially grooved and with narrow wings; lamina 2-pinnatipartite, broadly ovate-triangular, 10–15 × 8–12 cm; lateral pinnae 1 or 2 pairs, opposite, decumbent, sessile, in shape of apical lateral pinnae but shorter, base decrescent to narrow wings; basal pinnae 2-forked, basispicopic pinnule smaller; fertile pinnae similar to sterile pinnae, but segments shorter and fewer; terminal pinna broadly lanceolate, 8–12 × 2.5–3.5 cm, base decurrent, connate below pinnae, pectinately divided nearly to costae on both sides, apex caudate; segments decumbent, contiguous, falcate-linear to lanceolate, 15–20 × 3–4 mm, margins serrulate, apex obtuse; lower segments shorter; costae adaxially convex, basally castaneous-brown, upper straw-colored, shallowly grooved, with acute spines (ca. 0.8 mm) on both sides; veins inconspicuous, parallel, very decumbent, often 2-forked, occasionally 3-forked; lamina pale green, firmly herbaceous when dried, glabrous, both surfaces with short raised false veins between veins.

Among rocks within forests; 100–900 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bhutan, N India, Indonesia, Japan (Ryukyu Islands), Malaysia, Nepal, Philippines, Thailand, Vietnam].

- 1a. Pinnae same color throughout 45a. var. *grevilleana*
 1b. Pinnae with parallel pallid spots along both sides of costa, spots ca. 1 cm wide ... 45b. var. *ornata*

45a. *Pteris grevilleana* var. *grevilleana*

林下凤尾蕨(原变种) lin xia feng wei jue (yuan bian zhong)

Pteris quadriaurita Retzius var. *digitata* Baker.

Pinnae same color throughout.

Among rocks within forests; 100–900 m. Guangdong (Foshan, Gaoyao, Xuwen), Guangxi, Hainan, Taiwan, Yunnan (Hekou, Xishuangbanna) [Bhutan, N India, Indonesia, Japan (Ryukyu Islands), Malaysia, Nepal, Philippines, Thailand, Vietnam].

45b. *Pteris grevilleana* var. *ornata* Alderwerelt, Malayan Ferns, 364. 1909.

白斑凤尾蕨 bai ban feng wei jue

Pinnae with parallel pallid spots along both sides of costa adaxially, spots ca. 1 cm wide.

Forests. Guangdong (Gaoyao), Guangxi (Wuming) [N India, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

Pteris grevilleana var. *ornata* is a beautiful ornamental plant.

46. *Pteris heteromorpha* Fée, Mém. Foug. 5: 127. 1852.

长尾凤尾蕨 chang wei feng wei jue

Pteris cretica Linnaeus var. *heteromorpha* (Fée) Beddome.

Plants 60–80 cm tall. Rhizome ascending, ca. 1 cm in diam., apex with brown scales. Fronds clustered (8–10 fronds); stipe dark straw-colored to brown, slightly lustrous, 25–45 cm, 2–3 mm in diam., glabrous, ± rough; rachis similar, scabrous, with sparse short hairs; lamina 2-pinnatipartite, oblong-ovate in outline, 30–40 × 20–25 cm; terminal pinna with linear-caudate tails, 12–15 × 0.8–1 cm, slightly decurrent at base, pectinately divided nearly to costa on both sides, sometimes not divided, apex acuminate; segments 0–8 pairs, alternate or subopposite,

contiguous and slightly imbricate, subspreading, linear-lanceolate, 2.5–3 cm, entire and with cartilaginous edges; lateral pinnae 4–6 pairs, opposite, decumbent, stalked (4–6 cm), similar to terminal pinna, distal 1 or 2 pairs of pinnae shorter, sessile, linear, long caudate, oblique, on both sides segments 1–15 pairs, or at basispicopic side only 1 or 2 segments and other side without segment; costae prominent abaxially, dark straw-colored or castaneous, surfaces ± rough, with shorter hairs, deeply grooved adaxially, with spines along grooves; veins conspicuous on both surfaces, oblique, 2-forked; lamina gray-green, firmly herbaceous when dried, abaxially with sparse multicellular gray short hairs.

Forests; 900–1200 m. S Yunnan (Jinghong, Simao) [Malaysia, Myanmar, Philippines, Vietnam].

47. *Pteris decrescens* Christ, Bull. Acad. Int. Géogr. Bot. 16: 244. 1906.

多羽凤尾蕨 duo yu feng wei jue

Plants 60–70 cm tall. Rhizome erect, short, 1–2 cm in diam., apex with black-brown scales. Fronds clustered (8–12 per plant); stipe dark straw-colored, slightly lustrous, 15–20 cm × ca. 2 mm, ± rough, with sparse gray bristles when young, bristles deciduous; rachis similar to stipe; lamina 2-pinnatipartite, oblong or broadly lanceolate in outline, 30–50 × 12–15 cm, attenuate toward base and apex; lateral pinnae 10–15 pairs, opposite, ca. 5 cm apart at base, oblique, slightly shortly stalked, upper sessile; terminal pinna lanceolate, 7–10 × 2–2.5 cm, wider at base, shortly stalked, base broadly cuneate, upward attenuate, apex narrowly linear-caudate, 1.5–4 cm; segments 15–20 pairs, alternate or subopposite, subspreading, 1–2 mm apart, linear, 5–12 × ca. 2.5 mm, slightly expanded at base, margins entire and with cartilaginous edge, apex obtuse and with 2–7(–12) small teeth; costae abaxially convex, straw-colored, with sparse multicellular gray bristles, adaxially deeply grooved, with narrow ridges on both sides along groove, with a spine at bifurcation of costa of segments; veins conspicuous and prominent on both surfaces, contiguous, oblique, 2-forked; lamina brown-green to pale green, herbaceous when dried.

Evergreen forests; 700–1200 m. Guangdong, Guangxi, Guizhou, Yunnan [Cambodia, Thailand, Vietnam].

The authors have not seen material of *Pteris decrescens* var. *remotipinnulata* Ching (Sinensia 1: 10. 1929).

- 1a. Lateral pinnae 10–15 pairs, caudate apex 1.5–2(–3) cm, basal pinnae gradually shorter, 5–7 cm, middle 8–10 × 2–3 cm, slightly shorter upward 47a. var. *decrescens*
 1b. Lateral pinnae 12–14 pairs, ca. 7 × 1.3 cm, caudate apex 3–4 cm, basal pair almost not shortened 47b. var. *parviloba*

47a. *Pteris decrescens* var. *decrescens*

多羽凤尾蕨(原变种) duo yu feng wei jue (yuan bian zhong)

Lateral pinnae 10–15 pairs, oblique, slightly shortly stalked, upper ones sessile, rounded-truncate at base, caudate apex 1.5–2(–3) cm; basal pinnae gradually shorter, 5–7 cm, middle 8–10 × 2–3 cm, slightly shorter upward.

Evergreen forests; 700–1200 m. Guangdong (Yangchun), Guangxi, Guizhou, Yunnan [Cambodia, Vietnam].

47b. *Pteris decrescens* var. *parviloba* (Christ) C. Christensen & Tardieu, *Notul. Syst.* (Paris) 6: 137. 1937.

大明凤尾蕨 *da ming feng wei jue*

Pteris parviloba Christ, *Bull. Acad. Int. Géogr. Bot.* 1907: 149. 1907.

Lateral pinnae 12–14 pairs, ca. 7 × 1.3 cm, narrowly linear caudate apex 3–4 cm; basal pair almost not shortened.

Guangxi (Daming Shan) [N Vietnam].

48. *Pteris longipinnula* Wallich ex J. Agardh, *Recens. Spec. Pter.* 19. 1839.

翠绿凤尾蕨 *cui lu feng wei jue*

Plants 0.5–1.2 m tall. Rhizome erect, short, 1–2 cm in diam., apex with black-brown scales. Fronds clustered; stipe brown, 30–70 cm, ca. 1 mm in diam., glabrous or with bristles, adaxially grooved; lamina 2-pinnatifid, ovate, 30–60 × 20–25 cm; lateral pinnae 4 or 5 pairs, opposite, adjacent to each other, decumbent, basal pair shortly stalked, upper sessile, broadly lanceolate, 20–25 × ca. 5 cm, base narrower and shortly cuneate, deeply pectinately pinnatifid forming narrow wings, apex acuminate; terminal pinna similar but wider and with stalk 2–6 cm; segments 20–30 pairs, opposite or alternate, decumbent, sinuses acute, 2–3 mm apart, 20–40 × 5–8 mm, base slightly expanded, margin entire and with cartilaginous border, apex obtuse and with a sharp point; costae with short spines along groove; veins biconvex, oblique, forked at base; lamina pale green, firmly herbaceous when dried, glabrous.

Hainan, SE Xizang, Yunnan [Bhutan, NE India, Myanmar, Nepal].

Pteris longipinnula is slightly similar to *P. decrescens* but is slightly larger, with lateral pinnae fewer (only 4 or 5 pairs), and much longer (to 25 cm). The segments are longer and not serrate. It is also similar to *P. heteromorpha* but differs in having the stipe straw-colored and the costae abaxially hairy.

- 1a. Plants 1–1.2 m tall; stipe, rachis, costae, and costules glabrous 48a. var. *longipinnula*
 1b. Plants 0.5–0.8 m tall; stipe, rachis, costae, and costules with bristles 48b. var. *hirtula*

48a. *Pteris longipinnula* var. *longipinnula*

翠绿凤尾蕨(原变种) *cui lu feng wei jue* (yuan bian zhong)

Pteris umbraculifera Mettenius ex Miquel.

Plants 1–1.2 m tall. Stipe, rachis, costae, and costules glabrous. Stipe 60–70 cm, upper part of stipe and rachis, costae, and costules blue-green; basal segments abruptly shortened, narrowly triangular, ca. 6 mm.

• Hainan (Diaoluo Shan), S Yunnan (Hekou, Xishuangbanna).

48b. *Pteris longipinnula* var. *hirtula* C. Christensen, *Contr. U.S. Natl. Herb.* 26: 312. 1931.

毛叶凤尾蕨 *mao ye feng wei jue*

Pteris hekouensis Ching; *P. hirtula* (C. Christensen) C. V. Morton; *P. subhirtula* Sarn. Singh & Panigrahi.

Plants 50–80 cm tall. Stipes 30–50 cm, adaxial groove with gray short bristles; costae adaxially prominent, costae and costules with gray sparse bristles. Rachis with gray multicellular bristles.

Evergreen rain forests; 100–200 m. SE Xizang, SE Yunnan (Hekou) [Myanmar].

49. *Pteris aspericaulis* Wallich ex J. Agardh, *Recens. Spec. Pter.* 22. 1839.

紫轴凤尾蕨 *zi zhou feng wei jue*

Plants 0.3–1.5 m tall. Rhizome ascending, short, 1.5–2 cm in diam., apex densely scaly; scales blackish brown with brown margins, lustrous, linear-lanceolate, 2–7 × 0.1–0.4 mm. Fronds clustered; stipe often light purple, sometimes straw-colored or green, 10–42 cm, ca. 2 mm in diam., glabrous, ± rough, with scattered pustules, scaly at base; lamina 2- or 3-pinnatifid, oblong-ovate in outline, 18–80 × (3–)8–25 cm; lateral pinnae (1 or 2) 2–14 pairs, opposite or subopposite, decumbent, lanceolate, 2–18(–23) cm, sessile or basiscopically shortly stalked, base cuneate, slightly oblique, pectinately divided to near costae, apex caudate with linear pointed tail, basal pair of pinnae often with 1(or 2) basiscopic pinnules near base similar in shape to main part of pinnae but smaller; segments 10–25(–35) pairs, alternate, narrowly separated or contiguous, subspreading, oblong, somewhat falcate, 8–30 × 3–7 mm, base slightly expanded, entire or sterile margins occasionally slightly undulate, apex mucronate or obtuse, and with a sharp corner; terminal pinna similar to median lateral pinnae, stalked (1–1.5 cm); costae prominent abaxially, glabrous, grooved adaxially, with short and robust spines along groove; veins conspicuous on both sides, decumbent, 2-forked from base, lateral veins of segment arising from rachis, 2 opposite veins of base reaching incision of pinnae; lamina gray-green, often mauve at margin, subleathery when dried, glabrous (abaxially glabrous, adaxially subglabrous when young).

Forests; 400–2900 m. Guangxi, Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, Nepal].

- 1a. Stipe, rachis, costae, lamina margin, and indusia ± purple or mauve.
 2a. Plants 1–1.5 m tall 49a. var. *aspericaulis*
 2b. Plants 0.3–0.5 m tall 49c. var. *subindivisa*
 1b. Stipe and rachis brown or straw-colored, lamina margin and indusia green.
 3a. Pinnae uniformly green 49b. var. *cuspidata*
 3b. Pinnae with wide white or rose-colored band along sides of costa ... 49d. var. *tricolor*

49a. *Pteris aspericaulis* var. *aspericaulis*

紫轴凤尾蕨(原变种) *zi zhou feng wei jue* (yuan bian zhong)

Pteris beddomei Sarn. Singh & Panigrahi; *P. panigrahiana* Sarn. Singh; *P. roseolilacina* Hieronymus; *P. submiaoensis* Sarn. Singh & Panigrahi; *P. tibetica* Ching; *P. tirapensis* Sarn. Singh & Panigrahi.

Plants 1–1.5 m tall. Stipe as long as lamina, 4–5 mm in diam.; stipe, rachis, costae, lamina margin, and indusia ± mauve, sometimes straw-colored; lamina oblong-ovate, 50–80 × 20–25 cm; lateral pinnae (2–)6–14 pairs, opposite, decumbent, sessile or basiscopically shortly stalked, lanceolate, (6–)15–18(–23) × (1.5–)2.5–3(–5) cm.

Forests; 800–2900 m. Guangxi (Baise), Sichuan (Shimian), Xizang (Nielamu, Zayü), Yunnan [Bhutan, N India, Nepal].

49b. *Pteris aspericaulis* var. *cuspidata* Ching, Acta Bot. Austro Sin. 1: 8. 1983.

高原凤尾蕨 gao yuan feng wei jue

Pteris shimianensis H. S. Kuang.

Plants 1–1.5 m tall, not purple. Stipe base brown, upper part, rachis, and costae straw-colored; stipe ± rough, sometimes glabrous.

• Forests along valleys; 1900–2300 m. Sichuan (Shimian), Xizang (Nielamu, Zayü), Yunnan (Gongshan).

49c. *Pteris aspericaulis* var. *subindivisa* (C. B. Clarke) Ching ex S. H. Wu, Fl. Reipubl. Popularis Sin. 3(1): 61. 1990.

高山凤尾蕨 gao shan feng wei jue

Pteris subindivisa C. B. Clarke, Trans. Linn. Soc. London, Bot., ser. 2, 1: 467. 1880; *P. quadriaurita* Retzius var. *subindivisa* (C. B. Clarke) Beddome.

Plants 0.3–0.5 m tall, precocious. Stipe ca. 8 cm; stipe, rachis, costae, lamina margin, and indusia ± purple; lamina to 18 × 3–3.5 cm, lateral pinnae 1 or 2 pairs, 2–6 cm.

W Yunnan (Gongshan) [common in S Himalaya].

49d. *Pteris aspericaulis* var. *tricolor* (Linden) T. Moore ex E. J. Lowe, Nat. Hist. Ferns, 19. 1862.

三色凤尾蕨 san se feng wei jue

Pteris tricolor Linden, Gard. Chron. 1860: 123, 217. 1860.

Plants 0.3–0.5 m tall. Pinnae white or rosy, with pink costa with wide whitish or rose-colored bands along both sides, margins green.

SE Yunnan (Yingjiang) [Bhutan, India (Sikkim)].

Pteris aspericaulis var. *tricolor* is a beautiful ornamental plant.

50. *Pteris scabrigena* Fraser-Jenkins, Verm & T. G. Walker, Taxon. Revis. Indian Subcontinental Pteridophytes, 111. 2008.

糙茎凤尾蕨 cao jian feng wei jue

Plants to ca. 1 m tall. Rhizome ascending, short, ca. 1.8 cm in diam., apex densely scaly; scales dark brown, triangular-subulate, to 7 mm. Fronds clustered; stipe darker at base, upper part and rachis grayish brown to straw-colored, stipe to 45 cm, 2.5–3 mm in diam., distinctly rough, conspicuously scaly when young, glabrous, adaxially grooved; lamina 2-pinnatifid, ovate in outline, 30–60 × 16–30 cm; lateral pinnae 5–11 pairs, opposite, obliquely ascending, basal pairs 6–8 cm apart, basal pair shortly stalked, upper sessile, lanceolate, 14–24 × 2.5–4 cm,

base obliquely cuneate, pectinately divided to near costae, apex linear-caudate, 1–3.5 cm, basal pair of pinnae each with basiscopical pinnule at base, similar to main part of pinnae but smaller; segments 20–29 pairs, subopposite to alternate, 2–3 mm apart, obliquely spreading, oblong-triangular, slightly to strongly falcate, 15–30 × 4–5 mm, progressively smaller distally, base slightly expanded, margins entire or minutely undulate, apex mucronate; terminal pinna similar to median lateral pinnae but larger, stalked; costae abaxially prominent, straw-colored, sometimes reddish adaxially, glabrous, adaxially grooved, with short adpressed teeth alongside groove near junction with costules; veins conspicuous on both surfaces, oblique, 2-forked from base; lamina bright pink when young, turning yellow and then green when mature, gray-green and stiffly papery when dried, glabrous. Indusia brown. $2n = 58$.

Forests; 900–1800 m. Xizang [Bhutan, N India, Nepal].

Pteris scabrigena is closest to *P. aspericaulis* from which it is most easily distinguished by the much more rigid fronds with inconspicuous short adpressed spines along the costae. The description is based on collections from Bhutan and India; the collection from Xizang at BM mentioned in the protologue was not found.

51. *Pteris caiyangheensis* L. L. Deng, Bull. Bot. Res., Harbin 16: 423. 1996.

菜阳河凤尾蕨 cai yang he feng wei jue

Plants ca. 50 cm tall. Rhizome ascending, short, ca. 5 mm in diam., apex with yellow-brownish scales. Fronds monomorphic, clustered; stipe ca. 2 × as long as lamina, 1–2 mm in diam., mauve (as on rachis and frond margin), with yellow-brownish scales at base, glabrous, ± rough; lamina 2-pinnatifid, 3-forked, ovate-triangular in outline, 15–20 × 10–15 cm; lateral pinnae 1 pair, with basiscopical pinnule similar to terminal pinna; segments 2–25 pairs, opposite or subopposite, contiguous, subspreading, somewhat falcate, 20–30 × ca. 5 mm, entire or sometimes slightly undulate, apex mucronate or obtuse, and with a protuberance; terminal pinna broadly lanceolate, basally broadly cuneate, stalked (1–2 cm), pectinate nearly to costae, apically tapering; costae prominent abaxially, glabrous, grooved adaxially, with 2–3 mm spine at intersecting point of segments and costa; veins conspicuous on both surfaces, 2-forked at base of segments, lateral veins of segment base arising from rachis; lamina green with mauve margins, subherbaceous when dried, glabrous. Indusia flavescens.

• Evergreen broad-leaved forests, monsoon forests; 800–1000 m. Yunnan (Simao).

Pteris caiyangheensis is similar to *P. aspericaulis* var. *aspericaulis* but differs in having lamina ovate-triangular, 2-pinnatifid, 3-forked; stipe 2 × as long as lamina; and indusia flavescens. It is treated as a synonym of *P. aspericaulis* var. *tricolor* by Zhang Xianchun in the Catalogue of Life, China (http://data.sp2000.cn/2010_cnode_e/show_species_details.php?name_code=90ed8812-a375-40c9-9b84-c224c315ed89; accessed 9 Jan 2012).

52. *Pteris splendida* Ching, Acta Bot. Austro Sin. 1: 9. 1983.

隆林凤尾蕨 long lin feng wei jue

Plants up to 1 m tall. Rhizome not seen. Stipe brown at base, dark, ca. 80 cm × 5 mm, upper part straw-colored, adaxially with 2 angular grooves; rachis straw-colored, glabrous; lamina 2- or 3-pinnatipartite, narrowly ovate in outline, ca. 55 × 25 cm; lateral pinnae ca. 7 pairs, opposite, decumbent, approximate, basal pair of pinnae with stalks ca. 2 cm, upper pairs shortly stalked to gradually sessile; basiscopic pinnae broadly lanceolate, 25–30 × 4–8 cm, basally narrower, subtruncate, symmetrical, pectinately divided nearly to costae, apex linear-caudate (ca. 5 cm); basal pair 2-forked at base, with a deeply pectinately pinnatifid pinnule at base; terminal pinna similar to lateral pinnae, but with longer stalk; segments ca. 30 pairs, alternate, contiguous, decumbent, linear-lanceolate, somewhat falcate, median ones 30–50 × 5–8 mm, upper ones gradually reduced, apex acute or obtuse, with a sharp point, entire; costae glabrous, adaxially grooved, with flat needlelike spines at both narrow sides of costa, and short spines on midvein; veins conspicuous, prominent abaxially, 2-forked at base, oblique; lamina papery when dried, abaxially gray-green, adaxially pale green or brown-green when dried, glabrous.

• Densely shaded or open forests; 700–1000 m. NW Guangxi, Guizhou, Hunan.

- 1a. Lateral pinnae ca. 25 × 8 cm;
median segments ca. 50 × 8 mm,
adaxially pale green when dried 52a. var. *splendida*
1b. Lateral pinnae 26–30 × 4–5 cm;
segments to 30 × 5–6 mm, adaxially
brown-green when dried 52b. var. *longlinensis*

52a. *Pteris splendida* var. *splendida*

隆林凤尾蕨(原变种) long lin feng wei jue (yuan bian zhong)

Lateral pinnae ca. 25 × 8 cm, apex linear, caudate; segments linear-lanceolate, somewhat falcate, median segments ca. 50 × 8 mm; lamina adaxially pale green.

• Open forests in sand-shale areas; ca. 700 m. NW Guangxi (Longlin), Guizhou, Hunan (Fenghuang, Tongdao).

The typical variety is similar to *Pteris fauriei*, but the former's pinnae are deeply pinnatifid, with many long spines, and with a short acute spine at each segment apex and a pair of veins at the segment base extending at near right angles, almost parallel to the rachis.

52b. *Pteris splendida* var. *longlinensis* Ching & S. H. Wu, Acta Bot. Austro Sin. 1: 9. 1983.

细羽凤尾蕨 xi yu feng wei jue

Lateral pinnae lanceolate, 26–30 × 4–5 cm; segments up to 30 × 5–6 mm; lamina brown-green when dried, slightly lustrous.

• Densely shaded forests; ca. 1000 m. NW Guangxi (Longlin), Hunan (Fenghuang).

53. *Pteris setulosocostulata* Hayata, Icon. Pl. Formosan. 4: 241. 1914 [*“setuloso-costulata”*].

有刺凤尾蕨 you ci feng wei jue

Plants 90–120 cm tall. Rhizome erect, robust, 2–3 cm in diam., woody, apex densely clothed with black-brown, subulate

scales. Fronds clustered (6–10 per plant); stipe 50–60 cm, ca. 4 mm in diam., basally brown and sparsely scaly, upper part and rachis straw-colored, sometimes brown-green, glabrous; lamina 2(or 3)-pinnatipartite, oblong, 40–60 × 20–30 cm; lateral pinnae 9–16 pairs, opposite, decumbent, lowest pair slightly shortly stalked, 15–18 × 2–3 cm, with 2–4 pinnules on basiscopic side, pectinately divided; upper pinnae sessile, linear-lanceolate, base broadly cuneate, pectinately divided nearly to costa, apex acuminate; terminal pinna similar to median lateral pinnae but larger, with stipe ca. 1 cm; segments 28–32 pairs, alternate, slightly decumbent, 1–2 mm apart, oblong, sometimes falcate, 10–18 × 3–5 mm, entire; costae straw-colored, sometimes light brown or mauve, abaxially convex, glabrous, adaxially grooved, with needlelike spines along groove and midvein; veins conspicuous on both surfaces, oblique, 2-forked from base, veins of segment base oblique, reaching margin of incision; lamina pale green, firmly herbaceous when dried, glabrous.

Forests; 1000–2500 m. Guizhou (Pu'an), Sichuan (Emei Shan), Taiwan, Xizang, S and W Yunnan [Japan, Philippines].

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 109, 575. 2008) tentatively treats this species as a synonym of *Pteris spinescens* C. Presl.

54. *Pteris kiuschiuensis* Hieronymus, Hedwigia 55: 341. 1914.

平羽凤尾蕨 ping yu feng wei jue

Plants 60–80 cm tall. Rhizome erect, short, ca. 1 cm in diam., apex with yellowish brown scales. Fronds clustered; stipe reddish brown at base, 25–55 cm, 2–3 mm in diam.; stipe and rachis straw-colored or brown-straw-colored, slightly lustrous, glabrous; lamina 2(or 3)-pinnatipartite, ovate in outline, 25–35(–40) × 20–25(–30) cm; lateral pinnae 4–9 pairs, opposite, spreading or ascending, basal pairs 3–4 cm apart, sessile, linear-lanceolate, straight or somewhat falcate, 12–16(–18) × 1.8–3.7 cm, base subtruncate or rounded-truncate, pectinate and forming narrow wings along costae, apex acuminate or long caudate (2–4 cm); upper pinnae slightly smaller than basal ones, spreading or oblique; apical pinnae similar to lateral pinnae but wider, sometimes narrower at base, stalked (1–2 cm); basal pair of pinnae often branched basiscopically near base, branch similar to main part of pinna but smaller; segments 23–28 pairs, alternate or subopposite, contiguous or at intervals of ca. 1 mm, slightly oblique, oblong, sometimes falcate, 1–1.5 cm × 4–5 mm, base slightly expanded, margin entire, apex obtuse; costae prominent abaxially, straw-colored, glabrous, adaxially grooved, with short and flat spines along groove, midvein sparsely spiny, spines sometimes poorly developed; veins conspicuous on both surfaces, oblique, 2-forked from base, veins at segment base oblique, reaching margin of incision. Lamina grass-green, thinly herbaceous when dried, glabrous.

Open forests, near river margins; 300–1200 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, S Yunnan [Japan].

- 1a. Lateral pinnae spreading at right angles, 1.8–2.5(–2.8) cm wide 54a. var. *kiuschiuensis*

- 1b. Lateral pinnae often ascending,
up to 3.7 cm wide 54b. var. *centrochinensis*

54a. *Pteris kiuschiuensis* var. *kiuschiuensis*

平羽凤尾蕨(原变种) ping yu feng wei jue (yuan bian zhong)

Lateral pinnae spreading at right angles to rachis, 12–16(–18) × 1.8–2.5(–2.8) cm.

Open forests; 500–1200 m. Chongqing, Fujian (Chong'an, Jianyang, Wuyi Shan), Guangdong (Guangzhou, Luofu Shan, Renhua), Guangxi, Guizhou (Dushan, Jiangkou, Langdai), Hunan, Jiangxi (Nanping, Yifeng), Sichuan (Emei Shan), S Yunnan [Japan].

54b. *Pteris kiuschiuensis* var. *centrochinensis* Ching & S. H. Wu, Acta Bot. Austro Sin. 1: 10. 1983 [“*centro-chinensis*”].

华中凤尾蕨 hua zhong feng wei jue

Lateral pinnae often ascending, up to 3.7 cm wide.

• Near river margins; 300–800 m. Chongqing, Fujian (Chong'an, Jianyang), Guangdong, Guangxi (Pingnan, Rongshui, Tianyang), Guizhou (Dushan, Langdai), Hunan (Baojing, Dong'an, Huitong), Jiangxi, Sichuan (Emei Shan), S Yunnan.

55. *Pteris oshimensis* Hieronymus, Hedwigia 55: 367. 1914.

斜羽凤尾蕨 xie yu feng wei jue

Plants 50–80 cm tall. Rhizome erect, short, apex with brownish black scales. Fronds clustered; stipe basally brown, upper part and rachis and costae straw-colored, 25–50 cm, ca. 2 mm in diam., glabrous; lamina 2(or 3)-pinnatifid, oblong in outline, 30–40 × 10–18 cm; lateral pinnae 7–9 pairs, opposite, decumbent, sessile, lanceolate, base broadly cuneate, symmetrical, lowest pair of pinnae cut obliquely from base, pectinately lobed nearly to costa, often with 1(or 2) basiscopic pinnules similar in shape to main part of pinna; terminal pinna same as lateral pinnae, with stipe ca. 1 cm; segments 22–30 pairs, alternate or opposite, ca. 1 mm apart, spreading or decumbent, lanceolate, somewhat falcate, 10–15 × 3–4 mm, slightly expanded, slightly narrower toward top, obtuse, entire; costae glabrous, abaxially grooved, with needlelike spines along groove, mid-vein with a few needlelike spines or spineless; veins conspicuous on both surfaces, 2-forked at base, oblique, basal pair of veins reaching margin above sinus; lamina pale green or brown-green when dried, herbaceous, glabrous.

Open forests; 300–900 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Zhejiang [Japan, N Vietnam].

- 1a. Basal lateral pinnae (8–)11–14(–17) cm,
with short, acute tips 1–2 cm 55a. var. *oshimensis*
1b. Basal lateral pinnae 14–25 cm,
with long tips (3–)4–9 cm 55b. var. *paraemeiensis*

55a. *Pteris oshimensis* var. *oshimensis*

斜羽凤尾蕨(原变种) xie yu feng wei jue (yuan bian zhong)

Pteris omeiensis Ching.

Basal lateral pinnae (8–)11–14(–17) × (1.7–)2–2.8 cm, apically attenuate to form linear, acute tip 1–2 cm, not or slightly narrower at base. 3*n* = 87.

Open forests; 300–900 m. Chongqing, Fujian (Nanping), Guangdong, Guangxi (Baise, Yangshuo), Guizhou (Pingtang, Zhenfeng), Hunan, Jiangxi (Dayu, Quannan, Yifeng), Sichuan (Emei Shan) [Japan, N Vietnam].

Christ (Bull. Herb. Boissier 2: 1016. 1901) treated material of this species as *Pteris asperula* J. Smith.

55b. *Pteris oshimensis* var. *paraemeiensis* Ching, Acta Bot. Austro Sin. 1: 10. 1983.

尾头凤尾蕨 wei tou feng wei jue

Lower lateral pinnae 14–25 × 1.7–3.5 cm, apically attenuate into long tips (3–)4–9 cm.

• Forests; 500–600 m. Chongqing, Guangxi (Baise), Hunan (Shimen), Sichuan.

Material of this taxon was originally included within *Pteris omeiensis* Ching (*Fang 17956*).

56. *Pteris fauriei* Hieronymus, Hedwigia 55: 345. 1914.

傅氏凤尾蕨 fu shi feng wei jue

Plants 50–90 cm tall. Rhizome ascending, short, ca. 1 cm in diam., apex densely scaly; scales dark brown, brown at margin, linear-lanceolate, ca. 3 mm. Fronds clustered; stipe straw-colored, 30–50 cm, 2–4 mm in diam., with dark brownish scales, glabrous, adaxially grooved; rachis similar; lamina 2(or 3)-pinnatifid, ovate to ovate-triangular in outline, 25–45 × 17–24(–30) cm; lateral pinnae 3–6(–9) pairs, basal pairs opposite, 4–8 cm apart, decumbent, rarely slightly decumbent, basal pair sessile or shortly stalked, often with a basiscopic pinnule near base similar to main part of pinna but smaller; upper pairs sessile, base attenuate, broadly cuneate, pectinate and forming narrow wings along costae, apex linear-caudate, 2–3(–4.5) cm, acuminate; terminal pinna similar but wider and stalked (2–4 cm); segments 20–30 pairs, alternate or opposite, conjoined or ca. 1 mm apart (fertile segments up to 2 mm apart), decumbent, falcate, broadly lanceolate, usually basiscopic segments longer than acroscopic segments, basal pair or several pairs of segments shortened at base, entire, apex obtuse; costae abaxially prominent, straw-colored, glabrous, grooved adaxially, with needlelike flat spines on both sides of groove, and few spines on costa; veins conspicuous on both surfaces, oblique, 2-forked at base, basiscopic vein of segment arising from rachis, and acroscopic vein arising from base of costa, opposite veins at base oblique up to margin of incision; lamina light green to pale green, papery when dried, glabrous (rarely glabrescent when young). *Indusia* gray-brown, linear, membranous, persistent. *n* = 29, 2*n* = 58, 87, 89.

Acidic soils in forests along valleys; sea level to 800 m. Anhui, Fujian, Guangdong, Guangxi, S Guizhou, Hainan, S Hunan, Jiangxi, Taiwan, Xizang, SE Yunnan, Zhejiang [Japan, N Vietnam].

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 109. 2008) includes *Pteris fauriei* within *P. khasiana* (C. B. Clarke) Hieronymus, which would extend the distribution to Bangladesh, NE India, Myanmar, Nepal, Philippines, and Vietnam.

Pteris medogensis Ching & S. K. Wu (Fl. Xizang. 1: 71–72, t. 16, fig. 1–4. 1983) and *P. bomiensis* Ching & S. K. Wu (loc. cit.: 72, t. 19) appear to fall within the range of variation accepted for *P. fauriei*.

Pteris wulaiensis C. M. Kuo (Bot. Bull. Acad. Sin., n.s., 30: 143. 1989) is an apomictic diploid intermediate between *P. fauriei* and *P. bella* and is presumed to be of hybrid origin (see Knapp, Ferns Fern Allies Taiwan, 371–372, 479. 2011).

The authors have not seen material of *Pteris fauriei* var. *rigida* Hieronymus (Hedwigia 55: 347. 1914), described from China.

- 1a. Lateral pinnae falcate-lanceolate, 3–4 cm wide; median segments of pinnae 15–22 × 4–6 mm 56a. var. *fauriei*
 1b. Lateral pinnae broadly lanceolate, 4–6 cm wide; median segments of pinnae 20–35 × (5–)6–8 mm 56b. var. *chinensis*

56a. *Pteris fauriei* var. *fauriei*

傅氏凤尾蕨(原变种) fu shi feng wei jue (yuan bian zhong)

Pteris fauriei var. *minor* Hieronymus; *P. guizhouensis* Ching; *P. linearis* Poiret var. *fauriei* (Hieronymus) C. Christensen & Tardieu; *P. pseudoconfusa* Sarn. Singh & Panigrahi; *P. quadriaurita* Retzius var. *abbreviata* Rosenstock.

Lateral pinnae falcate-lanceolate, 13–23 × 3–4 cm; median segments of pinnae 15–22 × 4–6 mm.

Acidic soils in forests along valleys; sea level to 800 m. Fujian (Chong'an, Shaowu), Guangdong, Guangxi (Duyun), Hainan (Lizhishan), S Hunan (Tongdao, Yizhang, Yongshun), Jiangxi, Taiwan, SE Yunnan (Hekou), Zhejiang (Nanhui, Tiantai Shan) [Japan, N Vietnam].

Hooker (Sp. Fil. 2: 179. 1858) and others included material of this taxon within *Pteris quadriaurita*, while C. Christensen (Index Filic. 593. 1906) included it within *P. baurita*.

56b. *Pteris fauriei* var. *chinensis* Ching & S. H. Wu, Acta Bot. Austro Sin. 1: 10. 1983.

百越凤尾蕨 bai yue feng wei jue

Pteris bifurcata Ching.

Lateral pinnae broadly lanceolate, 16–22 × 4–6 cm; median segments of pinnae 20–35 × (5–)6–8 mm.

• Forests along valleys; 300–700 m. Fujian (Chong'an), Guangdong (Gaoyao, Qujiang, Yunfu), Guangxi, S Guizhou (Dushan), Hainan (Chengmai, Danxian, Lingao).

Material of this taxon was identified as *Pteris longipinnula* by Merrill (Lingnan Sci. J. 5: 16. 1927) and as *P. fauriei* s.s. by Ching (Icon. Fil. Sin. 3: t. 140. 1935).

57. *Pteris angustipinnula* Ching & S. H. Wu, Acta Bot. Austro Sin. 1: 11. 1983.

线裂凤尾蕨 xian lie feng wei jue

Plants ca. 1 m tall. Rhizome not seen. Stipe 43–65 cm, ca. 3 mm in diam., sparsely scaly; stipe apically straw-colored, or slightly dark chestnut, slightly lustrous, glabrous, grooved adaxially; scales brown, lanceolate, ca. 2 mm, gradually deciduous; rachis straw-colored, glabrous, adaxially grooved; lamina 2- or 3-pinnatifid, oblong-ovate in outline, 35–45 × 16–24 cm; lateral pinnae 5–7 pairs, opposite, slightly decumbent, basal pairs 5.5–7.5 cm apart; basal pair slightly shortly stalked; distal

pairs sessile, median pinnae broadly lanceolate, 17–22 × 4–6.5 cm, base rounded-cuneate, pectinately divided with narrowly winged costa, apex caudate-acuminate (4–5.5 mm); pinnae asymmetrical; basal pairs slightly wider, with 1 or 2 basispic pinnules similar in shape to main part of pinna but smaller; segments 21–25 pairs, opposite or alternate, decumbent, 2–4 mm apart, linear-lanceolate, somewhat falcate, basal segments slightly shorter; middle segment 25–40 × 4–5 mm, apical segment shorter and becoming narrow, obtuse, slightly expansive at base, entire; terminal pinna similar to lateral pinnae, but wider, and shortly stalked (5–15 cm); costae and midvein prominent abaxially, light straw-colored, glabrous, adaxially grooved, with needlelike flat spines along groove of costae, and with a few needlelike spines along midvein; veins conspicuous on both sides, 2-forked, decumbent, oblique, basispic vein at segment base arising from rachis, and acrosopic vein together extending up to margin of incision; lamina gray-green, papery when dried, glabrous, or rarely minutely puberulent. Indusia gray-brown, linear, membranous, entire, persistent.

• Forests in valleys. SW Guangxi (Fusui, Longjin).

Pteris angustipinnula is similar to *P. fauriei*, but differs in having linear-lanceolate segments that are distant from each other.

58. *Pteris obtusiloba* Ching & S. H. Wu, Acta Bot. Austro Sin. 1: 11. 1983.

江西凤尾蕨 jiang xi feng wei jue

Plants ca. 70 cm tall. Rhizome not seen. Stipe light straw-colored or chestnut abaxially, shiny, ca. 40 cm, up to 2 mm in diam., shallowly grooved adaxially, basally scaly, distally glabrous; scales brown with brown margins, lanceolate, ca. 1 mm; lamina 2- or 3-pinnatifid, oblong-ovate in outline, ca. 30 × 20 cm; lateral pinnae 6 or 7 pairs, opposite, oblique, 3.5–4.5 (–7) cm apart; basal pair of pinnae shortly stalked, other pairs sessile, lanceolate, 12–16 × 2–2.5 cm, base rounded-cuneate, apex caudate-acuminate, pinnae anisomerous, pectinately deeply divided leaving narrowly winged rachis, basispic side wider, basal pair of pinnae often with a basispic pinnule near base similar to main part of pinna but smaller; segments 19–23 pairs, alternate or subopposite, oblique, ca. 1 mm apart, linear, somewhat falcate, basal lobes shorter, median 13–16 × ca. 4 mm, parallel on both sides, base widened, margin entire, apex obtuse; terminal pinnae same shape and size as lateral pinnae, but symmetrical on both sides, shortly stalked (ca. 1 cm); costae and midvein prominent abaxially, pale straw-colored, glabrous, costae shallowly grooved adaxially, with spines on both sides, and a few spiculate thorns on costae; veins conspicuous on both surfaces, 2-forked, oblique, lateral veins of segment base arising abaxially from rachis, other lateral vein adaxially extended to margin of incision; lamina green, herbaceous when dried, glabrous; rachises same as stipes in color, glabrous, slightly grooved adaxially. Indusia gray-brown, linear, membranous, entire, persistent.

• Forests along valleys; ca. 500 m. Hunan (Lingxian, Yongshun), SW Jiangxi (Chongyi), Zhejiang.

Pteris obtusiloba is similar to *P. fauriei* but differs by the herbaceous lamina; narrow pinnae, median 2–2.5 cm wide, with shorter seg-

ments, 13–16 × ca. 4 mm, linear, slightly falcate, apex rounded; and costae with spiculate spines on both sides of groove adaxially.

59. *Pteris majestica* Ching, Acta Bot. Austro Sin. 1: 12. 1983.

硕大凤尾蕨 shuo da feng wei jue

Plants more than 1.3 m tall. Rhizome not seen. Stipe straw-colored, ca. 80 cm, ca. 5 mm in diam. at middle, glabrous, grooved adaxially; rachis similar, slightly lustrous, glabrous, grooved adaxially; lamina 2- or 3-pinnatipartite, ovate-oblong in outline, ca. 65 × 30–50 cm; lateral pinnae ca. 7 pairs, opposite or subopposite, slightly decumbent, stalked (5–10 mm), distal ones sessile, slightly asymmetrically broadly lanceolate, ca. 35 × 8 cm, base broadly cuneate, pectinately divided to narrowly winged costae, apex caudate-acuminate; basal pair of pinnae often with a basiscopic pinnule near base similar to main part of pinna but smaller; segments 30–35 pairs, alternate, 1.5–3 mm apart, decumbent, lanceolate, somewhat falcate, median ones 35–55 × 7–9 mm, basally wider, margins entire, apex obtuse; basal segments conspicuously shorter; terminal pinna similar to middle lateral pinnae, but symmetrical and with basal stalk ca. 1 cm; costae and midvein prominent abaxially, straw-colored, glabrous, costae adaxially shallowly grooved, with flat rigid spine on both sides, midvein with a few very short spines on upper surface; veins conspicuous on both sides, decumbent, 2-forked at base, lateral veins of segment base abaxially arising from rachis, and other lateral vein adaxially extended at margin of incision; lamina grass-green, thickly papery when dried, glabrous. Indusia gray-brown, linear, membranous, entire, persistent.

• Dense forests, wet valleys; ca. 2700 m. Guangdong, Sichuan (Emei Shan, Ya'an), SE Yunnan (Jingdong, Wuliang Shan).

Pteris majestica is similar to *P. fauriei* but much taller, more than 1.3 m, with lateral pinnae ca. 35 × 8 cm, and middle segments 3.5–5.5 cm × 7–9 mm.

60. *Pteris puberula* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 52. 1941.

柔毛凤尾蕨 rou mao feng wei jue

Plants 50–75 cm tall. Rhizome erect, short, ca. 1 cm in diam., apex densely clothed with brown scales. Fronds clustered; stipe brown-straw-colored, rarely pale straw-colored, shiny, 17–40 cm, 2–3 mm in diam., glabrous; rachis similar in color, slightly lustrous, sparsely gray puberulent or glabrescent; lamina 2- or 3-pinnatipartite, broadly ovate in outline, 30–44 × (14–)22–27 cm; lateral pinnae 5–7 pairs, opposite, oblique or decumbent, basal pair shortly stalked, remainder sessile, broadly lanceolate, 14–17 × 3.2–4.5 cm, base rounded-truncate, pectinately divided to narrowly winged costae, apex acuminate, lobate or shortly caudate; basal pair of pinnae often with 1(or 2) basiscopic pinnules similar to main part of pinna but smaller; segments 25–30 pairs, alternate or subopposite, slightly decumbent, 1–2 mm apart, falcate, broadly linear, 20–25 × 5–6 mm, base conspicuously expanded, margin entire, apex obtuse; terminal pinna similar to median lateral pinnae, stalk 1–1.5 cm; costae prominent abaxially, light straw-colored, slightly lustrous, sparsely gray strigose, with soft flat spines along grooves, midvein sparsely gray puberulent abaxially; veins conspicuous

on both sides, decumbent, 2-forked at base, pair of opposite veins at segment base extending up to margin of incision; lamina light green when dried, thinly herbaceous, abaxially sparsely gray strigose, adaxially glabrous.

Forests; 2500–2800 m. Xizang (Neilalmu), Yunnan (Dangbi, Dayao) [Bhutan, N India, Nepal].

61. *Pteris viridissima* Ching, Acta Bot. Austro Sin. 1: 13. 1983.

绿轴凤尾蕨 lu zhou feng wei jue

Plants ca. 70 cm tall. Rhizome erect, short, ca. 1.5 cm in diam., apex with brown scales. Fronds clustered; stipe dark brownish on lower parts, slightly lustrous, ca. 30 cm × 2 mm, slightly flat, upper part of stipes and rachises and costae blue-green, slightly lustrous, glabrous; lamina 2(or 3)-pinnatipartite, oblong-ovate in outline, ca. 45 × 20 cm; lateral pinnae ca. 9 pairs, decumbent, lower subopposite, shortly stalked, upper subopposite or alternate, sessile, broadly lanceolate, 13–15 × 4–5 cm, basally rounded-cuneate, pectinately divided to narrowly winged costae, apex acuminate and lobate; basal pair of pinnae basiscopically branched near base, branch similar to main part of pinna but smaller; segments ca. 25 pairs, alternate, slightly decumbent, contiguous or narrowly separated, broadly linear and straight, 20–30 × 4–5 mm, basally slightly expanded, margins entire, apex mucronate or subobtusate; terminal pinna similar to lateral pinnae but with stipe ca. 1 cm; costae grooved with flat spines on both sides, midvein with spiculate spinules; veins conspicuous on both surfaces, decumbent, 2-forked at base, pair of opposite veins at segment base extending up to margin of incision; lamina blue-green, thinly herbaceous when dried, pinnae abaxially glandular along both sides of rachis.

• Limestone soils; 600–2000 m. Guizhou (Pingtang), Hunan (Shimen), Yunnan.

62. *Pteris hirsutissima* Ching, Acta Bot. Austro Sin. 1: 13. 1983.

微毛凤尾蕨 wei mao feng wei jue

Plants 75–90 cm tall. Rhizome ascending, short and thick. Fronds clustered; stipe brown at base, apical portion straw-colored, 30–45 cm × 2–3 mm, with brown scales at base; lamina 2(or 3)-pinnatipartite, oblong, 40–45 × 20–25 cm; lateral pinnae 4–8 pairs, subopposite or opposite, decumbent, sessile or basal pair stalked, stalk lanceolate, ca. 1 cm; basal pairs 20–23 × 4.5–5.5 cm, basally rounded-cuneate, pinnate to costa, apex acuminate, caudate; basal pair of pinnae each with basiscopic pinnule similar in shape to main part of pinna but smaller; segments 24–30 pairs, oblique, ca. 2 mm apart, lanceolate, 2–3.5 cm, basally enlarged (6–7 mm wide), margin entire, apex attenuate, acuminate; basiscopic segments slightly longer than acroscopic segments; terminal pinna similar to median lateral pinnae, stalked (2.5–3.5 cm); costae prominent abaxially, pale brown-straw-colored, sometimes mauve, with flat short spines on both sides of groove, midvein with 3–5 thin spines; costae, midvein, and abaxial surface of segments sparsely strigose; rachis straw-colored, glabrous; veins conspicuous on both surfaces, oblique, 2-forked from base, and opposite veins at segment base oblique

up to margin of incision; lamina brown-green, herbaceous when dried.

- Forests; ca. 1400 m. Sichuan (Mianning).

63. *Pteris subquinata* Wallich ex J. Agardh, Recens. Spec. Pter. 21. 1839.

勐海凤尾蕨 meng hai feng wei jue

Pteris monghaiensis Ching; *P. quadriaurita* Retzius var. *subquinata* (Wallich ex J. Agardh) Beddome.

Plants 80–90 cm tall. Rhizome not seen. Stipe straw-colored, 50–60 cm × ca. 3 mm, glabrous, grooved adaxially; lamina 2- or 3-pinnatifid, triangular-ovate in outline, ca. 30 × 20 cm; lateral pinnae 3 pairs, opposite, decumbent, sessile, lanceolate, 15–17 × ca. 3.5 cm, base rounded-cuneate, pectinately pinnate, apex acuminate and lobate; basal pair of pinnae often with a basicopic pinnule similar to main part of pinna but smaller; segments 30–35 pairs, alternate or subopposite, spreading, 2–3 mm apart, linear and substraight, 15–20 × ca. 3 mm, base enlarged, margin entire, apex obtuse; terminal pinna similar to median lateral pinnae, stalked (ca. 1 cm); costae prominent abaxially, straw-colored, glabrous, grooved adaxially, with soft flat spines along grooves; veins conspicuous on both surfaces, oblique, thick and dense, 2-forked at base, acroscopic vein on segment base, and basicopic vein arising from rachis, and opposite veins at base oblique up to margin of incision; lamina gray-brown, subleathery when dried, glabrous.

Forests along valleys; ca. 1000 m. S Yunnan (Menghai, Xishuangbanna) [Bhutan, N India, Nepal].

64. *Pteris bella* Tagawa, Acta Phytotax. Geobot. 8: 166. 1939.

栗轴凤尾蕨 li zhou feng wei jue

Pteris wangiana Ching.

Plants 50–70 cm tall. Rhizome long ascending, ca. 1 cm in diam., woody, apex with light brown scales. Fronds clustered; stipe with basal part castaneous-brown, upper part and rachis castaneous-red, shiny, 30–40 cm, ca. 2 mm in diam., glabrous, scales with expanded bases; lamina 2- or 3-pinnatifid, broadly ovate to oblong in outline, 30–35 × 15–20 cm; lateral pinnae 5 or 6, opposite, decumbent; basal pair shortly stalked, each often with 1 (or 2) basicopic pinnules similar to main part of pinna but smaller, middle pinnae sessile, lanceolate, 10–15 × 2–3 cm, pectinately divided to near costa, apex long acuminate; segments 20–25 pairs, alternate, approximate, slightly decumbent, narrowly oblong, 10–15 × 3–4 mm, base rounded-cuneate, basally enlarged with basicopic side slightly decurrent, margin entire, apex obtuse; terminal pinna similar to median lateral pinnae, but with stipe ca. 1 cm; costae abaxially light straw-colored, sometimes chestnut abaxially, shiny, glabrous, slightly grooved adaxially, with aciculate spines on both sides of groove; veins conspicuous, sparse, oblique, basal part forked but simple upward; lamina grass-green, herbaceous when dried, glabrous.

Shaded forests; 600–1600 m. Hainan (Wuzhi Shan), Hunan (Yizhang), N and S Taiwan, Yunnan [S Vietnam].

65. *Pteris scabristipes* Tagawa, Acta Phytotax. Geobot. 5: 103. 1936.

红柄凤尾蕨 hong bing feng wei jue

Rhizome ascending, short, scaly. Stipe reddish, 25–45 cm, muricate, scaly at base, scales not expanded at base; lamina 2-pinnatifid, oblong-ovate in outline, 30–50 cm; lateral pinnae 4–9 pairs, opposite; basal pinnae each with a basicopic pinnule similar to main part of pinna but smaller; middle pinnae sessile, narrowly lanceolate, pectinately divided; segments 20–26 pairs, often opposite, narrowly oblong-falcate, to ca. 15 × 5 mm, margin entire, apex subacute.

- Taiwan.

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 108. 2008) included *Pteris scabristipes* within *P. aspericaulis*.

66. *Pteris arisanensis* Tagawa, Acta Phytotax. Geobot. 5: 102. 1936 [“*arisanensis*”].

线羽凤尾蕨 xian yu feng wei jue

Pteris biaurita Linnaeus var. *intermittens* C. Christensen; *P. confusa* T. G. Walker; *P. vijaynagarensis* Sarn. Singh & Panigrahi.

Plants 1–1.5 m tall. Rhizome erect, short, 1.5–2 cm in diam., apex with black-brown scales. Fronds clustered (6–8 per plant); stipe basally brown, upper part straw-colored, slightly lustrous, as long as fronds, 3–4 mm in diam., glabrous; lamina 2- or 3-pinnatifid, oblong-ovate in outline, 50–70 × 20–30 cm; lateral pinnae 5–15 pairs, opposite, slightly decumbent, sessile or basal pairs shortly stalked, lanceolate, 15–25(–33) × 3–4(–5.5) cm, base rounded-cuneate and slightly oblique, deeply pectinately divided to winged costa, apex long caudate; basal pair of pinnae often each with basicopic pinnule similar to main part of pinnae but smaller; segments 25–35 pairs, alternate, subspreading or oblique, falcate-oblong, 20–30 × 5–8 mm, base slightly enlarged, margins entire, apex obtuse or mucronate; terminal pinna similar to lateral pinnae; costae with 6–10 mm wide wings, prominent abaxially, straw-colored, glabrous, grooved adaxially, with spines; veins conspicuous and convex on both sides, decumbent, 2-forked at base, basicopic vein of segment base arising from rachis, and acroscopic vein from base of costa, 2 opposite veins of pinna base arriving at margin of incision and forming a fork or triangle, or sometimes interlinked into a continuous triangular mesh, and other veins outward from mesh separate and extending to base of incision; lamina green, yellowish green, or brown-green, subleathery when dried, glabrous.

Dense forests, wet areas near streamsides; 100–1800 m. Guangdong, Guangxi, SW Guizhou (Ceheng), Hainan, Sichuan (Dechang, Yanbian), Taiwan, C, S, and W Yunnan [India, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

According to Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 116–117. 2008), *Pteris arisanensis* is the correct name for Himalayan material previously incorrectly identified as *P. linearis* Poiret.

67. *Pteris longipes* D. Don, Prodr. Fl. Nepal. 15. 1825.

三轴凤尾蕨 san zhou feng wei jue

Hypolepis pteridioides Hooker; *Pteris brevisora* Baker; *P. pellucens* J. Agardh; *P. zollingeri* Mettenius ex Miquel.

Plants 1.2–1.5 m tall. Rhizome erect, short, 1.5–2 cm in diam., woody, apex with dark brown scales. Fronds clustered; stipe dark straw-colored to light brown, slightly lustrous, 70–80 cm, 6–8 mm in diam., firm, glabrous; lamina 3-pinnatipartite, triangular-ovate in outline, 60–70 × 35–45 cm; lateral pinnae 12–20 pairs, subopposite or alternate, oblique, sessile, lanceolate, 10–12 × 1.5–2 cm, base truncate, pectinately divided nearly to costae, apex caudate (2–3 cm), with linear lobes; segments 25–28 pairs, alternate, interlinked and slightly decumbent, oblong, ca. 10 × 3–4 mm, base slightly enlarged, apex obtuse and crenate; apical pinnule same as middle lateral ones, stalked (ca. 1 cm); costae prominent abaxially, straw-colored, glabrous, slightly grooved adaxially, with needlelike spines on both sides; veins conspicuous on both surfaces, oblique, 2-forked at base, and opposite two veins oblique up to margin of incision; lamina pale green to green-brown, herbaceous when dried, glabrous.

Forests; 600–2400 m. W Guangxi (Tianlin), Hunan (Tongdao), C and SW Taiwan, Yunnan (Jingdong, Malipo, Simao) [widely distributed in Bhutan, India, Indonesia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, and Vietnam].

68. *Pteris paucipinnula* X. Y. Wang & P. S. Wang, Pterid. Fl. Guizhou, 596. 2001.

稀羽凤尾蕨 xi yu feng wei jue

Plants ca. 1 m tall. Rhizome not seen. Stipe reddish brown at base, ca. 55 cm, ca. 3 mm in diam., stipe and rachis brown-straw-colored, slightly lustrous, glabrous; lamina 3-pinnatipartite, with 3 pinnatisect divisions, lateral branches same in shape with central division, oblong-ovate, 38–44 × 20–26 cm; lateral pinnules 4–6 pairs, opposite or nearly opposite, oblique, sessile, median pinnules linear-lanceolate, 16–20 × 2.5–3.2 cm, base broadly cuneate, pectinately divided nearly to costae, apex lin-

ear, apical pinnules same as lateral ones in shape and size, but with stalks 1–1.5 cm; segments 22–28 pairs, alternate, slightly oblique, oblong to linear-oblong, 1–2 cm × 3–4 mm, slightly enlarged at base, margin entire, apex blunt; lamina yellowish green, herbaceous when dried, glabrous; costae abaxially prominent, adaxially grooved, with needlelike setae along groove; main veins sparsely spiny, spines sometimes poorly developed; veins free, conspicuous on both surfaces, oblique, 2-forked from base, veins at segment base oblique, reaching margin of sinus.

- Forested canyons. N Guizhou (Chishui).

Pteris paucipinnula is most similar to *P. longipes* but has only 4–6 pairs of lateral pinnae with entire sterile margins.

69. *Pteris quadristipitis* X. Y. Wang & P. S. Wang, Pterid. Fl. Guizhou, 598. 2001.

方柄凤尾蕨 fang bing feng wei jue

Plants to 63 cm tall. Rhizome erect. Fronds clustered, monomorphic; stipe chestnut-brown, 30–38 cm, ca. 2 mm in diam., nearly square in cross section, glabrous; lamina odd-pinnate, ovate in outline, 18–25 × 14–20 cm; lateral pinnae 2 or 3 pairs, opposite, oblique, basal pair shortly stalked, with basiscopic pinna, upper pairs sessile, linear-lanceolate, 10–13 × 1.3–1.6 cm, base cuneate or rounded-cuneate, margin undulate, often shallowly pinnatifid or with 1 or 2 lobes on each side, apex acuminate; terminal pinna similar to lower lateral ones in shape but longer, stalked, apex sterile, and sterile margin with short teeth; lamina gray-green when dried, papery, glabrous; veins conspicuous, midvein abaxially prominent, adaxially grooved, with needlelike spines along groove, lateral veins 2-forked. Sori linear, indusia grayish white, membranous, entire.

- Along streams in forests; ca. 400 m. S Guizhou (Libo).

Pteris quadristipitis looks superficially like *P. cretica* because of the rather few undivided pinnae; however, the entire pinna margins and spines along the costae place it in *P. sect. Quadriauricula*.

3. *Pteris* sect. **Campteria** (C. Presl) Ching, Acta Bot. Austro Sin. 1: 2. 1983.

网眼凤尾蕨组 wang yan feng wei jue zu

Campteria C. Presl, Tent. Pterid. 146. 1836.

Plants often large. Fronds monomorphic, division patterns and lobe shape same as for *Pteris* sect. *Quadriauricula* but often divided and 3-divaricate (lateral pinnae usually again divided into 2 forks); lobes without cartilaginous margin, serrate; costae spiny along both sides of groove on adaxial side; venation anastomosing to form a series of narrow areoles along costae, veinlets free beyond areoles and extending to margins. Sori linear, extending continuously along lobe margins, often sterile at apex; indusia brown or light brown, linear, membranous, entire, persistent.

Mainly distributed in the tropics; nine species (four endemic) in China.

70. *Pteris biaurita* Linnaeus, Sp. Pl. 2: 1076. 1753.

狭眼凤尾蕨 xia yan feng wei jue

Campteria biaurita (Linnaeus) Hooker; *Pteris flavicaulis* Hayata.

Plants 70–110 cm tall. Rhizome erect, robust, 2–2.5 cm in diam., woody, apex densely clothed with brown scales. Fronds clustered; stipe light brown, apically straw-colored to pale

green, slightly lustrous, 40–60 cm, 3–5 mm in diam., glabrous, scaly, rarely with a few scales, adaxially narrowly grooved; rachis straw-colored, glabrous, narrowly grooved adaxially; lamina 2- or 3-pinnatipartite, oblong-ovate in outline, 40–55 × 20–30 cm; lateral pinnae 8–10 pairs, decumbent, opposite, lower ones shortly stalked, 3–5 cm apart; upper ones sessile, broadly lanceolate, 15–20 × 3–5.5 cm, base broadly cuneate, pectinately divided to broadly winged costa (to 8 mm wide), apex narrowly lanceolate and caudate (2–3 cm); basal pair of pinnae often

each with 1 or sometimes 2 basicopic pinnules similar to main part of pinna but smaller; segments 20–25 pairs, alternate, subspreading, sinuses obtuse-rounded, 2–5 mm apart, falcate, broadly lanceolate to falcate-oblong, 18–35 × 5–7 mm, base slightly enlarged, margins entire, apex slightly narrow and obtuse; terminal pinna similar to middle lateral pinnae, stalked (ca. 1.5 cm); costae prominent abaxially, straw-colored, glabrous, slightly grooved adaxially, with short spines on both sides; veins slightly raised, conspicuous on both surfaces, acroscopic veinlet of lobe base and a basicopic veinlet of upper lobe base combining to form an arcuate vein, anastomosing to form a series of narrow areoles along costules, with 5 or 6 free veinlets extending to margin at arcuate vein, and a majority of veinlets outward from areole usually 2-forked; lamina gray-green, thickly papery when dried, glabrous. Indusia light brown, membranous, entire, persistent.

Dry sloping fields; 200–1500 m. Guangdong, Guangxi (Baise), Guizhou, Hainan, C and S Taiwan, Xizang, Yunnan [Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand; pantropical].

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 115–116. 2008) recognized two subspecies, both apomictic, for Asian material: *Pteris biauirta* subsp. *walkeriana* Fraser-Jenkins & Rajkumar (loc. cit.: 115) for a diploid plant, type from Sri Lanka and also recorded from Bangladesh, Bhutan, India, Indonesia, Myanmar, Nepal, Philippines, and Thailand and including Xizang and S and SW China, and *P. biauirta* subsp. *forficata* Fraser-Jenkins (loc. cit.: 116), a more common and widespread triploid plant, also with a type from Sri Lanka and recorded from Bangladesh, Bhutan, India, Indonesia, Malaysia, Nepal, and Thailand and including Taiwan, Xizang, and S and SW China. The latter has more regularly arcuate veins, slightly deeper connections between the pinna segment, and a more papery lamina.

71. *Pteris maclurei* Ching, Bull. Dept. Biol. Sun Yatsen Univ. 6. 28. 1933.

两广凤尾蕨 liang guang feng wei jue

Pteris nakasimae Tagawa.

Plants 80–90 cm tall. Rhizome ascending, ca. 1 cm in diam., apex densely clothed with brown scales. Fronds subclustered; stipe dark chestnut, apically light chestnut, shiny, 40–50 cm, 3–4 mm in diam., glabrous, scaly, narrowly grooved adaxially; lamina 2- or 3-pinnatipartite, broadly ovate in outline, 40–45 × 25–30 cm; lateral pinnae 5–7 pairs, decumbent, opposite, 7–10 cm apart, shortly stalked with a narrow wing, or sessile toward apex, broadly lanceolate, 15–20(–32) × 4–6(–8) cm, base cuneate, pectinately divided to within 5–6 mm of costa, apex lobate or long caudate (2–7 cm), basal pinnae with 1–3 pairs of pinnae often with a basicopic pinnule similar to main part of pinna but smaller; segments 14–20 pairs, alternate or subopposite, sinuses obtuse, 4–8 mm wide, slightly oblique, falcate-lanceolate, 20–65 × 6–9 mm, base enlarged, margins serrate or crenate, entire toward apex, apex acuminate or obtuse; terminal pinna similar to median lateral pinnae; costae abaxially prominent, light brown, upper 1/3 part straw-colored, straw-colored and slightly grooved adaxially, with needle-like spines, winged, wing 5–6 mm wide on both sides of costule; veins anastomosing to form a series of narrow areoles along costules, areoles 1/3–2/3 as wide as costule wing, acro-

scopic arcuate veinlet of areole arising from rachis of segment below base of costa, veinlets outward from areole free, and veinlet of segment 2-forked besides 2 or 3 apical pairs; lamina brown-green, thinly herbaceous when dried, glabrous.

Dense wet forests; 600–700 m. Fujian (Jianou), Guangdong (Lechang, Meixian, Yingde), Guangxi (Xiangxian, Xingde, Yaoshan), S Hunan (Jianghua, Jiangyong, Tongdao), S Jiangxi, ?Zhejiang [S Japan, N Vietnam].

Material of *Pteris maclurei* was first identified by Y. C. Wu et al. (Bull. Dept. Biol. Sun Yatsen Univ. 3: 246, t. 114. 1932) as *P. biauirta*.

72. *Pteris maclurioides* Ching, Acta Bot. Austro Sin. 1: 15. 1983.

岭南凤尾蕨 ling nan feng wei jue

Plants 60–75 cm tall. Rhizome ascending, apex densely clothed with dark brown scales. Fronds clustered; stipe dark chestnut at base, upper part paler, shiny, ca. 30 cm × 2 mm, adaxially narrowly grooved; lamina 2- or 3-pinnatipartite, ovate in outline, ca. 45 × 25 cm; lateral pinnae 7–9 pairs, subopposite, decumbent, 14–18 × 3.5–4 cm, base slightly attenuate-cuneate, deeply pectinately divided to within ca. 3 mm of costa, apex acutely lanceolate caudate (3–5 cm); basal pinnae pair largest, each shortly stalked and with a basicopic pinnule near base similar to main part of pinna but smaller; segments 15–18 pairs, alternate, oblique, narrowly lanceolate, 13–25 × ca. 4 mm, margin not densely serrate, interval equal to width of segment; apical pinnae same as middle lateral pinnae in shape and size, but cuneate and decurrent at base; costae prominent abaxially, below middle part maroon, upper 1/3 part straw-colored, straw-colored and slightly grooved adaxially; veins anastomosing to form a series of narrow areoles along costules, width of areole ca. 1/2 wing width to almost same size, occasionally incised, veinlet in segment 2-forked; lamina brown-green, herbaceous when dried, glabrous.

• Open forests; ca. 400 m. Guangdong (Shixing), ?Guangxi [N Vietnam].

Pteris maclurioides is closely related to *P. maclurei* but is smaller with pinnae 14–18 × 3.5–4 cm, segments 13–25 × ca. 4 mm, 3–5 mm apart, costae with ca. 3 mm wide wings, and areoles from 1/2 as wide as wing to as wide.

Ching and S. H. Wu (Fl. Reipubl. Popularis Sin. 3(1): 81. 1990) gave a brief note on "*Pteris maclurioides* var. *tonkinensis*" (中越凤尾蕨 zhong yue feng wei jue) from Guangxi and N Vietnam, but as it lacked a Latin description or diagnosis and no type was indicated the name was not validly published (*Melbourne Code*, Art. 39.1 and 40.1). It differed by the more oblique pinnae, longer basal pinnae, to 30 cm, and the larger segments, 35–45 × 5–6 mm, with tapering apices.

73. *Pteris wallichiana* J. Agardh, Recens. Spec. Pter. 69. 1839.

西南凤尾蕨 xi nan feng wei jue

Rhizome erect, short, thick, 1.5–2 cm in diam., woody, apex with brown scales. Fronds clustered; stipe 60–80 cm, slightly extended at base, 1–2 cm in diam., firm, scabrous, glabrous or with purple-brownish bristles, broadly grooved adaxially; lamina usually 3-partite, lateral branches usually pedately divided, broadly ovate-pentagonal in outline, 70–85 × ca. 60

cm; central division 1- or 2-pinnatipartite, 50–70 × 20–25 cm, basal stalk 7–10 cm, thicker; lateral pinnae more than 20 pairs, alternate, oblique or decumbent, basal ones shortly stalked, 3–4 cm apart, apical ones sessile, lanceolate, 11–15(–20) × 2–2.5(–3.5) cm, base subtruncate to broadly cuneate, deeply pectinately divided to leave narrowly winged costule, margins flat serrate, apex linear-caudate (1–2 cm); basal pinnules slightly shorter; segments 23–30 pairs, alternate, contiguous or acutely incised, 1–2 mm apart, oblique, oblong or broadly lanceolate, 10–13(–18) × 3.5–4.5 mm, margins obtusely flat serrate, apex acuminate or obtuse; terminal pinna similar to lateral pinnae, base cuneate with short stalk; costules prominent abaxially, glabrous, slightly grooved adaxially, with short spines; veins conspicuous on both surfaces, oblique, acroscopic vein of segment base anastomosing with basisopic vein of adjacent segment into an arcuate vein, to form a series of narrow areoles along costules, and with several free simple veinlets arriving at incision in outer edge of arcuate vein, apical 2 or 3 pairs simple, other 2-forked at base, decumbent; lamina pale green or gray-green, firmly herbaceous when dried, subglabrous; glabrous, slightly grooved adaxially.

Forests, valleys. Chongqing, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Indonesia, Japan, Kashmir, Laos, Malaysia, Nepal, Philippines, Thailand, Vietnam].

- 1a. Stipes and rachis with dense purple-brownish hispid hairs 73b. var. *yunnanensis*
 1b. Stipes and base of rachis glabrous (sometimes stipes slightly hairy).
 2a. Segments acuminate 73a. var. *wallichiana*
 2b. Segments obtuse 73c. var. *obtusa*

73a. *Pteris wallichiana* var. *wallichiana*

西南凤尾蕨(原变种) xi nan feng wei jue (yuan bian zhong)

Campteria wallichiana T. Moore; *Litobrochia wallichiana* Fée (1850), not C. Presl (1836); *Pteris morrisonicola* Hayata.

Plants ca. 1.5 m tall; stipes castaneous-reddish, costa and costules straw-colored; segment apices usually acuminate; segments 3.5–4.5 mm wide.

Forests within valleys; 800–2600 m. Chongqing, Guangdong (Xinyi), Guangxi (Huaping), Guizhou (Qingzhen), Hainan (Sanya), Hunan, Sichuan (Emei Shan, Hanyuan, Hongxi), Taiwan, Xizang (Cuona), Yunnan (Jingdong, Yangbi, Yingjiang) [Bhutan, India, Indonesia, Japan, Laos, Malaysia, Nepal, Philippines, Thailand, Vietnam].

73b. *Pteris wallichiana* var. *yunnanensis* (Christ) Ching & S. H. Wu, Fl. Reipubl. Popularis Sin. 3(1): 83. 1990.

云南凤尾蕨 yun nan feng wei jue

Pteris yunnanensis Christ, Bull. Herb. Boissier 6: 957. 1898; *P. tomentella* Handel-Mazzetti.

Plants up to 2 m tall. Stipes and rachises with dense purple-brown multicellular hispid hairs; costules abaxially slightly purple-brown and with multicellular hispid hairs.

Mountain forests, along valleys; 500–2300 m. S and W Yunnan [N India, Nepal].

73c. *Pteris wallichiana* var. *obtusa* S. H. Wu, Acta Bot. Austro Sin. 1: 15. 1983.

圆头凤尾蕨 yuan tou feng wei jue

Plants ca. 1 m tall. Stipes castaneous-reddish, slightly scabrous; segments obtuse, 1.5–1.8 cm wide.

• Forests. Jiangxi (Wugong Shan), Sichuan (Emei Shan), S Yunnan.

74. *Pteris austrosinica* (Ching) Ching, Acta Phytotax. Sin. 10: 302. 1965.

华南凤尾蕨 hua nan feng wei jue

Pteris wallichiana J. Agardh var. *austrosinica* Ching, Bull. Dept. Biol. Sun Yatsen Univ. 6. 27. 1933.

Plants ca. 1.5 m tall. Rhizome erect, short, thick, ca. 2 cm in diam., woody, apex with brown scales. Fronds clustered; stipe pale castaneous, up to 1 m, ca. 1.5 cm in diam., firm, glabrous, broadly grooved adaxially; rachis pale chestnut or reddish brown, sometimes brown straw-colored, with sparse reddish brown multicellular hairs, narrowly grooved adaxially; lamina usually 3-pinnatipartite, pentagonal–broadly ovate in outline, 80–100 × ca. 70 cm, central division a long ovate column, 60–70 cm, middle ones ca. 25 cm wide, stalked (8–10 cm), lateral branches smaller, usually again divided; lateral pinnules 14–20 pairs, alternate, decumbent, sessile or slightly shortly stalked, basal several pairs slightly shorter, ca. 1.5 cm apart, middle pinnules lanceolate, 15–20 × 3–4 cm, base broadly cuneate, nearly symmetrical, deeply pectinately divided leaving broadly winged costule, apex shortly linear-caudate; segments 17–25 pairs, alternate, sinuses obtuse-acute, 3–5 mm wide, slightly decumbent, falcate-lanceolate, 20–25 × ca. 3 mm, basally enlarged, apex shortly acuminate, sterile apex obtusely dentate; terminal pinnules similar to median lateral pinnules, stalked (ca. 1 cm); costules straw-colored, glabrous, with short spines on both sides of adaxial groove; veins conspicuous, oblique, anastomosing to form a series of narrow areoles along costules, several simple veinlets reaching incision in outer edge of arcuate vein, and veinlet free outward from areole, and basal veinlet of segment 2-forked at base; lamina brown-green, papery when dried, below with brown slender multicellular hairs.

• Dense forests within wet valleys; 400–1000 m. Guangdong, Guangxi, Jiangxi.

75. *Pteris occidentalisinica* Ching, Acta Bot. Austro Sin. 1: 15. 1983.

华西凤尾蕨 hua xi feng wei jue

Plants to 2 m tall. Rhizome not seen. Stipe basally dark brown, ca. 5 mm in diam.; lamina usually 3-branched from apex of stipe, lobes deeply 3-pinnatifid; pinnae oblong-lanceolate, ca. 80 cm, middle ones ca. 40 cm; pinnules more than 20 pairs, alternate or subopposite, oblique, contiguous with each other; middle ones longest, lanceolate, 20–25 × ca. 4.5 cm, base broadly cuneate, apex long acuminate (ca. 2 mm); segments opposite or alternate, 2–4 mm apart, obliquely patent, 20–25 × ca. 5 mm, apex obtuse or bluntly acute, flat serrate; costae straw-

colored, slightly brown; costules abaxially straw-colored, with short spines along both sides of adaxial groove; veins conspicuous on both surfaces, anastomosing to form a series of narrow areoles along costules; lamina pale green when dried, thinly papery, subglabrous.

- Forests; ca. 2400 m. S Sichuan (Laibo).

76. *Pteris taiwanensis* Ching, Acta Bot. Austro Sin. 1: 16. 1983.

台湾凤尾蕨 tai wan feng wei jue

Plants ca. 2 m tall. Rhizome not seen. Stipe light straw-colored, glabrous, adaxially grooved; lamina 3-pinnatifid, broadly ovate in outline, 80–100 × 60–70 cm; segments of central division oblong, up to 100 × 30–35 cm, lateral branches 2, shorter than central one; pinnules more than 20 pairs, opposite or subopposite, lower ones stipitate, upper sessile, lanceolate, 20–30 × 5–7 cm, base broadly cuneate, pectinately divided to leave narrowly winged costule, apex long acuminate, serrulate; base of pinnules with several pairs of free segments; segments 30–35 pairs, alternate, subspreading, 5–8 mm apart, linear, 25–35 × ca. 3 mm, base slightly enlarged, margins flat serrate, apex acuminate; costules abaxially convex, straw-colored, sparsely multicellular brown strigose or glabrous, adaxially flat grooved, with short spines on both sides; veinlets conspicuous abaxially, flared, anastomosing to form a series of narrow areoles along costules; lamina brown-green, herbaceous when dried, brown multicellular strigose on both surfaces; rachises straw-colored, grooved adaxially.

- About 800 m. Taiwan (Wulai).

The present authors have not seen material of *Pteris taiwanensis*. Yang et al. (Man. Taiwan Vasc. Pl. 6: 102. 2002) considered it to be a synonym of *P. semipinnata*.

77. *Pteris finotii* Christ, J. Bot. (Morot) 19: 72–73. 1905.

疏裂凤尾蕨 shu lie feng wei jue

Pteris finotii var. *obtusata* Tagawa.

Plants to 2.5 m tall. Rhizome erect, short and thick, ca. 2 cm in diam., apex with bright brown scales. Fronds clustered; stipe dark straw-colored to dark brown, ca. 100 cm, 7–12 mm in diam., glabrous; rachis straw-colored, glabrous; lamina with 3 pinnatifid divisions, ovate-triangular in outline, to more than 100 × 60 cm, central division ovate, columnar, to more than 80 × 35–40 cm, stalk 6–10 cm; two lateral branches smaller; lateral pinnules 6–8 pairs, opposite or subalternate, oblique, stalked (ca. 1 cm), upper ones sessile, broadly lanceolate, 20–27 × 6–10 cm, base rounded-truncate, apex caudate (4–8 cm); segments 13–20 pairs, alternate or basal pairs subopposite, linear-lanceolate, 25–70 × 4–7 mm, basally slightly enlarged, sterile margins slightly serrate, apex obtuse or acuminate; sterile pinnules with

wider segments; terminal pinnule triangular, 20–25 × 15–18 cm, stalked (1.5–2 cm), base rounded-cuneate, along costule narrowly cuneate, pectinately divided with broadly winged costa, margins flat, obtusely serrate, apex linear-lanceolate (4–5 cm); costules prominent abaxially, straw-colored, glabrous, grooved adaxially, with inconspicuous spines or without spines; veinlets slender, conspicuous only abaxially, anastomosing to form a series of narrow areoles along costules and midvein, areoles along costules long and narrow, areoles along midvein irregularly polygonal, veins of segments free; lamina gray-green, herbaceous when dried, glabrous.

Forests, by small streams; 100–500 m. Guangdong, Hainan, S Yunnan (Hekou, Xishuangbanna) [N Vietnam].

78. *Pteris tripartita* Swartz in Schrader, J. Bot. 1800(2): 67. 1801.

三叉凤尾蕨 san cha feng wei jue

Litobrochia marginata (Bory) C. Presl; *L. tripartita* (Swartz) C. Presl; *Pteris marginata* Bory.

Plants more than 2 m tall. Rhizome erect, short, ca. 2 cm in diam., apex with gray-brown scales. Fronds clustered; stipe dark brown or straw-colored, 100–150 cm, ca. 1 cm in diam., glabrous; lamina with 3 1- or 2-pinnatifid divisions, broadly ovate in outline, 80–100 × ca. 70 cm, central division oblong-ovate in outline, 80–100 × 25–30 cm, stalked (10–12 cm), lateral branches smaller, and basal ones usually again divided into 2 or 3 forks; pinnules 20–30 pairs, alternate or subopposite, oblique, shortly stalked, upper ones sessile; pinnules at base and apex slightly shorter, middle pinnules lanceolate, 15–21 × 4–5 cm, base rounded-truncate, pectinately divided and forming 2 broad wings of costule, apex acute and lanceolate-caudate (3–4 cm); segments 14–25 pairs, alternate, slightly oblique, 2–5 mm apart, falcate-lanceolate, 10–30 × 4–6 mm, base slightly enlarged, sterile margins serrate, apex mucronate or obtuse; terminal pinnule similar to middle lateral pinnae but stalked; costules abaxially convex, straw-colored, glabrous, shallowly grooved adaxially, with short spines on both sides; veinlets slender, conspicuous only abaxially, veinlets from adjacent segment anastomosing to form a series of narrow areoles along costa, veinlets further anastomosing to form a series of narrow polygonal areoles along costules; lamina brown-green, thinly papery when dried, glabrescent.

Guangdong, Guangxi (Baise, Napo), Hainan (Lingshui), Hunan (Shimen), ?Taiwan [India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Madagascar, Pacific islands (Polynesia), South America (Brazil)].

Knapp (Ferns Fern Allies Taiwan, 478. 2011) believes that the records from Taiwan were based on misidentifications of *Pteris wallichiana*.

Uncertain taxa

Pteris blumeana C. Agardh (Recens. Spec. Pter. 22. 1839; *P. quadriaurita* Retzius var. *blumeana* (C. Agardh) C. B. Clarke), recorded from Yunnan.

Pteris hunanensis C. M. Zhang (in W. T. Wang et al., Keys Vasc.

Pl. Wuling Mount. 562. 1995), described from Hunan. The image of the type shows a single incomplete frond probably belonging to *P. sect. Pteris*.

Pteris intromissa Christ (Philipp. J. Sci., C. 2: 173. 1907). As well

as a number of collections from the Philippines, the protologue mentioned a collection by Henry from China ("Swatow"), but this collection has not been seen.

Pteris rufopilosa Ching & Y. X. Lin (Acta Phytotax. Sin. 22: 197.

1984), described from Xizang (Médog) and compared with *P. austrosinica* (Ching) Ching in the protologue.

Pteris shimenensis C. M. Zhang (in W. T. Wang et al., Keys Vasc. Pl. Wuling Mount. 561. 1995), described from Hunan.

6. ANOGRAMMA Link, Fil. Spec. 137. 1841.

翠蕨属 cui jue shu

Zhang Gangmin (张钢民); Tom A. Ranker

Plants annual, small, terrestrial or on rocks. Rhizomes short, poorly developed, sparsely scaly; scales small, fibrous. Fronds many, monomorphic, tufted; stipe chestnut-colored or chestnut-brown, slender, rounded abaxially, grooved adaxially, glabrous; lamina ovate, ovate-deltoid to ovate-lanceolate, or lanceolate, 1–3-pinnate, thinly herbaceous or submembranous, both surfaces usually glabrous. Ultimate pinnules or segments small, ovate-elliptic, spatulate, or obovate, margin entire, or shallowly lobed at apex. Veins free, forked, 1 veinlet per segment, far from frond margins. Indusia absent. Sori borne along veinlets, paraphyses absent. Spores tetrahedral, somewhat ridged on surface. Gametophytes still alive for a long time after sporophytes are produced. $x = 29, 58$.

About six species: worldwide tropics, subtropics, and Mediterranean region and Europe along Atlantic Ocean; two species in China.

- 1a. Ultimate pinnules or segments obovate or obdeltoid (pinnae fan-shaped when lamina pinnate), apex shallowly lobed 1. *A. leptophylla*
 1b. Ultimate pinnules or segments elliptic or spatulate, apex obtuse or mucronulate 2. *A. microphylla*

1. Anogramma leptophylla (Linnaeus) Link, Fil. Spec. 137. 1841.

薄叶翠蕨 bao ye cui jue

Polypodium leptophyllum Linnaeus, Sp. Pl. 2: 1092. 1753; *Acrostichum leptophyllum* (Linnaeus) Lamarck & Candolle; *Grammitis leptophylla* (Linnaeus) Swartz; *Gymnogramma leptophylla* (Linnaeus) Desvaux.

Rhizomes small, short; scales few, pellucid. Fronds tufted; stipe chestnut-brown, 2–6 cm × 0.5–1 mm, glabrous or occasionally with 1 or 2 pellucid and jointed long hairs; lamina yellowish green, ovate-deltoid to ovate-lanceolate, 4–8 × 1.5–3 cm, submembranous when dry, glabrous, 2-pinnate to 2-pinnate-pinnatifid. Basal pinnae usually larger than adjacent ones; distal pinnae gradually reduced. Ultimate pinnules or segments obovate or obdeltoid, base cuneate and decurrent, apex shallowly lobed. Veins visible on both surfaces. $2n = 58$.

Evergreen broad-leaved forests, stream banks; below 2900 m. Taiwan, Yunnan [India, Vietnam; Africa, SW Asia, Australia, Europe, Pacific islands, South America].

Anogramma leptophylla is variable in frond shape. The laminae of young plants can be orbicular-fan-shaped, bifurcate, or tripartite, or in 1-

pinnate individuals narrowly ovate, with all the pinnae fan-shaped and shallowly lobed at apex.

2. Anogramma microphylla (Hooker) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 259. 1899.

翠蕨 cui jue

Gymnogramma microphylla Hooker, Icon. Pl. 10: t. 916. 1854; *Cerosora microphylla* (Hooker) R. M. Tryon; *Grammitis microphylla* (Hooker) Beddome.

Rhizomes short, together with stipe base sparsely scaly; scales blackish, less than 0.8 mm. Fronds many, clustered; stipe chestnut-brown, 2–10 cm × ca. 0.6 mm, glabrous; lamina green, ovate-deltoid or ovate-lanceolate, 2–5 × 2–4 cm, thinly herbaceous when dry, both surfaces glabrous, 2-pinnate-pinnatifid to 3-pinnate. Pinnae 5–7 pairs, basal pair largest, ovate-deltoid, 1–2 × 0.7–1.2 cm, inequilateral, shortly stalked. Pinnules anatroous, with winged short stalks. Ultimate pinnules or segments elliptic or spatulate, base long cuneate and decurrent to costules, margin entire, apex obtuse or mucronulate, rarely emarginate. Veins visible on both surfaces. $2n = 116$.

Montane gorges, on rocks, in rock crevices; 1100–2900 m. E Guangxi, Guizhou, Yunnan [Bhutan, India, Myanmar, Nepal].

7. TAENITIS Willdenow ex Schkuhr, Kl. Linn. Pfl.-Syst. 1: 20. 1804.

竹叶蕨属 zhu ye jue shu

Dong Shiyong (董仕勇); Masahiro Kato

Plants terrestrial. Rhizome creeping, apex covered with dark, rigid bristles; bristles with a single row of cells at apex and a few rows of cells at base. Fronds monomorphic or dimorphic; stipes with 1, 2, or 4 vascular bundles near base, adaxially grooved; lamina simple or 1-pinnate, with terminal pinnae similar to lateral pinnae; pinnae simple, entire, thickly papery to leathery, glabrous; veins reticulate, areoles without included free veinlets. Sori linear and forming a narrow longitudinal band between midrib and margin, or borne irregularly along veins, or converging to orbicular or oblong sori, or in long inframarginal grooves, or acrostichoid on abaxial surface of contracted fertile pinnae, exindusiate; paraphyses abundant, multicellular. Spores trilete, tetrahedral-globose, with tubercles or rodlets. $n = 44, 108, 110, 114$.

About 15 species: from Sri Lanka and S India to S China, through Malaysia and Indonesia to N Queensland and Fiji; one species in China.

The taxonomic state and position of this group has been disputed. Ching (Acta Phytotax. Sin. 16(3): 10. 1978) treated it as a monogeneric family and thought it related to Lindsaeaceae. In other later systems, it was treated as a genus related to *Syngrogramma* J. Smith within the Pteridaceae, a view accepted by Smith et al. (Taxon 55: 714–715. 2006) and Christenhusz et al. (Phytotaxa 19: 14. 2010).

The authors have not seen the type of *Taenitis chinensis* Desvaux (Mag. Neuesten Entdeck. Gesamten Naturk. Ges. Naturf. Freunde Berlin 5: 308. 1811). It was treated as a synonym of *T. blechnoides* in FRPS.

1. *Taenitis blechnoides* (Willdenow) Swartz, Syn. Fil. 24, 220. 1806.

竹叶蕨 zhu ye jue

Pteris blechnoides Willdenow, Phytographia, 13. 1794;
Taenitis pteroides Willdenow ex Schkuhr, nom. illeg. superfl.

Rhizome long creeping, 1–2 mm in diam., with bristles at apex; bristles dark brown, stiff, 2–3 mm. Fronds distant, 2–4 cm apart; stipe castaneous at base, straw-colored or brown distally, 40–70 cm, adaxially grooved, glabrous; lamina 1-pinnate,

slightly dimorphic, 20–40 × 20–30 cm, with 3–8 pairs of lateral pinnae, papery to leathery, glabrous; sterile pinnae 15–25 × 2.5–4 cm, lanceolate or linear-lanceolate, shortly stalked, base narrowly cuneate, margin entire, apex acuminate; costae abaxially distinctly raised, adaxially flat or slightly sunken; fertile pinnae narrower, 13–25 × 1.2–3 cm. Veins fully reticulate without included veinlets. Sori linear and forming a narrow longitudinal band between midrib and margin, rarely interrupted, 1–1.5 mm wide.

Terrestrial in forests; 400–1000 m. Hainan [Cambodia, India, Indonesia, Laos, Malaysia, Sri Lanka, Thailand, Vietnam; Pacific islands].

8. *PITYROGRAMMA* Link, Handbuch 3: 19. 1833.

粉叶蕨属 fen ye jue shu

Zhang Gangmin (张钢民); Tom A. Ranker

Plants terrestrial. Rhizomes erect or ascending, short, dictyostelic; scales reddish brown, thin, lanceolate, margins entire. Fronds monomorphic, clustered; stipe purplish black, lustrous, rounded proximally, upward with single longitudinal groove adaxially, base scaly, glabrous distally; lamina 2- or 3-pinnate, ovate to oblong in outline, apex acuminate. Pinnae many, oblique, lanceolate, somewhat stalked, 2- or 3-pinnate, herbaceous to somewhat leathery, abaxially white or yellow farinose, adaxially glabrous, base subequilateral, apex acuminate. Pinnules many, anisotropic, base inequilateral, usually adnate to costae, margins serrate. Veins of ultimate segments free, obscure, pinnately branched or not. Indusia absent. Sori along veins but not to vein tips, without paraphyses. Spores dark colored, globose-tetrahedral, perispore reticulate with irregular ridges. $x = 29(30)$.

About 20 species: tropical Africa, America, and Asia; one species (introduced) in China.

1. *Pityrogramma calomelanos* (Linnaeus) Link, Handbuch 3: 20. 1833 [*“calomelas”*].

粉叶蕨 fen ye jue

Acrostichum calomelanos Linnaeus, Sp. Pl. 2: 1072. 1753; *Ceropteris calomelanos* (Linnaeus) Link; *Gymnogramma calomelanos* (Linnaeus) Kaulfuss; *Neurogramma calomelanos* (Linnaeus) Diels.

Stipe 40–50 cm; lamina 2-pinnate, long oblong or oblong-lanceolate, 15–40 × 10–20 cm, thickly papery when dry, abaxially densely white farinose, adaxially grayish green, glabrous, base broadly cuneate, apex acuminate; rachis and costae purple-black, lustrous, glabrous, grooved adaxially; pinnae 16–20

pairs, oblique, with short, winged stalks; basal pair of pinnae not shortened, lanceolate, 10–15 × 2–5 cm, base slightly inequilateral; pinnules (or segments) 16–18 pairs, deltoid, ovate-lanceolate, or lanceolate, 1.1–1.4 × ca. 0.5 cm, base inequilateral, somewhat decurrent to costae, apex acute or acuminate; proximal pinnule margins serrate or lobed; lobes serrate or entire, with only 1 or 2 teeth at apex. Sori nearly confluent throughout abaxial pinnule surface when mature. $2n = 240$.

Forest margins, stream banks; below 600 m. Hainan, Taiwan, S Yunnan (Lüchun) [Cambodia, Laos, Vietnam; Africa, South America].

Pityrogramma calomelanos is a cultivated ornamental plant of New World origins, which has become widely naturalized in the Old World.

9. *ONYCHIUM* Kaulfuss, Berlin. Jahrb. Pharm. Verbundenen Wiss. 21: 45. 1820.

金粉蕨属 jin fen jue shu

Zhang Gangmin (张钢民); George Yatskievych

Plants terrestrial or less commonly on rocks. Rhizomes long creeping or rarely short and decumbent, siphonostelic, scaly, scales concolorous, light brown to reddish brown, opaque to somewhat translucent, non-clathrate, linear-lanceolate to ovate-lanceolate, margins entire. Fronds monomorphic to somewhat dimorphic, widely or closely spaced. Stipe straw-colored above a usually darker proximal portion, occasionally uniformly straw-colored or reddish brown to dark brown (especially abaxially), glabrous above scaly base, with (1 or) 2 vascular bundles at base, adaxially grooved. Lamina ovate-deltoid or ovate-lanceolate, less often elongate lanceolate, herbaceous or papery, finely 2–5-pinnate-pinnatifid, rarely 2-pinnate, glabrous or nearly so or fertile segments yellow-farinose

abaxially; rachis and costae usually grooved adaxially. Pinnae alternate. Ultimate segments or lobes narrow and small, lanceolate to oblong-lanceolate or narrowly oblong, base cuneate and often decurrent, apex acute or acuminate. Veins simple or pinnately branched, free, slightly thickened, sometimes raised abaxially, in fertile segments veinlets connected by an inframarginal commissural vein. Sori borne along commissural veins, linear. False indusia usually well developed, membranous, continuous but interrupted at segment apex and base, reaching to midvein or nearly so (narrow in *Onychium tenuifrons*), margins entire, slightly undulate, or less commonly erose. Spores trilete, globose-tetrahedral, perispore coarsely tuberculate-reticulate on distal face, proximal face tuberculate and with prominent, coarse ridges parallel to equatorial flange. $x = 29$.

About ten species: tropical and subtropical Africa (one species), Asia; eight species (two endemic) in China.

The taxonomy of *Onychium* is poorly understood and is complicated by polyploidy and apomixis in several of the taxa. The descriptions below contrast sterile and fertile fronds, but it should be noted that plants of some species often also produce intermediate fronds that are fertile distally and sterile proximally. Small specimens of *Onychium* sometimes are confused with dissected-leaved *Asplenium* species; collectors should examine rhizome scales (clathrate in *Asplenium*), sori (true indusia lateral on veins in *Asplenium*), and spores (monolete, mostly ellipsoid, and lacking an equatorial flange in *Asplenium*).

- 1a. Longest sori 1–2 cm or more; fertile lamina with yellow farina abaxially; rhizome scales linear-lanceolate 1. *O. siliculosum*
 1b. Sori usually all less than 1 cm; fertile lamina not farinose; rhizome scales lanceolate to ovate-lanceolate.
 2a. Rhizomes short, decumbent; fronds closely spaced, ± clustered; scales of stipe base pale brown; margins of ultimate segments ± serrulate toward tip; margins of false indusia erose 2. *O. tenuifrons*
 2b. Rhizomes long creeping (sometimes shortly creeping in *O. angustifrons*); fronds mostly widely spaced; scales of stipe base reddish brown or dark brown; margins of ultimate segments entire; margins of false indusia entire or slightly undulate.
 3a. Lamina less than 10 cm wide, narrowly deltoid-lanceolate, 2- or 3-pinnate.
 4a. Lamina of fertile frond 4–10 cm wide, 3-pinnate 7. *O. moupinense*
 4b. Lamina of fertile frond 1–3 cm wide, 2-pinnate 8. *O. angustifrons*
 3b. Lamina 12–30 cm or more wide, ovate to ovate-deltoid, 3–5-pinnate-pinnatifid.
 5a. Lamina thinly herbaceous; ultimate segments crowded, sometimes overlapping 6. *O. plumosum*
 5b. Lamina ± papery; ultimate segments mostly well separated, not overlapping.
 6a. Lamina ovate-deltoid to ovate-lanceolate; ultimate segments crowded, sometimes overlapping 5. *O. japonicum*
 6b. Lamina usually broadly ovate or elliptic; ultimate segments not crowded.
 7a. Stipe bases black; pinna apices acuminate; fertile segment apices acute to slightly acuminate; lamina green to grayish green 3. *O. cryptogrammoides*
 7b. Stipe bases dark brown; pinna apices caudate; fertile segment apices acuminate; lamina dark green 4. *O. tibeticum*

1. *Onychium siliculosum* (Desvaux) C. Christensen, Index Filic. 469. 1906.

金粉蕨 jin fen jue

Pteris siliculosa Desvaux, Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin 5: 324. 1811; *Acrostichum viviparum* Cavanilles (1802), not Linnaeus f. (1782); *Allosorus auratus* (Kaulfuss) C. Presl; *Cryptogramma aurata* (Kaulfuss) Prantl; *Onychium auratum* Kaulfuss; *O. chrysocarpum* (Hooker & Greville) C. Christensen; *O. siliculosum* var. *chrysocarpum* (Hooker & Greville) Tardieu & C. Christensen; *O. tenue* Christ; *Pteris aurata* (Kaulfuss) Mettenius; *P. chrysocarpha* Hooker & Greville.

Rhizomes erect or ascending, short; scales dark brown, linear-lanceolate. Fronds somewhat dimorphic (fertile fronds with longer, broader segments), clustered. Stipe (5–)12–30 cm × 1–5 mm, straw-colored above a brown base, brown color sometimes extending abaxially to rachis. Lamina of sterile fronds ovate-deltoid to narrowly ovate-deltoid, 2- or 3-pinnate-pinnatifid, apex acuminate, papery when dry, green to grayish green, not farinose. Lamina of fertile fronds ovate-lanceolate to oblong-ovate, (5–)15–35 × 9–18 cm, 3- or 4-pinnate or rarely 2-pinnate-pinnatifid, with long, linear, simple, terminal segments;

lateral pinnae (4–)10–15 pairs, basal pair slightly largest, oblong-lanceolate or deltoid, with stalks 3–6 mm. Ultimate segments of sterile lamina sometimes closely spaced but not overlapping, sessile, less than 1 mm wide at base, slightly wedge-shaped, apex wider and with 1–3 small teeth or narrowly notched, slightly thickened or recurved. Ultimate pinnules of fertile lamina not overlapping, linear when young, 5–15 × 1.5–2 mm, wider at maturity (2–3 mm), stalks 2–3 mm, base cuneate, apex acuminate or acute. Longest sori 10–20 mm or more, intermixed with bright yellow farina. False indusia linear, extending nearly to midvein, with entire margins. $2n = 58$.

Rock crevices of dry valleys; 100–1500 m. E Hainan, Taiwan, Xizang, Yunnan [Bangladesh, Bhutan, Cambodia, India, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam; Oceania].

2. *Onychium tenuifrons* Ching, Lingnan Sci. J. 8: 500. 1934.

蚀盖金粉蕨 shi gai jin fen jue

Onychium japonicum (Thunberg) Kunze var. *delavayi* Christ.

Rhizomes short, decumbent; scales light brown, narrowly lanceolate. Fronds slightly dimorphic (fertile fronds with narrower segments than sterile ones), closely spaced, often ap-

pearing clustered. Stipe straw-colored, sometimes slightly darkened at very base, 7–20 cm × ca. 2 mm (longer on fertile than sterile fronds). Lamina of sterile fronds ovate to narrowly ovate or elliptic-lanceolate, 3-pinnate-pinnatifid, thinly herbaceous. Lamina of fertile fronds elliptic-lanceolate, 15–25 × 5–10 cm, 3- or 4-pinnate, apex acuminate, firmly papery when dry, green, not farinose; lateral pinnae 8–10 pairs; longest pinnae lanceolate, stalks 4–10 mm. Ultimate pinnules (segments) of sterile lamina crowded but mostly not overlapping, obovate or oblong, with sharp teeth at apex, 1 veinlet per tooth, margins often slightly thickened or somewhat cartilaginous. Ultimate pinnules (segments) of fertile lamina not overlapping, oblong-linear or lanceolate, 1–6 × 0.4–0.9 mm, sessile or decurrent on costule, apex acuminate or acute. Sori 3–5 mm, glabrous. False indusia linear to narrowly oblong, not approaching midvein, with erose margins. $2n = 87$.

Forest margins, under shrubs; 100–2700 m. W Guizhou, Sichuan, Yunnan [Bhutan, India, N Myanmar, Nepal, Philippines].

Onychium tenuifrons is similar to *O. japonicum* but differs in having clustered fronds, lighter and thinner rhizome scales, and false indusia with erose margins.

3. *Onychium cryptogrammoides* Christ, Notul. Syst. (Paris) 1: 52. 1909.

黑足金粉蕨 hei zu jin fen jue

Onychium japonicum (Thunberg) Kunze var. *intermedia* C. B. Clarke; *O. japonicum* var. *multisecta* C. B. Clarke.

Rhizomes long creeping; scales dark brown, lanceolate. Fronds monomorphic, closely or widely spaced. Stipe (15–)20–50 cm × 2–3 mm, straw-colored above a black base. Lamina ovate to ovate-deltoid or often broadly ovate, (12–)20–38 × 10–26 cm, apex acuminate, finely 4-pinnate-pinnatifid, thinly papery when dry, green to grayish green, not farinose. Lateral pinnae 10–14 pairs, basal pair largest, ovate-deltoid, apex acuminate, 10–25 × 5–14 cm, stalked to ca. 1 cm. Ultimate pinnules (segments) not overlapping, linear to narrowly oblanceolate, narrowly oblong, or narrowly elliptic, 2–5 × 0.5–1.5 mm wide, margins often cartilaginous, entire or with 1 or 2 sharp teeth, base cuneate, decurrent, apex acute to slightly acuminate. Sori 1–3 mm. False indusia linear to oblong, extending nearly to midvein, entire. $2n = 87, 116$.

Open woods, stream banks, valleys, often forming large, dense, clonal colonies; 1200–3500 m. S Gansu, Guizhou, Sichuan, Taiwan, S Xizang, NW Yunnan [Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

The *Onychium cryptogrammoides* group is a polyploid complex that requires further study. *Onychium cryptogrammoides* resembles *O. japonicum* but differs in its black stipe bases, finely divided lamina, and more slender costae and costules. The two species have different distributions. The name *O. contiguum* Wallich ex C. Hope has been applied to this taxon in much of the literature on Asian pteridophytes, but that epithet is a nom. illeg. superfl. for the taxon here treated as *O. japonicum* var. *lucidum*, as the basionym *Leptostegia lucida* D. Don was cited in synonymy in the protologue.

4. *Onychium tibeticum* Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. 1: 77–78. 1983.

西藏金粉蕨 xi zang jin fen jue

Rhizomes long creeping; scales brown or reddish brown, lanceolate. Fronds monomorphic, widely spaced. Stipe 10–28 cm, straw-colored above a dark brown base. Lamina elliptic, 24–28 × ca. 15 cm, base cuneate, apex acuminate, 3-pinnate-pinnatifid to 4-pinnate, thinly papery to papery when dry, dark green, not farinose. Lateral pinnae 8–10 pairs, alternate, crowded, basal pair similar to but larger than adjacent pinnae, elliptic, 13–16 × 3–5 cm, stalked to ca. 1 cm, base cuneate, apex caudate. Ultimate sterile pinnules (segments) similar to but shorter than fertile ones. Ultimate fertile pinnules (segments) not overlapping, linear to elliptic-lanceolate, 5–7(–10) × ca. 1 mm, apex acuminate. Sori restricted to median portions of ultimate fertile pinnules (segments), 2–5 mm. False indusia oblong to narrowly oblong, extending nearly to midvein, entire.

- Banks of ditches under trees; 2000–2300 m. Xizang.

Onychium tibeticum is similar to *O. cryptogrammoides* but differs in having a brown stipe base, caudate pinna apices, and longer ultimate segments. However, some botanists consider it to represent a mere variant of *O. japonicum* that was described based on a specimen with the frond intermediate between sterile and fertile morphologies.

5. *Onychium japonicum* (Thunberg) Kunze, Bot. Zeitung (Berlin) 6: 507. 1848.

野雉尾金粉蕨 ye zhi wei jin fen jue

Rhizomes long creeping; scales brown or reddish brown, lanceolate. Fronds slightly dimorphic (fertile fronds slightly more coarsely divided than sterile ones), mostly widely spaced. Stipe 7–45(–60) cm, 2–4 mm in diam., straw-colored throughout or with a brown to dark brown base, dark color sometimes extending to rachis abaxially. Lamina ovate-deltoid or narrowly ovate, (9–)20–48 × 10–20 cm, apex acuminate, finely 2-pinnate-pinnatifid to 4-pinnate, firmly papery when dry, green to dark green or grayish green, not farinose. Lateral pinnae 10–15 pairs, deltoid-lanceolate or oblong-lanceolate; basal pair largest, 9–20 × 5–10 cm, stalked to 1–2 cm, apex acuminate. Ultimate fertile pinnules (segments) crowded, sometimes overlapping, linear to linear-lanceolate, 4–10 × 1–2 mm, apex acute. Ultimate sterile pinnules (segments) similar to fertile ones but mostly somewhat shorter, apex shortly acuminate. Sori (2–)3–6 mm. False indusia extending nearly to midvein, entire. $2n = 58, 87, 116, 174$.

Stream banks, roadsides, forest margins, mountain slopes; 200–2400 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, W Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Korea, Myanmar, Nepal, Pakistan, Philippines, Thailand, Vietnam; Pacific islands].

The *Onychium japonicum*/*O. moupinense* group is a polyploid complex whose taxonomy requires further study. Although the two varieties reported for China have been treated as separate species by some botanists, they exhibit a great deal of morphological overlap and perhaps should not be formally recognized.

- 1a. Plants (16–)40–60 cm tall; stipe straw-colored above a sometimes brown to dark brown base; ultimate pinnules or segments usually 5–7 mm 5a. var. *japonicum*
- 1b. Plants (39–)45–80 cm tall; stipe brown

to dark brown above base, at least abaxially, dark color sometimes extending to rachis; ultimate pinnules or segments mostly 7–10 mm 5b. var. *lucidum*

5a. *Onychium japonicum* var. *japonicum*

野雉尾金粉蕨(原变种) *ye zhi wei jin fen jue* (yuan bian zhong)

Trichomanes japonicum Thunberg, Fl. Jap. 340. 1784; *Caenopteris japonica* (Thunberg) Thunberg; *Cryptogramma japonica* (Thunberg) Prantl; *Darea japonica* (Thunberg) Willdenow; *Onychium chinense* (Desvaux) Fée; *Phorolobus chinensis* Desvaux; *Pteris japonica* (Thunberg) Mettenius.

Plants (16–)40–60 cm tall. Rhizomes ca. 3 mm in diam. Stipe straw-colored, at most brown proximally. Ultimate pinnules or segments usually 5–7 mm.

By streams, roadsides, forest margins; 200–2200 m. Anhui, Fujian, S Gansu, Guangxi, Guizhou, W Hebei (Xinle), Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Thailand; Oceania].

5b. *Onychium japonicum* var. *lucidum* (D. Don) Christ, Bull. Soc. Bot. France 52(Mém. 1): 60. 1905.

栗柄金粉蕨 *li bing jin fen jue*

Leptostegia lucida D. Don, Prodr. Fl. Nepal. 14–15. 1825; *Onychium contiguum* Wallich ex C. Hope, nom. illeg. superfl.; *O. dulongjiangense* W. M. Chu; *O. lucidum* (D. Don) Sprengel.

Plants (39–)45–80 cm tall or more. Rhizomes ca. 4 mm in diam. Stipe usually brown to chestnut-brown. Ultimate pinnules or segments mostly 7–10 mm.

Roadsides, forest margins, mountain slopes; 200–2400 m. Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hubei, Jiangxi, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan, India, Myanmar, Nepal, Pakistan, Vietnam].

Onychium dulongjiangense, which is known only from the type collection from Yunnan, appears to represent merely a robust plant of *O. japonicum* var. *lucidum*.

6. *Onychium plumosum* Ching, Lingnan Sci. J. 13: 499–500. 1934

繁羽金粉蕨 *fan yu jin fen jue*

Onychium japonicum (Thunberg) Kunze var. *parvisorum* Bonaparte.

Rhizomes stout, decumbent; scales dark brown, shiny, subulate-lanceolate. Fronds monomorphic or nearly so (fully fertile fronds slightly more coarsely divided than entirely sterile ones, but many fronds intermediate), closely spaced, often appearing clustered. Stipe straw-colored above a brown base, (12–)25–30 cm × ca. 4 mm. Lamina deltoid-oblong or deltoid-ovate, 35–60 × 20–30 cm, apex acuminate, 4- or 5-pinnate-pinnatifid, thinly herbaceous when dry, bright green to grayish green, not farinose. Lateral pinnae 9–15 pairs, basal pair largest, (8–)15–22 × 6–16 cm, stalked to ca. 1.5 cm, apex acuminate. Pinnules deltoid or elongate ovate, stalked; stalks with narrow

wings. Ultimate segments crowded, sometimes overlapping, linear to narrowly oblanceolate, 2–3(–7) × ca. 1 mm, apex acuminate. Sori 1–3 mm. False indusia extending nearly to midvein, margins entire. $2n = 116$.

Forests and ditches; 1200–2800 m. SW Sichuan, NW Yunnan [Bhutan, India, Nepal, Thailand].

7. *Onychium moupinense* Ching, Lingnan Sci. J. 8: 500. 1934.

木坪金粉蕨 *mu ping jin fen jue*

Rhizomes long creeping; scales dark brown, subulate-lanceolate to lanceolate. Fronds monomorphic or slightly dimorphic (fertile laminae somewhat wider and more finely divided than sterile ones), closely to widely spaced. Stipe straw-colored above a sometimes brown base, 5–32 cm × ca. 1 mm. Lamina of sterile fronds narrowly lanceolate to lanceolate, 10–15 × 2.5–3.5 cm, 2-pinnate or 2-pinnate-pinnatifid. Lamina of fertile fronds larger than sterile lamina, lanceolate to ovate-lanceolate, 14–32 × 6–10 cm, apex long attenuate to somewhat caudate, 3-pinnate, papery when dry, green to grayish green, not farinose. Lateral pinnae 8–15 pairs, obliquely patent or curved upward, basal pair largest, lanceolate or ovate-lanceolate, 3–8 × 2–3 cm, stalked to 5–10 mm, apex long acuminate or caudate. Ultimate pinnules (segments) of sterile fronds obliquely ovate, apex sharply serrate. Ultimate pinnules (segments) of fertile fronds linear, 3–8 × ca. 1.5 mm, base narrowly winged and decurrent on costae, apex acuminate. Sori 2–7 mm. False indusia oblong to linear, entire. $2n = 87, 174$.

Rock crevices under shrubs or in broad-leaved forests, shaded wet places; 500–1900 m. Hubei, Shaanxi, Sichuan, Yunnan [Japan, Nepal].

As noted under *Onychium japonicum*, the *O. japonicum*/*O. moupinense* group is a polyploid complex that requires further study. Two varieties are tentatively accepted here, both in China.

- 1a. Fronds subdimorphic; sterile lamina lanceolate; fertile lamina ovate-lanceolate; ultimate segments 6–8 mm; sori 5–7 mm 7a. var. *moupinense*
- 1b. Fronds monomorphic or nearly so; sterile and fertile laminae lanceolate; ultimate segments 3–5 mm; sori 2–3 mm 7b. var. *ipii*

7a. *Onychium moupinense* var. *moupinense*

木坪金粉蕨(原变种) *mu ping jin fen jue* (yuan bian zhong)

Onychium japonicum (Thunberg) Kunze subsp. *moupinense* (Ching) Fraser-Jenkins.

Plants to 25–70 cm tall. Fronds subdimorphic. Sterile lamina lanceolate; fertile lamina ovate-lanceolate. Ultimate segments linear, 6–8 mm. Sori 5–7 mm.

Crevice in shrubs or broad-leaved forests; 500–1900 m. Hubei, Shaanxi, Sichuan, Yunnan [Japan, Nepal].

7b. *Onychium moupinense* var. *ipii* (Ching) K. H. Shing, Fl. Reipubl. Popularis Sin. 3(1): 112. 1990.

湖北金粉蕨 *hu bei jin fen jue*

Onychium ipii Ching, Lingnan Sci. J. 15: 282. 1936.

Plants mostly 20–40 cm tall. Fronds monomorphic. Sterile and fertile laminae lanceolate. Ultimate segments short, 3–5 mm. Sori 2–3 mm.

- Shaded wet places; below 1100 m. W Hubei (Gucheng).

Some botanists continue to treat this taxon as a separate species, and *O. angustifrons* is sometimes treated as a synonym.

8. *Onychium angustifrons* K. H. Shing, Fl. Reipubl. Popularis Sin. 3(1): 112. 1990.

狭叶金粉蕨 xia ye jin fen jue

Onychium angustifolium Ching, Acta Phytotax. Sin. 20: 233. 1982, not *O. angustifolium* (Kunth) Kunze (1848).

Rhizomes long creeping or occasionally shortly creeping; scales dark brown, subulate-lanceolate. Fronds slightly dimorphic, mostly relatively closely spaced. Stipe straw-colored above a ± black base, 4–11 cm × ca. 1 mm. Lamina of sterile fronds

narrowly lanceolate, 5–7 cm, pinnate-pinnatifid. Lamina of fertile fronds larger than sterile lamina, lanceolate or narrowly lanceolate, 7–12 × 1–3 cm, apex pinnatifid and long acuminate, 2-pinnate, thinly papery when dry, green to grayish green, not farinose. Lateral pinnae 7–15 pairs, strongly ascending obliquely, basal pair largest, deltoid-lanceolate or oblong-lanceolate, 1.5–2 × 0.4–0.5 cm. Pinnules (segments) of sterile fronds oblong, ca. 2 × 1 mm, apex acute or with 2 or 3 sharp teeth, 1 tooth per veinlet. Ultimate pinnules (segments) of fertile fronds linear, 4–8 × ca. 0.7 mm, base narrowly cuneate and narrowly winged-decurrent on costae, apex acuminate. Sori 3–6 mm. False indusia oblong to linear, entire.

- Exposed rock crevices. C Sichuan.

Onychium angustifrons has lamina less divided than most other *Onychium* species and is small in stature, mostly less than 20 cm tall. It resembles *O. moupinense* in habit. Further studies are needed to show whether it is indeed a distinct species or merely a reduced form of *O. moupinense* in an extreme habitat.

4. Subfam. CHEILANTHOIDEAE

碎米蕨亚科 sui mi jue ya ke

Zhang Gangmin (张纲民); George Yatskievich, Elisabeth A. Hooper, Tom A. Ranker

Plants terrestrial or on rocks, mostly medium-sized or small. Rhizomes erect or ascending to prostrate, caespitose to long creeping, siphonostelic, infrequently dictyostelic, with scales. Fronds monomorphic or rarely dimorphic, clustered to widely scattered. Stipe brown to black, with 1 or 2 vascular bundles near base, terete or adaxially grooved, glabrous, hairy, or scaly. Lamina variously shaped, 2–4-pinnate, sometimes also simple or pinnatifid, herbaceous to papery or leathery, glabrous or hairy, scaly, and/or farinose. Veins free, occasionally anastomosing (without included free veinlets). Sori submarginal at vein tips or along veins, variously shaped, discrete to confluent, sometimes along commissural vein connecting vein tips (*Doryopteris*). Indusia absent (*Parahemionitis* and *Paragymnopteris*) or more commonly present, then formed by reflexed and somewhat modified lamina margin (false indusium). Spores mostly brown, trilete, globose-tetrahedral to globose, perispore variously ornamented.

About 19 genera and ca. 500 species: worldwide, mainly in subtropical areas; seven genera and 56 species (24 endemic) in China.

Molecular data have shown that the cheilanthoid ferns form a well-defined monophyletic group, Cheilanthoideae, within Pteridaceae. In FRPS, this fern group was separated into two different families, Sinopteridaceae and Hemionitidaceae.

10. *CALCIPHILOPTERIS* Yesilyurt & H. Schneider, Phytotaxa 7: 53. 2010.

戟叶黑心蕨属 ji ye hei xin jue shu

Zhang Gangmin (张纲民); George Yatskievich

Plants terrestrial or on rocks. Rhizomes shortly to long creeping; scales lanceolate to narrowly ovate, mostly bicolorous, with a dark brown, ± clathrate, central band and lighter brown margins. Fronds scattered to ± clustered, dimorphic, fertile fronds with longer stipes and more finely divided laminae than sterile ones. Stipe longer than lamina (except sometimes in sterile fronds), shiny, dark brown to black, rounded or distally somewhat flattened to slightly grooved adaxially, with 1 vascular bundle at base, scaly at base, glabrescent or with sparse, short hairs and/or scales distally. Lamina pedate-pinnatifid to pedate-bipinnatifid, pedately lobed, or trilobate (smaller fronds sometimes unlobed), pentagonal to broadly cordate, hastate, sagittate, or ovate in outline, margins entire and often white cartilaginous, papery to leathery, glabrous on both surfaces or rarely sparsely glandular hairy and/or scaly abaxially at base, midvein and costae blackish abaxially. Veins faint, anastomosing, those of fertile fronds connected to a marginal commissural vein, those of sterile fronds free near margins, ending in submarginal, adaxial hydathodes. Sori with numerous sporangia continuous along commissural vein, margin of false indusium entire to slightly erose. False indusia formed by reflexed lamina margins, continuous except at segment tips. Spores dark brown, globose to globose-tetrahedral, echinate to cristate. $x = 29$.

Four species: SE Asia to New Guinea and Australia; one species in China.

Recently, *Calciphlopteris* was segregated from *Doryopteris* based mainly on molecular data. The plants tend to grow in limestone areas and have creeping rhizomes and semiclatrate rhizome scales.

1. Calciophlopterus ludens (Wallich ex Hooker) Yesilyurt & H. Schneider, *Phytotaxa* 7: 56. 2010.

戟叶黑心蕨 *ji ye hei xin jue*

Pteris ludens Wallich ex Hooker, *Sp. Fil.* 2: 210. 1858; *Doryopteris ludens* (Wallich ex Hooker) J. Smith; *Litobrochia ludens* (Wallich ex Hooker) Beddome; *Pellaea ludens* (Wallich ex Hooker) Prantl.

Rhizomes long creeping, ca. 4 mm in diam.; scales lanceolate to narrowly ovate, 2–3 mm, margins entire. Fronds mostly widely spaced. Stipe rounded, 10–35 cm (sterile) or 20–40 cm

(fertile), sparsely scaly proximally, with sparse scales and hairs 1–2 mm distally, glabrescent with age. Lamina yellowish green to pale green abaxially, medium green adaxially, 10–25 cm, deeply cordate at base; sterile lamina coarsely divided, sagittate or hastate to pedately lobed (rarely smallest fronds unlobed); fertile lamina more finely divided, pedately lobed to pedate-pinnatifid or pedate-bipinnatifid with 3 or 4 pairs of primary lobes; basal pair largest, strongly produced basiscopically; ultimate lobes caudate. $2n = 232$.

Limestone rocks by streams in forests; 400–1000 m. S Yunnan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; Australia].

11. DORYOPTERIS J. Smith, *J. Bot.* (Hooker) 3: 404. 1841, nom. cons.

黑心蕨属 *hei xin jue shu*

Zhang Gangmin (张钢民); George Yatskievych

Cassebeera Kaulfuss, nom. rej.

Plants terrestrial or on rocks. Rhizomes shortly creeping to ascending or erect, compact; scales lanceolate to narrowly ovate, mostly bicolorous, with a dark brown, non-clathrate, central band and lighter brown margins. Fronds \pm clustered, monomorphic to somewhat dimorphic, fertile fronds sometimes with longer stipes and more finely divided laminae than sterile ones. Stipe longer than to \pm as long as lamina, shiny, reddish brown to black, rounded or grooved adaxially, with 1 or 2 vascular bundles at base, scaly at base, glabrescent or with sparse, short hairs. Lamina mostly pedately 1–3 times lobed or pinnatifid, in a few species pinnate, trilobate, or entire, pentagonal to broadly cordate, hastate, sagittate, or ovate in outline, margins entire to weakly crenulate, often with a white, brown, or black cartilaginous border, papery to leathery, glabrous on both surfaces or rarely sparsely glandular hairy and/or scaly abaxially at base, in some species with a proliferous bud at base, midvein and costae reddish brown to blackish abaxially. Veins faint, free or anastomosing, those of fertile fronds connected to a marginal commissural vein, those of sterile fronds free near margins, slightly to noticeably enlarged, then ending in submarginal, adaxial hydathodes. Sori with numerous sporangia continuous along commissural vein, margin of false indusium entire to slightly erose. False indusia formed by reflexed lamina margins, usually continuous except at segment tips. Spores yellow to brown, globose to globose-tetrahedral, rugulate or echinate to cristate. $x = 29, 30$.

About 35 species: Africa, Asia, Australia, North and South America; one species in China.

1. Doryopteris concolor (Langsdorff & Fischer) Kuhn in Decken, *Reisen Ost-Afr.* 3(3): 19. 1879.

黑心蕨 *hei xin jue*

Pteris concolor Langsdorff & Fischer, *Pl. Voy. Russes Monde* 19, t. 21. 1810; *Allosorus concolor* (Langsdorff & Fischer) Kuntze; *Cheilanthes concolor* (Langsdorff & Fischer) R. M. Tryon & A. F. Tryon; *Pellaea concolor* (Langsdorff & Fischer) Baker; *Pteris cheilanthesoides* Hayata.

Rhizomes erect or ascending, short. Fronds monomorphic, clustered. Stipe reddish brown, shiny, 6–24 cm \times 1–2 mm, rounded abaxially, shallowly grooved adaxially, with 1 U-shaped vascular bundle at base. Lamina green to yellowish green, pentagonal to elongate pentagonal, as long as wide, 4–8 cm, pedate-bipinnatisect to pedate quadripinnatisect, lacking

proliferous buds, thin to relatively firm in texture, glabrous, base deeply cordate, apex of segments acute, bluntly to sharply pointed. Middle primary segment broadly rhombic, 3.5–5 \times 2–4 cm, base broadly cuneate, decurrent along rachis. Lateral pair of pinnae deltoid, 3–4.5 \times 2.5–3.5 cm, bases decurrent and connected to middle pinna with broad wings; basiscopic pinnules much longer than acroscopic ones, proximal basiscopic pinnule longest, pinnatifid margins entire or slightly crenate, with a white or brown border. Veins free, obscure, free vein ends forming adaxial hydathodes. Sori along segment margins, interrupted at sinuses and segment tips. Spores yellow, rugulate. $2n = 60$.

Terrestrial or on rocks, along streams, in forests or open areas; 200–900 m. Guangdong, Guangxi, Hainan, Taiwan [India, Malaysia, Sri Lanka, Vietnam; Africa, Australia, Caribbean islands, Central and South America, Madagascar, Mexico].

12. PELLAEA Link, *Fil.* Sp. 59. 1841, nom. cons.

旱蕨属 *han jue shu*

Zhang Gangmin (张钢民); George Yatskievych

Plants usually on rocks. Rhizomes erect to decumbent or long creeping, siphonostelic; scales concolorous or bicolorous, brown to nearly black, sometimes with narrow pale margins, narrowly lanceolate or subulate-lanceolate to lanceolate, margins entire or toothed. Fronds monomorphic or slightly dimorphic, clustered or more widely spaced. Stipe usually brown to black, usually lustrous, terete or adaxially grooved, with 1 vascular bundle at base. Lamina oblong-lanceolate to deltoid-lanceolate, 1–4-pinnate, with a dis-

crete terminal pinnule or segment, usually leathery, thick, glabrous on both surfaces or occasionally hairy or scaly. Ultimate pinnules or segments stalked, or if sessile then narrowly attached, variously shaped, sometimes with 1 or 2 blunt basal lobes, margins entire, apex rounded to acute. Veins free or rarely anastomosing, pinnately branched. Sori small, orbicular, at vein tips, usually confluent at maturity. False indusia linear, continuous, usually narrow, margins entire or erose. Spores globose-tetrahedral, perispore granular, cristate, rugose, or rarely tuberculate to verrucate. $x = 29, 30$.

About 30 species: S Africa, Asia, Australia, North and South America, Pacific islands (New Zealand); two species (one endemic) in China.

Traditionally, the genus *Pellaea* was circumscribed broadly to include 45–50 species in four sections distributed on most continents. However, this version of *Pellaea* is polyphyletic and includes several distantly related groups. Of the two Chinese species treated here, *P. calomelanos* is clearly a member of *P. sect. Holchochlaena* Hooker & Baker, which includes 10 or more species with a center of diversity in Africa. In the future, it is likely that this group will be raised to generic status, as it is only distantly related to *P. sect. Pellaea*. The systematic position of the rare *P. connectens* has not yet been evaluated because of the lack of recently collected material, but it likely is related to *P. calomelanos*. Other species included in *Pellaea* in some of the literature on Asian ferns are here treated in *Cheilanthes*, including those sometimes segregated under the generic name *Mildella*.

- 1a. Pinnules ovate to ovate-hastate, base cordate, terminal pinnules almost always with a pair of blunt, spreading lobes 1. *P. calomelanos*
 1b. Pinnules oblong to ovate, unlobed, base rounded to truncate 2. *P. connectens*

1. *Pellaea calomelanos* (Swartz) Link, Fil. Sp. 61. 1841.

三角羽旱蕨 san jiao yu han jue

Pteris calomelanos Swartz, J. Bot. (Schrader) 1800(2): 70. 1801.

Rhizomes decumbent or ascending, short and stout, 4–8 mm in diam.; scales bicolorous, black, with narrow pale brown margins, lustrous, lanceolate to narrowly lanceolate. Fronds clustered. Stipe dark brownish black, (3–)5–12(–30) cm, terete, with sparse narrow scales at base, glabrous above. Lamina grayish green, pale abaxially, ovate to oblong-deltoid, (5–)8–15(–25) × 4–6(–15) cm, 2-pinnate with discrete terminal pinnule, leathery, glabrous on both surfaces; rachis, costae, and pinnule stalks dark brownish black, terete, glabrous or rarely sparsely shortly hairy or -glandular. Pinnae 11–21, oblique; basal or second pairs of pinnae largest, medial and distal pinnae gradually reduced, undivided or imparipinnate with 3–11 pinnules, stalks 3–10 mm. Pinnules discrete, 3–7(–11), ovate to ovate-hastate, 6–25 × 4–22 mm, with stalks to ca. 3 mm, base cordate, apex obtuse. Veins obscure. Sori confluent. False indusia continuous, brown, slender, margins entire.

Rock crevices in dry valleys; 900–1800 m. S Sichuan, Yunnan [India, Nepal, Pakistan; Africa, S Europe, Indian Ocean islands (Mascarene Islands), Madagascar].

This widespread species sometimes has been divided into two or

more varieties in Africa. The Chinese plants correspond to *Pellaea calomelanos* var. *calomelanos*.

2. *Pellaea connectens* C. Christensen, Acta Horti Gothob. 1: 84. 1924.

四川旱蕨 si chuan han jue

Rhizomes erect, short; scales concolorous, brown, subulate-lanceolate, thin and twisted. Fronds densely clustered. Stipe dark brown, 3–8 cm, terete, brittle, with sparse narrow scales at base, occasionally with sparse, brown, hairlike scales distally. Lamina brownish green when dry, lanceolate to somewhat oblong-triangular, 5–10 × 2–4 cm, 2-pinnate or occasionally 3-pinnate with a discrete terminal pinnule or segment, papery, glabrous on both surfaces, base not reduced, apex shortly acuminate; rachis straight; rachis, costae, and costules chestnut-colored, lustrous. Pinnae 7–21, oblique; basal or second pair of pinnae largest, medial and distal pinnae gradually reduced, undivided or imparipinnate with 3–9 pinnules, stalks 1–3 mm. Ultimate pinnules or segments discrete, oblong to ovate, unlobed, 3–6 × 2–3 mm, shortly stalked, base rounded to truncate, apex rounded or obtuse. Sori ± confluent, continuous or sometimes interrupted at pinnule or segment apex. False indusia poorly developed, pale green, narrow, margins undulate or irregularly crenate.

● Rare, limestone crevices in hot dry valleys; 1900–2800 m. SW and W Sichuan.

13. CHEILANTHES Swartz, Syn. Fil. 5, 126. 1806, nom. cons.

碎米蕨属 sui mi jue shu

Zhang Gangmin (张钢民); George Yatskievych

Allosorus Bernhardt; *Mildella* Trevisan.

Plants terrestrial or on rocks. Rhizomes erect and short, less commonly decumbent or creeping, siphonostelic; scales concolorous or bicolorous, brown to chestnut-black, sometimes with a pale border, subulate to lanceolate. Fronds monomorphic, tufted, clustered, or relatively closely spaced along rhizome. Stipe chestnut-colored to black, sometimes lustrous, terete or grooved adaxially, with 1 vascular bundle at base, sparsely to densely scaly and hairy, at least proximally or when young, sometimes glabrescent at maturity. Lamina lanceolate, oblong-lanceolate, oblong, or ovate-pentagonal, 1–3-pinnate-pinnatifid, herbaceous or papery to leathery, glabrous or hairy on both surfaces. Ultimate segments sessile to shortly stalked, broadly or narrowly attached, variously shaped. Veins of ultimate segments free (but sometimes obscure), unbranched or forked distally. Sori orbicular, at vein tips, often confluent at maturity. False indusia absent or formed by reflexed margins, interrupted to continuous, sometimes somewhat modified, margins entire, erose, serrulate, or ciliate. Spores globose-tetrahedral, perispore granular, pseudo-reticulate, cristate, or rarely rugulate. $x = 28, 29, 30$.

More than 100 species: Africa, Asia, Australia, Europe, Oceania, South America; 17 species (seven endemic) in China.

As treated here, the genus *Cheilanthes* is an unnatural assemblage that includes members of two groups. The genera *Cheilosoria* Trevisan and *Notholaena* R. Brown are typified by New World species, and these names have been misapplied to Asian taxa. The Asian species that have been treated under these names are part of a lineage that includes the species of *Aleuritopteris*, according to several independent studies of molecular phylogeny. These taxa are included in *Cheilanthes* for convenience, both because the necessary combinations in *Aleuritopteris* have not been published and because taxonomic relationships within the *Aleuritopteris* lineage are still poorly understood. Species formerly included in *Mildella*, which sometimes have been misclassified in *Pellaea*, also are members of this lineage. On the other hand, *C. tenuifolia* is part of *Cheilanthes* s.s., a group of ca. 35 species with centers of diversity in Australia, Africa (South Africa), and South America.

- 1a. Lamina margins not or only slightly reflexed, differentiated false indusia absent; lamina densely covered with yellow to brownish long hairs abaxially.
- 2a. Rhizomes long creeping; fronds scattered; lamina pinnate-pinnatifid; pinnae subsessile 2. *C. chinensis*
- 2b. Rhizomes short, erect or decumbent; fronds clustered; lamina 2-pinnate-pinnatifid; pinnae distinctly stalked 3. *C. nudiuscula*
- 1b. Lamina margins strongly reflexed and modified forming scarious false indusia; lamina frequently glabrous abaxially.
- 3a. Lamina thickly papery to leathery, coarsely divided, often caudate at apex; false indusia continuous.
- 4a. Stipes straw-colored, sometimes tan proximally.
- 5a. Fronds subdimorphic; lamina pinnate-pinnatifid, to 15 × 10 cm; segments 2–4 cm 12. *C. christii*
- 5b. Fronds monomorphic; lamina 2-pinnate-pinnatifid, to 10 × 3 cm; pinnules 1–2 cm.
- 6a. Stipes longer (usually much longer) than laminae; false indusia broad, nearly reaching midvein, margins sparsely fimbriate 13. *C. smithii*
- 6b. Stipes ± as long as laminae; false indusia narrow, not approaching midvein, margins entire to somewhat erose 14. *C. tibetica*
- 4b. Stipes brown to black.
- 7a. Pinnules deltoid, ovate, or oblong, at least those of basal pinnae stalked, apex obtuse; rachis flexuous 11. *C. trichophylla*
- 7b. Pinnules lanceolate or linear, base adnate to costa, apex acuminate; rachis straight or nearly so.
- 8a. Stipes and rachises glabrous above scaly base; lamina ovate-pentagonal, ± as long as wide 17. *C. bhutanica*
- 8b. Stipes and rachises shortly hairy and/or with broader scales; lamina oblong to oblong-deltoid or ovate-deltoid, nearly 2 × as long as wide.
- 9a. Stipes sparsely scaly above base, but densely shortly hairy; apices of lamina and pinnae obtuse or shortly caudate, caudate portion less than 1 cm; pinnules (segments) closely spaced 15. *C. nitidula*
- 9b. Stipes moderately to densely scaly throughout, also shortly hairy; apices of lamina and pinnae long caudate; caudate portion to ca. 2 cm; pinnules (segments) widely spaced 16. *C. brausei*
- 3b. Lamina herbaceous to somewhat papery, finely divided, apex pinnatifid, acuminate; false indusia usually interrupted.
- 10a. Lamina ovate-pentagonal or elongate deltoid, 3-pinnate; basal pair of pinnae larger than adjacent pinnae and proximal basispic pinnules conspicuously enlarged.
- 11a. Stipe terete or slightly flattened 10. *C. hancockii*
- 11b. Stipe noticeably flattened or grooved abaxially.
- 12a. Scales of rhizome and stipe base brownish, soft; stipe slightly grooved adaxially, without two sharp margins 1. *C. tenuifolia*
- 12b. Scales of rhizome and stipe base black, stiff; stipe and rachis flattened to shallowly grooved abaxially with two sharp margins 8. *C. patula*
- 10b. Lamina lanceolate, pinnate-pinnatifid to 3-pinnate; basal pair of pinnae not larger than adjacent pinnae; proximal basispic pinnules not conspicuously enlarged.
- 13a. Lamina 3-pinnate; costae sparsely clothed with glandular hairs adaxially 9. *C. insignis*
- 13b. Lamina pinnate-pinnatifid to 2-pinnate; costae glabrous or with non-glandular hairs and/or scales adaxially.
- 14a. Pinnae obtuse at apex, sparsely hairy on both surfaces; margins of false indusia fimbriate 4. *C. fragilis*
- 14b. Pinnae acute or acuminate at apex, glabrous on both surfaces; margins of false indusia entire to slightly irregular or undulate.
- 15a. Pinnae widely separated, long acuminate at apex; basal pinnae of lamina same size as adjacent pinnae; basal basispic pinnules larger than acroscopic ones, proximal basispic pinnule largest; false indusia continuous, rarely somewhat interrupted 7. *C. belangeri*

- 15b. Pinnae closely spaced, acute at apex, basal pinnae of lamina somewhat smaller than adjacent pinnae; basal basicopic pinnules same size as acroscopic ones; false indusia interrupted.
- 16a. Winglike ridges along margins of stipe and rachis groove with short hairs and narrow scales 5. *C. chusana*
- 16b. Winglike ridges along margins of stipe and rachis groove glabrous 6. *C. opposita*

1. *Cheilanthes tenuifolia* (N. L. Burman) Swartz, Syn. Fil. 129, 332. 1806.

薄叶碎米蕨 bao ye sui mi jue

Trichomanes tenuifolium N. L. Burman, Fl. Indica, 237. 1768; *Acrostichum tenue* Retzius; *Adiantum cicutifolium* Lamarck; *Cassebeera tenuifolia* (N. L. Burman) J. Smith; *Cheilosoria tenuifolia* (N. L. Burman) Trevisan.

Rhizomes erect, short; scales yellowish brown, subulate, not sclerified. Fronds clustered. Stipe chestnut-brown, 6–25 cm, grooved adaxially, margins of groove blunt, rounded abaxially, sparsely scaly proximally, glabrous distally. Lamina green to yellowish green, deltoid, pentagonal-ovate, or broadly ovate-lanceolate, shorter than stipe, 4–18 × 4–12 cm, tripinnate or pinnate-bipinnatifid, herbaceous, thin, glabrous abaxially, with sparse, short hairs adaxially; rachis and costae grooved adaxially, margins of grooves narrowly winged on distal rachis and costae. Pinnae 6–8 pairs; basal pair largest, ovate-deltoid or ovate-lanceolate, 3–9 × 2.5–4.5 cm, stalked (stalks 0.3–1 cm), apex acuminate; proximal pinnae inequilateral, basal basicopic pinnules largest. Ultimate segments connected by very narrow wings, lobed, lobes elliptic. Sori confined to distal portion of lobes, interrupted at segment bases. False indusia continuous or not, margins entire to somewhat undulate or erose. $2n = 108, 112, 120$.

On rocks in forests and along stream banks, roadsides, rice fields; 100–1000 m. Fujian, Guangdong, Guangxi, Hainan, S Hunan, Jiangxi, Taiwan, Yunnan [Cambodia, India, Laos, Malaysia, Nepal, Sri Lanka, Thailand, Vietnam; Australia, Oceania (including New Zealand)].

2. *Cheilanthes chinensis* (Baker) Domin, Biblioth. Bot. 85: 133. 1913.

中华隐囊蕨 zhong hua yin nang jue

Notholaena chinensis Baker, Gard. Chron., n.s., 14: 494. 1880.

Rhizomes creeping, 2–3 mm in diam.; scales linear to linear-lanceolate, bicolorous with dark brown central stripe and lighter margins. Fronds ± closely spaced. Stipe dark brown, lustrous, terete, (2–)3–14 cm, scaly proximally. Lamina narrowly deltoid to oblong-triangular, 7–18 × 2–8 cm, pinnate-pinnatifid, papery, abaxially moderately to densely tomentose with fine, long, yellowish brown to orangish brown hairs, adaxially sparsely to moderately villous with fine, brown hairs. Pinnae 10–20 pairs; basal pair largest, 2–4 × 1.5–3 cm, sessile, apex rounded to angled; proximal 2–4 pairs strongly inequilateral, basicopic segments greatly enlarged, much longer than adjacent acroscopic ones; distal pinnae gradually reduced, ± equilateral, pinnatifid or not, apex obtuse. Ultimate segments sessile, broadly adnate to costae, margins slightly recurved but not covering sori. Sori ± continuous or sometimes interrupted at

segment sinuses, containing few sporangia, immersed in pubescence. False indusium absent.

• Limestone crevices; 400–800 m. Chongqing, N Guangxi (Lingui), NE Guizhou, W Hubei, Sichuan.

3. *Cheilanthes nudiuscula* (R. Brown) T. Moore, Index Fil. 249. 1861.

隐囊蕨 yin nang jue

Pteris nudiuscula R. Brown, Prodr. 155. 1810; *Cheilanthes densa* Fée; *C. hirsuta* (Poiret) Mettenius (1859), not Link (1833); *Notholaena hirsuta* (Poiret) Desvaux; *N. nudiuscula* (R. Brown) Desvaux; *N. sulcata* Link; *Pellaea nudiuscula* (R. Brown) Hooker; *Pteris hirsuta* Poiret.

Rhizomes erect, short; scales concolorous, reddish brown, subulate-lanceolate. Fronds clustered. Stipe chestnut-colored, slightly lustrous, 8–12 cm, shallowly grooved adaxially, margins of groove blunt, villous and with sparse linear scales, sometimes glabrescent with age. Lamina oblong to oblong-lanceolate, 10–16 × 2.5–8 cm, 2-pinnate-pinnatifid, papery to somewhat leathery, abaxially moderately to more commonly densely villous to subtomentose with dense, long, multicellular brown hairs, adaxially sparsely to moderately villous with multicellular gray hairs; rachis and costae chestnut-brown, sparsely to densely villous. Pinnae 8–10 pairs; proximal pairs ovate-lanceolate or oblong-lanceolate, 2–4.5 × 1–3 cm, stalked (stalks 3–5 mm), apex rounded or angled, proximal 2–4 pairs inequilateral, basal basicopic pinnules somewhat larger than acroscopic ones. Ultimate segments sessile, margins shallowly lobed to entire, slightly recurved but not covering sori. Sori ± continuous or sometimes interrupted at segment sinuses, containing several sporangia, embedded in pubescence. False indusium absent. $2n = 168$.

On rocks along rivers or rice fields; near sea level to 700 m. Fujian, Guangdong, Guangxi (Nanning), Taiwan [Malesia; Australia, Oceania].

4. *Cheilanthes fragilis* Hooker, Fil. Exot. t. 96. 1859.

脆叶碎米蕨 cui ye sui mi jue

Cheilosoria fragilis (Hooker) Ching & K. H. Shing.

Rhizomes erect; scales concolorous, grayish brown, subulate-lanceolate. Fronds clustered. Stipe chestnut-brown to nearly black, 5–6 cm, with dense glandular hairs and few lanceolate scales. Lamina green to dark green, narrowly lanceolate, 20–25 × 4–6 cm, 2-pinnate, herbaceous, thin when dry, sparsely with glandular hairs on both surfaces, slightly narrowed proximally, apex acuminate; rachis chestnut-black, sparsely pubescent and with glandular hairs on both surfaces. Pinnae 15–20 pairs, almost spreading; medial pinnae largest, 3–4 × ca. 1 cm, lanceolate, shortly stalked, slightly narrowed proximally, apex

somewhat obtuse; basal pinnae equilateral, basiscopic pinnules not enlarged. Pinnules narrowly oblong, medial ones larger, to 7×3 mm, somewhat adnate to costa, margins irregularly crenate and somewhat ciliate, apex obtuse-rounded. Veins pinnate, lateral veins forked. Sori interrupted. False indusia well developed, discontinuous, reniform to nearly semicircular, margins fimbriate.

Limestone rocks; ca. 1000 m. S Yunnan (Mengla, Yiwu) [Malaysia, Myanmar].

5. *Cheilanthes chusana* Hooker, Sp. Fil. 2: 95. 1852.

毛轴碎米蕨 mao zhou sui mi jue

Adiantopsis fordii (Baker) C. Christensen; *Cheilanthes bockii* Diels; *C. boltonii* Copeland; *C. fordii* Baker; *C. mysurensis* Wallich ex Hooker var. *chusana* (Hooker) Christ; *C. mysurensis* var. *giraldii* Christ; *Cheilosoria chusana* (Hooker) Ching.

Rhizomes erect, short; scales concolorous and reddish brown or bicolorous and dark brown to black with narrow orangish brown margins, lanceolate. Fronds tufted. Stipe dark brown, lustrous, 2–7 cm, densely scaly and with sparse, short hairs; scales occasionally bicolorous at base, but then grading abruptly to concolorous, reddish brown, lanceolate or subulate-lanceolate, adaxially grooved, groove with a pair of narrow winglike ridges along margins, these with brown, short hairs and/or narrow scales, some hairs and scales often minutely gland-tipped. Lamina green, elliptic-lanceolate to lanceolate, $8\text{--}28 \times 2\text{--}6$ cm, pinnate-pinnatisect, herbaceous, glabrous on both surfaces, somewhat narrowed at base, shortly tapered at apex. Pinnae 10–20 pairs, relatively closely spaced, oblique, sessile; medial pinnae largest, $1\text{--}3.5 \times 0.8\text{--}1.5$ cm, lanceolate-triangular, acute or obtuse at apex; pinnae gradually reduced proximally and distally, widely separated; basal pair of pinnae oblong to triangular-oblong, equilateral, basiscopic pinnules not enlarged. Ultimate segments oblong to narrowly oblong, often decurrent at base, margins crenate, apex rounded to obtuse. Sori discrete. False indusia well developed, discontinuous, elliptic-reniform to reniform, margins otherwise entire or slightly irregular.

Rock crevices at roadsides, stream banks, forests; below 100–1500 m. Anhui, Chongqing, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Zhejiang [Japan, Philippines, Vietnam].

6. *Cheilanthes opposita* Kaulfuss, Enum. Filic. 211. 1824.

碎米蕨 sui mi jue

Cheilanthes mysurensis Wallich ex Hooker; *Cheilosoria mysurensis* (Wallich ex Hooker) Ching & K. H. Shing.

Rhizomes erect, short; scales mostly bicolorous and dark brown to black with narrow orangish brown margins, narrowly lanceolate. Fronds tufted. Stipe dark brown to black, 2–7 cm, densely scaly proximally, sparsely scaly distally; scales concolorous, reddish brown, lanceolate or subulate-lanceolate, adaxially grooved, groove with a pair of narrow winglike ridges along margins, these glabrous, occasionally with few minute teeth. Lamina brown when dry, elongate lanceolate to narrowly

oblong-elliptic, $8\text{--}18\text{--}(23) \times 1\text{--}2$ cm, bipinnate, rarely bipinnate-pinnatifid, herbaceous, glabrous on both surfaces, base gradually tapered, apex acuminate. Pinnae 10–20 pairs, relatively closely spaced; medial pinnae deltoid or deltoid-lanceolate, $1\text{--}1.5 \times 0.5\text{--}0.8$ cm, sessile; lower pinnae widely separated and gradually shortened proximally, oblong to narrowly deltoid; basal pair of pinnae often reduced to small auricles, equilateral or nearly so. Pinnules of medial pinnae usually divided into 3 or 4 pairs of orbicular lobes. Sori 1 or 2 per lobe, discrete. False indusia discontinuous, reniform or somewhat elliptic-reniform, margins otherwise entire or slightly irregular. $2n = 60$.

On rocks on stream banks or under shrubs; 100–300 m. Fujian, Guangdong (Dapu), Hainan, Taiwan [India, Myanmar, Sri Lanka, Vietnam].

Cheilanthes opposita is easily confused with the closely related *C. chusana*, and some botanists combine the two taxa under the latter name.

7. *Cheilanthes belangeri* (Bory) C. Christensen, Index Filic. 172. 1905.

疏羽碎米蕨 shu yu sui mi jue

Pteris belangeri Bory in Bélanger, Voy. Indes Or. 2: 44. 1883; *Allosorus cambodiensis* (Baker) Kuntze; *Cheilanthes varians* Wallich ex Hooker; *Cheilosoria belangeri* (Bory) Ching & K. H. Shing; *Pellaea cambodiensis* Baker; *Pteridella belangeri* (Bory) Mettenius ex Kuhn.

Rhizomes erect, short; scales concolorous, dark brown, subulate-lanceolate. Fronds tufted. Stipe dark brown to nearly black, 8–23 cm, adaxially shallowly grooved, groove rounded or blunt along margins, scaly toward base; scales concolorous, dark brown, subulate lanceolate to subulate. Lamina brown when dry, narrowly triangular-lanceolate, $9\text{--}26 \times 3\text{--}5$ cm, pinnate-pinnatifid to 2-pinnate, papery, glabrous on both surfaces, base not or only slightly narrowed, apex long acuminate; rachis and costae dark brown, adaxially grooved, usually with minute, stalked glands, especially adaxially, sometimes glabrous abaxially. Pinnae 12–18 pairs, widely separated; basal pinnae slightly shorter to \pm as long as second pair, elongate deltoid, $1.5\text{--}3.5 \times 0.6\text{--}1.5$ cm, stalked (stalks 1–4 mm), base broadly cuneate, apex acuminate and often somewhat caudate. Pinnules (segments) of proximal pinnae 4–6 pairs, adnate to costa, inequilateral, basiscopic pinnules somewhat longer than adjacent acroscopic ones; basal basiscopic pinnule longest, oblong-lanceolate, somewhat lobed. Sori interrupted at segment sinuses. False indusia discontinuous, margins entire or slightly undulate. $2n = 120$.

On rocks, occasionally in wet soil; 100–800 m. Hainan [Bangladesh, Cambodia, India, Indonesia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

8. *Cheilanthes patula* Baker, J. Bot. 26: 225. 1888.

平羽碎米蕨 ping yu sui mi jue

Cheilosoria patula (Baker) P. S. Wang; *Pellaea patula* (Baker) Ching (1965), not (Fée) Prantl (1882).

Rhizomes erect, short; scales concolorous, black to blackish brown, subulate-lanceolate. Fronds tufted. Stipe dark

brown, 8–15 cm × ca. 2 mm, adaxially flattened to shallowly grooved, groove with a pair of narrow winglike ridges along margins, these glabrous, scaly toward base; scales dark brown, subulate. Lamina brownish green when dry, elongate deltoid, 12–20 × 6–11 cm, 2- or 3-pinnate, papery, glabrous on both surfaces, broadest at base, apex acuminate; rachis somewhat flexuous; rachis and costae dark brown, adaxially grooved, groove with a pair of narrow winglike ridges along margins. Pinnae 8–10 pairs, with stalks 2–4 mm; basal pair of pinnae largest, oblong-deltoid, 3–6 × 1.6–2 cm; pinnules deltoid, 8–12 × 4–6 mm, shortly stalked, inequilateral, basiscopic pinnules longer than adjacent acroscopic ones; basal basiscopic pinnule longest. Ultimate segments oblong, margins entire, apex obtuse. Sori usually not interrupted on segments. False indusia continuous or rarely somewhat discontinuous, margins entire.

• Rock crevices; 400–900 m. Chongqing, Guangxi, Guizhou, W Hubei.

9. *Cheilanthes insignis* Ching, Fl. Tsinling. 2: 208. 1974.

厚叶碎米蕨 *hou ye sui mi jue*

Cheilosoria insignis (Ching) Ching & K. H. Shing.

Rhizomes creeping to ascending, short; scales concolorous or bicolorous, black, sometimes with brown margins, shiny, lanceolate, stiff. Fronds closely spaced. Stipe reddish brown to brown, lustrous, 10–15 cm × ca. 2 mm, grooved adaxially, groove rounded along margins, scaly toward base or smaller fronds with scales sometimes distributed nearly to lamina; scales dark brown, mostly concolorous, lanceolate-subulate to hairlike. Lamina brownish green when dry, broadly lanceolate, 15–17 × 5–6 cm, 3-pinnate, papery, glabrous on both surfaces or with minute stalked glands, mostly adaxially; rachis and costae dark brown, adaxially grooved, with sparse, minute, stalked glands adaxially. Pinnae 9–14 pairs, oblique; second or third pinnae largest, ovate-lanceolate or broadly lanceolate, 4–5 × 1.5–2.5 cm, shortly stalked, acroscopic basal pinnule parallel to rachis, basiscopic base cuneate, apex acuminate. Pinnules of basal pinnae slightly inequilateral, basiscopic pinnules slightly longer than adjacent acroscopic ones; basal basiscopic pinnule shorter than adjacent basiscopic ones, oblong to oblong-ovate, lobed, axes narrowly winged. Ultimate segments ovate or oblong, margins shallowly lobed. Sori interrupted at segment sinuses. False indusia discontinuous, margins slightly erose.

• On rocky slopes or under shrubs in dry hot valleys; 1700–3300 m. N Sichuan, E Xizang.

10. *Cheilanthes hancockii* Baker, Bull. Misc. Inform. Kew 1895: 54. 1895.

大理碎米蕨 *da li sui mi jue*

Cheilanthes bonatiana Brause; *C. henryi* Christ; *C. taliensis* Christ; *C. wilsonii* Christ; *Cheilosoria hancockii* (Baker) Ching & K. H. Shing.

Rhizomes erect, short; scales bicolorous, dark brown to black with lighter margins, subulate-lanceolate. Fronds clustered. Stipe dark brown, lustrous, 6–20 cm × ca. 1 mm, terete, scaly toward base; scales dark brown, concolorous to slightly bicolorous, lanceolate-subulate. Lamina brownish green when

dry, pentagonal-ovate to broadly deltoid, 5–15 × 5–9 cm, 3-pinnate, herbaceous, glabrous on both surfaces, apex acuminate to long acuminate; rachis and costae flattened to shallowly grooved adaxially, glabrous. Pinnae 5–7 pairs; basal pair longest, elongate deltoid, (3–)5–9 × 2–4 cm, shortly stalked, acroscopic basal pinnule parallel to rachis, basiscopic base cuneate; basal basiscopic pinnule largest, much longer than adjacent acroscopic ones, apex acuminate. Ultimate segments oblong, ca. 1 × 0.2–0.3 cm, base narrowly winged, margins undulate or crenate, apex obtuse or rounded. Sori discrete at vein tips. False indusia discontinuous, reniform, semi-orbicular, or oblong, sometimes adjacent ones fused and indusium then 2-lobed, margins otherwise entire or somewhat erose. $2n = ca. 120$.

On rocks in woods or under shrubs by roads; 1400–3000 m. Gansu (Wenxian), W Guizhou, Sichuan, Xizang (Zayü), Yunnan [Bhutan].

11. *Cheilanthes trichophylla* Baker, Ann. Bot. (Oxford) 5: 211. 1891.

毛旱蕨 *mao han jue*

Cheilanthes delavayi Baker; *C. undulata* C. Hope & C. H. Wright; *Pellaea trichophylla* (Baker) Ching.

Rhizomes decumbent to erect, short; scales concolorous or somewhat bicolorous, dark brown to black, sometimes with very narrow, lighter brown margins, lustrous, subulate-lanceolate, stiff. Fronds tufted. Stipe dark brown to black, 10–30 cm × 1–2 mm, terete, with fine, orangish brown to brown, multicellular hairs of 2 kinds: moderate to dense, ascending, short hairs and scattered, longer, spreading hairs. Lamina dull brownish green when dry, deltoid-lanceolate, at least slightly longer than stipe, 5–15 cm wide, 2-pinnate-pinnatifid, papery, strigose on both surfaces, apex shortly acuminate; rachis flexuous; rachis, costae, and pinnule stalks dark brown, terete, densely pubescent with short, multicellular hairs. Pinnae 6–10 pairs, basal pair longest, deltoid or deltoid-lanceolate, 5–11 × 2.5–5 cm, stalks 5–12 mm, equilateral, apex acute. Pinnules 3–5 pairs, ovate-deltoid, 1.5–2.5 × 1–2 cm, stalks 1–2 mm, base rounded to truncate or somewhat cordate, pinnatifid, costules winged; segments oblong, margins usually entire. Sori confluent, sometimes interrupted at segment tip. False indusia continuous, narrow, margins undulate to crenulate. $2n = 60$.

• Rock crevices in hot dry valleys or woods; 800–2500 m. W Sichuan, E Xizang, W Yunnan [possibly India (Sikkim)].

12. *Cheilanthes christii* Fraser-Jenkins & Yatskievych, Indian Fern J. 27: 213. 2011.

凤尾旱蕨 *feng wei han jue*

Pteris paupercula Christ, Bull. Acad. Int. Géogr. Bot. 16: 131. 1906; *Cheilanthes paupercula* (Christ) Fraser-Jenkins (2008), not (Kunze) Mettenius (1856); *Mildella paupercula* (Christ) C. C. Hall & Lellinger; *Pellaea paupercula* (Christ) Ching.

Rhizomes erect, short; scales shiny, bicolorous, dark brown to black with light brown margins, narrowly lanceolate, thick and stiff. Fronds clustered, subdimorphic (sterile fronds somewhat shorter and with slightly broader segments). Stipe straw-colored, sometimes tan proximally, 5–22 cm, terete or

flattened to grooved adaxially, with concolorous, reddish brown, soft, narrowly lanceolate scales extending onto rachis, also pubescent toward tip with moderate to dense, short and sparse, longer, multicellular hairs. Rachis and costae straw-colored, densely pubescent with short, viscid hairs and sparse hairlike scales mostly adaxially. Sterile lamina shorter than fertile lamina, pale brownish green when dry, herbaceous, glabrous on both surfaces. Fertile lamina oblong, 5–15 × 3–10 cm, 2-pinnate, apex caudate; pinnae 3–7 pairs, proximal pinnae ovate-deltoid, 3–7 × 2–4 cm, shortly stalked, apex caudate. Ultimate sterile segments oblong or broadly linear, 5–6 mm wide, margins entire or occasionally obscurely crenulate. Ultimate fertile segments linear, 2–3 mm wide, base decurrent on costa, apex acuminate. Sori confluent, not interrupted at sinuses or segment tips. False indusia continuous, margins erose and sparsely ciliate.

- Rock crevices in dry valleys; 1200–2900 m. W Sichuan.

Cheilanthes christii superficially resembles some of the smaller species of *Pteris*, but these *Pteris* species have more strongly dimorphic fronds, usually with the margins of the sterile fronds finely dentate-serrulate, and stipes that are grooved and glabrous above the base.

13. *Cheilanthes smithii* (C. Christensen) R. M. Tryon, Amer. Fern J. 76: 185. 1986.

西南旱蕨 xi nan han jue

Pellaea smithii C. Christensen, Acta Horti Gothob. 1: 84. 1924; *Mildella smithii* (C. Christensen) C. C. Hall & Lellinger.

Rhizomes erect or ascending, short; scales bicolorous, dark brown to black with light brown margins, lanceolate. Fronds clustered, monomorphic or nearly so. Stipe straw-colored, sometimes tan proximally, 6–20 cm × ca. 1 mm, terete or flattened to slightly grooved adaxially, with concolorous, reddish brown, soft, narrowly lanceolate scales mostly at base, also pubescent adaxially with shorter and longer, lax, unicellular and multicellular, viscid hairs, short hairs mostly glandular distally. Lamina pale brownish green when dry, oblong, much shorter than stipe, 4–10 × 2–3 cm, 2-pinnate, leathery, glabrous on both surfaces; rachis straw-colored, sometimes light brownish tinged, grooved, with sparse viscid hairs adaxially. Pinnae 2–7 pairs, ovate-deltoid, 1–2.3 × 1–2 cm, sessile. Pinnules or segments 3–5 pairs, linear, 0.5–1.5 cm × 1.2–1.6 mm, base decurrent on costa, margins entire or obscurely crenulate, sometimes with 1–3 small lobes, apex obtuse or mucronate. Sori confluent, not interrupted at sinuses or segment tips. False indusia continuous, broad, nearly to midvein, margins fimbriate.

- Rock crevices under shrubs in dry valleys; 1300–2600 m. W Sichuan, NW Yunnan.

14. *Cheilanthes tibetica* Fraser-Jenkins & Wangdi, Fern Gaz. 18: 218. 2009.

禾秆旱蕨 he gan han jue

Pellaea straminea Ching, Bull. Fan Mem. Inst. Biol. 2: 203. 1931, not *Cheilanthes straminea* Brause (1913); *Mildella straminea* (Ching) C. C. Hall & Lellinger; *P. straminea* var. *tibetica* Ching.

Rhizomes erect or ascending, short; scales somewhat bicolorous, with dark brown to black central stripe grading to lighter brown margins, shiny, lanceolate. Fronds clustered, monomorphic. Stipe straw-colored, to 7 cm × ca. 1 mm, grooved adaxially, at least toward tip, brittle, scaly; scales concolorous, brown proximally, grading to light brown below midpoint, also pubescent with sparse to dense, short, mostly bicellular, viscid hairs adaxially. Lamina grayish green when dry, ovate-oblong to ovate-deltoid, (3–)5–8 × 1.5–3 cm, pinnate-pinnatifid, herbaceous to thinly papery, glabrous on both surfaces, apex acute or acuminate; rachis and costae straw-colored, grooved adaxially, with dense, short, viscid hairs adaxially. Pinnae 3–5(–7) pairs, subsessile; basal pair longest, elongate ovate or ovate-deltoid, 1.5–2 × 1–1.4 cm, apex caudate. Segments linear-lanceolate, 6–15 × 1–2 mm, bases adnate to costae, margins entire or somewhat undulate. Sori ± confluent, not interrupted at sinuses or segment tips, occasionally interrupted along lateral margins. False indusia narrow, continuous or occasionally somewhat interrupted, membranous, margins entire.

On rocks; 3000–4500 m. Gansu (Linxia), S Qinghai (Nangqian), Xinjiang, Xizang [Bhutan].

Pellaea straminea var. *tibetica* was described based on a specimen from Xizang. It was said to differ from var. *straminea* only in its larger stature (to 22 cm tall) and likely represents plants collected in moister or shadier than usual habitats. The name *Cheilanthes tibetica* is based on the type of *P. straminea* and was published without reference to the existence of the heterotypic infrataxon, *P. straminea* var. *tibetica*.

15. *Cheilanthes nitidula* Wallich ex Hooker, Sp. Fil. 2: 112. 1852.

旱蕨 han jue

Cheilanthes nitidula subsp. *henryi* (Christ) Fraser-Jenkins; *Mildella henryi* (Christ) C. C. Hall & Lellinger; *M. nitidula* (Wallich ex Hooker) C. C. Hall & Lellinger; *Pellaea henryi* Christ; *P. nitidula* (Wallich ex Hooker) Baker.

Rhizomes ascending to erect, sometimes with creeping branches; scales bicolorous, dark brown with very narrow, light brown margins, subulate-lanceolate. Fronds numerous, clustered or closely spaced. Stipe dark brown to nearly black, 6–20 cm × 1–1.5 mm, terete, with ± bicolorous, subulate-lanceolate to linear scales near base, these grading abruptly to sparse, unicellular scales, also with sparse to occasionally dense, short, reddish brown, unicellular hairs, these sometimes mostly adaxial. Lamina brownish green when dried, oblong to oblong-deltoid, 4–12 × 3–6 cm, 2-pinnate-pinnatifid, leathery, glabrous on both surfaces, apex blunt or shortly caudate; rachis and costae dark brown, densely shortly hairy. Pinnae 3–5 pairs, sessile or subsessile; basal pair longest, deltoid, 2.5–3.5 × 2–2.5 cm; pinnules relatively closely spaced, those of basal pinnae 4–6 pairs, adnate to costae; basispic pinnules enlarged, basal basispic pinnules longer than adjacent acroscopic ones, oblong, 1.5–2 × 0.8–1.5 cm, pinnatifid, with 5–7 pairs of lanceolate to deltoid segments, other pinnules lanceolate or linear, few lobed to entire. Sori confluent, not interrupted at sinuses or segment tips. False indusia continuous, brown, membranous, margins irregularly dentate to erose, sparsely ciliate. $2n = 58, 116$.

On rocks in forests and dry valleys; 200–2400 m. Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, Kashmir, Nepal, Pakistan, Vietnam].

Traditionally, two taxa have been accepted in this complex. *Cheilanthes nitidula* subsp. *henryi* occurs in the eastern portion of the species range and differs from subsp. *nitidula* mostly in its denser rachis and stipe pubescence with the hairs often tending to extend around the stipe (vs. restricted to the adaxial side). The ranges of the two subspecies overlap extensively and there are too many intermediates to allow formal recognition of subspecies.

16. *Cheilanthes brausei* Fraser-Jenkins, Taxon. Revis. Indian Subcontinental Pteridophytes, 122. 2008.

滇西旱蕨 dian xi han jue

Pellaea mairei Brause, Hedwigia 54: 201. 1914, not *Cheilanthes mairei* Brause (1913); *Mildella mairei* (Brause) C. C. Hall & Lellinger.

Rhizomes ascending to erect, sometimes with creeping branches; scales bicolorous, dark brown to black with narrow, light brown to reddish brown margins, narrowly lanceolate. Fronds clustered or closely spaced. Stipe dark brown, lustrous, 8–16 cm × 1.5–2 mm, ± terete, densely scaly at base; scales often slightly bicolorous, narrowly lanceolate, grading abruptly to moderate to dense, concolorous, linear-subulate (above a slightly expanded base) scales, also moderately to densely pubescent with short, unicellular hairs, mostly adaxially. Lamina brownish green when dry, ovate-deltoid or oblong-deltoid, 6–12 × 4–7 cm, pinnate-pinnatifid, papery, glabrous on both surfaces, apex caudate; rachis dark brown, slightly grooved adaxially, densely shortly hairy and with few small scales. Pinnae 3–5 pairs, basal pair longest, ovate-deltoid, 2.5–5 × ca. 2 cm, sessile, apex long caudate (caudate portion ca. 2 cm); segments widely spaced, basicopic segments enlarged, basal basicopic segments longer than adjacent acroscopic ones, linear-lanceolate to narrowly oblong, 1.5–2 × 0.2–0.3 cm, margins

entire, crenulate, or with 1 or 2 small lobes. Sori confluent, not interrupted at lobe sinuses or segment tips. False indusia continuous, appearing somewhat inflated, margins entire to erose, irregularly ciliate. $2n = 120^*$.

• Rock crevices and stone walls; 1000–3200 m. Guizhou, Hunan, Shaanxi (Ningshan), SW Sichuan, Yunnan.

Cheilanthes brausei is similar to *C. nitidula* but has long-caudate pinnae, more widely separated segments, and scales extending up the stipe.

17. *Cheilanthes bhutanica* Fraser-Jenkins & Wangdi, Fern Gaz. 18: 220. 2009.

云南旱蕨 yun nan han jue

Pellaea yunnanensis Ching, Acta Phytotax. Sin. 20: 235. 1982, not *Cheilanthes yunnanensis* Brause (1913).

Rhizomes ascending to erect, sometimes with creeping branches; scales bicolorous, black with narrow, light brown margins, lanceolate to narrowly lanceolate. Fronds clustered or closely spaced. Stipe shiny, dark brown to nearly black, to 19 cm × 1.5–2 mm, terete or slightly flattened adaxially, scaly toward base; scales mostly bicolorous, narrowly lanceolate, glabrous above. Lamina brownish green when dry, ovate-pentagonal, 9–12 × ca. 9 cm, 2-pinnate-pinnatifid, papery, glabrous on both surfaces, apex acute to shortly acuminate; rachis grooved adaxially, glabrous. Pinnae ca. 6 pairs, basal pair largest, deltoid, 4–6 × ca. 5 cm, shortly stalked (2–3 mm), apex acuminate; pinnules 4 or 5 pairs, basicopic pinnules enlarged, basal basicopic pinnules longer than adjacent acroscopic ones, oblong-lanceolate to narrowly deltoid, 2–4 × 0.8–2 cm, sessile, base unequally cuneate, apex acuminate. Ultimate segments 3 or 4 pairs, oblong, 6–15 × 3–5 mm, margins mostly entire. Sori confluent, but mostly interrupted at sinuses. False indusia continuous, margins somewhat erose.

Rock crevices in forests; 1500–1900 m. Sichuan (Kangding), Yunnan (Kunming) [Bhutan].

14. ALEURITOPTERIS Fée, Mém. Foug. 5: 153. 1852.

粉背蕨属 fen bei jue shu

Zhang Gangmin (张钢民); George Yatskievych, Elisabeth A. Hooper

Leptolepidium K. H. Shing & S. K. Wu; *Sinopteris* C. Christensen & Ching.

Plants small, usually on rocks. Rhizomes erect or ascending, short; scales brown to black, concolorous or bicolorous with dark, central stripe and lighter margins, mostly narrowly to broadly lanceolate. Fronds numerous, clustered. Stipe and rachis black, dark brown, or reddish brown, shiny, terete or rarely sulcate, scaly proximally or less commonly throughout, occasionally also hairy. Lamina variously shaped, pinnate-pinnatifid to pinnate-tripinnatifid, abaxially farinose or less commonly lacking farina, farina white to milky yellow or yellow, otherwise glabrous or occasionally hairy and/or scaly abaxially, adaxially glabrous or rarely with hairs or scales; rachis grooved adaxially. Pinnae sessile or sessile, at least some pinnae often somewhat falcate, basal pinnae usually largest; basal basicopic segments enlarged, longer than adjacent acroscopic ones. Veins free but often obscure, pinnate, usually branched. Sori consisting of 1–10 sporangia, orbicular, at vein tips, separate when young, often confluent at maturity. False indusia membranous or herbaceous, brown, grayish brown, or rarely light green, often drying brown, continuous, or interrupted, margins entire, erose, lacerate, or fimbriate. Spores globose to globose-tetrahedral or tetrahedral, trilete, perispore reticulate, cristate, echinate, rugulate, or granular. $x = 29, 30$.

About 40 species: tropical and subtropical regions of both the Old and New Worlds; 29 species (14 endemic) in China.

The genus *Aleuritopteris* is here circumscribed relatively broadly to include *Leptolepidium* and *Sinopteris*, which were segregated based on

morphological characters that represent specializations within *Aleuritopteris*. Additionally, most of the species assigned by previous authors to *Cheilosoria* Trevisan and *Notholaena* R. Brown are more closely related to *Aleuritopteris* based on molecular data, which would raise the total number of species in the genus to ca. 70. See *Cheilanthes* for further discussion of these groups. Circumscription of *Aleuritopteris* remains controversial, and a stable resolution must await future publication of a comprehensive generic classification for the cheilanthoid ferns that incorporates the full range of morphological, cytological, and molecular data.

- 1a. Veins dark brown to black (sometimes partially obscured by farina), stout, prominently raised abaxially; sori with 1(or 2) large sporangium with broad annuli.
 - 2a. Lamina 7–10 cm; medial pinnae pinnatifid; false indusia interrupted 1. *A. grevilleoides*
 - 2b. Lamina 3.5–8 cm; medial pinnae bipinnatifid; false indusia continuous 2. *A. albofusca*
- 1b. Veins green (sometimes obscured by farina), slender, not or only slightly raised abaxially; sori consisting of (1 or)2 to several small sporangia with narrow annuli.
 - 3a. Lamina mostly pentagonal, nearly as wide as long; pinnae lobed to pinnatifid or only proximal 1–3 pairs of pinnae separated by wingless rachis; false indusia continuous, with entire or undulate margins.
 - 4a. Lamina moderately to densely scaly on surface and veins abaxially 3. *A. squamosa*
 - 4b. Lamina lacking scales abaxially or scaly only on rachis and costae.
 - 5a. Lamina glabrous, lacking farina abaxially.
 - 6a. Pinnae curved upward; basal pinnae strongly inequilateral, acroscopic pinnules strongly reduced or lacking; lamina coarsely divided, ultimate segments falcate 12. *A. duclouxii*
 - 6b. Pinnae spreading or obliquely angled upward, moderately inequilateral, basal acroscopic pinnules developed, but shorter than basiscopic ones; lamina finely divided, ultimate segments relatively straight.
 - 7a. Second pair of pinnae (from lamina base) shorter than basal and third ones 9. *A. tamburii*
 - 7b. Second pair of pinnae (from lamina base) shorter than basal pair but longer than third ones 11. *A. argentea*
 - 5b. Lamina with white or yellow farina abaxially (note that herbarium specimens dried with heat or treated with chemicals sometimes appear to lack farina and also rare hybrids involving farinose parental taxa sometimes do not produce farina).
 - 8a. Lamina usually less than 5 cm, with snow-white farina abaxially; sori consisting of (1 or)2 or 3 sporangia, discrete.
 - 9a. Laminae longer than stipes; stipes with scales and twisted hairs, these extending onto rachis and costae 4. *A. pygmaea*
 - 9b. Laminae shorter than stipes; stipes scaly only at base, not hairy; rachis and costae not hairy or scaly.
 - 10a. Lamina with basal pair of pinnae nearly equilateral, basal acroscopic segments lobed or pinnatifid, nearly as long as opposing basal basiscopic segments 5. *A. speciosa*
 - 10b. Lamina with basal pair of pinnae inequilateral, basal acroscopic segments simple, entire, much shorter than opposing basal basiscopic segments 6. *A. niphobola*
 - 8b. Lamina usually more than 5 cm, with milky white or yellow farina abaxially; sori consisting of 3 to several sporangia, often confluent at maturity.
 - 11a. Scales of rhizome concolorous, dark brown to black.
 - 12a. Lamina with white farina abaxially and with relatively dense red glands (actually farina-producing glands with a red apical cell) 7. *A. likiangensis*
 - 12b. Lamina with milky yellow farina abaxially, lacking red glands or some farina-producing glands with apical cell light brown, rarely somewhat reddish tinged 8. *A. veitchii*
 - 11b. Scales of rhizome bicolorous, with a brown to black central stripe and lighter margins.
 - 13a. Lamina with light yellow to lemon-yellow farina abaxially 12. *A. duclouxii*
 - 13b. Lamina with white farina abaxially.
 - 14a. Second pair of pinnae (from lamina base) shorter than basal pair but longer than third ones 11. *A. argentea*
 - 14b. Second pair of pinnae (from lamina base) shorter than basal and third ones.
 - 15a. Medial pinnae rounded or bluntly pointed at tips; distal lobes of pinnae oblong, oblong-triangular, or nearly semicircular, with narrow V-shaped sinuses between lobes 9. *A. tamburii*
 - 15b. Medial pinnae attenuate at tips; distal lobes of pinnae linear to narrowly oblong, with broad U-shaped sinuses between lobes 10. *A. yalungensis*
 - 3b. Lamina triangular-ovate, oblong-lanceolate, or oblong; pinnae usually 5–10 pairs or more, separated from each other by wingless rachis; false indusia usually interrupted, rarely continuous.
 - 16a. Lamina lacking farina at maturity (young fronds sometimes farinose).

- 17a. False indusia continuous, margins undulate; lamina hairy abaxially 28. *A. subvillosa*
- 17b. False indusia interrupted, margins laciniate; lamina glandular abaxially or glabrous except for inconspicuous hairs at pinna bases.
- 18a. Fronds (15–)25–40 cm; stipe terete; lamina glabrous abaxially or occasionally sparsely and inconspicuously hairy at pinna bases 26. *A. leptolepis*
- 18b. Fronds 7.5–15 cm; stipe grooved distally; lamina with brown glands along costae and veins abaxially 27. *A. duthiei*
- 16b. Lamina with white or yellow farina abaxially.
- 19a. Stipe with short, dark brown glands 13. *A. sichouensis*
- 19b. Stipe not glandular, but often scaly, occasionally also hairy.
- 20a. Stipe, rachis, and costae scaly.
- 21a. Scales on stipe broadly lanceolate, distinctly bicolorous, with conspicuous pale margins 23. *A. albomarginata*
- 21b. Scales on stipe narrowly lanceolate, reddish brown, concolorous or mixed with occasional scales having narrow, lighter margins.
- 22a. Lamina glabrous or rarely sparsely hairy adaxially; lamina widest at base 24. *A. dubia*
- 22b. Lamina sparsely hairy and with sparse slender scales adaxially; lamina usually widest above base 25. *A. rufa*
- 20b. Stipe scaly at base, sometimes up to rachis, but scales not extending to costae.
- 23a. Lamina with milky yellow or golden-yellow farina abaxially.
- 24a. Stipe black, basalmost stipe scales black, slightly bicolorous, with very narrow, brown margins 14. *A. ebenipes*
- 24b. Stipe usually reddish brown to dark brown, basalmost stipe scales concolorous, reddish brown.
- 25a. Lamina with golden-yellow farina abaxially; stipe scales linear-lanceolate 15. *A. chrysophylla*
- 25b. Lamina with milky yellow farina abaxially; stipe scales broadly lanceolate 16. *A. krameri*
- 23b. Lamina with white farina abaxially.
- 26a. Stipe and rachis densely scaly 17. *A. formosana*
- 26b. Stipe scaly proximally, rachis not scaly (occasionally sparsely scaly at base in *A. anceps*).
- 27a. Rhizome scales brown, ovate-lanceolate, thin and translucent.
- 28a. Lamina hairy along costae and veins 28. *A. subvillosa*
- 28b. Lamina lacking hairs 29. *A. kuhni*
- 27b. Rhizome scales black, lanceolate, relatively thick and opaque.
- 29a. Rhizome scales concolorous 18. *A. gongshanensis*
- 29b. Rhizome scales bicolorous.
- 30a. False indusia poorly developed to nearly absent 19. *A. dealbata*
- 30b. False indusia well developed.
- 31a. False indusia interrupted, with laciniate margins 20. *A. anceps*
- 31b. False indusia continuous or sometimes interrupted, margins entire or undulate.
- 32a. Lamina 2–6 cm, thinly herbaceous; false indusia poorly developed, narrow; stipe scales linear-lanceolate 21. *A. rosulata*
- 32b. Lamina (3–)10–20 cm, leathery; false indusia well developed, broad; stipe scales broadly lanceolate 22. *A. grisea*

1. *Aleuritopteris grevilleoides* (Christ) G. M. Zhang ex X. C. Zhang, *Lycophytes Ferns China*, 231. 2012.

中国蕨 zhong guo jue

Cheilanthes grevilleoides Christ, *Notul. Syst. (Paris)* 1: 51. 1909; *Sinopteris grevilleoides* (Christ) C. Christensen & Ching.

Rhizomes erect, short; scales bicolorous, black with brown margins, lanceolate. Fronds clustered. Stipe 10–18 cm. Lamina brownish green adaxially when dry, pentagonal, as long as

broad, 7–10 cm, almost equally tripartite, leathery, with white farina abaxially. Middle pinna largest, oblong-lanceolate, 6–9 × 3–4.5 cm, pinnatifid, base abruptly reduced, cuneate and decurrent, connected to lateral pinnae by a narrow wing, apex shortly acuminate; segments ca. 15 pairs, obliquely spreading, linear-lanceolate, medial segments larger than proximal and distal ones, 2–3 × 0.3–0.5 cm, margins entire or with few large teeth. Lateral pinnae deltoid, 3.5–6 cm, inequilateral, 2-pinnatifid; proximal basisopic pinnules especially enlarged, 3–4.5 × 1–1.5 cm, pinnatifid, connected to costules by narrow wings. Veins

free, pinnate, close together and prominently raised abaxially as rows of tiles on roof. Sori consisting of 1 (or 2) large sporangium, sporangia with broad annulus. False indusia narrow, margins divided into deltoid large teeth, concealing sori.

• Rock crevices along riverbanks or under shrubs; 1000–1800 m. N Sichuan (Qingchuan), W Yunnan (Binchuan, Dayao, Qiaojia).

2. *Aleuritopteris albofusca* (Baker) Pichi Sermolli, Nuovo Giorn. Bot. Ital., n.s., 53: 154. 1946.

小叶中国蕨 xiao ye zhong guo jue

Cheilanthes albofusca Baker, Bull. Misc. Inform. Kew 1895: 54. 1895; *C. mairei* Brause; *Sinopteris albofusca* (Baker) Ching; *S. hopeiensis* C. Christensen & Ching.

Rhizomes erect, short; scales bicolorous, chestnut-black with narrow, brown margins, lanceolate. Fronds clustered. Stipe 4–12 cm. Lamina dull green adaxially when dry, as long as broad, 3.5–6 cm, tripartite, leathery, abaxially white farinose. Middle pinna somewhat rhombic, as long as wide, 3–5 cm, 2-pinnatifid, base cuneate and decurrent, usually connected with lateral pinnae by a narrow wing, rarely free, apex acuminate; pinnules 4 or 5 pairs, proximal pair largest, 2–3 × 0.4–0.8 cm, linear-lanceolate, apex obtuse or acute; ultimate segments 6–9 pairs, oblong or triangular, margins entire, apex obtuse or obtusely acute. Lateral pinnae triangular, 2–4 × 2–3 cm, inequilateral, 2-pinnatifid; proximal basicopic segment especially enlarged, lanceolate or oblong, 1–2 × 0.3–0.6 cm, pinnatifid, apex shortly acuminate or acute, connected to costule by narrow wings. Veins free, prominently raised abaxially. Sori consisting of 1 (or 2) large sporangium, sporangia with broad annulus. False indusia usually wide, continuous, margins irregularly undulate-crenulate.

• Rock crevices under trees and shrubs; 500–3200 m. Gansu (Wenxian), Guizhou, Hebei, S Hunan, Sichuan, Xizang, Yunnan.

3. *Aleuritopteris squamosa* (C. Hope & C. H. Wright) Ching, Hong Kong Naturalist 10: 199. 1941.

毛叶粉背蕨 mao ye fen bei jue

Pellaea squamosa C. Hope & C. H. Wright, J. Linn. Soc., Bot. 35: 518. 1903; *Cheilanthes hopeana* C. Christensen; *Doryopteris squamosa* (C. Hope & C. H. Wright) C. Christensen.

Rhizomes erect, short; scales bicolorous, black, with light brown margins, lanceolate. Fronds clustered. Stipe 5–15 cm, chestnut-colored, densely covered with light brown, broadly lanceolate, often slightly bicolorous scales, becoming sparsely scaly with age. Lamina brownish green, pentagonal, nearly as long as broad, 5–10 cm, 3-pinnatifid, thickly papery when dry, abaxially with snow-white farina and membranous, translucent, light brown, broadly lanceolate scales with margins erose-serrulate, adaxially glabrous, apex shortly acuminate. Pinnae 5–7 pairs, connected by a narrow wing; basal pair largest, subtriangular, 4–5 cm, obliquely spreading upward, 2-pinnatifid; pinnules 4–6 pairs, proximal basicopic pinnule largest, 3–3.5 × 1–1.5 cm, obliquely spreading; ultimate segments 3 or 4 pairs, 3–8 × ca. 2 mm; second and upper pairs of pinnae gradually shortened distally, lanceolate or oblong-lanceolate, pinnatifid, base decurrent and connected to rachis by broad

wings, apex shortly acute. Sori consisting of few sporangia. False indusia continuous, narrow, membranous, margins entire.

• Rock crevices or under shrubs in dry hot valleys; 400–1000 m. Hainan, S Yunnan.

Aleuritopteris squamosa is quite distinct and is distinguished from other species of the genus with pentagonal fronds by the presence of scales on abaxial lamina, which also has dense, snow-white farina.

4. *Aleuritopteris pygmaea* Ching in S. K. Wu, Acta Phytotax. Sin. 19: 61. 1981.

矮粉背蕨 ai fen bei jue

Rhizomes ascending, short; scales bicolorous, dark brown with light brown margins, lanceolate. Fronds clustered. Stipe reddish brown, 1–2 cm, densely covered with concolorous brown scales and fibrous, twisted hairs, these extending onto rachis and costae. Lamina ovate, 1.3–1.5 × ca. 1 cm, bipinnatifid, papery when dry, abaxially with snow-white farina and sparse hairs, adaxially glabrous. Pinnae 3 or 4 pairs, opposite, slightly oblique upward; basal pair of pinnae widely separated from adjacent one, ca. 0.6 cm, pinnatifid; ultimate segments 3 or 4 pairs, obliquely spreading, basal basicopic segment larger, entire; second pair of pinnae subequal to or slightly longer than basal one, base decurrent or not. Veins obscure. Sori sparse, discontinuous, consisting of 2 or 3 sporangia. False indusia continuous, narrow, margins entire.

• Rock crevices in valleys; 3800–3900 m. Xizang.

Aleuritopteris pygmaea is the smallest species in the genus. It is distinguished from other species by its reddish brown stipe, which is densely covered with scales and twisted, long hairs.

We have not seen material of *Aleuritopteris mengshanensis* F. Z. Li (Acta Phytotax. Sin. 22: 153. 1984), described from Shandong. It appears to be most closely related to *A. pygmaea* but without the twisted hairs on the stipe.

5. *Aleuritopteris speciosa* Ching & S. K. Wu, Acta Phytotax. Sin. 19: 61. 1981.

美丽粉背蕨 mei li fen bei jue

Rhizomes erect, short; scales concolorous, reddish brown, narrowly lanceolate. Fronds usually clustered. Stipe reddish brown, lustrous, 10–18 cm. Lamina dark green, pentagonal, nearly as long as broad, ca. 4 cm, pinnate-bipinnatifid, leathery to thinly leathery when dry, abaxially with dense snow-white farina, adaxially glabrous or with sparse white farina, apex shortly acuminate; rachis, costae, and costules dark brown, lustrous. Pinnae 3 or 4 pairs, opposite, oblique, separated from each other; basal pair largest, deltoid, ca. 2 × 2 cm, 2-pinnate-pinnatifid, apex acuminate; acroscopic pinnules pinnatifid; proximal basicopic pinnule larger, elliptic, ca. 1.5 × 1 cm, 1-pinnate-pinnatifid; second and upper pairs of pinnae gradually shortened distally, pinnatifid. Veins pinnate, obscure. Sori consisting of 1 or 2 sporangia, discrete. False indusia pale green, broad, thickly membranous.

• Rock crevices; ca. 3100 m. E Xizang (Zhag'yab).

Aleuritopteris speciosa is a rare small fern, known thus far only from the type (PE).

6. *Aleuritopteris niphobola* (C. Christensen) Ching, Hong Kong Naturalist 10: 197. 1941.

雪白粉背蕨 xue bai fen bei jue

Cheilanthes niphobola C. Christensen, Acta Horti Gothob. 1: 88. 1924; *Aleuritopteris niphobola* var. *concolor* Ching; *A. niphobola* var. *pekingensis* Ching & Y. P. Hsu.

Rhizomes erect, short; scales concolorous or often bicolorous, uniformly reddish brown or with dark central stripe and lighter margins, lanceolate. Fronds clustered. Stipe reddish brown or ebony, 4–13 cm, glabrous or occasionally with sparse scales as those of rhizome. Lamina dark green, pentagonal, nearly as long as broad, 1.5–4 cm, tripinnatifid, papery or herbaceous when dry, abaxially with snow-white farina, adaxially glabrous; rachis and costae of same color as stipe. Pinnae 2 or 3 pairs, connected to rachis by narrow wings; basal pair largest, triangular, inequilateral, bipinnatifid; basal basicopic pinnule largest, pinnatifid; ultimate segments narrowly oblong, margins entire; second pinnae oblong-lanceolate or lanceolate, pinnatifid or entire. Veins pinnate, obscure. Sori consisting of 1–3 sporangia, discrete. False indusia continuous, pale green, broad, margins entire.

• Rock crevices; 300–3400 m. Gansu, Hebei, Nei Mongol, Ningxia, Shaanxi, Shanxi, Sichuan, Xizang.

Aleuritopteris niphobola var. *concolor* was based on a specimen from Gansu apparently lacking abaxial frond farina. Examination of the type specimen at PE reveals that it possesses dense farinose glands abaxially but that the farina were lost during the drying process.

7. *Aleuritopteris likiangensis* Ching in S. K. Wu, Acta Phytotax. Sin. 19: 64. 1981.

丽江粉背蕨 li jiang fen bei jue

Rhizomes erect, short; scales concolorous, dark brown to black, narrowly lanceolate. Fronds clustered. Stipe ebony, lustrous, 5–20 cm, base covered with reddish brown, concolorous, lanceolate scales. Lamina dark green, ovate-pentagonal, (4–)6–15 × (4–)6–12 cm, 3-pinnatifid, thinly leathery when dry, abaxially with white farina, also appearing to have contrasting red glands (these actually red terminal cells of farinose glands), adaxially glabrous, apex long acuminate or caudate; rachis and costae of same color as stipe. Pinnae 2–4 pairs, sessile, basal pair largest, subtriangular, 2-pinnatifid; pinnules 4 or 5 pairs, basal basicopic pinnule largest, 4–6.5 cm × 3–4 mm, 1-pinnatifid; second and third pinnae gradually shortened distally, narrowly triangular, 1-pinnatifid. Veins pinnate, obscure. Sori consisting of 3 to several sporangia, confluent at maturity. False indusia continuous, margins entire.

• Rock crevices in dry hot valleys; 1500–2900 m. SW Sichuan, NW Yunnan.

Specimens of *Aleuritopteris likiangensis* and *A. veitchii* are often difficult to separate. Many specimens determined as *A. veitchii* have at least some colored apical cells on farinose glands, especially along costae, but they are tan rather than red. The species are retained here provisionally but in the future may prove to be merely forms of a single species.

8. *Aleuritopteris veitchii* (Christ) Ching, Hong Kong Naturalist 10: 200. 1941.

金爪粉背蕨 jin zhua fen bei jue

Doryopteris veitchii Christ, Bull. Acad. Int. Géogr. Bot. 16: 134. 1906; *Aleuritopteris cremea* Ching; *Cheilanthes veitchii* (Christ) Ching.

Rhizomes ascending, short; scales concolorous, dark brown to black, narrowly lanceolate. Fronds clustered. Stipe chestnut-red to dark brown, lustrous, 8–15 cm, with reddish brown, linear scales at base. Lamina brownish green, ovate-pentagonal, 7–15 × 5–10 cm, pinnate-bipinnatifid, papery when dry, abaxially with white or milky yellow farina, often also with at least some farinose glands having apical cell tan to pale red, adaxially glabrous; rachis and costae of same color as stipe. Pinnae 4 or 5 pairs, sessile, separated from each other, basal pair largest, subtriangular, 1-pinnate-pinnatifid; pinnules 4–7 pairs, basal basicopic pinnule largest, 3–4 × 1–2 cm, 1-pinnatifid; ultimate segments oblong or ovate. Veins pinnate, obscure. Sori consisting of 3 to several sporangia, borne at vein tips. False indusia continuous, membranous, margins entire.

• Rock crevices; 1300–2000 m. Guangxi, S and SW Sichuan.

In earlier references, *Aleuritopteris veitchii* sometimes was confused with *A. duclouxii* var. *sulphurea*, which has bicolorous rhizome scales.

9. *Aleuritopteris tamburii* (Hooker) Ching, Hong Kong Naturalist 10: 198. 1941.

阔羽粉背蕨 kuo yu fen bei jue

Rhizomes erect, short; scales bicolorous, brown or reddish brown with lighter margins, lanceolate. Fronds clustered. Stipe reddish brown, lustrous, 10–35 cm, scaly at base; scales mostly bicolorous, narrowly lanceolate. Lamina pentagonal, 8–15(–24) × 6–12(–18) cm, tripinnatifid to pinnate-bipinnatifid, herbaceous or papery when dry, abaxially with snow-white farina or rarely glabrous, adaxially glabrous; rachis and costae chestnut-brown. Pinnae 3–5 pairs, sessile, connected by broad wings, distal lobes oblong, oblong-triangular, or nearly semicircular, with narrow V-shaped sinuses between lobes; basal pair largest, 7–8 × 4–5 cm, triangular, obliquely spreading upward, 2-pinnatifid, medial pinnae rounded or bluntly pointed at tips; pinnules 4 or 5 pairs, basal basicopic pinnule largest; second pair of pinnae shorter than basal and third ones, simple, triangular; other pairs gradually shortened distally; ultimate segments closely spaced, deltoid or ovate, broad, apex obtuse. Veins pinnate, distinct. Sori consisting of 3 to several sporangia, borne at vein tips. False indusia continuous, narrow, margins entire.

Thickets, rock crevices in dry hot valleys; 1900–2700 m. S Sichuan, NW Yunnan [India, Nepal].

Aleuritopteris tamburii is easily distinguished from related taxa in its large fronds that are coarsely dissected and with broad, somewhat rounded ultimate segments.

- 1a. Fronds with white farina abaxially 9a. var. *tamburii*
1b. Fronds glabrous, lacking farina abaxially ... 9b. var. *viridis*

9a. *Aleuritopteris tamburii* var. *tamburii*

阔羽粉背蕨(原变种) kuo yu fen bei jue (yuan bian zhong)

Pellaea tamburii Hooker, Sp. Fil. 2: 134. 1858; *Allosorus*

tamburii (Hooker) Kuntze; *Cheilanthes argentea* (S. G. Gmelin) Kunze var. *tamburii* (Hooker) Beddome; *C. tamburii* (Hooker) T. Moore; *Doryopteris tamburii* (Hooker) C. Christensen.

Fronds with white farina abaxially.

Thickets, rock crevices in dry hot valleys; 1900–2700 m. S Sichuan, NW Yunnan [India, Nepal].

9b. *Aleuritopteris tamburii* var. *viridis* H. S. Kung, Acta Bot. Yunnan. 5: 356. 1983.

深绿阔羽粉背蕨 shen lü kuo yu fen bei jue

Fronds glabrous abaxially.

• Rare, in rock crevices; ca. 2000 m. SW Sichuan (Yanbian).

10. *Aleuritopteris yalungensis* H. S. Kung, Acta Bot. Yunnan. 5: 356. 1983.

雅砻粉背蕨 ya long fen bei jue

Rhizomes ascending, short; scales bicolorous, dark brown with lighter margins, linear-lanceolate. Fronds clustered. Stipe brown or reddish brown, lustrous, 18–25 cm. Lamina ovate-pentagonal, 15–24 × 12–18 cm, 3-pinnatifid, papery when dry, abaxially with white farina, adaxially glabrous; rachis and costae brown. Pinnae 5 or 6(–8) pairs, angled obliquely upward, decurrent at base, distal lobes linear to narrowly oblong, with broad U-shaped sinuses between lobes; basal pair largest, 8–12 × 4–9 cm, triangular, inequilateral, 2-pinnatifid, medial pinnae attenuate at tips; pinnules ca. 5 pairs, alternate, basal basicopic pinnule largest, 5–7 × 1.5–2 cm, lanceolate, pinnatifid; second pinnae shorter than basal one and third one, 2–4 cm × 5–8 mm, other pairs gradually shortened distally, lanceolate, 1-pinnatifid or simple; ultimate segments distant from each other, lanceolate, narrow. Veins pinnate, obscure. Sori consisting of 3 to several sporangia, borne at vein tips. False indusia continuous, gray, membranous, margins entire.

• Rare; ca. 2000 m. SW Sichuan (Dechang).

Aleuritopteris yalungensis resembles *A. tamburii* but differs in its finely dissected fronds and lanceolate ultimate segments.

11. *Aleuritopteris argentea* (S. G. Gmelin) Fée, Mém. Foug. 5: 154. 1852.

银粉背蕨 yin fen bei jue

Rhizomes erect or ascending; scales bicolorous, brown with lighter margins, lanceolate. Fronds clustered. Stipe chestnut-colored to black, lustrous, 10–22 cm, scaly at base. Lamina pentagonal or ovate-pentagonal, 5–13 × 5–10 cm, 3-pinnatifid, papery or somewhat leathery when dry, adaxially glabrous; rachis and costae of same color as stipe. Pinnae 3–5 pairs, opposite; basal pair largest, 3–5 × 2–4 cm, right-triangular; pinnules 3 or 4 pairs, proximal basicopic pinnule largest, 2–2.5 cm × 5–10 mm, oblong-lanceolate, pinnatifid or simple; other pairs gradually shortened distally, lanceolate, 1-pinnatifid or simple; ultimate segments deltoid or falcate. Veins pinnate, obscure. Sori consisting of 3 to several sporangia, confluent at maturity. False indusia continuous, yellowish green, membranous, margins entire. $2n = 116$.

Limestone crevices, cliffs, rock walls; below 3900 m. Widely dis-

tributed throughout China [Bhutan, Japan, Korea, Mongolia, Nepal, Russia].

- 1a. Fronds with white or pale yellow farina abaxially 11a. var. *argentea*
 1b. Fronds glabrous, lacking farina abaxially 11b. var. *obscura*

11a. *Aleuritopteris argentea* var. *argentea*

银粉背蕨(原变种) yin fen bei jue (yuan bian zhong)

Pteris argentea S. G. Gmelin, Novi Comment. Acad. Sci. Imp. Petrop. 12: 519. 1768; *Aleuritopteris argentea* var. *flava* Ching & S. K. Wu; *A. argentea* var. *geraniifolia* Ching & S. K. Wu; *A. argentea* var. *major* Ching; *A. michelii* (Christ) Ching; *A. qianguiensis* W. M. Chu & H. G. Zhou; *A. subargentea* Ching; *Allosorus argenteus* (S. G. Gmelin) C. Presl; *Cheilanthes argentea* (S. G. Gmelin) Kunze; *C. subargentea* (Ching) C. M. Kuo; *Doryopteris argentea* (S. G. Gmelin) Christ; *D. michelii* Christ.

Fronds with white or pale yellow farina abaxially.

Limestone crevices or rock walls; below 3900 m. Widely distributed throughout China [Bhutan, Japan, Korea, Mongolia, Nepal, Russia].

Aleuritopteris qianguiensis refers to specimens in which the laminae appear glandular but not farinose abaxially. This likely resulted from the drying process, as application of heat during pressing can cause the farina to melt and soak into the pressing papers.

11b. *Aleuritopteris argentea* var. *obscura* (Christ) Ching, Hong Kong Naturalist 10: 198. 1941.

陕西粉背蕨 shan xi fen bei jue

Cheilanthes argentea var. *obscura* Christ, Nuovo Giorn. Bot. Ital., n.s., 4: 88. 1897; *Aleuritopteris nuda* Ching; *A. shensiensis* Ching.

Fronds finely dissected, glabrous, lacking farina abaxially.

• Rock crevices; below 2600 m. Gansu, Guizhou, Hebei, Henan, Liaoning, Qinghai, Shandong, Shaanxi, Shanxi, Sichuan, Yunnan.

12. *Aleuritopteris duclouxii* (Christ) Ching, Hong Kong Naturalist 10: 199. 1941.

裸叶粉背蕨 luo ye fen bei jue

Rhizomes ascending, short; scales bicolorous, dark brown to black with lighter margins, lanceolate. Fronds clustered. Stipe reddish brown to black, lustrous, 6–25 cm, scaly at base; scales mostly bicolorous, narrowly lanceolate. Lamina pentagonal or ovate-pentagonal, nearly as long as broad, 5–13 × 5–10 cm, pinnate-pinnatifid to tripinnatifid, thinly leathery when dry, apex acuminate; rachis and costae of same color as stipe. Pinnae 2 or 3 pairs, basal pair largest, 3–5 × 2–4 cm, triangular; pinnules 3 or 4 pairs, basal basicopic pinnule largest, 2–2.5 cm × 5–10 mm, oblong-lanceolate, pinnatifid or simple; other pairs gradually shortened distally, lanceolate, 1-pinnatifid or simple; ultimate segments deltoid or falcate. Veins pinnate, obscure. Sori consisting of several sporangia, confluent at maturity. False indusia continuous, yellowish green, membranous, margins entire.

• Rock crevices or rock outcrops in forests; 800–2300 m. Guangxi, Guizhou, Hunan, Sichuan, Yunnan.

- 1a. Lamina glabrous on both surfaces 12a. var. *duclouxii*
 1b. Lamina glabrous adaxially, with light
 yellow farina abaxially 12b. var. *sulphurea*

12a. *Aleuritopteris duclouxii* var. *duclouxii*

裸叶粉背蕨(原变种) *luo ye fen bei jue* (yuan bian zhong)

Doryopteris duclouxii Christ, Bull. Acad. Int. Géogr. Bot. 11: 231. 1902; *Cheilanthes duclouxii* (Christ) Ching; *D. mairei* Brause; *D. muralis* Christ.

Lamina relatively coarsely dissected, glabrous on both surfaces; pinnae strongly inequilateral; basal basiscopic pinnules much longer than acroscopic ones.

• Rock crevices; 800–2300 m. Guangxi, Guizhou, Hunan, Sichuan, Yunnan.

12b. *Aleuritopteris duclouxii* var. *sulphurea* (Ching) Ching, Hong Kong Naturalist 10: 199. 1941.

硫磺粉背蕨 *liu huang fen bei jue*

Cheilanthes duclouxii var. *sulphurea* Ching, Icon. Filic. Sin. 3: 133. 1935.

Lamina finely dissected, with light yellow farina abaxially, glabrous adaxially; basal basiscopic pinnules longer to much longer than acroscopic ones.

• Rock crevices, in woods; 1300–2200 m. Sichuan, Yunnan.

13. *Aleuritopteris sichouensis* Ching & S. K. Wu, Acta Phytotax. Sin. 19: 69. 1981.

西畴粉背蕨 *xi chou fen bei jue*

Rhizomes erect, short; scales bicolorous, brown with lighter margins, subulate. Fronds clustered. Stipe black, lustrous, 15–25 cm × 1–1.5 mm, scaly only at base, densely covered with short, dark brown glands. Lamina ovate-deltoid or ovate-lanceolate, 12–15 × 8–10 cm, pinnate-bipinnatifid, leathery when dry, abaxially with white farina, adaxially glabrous; rachis and costae with same glands as stipe; pinnae 8–10 pairs, opposite, basal ones largest, ovate-lanceolate, bipinnatifid; pinnules 6–8 pairs, alternate; proximal basiscopic pinnules largest, linear-lanceolate, 2–2.5 cm × 3–4 mm, pinnatifid; ultimate segments 4 or 5 pairs, deltoid; second and upper pairs of pinnae gradually shortened distally, lanceolate, bipinnatifid. Veins obscure. Sori consisting of 3 or 4 sporangia. False indusia continuous, poorly developed, narrow, margins entire.

• Limestone cliffs; 1400–1500 m. S Yunnan (Xichou).

Aleuritopteris sichouensis is distinguished from other species of the genus by its glandular stipe and rachis, subulate rhizome scales, and very narrow false indusia.

14. *Aleuritopteris ebenipes* X. C. Zhang, Acta Phytotax. Sin. 32: 94. 1994.

黑柄粉背蕨 *hei bing fen bei jue*

Rhizomes ascending, short; scales inconspicuously bicolorous, black with very narrow brown margins, lanceolate.

Fronds clustered. Stipe black, lustrous, 5–12 cm, scaly at base; basalmost scales black, with narrow brown margins, grading to concolorous, lanceolate. Lamina deltoid, 5–10 × 4–8 cm, pinnate-bipinnatifid, papery, abaxially with milky yellow farina, adaxially glabrous; rachis similar to stipe; pinnae 5 or 6 pairs, sessile, basal pair largest, deltoid, strongly inequilateral, 2–4 × 1.5–3 cm, bipinnatifid; pinnules 6 or 7 pairs, proximal basiscopic pinnules largest, oblong, up to 3 cm, pinnatifid; other pairs gradually shortened distally, lanceolate, 1-pinnatifid or simple; ultimate segments deltoid to narrowly oblong or lanceolate. Veins pinnate, obscure. Sori consisting of several sporangia, confluent at maturity. False indusia continuous, narrow, membranous, with subentire margins.

• Rock crevices; 500–1300 m. Guizhou (Danzhai, Guiding, Pingfa).

Aleuritopteris ebenipes is similar to *A. veitchii* in its lamina being covered with milky yellow farina abaxially but differs in its bicolorous scales with brown, narrow margins, which in some specimens can be difficult to detect. The difference noted in couplet 3 of the key of the triangular-ovate lamina in *A. ebenipes* (vs. pentagonal in *A. veitchii*) also may provide a clue for distinguishing these two species. However, some specimens can be difficult to assign to one or the other of these taxa. Further research is needed on separation of *A. ebenipes* from *A. veitchii*.

15. *Aleuritopteris chrysophylla* (Hooker) Ching, Hong Kong Naturalist 10: 201. 1941.

金粉背蕨 *jin fen bei jue*

Cheilanthes chrysophylla Hooker, Sp. Fil. 2: 113. 1852; *Aleuritopteris flavopygmaea* S. R. Ghosh; *A. humatifolia* X. C. Zhang & L. Shi; *Cheilanthes argentea* (S. G. Gmelin) Kunze var. *chrysophylla* (Hooker) Hooker; *C. farinosa* (Forsskål) Kaulfuss var. *chrysophylla* (Hooker) C. B. Clarke.

Rhizomes erect, short; scales concolorous, dark brown, linear-lanceolate to lanceolate. Fronds clustered. Stipe reddish brown or ebony, lustrous, 2–10 cm × ca. 1 mm, sparsely scaly above base; scales concolorous, reddish brown, linear-lanceolate. Lamina ovate-deltoid, 3–5 × 2–3 cm, pinnate-pinnatifid to bipinnatifid, papery or thinly leathery when dry, abaxially with golden-yellow farina, adaxially glabrous; rachis and costae same color as stipe; pinnae 3 or 4 pairs, subopposite, sessile, basal pair largest, triangular, pinnatifid; pinnules 3 or 4 pairs, alternate; basal basiscopic pinnules largest, lanceolate; second and upper pairs of pinnae gradually shortened distally, lanceolate, pinnatifid. Veins obscure. Sori consisting of several sporangia, confluent at maturity. False indusia continuous, membranous, margins undulate. $2n = 60$.

Rock crevices; 1000–2600 m. Guangxi, Hainan, Yunnan [Bhutan, India, Nepal].

16. *Aleuritopteris krameri* (Franchet & Savatier) Ching, Hong Kong Naturalist 10: 202. 1841.

克氏粉背蕨 *ke shi fen bei jue*

Cheilanthes krameri Franchet & Savatier, Enum. Pl. Jap. 2: 212, 619–620. 1879; *Aleuritopteris agetae* Saiki; *C. agetae* (Saiki) C. M. Kuo.

Rhizomes erect, short; scales bicolorous, black with narrow brown margins, lanceolate. Fronds clustered. Stipe dark brown, lustrous, 10–25 cm × 1–1.5 mm, scaly from base nearly to midpoint; basalmost scales similar to rhizome scales, grading abruptly to concolorous, orangish brown, and broadly lanceolate. Lamina triangular or ovate-triangular, 6–20 × 4–12 cm, pinnate-bipinnatifid, papery or herbaceous when dry, abaxially with milky yellow or white farina, adaxially glabrous; pinnae 5–9 pairs, separated from each other by wingless rachis, basal pair triangular or triangular-lanceolate, 2–5 × 1–3 cm, bipinnatifid; basal basicopic pinnules largest, pinnatifid; second and third pairs of pinnae with same shape as basal pair, but shorter and narrower; distal pinnae lanceolate. Veins obscure. Sori consisting of 5–7 sporangia, confluent at maturity. False indusia usually interrupted, broad, margins undulate to irregularly crenate, somewhat corrugate, usually farinose externally.

Rock crevices on slopes or cliffs; 1800–2700 m. Taiwan [Japan, Thailand].

The status of the Taiwanese endemic *Aleuritopteris agetae* remains unresolved. This taxon is said to differ from *A. krameri* s.s. in its milky yellow (vs. white) farina and stipe scales that are sometimes slightly bicolorous. Ralf Knapp (pers. comm.), the author of a recent authoritative guide to the pteridophytes of Taiwan, *Ferns and Fern Allies of Taiwan* (2011), has stated that where the two taxa grow together they are readily distinguishable in the field. However, based on examination of herbarium material collected in Taiwan, the present authors could not consistently discern two discrete morphological entities. Some of the specimens from mainland China also appear to have milky-colored farina. The situation requires further study.

17. *Aleuritopteris formosana* (Hayata) Tagawa, Acta Phytotax. Geobot. 14: 191. 1952.

台湾粉背蕨 tai wan fen bei jue

Cheilanthes formosana Hayata, Enum. Pl. Formosa, 612. 1906; *C. anceps* Blanford var. *brevifrons* Khullar; *C. brevifrons* (Khullar) Khullar.

Rhizomes erect, short; scales bicolorous, black with pale brown margins, narrowly lanceolate. Fronds clustered. Stipe dark brown, lustrous, 5–23 cm × 1–2 mm, scaly up to rachis; scales bicolorous, grading to concolorous above stipe midpoint, lanceolate. Lamina oblong-lanceolate, 4–17 × 2–7 cm, pinnate-bipinnatifid, papery when dry, abaxially with white farina, adaxially glabrous; rachis and costae same color as stipe; pinnae 4–6 pairs, discrete along rachis, basal pair triangular, bipinnatifid; acroscopic ones smaller, basal basicopic pinnules largest, 1.5–2.5 × 0.5–1 cm, lanceolate, pinnatifid; second pair of pinnae oblong-lanceolate, shorter and narrower than basal one; third and upper pairs of pinnae lanceolate. Veins obscure. Sori consisting of several sporangia, confluent at maturity. False indusia membranous, relatively broad, interrupted, margins lacinate. $2n = 60$.

Rock crevices on slopes; 600–2000 m. Fujian, Guangdong, Guangxi, Guizhou, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Pakistan, Philippines, Thailand].

18. *Aleuritopteris gongshanensis* G. M. Zhang, Novon 14: 513. 2004.

贡山粉背蕨 gong shan fen bei jue

Plants 20–30 cm tall. Rhizomes erect, short; scales concolorous, black or dark brown, lanceolate, ca. 0.5 × 6 mm. Fronds clustered. Stipe ebeneous, lustrous, 10–18 cm × 1–1.5 mm, scaly at base, scales similar to those of rhizome. Lamina ovate-deltoid, 8–13 × 4.5–8.5 cm, pinnate-bipinnatifid, papery or somewhat leathery, abaxially with white farina, adaxially glabrous, apex caudate; rachises similar to stipes, grooved adaxially; pinnae 5–8 pairs, usually opposite or sometimes alternate, oblique, sessile, basal pinnae largest, deltoid, strongly inequilateral, 4–7 × 4–5 cm, bipinnatifid; pinnules 4–7 pairs, alternate; acroscopic pinnules much smaller, usually simple, ca. 8 × 3 mm, broadly adnate to costa, apex obtuse; basal basicopic pinnules largest, oblong, ca. 4 × 1.5 cm, pinnatifid; ultimate segments 4 or 5 pairs, oblong to ovate, middle ones to 1.5 × 0.3 cm; second pinnae 1.5–4 cm, apart from basal ones, similar but smaller; upper pairs gradually shortened distally. Sori consisting of several sporangia, confluent at maturity. False indusia narrow, membranous, continuous, with denticulate margins.

• Under thickets in dry hot valleys; 1000–1700 m. C and NW Yunnan.

Aleuritopteris gongshanensis is similar to *A. veitchii* in its concolorous rhizome scales but differs in its ovate-deltoid fronds with white farina abaxially, false indusia margins distinctly lacerate, and spores with a reticulate-cristate perine.

19. *Aleuritopteris dealbata* (C. Presl) Fée, Gen. Filic. 5: 154. 1852.

无盖粉背蕨 wu gai fen bei jue

Allosorus dealbatus C. Presl, Tent. Pterid. 153. 1836, based on *Cheilanthes dealbata* D. Don, Prodr. Fl. Nepal. 16. 1825, not Pursh (1813); *Aleuritopteris doniana* S. K. Wu, nom. illeg. superfl.; *A. interrupta* Saiki; *A. sikkimensis* S. R. Ghosh; *C. doniana* Fraser-Jenkins & Khullar.

Rhizomes erect, short; scales bicolorous, black with pale margins, lanceolate. Fronds clustered. Stipe dark brown to black, (15–)20–35 cm × 1.5–2 mm, sparsely scaly at base; scales lanceolate, those at stipe base bicolorous, dark brown with lighter margins, often grading to concolorous above. Lamina lanceolate to somewhat oblong-lanceolate, 20–40 × 7–16 cm, pinnate-bipinnatifid, papery or thinly leathery when dry, abaxially with white farina, adaxially glabrous, apex acuminate; rachis and costae same color as stipe; pinnae 5–20 pairs, sessile, distinct along rachis, basal pair of pinnae largest, inequilateral, triangular-lanceolate, bipinnatifid; pinnules ca. 10 pairs, acroscopic ones smaller, basal basicopic pinnules largest, 3–4 cm × 1–1.5 mm, pinnatifid; second and third pairs of pinnae of same shape as basal one, but slightly shorter; fourth and upper pairs of pinnae lanceolate. Sori consisting of several sporangia, confluent at maturity. False indusia poorly developed, very narrow, indistinct.

On rocks; 600–1500 m. Guizhou (Xingyi), Yunnan [Bhutan, India, Nepal, Thailand].

This beautiful species is distinguished from its relatives by its large fronds and poorly developed false indusia. Fée listed *Aleuritopteris dealbata* and *A. farinosa* (Forsskål) Fée as distinct taxa in his

diagnosis of his new genus *Aleuritopteris* on p. 153. One must presume therefore that when he cited *Cheilanthes farinosa* Hooker & Greville (Icon. Filic. 2: t. 134. 1831) as a synonym of his *A. dealbata*, he implicitly restricted their account to the Nepalese element. This was first invalidly described by D. Don and validated by C. Presl, who included Hooker and Greville's account within his concept of the taxon. Fée's name was incorrectly treated as invalid by recent Asian authors, but their replacement name, *A. doniana*, must be treated as a superfluous illegitimate name.

20. *Aleuritopteris anceps* (Blanford) Panigrahi, Bull. Bot. Surv. India 2: 321. 1961.

粉背蕨 fen bei jue

Cheilanthes anceps Blanford, J. Simla Naturalists' Soc. 1(2): 21. 1886; *Aleuritopteris farinosa* (Forsskål) Fée var. *anceps* (Blanford) Ching; *A. pseudofarinosa* Ching & S. K. Wu; *A. pseudofarinosa* var. *glandulosa* H. G. Zhou; *A. wuyishanensis* Ching; *C. farinosa* (Forsskål) Kaulfuss var. *anceps* (Blanford) Blanford; *C. pseudofarinosa* (Ching & S. K. Wu) K. Iwatsuki.

Rhizomes erect, short; scales bicolorous, black with pale brown margins, lanceolate. Fronds clustered. Stipe dark brown, lustrous, 8–30 cm × 1–2 mm, scaly toward base; scales sometimes extending up stipe to rachis, those at stipe base bicolorous, dark brown to black with lighter margins, some of distal scales concolorous or darker tipped. Lamina ovate-deltoid, oblong, or ovate-lanceolate, 10–25 × 5–10 cm, pinnate-bipinnatifid, papery or thinly leathery when dry, abaxially with white farina, adaxially glabrous; rachis sometimes with a few scales similar to those of stipe; pinnae 5–10 pairs, distinct along rachis, basal pair inequilateral, triangular, bipinnatifid; pinnules 5–8 pairs, basal basispicopic pinnules largest, much longer than adjacent acroscopic ones, lanceolate, pinnatifid; second and upper pairs of pinnae lanceolate. Veins obscure. Sori consisting of several sporangia, confluent at maturity. False indusia interrupted, membranous, with lacinate margins. $2n = 58, 60, 116$.

Rock crevices on slopes; 300–2600 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Bhutan, India, Kashmir, Nepal, Pakistan].

21. *Aleuritopteris rosulata* (C. Christensen) Ching, Hong Kong Naturalist 10: 197. 1941.

莲座粉背蕨 lian zuo fen bei jue

Cheilanthes rosulata C. Christensen, Acta Horti Gothob. 1: 89. 1924.

Rhizomes erect, short; scales bicolorous, dark brown with light brown margins, narrowly lanceolate. Fronds clustered. Stipe reddish brown, lustrous, 3–8 cm, sparsely scaly; scales concolorous to slightly bicolorous, light brown, linear-lanceolate, thin. Lamina ovate-pentagonal, slightly longer than broad, 2–5 cm, 3-pinnatipartite, thinly herbaceous when dry, abaxially with white farina, adaxially glabrous or sparsely farinose; rachis reddish brown. Pinnae 3–5 pairs; basal pair of pinnae ovate-triangular, apex obtusely acute; basal basispicopic pinnule largest, longer than adjacent acroscopic ones, ca. 1 cm, pinnatipartite, ultimate segments 4 or 5 pairs; second pair of pinnae ovate-lanceolate, ca. 2 × 1 cm, pinnatipartite; other pinnae gradually

shortened distally. Sori sparse, consisting of mostly 2 or 3 sporangia, not fully confluent at maturity. False indusia narrow, membranous, continuous, margins entire to slightly undulate.

• Rock crevices; 1500–2700 m. W Sichuan.

Aleuritopteris rosulata is a rare fern with laminae thin and herbaceous. The species was originally described as having dimorphic fronds, but subsequent collections have shown that this is incorrect.

22. *Aleuritopteris grisea* (Blanford) Panigrahi, Bull. Bot. Surv. India 2: 321. 1961.

阔盖粉背蕨 kuo gai fen bei jue

Cheilanthes grisea Blanford, J. Simla Naturalists' Soc. 1(2): 21. 1886; *Aleuritopteris farinosa* (Forsskål) Fée var. *grisea* (Blanford) Ching; *A. grisea* var. *alpina* (Ching) S. K. Wu; *A. platyklamys* Ching; *A. platyklamys* var. *alpina* Ching; *A. stenochlamys* Ching; *C. farinosa* (Forsskål) Kaulfuss var. *grisea* (Blanford) Blanford; *C. farinosa* f. *minor* C. B. Clarke & Baker; *C. farinosa* var. *tenera* C. B. Clarke & Baker; *C. platyklamys* (Ching) Fraser-Jenkins.

Rhizomes erect, short; scales slightly bicolorous, black with brown margins, narrowly lanceolate. Fronds clustered. Stipe dark brown, lustrous, 5–30 cm × 0.8–2 mm, scaly at base or nearly to midpoint; scales concolorous, reddish brown, broadly lanceolate. Lamina oblong-lanceolate or ovate-lanceolate, (3–)10–20 × 2–14 cm, tripinnatifid, papery or thinly leathery when dry, abaxially with white farina, adaxially glabrous, apex acuminate; rachis and costae same color as stipe; pinnae 6–12 pairs, distinct along rachis, basal pair of pinnae subtriangular, (1–)2–7 × (0.8–)2–3 cm, pinnate-pinnatifid, inequilateral; basal basispicopic pinnules larger than adjacent acroscopic ones, pinnatifid; second and third pairs of pinnae with same shape as pinnae, but slightly shorter and narrower; distal pairs lanceolate, equilateral. Veins obscure. Sori consisting of several sporangia, confluent at maturity. False indusia broad, sometimes nearly to midvein, continuous or somewhat interrupted, margins entire or undulate. $2n = 60$.

Rock crevices on slopes; 1000–4600 m. Guangxi, Guizhou, Hebei, Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Pakistan, Thailand].

The name *Aleuritopteris stenochlamys* refers to populations occurring from N India and C Nepal to SW China (Sichuan, Yunnan, Xizang) at elevations below ca. 3000 m. These plants have relatively large fronds and seem to differ from typical *A. grisea* in their spores (crystate-reticulate vs. echinate-rugulate). *Aleuritopteris grisea* s.l. likely represents a species complex that requires more detailed study to tease apart its cryptic component taxa.

23. *Aleuritopteris albomarginata* (C. B. Clarke) Ching, Hong Kong Naturalist 10: 199. 1941.

白边粉背蕨 bai bian fen bei jue

Cheilanthes albomarginata C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 456. 1880; *C. farinosa* (Forsskål) Kaulfuss var. *albomarginata* (C. B. Clarke) Beddome.

Rhizomes erect, short; scales bicolorous, black with broad, pale margins, lanceolate. Fronds clustered. Stipe dark brown,

lustrous, 6–12 cm × 1–2 mm, scaly; scales black or dark brown, with conspicuous lighter margins, broadly lanceolate. Lamina oblong-deltoid to deltoid, 9–19 × 4–10 cm, pinnate-bipinnatifid at base, papery when dry, with white or pale yellow farina abaxially, also with scales along costae and midveins abaxially, glabrous adaxially; pinnae 3–5 pairs, sessile, distinct along rachis, basal pair of pinnae ovate-deltoid, inequilateral, bipinnatifid; pinnules 6–8 pairs, basal basicopic pinnules larger than adjacent acroscopic ones, 2–3 cm × 0.5–1 mm, lanceolate, pinnatifid; second pair of pinnae with same shape as basal ones; third and upper pairs of pinnae lanceolate, pinnatifid. Sori consisting of several sporangia, confluent at maturity. False indusia broad, often nearly to midvein, interrupted, margins fimbriate. $2n = 58, 60, 116$.

Rock crevices on slopes; 1300–2700 m. Guangxi, Guizhou, Sichuan, S Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Pakistan].

24. *Aleuritopteris dubia* (C. Hope) Ching, Hong Kong Naturalist 10: 200. 1941.

中间粉背蕨 zhong jian fen bei jue

Cheilanthes dubia C. Hope, J. Bombay Nat. Hist. Soc. 12: 528. 1899; *Aleuritopteris subrufa* (Baker) Ching; *C. leveillei* Christ; *C. subrufa* Baker; *C. wusukungii* Miyamoto & H. Ohba.

Rhizomes erect, short; scales bicolorous, black with narrow brown margins, lanceolate. Fronds clustered. Stipe dark brown or black, lustrous, usually noticeably shorter than lamina, 5–15 cm × 1–2 mm, densely scaly and often with multicellular hairs; scales concolorous or somewhat bicolorous with lighter margins, narrowly lanceolate to hairlike. Lamina oblong to deltoid, 6–25 × 4–10 cm, pinnate-bipinnatifid, papery when dry, with white or pale yellow farina abaxially, also with hairlike to narrowly lanceolate scales along costae and midveins abaxially, glabrous or rarely sparsely hairy adaxially; pinnae 4–12 pairs, distinct along rachis, basal pair of pinnae ovate-deltoid, inequilateral, bipinnatifid; basal basicopic segments larger than adjacent acroscopic ones; second and upper pairs of pinnae lanceolate, pinnatifid. Sori consisting of several sporangia, confluent at maturity. False indusia interrupted, with fimbriate margins.

Rock crevices on slopes, rock walls; 1300–2700 m. Guizhou, Sichuan, Yunnan [Bhutan, India, Kashmir, Nepal, Thailand].

Some specimens of *Aleuritopteris dubia* appear to be intermediate between *A. dubia* and *A. albomarginata* or *A. rufa*. The complex requires further study. Some of the intermediates may represent interspecific hybrids.

25. *Aleuritopteris rufa* (D. Don) Ching, Hong Kong Naturalist 10: 200. 1941.

棕毛粉背蕨 zong mao fen bei jue

Cheilanthes rufa D. Don, Prodr. Fl. Nepal. 16. 1825.

Rhizomes erect, short; scales bicolorous, black with narrow brown margins, narrowly lanceolate. Fronds clustered. Stipe dark brown or black, lustrous, usually noticeably shorter than lamina, 3–9 cm × 1–2 mm, densely scaly and hairy; scales light orangish brown, narrowly lanceolate to hairlike. Lamina

oblong, 4–12 × 2–7 cm, pinnate-pinnatifid, herbaceous or papery when dry, with milky yellow farina and also dense hairs and scales abaxially, with sparse linear-lanceolate scales and multicellular hairs adaxially; rachis and costae scales similar to those of stipe; pinnae 4–10 pairs, opposite, sessile, distinct along rachis, often relatively straight and spreading, basal pair of pinnae oblong-triangular or oblong-lanceolate, 2–4 × 1–2 cm, inequilateral, pinnatifid; segments 5–8 pairs, basal basicopic pinnules longer than adjacent acroscopic ones, 1–1.5 cm × 2–4 mm, oblong; second and upper pairs of pinnae oblong-lanceolate, pinnatifid. Sori consisting of several sporangia, confluent at maturity. False indusia interrupted, with fimbriate margins. $2n = 58$.

Rock crevices on slopes, rock walls; 1000–3000 m. Guangxi, Guizhou, Yunnan [India, Kashmir, Myanmar, Nepal, Philippines, Thailand].

26. *Aleuritopteris leptolepis* (Fraser-Jenkins) Fraser-Jenkins, Taxon. Revis. Indian Subcontinental Pteridophytes, 127. 2008.

薄叶粉背蕨 bao ye fen bei jue

Cheilanthes leptolepis Fraser-Jenkins, Bot. Helv. 102: 144. 1992; *Aleuritopteris dalhousiae* (Hooker) Ching, nom. utique rej.; *C. dalhousiae* Hooker, nom. utique rej.; *C. farinosa* (Forskål) Kaulfuss var. *dalhousiae* (Hooker) C. B. Clarke, nom. utique rej.; *Leptolepidium dalhousiae* (Hooker) K. H. Shing & S. K. Wu, nom. utique rej.; *L. leptolepis* (Fraser-Jenkins) Kholia & Punetha.

Rhizomes erect, short; scales bicolorous, black with narrow brown margins, ovate to broadly lanceolate. Fronds clustered. Stipe dark brown, lustrous, shorter than lamina, 10–15 cm, scaly at base or nearly to midpoint; basalmost scales bicolorous, dark brown to black with lighter margins, grading to concolorous, light brown, thin and translucent, ovate to broadly lanceolate. Lamina ovate-triangular, 15–22 × 8–12 cm, pinnate-bipinnatifid, thinly herbaceous when dry, usually farinose during development but becoming non-farinose or nearly so at maturity, glabrous except for inconspicuous hairs at pinna bases abaxially, glabrous adaxially; pinnae 10–12 pairs, basal pair of pinnae triangular-lanceolate, 6–10 × 4–6 cm, bipinnatifid; pinnules 8–10 pairs, basal basicopic segments longer than adjacent acroscopic ones, to 3 cm, lanceolate, pinnatifid; second and upper pairs of pinnae of same shape as basal one, but slightly shorter and narrower. Veins pinnate, relatively conspicuous. Sori consisting of several sporangia, confluent at maturity. False indusia interrupted, membranous, with lacinate margins. $2n = 60$.

Rock crevices in forests; 1900–3500 m. SW Sichuan, SE Xizang, NW Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan, Philippines].

Aleuritopteris leptolepis was long known to Asian botanists as *A. dalhousiae*, but the basionym *Cheilanthes dalhousiae* was typified by a mixed collection and was thus of ambiguous application; the name has been formally rejected preventing further use.

27. *Aleuritopteris duthiei* (Baker) Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 271. 1949.

杜氏粉背蕨 du shi fen bei jue

Cheilanthes duthiei Baker, Ann. Bot. (Oxford) 5: 210. 1891; *Leptolepidium duthiei* (Baker) X. C. Zhang & G. M. Zhang.

Rhizomes erect, short; scales concolorous, dark brown, broadly lanceolate. Fronds clustered. Stipe dark brown to black, 2.5–9 cm, grooved, scaly, at least a few scales extending to rachis; scales concolorous, dark brown to reddish brown, broadly lanceolate at stipe base, grading abruptly to narrowly ovate above base. Lamina oblong-deltoid to ovate-deltoid or subpentagonal, 5–7 × 3–5 cm, pinnate-bipinnatifid to pinnate-tripinnatifid, thinly herbaceous to membranous when dry, non-farinose abaxially but with short, brown to dark brown, capitate glands along costae, costules, and veins, glabrous adaxially; pinnae 4 or 5 pairs, distinct along rachis, basal pair of pinnae oblong-deltoid, ca. 1.5 × 1 cm, bipinnatifid to tripinnatifid; pinnules 3 or 4 pairs, proximal basicopic ones largest, pinnatifid to pinnate; second and upper pairs of pinnae same shape as basal one, but slightly shorter and narrower. Veins pinnate, relatively conspicuous. Sori consisting of 2–4 sporangia, confluent at maturity. False indusia interrupted, margins irregularly crenate or dentate.

Rock crevices; 3500–4400 m. SW Sichuan, Xizang [Bhutan, India, Nepal].

Aleuritopteris duthiei is a relatively small-fronded species, readily distinguished from other species of the genus by its lamina not farinose or villous; the grooved stipes and rachises; and the distinctive, dense, short, brown to dark brown capitate glands on costae, costules, and veins abaxially. It is apparently a rare species, occasionally collected at high elevations in the Himalayan region.

28. *Aleuritopteris subvillosa* (Hooker) Ching, Hong Kong Naturalist 10: 203. 1941.

绒毛粉背蕨 rong mao fen bei jue

Rhizomes erect, short; scales concolorous or slightly bicolorous, brown, occasionally with lighter margins, sometimes slightly translucent, lanceolate. Fronds clustered. Stipe dark brown to black, lustrous, 10–15 cm, scaly at base or to midpoint of stipe; scales concolorous or bicolorous, light brown or brown with lighter margins, broadly ovate to ovate-lanceolate with filiform tips. Lamina oblong-lanceolate, 15–30 × 3–10 cm, pinnate-bipinnatifid, thinly herbaceous when dry, abaxially hairy along costae and costules, sometimes also with white farina abaxially, adaxially glabrous; pinnae 7–10 pairs, widely separated along rachis, basal pair of pinnae elliptic-triangular, 3–4 × 2–3 cm, sessile, bipinnatifid; pinnules 4 or 5 pairs, basal basicopic segments longer than adjacent acroscopic ones, 1.5–2 cm × 7–10 mm, oblong, pinnatifid; second pair of pinnae triangular, slightly longer than basal pair; third and upper pairs gradually shortened distally. Veins pinnate, relatively conspicuous. Sori consisting of several sporangia, confluent at maturity. False indusia herbaceous, continuous or rarely discontinuous, margins undulate. $2n = 60$, ca. 120.

Under shrubs or in rock crevices, usually on dry slopes; 2000–3900 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal].

1a. Lamina without farina abaxially,

except sometimes on developing

fronds 28a. var. *subvillosa*

1b. Lamina with moderate to dense

farina abaxially at maturity 28b. var. *tibetica*

28a. *Aleuritopteris subvillosa* var. *subvillosa*

绒毛粉背蕨(原变种) rong mao fen bei jue (yuan bian zhong)

Cheilanthes subvillosa Hooker, Sp. Fil. 2: 87. 1852; *Aleuritopteris subvillosa* var. *dilatata* (Brause) H. S. Kung; *C. yunnanensis* Brause; *C. yunnanensis* var. *dilatata* Brause; *Leptolepidium subvillosum* (Hooker) K. H. Shing & S. K. Wu; *L. subvillosum* var. *dilatatum* (Brause) K. H. Shing & S. K. Wu.

Lamina hairy but lacking farina abaxially at maturity, sometimes somewhat white farinose when young.

Under shrubs and in rock crevices; 2000–3900 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal].

Although plants of *Aleuritopteris subvillosa* var. *subvillosa* are easily distinguished from the relatively densely farinose var. *tibetica*, there is a lot of variation among populations. In most cases, plants with non-farinose mature fronds produce at least some farina on fiddleheads. Additionally, some plants have sparse abaxial farina persistent on mature fronds.

28b. *Aleuritopteris subvillosa* var. *tibetica* (Ching & S. K. Wu) H. S. Kung, Fl. Sichuan. 6: 258. 1988.

西藏粉背蕨 xi zang fen bei jue

Leptolepidium subvillosum var. *tibeticum* Ching & S. K. Wu, Acta Bot. Yunnan. 1(1): 116. 1979.

Lamina moderately to densely white farinose abaxially, also hairy.

• Rock crevices on dry slopes; usually above 3500 m. S and SW Sichuan, Xizang, NW Yunnan.

29. *Aleuritopteris kuhni* (Milde) Ching, Hong Kong Naturalist 10: 202. 1941.

华北粉背蕨 hua bei fen bei jue

Cheilanthes kuhni Milde, Bot. Zeitung (Berlin) 25: 149. 1867; *Aleuritopteris caesia* (Christ) Ching; *A. caesia* var. *efarinosa* H. S. Kung, Li Bing Zhang & X. S. Guo; *A. kuhni* var. *brandtii* (Franchet & Savatier) Tagawa; *A. kuhni* f. *efarinosa* (Makino) Tagawa; *A. tenella* (Ching & S. K. Wu) Saiki; *C. brandtii* Franchet & Savatier; *C. brandtii* var. *efarinosa* Makino; *C. caesia* Christ; *C. farinosa* (Forsskål) Kaulfuss var. *brandtii* (Franchet & Savatier) C. Christensen; *C. kuhni* var. *brandtii* (Franchet & Savatier) Tagawa; *C. kuhni* var. *caesia* (Christ) C. Christensen; *C. kuhni* f. *gracilis* Kitagawa; *C. lanceolata* C. Christensen; *Leptolepidium caesium* (Christ) K. H. Shing & S. K. Wu; *L. kuhni* (Milde) K. H. Shing & S. K. Wu; *L. kuhni* var. *brandtii* (Franchet & Savatier) K. H. Shing & S. K. Wu; *L. tenellum* Ching & S. K. Wu.

Rhizomes erect, short; scales bicolorous, black with reddish brown margins, broadly lanceolate. Fronds clustered. Stipe reddish brown, lustrous, 10–20 cm, scaly at base or to midpoint of stipe; scales bicolorous, brown with lighter margins, translucent, narrowly ovate to ovate-lanceolate. Lamina oblong-lan-

ceolate, 15–30 × 5–13 cm, pinnate-bipinnatifid, herbaceous when dry, abaxially with white farina or rarely non-farinoso and usually glabrous, adaxially glabrous; pinnae 8–12 pairs, sessile or subsessile, distinct along rachis, basal pair of pinnae slightly shorter than or equal to second pair, ovate-triangular to oblong-lanceolate, 2.5–4(–7) cm, bipinnatifid; pinnules 4–6 pairs, basal basicopic pinnules longer than adjacent acroscopic ones, 1–1.5 cm × 5–7 mm, ovate-oblong, pinnatifid; second and upper pairs gradually shortened distally. Veins pinnate, obscure or more

conspicuous on adaxial surface. Sori consisting of several sporangia, confluent at maturity. False indusia continuous, herbaceous, margins undulate.

Rock crevices on dry slopes, forests; 1000–3500 m. Gansu, Hebei, Henan, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [Japan, Korea, Russia].

Aleuritopteris kuhnii is widely distributed and exhibits great variation in lamina form. *Aleuritopteris caesia* was based on large-fronded plants of *A. kuhnii*.

15. PARAHMIONITIS Panigrahi, Indian Fern J. 9: 244. 1993.

泽泻蕨属 ze xie jue shu

Zhang Gangmin (张钢民); Tom A. Ranker

Plants terrestrial. Rhizomes erect, short, with small, fluffy scales and long, jointed hairs, dictyostelic. Fronds somewhat dimorphic, clustered; stipe chestnut-colored or purple-black, densely scaly and hairy as on rhizomes; stipe of fertile frond usually 1–3 × length of stipe of sterile frond; lamina simple, ovate, oblong-ovate, or hastate, herbaceous, brown and sparsely covered with small subulate scales abaxially, glabrous adaxially, base strongly cordate, apex obtuse or rounded. Veins anastomosing, areoles numerous, densely arranged, elongate hexagonal. Indusia absent. Sori following course of veins, confluent throughout abaxial surface when mature. Spores globose-tetrahedral, cristate. $x = 30$.

One species: tropical Asia.

Parahemionitis cordata is often included in the genus *Hemionitis* Linnaeus, but it has subulate scales instead of hairs abaxially, differing from *Hemionitis* species in the Americas. As well, *P. cordata* has hairs on the adaxial lamina surface with small fingerlike projections on the non-apical cells that are not found on the hairs of true *Hemionitis*. Panigrahi thought it reasonable to put the Asian species into another genus, *Parahemionitis*.

1. Parahemionitis cordata (Roxburgh ex Hooker & Greville) Fraser-Jenkins, New Sp. Syndr. Indian Pteridol. 187. 1997.

泽泻蕨 ze xie jue

Hemionitis cordata Roxburgh ex Hooker & Greville, Icon. Filic. 1: t. 64. 1828; *Gymnogramma sagittata* (Fée) Ettingshausen; *H. sagittata* Fée; *H. toxotis* Trevisan.

Rhizomes erect, short; scales brownish, narrowly lanceolate. Stipe of fertile frond much longer than that of sterile frond (more than 2–3 × length in dense forests, ca. 1 × in dry shrublands), 6–18 cm × ca. 1 mm; lamina abaxially brown, adaxially brownish green, ovate, narrowly ovate, or hastate, 3–6(–10) × 2–4(–6) cm, forming an oblique angle with stipe, herbaceous

when dry, abaxially with sparse, small subulate scales (scales rather dense along main vein), adaxially glabrous, base strongly cordate, margin with sparse, reddish brown, jointed hairs, apex obtuse or rounded. Sori brown, following course of veins, confluent throughout abaxial surface when mature. $2n = 120$.

Wet soil and rock crevices of stream valleys in dense forests, shrublands, slopes; below 1000 m. Hainan, SW Taiwan, S Yunnan (Menghai) [Cambodia, India, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam].

Parahemionitis cordata used to be called *Hemionitis arifolia* (N. L. Burman) T. Moore or *P. arifolia* (N. L. Burman) Panigrahi (based on *Asplenium arifolium* N. L. Burman), but the type of the latter is in fact *Acrostichum aureum*, following Morton (Contr. U.S. Natl. Herb. 38: 283–396. 1974).

16. PARAGYMNOPTERIS K. H. Shing, Indian Fern J. 10: 227. 1994.

金毛裸蕨属 jin mao luo jue shu

Zhang Gangmin (张钢民); Tom A. Ranker

Plants usually epilithic, xeric. Rhizomes erect or decumbent, short, dictyostelic, scaly and villous; scales tan, linear or subulate, margins entire. Fronds monomorphic, clustered; stipe chestnut-brown, lustrous, terete, densely villous distally; lamina oblong-lanceolate, 1- or 2-pinnate, papery or leathery, soft, densely tan (gray when old), fine sericeous throughout (especially abaxially), or with pellucid, lanceolate, entire, and imbricately arranged scales abaxially. Ultimate pinnules or segments ovate, oblong, or oblong-lanceolate, base rounded or cordate, margins entire, apex obtuse or rounded. Veins free, pinnately branched and divergent distally, or occasionally connected near frond margin. Indusia absent. Sori linear, following entire course or distal portion of veins, covered with hairs or scales, somewhat revealed when mature. Spores globose-tetrahedral, perispore cristate. $x = 30$.

About five species: Bhutan, China, India, Nepal, Russia, Thailand; Europe; five species (two endemic) in China.

1a. Lamina densely covered with imbricately arranged ovate-lanceolate scales abaxially.

2a. Lamina 1-pinnate; stipe covered with jointed long hairs or subglabrous; rachis glabrous adaxially; plants

usually on bare limestone rocks 1. *P. delavayi*

- 2b. Lamina 1-pinnate-pinnatifid; stipe covered with fibrous scales; rachis sparsely scaly adaxially; plants in crevices of non-calcareous rocks 2. *P. marantae*
- 1b. Lamina densely sericeous abaxially.
- 3a. Lamina 1-pinnate; pinnae rounded at base (occasionally proximal pinnae somewhat cordate at base); veins connected near frond margin 3. *P. vestita*
- 3b. Lamina 1- or 2-pinnate; pinnae or pinnules strongly cordate or with 1 or 2 segments at base; veins free, not connected near frond margin.
- 4a. Lamina 1- or 2-pinnate; pinnules ovate, 7–14 mm 4. *P. bipinnata*
- 4b. Lamina 2-pinnate; pinnules ovate-deltoid or hastate, 4–5 mm 5. *P. sargentii*

1. *Paragymnopteris delavayi* (Baker) K. H. Shing, Indian Fern J. 10: 229. 1994.

滇西金毛裸蕨 *dian xi jin mao luo jue*

Gymnogramma delavayi Baker, Ann. Bot. (Oxford) 5: 484. 1891; *Gymnopteris delavayi* (Baker) Underwood; *G. marantae* (Linnaeus) Ching var. *intermedia* Ching; *Neurogramma delavayi* (Baker) Diels; *Notholaena bureauii* Christ; *N. delavayi* (Baker) C. Christensen; *N. marantae* (Linnaeus) R. Brown var. *delavayi* (Baker) Tagawa; *Paraceterach delavayi* (Baker) R. M. Tryon; *Paragymnopteris delavayi* var. *intermedia* (Ching) X. C. Zhang; *P. marantae* (Linnaeus) K. H. Shing var. *intermedia* (Ching) K. H. Shing.

Rhizomes ascending or decumbent, short, stout; scales tan, narrowly subulate. Fronds clustered; stipe chestnut-black, 8–12 cm × 1–2 mm, base slightly scaly and hairy, distally hairy or subglabrous; lamina adaxially pale green, oblong-lanceolate or broadly linear-lanceolate, 5–14 × 2–4 cm, imparipinnate, leathery when dry, abaxially densely covered with brown, pellucid, ovate-lanceolate scales, adaxially glabrous, apex shortly acuminate or caudate; rachis with sparse, narrow subulate scales. Pinnae (5–)10–15 pairs, falcate-lanceolate or lanceolate, 1.5–2.5 × ca. 0.5 cm, shortly stalked (distal pinnae sessile), base rounded or with a macroscopic auricle (sometimes a small oblong segment). Veins obscure, pinna midrib convex abaxially, slightly concave adaxially. Sori usually covered with scales, with 32 spores per sporangium.

Limestone crevices in open woods; 2200–4600 m. Gansu, W Guizhou, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [Bhutan, N India (Uttarakhand), Nepal].

Paragymnopteris delavayi looks very much like *P. marantae* except for its undivided pinnae and jointed long hairs (rarely with hairy scales with 2 or 3 rows of cells) on stipes. In addition, both are distributed in NW Yunnan, even in the same locality, only the former grows on calcareous substrates and the latter mostly on non-calcareous rocks.

2. *Paragymnopteris marantae* (Linnaeus) K. H. Shing, Indian Fern J. 10: 229. 1994.

欧洲金毛裸蕨 *ou zhou jin mao luo jue*

Acrostichum marantae Linnaeus, Sp. Pl. 2: 1071. 1753; *A. canariense* Willdenow; *A. subcordatum* Cavanilles; *Ceterach marantae* (Linnaeus) Candolle; *Cheilanthes marantae* (Linnaeus) Domin; *Cincinalis marantae* (Linnaeus) Desvaux [“*maranthae*”]; *Gymnogramma marantae* (Linnaeus) Mettenius; *Gymnopteris marantae* (Linnaeus) Ching; *Notholaena marantae* (Linnaeus) R. Brown; *N. marantae* subsp. *subcordata*

(Cavanilles) Benl & Poelt; *Paraceterach marantae* (Linnaeus) R. M. Tryon.

Rhizomes decumbent or ascending, short, stout; scales tan, narrowly subulate. Fronds clustered or closely spaced; stipe 6–17 cm × 1.5–2.5 mm, covered with fibrous scales; lamina adaxially brownish green, broadly lanceolate, (8–)12–20 × 2.5–5 cm, thinly papery, abaxially densely covered with reddish brown, pellucid, ovate-lanceolate scales, adaxially glabrous, pinnate-pinnatifid, gradually tapered to pinnatifid apex; rachis and costae with sparse, small subulate-lanceolate scales. Pinnae (6–)10–16 pairs, obliquely spreading, ovate-deltoid or somewhat deltoid, 2–3 × 1–1.5 cm, pinnatifid nearly to costae; proximal pairs of pinnae shortly stalked. Segments 2–5 pairs, oblong-lanceolate or oblong, 5–8 × ca. 3 mm, apex rounded. Veins obscure. Sori spreading along lateral veins, covered with scales. $2n = 58$.

Rock crevices in woods in dry regions; 1800–4200 m. Sichuan, Xizang, Yunnan [India, Nepal, Pakistan; N and NE Africa, SW Asia, Europe].

3. *Paragymnopteris vestita* (Hooker) K. H. Shing, Indian Fern J. 10: 230. 1994.

金毛裸蕨 *jin mao luo jue*

Gymnogramma vestita Hooker, Icon. Pl. 2: t. 115. 1837; *Gymnopteris vestita* (Hooker) Underwood; *Hemionitis vestita* (Hooker) J. Smith; *Neurogramma vestita* (Hooker) Diels; *Notholaena himalaica* Fraser-Jenkins; *Paraceterach vestita* (Hooker) R. M. Tryon; *Syngramma vestita* (Hooker) T. Moore.

Rhizomes decumbent or ascending, short, stout; scales tan, narrowly subulate. Fronds clustered or closely spaced; stipe (6–)10–20 cm × 1–2.5 mm, densely brownish sericeous; lamina brown when dry, lanceolate, 10–15 × 2.5–5(–7) cm, imparipinnate, soft leathery, abaxially densely golden sericeous, adaxially sparsely pale brown sericeous; rachis and costae sericeous. Pinnae (7–)10–17 pairs, ovate or narrowly ovate, 1.5–4 × 1–2 cm, alternate, shortly stalked, base rounded or sometimes slightly cordate, rarely macroscopically auriculate, margins entire, apex obtuse. Veins obscure, pinnate and divergent, connecting near pinna margins. Sori covered with hairs. $2n = 60$.

Among shrubs in rock crevices; 800–3900 m. W Guizhou, Hebei, Shanxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Nepal, Pakistan, N Thailand].

The epithet was first introduced by Wallich (Numer. List, no. 12. 1829) as “*Grammitis vestita*.” K. H. Shing incorrectly cited “Wallich ex C. Presl” (Tent. Pterid. 218. 1836, nom. nud.) as the authority for the basionym.

4. *Paragymnopteris bipinnata* (Christ) K. H. Shing, Indian Fern J. 10: 230. 1994.

川西金毛裸蕨 *chuan xi jin mao luo jue*

Rhizomes decumbent, short, stout, densely scaly; scales brown or dark brown, shiny, narrowly subulate. Fronds closely spaced; stipe densely pale brown sericeous when young; lamina adaxially brownish green, lanceolate to broadly lanceolate or ovate, soft leathery when dry, abaxially densely sericeous, adaxially sparsely sericeous, 1- or 2-imparipinnate; rachis and costae sericeous. Pinnae long stalked. Ultimate pinnules ovate or narrowly ovate, base cordate, margins entire or with 1 or 2 small segments, apex obtuse. Veins obscure. Sori covered with hairs.

• Rock cliffs, rock crevices by ditches, on rocks beneath shrubs or woods; 800–3600 m. Gansu, Hebei, Henan, W Hubei, Nei Mongol, Shaanxi, Sichuan, Xizang, Yunnan.

- 1a. Lamina 2-pinnate; inframedial pinnae lanceolate or deltoid-lanceolate 4a. var. *bipinnata*
 1b. Lamina 1-pinnate; pinnae ovate or narrowly ovate, entire, or at most with 1 or 2 free segments in proximal pinnae 4b. var. *auriculata*

4a. *Paragymnopteris bipinnata* var. *bipinnata*

川西金毛裸蕨(原变种) *chuan xi jin mao luo jue (yuan bian zhong)*

Gymnopteris bipinnata Christ, Notul. Syst. (Paris) 1: 55. 1909; *Hemionitis bipinnata* (Christ) Mickel; *Paraceterach bipinnata* (Christ) R. M. Tryon.

Stipe 10–22 cm × 1–3 mm; lamina 15–25 × 3–7 cm, 2-pinnate (apical portion 1-pinnate). Pinnae 10–17 pairs, lanceolate or deltoid-lanceolate, imparipinnate. Lateral pinnules 1–6 pairs, ovate or narrowly ovate, shortly stalked or sessile, base somewhat cordate, margins entire or rarely with 1 or 2 small lobes, apex obtuse; terminal pinnule as lateral ones but larger and with longer stalk.

• Rock cliffs, rock crevices by ditches; 1100–3200 m. Gansu, Shaanxi, Sichuan, Xizang, Yunnan.

4b. *Paragymnopteris bipinnata* var. *auriculata* (Franchet) K. H. Shing, Indian Fern J. 10: 230. 1994.

耳羽金毛裸蕨 *er yu jin mao luo jue*

Gymnogramma vestita Hooker var. *auriculata* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 10: 123. 1887; *Gymnopteris bipinnata* var. *auriculata* (Franchet) Ching; *G. borealisinensis* Kitagawa; *G. vestita* (Hooker) Underwood var. *auriculata* (Franchet) C. Christensen.

Lamina 1-pinnate. Pinnae ovate or narrowly ovate, stalked (stalks to 1 cm), base strongly cordate, margins entire or often enlarged forming auricles at both sides near base, sometimes proximal pinnae with 1 or 2 free segments, apex obtuse.

• On rocks beneath shrubs or woods; 800–3600 m. Gansu, Hebei, Henan, W Hubei, Nei Mongol, Sichuan, Xizang, Yunnan.

Paragymnopteris bipinnata var. *auriculata* is similar to *P. vestita*. It differs in its long pinna stalks (to 1 cm), strongly cordate pinna base, and free veins.

5. *Paragymnopteris sargentii* (Christ) K. H. Shing, Indian Fern J. 10: 230. 1994.

三角金毛裸蕨 *san jiao jin mao luo jue*

Gymnopteris sargentii Christ, Bot. Gaz. 51: 355. 1911; *Notholaena sargentii* (Christ) Fraser-Jenkins; *Paraceterach sargentii* (Christ) R. M. Tryon.

Plants small, less than 40 cm tall. Rhizomes decumbent or ascending, short, stout; scales shiny, brown, narrowly lanceolate. Fronds clustered; stipe light chestnut-colored, 5–12 cm × 1.5–2 mm, densely light brown sericeous proximally, becoming sparsely so distally; lamina adaxially brownish green, deltoid-lanceolate or oblong-lanceolate, 10–25 × 4–10 cm, 2-pinnate (apical portion 1-pinnate), leathery when dry, abaxially densely sericeous, adaxially sparsely sericeous; rachis and costae with same hairs as on lamina surface. Pinnae 8–14 pairs, inframedial pinnae alternate, lanceolate, 3.5–7 × 1–1.5 cm, stalked (stalks 3–7 mm), imparipinnate; pinnules 3–8 pairs, anisopinnate, ovate-deltoid or hastate, 4–5 × 3–4 mm, shortly stalked, base cordate, apex obtuse; terminal pinnule as lateral ones but with longer stalk and often inequilateral. Veins obscure. Sori covered with hairs.

• Rocky slopes, among shrubs in dry valleys; 1900–3300 m. W Sichuan, Xizang, NW Yunnan.

5. Subfam. VITTARIOIDEAE

书带蕨亚科 *shu dai jue ya ke*

Lin Youxing (林尤兴), Zhang Xianchun (张宪春); Michael G. Gilbert, Jefferson Prado

Plants terrestrial, epiphytic, or epilithic, medium-sized or small. Rhizome creeping or short and erect, siphonostelic, bearing roots with very numerous water-absorbing root hairs, scaly; scales brown or black, sometimes clathrate and iridescent. Fronds monomorphic, clustered to widely scattered; stipe well defined, dark, often glossy, or ill defined and merging with lamina, lamina entire or 1–3- or more pinnate or 1–3-dichotomous with pedate branches, herbaceous, papery, leathery, or less often membranous or fleshy; pinnules sometimes with articulate stalk, ovate, flabellate, orbicular-flabellate, or dimidiate, often glabrous, epidermis sometimes with large elongate siliceous cells, veins free, reaching margins, or anastomosing, simple or dichotomously forked, often radiate. Sori elongate along fertile veins, usually immersed in grooves, on veins of recurved, membranous false indusium, often with abundant paraphyses. Spores transparent, mostly ellipsoid, sometimes fusiform, or tetrahedral-globose, trilete or monolete.

Eleven genera and ca. 300 species: pantropical; four genera and 58 species (17 endemic) in China.

Molecular data have shown that Vittariaceae and Adiantaceae form a well-defined monophyletic group, Vittarioideae, within the Pteridaceae.

rbcL gene analysis by Crane (Syst. Bot. 22: 509–517. 1997) indicated that the traditional *Antrophyum* and *Vittaria* Smith are both polyphyletic or paraphyletic. Ten monophyletic genera are recognized in Vittariaceae, i.e., *Ananthacorus* Underwood & Maxon, *Anetium* Splitgerber, *Antrophyum*, *Haplopteris*, *Hecistopteris* J. Smith, *Monogramma*, *Polytaenium* Desvaux, *Radiovittaria* (Benedict) E. H. Crane, *Scoliosorus* T. Moore, and *Vittaria*. Only *Antrophyum*, *Haplopteris*, and *Monogramma* are distributed in China. All the Chinese species formerly classified in *Vittaria* are now treated in *Haplopteris*.

17. ADIANTUM Linnaeus, Sp. Pl. 2: 1094. 1753.

铁线蕨属 tie xian jue shu

Lin Youxing (林允兴); Jefferson Prado, Michael G. Gilbert

Plants terrestrial or epilithic, medium-sized or small; outlines highly variable. Rhizomes short and erect, or long and creeping, with siphonostele, covered with scales; scales brown or black, lanceolate, thick in texture, usually entire. Fronds monomorphic, whorled and clustered, scattered in 2 rows or compact, not articulate; stipe black or reddish brown, glossy, fine and rounded, hard, with 1 or 2 vascular bundles and combined into 1 upward; lamina mostly 1–3- or more pinnate or 1–3-dichotomous with pedate branches, rarely reduced to solitary entire and orbicular-flabellate pinnule, herbaceous or papery, less often leathery or membranous; rachises, costae, and stalks same color as stipe; pinnules sometimes with articulate stalk, ovate, flabellate, orbicular-flabellate, or dimidiate, margins serrate, lobed, or entire, usually deciduous when dried; veins free, reaching margins, simple or dichotomously forked, often radiate [rarely anastomosing (*Hewardia*)], usually visible on both surfaces of lamina. Sori borne on veins of recurved, membranous margins (false indusium); false indusium orbicular, reniform, lunate, ± rectangular, or oblong, free or continuous, upper margins forming deep sinus, retuse or truncate. Sporangia globose, long stalked, annuli erect; mostly consisting of 18–28 incrassate cells. Spores yellowish, tetrahedral, trilete, transparent, smooth. $x = 15(30), 29$.

More than 200 species: from cold temperate zone to tropics, most in South America; 34 species (16 endemic) in China.

The following species could not be treated here because no material was seen by the present authors: *Adiantum menglianense* Y. Y. Qian (Acta Bot. Austro Sin. 8: 37. 1992) and *A. ornatum* Ching (Bull. Fan Mem. Inst. Biol., Bot. 11: 55. 1941).

- 1a. Fronds each with a single suborbicular or orbicular-reniform pinnule 1. *A. reniforme*
 1b. Fronds each with several to very many pinnules.
 2a. Fronds 1–3-palmate or dichotomously branched.
 3a. Fronds 2- or 3-dichotomously or nearly dichotomously branched, primary branches with 1-pinnate pinnae on both sides.
 4a. Pinnules including indusia hairy 18. *A. hispidulum*
 4b. Pinnules glabrous 19. *A. flabellulatum*
 3b. Fronds pedately branched, with 2–6(or 8) 1-pinnate pinnae per branch.
 5a. Sori 1 or 2 per pinnule; lamina ca. 15 cm; pinnules ca. 10 × 3–4 mm 17. *A. subpedatum*
 5b. Sori 4–6 per pinnule; pinnules ca. 20 × 6 mm.
 6a. Pinnules with upper margin divided for 1/3–1/2 of length, apex with blunt serrations, abaxially green; indusia retuse at upper margin 15. *A. pedatum*
 6b. Pinnules with upper margin more shallowly lobed, apex with acute triangular serrations, abaxially glaucous; indusia deeply sinuate at upper margin 16. *A. myriosorum*
 2b. Fronds 1–4-pinnate.
 7a. Fronds 1-pinnate, lanceolate or linear-lanceolate in outline.
 8a. Pinnules entire, stalk ± articulate at apex and pinnule easily lost when dry.
 9a. Plants small, creeping, 1.5–3 cm tall, lamina with 3–5 small orbicular pinnules; indusia orbicular, upper margin truncate, 1 per pinna 2. *A. mariesii*
 9b. Plants erect, above 3 cm tall, lamina usually with 5–7 or more flabellate pinnules; indusia reniform or elongated, upper margins retuse or truncate, 1 to many per pinna.
 10a. Plants soft and weak; lamina narrowly flabellate, thin in texture, stipe as slender as a hair, 1/3–1/2 as long as pinnae 3. *A. lianxianense*
 10b. Plants strong; lamina broadly flabellate, stipe robust, less than 1/5 as long as lamina.
 11a. Pinnules obtriangular, indusia depressed at upper margins, scale margins denticulate 4. *A. gravesii*
 11b. Pinnules orbicular-flabellate or obtriangular, indusia truncate at upper margins, scale margins entire.
 12a. Pinnules orbicular-flabellate, usually with 3 or 4 sori 5. *A. juxtapositum*
 12b. Pinnules obtriangular, with 1(or 2) sori 6. *A. chienii*
 8b. Pinnules ± divided, stalk not articulate and pinnule persistent when dry.
 13a. Apex of frond not prolonged into whiplike structure 19. *A. diaphanum*
 13b. Apex of frond usually elongated and whiplike, often forming plantlet at end.

- 14a. Stipes, rachises, and both sides of lamina multicellular brown hirsute.
- 15a. Pinnule upper margins subentire or crisped or lobed for ca. 1/3 of breadth of pinnule or with 3 or 4 short, broad lobes.
- 16a. Stipe 4–12 cm, densely hairy; lamina 1.2–2.4 cm wide; sori 2 or 3 per pinnule; Yunnan, rare 9. *A. sinicum*
- 16b. Stipe 10–20 cm, very sparsely hairy or glabrous; lamina 3–6 cm wide; sori 5–16 per pinnule; Taiwan, rare 10. *A. meishanianum*
- 15b. Pinnule upper margins with many long lobes; widely distributed S of Chang Jiang, common.
- 17a. Basal pair of pinnules smaller than immediately distal pinnules; abaxial surface of rachis and lamina sparsely hairy, hairs facing all directions; rhizome scale margins entire 7. *A. caudatum*
- 17b. Basal pair of pinnules larger than more distal pinnules; abaxial surface of rachis and lamina densely hairy, hairs appressed and facing laminal front; rhizome scale margins serrate 8. *A. malesianum*
- 14b. Stipes, rachises, and both surfaces of lamina glabrous or occasionally with 1 or 2 stiff hairs.
- 18a. Stipes, rachises, and stalks with membranous, brown wings 11. *A. soboliferum*
- 18b. Stipes, rachises, and stalks terete.
- 19a. Pinnules semidimidiolate, subsessile 14. *A. edgeworthii*
- 19b. Pinnules semilunar, orbicular-flabellate, or orbicular, with longer stalk.
- 20a. Pinnules lunate, base asymmetrical, stalk ca. 10 mm 12. *A. philippense*
- 20b. Pinnules orbicular-flabellate or orbicular, base symmetrical, stalk 2–3 mm 13. *A. capillus-junonis*
- 7b. Fronds 2–4-pinnate.
- 21a. Pinnules with sparse deep brown and appressed long needlelike setae 21. *A. diaphanum*
- 21b. Pinnules glabrous.
- 22a. Rachises and stalks brown hispidulous.
- 23a. Rhizome short and erect, fronds clustered; pinnules 2 pairs per pinna; sori 4–6 per pinnule (rarely 1 or 2 on ultimate pinnules) 20. *A. induratum*
- 23b. Rhizome long creeping, fronds spaced; pinnules 4 or 5 pairs per pinna, stiffly papery; sori 1(or 2) per pinnule 24. *A. davidii*
- 22b. Rachises, stalks, and pinnules glabrous.
- 24a. Pinnules with upper margin entire, bluntly toothed, or undulate-crenate.
- 25a. Rhizome long creeping; upper margin of pinnules distinctly bluntly triangular serrate 29. *A. monochlamys*
- 25b. Rhizome shortly creeping or ascending; upper margin of pinnules entire or undulate-crenate.
- 26a. Upper margin of pinnules undulate-crenate; sori mostly 1 per pinnule 30. *A. erythrochlamys*
- 26b. Upper margin of pinnules entire; sori 2–4 per pinnule.
- 27a. Pinnules 8–14 mm wide 33. *A. refractum*
- 27b. Pinnules 4–7 mm wide.
- 28a. Pinnules triangular, leathery 31. *A. roborowskii*
- 28b. Pinnules fan-shaped, herbaceous 32. *A. formosanum*
- 24b. Pinnules with upper margin densely finely sharply toothed to erose-dentate.
- 29a. Plants to 10 cm tall; fronds 2-pinnate; indusia rectangular, truncate at upper margins; pinnules nearly as long as wide 22. *A. fengianum*
- 29b. Plants more than 15 cm tall; fronds usually 3-pinnate; indusia orbicular, orbicular-reniform, or oblong.
- 30a. Stipe base densely brownish, multicellular setose (setae deciduous but leaving marks and rough feel) 23. *A. bonatianum*
- 30b. Stipe base glabrous.
- 31a. Pinnule 12–20 × 10–15 mm, upper margin 2–4-lobed; sori 3–10 per pinnule 34. *A. capillus-veneris*
- 31b. Pinnule 3–11(–13) × 3–13 mm, upper margin truncate, curved, or emarginate; sori 1–3(–5) per pinnule.
- 32a. Indusia orbicular or reniform, upper margins emarginate or curved.

- 33a. *Indusia orbicular*, upper margins sinuate; pinnule abaxially green; veins distinctly raised 25. *A. venustum*
 33b. *Indusia reniform*, upper margins curved; pinnule abaxially glaucous; veins indistinct 26. *A. tibeticum*
 32b. *Indusia* elongated or orbicular-reniform, upper margins truncate or slightly curved.
 34a. Upper margins of pinnules with long and sharp serrations 27. *A. fimbriatum*
 34b. Upper margins of pinnules with short and obtuse serrations 28. *A. breviserratum*

1. *Adiantum reniforme* Linnaeus var. **sinense** Y. X. Lin, Acta Phytotax. Sin. 18: 102. 1980.

荷叶铁线蕨 he ye tie xian jue

Adiantum nelumboides X. C. Zhang.

Plants 5–20 cm tall. Rhizomes erect, short, scales brown, lanceolate, also multicellular villous. Fronds clustered; stipe dark castaneous, 3–14 cm, 0.5–1.5 mm in diam., base densely scaly, distally villous, hairs easily rubbed off when dried; lamina a single terminal pinnule, orbicular or orbicular-reniform, 2–6 cm in diam., papery or hard papery, greenish when dried, dark brown upon natural drying, adaxially laxly brown multicellular villous, base symmetrical, cordate, sinus shallow to deep with overlapping lobes forming 1–3 concentric rings around apex of stipe, margins bluntly crenate but crenation indistinct on fertile lamina; veins radiate from bases to all sides, multidichotomous, visible on both surfaces. Sori many per pinnule; false indusia deep brown, orbicular or subrectangular, membranous, flat and straight at upper margins and spreading along margins, approximate or wider spaced, persistent. $2n = 120^*$.

• Gregarious on rocks or in rock crevices; ca. 300 m. Sichuan (Shizhu).

This plant is endangered in its native habitat by road building and collection for medicinal use (L. K. Fu & J. M. Jin, China Red Data Book 1: 2–3. 1992). It is now cultivated (e.g., in the Wuhan Botanical Garden) as an ornamental.

Adiantum reniforme var. *sinense* has been used in Chinese medicine for more than 100 years; it is known as “荷叶金钱草 he ye jing quan cao” in Sichuan.

X. C. Zhang very recently elevated the Chinese variety to a distinct species. The typical variety occurs in the Atlantic Ocean islands while further varieties are recorded from scattered localities throughout Africa, Madagascar, Mauritius, and Réunion.

2. *Adiantum mariesii* Baker, Gard. Chron., n.s., 16: 494. 1880.

小铁线蕨 xiao tie xian jue

Adiantum acrocarpon Christ; *A. nanum* Ching.

Plants epilithic, small, 2–3 cm tall. Rhizomes erect, short, scales black-brown, lanceolate, margins entire. Fronds clustered; stipe dark castaneous, ca. 1 cm, as slender as silk; lamina 1-pinnate, ovate in outline, ca. 2 × 1 cm, costae and stalks same color as stipe; pinnules 1–3 pairs, subopposite, easily deciduous when dry; stalk 1–2 mm, articulate; blade obliquely spreading, orbicular or subovate-orbicular, 2.5–4 × 2.5–4 mm, papery,

abaxially slightly pale blue-grayish, glabrous, adaxially brown-green and glossy, base rounded or rounded-cuneate, lateral margins entire or slightly undulate, upper margin rounded and with indistinct sinuses in middle; veins undivided, 4 forked veinlets running from base to margin, visible on both surfaces. Sori 1 per pinnule; false indusia brown, orbicular, upper margins flat and straight, slightly depressed, persistent.

• Usually gregarious on wet limestone cliffs; ca. 200 m. Guangxi, Guizhou, Hubei, Sichuan.

3. *Adiantum lianxianense* Ching & Y. X. Lin, Acta Phytotax. Sin. 18: 102. 1980.

粤铁线蕨 yue tie xian jue

Plants 5–7 cm tall. Rhizomes erect, short, scales black lanceolate. Fronds clustered; stipe castaneous-black, slightly glossy, 2–3 cm, as slender as a hair, glabrous; lamina oblong in outline, 3–5 × 1–1.5 cm, 1-pinnate; costae and stalks same color as stipe; pinnules 3 or 4 pairs, 6–9 mm apart, opposite, obliquely spreading; stalk 1.5–4 mm, 1/3–1/2 as long as pinnules, articulate at end, persistent after pinnules fall; pinnules narrowly ovate or narrowly flabellate, 4–6 × 2.5–4 mm, papery, brownish green, both surfaces glabrous, base cuneate, both sides entire and undulate, upper margins subtruncate, with one sinus at middle; terminal pinnae same shape as and slightly larger than lateral pinnae; veins undivided, 4 forked veinlets arising from base, visible on both surfaces. Sori 1 per pinnule; false indusia brown, reniform or elliptic, leathery, upper margins depressed, persistent.

• Gregarious on wet calcareous rocks and calcitic soils. Guangdong (Lianxian).

Ching initially misidentified this species as *Adiantum gravesii* Hance. *Adiantum lianxianense* is believed to be extinct due to habitat loss (China Plant Specialist Group 2004. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4. <www.iucnredlist.org>; accessed 27 Apr 2011).

4. *Adiantum gravesii* Hance, J. Bot. 13: 197. 1875.

白垩铁线蕨 bai e tie xian jue

Adiantum greenii Ching; *A. leveillei* Christ.

Plants terrestrial, 4–14 cm tall. Rhizomes erect, short, scales black subulate-lanceolate, margins denticulate. Fronds clustered; stipe castaneous-black, glossy, 1–6 cm, slender, glabrous; lamina 1-pinnate, oblong or ovate-lanceolate in outline, 3–6 × 2–2.5 cm; costae and stalks same color as stipes; pinnules 2–4 pairs, 1–2 cm apart, alternate, obliquely spreading upward;

stalk up to 3 mm (ca. 1/5 as long as pinnae or shorter), articulate, persistent after pinnules fall; blade broadly obovate or broadly ovate-triangular, ca. 1 × 1 cm, papery, abaxially glaucous, adaxially grayish green, both surfaces glabrous, base rounded-cuneate or rounded, both sides slightly undulate, apex rounded, with 1(or 2) shallow sinus, entire; veins dichotomously branching, and reaching cartilaginous margins, visible on both surfaces. Sori 1(or 2) per pinna; false indusia brown, reniform or lunate (rarely orbicular), leathery, upper margin depressed, persistent.

Gregarious on wet cliffs, rock crevices, chalky soils in caves; 600–1500 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, Sichuan, Yunnan, Zhejiang [N Vietnam].

Adiantum gravesii is very similar to *A. lianxianense* but differs in the plants being taller and stronger, having larger, broadly ovate or broadly obovate-triangular pinnules that are abaxially glaucous and with shorter stalks.

"*Adiantum gravesii* var. *leveillei*" (Ching ex S. K. Wu, FRPS 3(1): 181. 1990) is a nomen nudum and was not therefore validly published (*Melbourne Code*, Art. 38.1(a)).

5. *Adiantum juxtapositum* Ching, Acta Phytotax. Sin. 6: 312. 1957.

仙霞铁线蕨 xian xia tie xian jue

Plants 8–20 cm tall. Rhizomes erect, short, scales black lanceolate. Fronds clustered; stipe castaneous, glossy, 2–9 cm, ca. 1 mm in diam., glabrous; lamina 1-pinnate, lanceolate in outline, 4–11 × 1.5–3 cm; costae and stalks same color as stipe, smooth; pinnules 5–9 pairs, opposite, nearly alternate upward, horizontally spreading; stalk 2–3 mm, articulate, persistent after pinnules fall; blade orbicular or broadly orbicular-flabellate (rarely obtriangular), ca. 1 × 1.2–1.5 cm, subleathery, adaxially greenish, abaxially glaucous and glabrous, base rounded-cuneate (rarely cuneate), upper margin rounded, slightly undulate; distal pinnules slightly smaller, obtriangular or flabellate; veins multidichotomously branching and reaching cartilaginous margins, visible on both surfaces. Sori (1–)3 or 4(or 6) per pinnule; false indusia black, orbicular or orbicular-reniform (rarely elongated), leathery, upper margins flat and straight or slightly depressed, entire or slightly undulate, persistent. Perispore indistinctly granular.

• Limestone crevices. N Fujian (Xian Xia Shan).

6. *Adiantum chienii* Ching, Sinensia 1: 50. 1930.

北江铁线蕨 bei jiang tie xian jue

Plants usually 20–30 cm tall. Rhizomes erect, short, scales castaneous-brown, linear. Fronds clustered, horizontally spreading; stipe castaneous-black, glossy, 5–10 cm, ca. 1 mm in diam., glabrous; lamina 1-pinnate, linear-lanceolate in outline, 13–18 × 3–4 cm, ca. 2 cm spaced; costae and stalks same color as stipe; pinnules opposite or subopposite, 6–8 pairs; stalk 2–3 mm, articulate at apex, persistent after pinnules fall; blade obovate-triangular, ca. 1.5 × 1.5 cm, papery, brownish, abaxially glaucous and glabrous, adaxially glossy, base rounded or rounded-cuneate, margin entire, upper margin truncate; distal pinnules similar but smaller; veins multidichotomously

branching, reaching cartilaginous margins, visible on both surfaces. Sori 1(or 2) per pinnule; false indusia brown, rectangular, up to 1 cm, leathery, upper margins flat and straight, entire, persistent.

• Guangdong (Beijiang).

The outline of *Adiantum chienii* is similar to *A. gravesii*; the plant differs by being much taller and larger, and the indusia narrowly linear, horizontally attached at upper margin.

7. *Adiantum caudatum* Linnaeus, Mant. Pl. 308. 1771.

鞭叶铁线蕨 bian ye tie xian jue

Adiantum caudatum var. *angustilobatum* Bonaparte; *A. lyratum* Blanco.

Plants terrestrial or epilithic, 10–40 cm tall. Rhizomes erect, short, scales deeply castaneous, lanceolate, margins entire. Fronds clustered; stipe castaneous, 1–10 cm, densely dark brown or brownish multicellular hirsute; lamina 1-pinnate, lanceolate in outline, 15–30 × 2–4 cm, base slightly narrow; rachis same color as stipe and similarly sparsely hirsute, glabrescent when old, apex usually prolonged into a whiplike stolon rooting at tip to form new plantlet; pinnules 20–44 pairs, 5–8 mm apart, alternate, or lower ones subopposite, horizontally spreading or slightly obliquely spreading, lower pinnules gradually reduced, middle ones ± dimidiate, suboblong, 0.7–2 × 0.6–1 cm, papery, brownish green, both surfaces sparsely multicellular hirsute and densely pubescent, base asymmetrical, lower margins substraight and entire, upper and outer margins deeply divided into many narrow lobes, upper side truncate; lobes linear, margins entire, upper part again lobed into fine linear segments, apex truncate, fine segments truncate or few dentate at apex; veins multidichotomously branching, visible on both surfaces. Sori 5–12 per pinna; false indusia dark brown, orbicular or oblong, hairy, upper margins flat and straight, entire, persistent. Perispore granular. $2n = 90$.

On rocks or in rock crevices in forests or mountain valleys; 100–1200 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; throughout Old World tropics].

8. *Adiantum malesianum* J. Ghatak, Bull. Bot. Surv. India 5: 73. 1963.

假鞭叶铁线蕨 jia bian ye tie xian jue

Adiantum caudatum Linnaeus var. *latilobatum* Bonaparte.

Plants terrestrial or epilithic, 10–40 cm tall. Rhizomes erect, short, densely covered with scales; scales brown, lanceolate, scale margins dentate. Fronds clustered; stipe brown when young, castaneous-black and partly fallen when old, 3–20 cm, base covered with same brown scales as rhizome and multicellular articulate hairs on whole stipe; lamina 1-pinnate, linear-lanceolate, 12–20 × 1.5–3 cm, attenuate upward, base not narrow; pinnae 18–30 pairs, sessile to shortly stalked; rachises same color as stipes and densely covered with same stiff hairs, apex of rachis usually prolonged into a whiplike stolon and rooting to form new plantlets; pinnule stalk ca. 1 mm, horizontally spreading, alternate or subopposite, ca. 1 cm spaced; proximal pair of pinnules suborbicular flabellate, ± reflexed

downward; middle lateral pinnules dimidiate, $0.7\text{--}2 \times 0.6\text{--}1$ cm, papery, brown-green, abaxially densely covered with brown multicellular stiff hairs, with appressed short hairs facing outer margins, sparsely covered with short hairs adaxially, upper and outer margins parted; segments 5 or 6 pairs per pinna, rectangular, lower and inner margins flat and straight, apex depressed; terminal pinnae subtriangular, upper margins rounded and parted; veins multidichotomously forked, distinctly raised adaxially and less visible abaxially. Sori 5–12 per pinna; false indusia brown, orbicular-reniform, papery, upper margins flat and straight, densely covered with hairs adaxially, entire, persistent.

On rocks or in rock crevices under thickets on slopes; below 100–1400 m. Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands (Polynesia)].

Material of this species was originally misidentified as *Adiantum caudatum* by Beddome (Ferns S. India, t. 2. 1863).

9. *Adiantum sinicum* Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 268. 1949.

苍山铁线蕨 cang shan tie xian jue

Plants 15–30 cm tall. Rhizomes erect, short, scales lanceolate. Fronds clustered; stipe castaneous-black, 4–12 cm, densely rufous-brown multicellular villous; lamina 1-pinnate, lanceolate in outline, $12\text{--}15 \times 1.2\text{--}2.4$ cm; costae same color as stipe, also with stiff hairs, apex acuminate, occasionally prolonged into a whiplike stolon and rooting to form new plantlets; pinnules 20–25 pairs, alternate, mostly horizontally spreading, basal pair obliquely reflexed, semidimidiate, $1\text{--}1.4 \times 0.4\text{--}0.6$ cm, progressively smaller distally, papery, greenish, abaxially covered with stiff brown multicellular hairs, adaxially with lax short hairs, base asymmetrical, lower margin straight and entire, inner margins substraight, upper margin truncate, entire or undulate-crenate; terminal pinnules small, obtriangular, base cuneate, outer margins rounded and 2–5-lobed; veins multidichotomously forked, visible on both surfaces. Sori 2 or 3 per pinnule; false indusia dark brown, rectangular, papery, hairy on upper sides, upper margins flat and straight, entire, persistent.

- On soil by sides of limestone rocks; ca. 1600 m. Yunnan.

Adiantum sinicum is listed as endangered in the IUCN Red Book (China Plant Specialist Group 2004. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>; accessed 16 Apr 2013).

10. *Adiantum meishanianum* F. S. Hsu ex Yea C. Liu & W. L. Chiou, Novon 19: 59. 2009.

梅山铁线蕨 mei shan tie xian jue

Rhizome erect to suberect, short, scales brown with black center, linear, to 4 mm, margins entire. Stipe castaneous to blackish purple, lustrous, 10–20 cm, scales like those on rhizome but uniformly brown; stipe and rachis glabrous or with sparse multicellular hairs; lamina 1-pinnate, linear to lanceolate in outline, $10\text{--}50 \times 3\text{--}6$ cm; apex usually prolonged into a whiplike stolon and rooting to form new plantlets, occasionally secondarily prolonged; pinnules 5–20 pairs, basal pinnules largest, reflexed; stalk distinct, usually 3–5 mm, at $60^\circ\text{--}90^\circ$ to

rachis; blade mostly dimidiate, usually $20\text{--}30 \times 10\text{--}15$ mm, softly herbaceous, both surfaces glabrous, lower margin straight, rounded at apex, upper margin subentire, crisped or lobed for ca. 1/3 of breadth of pinnule, sinuses narrow, lobes rounded to quadrangular, rounded to truncate at subentire or toothed apex; distal pinnules gradually smaller toward apex. Sori 5–16 per pinnule; false indusia 2–3 mm wide, glabrous.

- Margins of secondary forests; ca. 1000 m. Taiwan.

Adiantum meishanianum is known only from a single very small population with less than 100 individuals and was rated in the protologue as critically endangered.

11. *Adiantum soboliferum* Wallich ex Hooker, Sp. Fil. 2: 13. 1851.

翅柄铁线蕨 chi bing tie xian jue

Adiantum alatum Copeland; *A. balansae* Baker; *A. caudatum* Linnaeus var. *soboliferum* (Wallich ex Hooker) Beddome; *A. dolabriforme* Hooker; *A. mettenii* Kuhn; *A. lunulatum* N. L. Burman var. *mettenii* (Kuhn) Beddome.

Plants ?terrestrial, 25–30 cm tall. Rhizomes erect, short, scales dark brown, linear-lanceolate, margins entire. Fronds clustered; stipe castaneous-black, glossy, 9–16 cm, each side with a narrow brown membranous wing, base with same scales as rhizome, distally glabrous; lamina 1-pinnate, lanceolate in outline, $9\text{--}20 \times 3.5\text{--}5.5$ cm; rachis and stalks similar to stipe, apex of usually sterile rachis prolonged into whiplike stolon and rooting to form new plantlets; pinnules 5–10 pairs, alternate; stalk 2–4 mm, articulate, persistent after pinnules fall; basal 1 or 2 pairs of pinnules slightly reflexed, pinnules below middle uniform in size, horizontally spreading, dimidiate, suboblong, $2\text{--}3.3 \times 0.9\text{--}1.4$ cm, papery, brownish green, both surfaces glabrous, base asymmetrically broadly cuneate, lower and inner margins nearly flat and straight, upper and outer margins obtuse and 4–6-lobed; distal pinnules similar but slightly smaller; terminal pinnules flabellate, outer margin with 3–6 sinuses; veins multidichotomously forked, reaching cartilaginous margins, visible on both surfaces. Sori 3–7 per pinnule; false indusia dark brown, elliptic or reniform, papery, upper margins flat and straight, entire, persistent. Perispore granular. $2n = 120$.

Wet forest soils; 100–700 m (in Taiwan). Guangdong, Guangxi, Hainan, Taiwan, N Yunnan [India, Indonesia, Nepal, Philippines, Vietnam; tropics and subtropics of N Africa and Asia].

12. *Adiantum philippense* Linnaeus, Sp. Pl. 2: 1094. 1753.

半月形铁线蕨 ban yue xing tie xian jue

Adiantum arcuatum (Poiret) Swartz; *A. lunatum* Cavanilles; *A. lunulatum* N. L. Burman; *A. lunulatum* var. *limbatum* Christ; *A. lunulatum* var. *subjunonicum* Christ; *Polypodium arcuatum* Poiret; *Pteris lunulata* (N. L. Burman) Retzius.

Plants terrestrial or epilithic, 10–50 cm tall. Rhizomes erect, short, scales dark brown, lanceolate, margins denticulate. Fronds clustered; stipe castaneous, glossy, 6–25 cm, terete, base with same scales as rhizome, distally glabrous; lamina 1-pinnate, lanceolate in outline, $12\text{--}25 \times 2\text{--}6.5$ cm; rachis, costae, and stalks same color as stipe, apex usually prolonged into a

whiplike stolon and rooting to form new plantlets; pinnules 6–12 pairs, alternate, obliquely spreading; stalk 10–20 mm, articulate, persistent after pinnules fall; blade below middle subequal in size, dimidiate-lunate or semi-orbicular-reniform, 1–4 × 1–2.3 cm, herbaceous, green or brown-green, both surfaces glabrous, upper margin rounded, apex obtuse or bent downward, sterile pinnules stalked, both sides asymmetrical; margins undulate-lobed, segments obtuse and serrulate at apex, lower margins entire, truncate or slightly bent downward, rarely broadly cuneate, fertile pinnules subentire or with 2–4 shallow sinuses, or slightly undulate; distal pinnules slightly smaller; terminal pinnules flabellate, slightly larger than basal pinnules; veins multidichotomously forked and reaching margins, visible on both surfaces. Sori 2–6 per pinna; false indusia dark brown or brown-green, linear-oblong, membranous, upper margins flat and straight or slightly depressed, entire, persistent. Perispore finely granular.

Gregarious on shaded wet places or on acidic soil in forests, sometimes rupicolous; 100–2000 m. Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Bhutan, India, Indonesia, Kashmir, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; tropics and subtropics of Africa, Oceania].

There has been controversy as to the correct name of this taxon. Pichi Sermolli (Webbia 12: 665. 1957) lectotypified *Adiantum philippense* with the illustration “*Adiantum Philippense, folio rotundo laciniato*” in Petiver (Gazophyl. Nat., 8, t. 4, f. 4, 1702–1709). Some (e.g., Morton in Contr. U. S. Natl. Herb. 38: 370. 1974; Verdcourt, Fl. Trop. East Africa: 58. 2002) have argued that this illustration is unidentifiable and might not even be a fern. Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 144. 2008) claims that Petiver’s drawing was copied from a drawing sent to him by Kamel and that the original drawing and herbarium material upon which it was based are available in the Sloane Herbarium (BM) and prove that *A. philippense* is indeed this species. Verma and Fraser-Jenkins (in S. C. Verma, S. P. Khullar & Cheema, Perspec. Pterido. 82–83. 2009, fidé Fraser-Jenkins, loc. cit.) recognized two further subspecies: the diploid sexual subsp. *teestae* S. C. Verma & Fraser-Jenkins in which they included Chinese material, the diploid and tetraploid apomictic subsp. *intermedium* S. C. Verma & Fraser-Jenkins, and epitypified subsp. *philippense* with material of a known triploid apomict from India.

Adiantum philippense is an indicator of acidic conditions, as it grows in soils of pH 4.5–5.

13. *Adiantum capillus-junonis* Ruprecht, Beitr. Pflanzenk. Russ. Reiches 3: 49. 1845.

团羽铁线蕨 tuan yu tie xian jue

Adiantum cantoniense Hance.

Plants epilithic, 8–20 cm tall. Rhizomes erect, short, scales dark brown, lanceolate, margins entire. Fronds clustered; stipe dark castaneous, glossy, 2–6 cm, as slender as iron wire, base covered with same scales as rhizome, distally glabrous; lamina 1-pinnate, lanceolate in outline, 8–15 × 2.5–3.5 cm; costae and stalks castaneous, apex usually prolonged into a whiplike stolon and rooting to form new plantlets; pinnules 4–8 pairs, lower pinnules opposite, upper ones subopposite, spreading obliquely upward; stalk 2–3 mm, articulate, persistent after pinnules fall; lower several pairs of pinnules subequal in size, orbicular-flabellate or orbicular, 1.1–1.6 × 1.5–2 cm, membranous, green,

both surfaces glabrous, base symmetrically rounded-cuneate or rounded, lateral sides entire, upper margins rounded, upper margin of sterile pinnules denticulate; fertile pinnules with 2–5 shallow sinuses, denticulate on sterile parts; distal and terminal pinnules similar to lower pinnules but smaller; veins multidichotomously forked, reaching margins, visible on both surfaces. Sori 1–5 per pinna; false indusia brown, orbicular or reniform, papery, upper margins flat and straight, persistent. Perispore granular.

Gregarious on wet limestone, basal crevices of walls, shaded wet chalky soil; 300–2500 m. Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Shandong, Sichuan, Taiwan, Yunnan [Japan, Korea].

14. *Adiantum edgeworthii* Hooker, Sp. Fil. 2: 14. 1851.

普通铁线蕨 pu tong tie xian jue

Adiantum caudatum Linnaeus var. *edgeworthii* (Hooker) Beddome; *A. caudatum* var. *rhizophorum* Wallich ex C. B. Clarke; *A. edgeworthii* var. *spencerianum* (Copeland) Tagawa; *A. guilelmi* Hance; *A. spencerianum* Copeland.

Plants terrestrial, 10–30 cm tall. Rhizomes erect, short, scales black-brown lanceolate, margins denticulate. Fronds clustered; stipe dark purplish, glossy, 4–16 cm, base covered with scales, distally smooth; lamina 1-pinnate, linear-lanceolate in outline, 6–23 × 2–3 cm, base subattenuate, apex acuminate; rachis castaneous, with sparse reddish brown linear scales, smooth, apex often prolonged into a whiplike stolon and rooting to form new plantlets; pinnules 10–30 each side, opposite or alternate, if rachis prolonged into a whiplike stolon then upper pinnules gradually further apart from each other; stalk ca. 1 mm; several basal pairs of pinnules shorter and relatively broader than middle pinnules and slightly reflexed, middle pinnules horizontally spreading, dimidiate, 1–1.5 × 0.5–0.8 cm, papery, dark brownish or brownish green, both surfaces glabrous, base asymmetrical with acroscopic side truncate, lower and inner margins straight and entire, upper margin shallowly 2–5-lobed, apex acute or obtuse; segments suborbicular, entire or slightly undulate; upper pinnules progressively smaller distally, terminal pinnules subflabellate, base cuneate, upper margins divided; veins multidichotomously forked, visible on both surfaces. Sori 2–5 per pinna, borne at apex of segments; false indusia orbicular or oblong, membranous, upper margins flat and straight, entire, persistent. Perispore granular.

Shaded wet places, on rocks; 700–2500 m. Gansu, Guizhou, Hebei, Henan, Liaoning, Shandong, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, N India, Japan, Malaysia, Myanmar, Nepal, Philippines, N Thailand, Vietnam].

15. *Adiantum pedatum* Linnaeus, Sp. Pl. 2: 1095. 1753.

掌叶铁线蕨 zhang ye tie xian jue

Adiantum aleuticum (Ruprecht) C. A. Paris; *A. boreale* C. Presl; *A. pedatum* var. *aleuticum* Ruprecht; *A. pedatum* var. *glaucescens* C. Christensen (1927), not Christ (1898); *A. pedatum* var. *kamtschaticum* Ruprecht.

Plants terrestrial, 40–60 cm tall. Rhizomes erect or decumbent, scales dark brown, broadly lanceolate, margins entire. Fronds clustered or approximate; stipe castaneous or brown,

20–40 cm, covered with same scales as rhizome, distally glabrous; lamina pedately dichotomous, broadly flabellate in outline, up to 30 × 40 cm; pinnae 4–6 per branch, 1-imparipinnate, linear-lanceolate in outline; rachises and stalks castaneous-red, glabrous; inner pinnae up to 28 × 2.5–3.5 cm, outer pinnae slightly shorter; pinnules 20–30 pairs per pinna, alternate, obliquely spreading; stalk 1–2.5 cm; basal pinnules slightly smaller, flabellate or semi-orbicular, with longer stalks; middle pinnules dimidiate, narrowly triangular, ca. 2 × 0.6 cm, herbaceous, green, both surfaces glabrous, base asymmetrical, cuneate, inner and lower margins straight and entire, apex undulate or with blunt teeth, upper margin divided to halfway, apex obtuse; segments ± square, entire or depressed at middle or undulate-crenate; distal pinnules similar but gradually smaller toward apices, terminal pinnules flabellate, divided at middle, bilateral sides lobed, equal in size or slightly larger than middle pinnules; veins multidichotomously forked, reaching margin, visible on both surfaces. Sori 4–6 per pinnule, horizontally attached in shallow sinuses; false indusia grayish green or dark brown, orbicular or reniform, membranous, entire, persistent. Perispore granular.

Near streamsides in forests; 300–3500 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [Bhutan, NE India, Japan, Korea, Nepal; North America].

The whole plant is used in traditional Chinese medicine.

The authors have not seen material of *Adiantum pedatum* var. *grandifolium* (Ching) Ching (Acta Phytotax. Sin. 6: 324. 1957; *A. grandifolium* Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 269. 1949), described from Yunnan, and so cannot confirm its status.

16. *Adiantum myriosorum* Baker, Bull. Misc. Inform. Kew 1898: 230. 1898.

灰背铁线蕨 hui bei tie xian jue

Adiantum myriosorum var. *recurvatum* Ching & Y. X. Lin; *A. pedatum* Linnaeus var. *glaucinum* Christ; *A. pedatum* var. *myriosorum* (Baker) Christ; *A. pedatum* var. *protrusum* Christ.

Plants terrestrial, 40–60 cm tall. Rhizomes erect or ascending, scales dark brown, broadly lanceolate, margins entire. Fronds clustered or approximate; stipe nearly black, 12–25 cm, covered with same scales as rhizome, distally glabrous; lamina pedately dichotomous, broadly flabellate in outline, 25–35 cm; pinnae 3–7 per branch, 1-imparipinnate, linear-lanceolate in outline, outer pinnae progressively shorter; rachises and stalks glabrous; pinnules 20–30 pairs per pinna, alternate, obliquely spreading, stalked; basal pinnules slightly smaller, flabellate or semi-orbicular, with longer stalks; middle pinnules dimidiate, triangular-elliptic, ca. 2 × 0.6 cm, herbaceous, abaxially glaucous, both surfaces glabrous, base asymmetrical, cuneate, inner and lower margins straight and entire, upper margin lobed, apex obtuse; segments ± square, with acute triangular teeth; distal pinnules similar to middle pinnules but gradually smaller toward apices, terminal pinnules flabellate, divided at middle, bilateral sides lobed, equal in size or slightly larger than middle pinnules; veins multidichotomously forked, reaching margin, visible on both surfaces. Sori 4–6 per pinnule, horizontally attached in shallow sinuses; false indusia grayish green or dark

brown, orbicular-reniform, membranous, entire, persistent. Perispore reticulate.

Dense forests; 900–2600 m. Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, NE India, Kashmir, N Myanmar, Nepal].

Adiantum myriosorum is a beautiful plant that is cultivated as an ornamental.

17. *Adiantum subpedatum* Ching, Bull. Bot. Res., Harbin 3(3): 2. 1983.

昌化铁线蕨 chang hua tie xian jue

Plants terrestrial, 24–28 cm tall. Rhizomes erect, short scales brown, broadly lanceolate. Fronds clustered; stipe blackish, 10–15 cm, ca. 1 mm thick, glabrous; lamina pedately dichotomous, ca. 15 × 11–20 cm; pinnae 2–4 (or 5) per branch, 1-imparipinnate, linear-lanceolate in outline, inner pinnae up to 13 × 2 cm, outer pinnae slightly shorter; pinnules ca. 24 pairs per pinna, alternate, spreading, stalked; basal pinnules slightly smaller, flabellate, with longer stalks; middle pinnules oblong, ca. 1 × 0.3–0.4 cm, submembranous, drying green, base cuneate, inner and lower margins straight and entire, upper margin minutely acutely dentate. Veins extending into marginal teeth, visible abaxially. Sori 1 or 2 per pinnule, horizontally attached in shallow sinuses; false indusia grayish green, orbicular or reniform, membranous, persistent.

• On calcareous rocks; ca. 1000 m. Zhejiang.

The possibility that *Adiantum subpedatum* is a depauperate form of the preceding species, *A. myriosorum*, merits further investigation.

18. *Adiantum hispidulum* Swartz in Schrader, J. Bot. 1800: 82. 1802.

毛叶铁线蕨 mao ye tie xian jue

Adiantum pedatum G. Forster (1786), not Linnaeus (1753); *A. pubescens* Schkuhr.

Plants ca. 40 cm tall. Rhizomes erect, short, scales purple-black, lanceolate, margins subentire. Fronds clustered; stipe dark castaneous, glossy, ca. 20 cm, ca. 2 mm in diam., densely brownish villous, glabrescent; lamina dichotomously 2- or 3-pinnate, broadly ovate-triangular in outline, ca. 18 × 10 cm, middle pinnae usually longest, 1-imparipinnate, linear-lanceolate in outline, ca. 16 cm; costae and stalks castaneous, densely brown pubescent; pinnules ca. 30 pairs per pinna, alternate, obliquely spreading, shortly stalked, lower 1 or 2 pairs of pinnules slightly reduced, flabellate or flabellate-rectangular, middle pinnules nearly uniform in size, orbicular, ca. 8 × 4–5 mm, papery, dark brown or deep olive-green, both surfaces sparsely brown pubescent, base asymmetrically cuneate, inner and lower margins straight and entire, with narrow shallow sinuses, outer margins rounded, upper margins rounded-truncate, sterile parts undulate and dentate; all lateral pinnae same shape as middle pinnae and gradually becoming shorter toward bilateral sides; fertile segments truncate and entire on upper margins, distal pinnules gradually smaller toward apex; terminal pinnules obtriangular, slightly larger than lower lateral ones; veins multidichotomously forked, visible on both surfaces. Sori 4–12 at

sinuses of pinnules; false indusia dark brown, orbicular, leathery, pubescent adaxially, upper margins deeply depressed or sinuate, entire, persistent. $2n = 360$.

Steep forested slopes, on rocks; 300–1500 m (in Taiwan). E Guangdong, E Taiwan, SE Yunnan [India, Indonesia (Java), Malaysia, Philippines; tropical and subtropical regions: Africa, Asia, Pacific islands].

19. *Adiantum flabellulatum* Linnaeus, Sp. Pl. 2: 1095. 1753.

扇叶铁线蕨 shan ye tie xian jue

Adiantum amoenum Wallich ex Hooker & Greville; *A. fuscum* Retzius.

Plants terrestrial, 20–45 cm tall. Rhizomes erect, short, scales dense, yellowish to brown, glossy, linear-lanceolate, margins entire. Fronds clustered; stipe black-purple, glossy, 10–30 cm, adaxially grooved with short stiff brown hairs inside, base covered with same scales as rhizome, distally glabrous; lamina pedately 2- or 3-dichotomously branched, flabellate in outline, 10–25 cm, middle pinnae usually longer, 1-imparipinnate; costae and stalks purple-black, abaxially glabrous, adaxially with dense, short, brown-red hairs; middle pinnae 1-pinnate, linear-lanceolate, 6–15 × 1.5–2 cm; outer pinnae similar but slightly shorter, up to 5 cm; pinnules 8–15 pairs per pinna, alternate, horizontally spreading; stalk 1–2 mm; blade below middle ± uniform in size, dimidiate-semi-orbicular when fertile, rhomboid when sterile, 6–15 × 5–10 mm, thinly leathery, green or dark brown, both surfaces glabrous, base broadly cuneate or flabellately cuneate, inner and lower margins straight and entire, outer and upper margins subrounded or rounded-truncate, fertile parts shallowly sinuate, segments entire, sterile parts denticulate; distal pinnules similar but slightly smaller; terminal pinnules obovate or flabellate, equal to or slightly larger than lower pinnules; veins multidichotomously forked and reaching margins, visible on both surfaces. Sori 2–5 per pinnule, horizontal, at upper and outer margins of segments; false indusia dark brown, semi-orbicular or oblong, glabrous, upper margins flat and straight, entire, persistent. Perispore indistinctly granular. $2n = 116$.

Acidic red and yellow soils in open areas; 100–1100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan (including Ryukyu Islands), Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

The whole plant is used in traditional Chinese medicine and has a variety of uses. The plant is an indicator of acidity, growing on red and yellow soils with a pH of 4.5–5.

The name "*Adiantum chinense*" was a pre-Linnaean name introduced by Plukenet and recorded by N. L. Burman (Fl. Indica, 236. 1768) as a synonym of *A. flabellulatum*.

20. *Adiantum induratum* Christ, J. Bot. (Morot), ser. 2, 1: 265. 1908.

圆柄铁线蕨 yuan bing tie xian jue

Plants 15–40 cm tall. Rhizomes erect, short, scales dense, dark brown. Fronds clustered; stipe brown when young, black when old, glossy, 4–20 cm, less than 1.5 mm in diam., adaxially

grooved with stiff brown hairs inside, terete when old, glabrescent; lamina 2–4-pinnate, broadly ovate in outline, 10–20 × 6–10 cm; pinnae 2–4 each side, obliquely spreading, stalked; rachis, costae, and stalks dark brown and glossy, abaxially glabrous, adaxially densely brown-yellow pubescent; basal pair of pinnae largest, narrowly ovate in outline, 4–9 × 2–4 cm, stalks 1–1.2 cm, 2- or 3-paripinnate; outer pinnae progressively shorter; pinnules 2 pairs per pinna, alternate, oblique upward; stalk ca. 3 mm, articulate at apex, persistent after pinnules fall; pinnules of fertile fronds subrounded, 5–9 × 8–11 mm, subleathery, dark brown-yellow or dark brown-green, abaxially sometimes slightly glaucous, both surfaces glabrous, base broadly cuneate or truncate, inner and lower margins straight and entire, outer and upper margins rounded or subrounded, entire or few sinuate; pinnules of sterile fronds slightly larger, oblong, 9–12 × 11–16 mm, bases broadly cuneate, entire, outer and upper margins undulately lobed, denticulate; distal pinnules similar but slightly smaller; terminal pinnules: stalks 2–4 mm, blades flabellate, slightly larger than lower pinnules. Veins multidichotomously forked, reaching margins, visible on both surfaces. Sori (1 or 2 or) 4–6 on ultimate pinnules, horizontally attached at upper margins; false indusia dark brown, reniform, broadly linear, or oblong, leathery, upper margins truncate or slightly depressed, entire, persistent.

Acidic soil of forests by roadsides or forest margins; 100–800 m. Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

21. *Adiantum diaphanum* Blume, Enum. Pl. Javae 2: 215. 1828.

长尾铁线蕨 chang wei tie xian jue

Adiantum affine Willdenow; *A. diaphanum* var. *affine* (Willdenow) Alderwerelt; *A. setulosum* J. Smith.

Plants epilithic, 15–30 cm tall. Rhizomes erect, short, scales dark brown, lanceolate, margins denticulate. Fronds clustered; stipe castaneous, glossy, 4–20 cm, slender, adaxially grooved, base sparsely covered with same scales as rhizome, distally glabrous; lamina 1-pinnate or 2-pinnate with a few lateral pinnae nearly as large as terminal pinna, deltoid-lanceolate in outline, 6–11 × 2–3 cm; rachis, costae, and stalks castaneous, glabrous; pinnules 8–16 pairs per pinna, alternate, obliquely spreading or lower ones subhorizontally spreading; stalk less than 2 mm; blade uniform in size, dimidiate, rhombic or quadrangular, 1–1.8 × 0.5–0.9 cm, membranous, abaxially slightly glaucous and with lax, appressed, brown, unicellular needlelike setae, adaxially glossy, dark brown or deep olive-green, base asymmetrical, broadly cuneate, margin with rounded sinuses, outer margin obtuse or truncate, upper margin truncate or rounded, distal pinnules similar but slightly smaller; terminal pinnules rhombic, slightly larger; veins flabellately forked, reaching margins, visible on both surfaces. Sori 2–10 per pinnule, inserted in sinuses between lobes except those attached along veinlet but also on mesophyll between veinlets; false indusia dark brown, orbicular, leathery, upper margins deeply sinuate and with unicellular, brown, needlelike setae, persistent. Perispore indistinctly granular. $2n = 116, 232$.

Wet soils or on rocks near streamsides in forests; 400–2200 m. Fujian, Guangdong, Hainan, Jiangxi, Taiwan [Indonesia, Malaysia, Vietnam; Australia, Pacific islands (New Zealand, Polynesia)].

22. *Adiantum fengianum* Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 267. 1949.

冯氏铁线蕨 feng shi tie xian jue

Plants ca. 10 cm tall. Rhizomes decumbent, slender, scales dense, dark brown. Fronds approximate; stipe dark castaneous, glossy, 3–6 cm, as slender as silk, smooth above base; lamina 2-pinnate, narrowly ovate to lanceolate in outline, 3–5 × 1–2 cm, apex obtuse; pinnae 4 or 5 each side, horizontally or obliquely spreading; rachises, costae, and stalks same as stipe; pinnae below middle only, ± uniform in size, imparipinnate, narrowly ovate in outline, 1–1.5 × ca. 0.8 cm; pinnules alternate, with short, slender stalks, spreading obliquely upward, uniformly obtriangular, ca. 4 mm, progressively slightly smaller distally, herbaceous, green, both surfaces glabrous, sterile pinnules: base symmetrically cuneate, bilateral margins straight and entire, upper margins divided and sharply serrate, apex rounded, fertile pinnules with apex truncate or with few sharp serrations on bilateral acroscopic corner; veins multidichotomously forked and reaching margins, visible on both surfaces. Sori 1 per pinnule, horizontally attached at upper margin; false indusia glaucous or dark brown, elongate, nearly as wide as upper margin of pinnule, membranous, upper margins truncate or slightly undulate, persistent. Perispore indistinctly granular.

• Wet rocks in forests; ca. 3400 m. N Yunnan (Lijiang, Yulong Shan).

Adiantum fengianum is listed as endangered in the IUCN Red Book (China Plant Specialist Group 2004. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>; accessed 16 Apr 2013).

23. *Adiantum bonatianum* Brause, Hedwigia 54: 206. 1914.

毛足铁线蕨 mao zu tie xian jue

Plants 25–60 cm tall. Rhizomes creeping, slender, scales black, lanceolate, also brown multicellular villous. Fronds approximate; stipe black-purple, glossy, 10–20 cm, base densely scaly and villous, hairs easily rubbed off when dried to leave rough feeling surface, distally smooth; lamina 3- or 4-pinnate, broadly ovate to triangular in outline, 20–40 × 19–25 cm, apex acuminate; primary pinnae 5–7 each side, 2- or 3-pinnate, obliquely spreading, stalks ca. 1 cm; rachis and costae same color as stipe, glabrous; basal 1 or 2 pairs of pinnae largest, triangular, 8–18 × 4–9 cm; pinnules 2–4, alternate; stalk castaneous-red, ca. 1 mm, hairlike; blade flabellate, 5–9 × 4–11 mm, thinly herbaceous, green, both surfaces glabrous, base symmetrical, cuneate, bilateral margins entire, apex rounded, with dense short and broad triangular serrations sometimes with cartilaginous, often crooked, tips extended into long awns; veins multidichotomously forked, reaching tips of serration, visible on both surfaces. Sori 1–4 per pinnule; false indusia dark brown, orbicular or orbicular-reniform, membranous, upper margins deeply sinuate, entire, persistent. Perispore indistinctly granular.

• Slightly acidic damp soil in forests, rock crevices at forest margins; 1400–2500 m. Guizhou, Sichuan, Yunnan.

1a. Apical serrations of ultimate pinnules with cartilaginous, usually crooked,

long awns at tips 23a. var. *bonatianum*
1b. Apical serrations of ultimate pinnules acute and without cartilaginous awn at tip 23b. var. *subaristatum*

23a. *Adiantum bonatianum* var. *bonatianum*

毛足铁线蕨(原变种) mao zu tie xian jue (yuan bian zhong)

Apical serrations of ultimate pinnules extended into cartilaginous, usually crooked, long awn points.

• Slightly acidic damp soil in forests, rock crevices at forest margins; 1400–2500 m. Guizhou, Sichuan, Yunnan.

23b. *Adiantum bonatianum* var. *subaristatum* Ching, Acta Phytotax. Sin. 6: 338. 1957.

无芒铁线蕨 wu mang tie xian jue

Apical serrations of ultimate pinnules acute, not extended into cartilaginous awn points.

• On rocks in forests; ca. 1400 m. Sichuan.

“*Adiantum pseudobonatianum*” (Ching in Y. L. Zhang et al., Sporae Pterid. Sin. 174. 1976) belongs here but was not validly published because no Latin description or diagnosis, or reference to such, was provided (*Melbourne Code*, Art. 39.1).

24. *Adiantum davidii* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 10: 112. 1887.

白背铁线蕨 bai bei tie xian jue

Adiantum aristatum Christ; *A. davidii* var. *aristatum* (Christ) C. Christensen; *A. davidii* var. *latedeltoideum* (Christ) Ching; *A. davidii* var. *longispinum* Ching; *A. davidii* var. *prattii* (Baker) C. Christensen; *A. latedeltoideum* (Christ) C. Christensen; *A. monochlamys* Eaton var. *latedeltoideum* Christ; *A. prattii* Baker.

Plants epilithic, 20–30 cm tall. Rhizomes long creeping, slender, scales dark brown, glossy, lanceolate, margins entire. Fronds spaced apart; stipe dark castaneous, 10–21 cm, with same scales as rhizome, distally glabrous; lamina 3-pinnate, triangular-ovate in outline, 10–15 × 6–10 cm, apex acuminate; pinnae 3–5 each side, obliquely spreading; rachises, costae, and stalks same color as stipes, with brown, multicellular, articulate hairs at base of pinnae and pinnules; basal pair of pinnae largest, 2-pinnate, narrowly triangular in outline, 5–7 × 3–4 cm; pinnules 4 or 5 pairs per pinna, slightly overlapping, obliquely spreading, apex obtuse; stalk castaneous, 1–4 mm, slender; blade uniform in shape, flabellate, 4–7 × 4–7 mm, progressively smaller distally, hard herbaceous, abaxially gray-green, adaxially green or glaucous, both surfaces glabrous, base cuneate, bilateral margins entire, apex rounded, with dense short and broad serrations with short cartilaginous awn points. Veins multidichotomously forked, reaching apices of serrations, visible on both surfaces. Sori 1(or 2) per pinnule, horizontally attached at apical sinus of pinnule; false indusia dark brown, reniform or orbicular-reniform, papery, upper margins shallowly depressed, entire, persistent. Perispore thickly granular. $2n = 240^*$.

• On rocks by streamsides; 1100–3400 m. Gansu, Guizhou, Hebei, Henan, Shaanxi, Shanxi, Sichuan, Yunnan.

25. *Adiantum venustum* D. Don, Prodr. Fl. Nepal. 17. 1825.细叶铁线蕨 *xi ye tie xian jue**Adiantum venustum* var. *wuliangense* Ching & Y. X. Lin.

Plants terrestrial, 25–50 cm tall. Rhizomes decumbent, thick, scales dense, dark brown, ovate-lanceolate, margins entire. Fronds remote; stipe castaneous-brown, 10–20 cm, base covered with same scales as rhizome, distally glabrous; lamina 3-pinnate, broadly ovate in outline, 10–25 × 5–12 cm, apex acuminate and 1-pinnate; pinnae ca. 6 each side, obliquely spreading, stalks 2–7 mm; rachises, costae, and stalks ± zigzag, same color as stipe, glabrous; basal pair of pinnae largest, 2-pinnate, ovate-elliptic, 5–13 × 4–7 cm; pinnules 4 or 5 pairs per lateral pinna, alternate, upwardly oblique, shortly stalked, flabellate, 7–10 × 7–10 mm, green or brown-green, herbaceous, both surfaces glabrous, base shortly cuneate, shortly stalked, apex rounded and denticulate. Veins multidichotomously forked, reaching teeth at pinnule margin, visible on both surfaces. Sori 1 or 2 (or 3) per pinnule, attached at rounded sinus; false indusia brownish, orbicular, membranous, upper margin deep sinuslike, entire, persistent. $2n = 120$.

Rock crevices, mountain slopes; 2000–2900 m. Xizang, Yunnan (Jingdong, Wuliang Shan) [Bhutan, India, Kashmir, N Myanmar, Nepal].

26. *Adiantum tibeticum* Ching, Acta Phytotax. Sin. 18: 104. 1980.西藏铁线蕨 *xi zang tie xian jue*

Plants ca. 30 cm tall. Rhizomes creeping, ca. 1.5 mm in diam., scales dense, brown, lanceolate. Fronds remote, erect; stipe castaneous-brown, glossy, ca. 15 cm, terete, adaxially grooved, distally glabrous; lamina 3-pinnate, ovate in outline, 10–16 × 5–7 cm, distally 1-pinnate; pinnae 4 or 5 each side, oblique upward, shortly stalked; rachises, costae, and stalks zigzag, same color as stipes, smooth; basal pinnae 2-pinnate, narrowly ovate in outline, ca. 6 × 2.8 cm; pinnules 3 or 4 pairs per pinna, shortly stalked, silklike; fertile pinnules flabellate, usually 7–11(–13) × 7–13 mm, thinly herbaceous, abaxially glaucous, adaxially greenish, both surfaces glabrous, base cuneate, oblique to irregularly shaped, apex rounded, with rounded sharp triangular teeth; terminal pinnules slightly larger. Veins multidichotomously forked, obscure. Sori 1 or 2 (or 4) on ultimate pinnule; false indusia brownish, orbicular-reniform or narrowly reniform, membranous, upper margin with a large depression, entire, persistent.

Forests by roadsides; 2800–3200 m. SE Xizang (Jilong) [Afghanistan, Bhutan, India, Kashmir, Nepal].

27. *Adiantum fimbriatum* Christ, Bull. Soc. Bot. France 52(Mém. 1): 62. 1905.长盖铁线蕨 *chang gai tie xian jue*

Adiantum fimbriatum var. *shensiense* (Ching) Ching & Y. X. Lin; *A. smithianum* (C. Christensen) Ching; *A. smithianum* var. *shensiense* Ching; *A. venustum* D. Don var. *smithianum* C. Christensen.

Plants terrestrial or epilithic, (10–)25–35 cm tall. Rhizomes creeping, slender, scales dense, brown, glossy, ovate-lan-

ceolate. Fronds spaced; stipe reddish castaneous, glossy, 10–20 cm, base covered with same scales as rhizome, distally glabrous; lamina 3- or 4-pinnate, ovate-triangular in outline, 7–25 × 10–20 cm, apex obtuse; pinnae 3–7 each side, oblique upward, stalks ca. 10 mm; rachises, costae, and stalks zigzag, same color as stipes, glossy, basal pair of pinnae largest, 2-pinnate, ovate-triangular in outline, 6–10 × 4–8 cm, apex obtuse; distal pinnae 1-pinnate; pinnules 3–5 pairs per ultimate pinna, stalked, obovate or flabellate, 6–7 × 6–7 mm or longer than wide, progressively smaller distally, thinly herbaceous, greenish or gray-green, both surfaces glabrous, base symmetrical or slightly oblique, cuneate, bilateral sides entire, apex rounded or ± oblique, with dense small sharp narrowly triangular teeth without awned tips. Veins flabellately forked, ending in marginal teeth, visible on both surfaces. Sori (1 or)2 or 3(–5) per pinnule; false indusia brownish, rectangular, reniform, orbicular, or orbicular-reniform, membranous, less often slightly depressed, upper margins more often flat and straight, entire, persistent. Perispore indistinctly granular.

• On rocks or in rock crevices in forests by streamsides; 2700–3600 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.

28. *Adiantum breviserratum* (Ching) Ching & Y. X. Lin, Acta Phytotax. Sin. 18: 104. 1980.圆齿铁线蕨 *yuan chi tie xian jue*

Adiantum venustum D. Don var. *breviserratum* Ching, Acta Phytotax. Sin. 6. 335. 1957.

Plants 20–30 cm tall. Rhizomes creeping, scales dense, brown, lanceolate. Fronds tufted or approximate; stipe castaneous-brown, glossy, 10–20 cm, base with same scales as rhizome, distally smooth; lamina 3- or 4-pinnate, subovate-triangular in outline, ca. 15 × 10 cm, apex acuminate; primary pinnae 5 or 6 each side, spreading obliquely upward, with stalk 2–6 mm; basal pair of pinnae largest, 2-pinnate, ovate or subovate-triangular in outline, 7–9 × 2.5–4 cm, apex obtuse; secondary pinnae 4 or 5 pairs, basal pair of pinnae largest, 1-pinnate, broadly ovate in outline, 2.5–3.5 × ca. 1.5 cm, apex obtuse; pinnules 2–4 pairs per ultimate pinna; stalk silklike; blade obovate or narrowly flabellate, 3–6 × 3–6 mm, progressively smaller distally, thinly herbaceous, grayish green, both surfaces glabrous, base cuneate, bilateral sides entire, upper margins rounded and crenate. Veins multidichotomously forked, reaching teeth of upper margin of pinnule, visible on both surfaces. Sori 1 per pinnule, horizontally attached at upper margin; false indusia brownish, suborbicular or rectangular, membranous, upper margins flat and straight, upper margins flat and straight, entire, persistent.

• On limestone; 2400–3500 m. Xizang, N Yunnan.

29. *Adiantum monochlamys* D. C. Eaton, Proc. Amer. Acad. Arts 4: 110. 1858.单盖铁线蕨 *dan gai tie xian jue*

Adiantum monochlamys var. *simozawai* Masamune; *A. veitchii* Hance; *A. venustum* D. Don var. *monochlamys* (D. C. Eaton) Luerssen.

Plants ?terrestrial, 15–55 cm tall. Rhizomes long creeping, scales dense, castaneous-black, glossy, narrowly lanceolate, margins entire. Fronds close together or spaced; stipe castaneous-black or castaneous, glossy, 15–28 cm, base covered with same scales as rhizome, distally glabrous; lamina 2(or 3)-pinnate, narrowly ovate-triangular in outline, 15–30 × 3–10 cm, base broadly cuneate, apex acuminate and 1-pinnate; pinnae 6–8 each side, spreading obliquely upward, stalk 1–1.5 cm; rachises, costae, and stalks zigzag, same color as stipes, glabrous; basal pair of pinnae largest, 2-pinnate, triangular-ovate, 4–8 × 3–4.5 cm; secondary pinnae 2 or 3 pairs per pinna; pinnules 3–5 pairs per pinna, obliquely ascending; stalk castaneous, short, slender; blade obtriangular, 6–10 × 5–8 mm, progressively slightly smaller distally, herbaceous, abaxially grayish green, both surfaces glabrous, base cuneate, apex rounded-truncate; fertile pinnules deeply depressed at middle, both sides with sharp triangular teeth, bilateral margins straight and entire; terminal pinnules with longer stalks. Veins multidichotomously forked, reaching ends of teeth of pinnules, visible on both surfaces. Sori 1(or 2) per pinnule, in sinus of upper margin; false indusia dark red-brown, reniform, thinly papery, upper margin deeply sinuate, entire or slightly undulate, persistent. $2n = 116$.

Forests on mountains, shaded rocks and cliffs in forests; 700–2500 m. Guizhou, Sichuan, Taiwan, Zhejiang [Japan, S Korea].

"*Adiantum monochlamys* var. *plurisorum*" (H. Lévillé, Bull. Acad. Int. Géogr. Bot. 20: 4. 1910) belongs here but is a nomen nudum and was not therefore validly published (*Melbourne Code*, Art. 38.1(a)).

30. *Adiantum erythrochlamys* Diels, Bot. Jahrb. Syst. 29: 201. 1900.

肾盖铁线蕨 *shen gai tie xian jue*

Adiantum roborowskii Maximowicz var. *robustum* Christ.

Plants epilithic, 16–35 cm tall. Rhizomes shortly creeping or ascending, scales dense, castaneous-black, glossy, narrowly lanceolate, margins entire. Fronds clustered or closely spaced; stipe castaneous, glossy, 5–22 cm, base densely covered with same scales as rhizome, distally glabrous; lamina 3-pinnate, lanceolate-triangular in outline, 4–22 × 4–8 cm, base cuneate, apex acuminate; pinnae 4–7 each side, stalk 5–10 mm; costae and stalks similar to stipe, glabrous, obliquely ascending; basal pinnae slightly larger, 2-pinnate below middle, narrowly ovate, 2.5–4 × ca. 2 cm, and with 2 pairs of pinnules; distal pinnae 1-pinnate; pinnules 3 or 4 pairs per pinna, alternate, obliquely ascending; stalk ca. 1 mm, slender; blade narrowly flabellate or obovate, 5–14 × 4–10 mm, progressively slightly smaller distally, papery, yellow-green or dark brown-green, both surfaces glabrous, base narrowly cuneate, bilateral sides symmetrical, undulate-crenate, outer and inner margins entire; sterile pinnules with upper margins distinctly bluntly triangular serrate, upper margin of fertile pinnules with wide and deep sinus at middle. Veins multidichotomously forked, reaching margins, visible on both surfaces. Sori 1(or 2) per pinnule, in sinus of upper margin; false indusia dark brown, orbicular or orbicular-reniform, subleathery, upper margins deeply sinuate, entire, persistent. Perispore granular.

• On rocks or in rock crevices in forests by streamsides; 600–3500 m. Guizhou, Henan, Hubei, Sichuan, ?Taiwan, Xizang.

Reviewer Ralf Knapp questions the occurrence of *Adiantum erythrochlamys* in Taiwan.

The authors have not seen material of *Adiantum erythrochlamys* var. *humanense* C. M. Zhang (in W. T. Wang et al., Keys Vasc. Pl. Wuling Mts. 563. 1995), described from Shimen, Hunan, and so cannot confirm its status.

31. *Adiantum roborowskii* Maximowicz, Mélanges Biol. Bull. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 11: 867. 1883.

陇南铁线蕨 *long nan tie xian jue*

Plants epilithic, 9–25(–35+) cm tall. Rhizomes erect or ascending, short, scales dense, dark brown, margins entire. Fronds clustered or approximate; stipe reddish castaneous, glossy, 2–20 cm, terete, base covered with same scales as rhizome, distally glabrous; lamina 3-pinnate on lower part, 1-pinnate on upper part, lanceolate or ovate-elliptic in outline, 2–18 × 2–6 cm, apex acuminate, pinnae 3–6 each side, all parts obliquely ascending, stalk 3–6 mm; rachises, costae, and stalks reddish castaneous, glabrous; basal pair of pinnae slightly larger, 2-pinnate, ovate-triangular, 1.5–3 × 1.2–1.4 cm, base rounded-cuneate, apex obtuse; distal pinnae progressively smaller, 1-pinnate; pinnules 1 or 2 pairs per pinna, alternate; stalk reddish castaneous, short, slender; blade subtriangular, narrowly flabellate, triangular, broadly ovate, or suborbicular-flabellate, 5–9 × 4–7 mm, papery or nearly hard papery, gray-green, both surfaces glabrous, base broadly or rounded cuneate, sterile pinnules with upper margins rounded and with slightly undulate projection; upper margins of fertile pinnules entire and with 1 or 2 deep sinuses at middle. Veins multidichotomously forked, nearly reaching margins, visible on both surfaces. Sori 1 or 2 per pinnule, in deep sinuses of upper margin; false indusia dark brown, orbicular or orbicular-reniform, subleathery, upper margins deeply sinuate, entire, persistent.

• In rock crevices in wet forests, on moss-covered or damp rocks and cliffs, on rocks or cliffs by ditch sides; 1000–3500 m. Gansu, Guizhou, Hubei, Qinghai, Shaanxi, Sichuan, C and S Taiwan, Xizang.

- 1a. Ultimate pinnules suborbicular-flabellate, base rounded-cuneate 31c. var. *faberi*
- 1b. Ultimate pinnules triangular, obovate, or broadly ovate, base broadly cuneate.
 - 2a. Stipe 4–20 cm, lamina 4–18 cm, pinnules narrowly flabellate 31a. var. *roborowskii*
 - 2b. Stipe 2–8 cm, lamina 2–7 cm, pinnules triangular or broadly ovate 31b. var. *taiwanianum*

31a. *Adiantum roborowskii* var. *roborowskii*

陇南铁线蕨(原变种) *long nan tie xian jue* (yuan bian zhong)

Stipe 4–20 cm; lamina 4–18 cm, ultimate pinnules narrowly flabellate, base broadly cuneate.

• In rock crevices in wet forests, on cliffs or rocks by ditch sides; 1000–2000 m. Gansu, Guizhou, Qinghai, Shaanxi, Sichuan.

31b. *Adiantum roborowskii* var. *taiwanianum* (Tagawa) W. C. Shieh, Quart. J. Chin. Forest. 2: 167. 1968.

台湾高山铁线蕨 tai wan gao shan tie xian jue

Adiantum taiwanianum Tagawa, Acta Phytotax. Geobot. 4: 93. 1935.

Stipe 2–8 cm; lamina 2–7 cm, ultimate pinnules triangular or broadly ovate, base broadly cuneate.

● On moss-covered rocks and cliffs; 2200–3500 m. C and S Taiwan.

31c. *Adiantum roborowskii* var. *faberi* (Baker) Y. X. Lin & Prado, **comb. et stat. nov.**

峨眉铁线蕨 e mei tie xian jue

Basionym: *Adiantum faberi* Baker, J. Bot. 26: 225. 1888; *A. roborowskii* f. *faberi* (Baker) Y. X. Lin.

Ultimate pinnules suborbicular-flabellate, base rounded-cuneate.

● On damp rocks; 1200–3000 m. Hubei, Sichuan.

32. *Adiantum formosanum* Tagawa, J. Jap. Bot. 14: 315. 1938.

深山铁线蕨 shen shan tie xian jue

Rhizomes creeping, short, scaly. Stipe dark castaneous, glossy, 5–12 cm; lamina 2- or 3-pinnate, narrowly ovate-triangular in outline, 4–10 × 3–4 cm; pinnae 3 or 4 each side, stalked; rachises and stalks zigzag, smooth; basal pair of pinnae slightly larger, 1- or 2-pinnate; pinnules 3 or 4 pairs per pinna, alternate, shortly stalked, fan-shaped, 5–10 × 4–6 mm, herbaceous, both surfaces glabrous, base cuneate, upper margin rounded, entire or shallowly 2-lobed. Sori (1 or 2)–(4) per pinnule, on lobe apices of upper margin, oblong to linear; indusium reniform.

● On wet moss-covered rocks and cliffs; 2300–3500 m. Taiwan.

33. *Adiantum refractum* Christ, Bull. Acad. Int. Géogr. Bot. 11: 224. 1902.

月牙铁线蕨 yue ya tie xian jue

Adiantum delavayi Christ; *A. edentulum* Christ; *A. edentulum* f. *muticum* (Ching) Y. X. Lin; *A. edentulum* f. *refractum* (Christ) Y. X. Lin; *A. muticum* Ching; *A. submarginatum* Christ, p.p.; *A. veneris* Linnaeus var. *sinuatum* Christ.

Plants epilithic, 15–30(–50) cm tall. Rhizomes erect or ascending, short, scales dense, brown, lanceolate, margins entire. Fronds clustered; stipe castaneous-black, glossy, 5–17 cm, base covered with same scales as rhizome, distally smooth; lamina usually 2- or 3-pinnate, ovate or ovate-lanceolate in outline, 10–15 × 4.5–12 cm, base cuneate, apex acute; pinnae 4–6 each side, all parts obliquely ascending, stalked; rachises and stalks similar to stipe, zigzag, smooth; basal pair of pinnae largest, 1- or 2-pinnate, narrowly ovate or narrowly triangular-ovate in outline, 2.5–12 × 2–3 cm; pinnae from second pair upward all similar but progressively smaller; pinnules 4 or 5 pairs per pinna, alternate; stalk 0.5–4 mm, slender as silk; blade asymmetrical, flabellate, 5–15 × 8–14 mm, papery, abaxially gray-

green, both surfaces glabrous, base shortly cuneate, bilateral sides entire, upper margin undulate-rounded, 1–4-lobate or semilobate (divided to middle), sterile pinnules entire or slightly undulate, fertile segments shallowly 2- or 4-lobed, terminal pinnules similar but slightly larger. Veins multidichotomously forked, reaching margins, visible on both surfaces. Sori 2–4(or 5) per pinnule, on lobe apices of upper margin; false indusia brown, narrowly reniform or orbicular-reniform, membranous, upper margins flat and straight or depressed, entire, persistent. Perispore reticulate.

● On rocks in forests, wet rocks covered with bryophytes in ditches, shaded wet cliffs, ditch sides of mixed forests; 1000–3600 m. Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang.

Adiantum refractum is very similar to the Himalayan species *A. wattii* Baker and perhaps should be included within that species.

34. *Adiantum capillus-veneris* Linnaeus, Sp. Pl. 2: 1096. 1753.

铁线蕨 tie xian jue

Adiantum capillus-veneris f. *dissectum* (M. Martens & Galeotti) Ching; *A. capillus-veneris* f. *fissum* (Christ) Ching; *A. capillus-veneris* var. *fissum* Christ; *A. capillus-veneris* f. *lan-yuanum* W. C. Shieh; *A. capillus-veneris* var. *trifidum* Christ; ?*A. lingii* Ching; *A. michelii* Christ; *A. submarginatum* Christ, p.p.; *A. tenerum* Swartz var. *dissectum* M. Martens & Galeotti.

Plants terrestrial or epilithic, 10–40 cm tall. Rhizomes creeping, slender, scales dense, brown, lanceolate, margins entire. Fronds remote or closely spaced; stipe castaneous-black, glossy, 3–20 cm, slender, base covered with same scales as rhizome, distally glabrous; lamina mostly 2-pinnate below middle, 1-pinnate above middle, ovate-triangular in outline, 6–25 × 8–16 cm, base cuneate, apex acute; pinnae 3–5 each side, obliquely ascending, stalk up to 15 mm; rachises, costae, and stalks same color as stipes, slightly zigzag, color passing into lamina base; basal pair of pinnae larger, 1(or 2)-pinnate, narrowly ovate in outline, 3–9 × 2.5–4 cm, apex obtuse; pinnae from second pair upward all similar but progressively smaller; pinnules 2–4 pairs per ultimate pinna, alternate, obliquely ascending; stalk castaneous-black, 1–2 mm, slender; blade subequal in size or basal pair slightly larger, 12–20 × 10–15 mm, thinly herbaceous, green or dark brown-green, both surfaces glabrous, base cuneate, sides entire, upper margin rounded, 2–4-lobed or divided into twiglike segments; sterile pinnules with apex obtuse, with marginal teeth broadly triangular or erose; fertile segments with apex truncate, straight or slightly depressed, entire or with erose teeth on both sides; terminal pinnules flabellate, usually larger, base narrowly cuneate, stalks up to 1 cm. Veins multidichotomously forked, reaching margins, visible on both surfaces. Sori 3–10 per pinnule, on apices of lobes of upper margin; false indusia yellowish green, brown when old, narrowly reniform or orbicular-reniform, membranous, upper margins flat and straight, entire, persistent. Perispore thickly granular.

On limestone near running streams, bottom of limestone caves, cliffs wet with dripping water; 100–2800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Japan,

Vietnam; widely distributed in temperate and tropical regions in Africa, America, Asia, Europe, Oceania].

Material of *Adiantum lingii* Ching (Acta Phytotax. Sin. 6: 341. 1957, from Sichuan) has not been seen and is placed here on the basis of the protologue. It was compared with *A. capillus-veneris* but differed by the smaller pinnules that dry olive-green, each with 4–6 sori with orbicular to orbicular-reniform false indusia.

Plants with ultimate pinnules shallowly divided on upper margins have been treated as *Adiantum capillus-veneris* f. *capillus-veneris*, while plants with ultimate pinnules deeply divided into several lobes have been treated as f. *dissectum*.

Adiantum capillus-veneris is an indicator of calcareous soil.

The whole plant is used in traditional Chinese medicine.

18. ANTROPHYUM Kaulfuss, Enum. Filic. 197, 282. 1824.

车前蕨属 *che qian jue shu*

Zhang Xianchun (张宪春); Michael G. Gilbert

Plants epiphytic or epilithic, small to medium-sized. Rhizome short erect or creeping, densely covered with clathrate, iridescent scales, and roots with numerous water-absorbing root hairs. Fronds simple; lamina fleshy, or leathery, shrunken when dry, broadly lanceolate or oblanceolate, sometimes linear, spatulate, obovate, or suborbicular, rarely forked at apex, mostly gradually narrowed into a stipelike base; costa usually only present in basal part; lateral veins abundantly reticulate, without free included veinlets. Sori forming coenosorus, soral lines superficial or immersed, on lateral veins, netted or branched, less often simple; paraphyses abundant, club-shaped with a capitate head, or taeniform, or filiform. Spores trilete, tetrahedral-globose, surface low-papillate, often with scattered spherules and rodlets.

About 40 ill-defined species: Old World tropics; nine species (one endemic) in China.

The species, which badly need taxonomic revision, are either epiphytic or epilithic. In dry periods the fronds shrivel and curl up to some extent. Like most tropical plants, the species of *Antrophyum* reach their northernmost limits of distribution in mainland Asia, south of the Chang Jiang in C China, while along the Pacific islands up to C Japan.

Ching (Sunyatsenia 5: 201–268. 1940; Acta Phytotax. Sin. 16(3): 11. 1978) treats this genus in a rather strict sense, which does not include the tropical American *Anetium* Splitgerber, *Polytaenium* Desvaux, and *Scoliosorus* T. Moore. This is also supported by molecular studies (Crane et al., Amer. Fern J. 85: 283–305. 1995; Crane, Syst. Bot. 22: 509–517. 1997). Kramer (in Kubitzki, Fam. Gen. Vasc. Pl. 1: 375. 1990) believed that “Although the genus has been divided into the Old World *Antrophyum* s.s., with the costa evanescent above the base and paraphyses present among the sporangia, and the New World genus *Polytaenium*, with percurrent costa (extending to apex) and without paraphyses, the overall characters are basically not much different, yet another monotypic American genus, namely *Anetium* might be included in it.”

The Asian species could be divided into three main groups according to the types of paraphyses, i.e., *Antrophyum obovatum* group with capitate paraphyses; *A. henryi* group with taeniform paraphyses; and *A. callifolium* group with filamentous paraphyses. *Antrophyum obovatum* group might be the most primitive group, while *A. callifolium* group might be the most advanced one in this genus.

Knapp (Ferns Fern Allies Taiwan, 422, 434. 2011) recorded *Antrophyum alatum* Brackenridge, described from the Pacific islands, from Taiwan but noted that further studies are required to determine if this species is conspecific with *A. callifolium*.

1a. Paraphyses club-shaped, capitate (*A. obovatum* group).

2a. Fronds 2–8 cm, 0.5–1 cm wide; lamina oblanceolate, spatulate, or elliptic; stipe indistinct 3. *A. parvulum*

2b. Fronds 10–25 cm, broadest above middle, 2–8 cm wide.

3a. Lamina obovate, as long as stipe; margin of scales toothed 1. *A. obovatum*

3b. Lamina oblanceolate, ca. 2 × as long as stipe; margin of scales entire 2. *A. castaneum*

1b. Paraphyses taeniform, or filiform, spirally twisted.

4a. Paraphyses taeniform (*A. henryi* group).

5a. Lamina oblong-lanceolate, 1.5–3 cm wide; stipe short or indistinct 4. *A. formosanum*

5b. Lamina linear-lanceolate, 0.5–1.8 cm wide; stipe indistinct 5. *A. henryi*

4b. Paraphyses filiform (*A. callifolium* group).

6a. Lamina linear, 0.7–1 cm wide; sori usually in one row near margin on both sides of lamina 9. *A. vittarioides*

6b. Lamina broad; soral lines many.

7a. Lamina oblanceolate, 1–1.5 cm wide; stipe indistinct; soral lines simple, parallel 8. *A. wallichianum*

7b. Lamina oblong-lanceolate to broadly oblanceolate, 1.5–10 cm wide; soral lines usually netted.

8a. Stipe 3–10 cm 6. *A. callifolium*

8b. Stipe indistinct 7. *A. sessilifolium*

1. *Antrophyum obovatum* Baker, Kew Bull. 233. 1898.

长柄车前蕨 *chang bing che qian jue*

Antrophyum japonicum Makino; *A. latifolium* Blume var. *obovatum* (Baker) C. Christensen; *A. petiolatum* Baker.

Rhizome short, erect; scales dark brown, lanceolate, 6–10 mm, apex long acuminate, bristlelike, margin minutely denticulate, clathrate. Fronds clustered; stipe 2–15 cm, appressed, base covered with scales like those on rhizome, upward with sparse different sized scales, gradually glabrous; lamina thinly

leathery, obovate, 2–10 × 2–8 cm, widest at middle or above, apex long acuminate or caudate, sometimes upper part irregularly lacerate at margin, base attenuate along stipe; costa absent; veins abundantly reticulate. Soral lines superficial or slightly immersed, on lateral veins, netted, fertile in middle part of lamina; paraphyses club-shaped with a capitate head. Spores trilete, tetrahedral-globose, surface papillate.

In evergreen broad-leaved forests, epiphytic on lower part of tree trunks or on rocks; 200–2400 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Japan, Myanmar, Nepal, N Thailand, Vietnam].

This species is very similar to *Antrophyum plantagineum* (Cavannes) Kaulfuss and more studies are needed.

2. *Antrophyum castaneum* H. Itô, J. Jap. Bot. 12: 473. 1936.

栗色车前蕨 li se che qian jue

Rhizome short erect or shortly creeping; scales dark brown, linear-lanceolate, 3–8 mm, apex long acuminate, bristle-like, margin entire, clathrate. Fronds clustered; stipe 5–10 cm, base covered with scales like those on rhizome, upward with scales, gradually glabrous; lamina leathery, oblanceolate, 10–20 × 1–3 cm, widest above middle, apex acute, base attenuate along stipe; costa absent; veins abundantly reticulate. Soral lines slightly immersed, netted or parallel; paraphyses club-shaped with a capitate head. Spores trilete, tetrahedral-globose, surface papillate.

- 1500–1900 m. Taiwan.

3. *Antrophyum parvulum* Blume, Enum. Pl. Javae 2: 110. 1828.

小车前蕨 xiao che qian jue

Antrophyum reticulatum (G. Forster) Kaulfuss var. *parvulum* (Blume) Beddome; *Hemionitis parvula* (Blume) C. Presl.

Rhizome short erect; scales brown, lanceolate, margin minutely denticulate, clathrate. Fronds clustered; stipe indistinct, appressed, base covered with small scales, gradually glabrous; lamina leathery, oblanceolate, spatulate, or oblong, 1–6 × 0.5–1 cm, apex acuminate or rounded, often lacerate or bifurcate, base attenuate; costa indistinct or only visible at lower 1/3; veins abundantly reticulate, invisible on both surfaces. Soral lines slightly immersed, forked but not netted; paraphyses club-shaped with a capitate head. Spores trilete, tetrahedral-globose, surface papillate.

Epiphytic on tree trunks or on limestone; 400–1600 m. Hainan, Taiwan [India, Indonesia, Malaysia, Philippines, Thailand, Vietnam].

Antrophyum parvulum might be conspecific with *A. immersum* (Bory de Saint-Vincent) Mettenius, which needs further studies. It is quite different from *A. obovatum* by its small size and indistinct stipe.

4. *Antrophyum formosanum* Hieronymus, Hedwigia 57: 210. 1916.

台湾车前蕨 tai wan che qian jue

Rhizome slender, short creeping or ascending; scales dark brown, lanceolate, 3–5 mm, ca. 0.5 mm wide at base, apex long

acuminate, margin minutely denticulate, clathrate. Fronds clustered; stipe with wings; lamina leathery, oblong-lanceolate, 10–20 × 1.5–3 cm, widest at middle or above, apex acute, base long attenuate; costa indistinct; veins abundantly reticulate. Soral lines slightly immersed, netted; paraphyses taeniform. Spores trilete, tetrahedral-globose, surface papillate.

On wet rocks by streams in forests; below 1300 m. Taiwan [Japan (Ryukyu Islands)].

Antrophyum formosanum and its relative *A. henryi* both have taeniform paraphyses, but the latter is much smaller with soral lines not anastomosing.

5. *Antrophyum henryi* Hieronymus, Hedwigia 57: 208. 1916.

车前蕨 che qian jue

Rhizome slender, shortly creeping or erect; scales pale brown, linear-lanceolate, 1.5–3.5 × 0.1–0.3 mm, margin obviously denticulate, clathrate. Fronds clustered; stipe indistinct; lamina subleathery, linear-lanceolate, 5–15 × 0.8–1.5 cm, widest at middle or above, apex narrowly acute, base long attenuate; costa indistinct; veins abundantly reticulate, raised abaxially, invisible adaxially. Soral lines 3–5, zigzag, subparallel, continuous or interrupted, or forming nets, lower 1/3 not fertile; paraphyses taeniform. Spores trilete, tetrahedral-globose, surface papillate.

On wet moss-covered rocks or epiphytic on tree trunks in valleys; 300–1600 m. Guangdong, Guangxi, Guizhou, ?Taiwan, Yunnan [India (Assam, Sikkim), N Thailand].

Reviewer Ralf Knapp notes that studies are being conducted by Taiwan Forestry Research Institute to determine whether material from Taiwan corresponds genetically with *Antrophyum henryi* or if it is closer to *A. formosanum*.

6. *Antrophyum callifolium* Blume, Enum. Pl. Javae 2: 111. 1828.

美叶车前蕨 mei ye che qian jue

Antrophyum annamense Tardieu & C. Christensen.

Rhizome short erect; scales dark brown, linear-lanceolate, ca. 6 × 1 mm, apex long acuminate, bristlelike, margin sparsely denticulate, clathrate. Fronds clustered; stipe 1–3 cm, appressed, glabrous; lamina leathery, obovate-lanceolate or oblong-lanceolate, 15–40 × 2–10 cm, widest above middle, apex acuminate or caudate, base attenuate along stipe; costa only visible at base; veins abundantly reticulate, raised abaxially, invisible adaxially. Soral lines continuous or interrupted, partly netted; paraphyses filiform, longer than sporangia. Spores trilete, tetrahedral-globose, surface papillate.

Epiphytic on tree trunks or epilithic on rocks; 100–1600 m. Guangxi, Hainan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

Antrophyum callifolium is a very variable species, particularly in the width of the lamina. *Antrophyum annamense* represents an extreme form with large, broad lamina, which is found in Hainan and N Vietnam, but intermediate forms link them together. It might be conspecific with *A. reticulatum* (G. Forster) Kaulfuss.

7. *Antrophyum sessilifolium* (Cavanilles) Sprengel, Syst. Veg. 4: 67. 1827.

无柄车前蕨 wu bing che qian jue

Hemionitis sessilifolia Cavanilles, Descr. Pl. 261. 1802;
Antrophyum cumingii Fée.

Rhizome short erect; scales linear-lanceolate, 5–6 mm, margin minutely denticulate, clathrate. Fronds clustered; stipe indistinct; lamina leathery, obovate-lanceolate or oblong-lanceolate, 15–30 × 1.5–2.5 cm, widest at middle or above, base attenuate; costa visible at base. Soral lines immersed; paraphyses filiform. Spores trilete, tetrahedral-globose, surface papillate.

On moist moss-covered rocks in dense forests, also epiphytic and close to streams; 100–300 m. Taiwan (Lan Yu) [Philippines].

No specimens of this species from Taiwan are available for comparison. Some specimens from Luzon in the Kew herbarium determined as this species are quite like the following species, *Antrophyum wallichianum*.

8. *Antrophyum wallichianum* M. G. Gilbert & X. C. Zhang, **nom. nov.**

革叶车前蕨 ge ye che qian jue

Replaced synonym: *Hemionitis coriacea* D. Don, Prodr. Fl. Nepal. 13. 1825; *Antrophyum coriaceum* (D. Don) Wallich, Numer. List, no. 43. 1829, not *A. coriaceum* (Kaulfuss) Blume, Fl. Javae Fil. 85. 1828.

Rhizome shortly creeping; scales dark brown, subulate-lanceolate, 6–9 mm, ca. 0.5 mm wide at base, apex acuminate, bristlelike, margin denticulate, clathrate. Fronds clustered; stipe indistinct; lamina leathery, oblanceolate, 15–30 cm, ca. 2 cm wide at middle, widest above middle, up to 3 cm wide, apex rounded, base long attenuate to very base; costa only visible at base; veins abundantly reticulate, raised abaxially, forming several parallel lines, invisible adaxially. Soral lines continuous,

rarely interrupted, parallel, not netted, only lower 1/3 fertile; paraphyses filiform, longer than sporangia. Spores trilete, tetrahedral-globose, surface papillate.

Usually epiphytic on tree trunks in evergreen forests; 1300–1500 m. Xizang, Yunnan [Bhutan, NE India, N Myanmar, Nepal].

Antrophyum wallichianum sometimes approaches the narrow-fronded forms of *A. callifolium*, except for the obvious stipes of the latter. Dried fronds are olive-green.

Blume's name, based on material from Mauritius, has been largely overlooked, hence the need for a new name. Wallich gave a clear reference to D. Don and thus his name was one of the few validated in his Numerical List. It seems appropriate to name the taxon in his honor.

9. *Antrophyum vittarioides* Baker, J. Bot. 28: 267. 1890.

书带车前蕨 shu dai che qian jue

Antrophyum stenophyllum Baker.

Rhizome shortly creeping, apex ascending or erect; scales pale-brown, subulate-lanceolate, 4–5 mm, 0.5–1 mm wide at base, margin dentate, base lacerate, clathrate. Fronds clustered; stipe ca. 1 cm or shorter, appressed and winged, base slightly swollen, covered with scales like those on rhizome, verrucate after loss of scales; lamina leathery, linear, 15–20 × 0.7–1 cm; costa obvious, inframedial visible, evanescent upward; veins reticulate, forming 2 or 3 linear areoles. Soral lines linear, submarginal, one row on each side of costa, parallel to costa, or interrupted, slightly immersed in grooves, middle part fertile; paraphyses filiform, longer than sporangia. Spores trilete, tetrahedral-globose, surface ornamentation obscure.

Epiphytic by streams in dense forests; 300–1000 m. Guizhou, Yunnan [Vietnam].

Antrophyum vittarioides is close to *A. brookei* Hooker and *A. subfalcatum* Brackenridge from tropical Asian islands in the soral lines usually in one row near the margin on both sides of fronds. It is superficially like *Haplopteris fudzinoi* (Makino) E. H. Crane.

19. HAPLOPTERIS C. Presl, Tent. Pterid. 141.1836.

书带蕨属 shu dai jue shu

Zhang Xianchun (张宪春); Michael G. Gilbert

Epiphytic or epilithic grasslike plants. Fronds simple, linear, entire, glabrous. Venation consisting of a costa and oblique unbranched veins, free except for a submarginal fertile connecting vein. Sori in one elongate marginal or submarginal groove on each side of lamina, immersed, rarely superficial; paraphyses long with a dark obconic head. Spores monoete, most ellipsoid, sometimes fusiform, smooth, transparent.

About 40 unclear species: tropical and subtropical Asia; 13 species in China.

Most of the Old World species formally classified in *Vittaria* now belong to *Haplopteris*.

Vittaria suberecta Hayata (Icon. Pl. Formosan. 6: 161. 1916), described from Taiwan, could not be treated here because no material was seen by the present authors.

1a. Soral line marginal, immersed in groove, open outward.

2a. Lamina up to 100 cm or longer, ca. 10 mm wide; stipe long, slender; scales dark brown 12. *H. elongata*

2b. Lamina 8–30 cm, 2–4 mm wide; stipe short; scales yellow-brown 13. *H. anguste-elongata*

1b. Soral line submarginal.

3a. Soral line superficial; lamina margins straight or revolute.

4a. Scales dark brown, small, straight, areole wall thick; soral line submarginal, covered by revolute

margins of lamina 1. *H. amboinensis*

- 4b. Scales yellow-brown, large, soft, twisted, areole wall thin; soral line with a broad area between margins of lamina.
- 5a. Lamina 2–3 mm wide; scales 3–7 × ca. 0.2 mm; soral line close to costa 5. *H. mediosora*
- 5b. Lamina over 5 mm wide; scales 10–20 × 0.5–2.5 mm; soral line with a broad area between costa.
- 6a. Stipe short, thick; lamina 10–30 mm wide; scales 10–20 mm 2. *H. doniana*
- 6b. Stipe absent, or slender; lamina 5–12 mm wide; scales ca. 10 mm.
- 7a. Lamina 6–12 mm wide; soral line 1–1.5 mm away from margins of lamina 3. *H. taeniophylla*
- 7b. Lamina 5–6 mm wide; soral line ca. 1 mm away from margins of lamina 4. *H. himalayensis*
- 3b. Soral line immersed in groove between costa and margins of lamina; lamina margins revolute.
- 8a. Lamina 5–10 mm wide, or more.
- 9a. Costa not raised adaxially, lamina with a narrow concave line adaxially 6. *H. plurisulcata*
- 9b. Costa raised adaxially, lamina with a broad concave line on each side of costa adaxially 7. *H. fudzinoi*
- 8b. Lamina (0.5–)2–4(–11) mm wide.
- 10a. Scales dark or light brown, 5–10 mm.
- 11a. Scales light brown; lamina with soral line very close to costa 8. *H. linearifolia*
- 11b. Scales dark brown; lamina with soral line close to margins 9. *H. hainanensis*
- 10b. Scales yellow-brown, 2–3 mm.
- 12a. Costa flattened abaxially, wide; soral line covered by costa 10. *H. sikkimensis*
- 12b. Costa raised abaxially, narrow; soral line with a broad area between costa 11. *H. flexuosa*

1. *Haplopteris amboinensis* (Fée) X. C. Zhang, Ann. Bot. Fenn. 40: 460. 2003.

剑叶书带蕨 *jian ye shu dai jue*

Vittaria amboinensis Fée, Mém. Foug. 3: 14. 1852; *Taeniopsis amboinensis* (Fée) Beddome; *V. chingii* B. S. Wang; *V. ensata* Christ; *V. latifolia* Ching (1959), not Benedict (1914); *V. lauana* Ching.

Rhizome thick, long creeping, bearing roots with very numerous water-absorbing root hairs; scales dark brown, obscure iridescent, subulate-lanceolate, 3–5 mm, ca. 0.5 mm wide at base, margin prominently denticulate, apex acuminate, apical areole not transparent, wall thick, obviously verrucate, dark colored. Fronds clustered, 2–4 mm apart; stipe 4–10 cm, slender, appressed, base covered with scales; lamina stiffly papery, or thinly leathery, brown when dry, lanceolate, 20–40 × 1–2.5 cm, gradually narrowed to both ends, base long attenuated along stipe, margin slightly revolute when dry, apex long acuminate; costa ± invisible and narrowly concave adaxially, raised abaxially, flattened, veins evident. Soral line submarginal, superficial, or slightly immersed, infra-medial and apical part sterile; paraphyses many, long, with head obconic, ca. 2 × as long as wide. Spores monolete, oblong in outline, surface papillate.

Epiphytic or epilithic in evergreen forests. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, N India, Indonesia, Japan, Laos, Malaysia, Myanmar, Thailand, Vietnam].

2. *Haplopteris doniana* (Mettenius ex Hieronymus) E. H. Crane, Syst. Bot. 22: 514. 1998.

带状书带蕨 *dai zhuang shu dai jue*

Vittaria doniana Mettenius ex Hieronymus, Hedwigia 57: 204. 1916; *V. forrestiana* Ching.

Rhizome thick, shortly creeping; scales yellow-brown, bright iridescent, soft, twisted, linear-lanceolate, 10–20 × 1–2.5 mm, lower margin subentire, upper part minutely denticulate, apex long acuminate, areole wall thin. Fronds clustered; stipe thick, short, 1–2 cm; lamina thick leathery, shrunken when dry,

ribbonlike, 15–35+ × 1–3 cm, widest at middle or above, base long attenuate and winged on stipe, margin cartilaginous, apex long attenuate or caudate; costa thick, slightly raised adaxially, keeled abaxially. Soral line 1–2 mm from margin, superficial; paraphyses long, with head obconic, longer than wide. Spores monolete, oblong in outline, surface rugate.

Epiphytic or epilithic; 1600–3300 m. Guangxi, Guizhou, Xizang, Yunnan [N India, N Myanmar].

Vittaria forrestiana perhaps represents a thin-fronded form of this species, which was found mainly from NW Yunnan. The reports of *Haplopteris doniana* from Thailand, Indochina, and Japan are all misidentifications of *H. amboinensis* (*V. amboinensis* Fée).

3. *Haplopteris taeniophylla* (Copeland) E. H. Crane, Syst. Bot. 22: 514. 1998.

广叶书带蕨 *guang ye shu dai jue*

Vittaria taeniophylla Copeland, Philipp. J. Sci. Suppl. 1: 157. 1906; *V. arisanensis* Hayata.

Rhizome shortly creeping; scales pale-brown, bright iridescent, lanceolate, ca. 10 × 0.5 mm. Fronds clustered; stipe absent; lamina thinly leathery, ribbonlike, 30–60+ × 0.6–1.2 cm, widest at middle or above, base long attenuate, apex acute; costa distinct. Soral line 1–1.3 mm from margin, superficial or slightly immersed.

Epiphytic on base of tree trunks; 2000–2600 m. Taiwan, Zhejiang [Philippines].

4. *Haplopteris himalayensis* (Ching) E. H. Crane, Syst. Bot. 22: 514. 1998.

喜马拉雅书带蕨 *xi ma la ya shu dai jue*

Vittaria himalayensis Ching, Sinensia 1: 190. 1931.

Rhizome shortly creeping, 3–5 mm thick; scales dark brown, bright iridescent, linear-lanceolate, ca. 10 × 1 mm, apex bristlelike, margin obviously denticulate. Fronds clustered; stipe slender, short or long; lamina thinly herbaceous, linear, 30–60 × 0.5–0.6 cm, wider usually near middle, narrowed gradually to

both ends, base attenuate to very base; costa invisible adaxially, raised abaxially, flattened. Soral line ca. 1 mm from margin, superficial; paraphyses long, with head obconic, longer than wide. Spores monolete, oblong in outline, surface papillate.

Epiphytic or epilithic; 1700–2900 m. S Xizang, NW and W Yunnan [Bhutan, N India, Nepal].

5. *Haplopteris mediosora* (Hayata) X. C. Zhang, *Ann. Bot. Fenn.* 40: 460. 2003.

中囊书带蕨 *zhong nang shu dai jue*

Vittaria mediosora Hayata, *Icon. Pl. Formosan.* 5: 346. 1915; *V. stenophylla* Copeland; *V. tibetica* Ching & S. K. Wu.

Rhizome shortly creeping or ascending; scales brown, bright iridescent, linear-lanceolate, 3–7 × ca. 0.2 mm, margin minutely denticulate, apex bristlelike. Fronds clustered; stipe slender, ca. 1 mm thick, 4–5 cm; lamina herbaceous, linear, 10–25 × 0.2–0.3 cm, base attenuate, margin straight or slightly revolute, apex gradually narrowed; costa invisible adaxially, raised abaxially, flattened, slender. Soral line superficial, between costa and margin of lamina; paraphyses long, with head obconic, as long as wide. Spores monolete, elliptic in outline, surface ornamentation obscure.

Epiphytic or epilithic; 2300–3500 m. W Sichuan, C Taiwan, Xizang, C Yunnan [E Himalaya, Philippines].

6. *Haplopteris plurisulcata* (Ching) X. C. Zhang, *Ann. Bot. Fenn.* 40: 461. 2003.

曲鳞书带蕨 *qu lin shu dai jue*

Vittaria plurisulcata Ching, *Sinensia* 1: 186. 1931.

Rhizome shortly creeping; scales light brown, lanceolate, 5–8 mm, ca. 1 mm wide at base, areole wall thin, soft, twisted, margin entire, apex bristlelike. Fronds clustered; stipe short; lamina herbaceous, lanceolate, 30–40 × 0.5–0.8 cm, gradually narrowed to both ends, margin slightly revolute; costa invisible adaxially, slightly raised abaxially, slender. Soral line immersed in groove, close to revolute margin, ca. 2 mm from costa, lower 1/3 not fertile; paraphyses long, with head obconic, ca. 2 × as long as wide. Spores monolete, elliptic in outline, surface ornamentation obscure.

Epiphytic or epilithic; 1800–2900 m. W Sichuan, ?C Taiwan, Xizang, C Yunnan [N Vietnam].

Reviewer Ralf Knapp suspects that the record from Taiwan is based on a misidentification of *Haplopteris flexuosa* (or possibly *H. taeniophylla*).

7. *Haplopteris fudzinoi* (Makino) E. H. Crane, *Syst. Bot.* 22: 514. 1998.

平肋书带蕨 *ping lei shu dai jue*

Vittaria fudzinoi Makino, *Bot. Mag. (Tokyo)* 12: 28. 1898; *V. centrochinensis* Ching ex J. F. Cheng; *V. japonica* Miquel var. *sessilis* Eaton ex Yoshinaga; *V. sessilis* (Eaton ex Yoshinaga) Makino (1916), not Copeland (1914); *V. suberosa* Christ.

Rhizome shortly creeping, or ascending; scales yellow-brown, bright iridescent, soft, twisted, small ones ca. 5 × 1 mm, subulate-triangular, margin denticulate, large ones ca. 8 mm,

0.1–0.2 mm wide, linear-lanceolate, apex bristlelike, margin subentire. Fronds clustered; stipe dark, 1–6 cm, or nearly absent; lamina thickly leathery, linear or narrowly ribbonlike, 15–55 × ca. 0.5(–1) cm, narrowed gradually to both ends, base long attenuate; costa raised adaxially, adaxial surface with 2 parallel long grooves beside costa, also raised abaxially, broadened, flattened. Soral line close to margin, immersed in groove or ± superficial; paraphyses long, with head obconic, longer than wide. Spores monolete, oblong in outline, surface obscurely papillate.

Epiphytic or epilithic; 1300–2800 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan].

The broad-fronded form, with soral line ± superficial and scales more brown in color, is mainly from Guangdong, Guangxi, Hunan, Jiangxi, and Zhejiang, and has been published as *Vittaria centrochinensis*. It approaches *Haplopteris taeniophylla*.

8. *Haplopteris linearifolia* (Ching) X. C. Zhang, *Ann. Bot. Fenn.* 40: 460. 2003.

线叶书带蕨 *xian ye shu dai jue*

Vittaria linearifolia Ching, *Sinensia* 1: 183. 1931.

Rhizome shortly creeping; scales light brown, bright iridescent, lanceolate, ca. 10 mm, ca. 1.5 mm wide at base, twisted, margin denticulate. Fronds clustered; stipe shorter, slender, glabrous, light brown at base; lamina thickly leathery, linear, 20–50 × 0.2–0.4 cm, margin strongly revolute; costa invisible adaxially, raised abaxially, flattened, very broad, up to half of width of lamina. Soral line deeply immersed in groove, very close to costa; paraphyses long, with head obconic, as long as or slightly shorter than wide. Spores monolete, oblong in outline, surface ornamentation obscure.

Epiphytic or epilithic; 1700–3400 m. SE Xizang, NW and W Yunnan [India (Assam), N Myanmar].

9. *Haplopteris hainanensis* (C. Christensen ex Ching) E. H. Crane, *Syst. Bot.* 22: 514. 1998.

海南书带蕨 *hai nan shu dai jue*

Vittaria hainanensis C. Christensen ex Ching, *Sinensia* 1: 182. 1931.

Rhizome shortly creeping, ca. 2 mm thick; scales dark brown, bright iridescent, linear-lanceolate, 5–10 mm, ca. 0.5 mm wide at base, apex bristlelike, marginal row of areole thin-walled, middle areole wall thick, dark colored. Fronds clustered; stipe absent; lamina very leathery, linear or lanceolate, 10–30 × 0.2–0.4(–1.1) cm, usually widest near middle, narrowed gradually to both ends, flattened to very base, margin strongly revolute; costa visible abaxially, sometimes adaxially, not raised; veins usually not evident. Soral line submarginal, immersed in deep groove, thus raised above; paraphyses long, with head obconic, ± as long as wide. Spores monolete, oval in outline, surface obscurely papillate.

On palm trees; 100–1000 m. Hainan, S Yunnan [N Vietnam].

Whether *Haplopteris hainanensis* is conspecific with *H. ensiformis* (Swartz) E. H. Crane or not is unclear.

10. *Haplopteris sikkimensis* (Kuhn) E. H. Crane, Syst. Bot. 22: 514. 1998.

锡金书带蕨 xi jin shu dai jue

Vittaria sikkimensis Kuhn, Linnaea 36: 66. 1869.

Plants very small. Rhizome very slender, shortly creeping or ascending; scales pale-brown, bright iridescent, subulate-lanceolate, 2–4 × 0.25–0.5 mm, marginal row of areole thin-walled, middle areole wall thick, dark colored; margin minutely denticulate, apex long bristlelike. Fronds clustered; stipe short, slender, appressed; lamina thinly herbaceous, linear, (1.5–)4–6(–12) cm × (0.5–)1(–1.5) mm, margin slightly revolute, apex acute or rounded, base long attenuate; costa invisible adaxially, raised abaxially, wide, flattened. Soral line deeply immersed in groove, covered by costa, occupying area between costa and margin when mature; paraphyses long, with head obconic, longer than wide. Spores monolete, elliptic in outline, surface sparsely papillate.

Epiphytic or epilithic in evergreen broad-leaved forests, mixed with *Leucobryum*; 1400–2200 m. SE Xizang, S, SE, and W Yunnan [N India, Myanmar, N Thailand, N Vietnam].

11. *Haplopteris flexuosa* (Fée) E. H. Crane, Syst. Bot. 22: 514. 1998.

书带蕨 shu dai jue

Vittaria flexuosa Fée, Mém. Foug. 3: 16. 1852; *Haplopteris modesta* (Handel-Mazzetti) E. H. Crane; *V. caricina* Christ; *V. costularis* Ching; *V. filipes* Christ; *V. japonica* Miquel; *V. lanceola* Christ; *V. modesta* Handel-Mazzetti; *V. nana* Ching; *V. ophiopogonoides* Ching.

Rhizome shortly creeping; scales deciduous, yellow-brown, bright, iridescent, subulate-lanceolate, (2–)5–6 mm, 0.2–0.5 mm wide at base, margin denticulate, apex bristlelike, areole wall thick, dark colored. Fronds clustered; stipe slender, short, base pale brown, with small fibrous scales; lamina herbaceous, linear, 15–40+ × 0.4–0.6 cm, small ones 6–12 × 0.1–0.25 cm, narrowed gradually to both ends, base long attenuate; costa narrowly concave adaxially, raised abaxially, slender, veins invisible, margin revolute and partly covering sori. Soral line submarginal, immersed in groove, with a broad area between costa, but in narrow-fronded plants line occupying whole area when mature, fertile medially; paraphyses many, long, with head obconic, ± as long as wide. Spores monolete, oblong in outline, surface obscurely papillate.

Epiphytic or epilithic; 100–3200 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, Cambodia, India (Sikkim), Japan, Korea, Laos, Myanmar, Nepal, Thailand, Vietnam].

The narrow-fronded form, with soral line occupying area between costa, growing in crevices of rocks in dry conditions or on wet cliffs of caves, is also known as *Vittaria caricina*, *V. nana*, and *V. modesta*; the epiphytic long-fronded form from humid evergreen monsoon forests in E Himalaya is called *V. ophiopogonoides*; while intermediate forms are known as *V. filipes* or *V. costularis*. This species, widespread in E Asia, is very variable in size but constant in its scale and paraphysis characters and its lamina margin always revolute and partly covering sori.

12. *Haplopteris elongata* (Swartz) E. H. Crane, Syst. Bot. 22: 514. 1998.

唇边书带蕨 chun bian shu dai jue

Vittaria elongata Swartz, Syn. Fil. 109, 302. 1806; *V. formosana* Nakai; *V. ogasawarensis* Kodama; *V. pauciarolata* Ching; *V. tortifrons* Hayata.

Rhizome rather long creeping, much branched, bearing roots with very numerous water-absorbing root hairs; scales dark brown, brightly iridescent, subulate-lanceolate, 4–5 mm, 0.5–1 mm wide at base, margin prominently denticulate, apex bristlelike, areole wall thick, dark colored. Fronds clustered, drooping; stipe ca. 0.5 mm distant; lamina thinly leathery, linear or ribbonlike, up to 100 × 0.5–2 cm, base gradually narrowed, apex rounded or obtuse; costa slender, not prominent, veins evident. Soral line marginal, immersed in deep groove, open outward, fertile throughout; paraphyses many, long, with head obconic, longer than wide. Spores monolete, narrowly oblong in outline, surface ornamentation obscure.

Epiphytic or epilithic; 100–1400 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, SE Xizang, S Yunnan [Indonesia, S Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Madagascar].

Haplopteris elongata always grows with other epiphytic ferns, notably with *Pseudodrynaria coronans* (*Aglaomorpha coronans*) and species of the *Asplenium nidus* and *A. laserpitifolium* groups. It is a polymorphic species, with fluctuations in plant size and scale color depending on the habitat. All Chinese records of *Vittaria zosterifolia* Willdenow and *V. merrillii* Christ were based on misidentifications of this species.

13. *Haplopteris anguste-elongata* (Hayata) E. H. Crane, Syst. Bot. 22: 514. 1998.

姬书带蕨 ji shu dai jue

Vittaria anguste-elongata Hayata, Icon. Pl. Formosan. 6: 161. 1916.

Rhizome slender, long creeping, ascending; scales yellow-brown, bright iridescent, linear-lanceolate, 5–7 mm, 0.2–0.3 mm wide at base, margin subentire, apex bristlelike, often with a glandlike head, marginal lumina wall thin, dark brown. Fronds clustered; stipe indistinct, slender, appressed, glabrous; lamina thinly herbaceous, brown when dry, linear, 8–30 × 0.2–0.4 cm, gradually narrowed to both ends, apex shortly acuminate or caudate; costa slender, indistinct abaxially, slightly raised adaxially, veins not evident. Soral line marginal, immersed in deep groove, open outward, fertile throughout; paraphyses many, long, with head obconic, ca. 2 × as long as wide. Spores monolete, oblong in outline, surface ornamentation obscure.

Epiphytic or epilithic; sea level to 1000 m (in Taiwan). Fujian, Hainan, Taiwan [Japan (Ryukyu Islands), Philippines].

Iwatsuki et al. (Fl. Japan 1: 87. 1995) treated *Vittaria anguste-elongata* as a synonym of *V. ensiformis* Swartz (*Haplopteris ensiformis* (Swartz) E. H. Crane), which is widely distributed in the Old World tropics. However, Knapp (Ferns Fern Allies Taiwan, 426, 482. 2011) reports that some populations in S Taiwan (southernmost tip of Ping Dong County) have a narrower, more leathery lamina and rhizome scales with fewer, larger cells than material of *H. anguste-elongata* from other areas in Taiwan and probably represent *H. ensiformis* s.s.

20. MONOGRAMMA Commerson ex Schkuhr, Krypt. Gewächse 1: 82. 1809.

一条线蕨属 yi tiao xian jue shu

Zhang Xianchun (张宪春); Michael G. Gilbert

Vaginularia Fée.

Fronds very small, simple, linear, entire, glabrous. Venation consisting of a costa and at most a few almost parallel fertile veins. Sori born in a single groove along costa or on fertile veins, continuous or interrupted; paraphyses without a head, short. Spores trilete, smooth, transparent.

About nine species: tropical Asia to Australia, and the Pacific islands; two species in China.

Vaginularia and *Monogramma* are both diminutive derived plants that resemble each other and cannot be distinguished properly.

- 1a. Sorus 1 per frond, in groove in costa 1. *M. paradoxa*
 1b. Sori 1 or 2 per frond, on lateral veins 2. *M. trichoidea*

1. *Monogramma paradoxa* (Fée) Beddome, Suppl. Ferns S. Ind. 24. 1876.

连孢一条线蕨 lian bao yi tiao xian jue

Pleurogramma ? *paradoxa* Fée, Mém. Foug. 3: 38. 1852;
Vaginularia paradoxa (Fée) Mettenius ex Miquel.

Small grasslike plants, fronds filiform. Rhizome less than 1 mm thick, creeping, stipes ca. 1 mm apart. Scales dark brown, clathrate, lanceolate, 0.8–1.25 × 0.25–0.5 mm, margin denticulate. Fronds clustered; lamina filiform, 3–12 cm × 0.5–1 mm, base long attenuate, apex acute, without lateral vein. Sorus solitary along groove in costa, elongate, not interrupted, covered by raised margins of costa, fertile medially, swollen when mature; paraphyses filiform, without a head. Spores trilete, surface ornamentation obscure.

Very rare, epiphytic or epilithic; 700–1400 m. Taiwan [Indonesia, Philippines, Sri Lanka, Thailand; Pacific islands (Micronesia, Polynesia)].

2. *Monogramma trichoidea* (Fée) Hooker, Sp. Fil. 5: 123. 1864.

针叶蕨 zhen ye jue

Vaginularia trichoidea Fée, Mém. Foug. 3: 34. 1852.

Small grasslike plants, fronds filiform. Rhizome less than 1 mm thick, creeping, stipes ca. 1 mm apart. Scales brown, subulate-lanceolate, ca. 0.5 mm, clathrate. Fronds clustered; lamina filiform, 5–12 cm, ca. 0.5 mm wide at sterile part; costa throughout, with 1 or 2 lateral veins. Sori 1 or 2 per frond, on lateral veins, covered by costa and outer side of raised lateral vein; paraphyses without a head, many. Spores trilete, surface ornamentation obscure.

Epilithic on shaded wet rocks in dense forests in valleys; 700–1400 m. Hainan, ?Taiwan [Indonesia (Sumatra), Malaysia, Philippines, S Thailand].

Reviewer Ralf Knapp notes that the present status for Taiwan is unconfirmed (see also Knapp, Ferns Fern Allies Taiwan, 467. 2011).