

DRYOPTERIDACEAE

鳞毛蕨科 lin mao jue ke

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Plants small to large, evergreen or deciduous, terrestrial, epilithic, hemiepiphytic, or epiphytic. Rhizomes erect, ascending, creeping, or sometimes climbing, dictyostelic (mostly radially), scaly; scales basally attached or very rarely peltate, often non-clathrate but sometimes clathrate, entire or dentate. Fronds caespitose or remote from one another, with segments anadromously or catadromously arranged, or sometimes anadromous at base and catadromous distally; stipe often not articulate but sometimes articulate at base, with 3 or more vascular bundles arranged in a semicircle or circle, scaly, sulcate adaxially, not hairy or sometimes hairy; lamina monomorphic or dimorphic, usually oblong, deltoid, pentagonal, lanceolate, ovate, or linear, 1–5-pinnate, or simple, rarely imparipinnate, scaly, glandular, hairy, or glabrous; if scaly then scales bullate or flat; glands absent or present; texture thinly papery, papery, or leathery. Rachises sulcate adaxially, with or without proliferous bulbils, rarely proliferous bulbils borne at a prolonged flagelliform rachis terminal; venation pinnate and free, or variously anastomosing to form 1 to multiple rows of areoles, with or without included veinlets. Fertile fronds conform or weakly to strongly difform with sterile fronds. Sporangia usually in orbicular sori; sori terminal, subterminal, or dorsal on veins, indusiate or rarely exindusiate; if indusiate then indusia orbicular or reniform or rarely ovoid, superior, lateral, or rarely inferior, sessile or rarely stalked, entire or toothed; sometimes sporangia nearly evenly covering fertile parts abaxially (not forming orbicular sori); sporangia with 3-rowed, short to long stalks. Spores monoete, achlorophyllous, with prominent perispore. $x = 41$.

About 25 genera and 2,100 species: nearly cosmopolitan, but highest diversity found in E Asia (*Dryopteris*, *Polystichum*) and the New World (*Ctenitis*, *Elaphoglossum*); ten genera and 493 species (260 endemic) in two subfamilies in China.

Eighty percent of the 2,100 species are in four genera (*Ctenitis*, *Dryopteris*, *Elaphoglossum*, and *Polystichum*). Subfamily Dryopteridoideae includes 17 genera: *Adenoderris* J. Smith, *Arachniodes* (incl. *Leptorumohra*, *Lithostegia*, *Phanerophlebiopsis*), *Coveniella* Tindale, *Ctenitis* (incl. *Ataxipteris*), *Cyclodium* C. Presl, *Cyrtomium*, *Dryopolystichum* Copeland, *Dryopteris* (incl. *Acrophorus*, *Acrorumohra*, *Dryopsis*, *Nothoperanema*, *Peranema*, *Revwattsia* D. L. Jones), *Lastreopsis*, *Maxonia* C. Christensen, *Megalastrum* Holttum, *Phanerophlebia* C. Presl, *Polystichopsis* (J. Smith) Holttum, *Polystichum* (incl. *Cyrtogonellum*, *Cyrtomidictyum*, *Papuapteris* Christensen, *Plecosorus*, *Sorolepidium*), *Rumohra* Raddi, *Stenolepia* Alderwerelt, and *Stigmatopteris* C. Christensen. Subfamily Elaphoglossoideae includes eight genera: *Arthrobotrya* C. Christensen, *Bolbitis* (incl. *Egenolfia*), *Elaphoglossum* (incl. *Microstaphyla* C. Presl, *Peltapteris* Link), *Lomagramma*, *Mickelia* R. C. Moran, Labiak & Sundue, *Olfersia* Raddi, *Polybotrya* Humbolt & Bonpland ex Willdenow, and *Teratophyllum*. These genera are placed in Dryopteridaceae on the basis of morphology and, for most, molecular studies as well.

Wang Chuhao. 1999. *Ctenitis*, *Lastreopsis*, *Bolbitidaceae*, and *Lomagramma*. In: Wu Shiewhung, ed., *Fl. Reipubl. Popularis Sin.* 6(1): 2–37, 56–59, 104–124, 129–133; Wu Shiew-hung. 1999. *Peranemataceae* [“*Peranemaceae*”]. In: Wu Shiew-hung, ed., *Fl. Reipubl. Popularis Sin.* 4(2): 216–238; Wu Shiewhung. 1999. *Elaphoglossaceae*. In: Wu Shiewhung, ed., *Fl. Reipubl. Popularis Sin.* 6(1): 134–142; Hsieh Yingtang, Wu Sugong & Lu Shugang. 2000. *Dryopteridaceae* (1). In: Wu Sugong, ed., *Fl. Reipubl. Popularis Sin.* 5(1): 1–220; Kung Hsianshiu, Chu Weiming, He Zhaorong, Zhang Libing & Hsieh Yingtang. 2001. *Dryopteridaceae* (2) (excluding *Cyclopeltis*). In: Kung Hsianshiu, ed., *Fl. Reipubl. Popularis Sin.* 5(2): 1–228.

Key to subfamilies and genera

- 1a. Fronds weakly to strongly dimorphic; sporangia nearly evenly covering fertile parts of fronds abaxially (2. Subfam. Elaphoglossoideae).
 - 2a. Stems climbing.
 - 3a. Venation of sterile fronds anastomosing; lamina catadromous (or isodromous) toward apex 9. *Lomagramma*
 - 3b. Venation of sterile fronds free; lamina often anadromous toward apex 10. *Teratophyllum*
 - 2b. Stems (rhizomes) erect or creeping.
 - 4a. Stipe base not articulate; lamina pinnate or rarely bipinnate, if simple then with reticulate venation; venation often reticulate 7. *Bolbitis*

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- 4b. Stipe base articulate (sometimes obscurely so); lamina simple; venation usually free 8. *Elaphoglossum*
- 1b. Fronds monomorphic; if dimorphic then rachis with proliferous bulbils borne at a prolonged flagelliform rachis terminal (*Polystichum* sect. *Cyrtomiopsis*); sporangia in orbicular sori (1. Subfam. Dryopteridoideae).
- 5a. Fronds often with ctenitoid hairs; costae and costules adaxially convex, not grooved.
- 6a. Rhizomes often long and creeping or ascending; fronds often distant from one another; ratio of length to width of lamina often approximately 1:1; pinnule rachises and midribs often with yellow or reddish glands 5. *Lastreopsis*
- 6b. Rhizomes short and erect or ascending; fronds caespitose; ratio of length to width of lamina often clearly larger than 1:1; pinnule rachises and midribs often without glands.
- 7a. Pinnules with veins indistinct on both adaxial and abaxial surfaces; sori dorsal on veinlets; scales ciliate on their margins, clathrate, and with nearly hexagonal and lustrous areoles 2. *Ctenitis*
- 7b. Pinnules with distinct veins on abaxial surfaces; sori terminal on veinlets, and marginal; scales entire and clathrate or not, but with long and dull areoles (*Dryopteris* sect. *Dryopsis*) 4. *Dryopteris*
- 5b. Fronds without ctenitoid hairs; costae and costules adaxially grooved.
- 8a. Sori if indusiate then indusia mostly reniform and lateral (attached to abaxial surface of fronds at notch of indusia), rarely orbicular and inferior (*Dryopteris* subg. *Nothoperanema*); if indusia ovoid then lamina finely 4- or 5-pinnate (*Arachniodes superba*); if sori exindusiate then ultimate segments of fronds not auriculate at acroscopic base (*Dryopteris dehuaensis*, *D. gymnosora*, *D. liangkvangensis*, *D. polita*, *D. scottii*, and *D. shikokiana*); venation free.
- 9a. Rhizomes short and erect or ascending; lamina dull or lustrous adaxially; laminar segments arranged catadromously except secondary segments of basalmost pair of pinnae of bipinnate fronds; if laminar segments arranged anadromously then lamina (2 or)3- or 4-pinnate and ultimate pinnules of lamina asymmetrical at base (*Dryopteris* sect. *Acrorumohra*) 4. *Dryopteris*
- 9b. Rhizomes often long and creeping or ascending; if rhizomes short then lamina finely 4- or 5-pinnate and indusia ovoid (*Arachniodes superba*); lamina lustrous adaxially; laminar segments arranged anadromously 1. *Arachniodes*
- 8b. Sori if indusiate then indusia orbicular and superior, peltate; if sori exindusiate then ultimate segments of fronds clearly auriculate at acroscopic base (*Polystichum alcornae*, *P. glaciale*, *P. grandifrons*, *P. gymnocarpium*, *P. longispinosum*, *P. loratum*, and *P. rufopaleaceum*) or less auriculate but microscales long, i.e., longer than 1 mm (*P. longipaleatum* and *P. nudisorum*); venation free or anastomosing.
- 10a. Lamina imparipinnate, apex with an apical pinna somewhat dissected at base, lamina rarely simple; venation always anastomosing to form 2 or more rows of areoles 3. *Cyrtomium*
- 10b. Lamina 1–3-pinnate, apex pinnatifid, without a clear apical pinna; venation mostly free, rarely anastomosing to form 1 or 2 rows of areoles (*Polystichum balansae*, *P. fraxinellum*, *P. hookerianum*, *P. lepidocaulon*, *P. ×rupestris*, *P. trapezoideum*, and *P. uniseriale*) 6. *Polystichum*

1. Subfam. DRYOPTERIDOIDEAE

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Fronds monomorphic, if dimorphic then rachis with proliferous bulbils borne at a prolonged flagelliform rachis terminal (*Polystichum* sect. *Cyrtomiopsis*). Sporangia in orbicular sori.

About 17 genera and 1,400 species: nearly cosmopolitan, but highest diversity found in E Asia (*Dryopteris*, *Polystichum*); six genera and 459 species (244 endemic) in China.

Subfamily Dryopteridoideae as defined here is based on morphological features and has not yet been recovered as monophyletic using molecular data.

1. ARACHNIODES Blume, Enum. Pl. Javae 2: 241. 1828.

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Byrsopteris C. V. Morton; *Leptorumohra* (H. Itô) H. Itô; *Lithostegia* Ching; *Phanerophlebiopsis* Ching; *Rumohra* sect. *Lep-torumohra* H. Itô.

Plants terrestrial, evergreen, medium-sized (or large). Rhizome long creeping to short and ascending, or rarely erect, densely

scaly; scales filiform, subulate, lanceolate, or ovate, often attenuate toward apex, margin entire or with toothlike (rarely fimbriate) projections. Fronds few, remote or approximate; stipe equal in length to lamina or longer, base as densely scaly as rhizome, adaxially sulcate; lamina deltoid, ovate, pentagonal, or rarely lanceolate, usually 2–4(or 5)-pinnate, but simply pinnate in a few species, herbaceous, papery to leathery, glabrous or with a few narrow scales, rarely hairy; dissection anadromous throughout; rachis adaxially sulcate, grooves continuous with those on axes of higher order, scaly to glabrescent, or rarely with pale gray unicellular acicular hairs, scales entire (or with irregular projections on margin), sometimes with enlarged and denticulate base; pinnae a few to numerous pairs, usually shortly stalked, basal ones often with long basal basicopic pinnules; upper divisions gradually reduced and ending in acuminate or caudate apices, or with a distinct terminal pinna; basicopic pinnules often slightly longer than acroscopic ones; ultimate segments sessile, usually oblong to rhomboid, or rarely linear, often inequilateral, with an acroscopic auricle, margin sharply dentate to aristate; venation usually also anadromous, veins free, pinnate or forked, not quite reaching margin of ultimate segment, often ending in a hydathode. Sori orbicular, terminal or dorsal on acroscopic branches of veinlets; indusia orbicular-reniform, attached at a deep sinus, persistent or fugacious; sporangia numerous, long stalked, with an annulus of 13–16 thickened cells. Spores ellipsoid, often with broad rugate perispore. $x = 41$.

About 60 species: tropical and subtropical regions worldwide, but mainly in E and SE Asia; 40 species (18 endemic) in China.

The following taxon is excluded from the present treatment, pending further research: *Arachniodes heyuanensis* Ching (Bull. Bot. Res., Harbin 6(3): 9. 1986), described from Guangdong.

- 1a. Rhizome slender and long creeping; lamina herbaceous, rather thin and usually soft; axes and main veins adaxially with pale gray unicellular acicular hairs.
 - 2a. Indusium entire; main veins abaxially with broadly ovate and bullate-based scales; stipe and primary rachis with copious scales 1. *A. miqueliana*
 - 2b. Indusium ciliate or entire; main veins abaxially with narrowly lanceolate, or hairlike and flat-based scales; upper part of stipe and primary rachis glabrescent.
 - 3a. Lamina pentagonal, 4(or 5)-pinnate, upper parts conspicuously abruptly narrowed toward apex and acuminate, brownish green when dried 2. *A. quadripinnata*
 - 3b. Lamina deltoid-pentagonal, 3-pinnate-pinnatifid, upper parts long acuminate, yellowish green when dried 3. *A. sinomiqueliana*
- 1b. Rhizome usually stout, creeping to ascending, or erect; lamina papery to leathery, or rarely herbaceous especially when young; axes and main veins adaxially glabrescent or with scales, but not unicellular hairs.
 - 4a. Lamina 4- or 5-pinnate, ultimate segments very narrowly lanceolate, with a single vein; sori solitary in each segment; indusia very firm, dark and entire, covering sorus when young and splitting into irregular segments when mature 4. *A. superba*
 - 4b. Lamina usually 2–4(or 5)-pinnate, rarely simply pinnate, ultimate segments asymmetrically oblong or rhomboid, with more than one vein; sori often more than one in each segment; indusia membranous, papery or firm, persistent or fugacious, margin entire or erose.
 - 5a. Lamina oblong-lanceolate, simply pinnate; pinnae lanceolate; free ultimate segments (pinnae) nearly symmetrically cuneate at base.
 - 6a. Stipe with dark brown scales at base; pinnae rachis abaxially with sparse hairlike scales; sori mostly dorsal at or below middle of veinlets 5. *A. neopodophylla*
 - 6b. Stipe with reddish brown scales at base; pinnae rachis abaxially glabrescent; sori terminal or subterminal on veinlets.
 - 7a. Lamina acuminate at apex or with a distinct terminal pinna; pinnae with aristate-tipped cartilaginous coarse teeth on margin 6. *A. blinii*
 - 7b. Lamina with a distinct terminal pinna; pinnae with non-aristate-tipped crenulate teeth on margin 7. *A. tsiangiana*
 - 5b. Lamina deltoid, ovate, or pentagonal, 2–4(or 5)-pinnate; pinnae usually deltoid or ovate-lanceolate; free ultimate segments usually asymmetrical at base with acroscopic auricles.
 - 8a. Sori dorsal on veinlets; ultimate segments with margin dentate or acutely serrate, never with aristate tips; texture thickly leathery 8. *A. cavaleriei*
 - 8b. Sori terminal on veinlets (or subdorsal but mixed with terminal ones on same lamina); ultimate segments with margin acutely dentate or pinnatilobate, teeth with or without aristate tips; texture papery, subleathery, or herbaceous.
 - 9a. Rhizome and base of stipe with shiny castaneous, ovate-lanceolate, and stiffly thickly papery scales; stipe upward and rachis throughout glabrescent and glossy.
 - 10a. Lamina caudate toward apex, and with a distinct terminal pinna; lateral pinnae also caudate at apices ... 9. *A. amoena*
 - 10b. Lamina abruptly narrowed toward apex and caudate-acuminate, without distinct terminal pinna; lateral pinnae also caudate-acuminate at apices 10. *A. tonkinensis*
 - 9b. Rhizome and base of stipe with blackish, grayish, or reddish brown, ovate-lanceolate, lanceolate, linear-lanceolate, or filiform, and membranous or thinly papery scales; stipe upward and rachis throughout ± scaly and often not glossy.

- 11a. Rhizome ascending, with tufted, reddish brown, long, tortuous, filiform scales extending to stipe base.
- 12a. Lamina 2-pinnate-pinnatifid, free ultimate segments 5–8 × ca. 1.5 cm.
- 13a. Stipe base with only long hairlike scales; lamina leathery, lustrous and brownish when dried 11. *A. grossa*
- 13b. Stipe base with broad, denticulate-margined scales and with hairlike scales adaxially; lamina papery, dull dark green when dried 12. *A. fengii*
- 12b. Lamina 3–5-pinnate, free ultimate segments at most to 2 × 1 cm.
- 14a. Fronds large, usually reaching ca. 1.7 m; lamina 5-pinnate; stipe with both subulate scales and broadly lanceolate, denticulate-margined thicker scales along both sides of adaxial groove at lower part above base 15. *A. gigantea*
- 14b. Fronds medium-sized, at most to 1.5 m; lamina 3- or 4-pinnate; stipe with scales similar to those on rhizome or bearing slightly wider scales along both sides of adaxial groove near base.
- 15a. Lamina papery, 3- or 4-pinnate; ultimate segments obviously separate from each other, apex and lobes mucronate, dull brownish when dried; indusia usually denticulate on margin 13. *A. globisora*
- 15b. Lamina thinly leathery, 4-pinnate; ultimate segments contiguous to imbricate, apex and lobes with non-aristate sharp teeth, shiny green when dried; indusia often entire on margin 14. *A. spectabilis*
- 11b. Rhizome long to shortly creeping or ascending, often bearing grayish or blackish brown, linear-lanceolate, ovate-lanceolate, or subulate scales extending to stipe base.
- 16a. Rhizome lignified, together with base of stipe bearing linear-lanceolate, lanceolate, or subulate, and thicker and firmer scales.
- 17a. Fronds dimorphic; fertile lamina strongly contracted with much shorter and narrower pinnae and pinnules 16. *A. hainanensis*
- 17b. Fronds monomorphic, or with minor differences between fertile and sterile laminae (or pinnae on same lamina).
- 18a. Lamina abruptly acuminate to caudate-acuminate toward apex, most often with a conform terminal pinna resembling lateral pinnae.
- 19a. Lamina 2- or 3-pinnate, with an elongated caudate-acuminate apex, lateral pinnae often linear-lanceolate (only lowest pinnae deltoid-lanceolate) 19. *A. longipinna*
- 19b. Lamina (2 or)3- or 4-pinnate, with a distinct terminal pinna resembling adjacent lateral pinnae, lower 2–4 pairs of pinnae often deltoid-lanceolate with long basal basiscopic pinnules.
- 20a. Lamina relatively smaller and less dissected when mature, (2 or)3-pinnate, lower pinnae proximally with 1 or 2 pairs of elongated and 1-pinnate pinnules 17. *A. simplicior*
- 20b. Lamina relatively larger and more dissected, 4-pinnate at base, lower pinnae proximally with 2 or 3 pairs of elongated and 1- or 2-pinnate pinnules 18. *A. ziyunshanensis*
- 18b. Lamina gradually acuminate to strongly acuminate, gradually reduced without a conform terminal pinna.
- 21a. Lamina 2- or 3-pinnate; stipe bearing brown or dark brown, linear-lanceolate to subulate, denticulate-based, appressed scales above base and rachis throughout.
- 22a. Lamina caudate-acuminate at apex; lower pinnae with basally elongated pinnules.
- 23a. Rhizome long creeping; lamina shiny brownish green when dried; sori medial on veinlets 20. *A. aristata*
- 23b. Rhizome shortly creeping; lamina dull greenish when dried; sori medial or more basal on veinlets 22. *A. jinpingensis*
- 22b. Lamina acuminate to shortly acuminate at apex; pinnae (except basal) often without basally elongated pinnules.
- 24a. Lamina acuminate to attenuate at apex, occasionally abruptly narrowed; lateral pinnae often with basal pinnules longest 21. *A. chinensis*
- 24b. Lamina acuminate at apex; lateral pinnae with basal pinnules as long as or shorter than adjacent upper ones 23. *A. japonica*
- 21b. Lamina (3 or)4(or 5)-pinnate; stipe bearing brown or coal-black, linear-lanceolate (or wider but often entire-margined) spreading scales above base and rachis throughout, or stipe glabrescent.
- 25a. Lamina subleathery, stiff or firm when dried.
- 26a. Lamina thickly papery to subleathery when mature; ultimate segments broader and with aristate or mucronate teeth 24. *A. speciosa*
- 26b. Lamina papery or thinly papery when mature; ultimate segments often narrower and with only sharply tipped (but non-aristate) teeth 25. *A. conifolia*
- 25b. Lamina thinly herbaceous, soft and tenuous when dried.

- 27a. Stipe above base and rachis throughout bearing sparse, dull brown, relatively thinner scales, or glabrescent 26. *A. festina*
- 27b. Stipe above base and rachis throughout bearing a number of coal-black and relatively thicker scales 27. *A. nigrospinosa*
- 16b. Rhizome succulent, especially at growing apex, bearing broadly lanceolate or ovate-lanceolate and more delicate scales extending to stipe base.
- 28a. Lamina abruptly caudate at apex and forming a conform linear terminal pinna.
- 29a. Sori marginal or submarginal; indusia margin ciliate at least when young 28. *A. amabilis*
- 29b. Sori medial; indusia margin entire.
- 30a. Pinnae strongly ascending (forming an angle of less than 30° with rachis), lower 3 or 4 pairs similar in shape and size; ultimate segment margin serrate; indusia with hairs on dorsal surface 30. *A. similis*
- 30b. Pinnae obliquely spreading (forming an angle of more than 60° with rachis), pinnae gradually reduced toward lamina apex (and sometimes lowest pair of pinnae with long basal basicopic pinnules); proximal ultimate segments on acroscopic or both margins often shallowly pinnate; indusia glabrous 29. *A. hekiiana*
- 28b. Lamina toward apex acuminate, attenuate, or abruptly narrowed but acute, or forming a broadly acuminate terminal pinna.
- 31a. Lamina 2-pinnate; ultimate segments often broader than 1 cm.
- 32a. Lamina gradually acuminate toward apex.
- 33a. Lamina as long as or shorter than stipe, deltoid-oblong, with a terminal pinna resembling or slightly wider than its lateral ones; ultimate segments not decurrent 31. *A. assamica*
- 33b. Lamina longer than stipe, often oblong, its 1-pinnate apex much longer and wider than lateral pinnae; ultimate segments decurrent 32. *A. yoshinagae*
- 32b. Lamina abruptly narrowed toward apex, with a distinct but acuminate terminal pinna.
- 34a. Stipe ochraceous; lamina papery, brownish green when dried; lateral pinnae broader than 5 cm 33. *A. pseudoassamica*
- 34b. Stipe stramineous; lamina thinly papery, yellowish green when dried; lateral pinnae narrower than 4 cm 34. *A. wulingshanensis*
- 31b. Lamina 2-pinnate-pinnatifid to usually 3- or 4(or 5)-pinnate; ultimate segments often narrower than 1 cm.
- 35a. Lamina abruptly narrowed toward apex and long acuminate or acute; lowest pinnae linear-lanceolate to lanceolate or basal 1(or 2) pairs of pinnules obviously elongated.
- 36a. Lamina 2-pinnate-pinnatifid; lateral pinnae linear-lanceolate or lanceolate; ultimate segments often deeply pinnatifid 35. *A. hunanensis*
- 36b. Lamina 3-pinnate; lower 3(or 4) pinnae deltoid with elongated basal pinnules; ultimate segments (except proximal ones) sharply serrate 36. *A. sinorhomboidea*
- 35b. Lamina acuminate or slightly attenuate at apex; lowest pinnae deltoid or ovate and often much broader, with basal basicopic pinnules slightly longer.
- 37a. Lamina thickly papery or subleathery, most often 3-pinnate; ultimate segments usually broader than 5 mm.
- 38a. Pinnules remote; lamina papery and often flexible, shiny yellowish green when dried; veins and costules with brown, appressed articulate hairs abaxially 37. *A. nipponica*
- 38b. Pinnules contiguous; lamina subleathery and often firm, pale greenish when dried; veins and costules glabrescent abaxially 38. *A. ailaoshanensis*
- 37b. Lamina herbaceous or papery, most often 4-pinnate; ultimate segments usually narrower than 5 mm.
- 39a. Ultimate segments with aristate-tipped teeth; indusia ciliate or erose; lamina firmly herbaceous or papery, often dull pale green when dried 39. *A. simulans*
- 39b. Ultimate segments with blunt-tipped teeth; indusia entire; lamina thinly herbaceous, often shiny green when dried 40. *A. henryi*

1. *Arachniodes miqueliana* (Maximowicz ex Franchet & Savatier) Ohwi, J. Jap. Bot. 37: 76. 1962.

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Aspidium miquelianum Maximowicz ex Franchet & Savatier, Enum. Pl. Jap. 240, 634. 1876; *Arachniodes borealis* Serizawa; *Aspidium fargesii* Christ; *Dryopteris fargesii* (Christ) C.

Christensen; *D. miqueliana* (Maximowicz ex Franchet & Savatier) C. Christensen; *Leptorumohra fargesii* (Christ) Nakaike & Yamato; *L. miqueliana* (Maximowicz ex Franchet & Savatier) H. Itô; *Nephrodium miquelianum* (Maximowicz ex Franchet & Savatier) Komarov; *Polystichopsis miqueliana* (Maximowicz ex Franchet & Savatier) Tagawa; *Rumohra miqueliana* (Maximowicz ex Franchet & Savatier) Ching.

Rhizome long creeping, densely clothed with brown lanceolate scales along growing parts. Fronds 0.6–1 m; stipe ochraceous, 32–62 cm, 5–6 mm in diam., copiously scaly throughout, scales similar to those on rhizome; lamina 4-pinnate, dull green to yellowish green when dried, deltoid-pentagonal, 35–52 × 26–35 cm, herbaceous, apex acuminate, rachis scaly as stipe; pinnae 6–10 pairs, alternate, obliquely spreading; lowest pinnae deltoid-ovate, 29–32 × 22–25 cm, apex acuminate; primary pinnules ca. 18 pairs, obliquely spreading, deltoid-lanceolate, basal basicopic one ca. 15 × 7 cm; secondary pinnules 6 or 7 pairs, stalked, blunt deltoid to oblong, ca. 3.5 × 2.5 cm, base broadly cuneate, apex obtuse; tertiary pinnules 3 or 4 pairs, ovate or rhombic, to 1.2 × 0.9 cm, apex obtuse or acute, margin deeply pinnatifid to obtusely serrate; upper pinnae gradually reduced; axes and main veins adaxially with pale gray unicellular acicular hairs, veins abaxially with scattered brown, bullate and ovate scales. Sori 1–3 per ultimate segment; indusia brown, entire.

Broad-leaved or mixed forests, terrestrial or occasionally on shaded wet and moss-covered rock surfaces; 400–1300(–1700) m. Anhui, Guizhou, Jiangxi, Jilin, WC Sichuan, N Yunnan, Zhejiang [Japan, Korea].

2. *Arachniodes quadripinnata* (Hayata) Serizawa, J. Jap. Bot. 61: 53. 1986.

四回毛枝蕨 *si hui mao zhi jue*

Microlepia quadripinnata Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30: 434. 1911; *Dryopteris quadripinnata* (Hayata) Hayata; *Leptorumohra quadripinnata* (Hayata) H. Itô; *Rumohra quadripinnata* (Hayata) Ching.

Rhizome long creeping, bearing brown ovate-lanceolate scales. Fronds 0.8–1 m; stipe purplish brown at base, upward gradually ochraceous or stramineous, 20–60 cm, 2–5 mm in diam., glabrescent or with a few scales similar to those on rhizome; lamina 4- or 5-pinnate, brownish green when dried, pentagonal-ovate, 29–48 × 27–40 cm, herbaceous, abruptly narrowed toward apex and acuminate, rachis glabrescent; pinnae ca. 10 pairs, alternate, obliquely spreading; lowest pinnae ovate-lanceolate, 16–28 × 8–16 cm, apex acuminate; primary pinnules 8–10 pairs, ovate-lanceolate, 5–13 × 2.5–6 cm (basal basicopic one largest), apex acuminate; secondary pinnules ca. 12 pairs, shortly stalked, ovate-lanceolate, to 3.5 × 1.2 cm; tertiary pinnules 6 or 7 pairs, ovate-oblong, to 1 × 0.5 cm, basal acroscopic one largest, margin pinnatifid or coarsely serrate, or pinnatisect in 5-pinnate lamina; upper pinnae gradually reduced; axes and main veins adaxially with pale gray unicellular acicular hairs, veins abaxially with sparse linear-lanceolate or hairlike, flat-based scales. Sori small, 1–4 per ultimate segment, medial between main vein and margin; indusia brown, margin entire to acicular ciliate.

On rather damp ground in broad-leaved or coniferous forests, especially in shaded places by streams, also in wet thickets; 1600–2700(–3000) m. Anhui, Guangxi, Guizhou, Jiangxi, Sichuan, Taiwan, Yunnan [Japan].

3. *Arachniodes sinomiqueliana* (Ching) Ohwi, J. Jap. Bot. 76: 1962.

无鳞毛枝蕨 *wu lin mao zhi jue*

Rumohra sinomiqueliana Ching, Sinensia 5: 65. 1934 [“*sino-miqueliana*”]; *Arachniodes quadripinnata* (Hayata) Serizawa subsp. *fimbriata* (Koidzumi) Serizawa; *Dryopteris miqueliana* (Maximowicz ex Franchet & Savatier) C. Christensen var. *fimbriata* Koidzumi; *Leptorumohra sinomiqueliana* (Ching) Tagawa; *Polystichopsis sinomiqueliana* (Ching) Tagawa.

Rhizome long creeping, with shiny castaneous lanceolate scales. Fronds 45–80 cm; stipe stramineous, 25–40 cm, 2–4 mm in diam., base with scales similar to those on rhizome, upward with a few dull brown lanceolate scales, or glabrescent; lamina 3-pinnate-pinnatifid, shiny or yellowish green when dried, deltoid-pentagonal, 23–40 × 16–30 cm, herbaceous, long acuminate toward apex, rachis glabrescent; pinnae ca. 15 pairs, alternate or lowest pair opposite, obliquely spreading; lowest pinnae ovate-lanceolate, 12–25 × 9–12 cm; primary pinnules ca. 15 pairs, stalked, deltoid-lanceolate, to 4.5 × 2 cm (basal basicopic one largest), apex obtuse; secondary pinnules 5 or 6 pairs, oblong, ca. 1.4 × 0.6 cm, base obliquely cuneate, margin deeply pinnatifid; lobes 2–4 pairs, basal acroscopic one almost free, oblong, apex with 2 or 3 blunt teeth; upper pinnae gradually reduced; axes and main veins adaxially with pale gray unicellular acicular hairs, veins abaxially with a few appressed and narrowly lanceolate, flat-based scales. Sori small, 2–4 per ultimate segment; indusia brown, margin acicular ciliate.

Slopes in broad-leaved forests or bamboos, especially in wet places along streams, or in non-forested valleys; (1000–)1400–2000 m. Chongqing, Guizhou, Hunan, Jiangxi, WC Sichuan, NE Yunnan, Zhejiang [Japan].

4. *Arachniodes superba* Fraser-Jenkins, New Sp. Syndr. Indian Pteridol. 39. 1997.

石盖蕨 *shi gai jue*

Aspidium foeniculaceum Hooker, Sp. Fil. 4: 36. t. 237. 1862; *Diacalpe foeniculacea* C. B. Clarke; *Lastrea foeniculacea* (Hooker) Beddome; *Lithostegia foeniculacea* (Hooker) Ching; *Polystichum foeniculaceum* (Hooker) J. Smith.

Rhizome ascending, stout, densely closed with brown, ovate acuminate, shortly fringed scales. Fronds 60–120 cm; stipe pale reddish or stramineous especially above, 18–40(–60) cm, 5–6 mm in diam., base with scales similar to those on rhizome, sparser upward; lamina 4- or 5-pinnate, shiny green adaxially, paler abaxially, ovate or deltoid-lanceolate, 45–80 × 30–50 cm, papery to softly leathery, slightly reduced at base, apex acuminate, rachis scaly as distal portion of stipe; pinnae 4 or 5(or 6) pairs, basal pair opposite, others alternate, stalked, obliquely spreading, contiguous; lowest pinnae longest, ca. 25 × 13 cm, broadly cuneate at base, apex acuminate; primary pinnules 14–16 pairs, alternate, stalked, obliquely spreading, lanceolate, 8–15 × 1.6–3 cm, basal pair longest, base broadly cuneate, apex acute; secondary pinnules ca. 10 pairs, alternate, rhombic-oblong, middle pair 1.6–2.4 × 0.7–1 cm, apex acuminate; tertiary pinnules 3 or 4 pairs, alternate, linear, basal pair 2- or 3-furcate; second pair of pinnae similar in size and shape to basal pair, upper pinnae gradually reduced to acuminate apex; pinnule axes and veins bearing brown, hairlike, and twisted

scales abaxially. Sori small, 1 per segment, terminal on a very short acroscopic veinlet branch (appearing dorsal on single vein of ultimate segment); indusium firm, dark purple, ovoid, entire and covering sorus when young, splitting into 2–3 irregular segments when mature. $n = 82$.

Evergreen broad-leaved forests, also broad-leaved and coniferous mixed forests; 2100–3200 m. Xizang, Yunnan [Bhutan, India, Myanmar, Nepal].

The combination "*Peranema foeniculacea*" (B. K. Nayar & S. Kaur, Natl. Bot. Gard. Bull. 81: 27. 1963) was not validly published because a full and direct reference to the author and place of valid publication of the basionym was not provided (*Melbourne Code*, Art. 41.5).

5. *Arachniodes neopodophylla* (Ching) T. Nakaike, J. Phytogeogr. Taxon. 49: 16. 2001.

长叶黔蕨 chang ye qian jue

Dryopteris neopodophylla Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 401. 1938; *Phanerophlebiopsis neopodophylla* (Ching) Ching ex Y. T. Hsieh.

Rhizome thick, creeping, or upper part ascending, densely clothed with blackish brown, linear-lanceolate scales. Fronds 47–86 cm; stipe stramineous, 24–60 cm, to 5 mm in diam., base with scales similar to those on rhizome, glabrescent upward; lamina 1-pinnate, turning gray when dried, glabrous but dull adaxially, ovate-oblong, 23–34 × 16–24 cm, papery, apex ending with a terminal pinna, rachis glabrescent; lateral pinnae 5–8 pairs, alternate or lowest pair opposite, obliquely spreading, stalked, linear-lanceolate, 8–17 × 1.4–2.8 cm, base narrowly cuneate to cuneate, apex acuminate to shortly caudate, margin with short coarse teeth, each tooth with 2–4 cartilaginous aristate tips; terminal pinna conform or sometimes slightly larger; veins pinnate, veinlets 2 or 3 pairs on each set of lateral veins, veinlets simple or forked, visible on both surfaces, bearing sparse brown or blackish hairlike scales abaxially. Sori in 2 or 3 rows on both sides of midvein of ultimate segment, for row next to midvein sori subterminal on veinlets, otherwise dorsal on middle or proximal part of veinlets; indusia brown, membranous, and fugacious.

- Forested valleys; 800–1300 m. Guizhou.

6. *Arachniodes blinii* (H. Léveillé) T. Nakaike, J. Phytogeogr. Taxon. 49: 9. 2001.

粗齿黔蕨 cu chi qian jue

Aspidium blinii H. Léveillé, Fl. Kouy-Tchéou, 456. 1915; *Arachniodes coadunata* (Ching) T. Nakaike; *A. duplicatoserrata* (Ching) T. Nakaike; *A. kweichowensis* (Ching) T. Nakaike; *A. neofalcata* T. Nakaike; *Phanerophlebiopsis blinii* (H. Léveillé) Ching; *P. coadunata* Ching ["*coadnata*"]; *P. duplicatoserrata* Ching; *P. falcata* Ching; *P. kweichowensis* Ching.

Rhizome thick, creeping, densely clothed with reddish brown, linear-lanceolate scales. Frond (30–)50–100 cm; stipe stramineous, 13–45 cm, 2–3 mm in diam., base with scales similar to those on rhizome, gradually sparser or glabrescent upward; lamina 1-pinnate, grayish green when dried, oblong or

lanceolate, 16–55 × 9–22 cm, thinly leathery, glabrous on both surfaces or axes sparsely bearing brown, linear scales abaxially, shiny adaxially, apex with a conform terminal pinna or gradually reduced, acuminate, rachis glabrescent; (lateral) pinnae 6–13 pairs, alternate or lower pairs opposite, spreading or slightly ascending, stalked, broadly to narrowly lanceolate, sometimes falcate, 6–15 × 1.5–3 cm, base symmetrical or nearly so, cuneate, apex acuminate to shortly caudate, margin strongly serrate, crenate, or shallowly lobed, teeth or lobes usually with 1–5 cartilaginous aristate tips; veins pinnate, veinlets 2–4 pairs on each set of lateral veins, veinlets simple or forked. Sori terminal or subterminal on veinlets, in 1–3 rows on both sides of midvein of ultimate segment; indusia brown, membranous, and fugacious.

- Evergreen forests, more often in valleys and damp shaded places, especially on acidic soils; 500–1600 m. Chongqing, Guangxi, Guizhou, Hunan, Jiangxi.

There is much variability in the frond size, the lamina apex (acuminate or with a distinct terminal pinna), the division on the pinna margin, and the number of rows of sori on each side of the midvein. Field observation revealed that this variation is continuous and can be found on leaves of a single rhizome. Thus, no characters can be used to distinguish the above mentioned synonyms, which were accepted in FRPS (5(1): 96–100. 2000).

Arachniodes intermedia (Ching) T. Nakaike (J. Phytogeogr. Taxon. 49: 13. 2001; *Phanerophlebiopsis intermedia* Ching, Bull. Bot. Res., Harbin 7(1): 72. 1987) and *A. neohunnanensis* T. Nakaike (J. Phytogeogr. Taxon. 49: 15. 2001; *Phanerophlebiopsis hunanensis* Ching, Bull. Bot. Res., Harbin 7(1): 74. 1987) may belong here. The types, both from Hunan (Yongshun), have not been seen, and no other specimens are available.

7. *Arachniodes tsiangiana* (Ching) T. Nakaike, J. Phytogeogr. Taxon. 49: 20. 2001.

黔蕨 qian jue

Phanerophlebiopsis tsiangiana Ching, Acta Phytotax. Sin. 10: 116. 1965; *Dryopteris tsiangiana* (Ching) R. M. Tryon & A. F. Tryon.

Rhizome long creeping, densely clothed with brown, lanceolate scales. Fronds 45–58 cm; stipe stramineous, 20–25 cm, 2–3 mm in diam., base with scales similar to those on rhizome, glabrescent upward; lamina 1-pinnate, turning grayish green when dried, broadly lanceolate, 20–33 × 10–12 cm, papery or thinly leathery, glabrous on both surfaces or bearing sporadic brown linear-lanceolate scales along axes abaxially, toward apex acuminate and ending with a distinct terminal pinna, rachis glabrescent; lateral pinnae 6–8 pairs, alternate or lower pairs opposite, spreading, stalked, lanceolate, 7–8 × 1.5–2 cm, base symmetrical, cuneate, apex acuminate, margin crenulate-serrulate, teeth non-aristate; terminal pinna similar to lateral ones in size, usually forked at base; veins pinnate, veinlets 2 or 3 pairs on each set of lateral veins, simple or forked. Sori terminal on veinlets, in 2 rows on each side of pinna axis (midvein); indusia brown, membranous, and fugacious.

- Shaded damp places in evergreen broad-leaved forests; 400–700(–1300) m. SE Guizhou.

8. *Arachniodes cavaleriei* (Christ) Ohwi, J. Jap. Bot. 37: 76. 1962 [*"cavalerii"*].

大片复叶耳蕨 da pian fu ye er jue

Aspidium cavaleriei Christ, Bull. Acad. Int. Géogr. Bot. 13: 116. 1904 [*"cavalerii"*]; *Arachniodes acuminata* Ching & Chu H. Wang; *A. baiseensis* Ching; *A. guangxiensis* Ching; *A. obtusiloba* Ching & Chu H. Wang; *A. pseudocavaleriei* Ching; *A. sphaerosora* (Tagawa) Ching; *A. triangularis* Ching; *Byrsopteris cavaleriei* (Christ) Sa. Kurata; *Dryopteris cavaleriei* (Christ) C. Christensen; *D. sphaerosora* Tagawa; *Polystichopsis cavaleriei* (Christ) Tagawa; *Rumohra cavaleriei* (Christ) Ching.

Rhizome ascending, woodlike stiff, apex scaly; scales yellow or dark brown, lanceolate, 1–2.5 × 0.2–0.4 cm, firmly papery, somewhat twisted clockwise. Fronds approximate, 0.5–1.1 m; stipe stramineous, 30–65 cm, 3–6 mm in diam., base moderately scaly, with scales similar to those on rhizome, glabrescent upward; lamina 3-pinnate, yellowish green when dried, ovate-deltoid, 25–50 × 20–35 cm, leathery, base cuneate or rounded-cuneate, apex acuminate and pinnatifid, rachis glabrescent; pinnae (1–)3–5-pairs, alternate, with 1–3 cm stalk, obliquely spreading, approximate; lowest pinna deltoid or oblong-deltoid, 15–28 × 10–15 cm, base broadly cuneate, apex acuminate; primary pinnules 5–9 pairs, with 0.5–1.5 cm stalk, obliquely spreading, basal basiscopic one ± longer than adjacent ones, lanceolate; secondary pinnules shortly stalked, deltoid-lanceolate, slightly falcate, 4–7 × 1.5–3 cm, base acroscopically oblique-truncate and auriculate, basiscopically cuneate, apex acuminate, caudate-acuminate, acute, or obtuse, margin pinnatifid, coarsely serrate, or crenate; lobes or serrations blunt or acute; upper pinnae triangular-lanceolate or lanceolate, often 1-pinnate; axes and veins of ultimate segments occasionally with sparse glandular hairs or minute brown scales abaxially. Sori dorsal on veinlets, 3–5(–7) pairs per ultimate segment, closer to midvein (of ultimate segment) than margin; indusia brown, membranous or thickening with age, entire, sometimes dorsally with glandular hairs.

Along streams in dense woods, in shaded ravines, or on moss-covered rocks by flowing water in open places, mixed with *Dicranopteris pedata*; (200–)400–1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Hunan, Jiangxi, Yunnan [Japan, N Thailand].

9. *Arachniodes amoena* (Ching) Ching, Acta Bot. Sin. 10: 256. 1962.

美丽复叶耳蕨 mei li fu ye er jue

Rumohra amoena Ching, Sinensia 5: 40–41. 1934; *Polystichum amabile* (Blume) J. Smith var. *controversum* Hance ex Y. C. Wu.

Rhizome creeping or ascending, stiff, 1–1.5 cm in diam., apex scaly; scales shiny castaneous, ovate-lanceolate, ca. 8 × 3 mm, firmly papery. Fronds remote or approximate, 0.4–1.1 m; stipe ochraceous or amber, 20–60 cm, 4–8 mm in diam., base with a tuft of imbricate scales similar to those on rhizome, upward sparsely scaly or glabrescent and glossy; lamina 3-pinnate(-pinnatifid), dark brown when dried, ovate-oblong or ovate-pentagonal, 20–60 × 25–45 cm, papery, base rounded, cordate, or hastate, apex caudate, with a conform terminal pinna, rachis sparsely scaly as distal portion of stipe or glabrescent;

pinnae (1–)3–6(or 7) pairs, alternate, with 1–1.5 cm stalk, obliquely spreading; lowest pinna deltoid-ovate, 20–25 × 15–22 cm, apex with a conform terminal pinnule; primary pinnules 15–25 pairs, basal 1 or 2 pairs elongated and with ca. 1 cm stalk, distally sessile; elongated primary pinnules with secondary pinnules 10–20 pairs, shortly stalked or sessile, spreading, oblong, 1–2.5 × 0.5–0.8 cm, base acroscopically truncate, basiscopically cuneate, apex obtuse, margin especially on acroscopic side lobed or serrate, aristate, proximal pair(s) sometimes longer and deeply pinnatifid; upper 1 or 2(or 3) pairs of pinnae with basal pinnules elongated; axes and veins of ultimate segments occasionally with minute brown lanceolate scales abaxially. Sori terminal on veinlets, 3–5 pairs per ultimate pinnule, medial between margin and midvein of ultimate segment; indusia brown, membranous, entire, and fugacious.

• On shaded moss-covered rocks or ravines by streams, on ground in woods or under shrubs; 400–1700 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Zhejiang.

10. *Arachniodes tonkinensis* (Ching) Ching, Acta Bot. Sin. 10: 260. 1962.

中越复叶耳蕨 zhong yue fu ye er jue

Rumohra tonkinensis Ching, Sinensia 5: 52. 1934; *Arachniodes obtusipinnula* Ching & Y. T. Hsieh; *A. subamoena* Ching; *R. callipteris* C. Christensen.

Rhizome ascending, stiff, apex scaly; scales castaneous and lustrous, ovate-lanceolate, 5–9(–15) × 2–3 mm, thin papery and spreading. Fronds approximate, 60–95 cm; stipe stramineous, 30–50 cm, ca. 4 mm in diam., base with scales similar to those on rhizome, distally glabrescent and glossy; lamina 3- or 4-pinnate, brownish when dried, deltoid-ovate or ovate-pentagonal, 30–55 × 25–30 cm, papery, base rounded or slightly hastate, apex caudate-acuminate, rachis glabrescent and glossy; pinnae 3–5 pairs, alternate, with 1–4 cm stalk, obliquely spreading; lowest pinnae deltoid, 15–22 × 12–17 cm, base rounded or cordate, apex caudate-acuminate; primary pinnules 15–20 pairs, basal pair enlarged, with ca. 1 cm stalk and usually proximal pair of secondary pinnules pinnate, distally abruptly shortened, shortly stalked; secondary (and tertiary) pinnules sessile, rhombic-oblong, 1–1.5 × 0.5–0.9 cm, base obliquely cuneate, apex obtuse, acroscopic margin deeply pinnatifid, lobes with 3–5 sharp teeth; upper 1(or 2) pairs of pinnae with proximal pair of pinnules elongated, upward triangular-lanceolate; veins with sparse minute brown lanceolate scales abaxially. Sori terminal on veinlets, 1–3 pairs per ultimate segment; indusia brown, firmly membranous, entire, fugacious.

Broad-leaved or mixed forests; 1200–1700 m. W Hunan, S Yunnan [Vietnam].

11. *Arachniodes grossa* (Tardieu & C. Christensen) Ching, Acta Bot. Sin. 10: 257. 1962.

粗裂复叶耳蕨 cu lie fu ye er jue

Rumohra grossa Tardieu & C. Christensen, Not. Syst. (Paris) 7: 85. 1938.

Rhizome ascending, woodlike stiff, 3–5 cm in diam., apex densely scaly; scales reddish brown, hairlike, to 2.5 × 0.1 cm,

tortuous or twisted, spreading, soft. Fronds approximate, 0.7–1 m; stipe stramineous, 35–55 cm, 5–6 mm in diam., base and lower parts with scales similar to those on rhizome, glabrescent upward; lamina 2-pinnate-pinnatifid, shiny brownish when dried, ovate-deltoid, 35–50 × 22–35 cm, leathery, base rounded-cuneate, apex acuminate, gradually reduced, rachis glabrescent; pinnae 2–4(–7) pairs, alternate or lower 1 or 2 pairs opposite, with to 1.5 cm stalk, obliquely spreading; lowest pinnae deltoid-lanceolate, to 28 × 15 cm, base broadly cuneate, apex long acuminate; (primary) pinnules or lobes 10–15 pairs, proximal ones shortly stalked, separate pinnules lanceolate, ca. 8 × 1.5 cm, proximal basicopic one sometimes much longer than others to 10 × 1.8 cm, base obliquely cuneate, apex caudate-acuminate, margin deeply pinnatifid, remaining pinnules or lobes ca. 2 × 1 cm, margin pinnatifid or crenate; lobe apex acute or obtuse, ending with a shortly mucronate tip, margin serrulate; upper pinnae lanceolate or linear-lanceolate; veins with a few minute brown subulate scales abaxially. Sori small, terminal on veinlets, in 1 or 2 rows on each side of midvein of ultimate segments, medial between margin and midvein; indusia dark brown, papery, and entire.

Open forests, on wet moss-covered rocks or cliffs along streams, arid steep slopes; 500–1100 m. S Guangdong, S Guangxi, Hainan [N Vietnam].

12. *Arachniodes fengii* Ching, Bull. Bot. Res., Harbin 6(3): 8. 1986.

国楣复叶耳蕨 *guo mei fu ye er jue*

Rhizome ascending, stiff, 2.5–3.5 cm in diam., apex densely scaly; scales reddish brown, narrowly lanceolate with an acicular apex, to 1.5 × 0.3 cm, tortuous or twisted, broader scales with margins denticulate. Fronds approximate, 75–95 cm; stipe ochraceous, 35–48 cm, ca. 7 mm in diam., base and lower parts densely scaly with scales similar to those on rhizome, scales of distal portion of stipe sparser and narrower (to subulate); lamina 2-pinnate-pinnatifid, dull dark green when dried, deltoid-oblong or broadly lanceolate, 45–55 × 24–30 cm, thinly papery, base cuneate, apex acuminate, gradually reduced, rachis scaly as distal portion of stipe; pinnae ca. 11 pairs, alternate or lower 1 or 2 pairs opposite, with to 1.5 cm stalk, obliquely spreading, (lower 3 or 4 pairs oblong-lanceolate, to 25 × 8 cm), base broadly cuneate, apex acuminate; primary pinnules ca. 16 pairs, proximal ones shortly stalked, lanceolate and slightly falcate, to 5 × 1.5 cm, base acroscopically truncate, basicopically cuneate, margin deeply pinnatifid; lobes to 9 pairs, oblong, to 1.2 × 0.5 cm, apex mucronate, margin entire or serrulate; upper pinnae deltoid-lanceolate or lanceolate, gradually reduced; axes and veins of ultimate segments moderately with minute red-brown threadlike scales abaxially. Sori terminal on veinlets, 1–5 pairs per ultimate segment, closer to midvein than to segment margin; indusia dark brown, thickly membranous, and entire.

• Wet valleys or flat lands in dense rain forests, on slopes in broad-leaved forests; 600–800(–1700) m. S Yunnan (Malipo and Mengla).

13. *Arachniodes globisora* (Hayata) Ching, Acta Phytotax. Sin. 9: 383. 1964.

台湾复叶耳蕨 *tai wan fu ye er jue*

Polystichum globisorum Hayata, Icon. Pl. Formosan. 4: 193. 1914; *Arachniodes arisanica* (Rosenstock) Ching; *A. guangnanensis* Y. T. Hsieh; *A. maguanensis* Ching & Y. T. Hsieh; *A. menglianensis* Y. T. Hsieh; *A. spinoserrulata* Ching; *Polystichum arisanicum* Rosenstock; *Rumohra arisanica* (Rosenstock) Ching; *R. globisora* (Hayata) H. Itô.

Rhizome ascending, stiff, 3–6 cm in diam., apex densely scaly; scales reddish brown, linear-lanceolate, 1–1.5 cm × 0.5–2 mm, upper parts threadlike and tortuous, thin and soft. Fronds approximate, (0.6–)0.8–1.2(–1.5) m; stipe ochraceous or amber, 45–75 cm, 3–5 mm in diam., base tufted with scales similar to those on rhizome, scales sparser upward; lamina 3- or 4-pinnate, dull dark brown when dried, ovate-deltoid, 40–70 × 30–50 cm, papery, base rounded, apex acuminate, caudate to abruptly narrowed and acuminate, rachis glabrescent; pinnae (5–)8–12 pairs, alternate, with to 3.5 cm stalk, obliquely spreading; lowest pinnae deltoid, to 30 × 20 cm, base rounded, apex acuminate with ca. 10 pairs of stalked primary pinnules, these lanceolate or oblong (basal basicopic one often longer, to 20 × 6 cm), base cuneate, apex acuminate and caudate; primary pinnules ca. 10 pairs, shortly stalked, ovate-lanceolate, to 4.5 × 2 cm, base rounded or broadly cuneate, apex acute or obtuse; secondary (and tertiary) pinnules obviously separate from each other, subsessile, oblong or obliquely rhomboid, to 12 × 6 mm, base cuneate, apex obtuse or acute, margin shallowly pinnatifid, lobe tipped with 2 or 3 mucronate sharp teeth; upper pinnae gradually reduced; axes and veins of ultimate segments with minute brown linear scales abaxially. Sori small, terminal (or subdorsal) on veinlets, 4–6 pairs per ultimate segment, closer to midvein than margin; indusia brown, firmly membranous, often denticulate on margin.

Wet slopes by streamlets in forests, sometimes in bamboos, also in thickets along roadsides, or occasionally on steep moss-covered rocks; 1000–2000 m. Taiwan, S Yunnan [N Thailand, N Vietnam].

14. *Arachniodes spectabilis* (Ching) Ching, Acta Bot. Sin. 10: 259. 1962.

清秀复叶耳蕨 *qing xiu fu ye er jue*

Rumohra spectabilis Ching, Sinensia 5: 58. 1934; *Arachniodes nitidula* Ching.

Rhizome ascending, stiff, 3–5 cm in diam., apex densely scaly; scales reddish brown, linear-lanceolate or filiform, 1.5–2.5 cm × 0.5–2 mm, tortuous and soft. Fronds approximate, 0.9–1.5 m; stipe stramineous, 50–75 cm, ca. 6 mm in diam., base tufted with scales similar to those on rhizome, scales sparser upward; lamina 3- or 4-pinnate, shiny brownish green when dried, ovate-oblong or ovate-pentagonal, 40–75 × 35–40 cm, subleathery, base rounded-cuneate, apex acuminate, rachis sparsely scaly as distal portion of stipe; pinnae ca. 10 pairs, stalked, alternate or lowest pair opposite, obliquely spreading, subimbricate; lowest pinnae broadly deltoid-lanceolate, to 35 × 25 cm, base rounded, apex acuminate; primary pinnules ca. 12 pairs, stalked, deltoid-oblong (lanceolate distally), proximal basicopic 1 or 2 slightly longer; secondary pinnules to 20 pairs, deltoid or linear-lanceolate, base cuneate, apex acuminate and caudate; ultimate pinnules (secondary pinnules for 3-pinnate leaves) contiguous to imbricate, oblique-oblong, ca. 12 × 4

mm, base acroscopically truncate, basicopically cuneate, apex obtuse, margin sharply serrate, teeth without mucronate tips; upper pinnae gradually reduced; axes and veins of ultimate segments with sparse minute brown linear scales abaxially. Sori large, terminal (or subdorsal) on veinlets, 1–4 pairs per ultimate segment, medial between margin and midvein; indusia dark brown, subleathery, and entire.

Slopes in broad-leaved forests or by streamlets, also on dry slopes under open forests, occasionally in bamboos; (600–)1200–1800 m. S Yunnan [India, Laos, Myanmar, N Thailand].

15. *Arachniodes gigantea* Ching, Bull. Bot. Res., Harbin 6(3): 66. 1986.

高大复叶耳蕨 gao da fu ye er jue

Rhizome ascending, 8–10 cm in diam., apex densely scaly; scales reddish brown, narrowly lanceolate to threadlike, to 3.5 cm × 1.5–3 mm, often tortuous and soft. Fronds approximate, 1.2–1.7(–2.5) m; stipe stramineous, 60–90 cm, ca. 8 mm in diam., base tufted with scales similar to those on rhizome, lower parts moderately with subulate scales, these mixed with broadly lanceolate, remotely serrulate-margined thicker scales along both sides of adaxial groove, scales sparser upward; lamina (4 or)5-pinnate, dull greenish when dried, broadly ovate, 60–90 × 45–70 cm, thinly papery, base rounded, apex acuminate, rachis scaly as distal portion of stipe; pinnae ca. 20 pairs, alternate, with to 10 cm stalk, obliquely spreading; lower 1 or 2(–4) pairs ovate-deltoid, base rounded, apex acuminate; primary and secondary pinnules proximally broadly lanceolate and stalked, distally linear-lanceolate and sessile; tertiary pinnules shortly stalked or sessile, oblong, to 2.5 × 1 cm; quaternary pinnules 4 or 5 pairs, sessile, contiguous, oblong, 5–6 × 2–2.5 mm, base obliquely cuneate, apex sharply serrate; veins with a few minute brown subulate scales abaxially. Sori small, 2–4 pairs per ultimate segment, medial between midvein and margin; indusia dark brown, membranous, and entire.

• Wet slopes by streamlets in broad-leaved forests, forested deep valleys; 1100–1800 m. S and W Yunnan.

16. *Arachniodes hainanensis* (Ching) Ching, Acta Bot. Sin. 10: 258. 1962.

海南复叶耳蕨 hai nan fu ye er jue

Rumohra hainanensis Ching, Sinensia 5: 44. 1934.

Rhizome shortly creeping, stiff, 2–3 cm in diam., apex densely scaly; scales reddish brown, linear-lanceolate, apex sometimes filiform, to 2 cm × 1.5 mm, spreading and soft. Fronds approximate, dimorphic, 30–60 cm. Sterile fronds 30–45 cm; stipe stramineous, 13–20 cm, ca. 2.5 mm in diam., base with scales similar to those on rhizome, scales sparser upward, appressed; lamina 2-pinnate, yellowish brown when dried, deltoid-lanceolate or lanceolate, 25–30 × 10–15 cm, subleathery, base rounded-cuneate, apex attenuate, rachis scaly as distal portion of stipe; pinnae 15–20 pairs, stalked, alternate or lower pairs opposite, spreading, lanceolate or deltoid-oblong, base rounded or broadly cuneate, apex acute or obtuse; pinnules 5–8 pairs per pinna, shortly stalked, oblong, to 2 × 0.8 cm, base acroscopically truncate and hardly auriculate, basicopically

cuneate, apex obtuse, margin serrate with mucronate teeth; axes of lamina, pinna, and pinnules with sparse minute brown filiform scales abaxially. Fertile fronds to 60 cm; stipe often 1/3 longer than lamina; lamina similar to that of sterile fronds in shape and dissection, but strongly contracted with much shorter and narrower pinnae. Sori small, terminal on veinlets, approximate, 4–8 pairs per ultimate segment, closer to midvein than margin; indusia dark brown, membranous, ciliate or irregularly denticulate on margin.

• Shaded wet moss-covered rocks in dense or open forests, also in thickets or in crevices on arid cliffs by streams; 400–500 m. Hainan.

Arachniodes dimorphophyllum (Hayata) Ching (Acta Bot. Sin. 10: 257. 1962 [“*dimorphophyllum*”]; *Polystichum dimorphophyllum* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30: 428. 1911; *Rumohra dimorphophyllum* (Hayata) H. Itô), the most closely related species to this fern, is reportedly from Taiwan. However, without available specimens, it is not included here and reserved for further verification.

17. *Arachniodes simplicior* (Makino) Ohwi, J. Jap. Bot. 37: 76. 1962.

长尾复叶耳蕨 chang wei fu ye er jue

Aspidium aristatum (G. Forster) Swartz var. *simplicior* Makino, Bot. Mag. (Tokyo) 15: 65. 1901; *Arachniodes aristatissima* Ching; *A. calcarata* Ching; *A. fujianensis* Ching [“*fujianensis*”]; *A. jiulongshanensis* Ching; *A. liyangensis* Ching & Y. C. Lan; *A. parasimplicior* Ching ex Y. T. Hsieh; *A. tibetana* Ching & S. K. Wu; *A. yasui-inouei* Sa. Kurata; *Byrsopteris simplicior* (Makino) Sa. Kurata; *Polystichopsis simplicior* (Makino) Tagawa; *Polystichum aristatum* (G. Forster) C. Presl var. *simplicior* (Makino) Matsumura; *P. simplicior* (Makino) Tagawa; *Rumohra simplicior* (Makino) Ching.

Rhizome shortly creeping, stiff, apex densely scaly; scales (reddish or dark) brown, linear-lanceolate or subulate, ca. 8 × 0.5–1.5 mm, base often remotely fimbriate, apex hairlike and often tortuous, firmly membranous. Fronds approximate, 0.4–1.1 cm; stipe stramineous, 20–65 cm, ca. 3 mm in diam., base with scales similar to those on rhizome, scales sparser upward, or rarely glabrescent; lamina (2 or)3-pinnate, pale green when dried, ovate-oblong, deltoid-ovate, or pentagonal, 20–60 × 15–40 cm, firmly papery or leathery, base rounded, cordate, or hastate, apex abruptly caudate with a stalked conform terminal pinna, rachis sparsely scaly as distal portion of stipe, or glabrescent throughout; lateral pinnae 2–5(or 6) pairs, alternate or lowest pair opposite, with to 2.5 cm stalk, obliquely spreading; lowest pinnae obliquely deltoid, to 28 × 15 cm, base broadly cuneate, apex caudate-acuminate; primary pinnules ca. 20 pairs, with to 1 cm stalk, basal pair elongated (basicopic one longer, to 15 × 2.2 cm), lanceolate, base cuneate, apex acuminate, pinnate, larger fronds with proximal 2 pairs of pinnules elongated and pinnate; secondary pinnules shortly stalked or sessile, oblong or larger ones slightly falcate, ca. 1.5 × 0.6 cm, base acroscopically truncate and auriculate, basicopically cuneate, apex acute, margin sharply serrate (or shallowly pinnatifid), aristate; upper 1–3 pairs of pinnae with basal pair of pinnules elongated, other lateral pinnae shorter and lanceolate; axes and veins of ultimate segments with minute (dark) brown subulate appressed scales abaxially. Sori terminal on veinlets, 1–6 pairs

per ultimate segment, medial between midvein and margin or closer to margin; indusia (dark) brown, membranous, entire. $2n = 82^*$.

Wet slopes in broad-leaved forests or bamboos, on wet rocks or cliffs (in crevices) by streams, thickets mixed with grasses, open places near forests; 200–1800 m. Anhui, Chongqing, Fujian, SE Gansu, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, SW Xizang, Yunnan, Zhejiang [Japan].

18. *Arachniodes ziyunshanensis* Y. T. Hsieh, Acta Phytotax. Sin. 22: 162. 1984.

紫云山复叶耳蕨 *zi yun shan fu ye er jue*

Arachniodes pseudosimplicior Ching; *A. shuangbaiensis* Ching; *A. yunqiensis* Y. T. Hsieh.

Rhizome shortly creeping, stiff, apex densely scaly; scales (reddish or dark) brown, linear-lanceolate or subulate, ca. 8×0.5 – 1.5 mm, base often remotely fimbriate, apex hairlike, firmly membranous. Fronds approximate, 0.9–1.3 m; stipe stramineous (or blackish brown near base), 50–70 cm, 3–4 mm in diam., lower parts with scales similar to those on rhizome, scales sparser upward; lamina 4-pinnate, greenish when dried, shiny on adaxial surface, ovate-oblong, 40–60 \times 30–45 cm, papery, base rounded-cuneate, apex abruptly narrowed and forming a stalked conform terminal pinna, rachis glabrescent; lateral pinnae 5–7 pairs, alternate or lower 1(–3) pairs opposite, with to 3 cm stalk, obliquely spreading; lowest pinnae ovate-deltoid, ca. 30×25 cm, base cordate, rounded, or cuneate, apex abruptly narrowed and caudate; primary pinnules ca. 20 pairs, proximal 2(or 3) pairs elongated, deltoid-lanceolate, to 20×4 cm, base broadly cuneate or rounded, apex acuminate; secondary pinnules ca. 16 pairs, with to 0.5 cm stalk, linear-lanceolate or oblong (proximal basiscopic ones (or both sides) elongated to 4.5×1.5 cm), base cuneate, apex acute; tertiary pinnules shortly stalked or sessile, oblong or falcate, 1–3 \times 0.5–1 cm, base acroscopically truncate, basiscopically cuneate, apex acute, margin sharply serrate or pinnatifid, aristate; upper 2 or 3 pairs of pinnae with proximal 1(or 2) pairs of pinnules elongated, other pinnae shortened and linear-lanceolate; axes and veins of ultimate segments with sparse minute brown subulate scales abaxially. Sori terminal on veinlets, 1–6 pairs per ultimate segment, medial between midvein and margin or closer to margin; indusia brown, membranous, and entire.

• Along gullies in broad-leaved forests or by streams on shaded slopes; 400–1800(–2300) m. Chongqing, Guizhou, Hunan, Yunnan, Zhejiang.

This fern differs from its closest affinity *Arachniodes simplicior* in its larger size and additional order of dissection of the lowest pinna; however, its immature fronds are inseparable from the latter.

19. *Arachniodes longipinna* Ching, Bull. Bot. Res., Harbin 6(3): 13. 1986.

长羽复叶耳蕨 *chang yu fu ye er jue*

Arachniodes pseudolongipinna Ching.

Rhizome shortly creeping, stiff, densely scaly; scales blackish brown, linear-lanceolate, ca. 5×0.5 – 1.5 mm, attenuate and hairlike at apex, firmly membranous and spreading. Fronds

approximate, 70–85 cm; stipe stramineous, 30–45 cm, 3–5 mm in diam., base with scales similar to those on rhizome, upward with dark brown subulate and remotely denticulate-based appressed scales; lamina 2- or 3-pinnate, dull greenish when dried, oblong, 40–45 \times 20–25 cm, papery, base cuneate, apex abruptly narrowed and elongated caudate-acuminate as a terminal pinna, rachis scaly as distal portion of stipe; lateral pinnae 4–6 pairs, alternate or lower 1(or 2) pairs opposite, with to 1 cm stalk, obliquely spreading, remote; lowest pinnae deltoid or linear-lanceolate, ca. 23×4 – 8 cm, base broadly cuneate, apex acuminate; primary pinnules ca. 30 pairs, contiguous, shortly stalked, linear-lanceolate, or oblong and subfalcate, ca. 3×0.7 cm, base acroscopically truncate and basiscopically cuneate, apex obtuse or acute, margin pinnatifid or serrate, aristate, sometimes basal pair or only basiscopic one elongated to 8×2 cm and pinnate; secondary pinnules shortly stalked or sessile, oblong and slightly falcate, ca. 6×3 mm; upper pinnae linear-lanceolate, terminal pinna 21–25 \times ca. 5 cm; axes and veins of ultimate segments with minute dark brown, broad-based, and denticulate-margined subulate scales abaxially. Sori small, terminal on veinlets, 6–8 pairs per ultimate pinnule, medial between midvein and margin or closer to midvein; indusia brown, firmly papery, entire or erose.

• Forests; 1000–1100 m. Guangxi (Lingyun).

20. *Arachniodes aristata* (G. Forster) Tindale, New South Wales Natl. Herb. 3(1): 89. 1961.

刺头复叶耳蕨 *ci tou fu ye er jue*

Polypodium aristatum G. Forster, Fl. Ins. Austr. 82. 1786; *Arachniodes carvifolia* (Kunze) Ching; *A. exilis* (Hance) Ching; *A. fengyangshanensis* Ching & C. F. Zhang ex Y. T. Hsieh; *A. lushanensis* Ching; *A. maoshanensis* Ching; *A. michelii* (H. Léveillé) Ching ex Y. T. Hsieh; *Aspidium aristatum* (G. Forster) Swartz; *A. carvifolium* Kunze; *A. exile* Hance; *Byrsopteris aristata* (G. Forster) C. V. Morton; *Dryopteris aristata* (G. Forster) Kuntze; *D. carvifolia* (Kunze) C. Christensen; *D. michelii* H. Léveillé; *Lastrea aristata* (G. Forster) T. Moore; *Nephrodium aristatum* (G. Forster) C. Presl; *Polystichopsis aristata* (G. Forster) Holttum; *Polystichum aristatum* (G. Forster) C. Presl; *P. carvifolium* (Kunze) C. Christensen; *Rumohra aristata* (G. Forster) Ching; *R. carvifolia* (Kunze) Ching.

Rhizome long creeping, 5–8 mm in diam., stiff, densely scaly; scales reddish brown, linear-subulate, ca. 5×1 mm, base remotely fimbriate, apex attenuate or filiform, and firmly membranous. Fronds remote, 40–80 cm; stipe 21–40 cm, 2–3 mm in diam., base with dense scales similar to those on rhizome, upward with appressed filiform scales; lamina 3-pinnate(–pinnatifid), shiny green or brownish when dried, ovate-pentagonal or deltoid-pentagonal, 20–35 \times 14–25 cm, papery or leathery, base cuneate or subtruncate, apex abruptly narrowed and elongated acute, rachis scaly as distal portion of stipe; pinnae (3 or)4–6(–10) pairs, alternate, with 0.5–1.2 cm stalk, obliquely spreading; lowest pinnae deltoid, 12–18 \times 8–12 cm, base broadly cuneate, apex caudate-acuminate; primary pinnules 15–22 pairs, basal basiscopic 1 or 2(–4) and acroscopical 1(–3) elongated (to ca. 12×3 cm and shortly stalked), distally abruptly

shortened and subsessile; secondary pinnules deltoid-oblong, ca. 1.5×0.7 cm, base acroscopically truncate and auriculate, basiscopically cuneate, apex acute, margin serrate to deeply pinnatifid, aristate; upper 1 or 2 pairs of pinnae with at least basal pair of pinnules elongated and pinnatifid to pinnate; remaining pinnae deltoid-lanceolate or linear-lanceolate; axes and veins of ultimate segments with minute brown linear-subulate scales abaxially. Sori terminal on veinlets, 5–8 pairs per ultimate pinnule, medial between midvein and margin; indusia brown, membranous, entire or shortly ciliate. $2n = 82^*$.

Broad-leaved forests, wet ravines along streams, sometimes under cypress forests or other coniferous forests; 100–1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangsu, Jiangxi, Shandong, Taiwan, Zhejiang [India, Japan, Korea, Malaysia, Nepal, Philippines; Australia, Pacific islands].

In China, this fern is distinguished by its long-creeping rhizome with fronds arising at remote intervals and its lamina abruptly narrowed toward apex and acuminate. However, fronds with a gradually acuminate apex, including those of the type specimen, are occasionally found from other countries. Whether it is reasonable to use *Arachniodes exilis* for the Chinese ferns still needs further comparison.

21. *Arachniodes chinensis* (Rosenstock) Ching, Acta Bot. Sin. 10: 257. 1962.

中华复叶耳蕨 zhong hua fu ye er jue

Polystichum amabile (Blume) J. Smith var. *chinense* Rosenstock, Repert. Spec. Nov. Regni Veg. 13: 130. 1914; *Arachniodes abrupta* Ching; *A. australis* Y. T. Hsieh; *A. caudata* Ching; *A. chinensis* var. *cornopteris* (Ching) S. K. Wu & H. He; *A. cornopteris* Ching; *A. costulisora* Ching; *A. cyrtomifolia* Ching; *A. damiaoshanensis* Y. T. Hsieh; *A. falcata* Ching; *A. gijiangensis* Ching; *A. huapingensis* Ching; *A. lanceolata* Y. T. Hsieh; *A. mengziensis* Ching; *A. nanchuanensis* Ching & Z. Y. Liu; *A. nibashanensis* Y. T. Hsieh; *A. semifertilis* Ching; *A. setifera* Ching; *A. simplicior* (Makino) Ohwi var. *major* (Tagawa) Ohwi; *A. yaoshanensis* (Y. C. Wu) Serizawa; *Polystichopsis chinensis* (Rosenstock) Holttum; *Polystichum amabile* var. *yaoshanense* Y. C. Wu; *P. simplicior* (Makino) Tagawa var. *major* Tagawa; *Rumohra chinensis* (Rosenstock) Ching; *R. simplicior* (Makino) Ching var. *major* (Tagawa) H. Itô.

Rhizome shortly creeping, stiff, densely scaly; scales (blackish) brown, linear-lanceolate or subulate, ca. 12×0.5 – 1.5 mm, firmly membranous and spreading. Fronds approximate, 0.4–1.2 m; stipe stramineous, 15–55 cm, 2.5–5(–6) mm in diam., base densely scaly with scales similar to those on rhizome, upward copiously with dark (or coal-black) subulate and remotely denticulate based appressed scales; lamina 2- or 3-pinnate, dark brown or dull green when dried, deltoid-ovate or ovate-oblong, 25 – 65×15 – 35 cm, papery or subleathery, base cordate, rounded-truncate, or broadly cuneate, apex acuminate, attenuate or abruptly narrowed and acuminate, rachis scaly as distal portion of stipe; pinnae 4–8 pairs, alternate or lower 1(or 2) pairs sometimes opposite, with to 2.5 cm stalk, obliquely spreading, remote, contiguous, or imbricate; lowest pinna deltoid-lanceolate, to 22×12 cm, base broadly cuneate, apex acuminate; primary pinnules ca. 17 pairs, with to 0.5 cm stalk,

linear-lanceolate or oblong, gradually shortened, or proximal 1(or 2) pairs especially basiscopical ones elongated (to 12×3.5 cm), base broadly cuneate, apex acuminate; secondary pinnules shortly stalked or sessile, oblong or falcate, ca. 2×1 cm, base acroscopically truncate and auriculate, basiscopically cuneate, apex acute or obtuse, margin serrate or pinnatifid, aristate; upper pinnae gradually reduced; axes and veins of ultimate segments with minute (blackish) brown, broad-based and denticulate-margined, appressed subulate scales abaxially. Sori terminal on veinlets, 1–8 pairs per ultimate segment, medial between midvein and margin or closer to midvein, remote or contiguous when mature; indusia brown, firmly membranous, subentire, ciliate or lacerate on margin. $2n = 82$.

Shaded slopes in dense woods, on wet rocks or ravines, more often in evergreen broad-leaved forests; 200–1700(–2100) m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Indonesia, Japan, Malaysia, Thailand, Vietnam].

This fern morphologically varies greatly in different habitats. Plants under shaded places normally exhibit broader, less-dissected, coarser, and more approximate segments with contiguous mature sori.

22. *Arachniodes jinpingensis* Y. T. Hsieh, Acta Bot. Yunnan. 5: 55. 1983.

金平复叶耳蕨 jin ping fu ye er jue

Arachniodes attenuata Ching; *A. chinensis* (Rosenstock) Ching var. *jinpingensis* (Y. T. Hsieh) S. K. Wu & H. He; *A. hekouensis* Ching; *A. valida* Y. T. Hsieh.

Rhizome shortly creeping, stiff, densely scaly; scales reddish brown, linear-subulate, ca. 8×0.5 – 1.5 mm, firmly membranous. Fronds approximate, 0.7–1 m; stipe stramineous, 30–45 cm, 3–6 mm in diam., base with scales similar to those on rhizome, upward with appressed (blackish) brown subulate and denticulate-based scales; lamina 3-pinnate, dull greenish when dried, ovate-oblong, 45 – 56×24 – 38 cm, (firm) papery, base truncate or hastate, apex abruptly narrowed and elongated acute, rachis scaly as distal portion of stipe; pinnae 6–9 pairs, alternate or lower 1(–5) pairs opposite, with to 2 cm stalk, spreading; lowest pinnae hastate, 19 – 26×12 – 15 cm, base rounded, apex abruptly narrowed and acuminate; primary pinnules ca. 24 pairs, shortly stalked, contiguous, lanceolate or distally slightly falcate, proximal 1(or 2) pairs elongated (12 – 15×2 – 3 cm), base rounded, apex acuminate; secondary pinnules ca. 17 pairs, shortly stalked or sessile, contiguous, oblong, ca. 1.7×0.7 cm, base acroscopically obliquely truncate and auriculate, basiscopically cuneate, apex acute, margin serrate or pinnatifid, aristate; upper 2(or 3) pinnae with proximal pairs of pinnules longer, others gradually reduced and linear-lanceolate; axes and veins of ultimate segments with brown linear-subulate and denticulate-based scales and sometimes with short multicellular hairs along veins abaxially. Sori terminal on veinlets, 5 or 6 pairs per ultimate pinnule, medial between midvein and margin, or closer to midvein; indusia dark brown, firmly membranous, ciliate or erose when immature, fugacious.

• Slopes in broad-leaved forests, thickets on shaded slopes, arid open forests; 800–1500(–2100) m. S Yunnan.

23. *Arachniodes japonica* (Sa. Kurata) Nakaike, Enum. Pterid. Jap., Fil. 188. 1975.

缩羽复叶耳蕨 suo yu fu ye er jue

Arachniodes chinensis (Rosenstock) Ching var. *japonica* Sa. Kurata, J. Geobot. 13: 99. 1965; *A. gradata* Ching; *A. nanqingensis* Ching; *A. reducta* Y. T. Hsieh & Y. P. Wu.

Rhizome shortly creeping, stiff, densely scaly; scales dark or reddish brown, linear-lanceolate or subulate, ca. 10 × 0.5–1.5 mm, firmly membranous and spreading, apex threadlike. Fronds contiguous, 65–95 cm; stipe stramineous, 30–50 cm, 2–3 mm in diam., base with scales similar to those on rhizome, upward with sparse appressed brown subulate and remotely denticulate-based scales; lamina 2- or 3-pinnate, green when dried, ovate-oblong, 35–45 × 24–30 cm, thinly or firmly papery, base rounded, apex acuminate, rachis scaly as distal portion of stipe; pinnae 8–10 pairs, alternate or lower 1(–3) pairs opposite, with to 2 cm stalk, (obliquely) spreading, contiguous or imbricate; lowest pinnae deltoid-lanceolate, ca. 17 × 7 cm, base rounded-cuneate, apex (long) acuminate; primary pinnules ca. 17 pairs, shortly stalked, imbricate, basal 1 pair as long as or shorter than distal pairs (ca. 5 × 1.9 cm), lanceolate, base acroscopically truncate, basiscopically cuneate, apex acuminate; secondary pinnules sessile, contiguous, oblong, apex acute or obtuse, margin dentate, aristate; upper pinnae slightly falcate; axes and veins of ultimate segments with dense minute brown subulate and denticulate-based scales abaxially. Sori terminal on ultimate veinlets, 1–6 pairs per ultimate segment, medial between midvein and margin or closer to midvein; indusia brown, membranous, lacerate or denticulate.

Forests; 300–800 m. Fujian (Nanjing), S Zhejiang [Japan].

24. *Arachniodes speciosa* (D. Don) Ching, Acta Bot. Sin. 10: 259. 1962.

美观复叶耳蕨 mei guan fu ye er jue

Aspidium speciosum D. Don, Prodr. Fl. Nepal. 5. 1825; *Arachniodes austroyunnanensis* Ching; *A. caudata* Ching var. *kansuensis* Ching; *A. emeiensis* Ching; *A. futeshanensis* Y. T. Hsieh; *A. guangtongensis* Ching; *A. ishingensis* Ching & Y. T. Xie; *A. kansuensis* (Ching) Y. T. Hsieh; *A. multifida* Ching; *A. neoaristata* Ching; *A. pseudoaristata* (Tagawa) Ohwi; *A. sichuanensis* Ching; *A. sinoaristata* Ching; *A. sparsa* Ching; *A. sporadosora* (Kunze) Nakaike; *A. subaristata* Ching & Y. T. Hsieh; *A. yandangshanensis* Y. T. Hsieh; *Aspidium affine* Wallich ex Mettenius; *A. cornucervi* D. Don; *A. sporadosorum* Kunze; *Byrsopteris pseudoaristata* (Tagawa) Sa. Kurata; *B. speciosa* (D. Don) C. V. Morton; *Dryopteris speciosa* (D. Don) C. Christensen; *Nephrodium speciosum* (D. Don) Handel-Mazzetti; *Polystichopsis pseudoaristata* (Tagawa) Tagawa; *Polystichum pseudoaristatum* Tagawa; *P. speciosum* (D. Don) J. Smith; *Rumohra aristata* (G. Forster) Ching var. *pseudoaristata* (Tagawa) H. Itô; *R. miyakei* H. Itô; *R. pseudoaristata* (Tagawa) H. Itô; *R. pseudoaristata* var. *magnipinna* H. Itô; *R. speciosa* (D. Don) Ching.

Rhizome shortly creeping, often stiff, densely scaly; scales brown or dark brown, linear-lanceolate or subulate, 8–15 × 0.5–1.5 mm, base slightly dentate or ciliate, apex attenuate, margin

entire, firmly membranous. Fronds approximate, 0.5–1.1 m; stipe (ochraceous or) stramineous, 27–60 cm, 3–4 mm in diam., base with scales similar to those on rhizome, upward sparser and often entire-margined, or ± glabrescent; lamina 3- or 4-pinnate, brownish when dried, ovate-oblong or ovate-deltoid (or ovate-pentagonal), 25–50 × 18–35 cm, papery or subleathery, base rounded or shallowly cordate, apex acuminate or narrowly deltoid, rachis scaly or glabrescent as distal portion of stipe; pinnae ca. 10 pairs, alternate or lower 1(–3) pairs opposite, with to 2 cm stalk, obliquely spreading; lowest pinnae deltoid or obliquely quadrangular, to 25 × 15 cm, base broadly cuneate, apex acuminate; primary pinnules ca. 16 pairs, deltoid-lanceolate or oblong, proximal basiscopical 1(or 2) slightly longer (to 13 × 4.5 cm), base broadly cuneate, apex acuminate; secondary (and tertiary) pinnules shortly stalked or sessile, oblong or rhombic, ca. 1.5 × 0.7 cm, base acroscopically truncate, slightly auriculate, basiscopically cuneate, apex acute or obtuse, margin sharply serrate or pinnatifid, often aristate; upper pinnae often oblong-lanceolate; axes of lamina, pinnae, and pinnules with sparse minute (ovate- or) lanceolate apical threadlike scales abaxially. Sori terminal (or subdorsal) on veinlets, 1–5 pairs per ultimate segment, medial between midvein and margin; indusia brown, membranous, entire, and fugacious. $2n = 82^*$.

By streams in forests, thickets, under shrubs, sometimes on shaded wet moss-covered rocks in valleys; below 100–1900 m. Anhui, Chongqing, Fujian, SE Gansu, Guangxi, Guizhou, Hainan, W Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India (Sikkim), Japan, Nepal, New Guinea, Thailand, Vietnam].

According to Fraser-Jenkins, the correct name of this fern should be *Arachniodes cornucervi* (D. Don) Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 323. 2008) and the name adopted here is a misapplication and should stand for the group of ferns for which we use the name *A. conifolia*, the following species. Without seeing the lectotype chosen by Fraser-Jenkins, we cannot determine if his interpretation of D. Don's name is better than Ching's.

This is a rather variable fern in frond size, lamina shape, and margin of ultimate segments in different habitats; it also shows to some extent morphological differences among fertile and sterile fronds or pinnae of the same frond. The sterile frond or pinnae often have a wider lamina or pinnules and longer awns along the ultimate segments.

25. *Arachniodes conifolia* (T. Moore) Ching, Acta Bot. Sin. 10: 257. 1962.

细裂复叶耳蕨 xi lie fu ye er jue

Lastrea conifolia T. Moore, Index Fil. 88. 1857, based on *Aspidium conifolium* Wallich ex Kunze, Linnaea 24: 293. 1851, not C. Presl (1822); *Arachniodes foeniculacea* Ching; *Byrsopteris conifolia* (T. Moore) C. V. Morton; *Rumohra wallichii* Ching.

Rhizome shortly creeping, stiff, apex densely scaly; scales blackish brown, linear-subulate, to 9 × 1 mm, firmly membranous, apex attenuate or hairlike. Fronds approximate, 0.8–1.2 m; stipe stramineous, 45–65 cm, 3–6 mm in diam., lower parts densely scaly with scales similar to those on rhizome, upward diminishing to glabrescent; lamina 4(or 5)-pinnate, yellowish green when dried, oblong-ovate, 35–60 × 25–40 cm, thinly papery, base rounded or slightly cordate, apex acuminate, rachis ± glabrescent; pinnae 10–15 pairs, alternate or lowest pair op-

posite, with to 2.5 cm stalk, obliquely spreading; lowest pinnae deltoid-lanceolate, 30–40 × 12–17 cm, base broadly cuneate, apex acuminate; primary pinnules 12–18 pairs, with to 1.2 cm stalk, obliquely spreading, basal basicopic one broadly lanceolate (to 14 × 4 cm), base cuneate, apex acuminate; secondary pinnules 10–12 pairs, shortly stalked, deltoid-lanceolate, proximal ones ca. 3.5 × 1.5 cm, base cuneate, apex acute or obtuse; tertiary (and quaternary) pinnules sessile, oblong, 7–10 × 3–5 mm, base obliquely cuneate with acroscopic side wider, apex obtuse, margin sharply serrate or pinnatifid, weakly mucronate; upper pinnae gradually reduced; axes and veins of ultimate segments with minute scattered darkish hairlike scales abaxially. Sori small, terminal on veinlets, 1–3 pairs per ultimate segment, medial between midvein and margin; indusia brown, membranous, entire, and fugacious.

Shaded or wet places along streams, in woods or bamboos, rarely under subalpine *Abies* forests; (900–)1100–2600(–2900) m. Chongqing, Guangxi, Guizhou, Sichuan, Yunnan [Bhutan, Nepal].

26. *Arachniodes festina* (Hance) Ching, Acta Bot. Sin. 10: 257. 1962.

华南复叶耳蕨 hua nan fu ye er jue

Aspidium festinum Hance, J. Bot. 21: 269. 1883; *Acromohra dissecta* Ching & Y. T. Hsieh; *Arachniodes erythrosora* Ching; *Dryopteris festina* (Hance) C. Christensen; *Rumohra festina* (Hance) Ching.

Rhizome shortly creeping or ascending, stiff, apex moderately scaly; scales dark or reddish brown, lanceolate, 5–9 × 1.5–2.5 mm, thinly papery, apex hairlike. Fronds approximate or caespitose, 0.7–1.2 m; stipe stramineous, 30–55 cm, 3–5 mm in diam., base scaly, upward glabrescent; lamina 4-pinnate, dark green when dried, ovate-deltoid or ovate-oblong, 30–65 × 18–30 cm, herbaceous, base rounded or slightly cordate, apex acuminate, rachis glabrescent; pinnae 5–11 pairs, alternate, with to 2 cm stalk, obliquely spreading, contiguous; lowest pinnae deltoid, 14–25 × 6–12 cm, base broadly cuneate, apex acuminate; primary pinnules 12–20 pairs, shortly stalked, basal basicopic one larger, oblong-lanceolate, 6–14 × 2–5 cm, base broadly cuneate, apex acuminate; secondary pinnules 10–16 pairs, proximal ones shortly stalked, deltoid or oblong-ovate (1.2–3 × 0.8–1.5 cm), base acroscopically rounded-truncate, basicopically cuneate, apex acute; tertiary pinnules 3 or 4 pairs, sessile, ovate-deltoid, 5–12 × ca. 4 mm, base cuneate, apex obtuse, margin coarsely 3–5-dentate, teeth acute or blunt, mucronate tip poorly developed; upper pinnae gradually reduced; axes and veins of ultimate segments with a few scattered minute brown hairlike scales abaxially. Sori small, terminal (or subdorsal) on veinlets, 2–4(or 5) pairs per ultimate segment, medial between midvein and margin; indusia brown or reddish brown, thickly membranous, and entire.

• Wet slopes by streams, dense woods or thickets at roadsides; 500–1200(–2000) m. Guangdong, Guangxi, Guizhou, Jiangxi, Sichuan, Taiwan, Yunnan.

This fern is the closest ally of *Arachniodes standishii* (T. Moore) Ohwi, which is distributed in Japan and Korea.

27. *Arachniodes nigrospinosa* (Ching) Ching, Acta Bot. Sin. 10: 258. 1962.

黑鳞复叶耳蕨 hei lin fu ye er jue

Polystichum nigrospinum Ching, Bull. Fan Mem. Inst. Biol. 2: 191. 1931; *Rumohra nigrospinosa* (Ching) Ching.

Rhizome shortly creeping, stiff, apex densely scaly; scales coal-black, broadly lanceolate or lanceolate, to 12 × 1–2.5 mm, firm, thick, apex attenuate and hairlike. Fronds approximate, 0.8–1.2 m; stipe dull amber, 45–65 cm, 3–6(–8) mm in diam., base densely scaly as rhizome, upward with similar but smaller blackened scales; lamina 4-pinnate, dark green when dried, oblong-ovate, 35–55 × 28–32 cm, thinly herbaceous, base cuneate or rounded, apex acuminate, rachis scaly as distal portion of stipe; pinnae ca. 15 pairs, stalked, alternate, obliquely spreading, contiguous; lowest pinnae deltoid-lanceolate, to 25 × 15 cm, base broadly cuneate, apex prolonged-acuminate; primary pinnules ca. 15 pairs, stalked, lanceolate or oblong, basal basicopic ones larger (to 14 × 4.5 cm), base cuneate, apex acuminate; secondary pinnules shortly stalked, ovate-oblong, to 3 × 1.5 cm, base cuneate, apex obtuse; tertiary pinnules ovate-oblong or oblong-rhombic, 8–10 × 5–6 mm, acroscopic base wider with poorly developed auriculate tip, basicopic base cuneate, apex obtuse or acute, margin coarsely serrate or pinnatifid, lobes sharpened at apex, margins with 1(or 2) pairs of short teeth with poorly developed mucronate tip; upper pinnae gradually reduced; axes and veins of ultimate segments with a few minute blackish brown subulate scales abaxially. Sori small, terminal on veinlets, 1–3 pairs per ultimate pinnule, medial between midvein and margin; indusia dark brown, papery, entire.

• In ravines, on shaded wet rocks, forests; 500–1500 m. Guangdong, Guangxi, Guizhou, Taiwan.

28. *Arachniodes amabilis* (Blume) Tindale, Contr. New South Wales Natl. Herb. 3(1): 90. 1961.

斜方复叶耳蕨 xie fang fu ye er jue

Aspidium amabile Blume, Enum. Pl. Javae. 2: 165. 1828; *Arachniodes amabilis* var. *fimbriata* K. Iwatsuki; *A. amabilis* var. *yakusimensis* (H. Itô) Ohwi; *A. rhomboidea* (Schott) Ching; *A. rhomboidea* var. *yakusimensis* (H. Itô) W. C. Shieh; *A. yakusimensis* (H. Itô) Nakaike; *Aspidium controversum* Hance; *A. rhomboideum* (Schott) Wallich ex Mettenius; *Byrsopteris amabilis* (Blume) C. V. Morton; *Dryopteris amabilis* (Blume) Kuntze; *Lastrea amabilis* (Blume) T. Moore; *Nephrodium amabile* (Blume) Handel-Mazzetti; *Polystichopsis amabilis* (Blume) Tagawa; *Polystichum amabile* (Blume) J. Smith; *P. controversum* (Hance) Ching; *Rumohra amabilis* (Blume) Ching; *R. amabilis* var. *yakusimensis* H. Itô.

Rhizome creeping, succulent at growing apex, 0.8–1.2 cm in diam., moderately scaly; scales pale brown, lanceolate or linear-lanceolate, 7–9 × 2–4 mm, thin and soft. Fronds remote, 0.4–1.1 m; stipe stramineous, 20–55 cm, 3–6 mm in diam., base scaly as rhizome, upward scales diminishing to glabrescent; lamina 2- or 3-pinnate, brownish green when dried, oblong-ovate, 20–60 × 15–40 cm, relatively soft, papery, base cuneate, cordate, or hastate, apex abruptly caudate and forming a conform terminal pinna, rachis with sparse linear scales or glabres-

cent; lateral pinnae (1–)4–8 pairs, alternate, with 1–1.5 cm stalk, obliquely spreading; lowest ones deltoid-lanceolate, 15–25 × 5–9 cm, base rounded-cuneate, apex acuminate; primary pinnules 10–25 pairs, shortly stalked, proximal basiscopic 1 or 2(or 3) elongated (or not), basal acroscopic one occasionally also longer; (simple primary pinnules and) secondary pinnules 5–15 pairs, rhombic-oblong, 0.8–2.2 × 0.5–1 cm, base acroscopically truncate, basiscopically cuneate, apex acute and aristate, margin especially acroscopic side sharply serrate, aristate; upper 1 or 2 pairs of pinnae sometimes with proximal 1(or 2) pinnules longer, other pinnae linear-lanceolate; glabrescent on both surfaces or axes and veins sparsely with brown linear minute scales abaxially. Sori terminal on veinlets, closer to margin than to midvein, 1–7 pairs per ultimate segment; indusia brown, membranous, and ciliate. $2n = 82^*$.

Along streams and in gullies in forests or bamboos, also in thickets or under shrubs at forest margins, or sometimes on shaded wet rocks or cliffs; below 100–2100 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [S India, Indonesia, Japan, Korea, Nepal, Philippines, Sri Lanka].

29. *Arachniodes hekiana* Sa. Kurata, J. Geobot. 13: 99. 1965.

假斜方复叶耳蕨 *jia xie fang fu ye er jue*

Arachniodes caudifolia Ching & Y. T. Hsieh; *A. rhomboidea* (Schott) Ching var. *sinica* Ching; *A. tiendongensis* Ching & C. F. Zhang.

Rhizome creeping, succulent at growing apex, 0.8–1.3 cm in diam., moderately scaly; scales pale brown, ovate-lanceolate or linear-lanceolate, 3–6(–8) × 0.5–2 mm, thin and soft. Fronds remote, 0.8–1.1 m; stipe ochraceous or amber, 35–50 cm, 3–5 mm in diam., base scaly as rhizome, upward scales spreading, gradually diminishing, scales on distal portion becoming subulate with curved apex; lamina 2(or 3)-pinnate-pinnatifid, yellowish brown when dried, ovate-oblong, 45–55 × 30–40 cm, papery, base cuneate, apex abruptly narrowed and caudate, with a conform terminal pinna, rachis scaly as distal portion of stipe or glabrescent; lateral pinnae (3–)5–8 pairs, alternate, with to 2 cm stalk, obliquely spreading; lowest pinnae linear-lanceolate (or hastate), to 25 × 7 cm, base broadly cuneate, apex acuminate with a caudate tip; (primary) pinnules to 25 pairs, spreading, shortly stalked, rhombic-oblong, to 4 × 1.2 cm, base acroscopically truncate and auriculate, basiscopically cuneate, apex acute or obtuse, aristate, margin pinnatifid and often with basal acroscopic lobe free, lobe apex and its 1–3 marginal teeth aristate, basal basiscopic (primary) pinnule occasionally elongated and pinnate; upper pinnae gradually reduced; terminal pinnae to 20 × 4 cm; axes and veins with sparse minute brown threadlike scales abaxially. Sori terminal on veinlets, 1–7 pairs per ultimate segment, medial between midvein and margin; indusia dark brown, firmly membranous, and entire. $2n = 82$.

Slopes by streamlets, in forests or bamboos, also in thickets along open places, sometimes on shaded wet rocks or in ravines; below 100–1800 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Sichuan, Yunnan, Zhejiang [Japan].

30. *Arachniodes similis* Ching, Bull. Bot. Res., Harbin 6(3): 19. 1986.

相似复叶耳蕨 *xiang si fu ye er jue*

Rhizome creeping, succulent at growing apex, moderately scaly; scales pale brown, linear-lanceolate, thin and soft. Fronds remote, 90–100 cm; stipe ochraceous, 45–50 cm, ca. 5 mm in diam., base scaly as rhizome, upward glabrescent, occasionally with a few pale brown curved threadlike scales; lamina 2-pinnate, dull green when dried, oblong, 50–60 × 20–25 cm, thickly papery, base cuneate, apex abruptly narrowed, with a conform terminal pinna, rachis glabrescent; pinnae 7 or 8 pairs, with 1–1.5 cm stalk, alternate, strongly ascending (forming an angle of less than 30 degrees with rachis); lower 3 or 4 pairs of pinnae similar in shape and size, lanceolate, ca. 19 × 3.5 cm, base almost equally sided, broadly cuneate, apex acuminate; pinnules ca. 22 pairs, shortly stalked, spreading, subimbricate, broadly rhombic, ca. 2 × 1 cm, base acroscopically slightly auriculate, basiscopically truncate, apex acute, margin serrate with mucronate teeth; upper pinnae slightly shorter, terminal pinna ca. 19 × 4 cm; axes, pinna, and pinnules (and veins as well) with sparse brown threadlike scales abaxially. Sori large, terminal on veinlets, 5 or 6 pairs per ultimate segment, medial between midvein and margin; indusia brown, firmly membranous, hairy on dorsal surface, margin entire.

• Forested slopes; (500–)700–800 m. Guangdong (Heyuan), SW Zhejiang.

31. *Arachniodes assamica* (Kuhn) Ohwi, J. Jap. Bot. 37: 76. 1962.

西南复叶耳蕨 *xi nan fu ye er jue*

Aspidium assamicum Kuhn, Linnaea 36: 108. 1869; *Arachniodes basipinnata* (Ching) Ching & Y. T. Hsieh; *A. leuconeura* Ching; *A. suijiangensis* Ching & Y. T. Hsieh; *A. xinpingsensis* Ching; *A. yaomashanensis* Ching; *Aspidium aristatum* (G. Forster) Swartz var. *assamicum* (Kuhn) Baker; *Byrsopteris assamica* (Kuhn) C. V. Morton; *Dryopteris assamica* (Kuhn) Rosenstock; *D. speciosa* (D. Don) C. Christensen var. *assamica* (Kuhn) C. Christensen; *Polystichopsis assamica* (Kuhn) Tagawa; *Polystichum assamicum* (Kuhn) Ching; *Rumohra assamica* (Kuhn) Ching; *R. assamica* f. *basipinnata* Ching.

Rhizome creeping, succulent at growing apex, 1.5–2 cm in diam., moderately scaly; scales pale brown, broadly lanceolate or ovate-subulate, 5–12 × 1.5–3.5 mm, thin and soft. Fronds approximate or remote, 0.5–1.2 m; stipe stramineous, 25–65 cm, 3–5 mm in diam., bases scaly as rhizome, upward scales diminishing to glabrescent; lamina 2-pinnate-pinnatifid, pale green when dried, ovate-deltoid, 25–60 × 20–50 cm, papery, base broadly cuneate, apex acuminate with a conform or nearly conform terminal pinna, rachis glabrescent; pinnae (1 or)2–4(–6) pairs, alternate, with 1–3 cm stalk, 5–10 cm apart, obliquely spreading; lowest pinna deltoid-lanceolate, 25–30 × 10–14 cm, base broadly cuneate, apex acuminate; primary pinnules 8–12 pairs, shortly stalked, spreading or slightly ascending, rhombic-lanceolate, occasionally falcate, 5–10 × 1.5–3.5 cm, base unequally cuneate, apex acuminate, margin pinnatifid; basal basiscopic primary pinnule sometimes elongated and pinnate; lobes with apex acute or acuminate, margin serrate with mucronate teeth; upper pinnae broadly lanceolate. Sori large, terminal on veinlets, 5–10 pairs per ultimate pinnule,

medial or closer to midvein; indusia brown, firmly membranous, entire.

Along streams in dense woods, bamboos, or shrubs; (700–)1200–2500 m. Chongqing, Guangxi, Guizhou, Sichuan, Yunnan [NE India, Myanmar, Nepal, N Thailand, N Vietnam].

Rumohra assamica f. *simplicipinnata* Ching (Sinensia 5(1–2): 49. 1934 [*“simplici-pinnata”*]), described from China, may belong here.

32. *Arachniodes yoshinagae* (Makino) Ohwi, Acta Phytotax. Sin. 9: 383. 1964.

东洋复叶耳蕨 *dong yang fu ye er jue*

Aspidium yoshinagae Makino, Bot. Mag. (Tokyo) 13: 57. 1899; *Phanerophlebiopsis bipinnata* S. F. Wu; *Polystichum yoshinagae* (Makino) Makino.

Rhizome creeping, succulent at growing apex, 1–2 cm in diam., moderately scaly; scales pale brown, ovate-lanceolate, 5–8 × 1.5–3.5 cm, membranous and soft. Fronds remote or approximate, 60–95 cm; stipe stramineous, 25–45 cm, 3–5 mm in diam., base scaly as rhizome, upward scales diminishing to glabrescent; lamina (1 or)2-pinnate, yellowish green when dried, ovate-oblong or oblong-lanceolate, 35–60 × 15–25 cm, firmly papery, base cuneate, apex acuminate, rachis glabrescent; separate pinnae 10–13 pairs, alternate, with to 2 cm stalk, obliquely spreading, remote, lower 1 or 2(–4) pairs pinnate or only deeply pinnatifid, lowest pinna lanceolate and ca. 18 × 4 cm, base obliquely cuneate, apex acuminate; (primary) pinnules and ultimate segments oblong, 2–3 × 1–1.2 cm, basal pair usually smaller, base cuneate with acroscopic side slightly broader, basiscopically decurrent, apex acute, margin coarsely serrate with mucronate to aristate teeth; upper pinnae gradually reduced and sometimes slightly falcate; axes and veins with a few minute dark brown hairlike scales abaxially. Sori large, terminal on veinlets, 2–6 pairs per ultimate segment, medial between midvein and margin; indusia dark brown, firmly membranous, and entire.

Along streams in forests; 700–1200 m. Chongqing (Simian Shan), Hunan (Sangzhi, Yizhang) [Japan].

This fern differs from *Arachniodes assamica* in having a lamina longer than the stipe, oblong in outline, and lacking conform terminal pinna, and in having lateral pinnae linear-lanceolate with ultimate segments decurrent and basal acroscopic side slightly auriculate.

33. *Arachniodes pseudoassamica* Ching, Bull. Bot. Res., Harbin 6(3): 16. 1986 [*“pseudo-assamica”*].

假西南复叶耳蕨 *jia xi nan fu ye er jue*

Rhizome creeping, succulent at growing apex, moderately scaly; scales pale brown, broadly lanceolate, thin and soft. Fronds remote or approximate, to 1 m; stipe ochraceous, 40–60 cm, 2.5–3 mm in diam., base scaly as rhizome, upward glabrescent; lamina 2-pinnate, brownish green when dried, ovate-oblong, ca. 40 × 25 cm, papery, glabrescent on both surfaces, base broadly cuneate, apex abruptly narrowed and forming an acuminate subconform terminal pinna, rachis glabrescent; lateral pinnae ca. 4 pairs, alternate or lower 1 or 2 pairs opposite, with to 2 cm stalk, obliquely spreading, lanceolate; lowest pinnae to 20 × 6–7 cm, base rounded-cuneate, apex acuminate; (primary)

pinnules ca. 22 pairs, proximal ones shortly stalked, spreading, rhombic-oblong, to 4 × 1.3 cm, base acroscopically truncate and auriculate, basiscopically cuneate, apex obtuse or acute, margin coarsely serrate or pinnatifid, lobes or teeth sharply tipped or mucronate; terminal pinna to 20 × 10 cm, with ca. 12 spreading and acroscopically pinnatifid pinnules. Sori small, terminal on veinlets, 1–4 pairs per ultimate segment, medial between midvein and margin; indusia brown, firmly membranous, and entire.

• Dense broad-leaved forests; (500–)1000–1300 m. Yunnan (Xishuangbanna).

This species is intermediate between *Arachniodes assamica* and *A. hekiana* in appearance, but it differs from the former by the caudate terminal pinna, and from the latter by the much broader pinnae and firmer texture.

34. *Arachniodes wulingshanensis* S. F. Wu, Keys Vasc. Pl. Wuling Mts. 572. 1995.

武陵山复叶耳蕨 *wu ling shan fu ye er jue*

Rhizome creeping, succulent at growing apex, ca. 1.5 cm in diam., densely scaly; scales pale brown, broadly lanceolate, 3–5 × 1.5–2 mm, thin and soft. Fronds approximate, to 80 cm; stipe stramineous, to 35 cm, ca. 4 mm in diam., base scaly as rhizome, upward scales diminishing to glabrescent; lamina 2-pinnate, yellowish green when dried, ovate-oblong, ca. 45 × 20 cm, thinly papery, base cuneate, abruptly narrowed, apex forming an acuminate terminal pinna much broader than lateral ones, rachis glabrescent; lateral pinnae ca. 6 pairs, basal 2 pairs opposite, others alternate, with 0.5–1.7 cm stalk, obliquely spreading; lowest pinnae lanceolate, to 18 × 4.5 cm, base rounded-cuneate, apex acuminate; (primary) pinnules ca. 15 pairs, spreading, with ca. 1.5 cm stalk, obliquely rhombic, slightly falcate, 2–2.5 × ca. 1 cm, basal pair slightly smaller, base acroscopically truncate and auriculate, basiscopically cuneate and slightly decurrent, apex acute or acuminate, margin serrate with mucronate teeth; upper pinnae similar in appearance, terminal pinna with shallowly pinnatifid pinnules; axes of pinna (and veins as well) occasionally with a few minute brown linear scales abaxially. Sori terminal on veinlets, 6–8 pairs per ultimate pinnule, medial between midvein and margin; indusia brown, firmly membranous, and entire.

• Forests; 200–400 m. Hunan (Yongshun).

35. *Arachniodes hunanensis* Ching, Bull. Bot. Res., Harbin 6(3): 10. 1986.

湖南复叶耳蕨 *hu nan fu ye er jue*

Rhizome creeping, succulent at growing apex, ca. 3 cm in diam., densely scaly; scales reddish brown, linear-lanceolate or ovate-lanceolate, ca. 8 × 0.5–2 mm, thin and soft. Fronds remote, 0.7–1.1 cm; stipe stramineous, 40–60 cm, ca. 4 mm in diam., base scaly as rhizome, upward glabrescent; lamina 2(or)3-pinnate-pinnatifid, lustrous pale green when dried, elliptic or ovate-oblong, 35–50 × 20–25 cm, herbaceous, base cuneate, apex abruptly narrowed and forming an acute terminal pinna, rachis glabrescent; lateral pinnae 4–6(–8) pairs, alternate, with to 1.5 cm stalk, obliquely spreading; lowest pinnae (linear-lanceolate or) lanceolate, 15–18 × 4–4.5 cm, base broadly cuneate,

apex acuminate; primary pinnules 15–18 pairs, shortly stalked, spreading, oblong-rhombic, ca. 3.2×1.5 cm, base acroscopically truncate and auriculate, basiscopically cuneate, apex acute, margin deeply pinnatifid (with proximal 1 or 2 pairs of lobes free), basal basiscopic primary pinnules occasionally longer and pinnate; ultimate segments with apex acute, margin serrate with cuspidate (or mucronate) teeth; axes and veins of ultimate segments with scattered minute brown threadlike scales abaxially. Sori large, terminal on veinlets, 1–3(–7) pairs per ultimate segment, closer to margin than to midvein; indusia dark brown, firmly membranous, and entire (or ciliate).

- By streams in dense forests in valleys; ca. 800 m. Hunan (Daoxian, Lingxian).

Arachniodes hunanensis is similar in frond size and shape to *A. ×subamabilis* Sa. Kurata, which has been accepted as the name of this species by some authors. However, with limited specimens and without cytological evidence, it cannot be sure whether this is conspecific with the Japanese fern.

36. *Arachniodes sinorhomboides* Ching, Bull. Bot. Res., Harbin 6(3): 55. 1986 [*“sino-rhomboides”*].

中华斜方复叶耳蕨 zhong hua xie fang fu ye er jue

Arachniodes hupingshanensis S. F. Wu.

Rhizome creeping, succulent at growing apex, 1.5–2.2 cm in diam., densely scaly; scales reddish brown, ovate-lanceolate or lanceolate, to $8 \times 1-3$ mm, apically attenuate, thin and soft. Fronds remote, 0.6–1.1 m; stipe pale stramineous, 30–60 cm, ca. 5 mm in diam., base scaly as rhizome, upward scales diminishing to glabrescent; lamina 3-pinnate, yellowish green when dried, broadly oblong or lanceolate-oblong, $30-50 \times 20-30$ cm, papery, base broadly cuneate or cordate, apex abruptly narrowed and long acuminate, rachis glabrescent; lateral pinnae 6–8 pairs, alternate or lower 1(or 2) pairs opposite, with to 2 cm stalk, obliquely spreading; lowest pinna narrowly deltoid, to 20×12 cm, base broadly cuneate, apex attenuate; primary pinnules ca. 15 pairs, shortly stalked, lanceolate or distally oblong, (proximal basiscopic 1(or 2) elongated, to 9×4 cm), base broadly cuneate, apex acuminate; secondary pinnules rhombic, shortly stalked or sessile, to 1.5×0.8 cm, base acroscopically truncate and auriculate, basiscopically cuneate or straight, apex acute, margin sharply serrate or pinnatifid with mucronate teeth; upper 2(or 3) pairs of pinnae with a slightly longer basal pair of primary pinnules, remaining pinnae linear-lanceolate and gradually reduced; axes and veins of ultimate segments with sparse minute brown threadlike scales abaxially. Sori terminal on veinlets, 1–4 pairs per ultimate segment, intramarginal; indusia brown, papery, entire or shortly ciliate.

- Along streams in mixed forests, forest margins; 600–1000 m. Guizhou (Guiyang), Hunan (Shimen, Lingxian), Sichuan (Emei Shan).

In appearance, this species looks like some specimens of *Arachniodes ×subamabilis* Sa. Kurata from Japan. But the Japanese plant was proved to be a hybrid between *A. amabilis* and *A. nipponica*, while this Chinese fern is intermediate between *A. amabilis* and *A. simulans*.

37. *Arachniodes nipponica* (Rosenstock) Ohwi, J. Jap. Bot. 37: 76. 1962.

贵州复叶耳蕨 gui zhou fu ye er jue

Polystichum nipponicum Rosenstock, Repert. Spec. Nov. Regni Veg. 13: 190. 1914; *Arachniodes anshunensis* Ching & Y. T. Hsieh; *A. gongshanensis* Ching & Y. T. Hsieh; *Byrsopteris nipponica* (Rosenstock) Sa. Kurata; *Polystichopsis nipponica* (Rosenstock) Tagawa; *Rumohra nipponica* (Rosenstock) Ching.

Rhizome creeping, succulent at growing apex, 1–2.5 cm in diam., densely scaly; scales pale or reddish brown, ovate-lanceolate or lanceolate, to $7 \times 1-2.5$ mm, apically attenuate, thin and soft. Fronds remote or proximate, 0.7–1.5 m; stipe ochraceous or amber, 36–75 cm, 4–8 mm in diam., base scaly as rhizome, upward scales diminishing to glabrescent; lamina 3(or 4)-pinnate, lustrous yellowish green when dried, oblong-lanceolate or ovate-oblong, $40-75 \times 25-45$ cm, often thickly papery and flexible, base rounded-cuneate, apex acuminate or slightly attenuate, rachis glabrescent; pinnae 6–8(–10) pairs, alternate or lowest 1 or 2 pairs opposite, with to 2 cm stalk, obliquely spreading; lowest pinnae deltoid-lanceolate, $18-35 \times$ ca. 10 cm, base rounded-cuneate, apex acuminate; primary pinnules 12–17 pairs, proximal ones with to 8 mm stalk, lanceolate, (basal basiscopic one $6-8 \times 2-3$ cm), base rounded-cuneate, apex acuminate, larger fronds with proximal 1–3 pairs of primary pinnules 2-pinnate; secondary pinnules shortly stalked or sessile, oblong, ca. 1.5×0.7 cm, base cuneate, apex acute, margin sharply dentate or pinnatifid, with mucronate teeth; upper pinnae gradually reduced; axes and veins of ultimate segments with brown, appressed, articulate hairs, and with a few minute brown ovate-based or linear scales abaxially. Sori terminal on veinlets, 2 or 3 pairs per ultimate segment, medial between midvein and margin; indusia pale brown, membranous, and entire.

Slopes by streams in broad-leaved forests or in shaded valleys, sometimes in coniferous forests or bamboos; 700–2300(–2800) m. Chongqing, Guangdong, Guizhou, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan].

Specimens from Guizhou and Yunnan are much larger in size than Japanese ones, and plants distributed in Yunnan occur at ca. 1000 meters higher in elevation.

38. *Arachniodes ailaoshanensis* Ching, Bull. Bot. Res., Harbin 6(3): 60. 1986.

哀牢山复叶耳蕨 ai lao shan fu ye er jue

Arachniodes jingdongensis Ching.

Rhizome creeping, succulent at growing apex, 2.5–3 cm in diam., densely scaly; scales pale brown, ovate-lanceolate, ca. 8×3 mm. Fronds remote, 0.9–1.2 m; stipe stramineous or purplish below, 50–55 cm, 3–5 mm in diam., base scaly as rhizome but fugacious, upward glabrescent; lamina 3-pinnate, pale greenish when dried, ovate-deltoid, $45-68 \times 30-45$ cm, subleathery and firm, base rounded-cuneate, apex acuminate, rachis glabrescent; pinnae 10–15 pairs, alternate, with 1.5–2 cm stalk, obliquely spreading, approximate or imbricate; lowest pair ovate-oblong, $29-35 \times 14-15$ cm, base cuneate, apex acuminate; primary pinnules 15–20 pairs, with ca. 1 cm stalk, obliquely spreading, contiguous, lanceolate, (proximal pairs $12-13 \times 4-4.5$ cm), base rounded-cuneate, apex acuminate;

secondary pinnules 12–14 pairs, subsessile, spreading, contiguous, obliquely rhombic, 2–2.5 × ca. 1 cm, base acroscopically slightly auriculate, apex acute, acroscopic margin pinnatifid; lobes obtuse, apex mucronate, margin often serrate with mucronate teeth; upper pinnae gradually reduced; axes of lamina, pinna, and pinnule (and veins as well) sometimes retaining a few minute dark brown subulate scales abaxially. Sori large, terminal on veinlets, 4–7 pairs per ultimate pinnule, medial between midvein and margin; indusia dark brown, firmly membranous, and entire.

- Evergreen broad-leaved forests; 2400–2500 m. Yunnan (Ailao Shan).

This fern is very closely related to *Arachniodes nipponica*, and it also is similar to *A. tomitae* Sa. Kurata in appearance.

39. *Arachniodes simulans* (Ching) Ching, Acta Bot. Sin. 10: 259. 1962.

华西复叶耳蕨 hua xi fu ye er jue

Rumohra simulans Ching, Sinensia 5: 54. 1934; *Arachniodes cantilenae* Sa. Kurata; *A. centrochinensis* Ching; *A. chingii* Y. T. Hsieh; *A. dayaoensis* Y. T. Hsieh; *A. decomposita* Ching; *A. elevatas* Ching; *A. gizushanensis* Ching; *A. guanxianensis* Ching; *A. jiangxiensis* Ching; *A. jinfoshanensis* Ching; *A. lushuiensis* Y. T. Hsieh; *A. pianmaensis* Ching; *A. yinjiangensis* Ching; *A. yunnanensis* Ching.

Rhizome creeping, succulent at growing apex, 1–3 cm in diam., densely scaly; scales pale brown, ovate-lanceolate or lanceolate, to 8 × 1–2 mm, apically attenuate or hairlike, thin and soft. Fronds remote or approximate, 0.7–1.2(–1.4) m; stipe stramineous, 38–60 cm, 4–6 mm in diam., base and lower part densely scaly as rhizome, upward scales diminishing to glabrescent; lamina (3 or 4)(or 5)-pinnate, dull pale green when dried, ovate-deltoid, 32–60 × 25–40 cm, firmly herbaceous or papery, base rounded or cordate, apex acuminate (or attenuate), rachis glabrescent or sparsely with linear scales; pinnae ca. 10 pairs, alternate, with to 3 cm stalk, obliquely spreading; lowest pinnae deltoid-lanceolate, to 35 × 18 cm, base rounded-cuneate, apex acuminate; primary pinnules ca. 16 pairs, with to 1.2 cm stalk, lanceolate, (basal basiscopic ones slightly longer, to 14 × 4 cm), base broadly cuneate, apex acuminate; secondary pinnules with to 0.5 cm stalk, deltoid-oblong or distally oblong-lanceolate, base cuneate, apex acuminate or obtuse; tertiary (and quaternary) pinnules shortly stalked or sessile, ovate-oblong or rhombic, ca. 1 × 0.5 cm, base acroscopically cuneate and slightly auriculate, basiscopic ones cuneate, apex acute or obtuse,

margin sharply serrate often with aristate teeth; upper pinnae gradually reduced; axes and veins of ultimate segments with sparse minute brown lanceolate and ± appressed linear scales abaxially. Sori terminal on veinlets, 1–4(–6) pairs per ultimate segment, submarginal; indusia brown, membranous, ciliate or erose, often fugacious.

Slopes in forests or bamboos, on shaded wet rocks, valleys, thickets or under shrubs by streams; (500–)900–2300(–2800) m. Anhui, Chongqing, SE Gansu, Guizhou, Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Yunnan [Bhutan, India, Japan].

40. *Arachniodes henryi* (Christ) Ching, Acta Bot. Sin. 10: 258. 1962.

云南复叶耳蕨 yun nan fu ye er jue

Polystichum henryi Christ, Notul. Syst. (Paris) 1: 36. 1909; *Byrsopteris henryi* (Christ) C. V. Morton; *Dryopteris henryi* (Christ) C. Christensen; *Rumohra henryi* (Christ) Ching.

Rhizome creeping, succulent at growing apex, 3–5 cm in diam., moderately scaly; scales pale brown, ovate-lanceolate or lanceolate, 5–8 × 1–3 mm, apically attenuate or hairlike, margin entire (or remotely denticulate), thin and soft. Fronds remote or approximate, 0.8–1.2(–1.5) m; stipe stramineous, 45–65 cm, 4–6 mm in diam., base scaly as rhizome, upward diminishing to glabrescent; lamina 4(or 5)-pinnate-pinnatifid, shiny green when dried, ovate-deltoid or ovate-oblong, 40–60 × 30–45 cm, thinly herbaceous, base rounded, apex acuminate, rachis glabrescent; stalked pinnae ca. 15 pairs, alternate, (obliquely) spreading; lowest pinnae ovate-deltoid, to 38 × 25 cm, base rounded-cuneate, apex acuminate; primary pinnules ca. 20 pairs, deltoid-lanceolate, basal basiscopic ones slightly elongated, to 18 × 8 cm, base rounded-cuneate, apex acuminate; secondary pinnules to 15 pairs, ovate, to 5 × 3 cm, base rounded, apex obtuse, proximal ones 2-pinnate-pinnatifid in larger fronds; tertiary pinnules ovate-oblong, shortly stalked or sessile, ca. 1.5 × 0.8 cm, base cuneate, apex obtuse, margin deeply pinnatifid (with proximal 1 or 2 pairs of lobes free), lobe sharply dentate, teeth blunt tipped; upper pinnae gradually reduced; axes and veins of ultimate segments occasionally with a few minute brown subulate or hairlike scales abaxially. Sori small, terminal (or subdorsal) on veinlets, 1–3 pairs per ultimate segment, medial between midvein and margin; indusium pale brown, membranous, and entire (or crenulate).

Dense woods in valleys, on slopes by streams in forests, sometimes on ridges in montane rain forests; (800–)1000–1500 m. S Yunnan [Myanmar, Thailand, N Vietnam].

2. CTENITIS (C. Christensen) C. Christensen in Verdoorn, Man. Pteridol. 544. 1938.

肋毛蕨属 lei mao jue shu

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

Dryopteris subg. *Ctenitis* C. Christensen, Biol. Arbejder Tilegnede. Eug. Warming, 77. 1911; *Ataxipteris* Holttum.

Plants terrestrial, 10–140 cm tall. Rhizome short, erect to ascending, densely scaly at apex and at stipe bases. Fronds clustered; stipe dark brown to stramineous, scaly throughout; scales of two different types: (1) lanceolate, membranous, appressed, and iridescent scales, and (2) subulate, stiff, spreading scales without obvious iridescence. Lamina oblong-lanceolate to ovate-triangular, broadest at base, 1–4-pinnate; basal pair of pinnae always largest, triangular or broadly lanceolate, basal basiscopic pinnules of basal pinnae usually much enlarged; distal pinnae or pinnules ± adnate to rachis or costae and ± decurrent at their bases; veins all free,

veinlets on ultimate pinnules or lobes simple or (rarely) bifurcate to pinnate; lamina texture herbaceous or papery, rarely leathery, with ctenitoid hairs on adaxial surface and short glandular hairs on abaxial surface, or rarely glabrous; costae of pinnules prominent, always covered with ctenitoid (multicellular) hairs. Sori medial or rarely submarginal; indusia present or not, sometimes very small and hidden by maturing sporangia. Perispore echinate, coarsely folded, or tuberculate. $x = 41$.

About 100–150 species: tropics and subtropics of America, Africa, Asia, and Australia; ten species (four endemic) in China.

- 1a. Scales on stipe, rachis, or at least those on abaxial surface of costae lanceolate to ovate-lanceolate.
- 2a. Pinnae (except basal one) 1-pinnatifid; veinlets obscure, some veinlets between pinna lobes arising from costae; perispore coarsely folded 9. *C. sinii*
- 2b. Pinnae (except basal one) 2-pinnatifid; veinlets distinct, no veinlets arising from costae; perispore coarsely folded or echinate.
- 3a. Basal pinnae broadly lanceolate with symmetrical bases; perispore coarsely folded 5. *C. guidianensis*
- 3b. Basal pinnae deltoid with asymmetrical bases, basicopic 2 or 3 pinnules much enlarged; perispore echinate.
- 4a. Sori indusiate, indusia usually fugacious or not well developed; widespread in SE Asia 10. *C. subglandulosa*
- 4b. Sori exindusiate, usually covered by scales; Hunan and Sichuan (endemic) 8. *C. pseudorhodolepis*
- 1b. Scales on stipe, rachis, and on abaxial surface of costae linear-lanceolate to subulate (inrolled and hairlike) or nearly so.
- 5a. Lamina with 2 or 3 pairs of free pinnae; pinnae shallowly lobed; some veinlets between pinna lobes arising from costae; perispore coarsely folded 2. *C. dianguiensis*
- 5b. Lamina with 5–15 pairs of free pinnae; pinnae 1–3-pinnate; no veinlets or rarely a few veinlets arising from costae; perispore coarsely folded, tuberculate, or echinate.
- 6a. Stipe scales 1–3 mm, linear to subulate; sori exindusiate; perispore echinate.
- 7a. Sori usually covered by scales 3. *C. dingnanensis*
- 7b. Sori naked, not scaly 6. *C. jinshonensis*
- 6b. Stipe scales 3–8 mm, subulate; indusia persistent or partly fugacious; perispore coarsely folded or tuberculate.
- 8a. Free pinnae (except basal ones) of same size, 1-pinnatifid, pinna bases not broadened 7. *C. mannii*
- 8b. Free pinnae gradually reduced toward lamina apex, 1- or 2-pinnatifid, nearly all pinnae with broadened bases.
- 9a. Fronds > 1 m, 4-pinnate at base; stipe scales and rachis rufescent, 6–8 mm 1. *C. decurrentipinnata*
- 9b. Fronds < 60 cm, 2- or 3-pinnate at base; stipe scales and rachis dark brown, 3–4 mm 4. *C. eatonii*

1. *Ctenitis decurrentipinnata* (Ching) Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 291. 1938 [*“decurrenti-pinnata”*].

海南肋毛蕨 hai nan lei mao jue

Dryopteris decurrentipinnata Ching, Bull. Fan Mem. Inst. Biol. 2: 195. 1931 [*“decurrenti-pinnata”*].

Rhizomes erect or suberect; rhizome scales brown, narrowly lanceolate to linear-subulate, 1.5–2 mm. Stipe stramineous, 40–70 cm; stipe scales spreading, reddish brown, subulate, 6–8 mm; scales on rachises and costae similar but smaller. Lamina 3-pinnate or 4-pinnate-pinnatifid, triangular-lanceolate, 60–80 × 30–50 cm; pinnae 12–18 pairs; basal pinnae largest, triangular-lanceolate, 20–30 × 15–25 cm; pinnules 10–13 pairs; basal basicopic pinnules of basal pinnae longest, 10–20 × 3–6 cm; bases of upper pinnae or lobes decurrent with veinlets arising from rachis. Lamina herbaceous to thinly papery; veins free, distinct, no veinlets arising from costae except a few in distal part of costae. Sori medial or submedial, indusiate, indusia usually persistent. Perispore coarsely folded or tuberculate.

Forests; 500–1400 m. Hainan [Philippines, Vietnam].

2. *Ctenitis dianguiensis* (W. M. Chu & H. G. Zhou) S. Y. Dong, Novon 18: 35. 2008.

滇桂肋毛蕨 dian gui lei mao jue

Ataxipteris dianguiensis W. M. Chu & H. G. Zhou, Acta Phytotax. Sin. 42: 376. 2004.

Plants 60–80 cm tall. Rhizome short, suberect or prostrate; scales at apex of rhizomes yellowish brown to dark brown, opaque, linear-lanceolate, 10–20 mm, margins entire, fibriform and curly at apex. Stipe brown at base, dark stramineous toward apex, 25–40 cm, 2–3 mm in diam. at base, grooved above, densely clothed with subulate, 3–5 mm, dark brown, spreading scales; scales on rachises and main veins similar but smaller. Lamina bipinnatifid, ovate-triangular, 25–40 × 15–25 cm, decurrent toward apex; pinnae 2–4 (or 5) pairs; basal pinnae largest, subopposite, triangular, 12–18 × 4–6 cm, bases asymmetrically rounded-cuneate, margins deeply lobed without free pinnules, apices caudate-acuminate; basal basicopic lobes of basal pinnae longest, 4–5 × 1–1.5 cm; bases of upper pinnae or lobes decurrent with veinlets arising from rachis. Lamina thickly papery to leathery, subglabrous on both surfaces, rachises and main veins stramineous, densely clothed with long, brown, articulate hairs and spreading, linear squamules; veins pinnate, free, distinct, with some veinlets arising from costae, simple or forked, rarely a few veinlets anastomosing. Sori orbicular, medial or submedial, in 2 irregular rows between main veins, exindusiate. Perispore coarsely folded.

Dense broad-leaved forests on limestone; 500–1400 m. Guangxi, Hainan, Yunnan [Vietnam].

3. *Ctenitis dingnanensis* Ching, Acta Phytotax. Sin. 19: 122. 1981.

二型肋毛蕨 er xing lei mao jue

Rhizomes erect or suberect; rhizome scales reddish brown, narrowly lanceolate, 10–20 mm. Stipe stramineous, 13–21 cm; stipe scales spreading, brown, linear-subulate, 2–3 mm; scales on rachis and costae similar but smaller. Lamina 3- or 4-pinnatifid, triangular, 15–30 × 10–25 cm; pinnae 6–8 pairs; basal pinnae largest, triangular, 5–15 × 5–10 cm; pinnules 6–10 pairs; basal basicopic pinnules of basal pinnae longest, 4–9 × 1.5–3 cm; bases of upper pinnae or upper lobes not obviously decurrent, without veinlets arising from rachises. Lamina herbaceous; veins free, distinct, no veinlets arising from costae. Sori submedial, exindusiate, some sori covered by scales. Perispore echinate and thinly winged.

- Forests; 300–700 m. Guangdong, Jiangxi.

4. *Ctenitis eatonii* (Baker) Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 291. 1938.

直鳞肋毛蕨 zhi lin lei mao jue

Nephrodium eatonii Baker in Hooker & Baker, Syn. Fil. 276. 1867; *Aspidium eatonii* (Baker) Christ; *A. leucostipes* (Baker) Christ; *Ctenitis changanensis* Ching; *C. confusa* Ching; *Dryopteris eatonii* (Baker) Kuntze; *D. leucostipes* (Baker) C. Christensen; *D. subtripinnata* (Miquel) Kuntze var. *leucostipes* (Baker) H. Itô; *Nephrodium leucostipes* Baker.

Rhizomes erect or suberect; rhizome scales dark brown, linear-subulate, 5–12 mm. Stipe stramineous, 5–35 cm; stipe scales spreading, dark brown, subulate, 2–4 mm; scales on rachis and costae similar but smaller. Lamina 2-pinnate to 3-pinnatifid, triangular-lanceolate, 7–35 × 5–15 cm; pinnae 5–12 pairs; basal pinnae largest, triangular-lanceolate, 2.5–13 × 1.5–7 cm; pinnules 2–10 pairs; basal basicopic pinnules or lobes of basal pinnae longest, 0.8–4.5 × 0.4–1.5 cm; bases of upper pinnae or upper lobes not obviously decurrent without veinlets arising from rachis. Lamina herbaceous; veins free, distinct, no veinlets arising from costae. Sori submedial, near costa, indusiate, indusia usually persistent. Perispore coarsely folded or tuberculate.

Wet places in forests, usually in limestone areas; sea level to 1400 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan [S Japan].

The authors have not seen any material of *Nephrodium eatonii* var. *formosana* Harrington (J. Linn. Soc., Bot. 16: 29. 1877), described from Taiwan.

5. *Ctenitis guidianensis* H. G. Zhou & W. M. Chu, Acta Bot. Yunnan. 17: 424. 1995.

桂滇肋毛蕨 gui dian lei mao jue

Rhizomes suberect; rhizome scales dark brown, narrowly lanceolate, ca. 12 mm. Stipe brown to stramineous, 50–90 cm; stipe scales appressed, brown, ovate-lanceolate, ca. 3 mm; scales on rachis and costae similar but smaller. Lamina 2-pinnate to 3-pinnatifid, ovate-lanceolate, 50–80 × 20–50 cm; pinnae 6–11 pairs; basal pinnae as large as second, broadly lanceolate, 15–

30 × 8–15 cm; pinnules 10–12 pairs; basal basicopic pinnules of basal pinnae as long as acroscopic ones, 2–8 × 1–3 cm; bases of upper pinnae or lobes not obviously decurrent, without veinlets arising from rachis. Lamina thickly papery; veins free, distinct, no veinlets arising from costae except a few in distal part of costae. Sori medial or submedial, indusiate; indusia usually fugacious. Perispore with inflated folds.

- Forests on limestone; 800–1100 m. Guangxi, Yunnan.

6. *Ctenitis jinfoshanensis* Ching & Z. Y. Liu, Bull. Bot. Res., Harbin 4(4): 14. 1984.

金佛山肋毛蕨 jin fo shan lei mao jue

Rhizomes suberect or prostrate; rhizome scales reddish brown, narrowly lanceolate, ca. 10 mm. Stipe brown to stramineous, ca. 60 cm; stipe scales spreading, brown, subulate, 5–6 mm; scales on rachis and costae similar but smaller. Lamina 2-pinnate to 3-pinnatifid, broadly ovate, ca. 70 × 50 cm; pinnae 12 pairs; basal pinnae largest, triangular, 20–25 × 13–15 cm; pinnules 12–15 pairs; basal basicopic pinnules of basal pinnae longest, 10–12 × ca. 3 cm, ultimate pinnule or pinna lobe oblong, obtuse at apex; bases of upper pinnae or lobes not obviously decurrent, without veinlets arising from rachis. Lamina herbaceous; veins free, distinct, no veinlets arising from costae. Sori medial, exindusiate, some covered by scales. Perispore coarsely echinate.

- Rock crevices in forests; 700–800 m. Sichuan.

7. *Ctenitis manni* (C. Hope) Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 289. 1938.

银毛肋毛蕨 yin mao lei mao jue

Nephrodium manni C. Hope, J. Bot. 28: 145. 1893; *Ctenitis fulgens* Ching & Chu H. Wang; *Dryopteris intermedia* (Muhlenberg ex Willdenow) A. Gray var. *mannii* (C. Hope) Christ; *D. manni* (C. Hope) Alderwerelt.

Rhizomes erect; rhizome scales brown, narrowly lanceolate, 5–7 mm. Stipe dark stramineous, 15–40 cm; stipe scales spreading, dark brown, subulate, 3–5 mm; scales on rachis and costae similar but smaller. Lamina 2- or 3-pinnatifid, broadly lanceolate, 20–30 × ca. 10 cm; pinnae 10–12 pairs; basal pinnae largest, triangular, 5–6 × ca. 4 cm; pinnules 5–8 pairs; basal basicopic pinnules or lobes of basal pinnae longest, ca. 3 × 1 cm; bases of upper pinnae or lobes not obviously decurrent, without veinlets arising from rachis. Lamina herbaceous; veins free, distinct, no veinlets arising from costae. Sori medial, indusiate, indusia partly persistent. Perispore coarsely folded or tuberculate.

- Forests; 100–200 m. Yunnan (Hekou) [NE India].

8. *Ctenitis pseudorhodolepis* Ching & Chu H. Wang, Acta Phytotax. Sin. 19: 121. 1981.

棕鳞肋毛蕨 zong lin lei mao jue

Rhizomes erect; rhizome scales reddish brown, linear, 1.5–1.8 mm. Stipe dark stramineous, 50–60 cm; stipe scales appressed, dark brown, narrowly lanceolate, 5–6 mm; scales on rachis and costae similar but smaller. Lamina 3-pinnate to 4-

pinnatifid, triangular, 40–50 × 35–45 cm; pinnae 8–10 pairs; basal pinnae largest, triangular, 20–30 × 10–15 cm; pinnules 8–10 pairs; basal basiscopic pinnules of basal pinnae longest, 8–10 × 3–4 cm; bases of upper pinnae or lobes not obviously decurrent, without veinlets arising from rachis. Lamina papery; veins free, distinct, no veinlets arising from costae. Sori submedial or near midvein, exindusiate, some sori covered by scales. Perispore coarsely echinate.

• Near streams in bamboo forests; 600–800 m. Guizhou, Hunan, Sichuan (Emei Shan).

9. *Ctenitis sinii* (Ching) Ohwi, Fl. Japan Pterid. 92. 1957.

厚叶肋毛蕨 hou ye lei mao jue

Tectaria sinii Ching, Bull. Dept. Biol. Sun Yatsen Univ. 6: 22. 1933; *Ataxipteris sinii* (Ching) Holttum; *Ctenitopsis sinii* (Ching) Ching.

Rhizomes erect, short, 2–2.5 cm in diam., densely scaly at apex and at base of stipes; rhizome scales reddish brown, narrowly lanceolate, 1–2 cm, thinly membranous, entire at margins, fibriform and curly at apex. Stipe dark brown at base, stramineous toward apex, 30–55 cm, 3.5–5 mm in diam. at base, grooved above, densely clothed with scales; scales appressed, reddish brown, lanceolate to ovate-lanceolate, 2–3 cm. Lamina bipinnatifid to tripinnatifid at base, triangular-lanceolate, 30–60 × 20–45 cm; pinnae (3–)7 or 8 pairs; basal pinnae largest, subopposite, triangular, 14–25 × 9–16 cm; pinnules 1–3 pairs; basal basiscopic pinnules or lobes of basal pinnae longest, 8–15 × 2.3–3.5 cm, bases asymmetrically rounded-cuneate, margins crenate-lobed, apices long acuminate; bases of upper pinnae or lobes decurrent, with veinlets arising from rachis; texture thickly papery to leathery, dark brown when dried, glabrous on both surfaces; rachises and main veins deeply stramineous and densely clothed with brown, long-articulate hairs and with sparse squamules. Veins free, pinnate, 6–10 pairs per lobe, inconspicuous, simple or 2–4-forked, basiscopic veinlets anastomosing, forming a single row of narrow areoles along costae. Sori orbicular, medial along veinlets, in 2 irregular rows between main veins; exindusiate. Perispore coarsely folded.

Densely forested valleys; 300–500 m. Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Zhejiang [Japan].

10. *Ctenitis subglandulosa* (Hance) Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 302. 1938.

亮鳞肋毛蕨 liang lin lei mao jue

Alsophila subglandulosa Hance, Ann. Sci. Nat., Bot., sér.

5, 5: 253. 1866; *Aspidium intermedium* Willdenow var. *rhodolepis* (C. B. Clarke) Christ; *A. subtripinnatum* Miquel; *Ctenitis anyuanensis* Ching & Chu H. Wang; *C. calcarea* Ching & Chu H. Wang; *C. chungyensis* Ching & Chu H. Wang; *C. costulifera* Ching; *C. dumrongii* Tagawa & K. Iwatsuki; *C. maolanensis* P. S. Wang; *C. membranifolia* Ching & Chu H. Wang; *C. rhodolepis* (C. B. Clarke) Ching; *C. subtripinnata* (Miquel) H. Itô; *C. yunnanensis* Ching & Chu H. Wang; *Cyathea subglandulosa* (Hance) Copeland; *Dryopteris maximowicziana* (Miquel) C. Christensen var. *rhodolepis* (C. B. Clarke) Koidzumi; *D. oldhamii* (Baker) C. Christensen; *D. rhodolepis* (C. B. Clarke) C. Christensen; *D. subglandulosa* (Hance) Hayata (1917), not Kuntze (1891); *D. subtripinnata* (Miquel) Kuntze; *Lastrea intermedia* (Willdenow) C. Presl var. *rhodolepis* (C. B. Clarke) Beddome; *Nephrodium rhodolepis* C. B. Clarke; *Polypodium oldhamii* Baker.

Rhizomes erect, suberect, or prostrate; rhizome scales reddish brown, linear, 1.5–3 mm. Stipe dark stramineous, 40–50 cm; stipe scales appressed, reddish brown, lanceolate or ovate-lanceolate, 2–3 mm; scales on rachis and costae similar but smaller. Lamina 3-pinnate to 4-pinnatifid, ovate-triangular, 40–60 × 30–40 cm; pinnae 12–14 pairs; basal pinnae largest, triangular, 18–22 × 12–16 cm; pinnules 10–12 pairs; basal basiscopic pinnules of basal pinnae longest, 8–10 × 2.5–3.5 cm; bases of upper pinnae or lobes not obviously decurrent, without veinlets arising from rachis. Lamina herbaceous; veins free, distinct, no veinlets arising from costae. Sori medial or submedial, often near costae, indusiate; indusia usually fugacious, glabrous. Perispore coarsely echinate.

Usually on limestone; sea level to 1700 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Malaysia, Philippines, Vietnam; SE Asia].

Ctenitis subglandulosa is a widespread and morphologically variable species. The indusia of this species are thin and colorless at an early stage but stop growing midway through its development. Therefore, in most herbarium specimens, the indusia are difficult to observe. However, sometimes the indusia are distinct and persistent. The size and abundance of the scales on stipes and rachises, the color and abundance of glands on the lamina beneath, as well as the abundance of hairs on the lamina are all variable characters. It is observed that when plants grow in open and dry habitats they develop hairs on the lower leaf surface, which are absent when growing in shade. Spore ornamentation of many samples of this species was examined, and we found most having echinate perispores, except one specimen from Hainan and one from Yunnan having folded perispores. The occurrence of these two different spore types may indicate that this is a species complex that needs more detailed taxonomic revision, preferably using molecular techniques.

3. CYRTOMIUM C. Presl, Tent. Pterid. 86. 1836.

贯众属 guan zhong shu

Zhang Libing (张丽兵); David S. Barrington

Amblyia C. Presl; *Cyrtomium* sect. *Amblyia* (C. Presl) T. Moore.

Plants terrestrial, perennial, evergreen. Rhizome erect or ascending, short, (together with basal stipe) densely covered with scales; scales concolorous or bicolorous, dark brown to blackish brown, ovate or broadly lanceolate, margins ciliate, fimbriate, toothed, or entire, apex acute or acuminate. Fronds 2–6 per rhizome, caespitose, monomorphic; stipe stramineous or brownish stramineous, canaliculate adaxially, scaly, scales similar to those on rhizome; distal stipe scales sparser, similar to but smaller than

basal stipe scales. Lamina linear-lanceolate, lanceolate, ovate-lanceolate, broadly lanceolate, or deltoid-ovate, imparipinnate, apex with apical pinna somewhat dissected at base, rarely simple; rachis sulcate adaxially, without proliferous bulbils, scaly, scales smaller than distal stipe scales. Pinnae lanceolate, ovate-lanceolate, falcate, or ovate, acroscopic base or both acroscopic and basispic bases auriculate (sometimes auricles indistinct), margins entire or toothed; texture papery or leathery, rarely thinly papery, with or without lanceolate or linear microscales abaxially, glabrous adaxially; venation reticulate, with 2–8 rows of oblique-polygonal areoles on each side of midrib, each areole with 1–3 free included veinlets. Sori orbicular, terminal on included veinlets, in 1 to a few rows on each side of midrib, indusiate; indusia peltate, orbicular.

About 35 species: mainly distributed in E Asia with its center of diversity in SW China; one species occurs in S India and two in E, S, and W Africa and Madagascar; one species is endemic to Japan; one species occurs in Asia and reaches Hawaii; one species is introduced but locally naturalized in South Africa, Europe, Hawaii, Réunion, and North America; 31 species (21 endemic) in China.

- 1a. Lamina leathery; pinna margins thickened, flat or sometimes repand.
 - 2a. Terminal pinna pinnatifid and acuminate; lateral pinnae 18–22 pairs 11. *C. chingianum*
 - 2b. Terminal pinna simple, with 1 or 2 lobes or without lobes; lamina simple or with lateral pinnae 1–26 pairs.
 - 3a. Lateral pinnae cordate at base.
 - 4a. Lateral pinnae usually shorter than 3 cm, ovate or rarely deltoid-lanceolate 1. *C. nephrolepioides*
 - 4b. Lateral pinnae usually longer than 6 cm, oblong-ovate, oblong-lanceolate, deltoid-ovate, or ovate.
 - 5a. Stipe scales ovate, margins fimbriate.
 - 6a. Lamina 18–24 cm; lateral pinnae 6–7 cm, acuminate; areoles 2 or 3 rows on each side of midrib; indusia entire 2. *C. shingianum*
 - 6b. Lamina ca. 42 cm; lateral pinnae 12–14 cm, acute; areoles 7–9 rows on each side of midrib; indusia toothed 3. *C. guizhouense*
 - 5b. Stipe scales lanceolate, margins with ciliate teeth.
 - 7a. Lamina deltoid or ovate, simple or rarely with 2 or more lobes or 2 or more free lateral pinnae; venation palmate or ternate 4. *C. hemionitis*
 - 7b. Lamina oblong or triangular, imparipinnate, lateral pinnae 1–5 pairs; venation pinnate 5. *C. pachyphyllum*
 - 3b. Lateral pinnae rounded-cuneate, broadly cuneate, or truncate at base.
 - 8a. Pinnae acuminate or caudate at apex.
 - 9a. Lateral pinnae lanceolate without acroscopic auricles; terminal pinna entire or lobed; indusia entire; stipe scales bicolorous, with dark brown centers and pale brown margins 9. *C. devexiscapulae*
 - 9b. Lateral pinnae obliquely ovate or ovate-lanceolate and with conspicuous acroscopic auricles; terminal pinna forked or trifurcate; indusia incised; stipe scales concolorous, pale brown 10. *C. falcatum*
 - 8b. Pinnae obtuse or rounded at apex.
 - 10a. Two sides of midrib and base of lateral pinnae nearly equilateral; lateral pinnae 1–6 pairs 6. *C. grossum*
 - 10b. Two sides of midrib of lateral pinnae obviously inequilateral, base of lateral pinnae oblique and subtruncate; lateral pinnae 1–21 pairs, apex acute or obtuse.
 - 11a. Lamina 3–7 cm, acute; lateral pinnae 1–4 pairs, obliquely broadly ovate or obliquely flabellate, length subequal to width 7. *C. sinningense*
 - 11b. Lamina 13–35 cm, acuminate; lateral pinnae 12–21 pairs, ovate, ca. 2 × as long as wide 8. *C. obliquum*
- 1b. Lamina papery, rarely subleathery or membranous; pinna margins flat, not thickened.
 - 12a. Lateral pinnae with coarse teeth on margin.
 - 13a. Acroscopic base of lateral pinnae ± auriculate.
 - 14a. Auricles of lateral pinnae small and blunt or semicircular; indusia entire on margin 25. *C. tsinglingense*
 - 14b. Auricles of lateral pinnae long and acute apically, deltoid; indusia irregularly dentate on margin 26. *C. caryotideum*
 - 13b. Acroscopic base of lateral pinnae not auriculate.
 - 15a. Lateral pinnae lanceolate.
 - 16a. Stipe 22–36 cm; base of pinnae nearly equilateral, cuneate; indusia toothed on margin 30. *C. aequibasis*
 - 16b. Stipe 40–55 cm; base of pinnae inequilateral, rounded-cuneate and with acroscopic side ± decurrent; indusia entire on margin 31. *C. yunnanense*
 - 15b. Lateral pinnae ovate, oblong-ovate, oblong-lanceolate, or broadly lanceolate.
 - 17a. Leaves membranous; indusia denticulate on margin 27. *C. membranifolium*
 - 17b. Leaves papery; indusia entire on margin.
 - 18a. Lamina acute; lateral pinnae 8–13 pairs, ovate 28. *C. serratum*
 - 18b. Lamina obtuse; lateral pinnae 3–6 pairs, broadly lanceolate or oblong-lanceolate 29. *C. anomophyllum*
 - 12b. Lateral pinnae with only small teeth or sometimes subtire on margin.
 - 19a. Lateral pinnae inequilateral.
 - 20a. Acroscopic margins of lateral pinnae cuneate, basispic margins broadly cuneate 24. *C. conforme*
 - 20b. Acroscopic margins of lateral pinnae subtruncate, basispic margins cuneate, broadly cuneate, or rounded-cuneate.

- 21a. Lateral pinnae obliquely ovate, rarely broadly lanceolate 20. *C. latifalcatum*
- 21b. Lateral pinnae lanceolate or oblong-lanceolate.
 - 22a. Lateral pinnae usually shorter than 4 cm and narrower than 1.5 cm; acroscopic base obviously auriculate, auricles deltoid; basispic base cuneate 12. *C. lonchitoides*
 - 22b. Lateral pinnae up to 8–12 cm and 2.6 cm wide or wider; acroscopic base slightly or obviously auriculate; basispic base rounded or cuneate.
 - 23a. Lateral pinnae usually shorter than 8 cm; acroscopic base slightly auriculate, auricles blunt 21. *C. fortunei*
 - 23b. Lateral pinnae 8–12 cm; acroscopic base obviously auriculate, auricles semicircular or deltoid.
 - 24a. Lamina obtuse; lateral pinnae 4–14 pairs, distant; indusia incised or toothed 22. *C. yamamotoi*
 - 24b. Lamina acute; lateral pinnae 20–22 pairs, contiguous; indusia entire 23. *C. confertifolium*
- 19b. Lateral pinnae nearly equilateral.
 - 25a. Lateral pinnae ovate or basal 1 or 2 pairs ovate.
 - 26a. Indusia toothed on margin 15. *C. tukusicola*
 - 26b. Indusia entire on margin.
 - 27a. Pinnae 2–6 pairs, 10–18 × 5–8 cm, ovate at base 13. *C. macrophyllum*
 - 27b. Pinnae more than 7 pairs, < 10 × 8 cm, rounded-cuneate to cuneate at base 14. *C. muticum*
 - 25b. Lateral pinnae broadly lanceolate, oblong-lanceolate, or lanceolate.
 - 28a. Lateral pinnae broadly lanceolate, elliptic, or oblong-lanceolate, base broadly cuneate to cuneate; both surfaces flat, without obvious apophyses (swellings on which sori are located).
 - 29a. Lateral pinnae 4–9 pairs; basal pinnae not contracted; pinna margins entire or distal portion with small teeth; terminal pinna forked or trifurcate, 10–13 × 6–10 cm; indusia grayish brown in center, entire or toothed on margin; areoles 7 or 8 rows on each side of midrib 17. *C. omeiense*
 - 29b. Lateral pinnae 15–20 pairs; basal 2 pairs of pinnae contracted toward lamina base; pinna margins with small teeth; terminal pinna entire or lobed, 5–8 × 1.8–2.5 cm; indusia dark brown in center, lacerate on margin; areoles 5 or 6 rows on each side of midrib 16. *C. atropunctatum*
 - 28b. Lateral pinnae lanceolate or linear-lanceolate, base cuneate; abaxial surface with pits containing sori or with obvious apophyses.
 - 30a. Lateral pinnae 8–13 pairs; terminal pinna obovate, ovate, or rhombic; sori contained in pits on abaxial surface of pinnae, without obvious apophyses; indusia flat or concave at middle 18. *C. urophyllum*
 - 30b. Lateral pinnae 6 or 7 pairs; terminal pinna oblong; sori on obvious apophyses; indusia raised and caplike at middle 19. *C. taiwanianum*

1. *Cyrtomium nephrolepioides* (Christ) Copeland, Philipp. J. Sci. 38: 136. 1929.

低头贯众 di tou guan zhong

Polystichum nephrolepioides Christ, Bull. Acad. Int. Géogr. Bot. 11: 258. 1902; *Cyrtomium tengii* Ching & K. H. Shing; *C. wulingense* S. F. Wu; *Phanerophlebia nephrolepioides* (Christ) Copeland.

Plants 12–28 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous or sometimes lower portion purple, 3–10 cm, 1–2 mm in diam. at base, densely scaly; scales brown, ovate or lanceolate, margins fimbriate. Lamina linear-lanceolate, 10–25 × 2–5 cm, base not contracted, 1-imparipinnate, apex acuminate; rachis densely scaly abaxially; scales brown, lanceolate, margins toothed. Lateral pinnae 10–26 pairs, crowded, alternate, spreading or slightly ascendant, shortly stalked, ovate or rarely deltoid-lanceolate; middle pinnae 1–2.5 × 0.6–1.2 cm, base cordate or sometimes obliquely cordate, margins entire and often slightly reflexed, apex rounded; terminal pinna ovate, sometimes with 1 or 2 basal lobes, (0.6–)1.5–2.5 × (0.3–)0.8–1 cm; texture thickly leathery, glabrous on both surfaces; venation pinnate, midrib concave on both surfaces, indistinct, lateral veins anastomosing to form 2 or 3 rows (stories) of areoles on each side of midrib, proximal row of areoles with 1 included veinlet. Sori 1 or 2 rows on each side of midrib; indusia margins irregularly toothed.

• Limestone crevices in forests or forest margins; 600–1600 m. Guangxi, Guizhou, Hunan (Sangzhi, Shimen), Sichuan (Emei Shan).

2. *Cyrtomium shingianum* H. S. Kung & P. S. Wang, Chin. J. Appl. Environm. Biol. 3(1): 23. 1997.

邢氏贯众 xing shi guan zhong

Plants ca. 45 cm tall. Rhizome erect, short, densely covered with lanceolate brown scales. Stipe stramineous, 25–34 cm, ca. 3 mm in diam. at base; lower portion densely scaly; scales brown or dark brown at middle, narrowly ovate or lanceolate, margins fimbriate. Lamina oblong-ovate, 18–24 × 12–14 cm, base not contracted, 1-imparipinnate, apex acuminate; rachis covered abaxially with linear brown scales. Lateral pinnae 5–7 pairs, alternate, attached nearly spreading or slightly ascendant, shortly stalked, oblong-ovate; middle pinnae 6–7 × 2–2.5 cm, base shallowly obliquely cordate or subtruncate, margins entire, apex acuminate; terminal pinna ovate, lower portion with 2 lobes or not lobed, 4–7 × 3–6 cm; leathery, glabrous abaxially, lustrous adaxially; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 2 or 3 rows of areoles on each side of midrib. Sori in 2 or 3 irregular rows on each side of midrib; indusia margins subentire. *2n* = ca. 164*.

• Limestone crevices in *Pinus* forests; ca. 800 m. S Guizhou (Libo).

Cyrtomium shingianum could be an allotetraploid of hybrid ori-

gin, with *C. grossum* being possibly its female parent based on chloroplast data.

3. *Cyrtomium guizhouense* H. S. Kung & P. S. Wang, Chin. J. Appl. Environm. Biol. 3(1): 23. 1997.

贵州贯众 *gui zhou guan zhong*

Plants ca. 70 cm tall. Rhizome erect. Stipe stramineous, ca. 58 cm, ca. 5 mm in diam. at base, lower portion densely scaly; scales brown, ovate or lanceolate, margins fimbriate. Lamina oblong-lanceolate, ca. 42 × 18 cm, base slightly wider, 1-imparipinnate, apex acute; rachis abaxially with sparse linear brown scales. Lateral pinnae 5 pairs, alternate, slightly ascendant, shortly stalked, oblong-lanceolate; middle pinnae 12–14 × 4–5 cm, base obliquely cordate, margins entire, apex long acuminate; terminal pinna narrowly ovate, ca. 11 × 4 cm; leathery, with sparse hairlike scales abaxially; venation pinnate, indistinct abaxially, slightly raised adaxially, veinlets anastomosing to form 7–9 irregular rows of areoles on each side of midrib. Sori in several irregular rows on each side of midrib; indusia large, ca. 1.5 mm in diam., black at center, toothed on margin, evanescent.

- Limestone crevices in valleys; 600–1000 m. S Guizhou (Libo).

Cyrtomium guizhouense is a sexual diploid.

4. *Cyrtomium hemionitis* Christ, Bull. Acad. Int. Géogr. Bot. 20: 138. 1910.

单叶贯众 *dan ye guan zhong*

Cyrtomium nephrolepioides (Christ) Copeland f. *hemionitis* (Christ) Ching.

Plants 4–28 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 4–18 cm, 1–3 mm in diam. at base, scaly throughout; scales dark brown, lanceolate or linear, margins entire or ciliate, often twisted. Lamina often simple, sometimes lower portion deeply pinnatifid and forming 1 pair of lobes or free pinnae, deltoid-ovate, both sides of lower portion often elevated at obtuse angle, 4–12 × 3.5–10 cm, base deeply cordate, margins entire, apex acute or acuminate; leathery, abaxially with hairlike microscales, glabrous adaxially; venation palmate, indistinct abaxially, slightly raised adaxially, veinlets anastomosing to form multiple rows of areoles on each side of midrib, each areole with 1–3 included veinlets. Sori throughout abaxial surface of lamina or pinnae; indusia with weakly dentate margins. $2n = 123^*$.

Limestone crevices in forests; 1100–1800 m. Guangxi, S Guizhou (Guiding, Libo), S Yunnan (Malipo, Xichou) [N Vietnam].

Cyrtomium hemionitis is an apomictic triploid.

5. *Cyrtomium pachyphyllum* (Rosenstock) C. Christensen, Index Filic., Suppl. 1: 11. 1917.

厚叶贯众 *hou ye guan zhong*

Polystichum pachyphyllum Rosenstock, Repert. Spec. Nov. Regni Veg. 13: 130. 1914; *Cyrtomium fengianum* Ching & K. H. Shing ex K. H. Shing.

Plants 12–40 cm tall. Rhizome erect, densely covered with

lanceolate brown scales. Stipe stramineous, 4–22 cm, 1–3 mm in diam. at base, scaly throughout; scales brown, lanceolate or linear, margins entire or ciliate, slightly twisted. Lamina oblong or triangular, 7–18 × 7–10 cm, base not contracted, 1-imparipinnate, apex acute. Lateral pinnae 1–5 pairs, alternate or subopposite, spreading, shortly stalked, deltoid-ovate or ovate, 3.5–5 × 2.5–3 cm, base cordate, margins entire, apex narrow and obtuse; terminal pinna deltoid-ovate, 3–8 × 3–5 cm, sometimes one or both lateral margins of lower portion bowed outward; leathery, abaxially with hairlike microscales, glabrous adaxially; venation pinnate, indistinct on both surfaces, veinlets anastomosing to form 3 or 4 rows of areoles on each side of midrib, each areole with 1 or 2 included veinlets. Sori throughout abaxial surface of pinnae; indusia margins weakly dentate.

- Limestone crevices in forests; 1300–1500 m. Guangxi, S Guizhou (Anshun, Pingtang), S Yunnan (Malipo, Xichou).

Cyrtomium pachyphyllum is an apomictic triploid.

6. *Cyrtomium grossum* Christ, Bull. Acad. Int. Géogr. Bot. 16: 239. 1906.

惠水贯众 *hui shui guan zhong*

Cyrtomium nephrolepioides (Christ) Copeland f. *grossum* (Christ) Ching.

Plants 25–30 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 8–16 cm, 1–2 mm in diam. at base; lower portion densely scaly; scales brown, sometimes blackish brown at middle, lanceolate or narrowly lanceolate, margins fimbriate. Lamina oblong-lanceolate, 12–22 × 5–8 cm, base not contracted, 1-imparipinnate, apex acute; rachis with sparse linear brown scales. Lateral pinnae 3–5 pairs, alternate, spreading or slightly ascendant, shortly stalked, oblong or broadly ovate, 3.5–4.5 × 2–3 cm, base rounded-truncate, margins entire, apex rounded-obtuse; terminal pinna rhombic-ovate, 4–8 × 2–4 cm; leathery, glabrous on both surfaces, inequilateral at base; venation pinnate, veinlets anastomosing to form 3 rows of areoles on each side of midrib. Sori throughout abaxial surface of pinnae; indusia margins erose. $2n = 164^*$.

- Limestone crevices in forests; 700–800 m. S Guizhou (Huishui, Libo), S Yunnan (Malipo, Xichou).

Cyrtomium grossum is a sexual tetraploid.

7. *Cyrtomium sinningense* Ching & K. H. Shing, Acta Phytotax. Sin., Addit. 1: 10. 1965.

新宁贯众 *xin ning guan zhong*

Plants 8–12 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 5–7 cm, ca. 1 mm in diam. at base, densely scaly; scales brown, ovate or lanceolate, margins dentate. Lamina ovate or oblong-lanceolate, 3–7 × 2.5–3 cm, 1-imparipinnate, apex acute; rachis with sparse lanceolate brown dentate scales. Lateral pinnae 1–4 pairs, alternate, spreading, shortly stalked, obliquely broadly ovate or flabellate, 1.2–1.6 × 1–1.2 cm, basispic margins broadly cuneate, acrosopic margins rounded, entire, apex rounded; terminal pinna deltoid-ovate, 1–1.5 × 1.2–1.5 cm leathery, glabrous on

both surfaces; venation pinnate, indistinct on both surfaces, veinlets anastomosing to form 2 or 3 rows of areoles on each side of midrib. Sori in 1 or 2 irregular rows on each side of midrib or restricted to pinna margins; indusia margins subentire.

- Forests; ca. 1100 m. Hunan (Xinning).

8. *Cyrtomium obliquum* Ching & K. H. Shing, Acta Phytotax. Sin., Addit. 1: 11. 1965.

斜基贯众 xie ji guan zhong

Cyrtomium calcicola Ching; *C. wangianum* Ching & K. H. Shing.

Plants 20–35 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 6–10 cm, 1–2 mm in diam. at base, densely scaly; scales brown, ovate or lanceolate, margins dentate. Lamina lanceolate, 13–35 × 3–5 cm, base slightly contracted, 1-impairipinnate, apex acuminate; rachis abaxially densely covered with lanceolate brown toothed scales. Lateral pinnae 12–21 pairs, alternate, spreading, shortly stalked, deltoid-ovate; middle pinnae 2–3 × 1–1.5 cm, base oblique, acroscopic margins arc-shaped, basicopic margins broadly cuneate, entire, apex obtuse; terminal pinna broadly lanceolate or nearly rhombic, lower portion often with 1 or 2 lobes, 2–2.5 × 1.2–2 cm; leathery, glabrous on both surfaces; venation pinnate, slightly raised abaxially, slightly concave adaxially, veinlets anastomosing to form 2 rows of areoles on each side of midrib. Sori 1 or 2 rows on each side of midrib; indusia margins entire.

- On rocks in forests or shaded places. Guangdong (Ruyuan), Guangxi (Hexian, Lingui), Zhejiang (Suichang).

Cyrtomium obliquum has both sexual and apomictic reproductive forms.

9. *Cyrtomium devexiscapulae* (Koidzumi) Koidzumi & Ching, Bull. Chin. Bot. Soc. 2(2): 96. 1936.

披针贯众 pi zhen guan zhong

Polystichum devexiscapulae Koidzumi, Acta Phytotax. Geobot. 1: 33. 1932; *Cyrtomium falcatum* (Linnaeus f.) C. Presl var. *devexiscapulae* (Koidzumi) Tagawa; *C. integrum* Ching & K. H. Shing ex K. H. Shing; *C. sinicum* Ching ex K. H. Shing; *Phanerophlebia falcata* (Linnaeus f.) Copeland var. *devexiscapulae* (Koidzumi) Ohwi.

Plants 40–80 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 16–50 cm, 3–5 mm in diam. at base, lower portion densely scaly; scales brown, often blackish brown at middle with a pale brown edge, ovate or lanceolate, margins fimbriate. Lamina ovate-lanceolate, 34–55 × 12–20 cm, base not contracted or sometimes slightly wider, 1-impairipinnate, apex acuminate; rachis with lanceolate or linear brown scales, fugacious. Lateral pinnae 7–10 pairs, alternate, ascendant, shortly stalked, lanceolate, sometimes falcate, pinnae below middle part 9–15 × 2–3.5 cm, base slightly obliquely broadly cuneate, margins entire or sometimes repand, apex acuminate or caudate, sometimes basalmost pair wider; terminal pinna lanceolate, margins repand, sometimes lower portion lobed, 9–10 × 2.5–3.5 cm; leathery, glabrous on both surfaces; venation pinnate, slightly raised abaxially, indistinct

adaxially, veinlets anastomosing to form 3–7 rows of areoles. Sori throughout adaxial surface of pinnae; indusia margins entire. $2n = 164$.

Among shrubs on limestone substrate, forests; below 100–1700 m. Chongqing (Chengkou), Fujian (Liancheng, Nanping), Guangdong, Guangxi, Guizhou (Libo, Liping, Sandu), Jiangxi (Pingxiang), Sichuan (Pingshan), Taiwan, Zhejiang (Putuo) [Japan, Korea, N Vietnam].

Cyrtomium devexiscapulae is similar to *C. falcatum* and is sometimes regarded as a variety of the latter. Flavanones are found in *C. devexiscapulae* but not in *C. falcatum*. This implies that these two should be treated as different species.

This species is a sexual tetraploid. Matsumoto (Ann. Tsukuba Bot. Gard. 22: 1–141. 2003) suggested that *Cyrtomium falcatum* is one of the potential progenitors of the allotetraploid *C. devexiscapulae*. Lu et al. (J. Plant Res. 118: 129–135. 2005) further proposed that *C. falcatum* is likely the female parent of *C. devexiscapulae* based on the shared chloroplast sequences.

10. *Cyrtomium falcatum* (Linnaeus f.) C. Presl, Tent. Pterid. 86. 1836.

全缘贯众 quan yuan guan zhong

Polypodium falcatum Linnaeus f., Suppl. Pl. 446. 1781; *Aspidium falcatum* (Linnaeus f.) Swartz; *Cyrtomium yiangshanense* Ching & Y. C. Lang; *Dryopteris falcata* (Linnaeus f.) O. Kuntze; *Phanerophlebia falcata* (Linnaeus f.) Copeland; *Polystichum falcatum* (Linnaeus f.) Diels (1899), not Fée (1850).

Plants 30–40 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 15–27 cm, 3–4 mm in diam. at base, lower portion densely scaly; scales pale brown, sometimes blackish brown at middle, ovate, lower portion fimbriate. Lamina broadly lanceolate, 22–35 × 12–15 cm, base contracted, 1-impairipinnate, apex acute; rachis with lanceolate brown dentate scales or glabrous. Lateral pinnae 5–14 pairs, alternate, spreading or ascendant, shortly stalked, lanceolate or ovate-lanceolate, often curved acroscopically; middle pinnae 6–10 × 2.5–3 cm, base obliquely rounded-cuneate, margins entire or repand, sometimes dentate, apex long acuminate or caudate; terminal pinna ovate-lanceolate, forked or trifurcate, 4.5–8 × 2–4 cm; leathery, glabrous on both surfaces; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 3 or 4 rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins slightly incised. $2n = 82$.

Coastal and lowland forests; sea level to 500 m. Fujian, Guangdong, Jiangsu, Liaoning, Shandong, Taiwan, Zhejiang [Indochina, Japan, Korea; Pacific islands (Polynesia)]; introduced and locally naturalized in Europe, Hawaii, North America, Réunion, South Africa].

Three cytotypes of *Cyrtomium falcatum* have been identified: sexual diploid, apomictic triploid, and sexual tetraploid. Based on the cytological evidence and geographical distribution, Matsumoto (Ann. Tsukuba Bot. Gard. 22: 70. 2003) divided this species into three subspecies: “subsp. *falcatum*,” “subsp. *littorale*,” and “subsp. *australe*.”

11. *Cyrtomium chingianum* P. S. Wang, Chin. J. Appl. Environm. Biol. 3(1): 24. 1997.

秦氏贯众 qin shi guan zhong

Plants 50–70 cm tall. Rhizome ascending, densely covered with lanceolate brown scales. Stipe stramineous, 30–38 cm, 3–4 mm in diam. at base, lower portion densely scaly; scales brown, sometimes dark brown at center, ovate or lanceolate, margins fimbriate, becoming glabrous upward. Lamina oblong-lanceolate, 24–46 × 12–14 cm, base not contracted, 1-pinnate, apex acuminate; rachis with narrowly lanceolate or linear dark brown scales. Lateral pinnae 18–22 pairs, alternate, nearly spreading, shortly stalked, oblong-lanceolate; middle pinnae 6–7 × 1.5–2 cm, basicopic base oblique and rounded-cuneate, acroscopic base truncate, margins flat or often repand, apex pinnatifid and acuminate; terminal pinna narrowly ovate, 4–5 × ca. 2.5 cm, lower portion often pinnately lobed; leathery, with sparse hairlike microscales abaxially, lustrous adaxially; venation pinnate, indistinct abaxially, slightly concave adaxially, veinlets anastomosing to form 1 or 2 rows of areoles. Sori 2 rows on each side of midrib; indusia margins subentire. $2n = 164^*$.

- Limestone crevices in forests; ca. 700 m. S Guizhou (Libo).

Cyrtomium chingianum is relatively large. Its lamina is not obviously imparipinnate and the terminal pinna is pinnatifid.

This species is a sexual tetraploid.

12. *Cyrtomium lonchitoides* (Christ) Christ, Bull. Acad. Int. Géogr. Bot. 11: 264. 1902.

小羽贯众 xiao yu guan zhong

Aspidium lonchitoides Christ, Bull. Herb. Boissier 7: 16. 1899; *Cyrtomium vittatum* Christ; *Polystichum lonchitoides* (Christ) Diels; *P. vittatum* (Christ) C. Christensen.

Plants 20–40 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 5–15 cm, 1–3 mm in diam. at base, lower portion scaly; scales brown, blackish brown at center, ovate or lanceolate, margins fimbriate, gradually becoming glabrous upward. Lamina linear-lanceolate, 22–45 × 3–8 cm, base slightly contracted, imparipinnate or not, apex acuminate; rachis with sparse lanceolate or linear brown ciliate scales; stalk bases often scaly. Lateral pinnae 18–24 pairs, alternate, spreading, shortly stalked, broadly lanceolate; middle pinnae 1.5–4 × 0.8–1.5 cm, basicopic base oblique, acroscopic base truncate and with acute auricles, pinna margins ± denticulate, apex with a gradually reduced lanceolate pinna; papery, abaxially with sparse lanceolate brown microscales or glabrous, glabrous adaxially; venation pinnate, indistinct on both surfaces, veinlets anastomosing to form 2 or 3 rows of areoles on each side of midrib, each areole with 1 or 2 included free veinlets. Sori throughout abaxial surface of pinnae; indusia margins with long teeth. $2n = 82^*$.

- Broad-leaved forests, *Pinus* forests, often on rocks; 1200–2700 m. Gansu (Wenxian), Guangxi, Guizhou, Henan (Nushan), Sichuan, Xizang, Yunnan.

Cyrtomium lonchitoides was assigned to *C.* subser. *Balansana* Ching & K. H. Shing ex K. H. Shing by Shing (Acta Phytotax. Sin. Suppl. 1: 1–48. 1965). Molecular data have shown that *C.* subser. *Balansana* should belong to *Polystichum* (Lu et al., J. Pl. Res. 118: 129–135. 2005). *Cyrtomium lonchitoides* has imparipinnate lamina (sometimes not obviously so) and multiple rows of sori on each pinna, which is consistent with its placement in *Cyrtomium*.

This species is a sexual diploid.

13. *Cyrtomium macrophyllum* (Makino) Tagawa, Acta Phytotax. Geobot. 3(2): 62. 1934.

大叶贯众 da ye guan zhong

Aspidium falcatum (Linnaeus f.) Swartz var. *macrophyllum* Makino, Bot. Mag. (Tokyo) 16: 90. 1902; *Cyrtomium falcatum* (Linnaeus f.) C. Presl var. *macropterum* (Diels) Christ; *C. macrophyllum* f. *minor* Ching & K. H. Shing; *C. pseudo-caudipinnum* Ching & K. H. Shing; *C. retrosopaleaceum* Ching & K. H. Shing; *Polystichum caryotideum* (Wallich ex Hooker & Greville) Diels var. *macropterum* (Diels) Nakai; *P. falcatum* (Linnaeus f.) Diels var. *macrophyllum* (Makino) Matsumura; *P. falcatum* f. *macropterum* Diels; *P. macrophyllum* (Makino) Tagawa.

Plants 30–60 cm tall. Rhizome erect, densely covered with lanceolate blackish brown scales. Stipe stramineous, 16–38 cm, 3–4 mm in diam. at base, lower portion densely scaly; scales blackish brown, ovate or lanceolate, dentate, often twisted. Lamina oblong-ovate or narrowly oblong, 28–54 × 10–30 cm, base not contracted or slightly wider, 1-imparipinnate, apex obtuse; rachis with lanceolate to linear blackish brown scales. Lateral pinnae 3–8 pairs, slightly ascendant, shortly stalked, basal 1 or 2 pairs ovate and often larger, remaining pinnae oblong-ovate; middle pinnae 12–20 × 4–7 cm, base broadly cuneate or rounded-cuneate, margins entire, sometimes distal margins serrulate, apex acuminate or acute and shortly caudate; terminal pinna ovate or rhombic-ovate, forked or trifurcate, 10–16 × 10–12 cm; hard papery, sometimes with sparse lanceolate brown microscales abaxially, glabrous adaxially; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form multiple rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins entire.

Forests; 700–2500 m. Anhui, S Gansu (Kangxian, Wenxian), Guizhou, Hubei, Hunan, Jiangxi, S Shaanxi (Pingli), Sichuan, Taiwan, Xizang (Bomi, Zham), Yunnan [Bhutan, India, Japan, Kashmir, Nepal, Pakistan].

Cyrtomium macrophyllum is both sexual and apomictic.

14. *Cyrtomium muticum* (Christ) Ching in C. Christensen, Index Filic., Suppl. 3: 66. 1933.

钝羽贯众 dun yu guan zhong

Cyrtomium falcatum (Linnaeus f.) C. Presl var. *muticum* Christ, Notul. Syst. (Paris) 1(2): 37. 1909; *C. macrophyllum* (Makino) Tagawa f. *muticum* (Christ) Ching & K. H. Shing.

Plants 30–45 cm tall. Rhizome erect, densely covered with lanceolate blackish brown scales. Stipe stramineous, ca. 25 cm, 3–4 mm in diam. at base, lower portion densely scaly; scales blackish brown, ovate or lanceolate, dentate, often twisted. Lamina oblong-lanceolate, up to 50 × 20 cm, base not contracted, 1-imparipinnate, apex obtuse; rachis with lanceolate to linear blackish brown scales. Lateral pinnae 8–10 pairs, slightly ascendant, shortly stalked, basal pairs not contracted, remaining pinnae ovate or suboblong; basal pinnae up to 10 × 8 cm, base rounded-cuneate to cuneate and often symmetrical, margins undulate or subentire, apex acuminate or acute and shortly cau-

date; terminal pinna ovate or rhombic-ovate, forked or trifurcate, 10–16 × 10–12 cm; hard papery, sometimes with sparse lanceolate brown microscales abaxially, glabrous adaxially; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form multiple rows of areoles. Sori throughout abaxial surface of pinnae; indusia entire.

- Forests; ca. 2000 m. ?Sichuan, Yunnan.

Cyrtomium muticum is usually treated as a synonym of *C. macrophyllum*, but it has more pairs of pinnae per lamina and its pinnae are rounded-cuneate to cuneate at base. Interestingly, *C. muticum* has different *rbcl* and *trnL-F* sequences from the latter. However, its distribution is insufficiently known. More studies are needed.

15. *Cyrtomium tukusicola* Tagawa, Acta Phytotax. Geobot. 7(2): 79. 1938.

齿盖贯众 chi gai guan zhong

Cyrtomium macrophyllum (Makino) Tagawa var. *tukusicola* (Tagawa) Tagawa.

Plants 40–60 cm tall. Rhizome erect, densely covered with lanceolate blackish brown scales. Stipe stramineous, 18–28 cm, 2–3 mm in diam. at base, lower portion densely scaly; scales blackish brown, ovate or lanceolate, toothed, often twisted. Lamina oblong-ovate to oblong-lanceolate, 24–50 × 14–20 cm, base not contracted or slightly wider, 1-imparipinnate, apex obtuse; rachis with sparse lanceolate to linear brown scales. Lateral pinnae 2–8 pairs, alternate, slightly ascendant, shortly stalked, basal 1 or 2 pairs ovate and larger, remaining pinnae oblong-lanceolate or narrowly ovate, entire, sometimes acroscopic margins sparsely serrulate; middle pinnae 11–15 × 3–5 cm, base broadly cuneate or rounded-cuneate, apex acuminate or caudate; terminal pinna obovate or rhombic-ovate, forked or trifurcate, 7–14 × 4–10 cm; hard papery, glabrous on both surfaces; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form multiple rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins finely dentate.

Forests; 1000–2600 m. Chongqing (Nanchuan), Guizhou (Fanjing Shan, Kaili), Hunan (Longshan, Sangzhi), Sichuan (Cangxi, Emei, Leibo), C Taiwan, Yunnan (Yangbi), Zhejiang (Qingyuan) [Japan].

Cyrtomium tukusicola is an apomictic species and is sometimes treated as a variety of *C. macrophyllum*.

16. *Cyrtomium atropunctatum* Sa. Kurata, Sci. Rep. Yokosuka City Mus. 8: 46. 1964.

黑点贯众 hei dian guan zhong

Cyrtomium fortunei J. Smith var. *atropunctatum* (Sa. Kurata) K. Iwatsuki.

Plants up to 80 cm tall. Rhizome erect, densely covered with brown scales. Stipe stramineous, up to 35 cm, 3–4 mm in diam. at base, lower portion densely scaly; scales brown, ovate, ovate-lanceolate, or lanceolate, ca. 5 × 1.2 mm, margins irregularly ciliate, apex caudate. Lamina oblong-lanceolate, up to 54 × 18 cm, base slightly contracted, 1-imparipinnate, apex obtuse; rachis with sparse lanceolate or linear brown scales. Lateral pinnae 15–20 pairs, alternate, nearly spreading, shortly

stalked, lanceolate; middle pinnae 9–12 × 2.3–2.7 cm, slightly oblique at base, serrate, acroscopic margins cuneate and without auricles, basisopic margins cuneate, apex acuminate; terminal pinna ovate-lanceolate, sometimes lower portion with 1 or 2 lobes, 5–8 × 1.8–2.5 cm; papery, abaxially with linear microscales, glabrous adaxially; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 5 or 6 rows of areoles. Sori dense on abaxial surface of pinnae, pinna apices often sterile; indusia blackish brown at center, brown at edge, lacerate.

Forests; ca. 2000 m. Taiwan (Yilan) [S Japan].

Cyrtomium atropunctatum is an apomictic species.

Sometimes, this species is recognized as a variety, *Cyrtomium fortunei* var. *atropunctatum*.

17. *Cyrtomium omeiense* Ching & K. H. Shing, Acta Phytotax. Sin., Addit. 1: 36. 1965.

峨眉贯众 e mei guan zhong

Cyrtomium caudatum Ching & K. H. Shing; *C. coriaceum* Ching & K. H. Shing; *C. falcipinnum* Ching & K. H. Shing; *C. hunanense* Ching & K. H. Shing.

Plants 40–60 cm tall. Rhizome erect, densely covered with lanceolate blackish brown scales. Stipe stramineous, 20–30 cm, 3–4 mm in diam. at base, lower portion densely scaly; scales brown or dark brown, ovate or lanceolate, dentate. Lamina oblong to oblong-lanceolate, 32–60 cm, base not contracted, 1-imparipinnate, apex obtuse; rachis with sparse lanceolate or linear brown scales. Lateral pinnae 4–9 pairs, alternate, slightly ascendant, shortly stalked, elliptic or oblong-lanceolate; middle pinnae 12–15 × 3–3.5 cm, base cuneate to broadly cuneate, margins entire or acroscopic margins serrulate, apex acuminate; terminal pinna obovate or rhombic-ovate, forked or trifurcate, 10–13 × 6–10 cm; papery, glabrous on both surfaces; venation pinnate, indistinct or slightly raised on both surfaces, veinlets anastomosing to form 7 or 8 rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins denticulate.

- Broad-leaved forests, meadows; 700–2500 m. Guizhou, W Hubei, Hunan (Huaihua), Sichuan, C Taiwan, SE Xizang (Zayü).

Cyrtomium omeiense is a sexual and apomictic species.

18. *Cyrtomium urophyllum* Ching, Bull. Chin. Bot. Soc. 2(2): 101. 1936.

线羽贯众 xian yu guan zhong

Cyrtomium salicipinnum Ching & K. H. Shing.

Plants 50–100 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 24–48 cm, 3–5 mm in diam. at base, lower portion densely scaly; scales brown, ovate or lanceolate, dentate. Lamina oblong-lanceolate, 34–70 cm, base slightly contracted, 1-imparipinnate, apex obtuse; rachis with sparse lanceolate or linear brown scales. Lateral pinnae 8–13 pairs, alternate, slightly ascendant, shortly stalked, linear-lanceolate; middle pinnae 9–20 × 1.5–2.5 cm, base cuneate, margins entire or acroscopic margins serrulate, apex acuminate

or caudate; terminal pinna obovate or rhombic-ovate, forked or trifurcate, 6–10 × 4–9 cm; papery, glabrous on both surfaces, adaxially with raised dots corresponding to abaxial pits containing sori; venation pinnate, indistinct or slightly raised on both surfaces, veinlets anastomosing to form multiple rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins denticulate or subentire. $2n = 82^*$.

• By streams in broad-leaved evergreen forests; 500–1700 m. Guangxi (Longsheng), Guizhou, Hunan (Jingxian, Xuefeng Shan), Sichuan (Daxiangling, Emei, Leibo, Pingshan), Yunnan (Suijiang).

Cyrtomium urophyllum is a species with sexual and apomictic forms.

19. *Cyrtomium taiwanianum* Tagawa, Acta Phytotax. Geobot. 7(2): 78. 1938.

台湾贯众 tai wan guan zhong

Polystichum taiwanianum (Tagawa) C. M. Kuo [“*taiwanense*”].

Rhizome not seen. Stipe stramineous, ca. 25 cm, sparsely scaly; scales brown, lanceolate or filiform, margins subentire. Lamina oblong, ca. 30 × 15 cm, 1-imparipinnate; rachis with sparse filiform scales. Lateral pinnae 6 or 7 pairs, alternate, slightly ascendant, shortly stalked, oblong-lanceolate, lower pinnae 12–15 × 2.5–3 cm, base broadly cuneate to cuneate, margins serrulate, apex acuminate; terminal pinna oblong, ca. 10 cm, unlobed; papery; venation distinct abaxially, veinlets anastomosing to form ca. 5 rows of areoles. Sori in 5 or 6 irregular rows; indusia raised on center, margins entire.

• Forests; (800–)1400–1900 m. Taiwan.

Cyrtomium taiwanianum is a sexual species. The epithet has sometimes been corrected to “*taiwanense*,” but the original epithet “*taiwanianum*” is not incorrect.

20. *Cyrtomium latifalcatum* S. K. Wu & Mitsuta, Acta Phytotax. Geobot. 36(1–3): 22. 1985.

宽镰贯众 kuan lian guan zhong

Plants 20–30 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 10–12 cm, 2–3 mm in diam. at base, lower portion densely scaly; scales brown or blackish brown, ovate or lanceolate, margins dentate. Lamina broadly lanceolate, 17–22 × 6–9 cm, base slightly contracted, 1-imparipinnate, apex acute; rachis with linear brown scales or glabrous. Lateral pinnae 5–8 pairs, alternate, nearly spreading, shortly stalked, ovate, rarely broadly lanceolate; middle pinnae 4.5–5.5 × 2–3 cm, base oblique, acroscopic margins subtruncate, basispic margins rounded-cuneate, margins with inconspicuous small blunt teeth, apex acuminate; terminal pinna broadly ovate, lower portion forked or trifurcate, 6–7 × 3–5 cm; papery, glabrous on both surfaces; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 3 or 4 rows of areoles. Sori throughout abaxial surface of pinnae; indusia not seen.

• Broad-leaved evergreen forests; ca. 600 m. Yunnan (Xishuangbanna).

Cyrtomium latifalcatum is a sexual species.

21. *Cyrtomium fortunei* J. Smith, Ferns Brit. For. 286. 1866.

贯众 guan zhong

Aspidium falcatum (Linnaeus f.) Swartz var. *fortunei* (J. Smith) Makino; *Cyrtomium falcatum* (Linnaeus f.) C. Presl var. *polypterum* (Diels) C. Christensen; *C. fortunei* f. *latipinna* Ching; *C. fortunei* f. *polypterum* (Diels) Ching; *C. recurvum* Ching & K. H. Shing ex K. H. Shing; *C. shandongense* J. X. Li; *Phanerophlebia fortunei* (J. Smith) Copeland; *Polystichum falcatum* (Linnaeus f.) Diels var. *fortunei* (J. Smith) Matsumura; *P. falcatum* f. *polypterum* Diels; *P. fortunei* (J. Smith) Nakai.

Plants 25–50 cm tall. Rhizome erect, densely covered with brown scales. Stipe stramineous, 12–26 cm, 2–3 mm in diam. at base, lower portion densely scaly; scales brown, sometimes with a dark brown central stripe, ovate or lanceolate, dentate. Lamina oblong-lanceolate, 20–42 × 8–14 cm, base not contracted or slightly contracted, 1-imparipinnate, apex obtuse; rachis with sparse lanceolate or linear brown scales. Lateral pinnae 7–16(–29) pairs, alternate, nearly spreading, shortly stalked, lanceolate, ± falcate; middle pinnae 5–8 × 1.2–2 cm, base oblique, acroscopic margins subtruncate and sometimes with weak, blunt auricles, basispic margins cuneate, margins entire or sometimes serrulate, apex acuminate or rarely caudate; terminal pinna ovate-lanceolate, sometimes lower portion with 1 or 2 lobes, 3–6 × 1.5–3 cm; papery, glabrous on both surfaces; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 4 or 5 rows of areoles on each side of midrib, each areole with 1 or 2 included free veinlets. Sori throughout abaxial surface of pinnae; indusia grayish, margins entire.

Limestone crevices in open areas or forests; 100–2400 m. Anhui, Chongqing (Fengjie, Nanchuan), Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hebei (Nanwutai Shan), Henan, Hubei, Hunan, Jiangsu, Jiangxi (Jincheng, Xiushui), Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [NE India (Manipur), Japan, S Korea, Nepal, Thailand, N Vietnam; introduced and locally naturalized in Europe and North America].

Cyrtomium fortunei is an apomictic species.

Sometimes three varieties, *Cyrtomium fortunei* var. *fortunei*, *C. fortunei* var. *clivicola* (Makino) Tagawa (*C. clivicola* (Makino) Tagawa), and *C. fortunei* var. *intermedium* Tagawa are recognized (e.g., Nakaike, New Fl. Jap. Pterid. 354–456. 1992), but it is obvious that var. *intermedium* should be recognized as a species, i.e., *C. yamamotoi*.

Nakaike (loc. cit.: 840) elevated *Cyrtomium fortunei* f. *laetevirens* Hiyama (1953) to *C. laetevirens* (Hiyama) Nakaike. Some additional authors recognize this taxon as a species. Iwashina et al. (Biochem. Syst. Ecol. 34: 14–24. 2006) isolated C-methylflavonones from this taxon with four flavonol glycosides and some C-glycosylflavones, which were not found in *C. fortunei*. This phytochemical evidence supports the recognition of this taxon. More studies are needed to clarify this taxon’s status.

Two recently described species, *Cyrtomium confertiserratum* J. X. Li, H. S. Kung & X. J. Li (Pl. Diversity Resources 34(1): 17. 2012) and *C. reflexosquamatum* J. X. Li & F. Q. Zhou (Pl. Diversity Resources 34(1): 19. 2012), might be conspecific with *C. fortunei*, but more studies are needed.

22. *Cyrtomium yamamotoi* Tagawa, Acta Phytotax. Geobot. 7(3): 187. 1938.

阔羽贯众 kuo yu guan zhong

Cyrtomium caryotideum (Wallich ex Hooker & Greville) C. Presl var. *intermedium* (Diels) C. Christensen; *C. falcatum* (Linnaeus f.) C. Presl var. *acuminatum* (Diels) C. Christensen; *C. falcatum* var. *intermedium* (Diels) C. Christensen; *C. fortunei* J. Smith f. *intermedium* (Tagawa) Ching; *C. fortunei* var. *intermedium* Tagawa; *C. macrophyllum* (Makino) Tagawa var. *acuminatum* (Diels) Tagawa; ?*C. macrophyllum* var. *simadae* Tagawa; *C. mediocre* Ching & K. H. Shing; *C. muticum* (Christ) Ching f. *acuminatum* (Diels) Ching; *C. muticum* f. *intermedium* (Diels) Ching; *C. simile* Ching; *C. yamamotoi* var. *intermedium* (Diels) Ching & K. H. Shing; *Polystichum acuminatum* (Diels) C. M. Kuo; *P. falcatum* Diels f. *acuminatum* Diels; *P. falcatum* f. *intermedium* Diels.

Plants 40–104 cm tall. Rhizome erect, densely covered with lanceolate blackish brown scales. Stipe stramineous, 22–30(–50) cm, 2–3 mm in diam. at base, densely scaly; scales blackish brown, or blackish brown with a brown edge, ovate or lanceolate, denticulate. Lamina ovate or ovate-lanceolate, 22–44(–54) × 12–18(–30) cm, base slightly contracted, 1-impairipinnate, apex obtuse; rachis with sparse, lanceolate, blackish brown or brown scales. Lateral pinnae 4–14 pairs, alternate, slightly ascendant, shortly stalked, lanceolate or broadly lanceolate, ± falcate; middle pinnae 8–12(–17.5) × 3–3.6 cm, base rounded-cuneate or inequilateral and broadly cuneate, acroscopic margins with semicircular or acute auricles, margins entire or distally denticulate, apex acuminate or caudate; terminal pinna ovate or rhombic-ovate, forked or trifurcate, 8–12 × 6–8 cm; papery, glabrous on both surfaces; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 3 or 4 rows of areoles. Sori throughout abaxial surface of pinnae; indusia dark brown in center, margins with incised teeth. $2n = 123$.

Forests; 400–2100 m. Anhui (Huangshan), Chongqing, S Gansu, Guangxi, Guizhou, Henan, Hubei (Jianshi, Junxian), Hunan (Dayong, Shimen), Jiangxi (Lushan), S Shaanxi, Sichuan, ?Taiwan, Yunnan, Zhejiang [Japan].

Cyrtomium yamamotoi is a sexual and apomictic species.

23. *Cyrtomium confertifolium* Ching & K. H. Shing, Acta Phytotax. Sin., Addit. 1: 24. 1965.

密羽贯众 mi yu guan zhong

Plants 60–70 cm tall. Rhizome erect, densely covered with ovate-lanceolate brown scales. Stipe stramineous, 24–26 cm, 3–4 mm in diam. at base, densely scaly; scales brown, with a dark brown center, ovate or lanceolate, margins toothed. Lamina oblong-lanceolate, 52–65 × 16–20 cm, base not contracted, 1-impairipinnate, apex acute; rachis with lanceolate or linear brown scales. Lateral pinnae 20–22 pairs, spreading, shortly stalked, lanceolate or broadly lanceolate, falcate; middle pinnae 9–10 × 1.8–2 cm, base oblique, acroscopic margins truncate and with triangular auricles, basiscopic margins broadly cuneate, margins often serrulate, apex acuminate; terminal pinna rhombic-ovate, lower portion with 1 or 2 shallow lobes, ca. 4 × 3 cm; papery, glabrous on both surfaces; venation pinnate,

slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 3 or 4 rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins entire.

• Among shrubs, forests; 1100–1200 m. E Guizhou (Wanshan), W Hunan, Jiangxi (Lushan), Zhejiang (Longquan).

24. *Cyrtomium conforme* Ching, Acta Phytotax. Sin., Addit. 1: 23. 1965.

福建贯众 fu jian guan zhong

Plants ca. 60 cm tall. Rhizome not seen. Stipe stramineous, ca. 23 cm, ca. 3 mm in diam. at base, base scaly; scales yellowish brown, with brown middle or distal portions, ovate or lanceolate, margins toothed. Lamina lanceolate, 44–48 × 12–14 cm, base slightly contracted, 1-impairipinnate, apex acute; rachis glabrous. Lateral pinnae 11–14 pairs, alternate, ascendant, shortly stalked, lanceolate; middle pinnae 7–8 × 2–2.2 cm, base oblique, acroscopic margins truncate and sometimes slightly auriculate, basiscopic margins broadly cuneate, margins entire or denticulate, apex acuminate; terminal pinna lanceolate, lower portion forked, 5–6 × 2–3 cm; papery, glabrous on both surfaces; venation pinnate, indistinct on both surfaces, veinlets anastomosing to form 2 or 3 rows of areoles. Sori 2 or 3 rows on each sides of midrib; indusia margins entire or with inconspicuous small teeth.

• On rocks in forests. Fujian (Liancheng).

25. *Cyrtomium tsinglingense* Ching & K. H. Shing, Acta Phytotax. Sin., Addit. 1: 41. 1965.

秦岭贯众 qin ling guan zhong

Cyrtomium megaphyllum Ching & K. H. Shing; *C. moupinense* Ching & K. H. Shing.

Plants 40–80 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 18–36 cm, 3–4 mm in diam. at base, lower portion densely scaly; scales dark brown, ovate or lanceolate, margins toothed, often twisted. Lamina oblong or oblong-lanceolate, 30–60 × 15–26 cm, base not contracted or slightly wider middle pinnae, 1-impairipinnate, apex obtuse; rachis covered with lanceolate to linear brown scales. Lateral pinnae 5–7 pairs, alternate, slightly ascendant, shortly stalked, basal 1 or 2 pairs ovate and often larger, others oblong-lanceolate; middle pinnae 11–20 × 3.5–5 cm, base broadly cuneate or rounded-cuneate, serrulate, acroscopic margins slightly auriculate, apex acuminate or acute and caudate; terminal pinna broadly obovate, forked or trifurcate, 9–15 × 6–9 cm; hard papery, abaxially with lanceolate brown microscales, glabrous adaxially; venation pinnate, slightly raised on both surfaces, veinlets anastomosing to form multiple rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins entire.

• Broad-leaved forests, *Abies* forests; 500–2400 m. Gansu (Kangxian), Guangxi (Longlin), Guizhou (Fanjing Shan), Shaanxi (Foping), Sichuan (Baoping, Emei), Yunnan.

Cyrtomium tsinglingense is an apomictic species.

26. *Cyrtomium caryotideum* (Wallich ex Hooker & Greville) C. Presl, Tent. Pterid. 86. 1836.

刺齿贯众 ci chi guan zhong

Aspidium caryotideum Wallich ex Hooker & Greville, Icon. Filic. 1: t. 69. 1828; *A. falcatum* (Linnaeus f.) Swartz var. *caryotideum* (Wallich ex Hooker & Greville) Baker; *Cyrtomium caducum* (Wallich ex Hooker & Greville) T. Moore subvar. *hastosum* (Christ) H. Léveillé; *C. caryotideum* f. *attenuatum* (T. Moore) Ching; *C. caryotideum* var. *attenuatum* T. Moore; *C. caryotideum* f. *grossedentatum* Ching; *C. caryotideum* f. *hastosum* (Christ) Ching; *C. caryotideum* subvar. *hastosum* Christ; *C. falcatum* (Linnaeus f.) C. Presl var. *caryotideum* (Wallich ex Hooker & Greville) Beddome; *C. falcatum* subvar. *hastosum* Christ; *Dryopteris caryotideum* (Wallich ex Hooker & Greville) Underwood ex A. Heller; *Polystichum caryotideum* (Wallich ex Hooker & Greville) Diels; *P. falcatum* (Linnaeus f.) Diels var. *caryotideum* (Wallich ex Hooker & Greville) Matsu-mune.

Plants 30–60 cm tall. Rhizome erect, densely covered with lanceolate blackish brown scales. Stipe stramineous, 16–32 cm, 2–3 mm in diam. at base, lower portion densely scaly; scales blackish brown or brown with a central blackish brown stripe, ovate or lanceolate, margins ciliate. Lamina oblong or oblong-lanceolate, 25–48 × 12–18 cm, base not contracted or slightly contracted, 1-impairipinnate, apex obtuse; rachis with sparse linear brown scales. Lateral pinnae 3–7 pairs, alternate, slightly ascendant, shortly stalked, deltoid-lanceolate, often falcate; middle pinnae 9–14 × 2.5–3.5 cm, base broadly cuneate or rounded-cuneate, acroscopic margins with long, acute auricles, margins serrulate, apex acuminate and often caudate; terminal pinna ovate or rhombic-ovate, forked or trifurcate, 10–16 × 8–11 cm; hard papery, abaxially with sparse lanceolate brown microscales, glabrous adaxially; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form multiple rows of areoles on each side of midrib, each areole in proximal row with 1 included veinlet, each areole in other rows with 2 or 3 included veinlets. Sori throughout abaxial surface of pinnae; indusia white or light brown, margins toothed.

Forests; 600–2700 m. Chongqing, S Gansu, N Guangdong, Guangxi, Guizhou, W Hubei, Hunan, Jiangxi (Jinggangshan), S Shaanxi, SW and W Sichuan, Taiwan, Xizang (Bomi, Gyirong, Médog), Yunnan [Bhutan, India, Japan, Nepal, Pakistan, Philippines, Vietnam].

Cyrtomium caryotideum is an apomictic species.

27. *Cyrtomium membranifolium* Ching & K. H. Shing ex H. S. Kung & P. S. Wang, Chin. J. Appl. Environm. Biol. 3(1): 24. 1997.

膜叶贯众 mo ye guan zhong

Plants ca. 40 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, ca. 15 cm, ca. 2 mm in diam. at base, lower portion densely scaly; scales dark brown, ovate or lanceolate, margins toothed. Lamina oblong-lanceolate, ca. 34 × 12 cm, base slightly contracted, 1-impairipinnate, apex obtuse. Lateral pinnae 6 pairs, alternate, slightly ascendant, shortly stalked, ovate or oblong-ovate; middle pinnae 9–10 × 3.5–4 cm, base broadly cuneate or rounded-cuneate, margins serrulate, apex acute or caudate; terminal pinna ovate or broadly ovate, forked or trifurcate, 6–9 × 6–7 cm; herbaceous, glabrous on both surfaces; venation pinnate, conspicuous on both surfaces, veinlets anastomosing to form multiple rows of

areoles. Sori throughout abaxial surface of pinnae; indusia margins denticulate.

• Forests; 1000–1300 m. Hubei (Shennongjia).

28. *Cyrtomium serratum* Ching & K. H. Shing, Acta Phytotax. Sin., Addit. 1: 38. 1965.

尖齿贯众 jian chi guan zhong

Cyrtomium ovale Ching & K. H. Shing.

Plants 25–50 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 10–18 cm, ca. 2 mm in diam. at base, lower portion scaly; scales brown, ovate or lanceolate, margins toothed. Lamina lanceolate, 22–40 × 10–12 cm, base slightly wider, 1-impairipinnate, apex acute; rachis glabrous. Lateral pinnae 8–13 pairs, alternate, slightly ascendant, shortly stalked, ovate; middle pinnae 5.5–7 × 2.2–3 cm, base oblique, serrulate, acroscopic margins truncate, basisopic margins broadly cuneate, apex acute or acuminate; terminal pinna ovate or rhombic-ovate, forked or not forked, 4–5 × 2.2–3 cm; papery, glabrous on both surfaces; venation pinnate, conspicuous on both surfaces, veinlets anastomosing to form 3 rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins entire.

• Forests; 200–700 m. Hunan (Yuelu Shan), Sichuan (Emei).

Cyrtomium serratum is an apomictic species.

29. *Cyrtomium anomophyllum* (Zenker) Fraser-Jenkins, Taxon. Revis. Indian Subcontinental Pteridophytes, 330. 2008.

奇叶贯众 qi ye guan zhong

Aspidium anomophyllum Zenker, Pl. Ind. 1: 1. 1835; *Cyrtomium beddomei* S. R. Ghosh; *C. brevicuneatum* Ching & K. H. Shing; *C. caryotideum* (Wallich ex Hooker & Greville) C. Presl var. *anomophyllum* (Zenker) T. Moore; *C. kansuense* Ching & K. H. Shing; *C. kungshanense* Ching & K. H. Shing; *C. microindusium* Sa. Kurata; *C. neocaryotideum* Ching & K. H. Shing; *C. nervosum* Ching & K. H. Shing; *C. shunningense* Ching & K. H. Shing; *C. yuanum* Ching & K. H. Shing; *Polystichum anomophyllum* (Zenker) Nakai; *P. nervosum* (Ching & K. H. Shing) C. M. Kuo.

Plants 25–70 cm tall. Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, 14–55 cm, 2–4 mm in diam. at base, lower portion scaly; scales brown, ovate or lanceolate, margins toothed. Lamina oblong or oblong-lanceolate, 18–44 × 10–16 cm, base slightly contracted or not contracted, 1-impairipinnate, apex obtuse; rachis covered with lanceolate or linear curved brown scales or glabrous. Lateral pinnae 3–6 pairs, alternate, slightly ascendant, shortly stalked, ovate, broadly lanceolate, or oblong-lanceolate; middle pinnae 7–15 × 2.5–4.5 cm, base broadly cuneate or rounded-cuneate, serrulate, acroscopic margins with weakly developed semicircular auricles, apex acuminate or slightly caudate; terminal pinna broadly obovate, obovate, or ovate, forked or trifurcate, 6–13 × 5–11 cm; hard papery or papery, glabrous on both surfaces; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form multiple rows of areoles. Sori throughout abaxial surface of pinnae; indusia dark, margins entire.

Forests; 1700–2800 m. W Sichuan (Muli), Taiwan, Xizang (Nyalam), NW Yunnan (Gongshan, Weixi, Zhenkang) [Bhutan, India, Japan, Nepal, Pakistan].

This species had been referred to *Cyrtomium nervosum* Ching & K. H. Shing (Fraser-Jenkins, Pakistan Syst. 5: 85–120. 1992; Kung et al., FRPS 5(2): 214. 2001) until Fraser-Jenkins's new combination.

There is cytological evidence showing that *Cyrtomium brevicuneatum*, *C. kansuense*, *C. kungshanense*, *C. neocaryotideum*, *C. nervosum*, and *C. yunnanense* are all conspecific with *C. anomophyllum*. While *C. brevicuneatum*, *C. kungshanense*, and *C. yunnanense* are the sexual forms, *C. kansuense*, *C. neocaryotideum*, and *C. nervosum* are apomictic forms (Matsumoto et al., 5th Symp. Asian Pteridol. Fern Show: Progr. & Abstr. 2010).

The sexual diploids have been discovered only in Sichuan and Yunnan, while apomictic triploids are spread all over the region. This implies that *Cyrtomium anomophyllum* may have originated in SW China and became dispersed throughout Sino-Japanese, Sino-Himalayan regions and India following the evolution of apomictic forms (Matsumoto et al., loc. cit.).

Two myricetin glycosides, the 3-O-glucoside and the 3-O-rhamnosylglucoside, were isolated from Japanese samples of *Cyrtomium anomophyllum*. However, they were absent from Nepalese, Taiwanese, mainland Chinese, and Pakistani samples, implying the heterogeneity in chemical constituents between the Japanese populations and those in the remaining regions.

This species is intermediate between *Cyrtomium caryotideum* and the entire (or rarely weakly toothed at the apices) *C. macrophyllum*. It is distinguished by its lower pinnae being very rounded and often bent at their basiscopic bases, with the margins rather weakly toothed, mainly toward the apices, sometimes becoming entire below (Fraser-Jenkins, Taxon. Revis. Indian Subcontinental Pteridophytes, 330. 2008).

Cyrtomium maximum Ching & K. H. Shing (Acta Phytotax. Sin., Addit. 1: 44. 1965), described from Simao, S Yunnan, is based on a single sterile frond. It is most similar to *C. anomophyllum*, but more studies are needed.

30. *Cyrtomium aequibasis* (C. Christensen) Ching, Bull. Chin. Bot. Soc. 2(2): 99. 1936.

等基贯众 deng ji guan zhong

Cyrtomium caryotideum (Wallich ex Hooker & Greville) C. Presl var. *aequibasis* C. Christensen, Amer. Fern J. 20(2): 51. 1930; *C. cuneatum* Ching; *C. houi* Ching.

Plants 30–50 cm tall. Rhizome erect, densely covered with lanceolate blackish brown scales. Stipe stramineous, 22–36 cm,

2–3 mm in diam. at base, lower portion scaly; scales blackish brown, ovate or lanceolate, margins ciliate, often twisted. Lamina oblong or oblong-lanceolate, 30–40 × 12–20 cm, base not contracted, 1-imparipinnate, apex obtuse; rachis with sparse linear curved brown scales or glabrous. Lateral pinnae 4–6 pairs, alternate, slightly ascendant, shortly stalked, lanceolate; middle pinnae 10–16 × 2.2–3.5 cm, base cuneate, margins serrulate, apex acuminate or caudate; terminal pinna ovate or rhombic-ovate, forked or trifurcate, 11–13 × 5–8 cm; papery or hard papery, glabrous on both surfaces; venation pinnate, slightly raised on both surfaces, veinlets anastomosing to form 3–5 rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins toothed. $2n = 123^*$.

• Limestone rocks in forests; 600–2000 m. Chongqing, Guizhou (Duyun), Sichuan, Yunnan (Longling, Maguan, Mengzi, Wenshan).

Cyrtomium aequibasis is a sexual and apomictic species.

31. *Cyrtomium yunnanense* Ching, Acta Phytotax. Sin., Addit. 1: 45. 1965.

云南贯众 yun nan guan zhong

Cyrtomium longipes Ching & K. H. Shing; *C. spectabile* Ching.

Plants up to 1 m tall. Rhizome not seen. Stipe stramineous, 40–55 cm, 3–5 mm in diam. at base, lower portion densely scaly; scales brown, ovate or lanceolate, margins toothed. Lamina oblong or oblong-lanceolate, 25–50 × 15–25 cm, base slightly contracted, 1-imparipinnate, apex obtuse; rachis glabrous. Lateral pinnae 4–6 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, falcate; middle pinnae 10–18 × 2.2–4 cm, base rounded-cuneate or broadly cuneate, serrulate, acroscopic margins ± decurrent to pinna stipe, apex acuminate; terminal pinna ovate, forked, 8–11 × 3–6 cm; hard papery, glabrous on both surfaces; venation pinnate, indistinct on both surfaces, veinlets anastomosing to form 5 or 6 rows of areoles. Sori throughout abaxial surface of pinnae; indusia margins entire.

• Forests; 1600–3000 m. C and S Yunnan.

The name *Cyrtomium longipes* was sunk into synonymy of *C. nervosum* Ching & K. H. Shing in FRPS (5(2): 214. 2001). Following Matsumoto et al. (J. Plant Res. Suppl. 119: 57. 2006), it is conspecific with *C. yunnanense*.

Cyrtomium yunnanense is an apomictic triploid.

4. DRYOPTERIS Adanson, Fam. Pl. 2: 20, 551. 1763, nom. cons.

鳞毛蕨属 lin mao jue shu

Wu Sugong (武素功), Xiang Jianying (向建英), Lu Shugang (陆树刚), Wang Faguo (王发国), Xing Fuwu (邢福武), Dong Shiyong (董仕勇), He Hai (何海), Zhang Libing (张丽兵); David S. Barrington, Maarten J. M. Christenhusz

Plants terrestrial, medium-sized. Rhizome erect or obliquely ascending, short, stout, rarely widely creeping, woody, dictyostelic, apex densely scaly; scales ferruginous, castaneous, brown, or black, glossy, ovate, broadly lanceolate, ovate-lanceolate, or lanceolate, entire or sparsely dentate or fimbriate, thick, consisting of slender, opaque cells with thick flexuose cell walls. Fronds caespitose or approximate, rarely remote, sometimes spirally arranged, segments catadromously or rarely anadromously arranged; stipe not articulate, with several separate vascular bundles, scaly, scales similar to those on rhizome, sometimes without scales on upper part of stipe; lamina broadly lanceolate, oblong, ovate, deltoid-ovate, or pentagonal, variously dissected, apex gradually reduced, rarely im-

paripinnate, once pinnate to quadripinnate or quinquepinnatifid; pattern of pinnation catadromous above base, commonly \pm scaly, rarely glabrous; scales linear to lanceolate, bullate or flat, base cordate or truncate, apex subulate, entire or fimbriate on edges; rachis with longitudinal groove adaxially; ultimate segment base rounded and equilateral or rarely cuneate and inequilateral, margin usually serrate, rarely spinulose. Lamina papery or subleathery, rarely herbaceous, with or without hairs or setae adaxially, scaly, glabrous or with glands abaxially; costae and costules canaliculate adaxially and rising from rachis at \pm acute angle; veins always free, pinnate or simple and undivided in once pinnate or bipinnatifid fronds, 2- or 3-forked in decompound fronds, all terminating in a prominent spindle-shaped hydathode short of frond margin. Sori orbicular, dorsal or rarely terminal on veins or veinlets, indusiate, rarely exindusiate; apophyses prominent or not; indusia persistent, superior or inferior, sessile or with a long stalk, orbicular-reniform to reniform or orbicular, rarely horseshoe-shaped, globose or subglobose, generally entire, smooth, rarely glandular or very rarely with erose margin, brownish, somewhat thick, sometimes thinly leathery, attached by a deep sinus on veins or veinlets. Spores monolete, surface verrucose or with broadly winged wall. $n = 41$.

About 400 species: widely distributed in both hemispheres, mainly in Asia, especially from the Himalaya to China, Japan, and Korea; 167 species (60 endemic) in four subgenera in China.

The generic delimitation of *Dryopteris* adopted here follows the most recent molecular analysis, which discovered that *Acrophorus*, *Acrorumohra*, *Diacalpe*, *Dryopsis*, *Nothoperanema*, and *Peranema* were embedded within a paraphyletic *Dryopteris* and thus should all be merged into *Dryopteris* (Li Bing Zhang et al., BMC Evol. Biol. 12: 180. 2012). Most species of these genera share a short rhizome and catadromous arrangement of frond segments, unlike the sister genus of *Dryopteris* s.l., *Arachniodes*.

- 1a. Lamina once imparipinnate, apical pinna similar to lower ones (1. *D.* subg. *Pycnopteris*).
- 1b. Lamina once pinnate to quadripinnate or quinquepinnatifid, pinnae near apex gradually reduced to a pinnatifid apex.
 - 2a. Fronds with non-glandular hairs; indusia orbicular or reniform, inferior or superior (4. *D.* subg. *Nothoperanema*).
 - 3a. Indusia superior (above sori), flat, and reniform 19. *D.* sect. *Nothoperanema*
 - 3b. Indusia inferior (beneath sori), globose or semiglobose.
 - 4a. Pinnae and pinnules of every order with or without a large cordate or ovate-lanceolate and often persistent scale at base; indusia membranous, semiglobose, indehiscent; lower portion of sporangiate stalk with a few multicellular clavate septate paraphyses; scales at base of stipe with multicellular clavate appendages on margin 20. *D.* sect. *Acrophorus*
 - 4b. Pinnae and pinnules of every order without a large cordate scale at base; indusia leathery, globose, often splitting into 2 or 3 valves upon maturity; lower portion of sporangiate stalk with single-celled clavate septate paraphyses or without any paraphyses; scales at base of stipe with single-celled clavate appendages on margin or without any appendages.
 - 5a. Sori sessile; lower portion of sporangiate stalk with single-celled clavate septate paraphyses; scales at base of stipe with entire margins 21. *D.* sect. *Diacalpe*
 - 5b. Sori stalked; lower portion of sporangiate stalk without any paraphyses; scales at base of stipe with single-celled clavate appendages on margin 22. *D.* sect. *Peranema*
- 2b. Fronds without hairs or with glandular or non-glandular hairs; indusia reniform, superior.
 - 6a. Scales bullate (broad-based scales with ciliate apices) on stipe, rachis, and especially on costa and costule; if scales flat then grooves of pinna rachis and pinnule rachis closed near their bases and fronds with multicellular non-glandular hairs (*D.* sect. *Dryopsis*), or frond segments anadromously arranged (*D.* sect. *Acrorumohra*), or stipe and rachis scales stiff and narrowly lanceolate and filiform (*D. liboensis*) (3. *D.* subg. *Erythrovariae*).
 - 7a. Frond segments anadromously arranged 17. *D.* sect. *Acrorumohra*
 - 7b. Frond segments catadromously arranged.
 - 8a. Grooves of pinna rachis and pinnule rachis closed near their bases and fronds with multicellular non-glandular hairs 18. *D.* sect. *Dryopsis*
 - 8b. Grooves of pinna rachis and pinnule rachis connected near their bases and fronds without hairs.
 - 9a. Lamina pentagonal-ovate, usually tripinnate; lowest basicopic pinnule on lowest pinna markedly longer than those above; pinnule caudate and acutely pointed 16. *D.* sect. *Variae*
 - 9b. Lamina lanceolate or ovate-lanceolate, usually pinnate to bipinnate; lowest basicopic pinnule on lowest pinna not markedly longer than those above; pinnule not caudate, rounded.
 - 10a. Upper stipe with many small scales; scales on base of stipe lanceolate, brown or light brown 14. *D.* sect. *Erythrovariae*
 - 10b. Upper stipe glabrous; scales on base of stipe linear-lanceolate, black or very dark brown 15. *D.* sect. *Indusiate*
 - 6b. Scales flat, not bullate on stipe and rachis (2. *D.* subg. *Dryopteris*).
 - 11a. Segments asymmetrical at base.
 - 12a. Lamina broadly lanceolate, basal pinnae symmetrical.

- 13a. Lamina tripinnatifid, with acute tooth on apex of segment 10. *D. sect. Remotae*
- 13b. Lamina bi- to quadripinnatifid, without acute tooth on apex of segment 11. *D. sect. Splendentes*
- 12b. Lamina triangular, basal pinnae asymmetrical, basiscopic basal pinnule proliferated.
- 14a. Lamina tri- to quadripinnate, stipe base scales filiform, golden 12. *D. sect. Purpurascentes*
- 14b. Lamina bi- to tripinnate, stipe base scales lanceolate or ovate-lanceolate, brown 13. *D. sect. Nephrocystis*
- 11b. Segments symmetrical at base.
- 15a. Lamina once pinnate, pinnae entire to deeply pinnatifid.
- 16a. Pinnae entire to lobed, veins simple, basal veins of a segment (or at least acroscopic one) terminating \pm halfway to segment margin 1. *D. sect. Hirtipedes*
- 16b. Pinnae pinnatifid or becoming nearly twice pinnate (at least several basal pairs), veins forked, rarely simple, terminating at segment margin.
- 17a. Indusia membranous or strombuliform, \pm thick, surrounding sporangia even when ripe 2. *D. sect. Pandae*
- 17b. Indusia not surrounding sporangia when ripe, sometimes deciduous.
- 18a. Scales filiform or linear on rachis, costa, and abaxial surface of lamina 3. *D. sect. Fibrillosae*
- 18b. Scales lanceolate on rachis, costa, and abaxial surface of lamina 4. *D. sect. Dryopteris*
- 15b. Lamina twice pinnate or more dissected.
- 19a. Lamina bipinnatifid, pinnules serrate.
- 20a. Margin of pinnule or segment with long, acute teeth; indusia margin lacerate or erose 5. *D. sect. Caespitosae*
- 20b. Margin of pinnule or segment without long, acute teeth; indusia entire, cartilaginous 6. *D. sect. Pallidae*
- 19b. Lamina tripinnatifid or mostly tripinnatisect to quadripinnatifid.
- 21a. Lamina oblong-lanceolate or broadly triangular, pinnae usually symmetrical 7. *D. sect. Marginatae*
- 21b. Lamina pentagonal, pinnae asymmetrical, basiscopic pinnule of pinnae longer.
- 22a. Pinnae shortly stalked, ultimate segments with long, acute teeth 8. *D. sect. Lophodium*
- 22b. Pinnae long stalked, ultimate segments without long, acute teeth 9. *D. sect. Aemulae*

1. *Dryopteris* subg. *Pycnopteris* (T. Moore) Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 371. 1938.

奇羽亚属 *qi yu ya shu*

Wu Sugong (武素功), Xiang Jianying (向建英); David S. Barrington

Pycnopteris T. Moore, Gard. Chron. 1855: 468. 1855.

Fronds once imparipinnate, terminal pinnae similar to lateral ones.

Five species: mainly in E Asia; five species (three endemic) in China.

This subgenus is apparently not monophyletic following a molecular analysis (Li Bing Zhang et al., BMC Evol. Biol. 12: 180. 2012).

- 1a. Plants 1–2.5 m tall, lateral pinnae 8–14 pairs, herbaceous, 2 or 3 basal pairs of veinlets not reaching margin, margins of pinnae nearly entire or with only shallow, undulate, rounded teeth 1. *D. bodinieri*
- 1b. Plants 0.5–1 m tall, lateral pinnae 1–5 pairs, occasionally a few more, leathery or herbaceous, only basiscopic basal veinlet not reaching margin.
- 2a. Stipe hard, scales black or brown, linear-subulate; pinnae narrow, generally ca. 2 cm wide, thinly leathery, often narrowed toward base 5. *D. podophylla*
- 2b. Stipe weak, scales pale brown or red-brown, lanceolate; pinnae broad, 3–3.5 cm wide, papery, not narrowed toward base.
- 3a. Pinnae 1–3 pairs (sometimes more), with nearly entire or sparse shallow rounded teeth 2. *D. sieboldii*
- 3b. Pinnae 3–5(–7) pairs, with undulate-incised or partite margin.
- 4a. Pinnae undulate-incised, with small rounded teeth 3. *D. enneaphylla*
- 4b. Pinnae undulate-incised, base of apical pinnae partite, segments entire or undulate 4. *D. toyamae*

1. *Dryopteris bodinieri* (Christ) C. Christensen, Index Filic. 254. 1905.

大平鳞毛蕨 *da ping lin mao jue*

Aspidium bodinieri Christ, Bull. Acad. Int. Géogr. Bot. 11: 248. 1902.

Plants 1–2.5 m tall. Rhizome erect, short, densely clothed with broadly lanceolate, brown or dark brown, entire scales.

Fronds caespitose; stipe stramineous, ca. 1/3 as long as lamina, grooved adaxially, base densely clothed with brown or dark brown, lanceolate, entire scales; rachis with narrowly lanceolate, acicular scales; lamina oblong-lanceolate, 55–60 \times 36–40 cm, once imparipinnate, apex acuminate; pinnae 6–10 pairs, oblique, 4–6 cm apart, oblong-lanceolate, 16–20(–30) \times 2.5–4(–6) cm, shortly stalked, apex shortly acuminate, uppermost few pinnae sessile, decurrent along rachis, margin incised-serrate; terminal pinna similar to lower ones but smaller, stalk 1–

1.5 cm. Lamina papery, glabrous on both surfaces; costa impressed into a groove adaxially, raised abaxially; veins pinnate, basal 1 or 2 pairs \pm midway to margin, remainder extending closer to margin. Sori irregularly scattered near both sides of costa, abaxial on veinlets, exindusiate.

• Evergreen forests; 1000–1800 m. Guizhou, Hunan, Sichuan, Yunnan.

2. *Dryopteris sieboldii* (Van Houtte ex Mettenius) Kuntze, Revis. Gen. Pl. 2: 813. 1891.

奇羽鳞毛蕨 *ji yu lin mao jue*

Aspidium sieboldii Van Houtte ex Mettenius, Fil. Hort. Bot. Lips. 87. 1856.

Plants 0.5–1 m tall. Rhizome erect, short, stout; scales of rhizome and lower part of stipe dense, pale brown, lanceolate. Fronds caespitose; stipe dark stramineous or ferruginous, 20–60 cm \times 2–5 mm, subglabrous upward; lamina oblong or deltoid-ovate, 25–40 \times ca. 20 cm, once imparipinnate; pinnae 1–4 pairs, broadly lanceolate or oblong-lanceolate, 15–20 \times 2.5–3.5(–6) cm, base rounded or rounded-cuneate, slightly inequilateral, shortly stalked, apex acuminate, terminal pinna similar but larger and with longer stalks than lower pinnae, pinnae entire or incised-serrate. Lamina thickly leathery, glabrous adaxially, rarely with filiform scales; veins indistinct, pinnate, veinlets simple or forked, 4–6 in pinnate groups, basal one of each group at distal side shorter, remainder extending toward margin. Sori abaxial in middle of veinlets, in 3 or 4 irregular rows along both sides of costa; indusia reniform, entire.

Forests; 400–900 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Zhejiang [Japan].

3. *Dryopteris enneaphylla* (Baker) C. Christensen, Index Filic. 263. 1905.

宜昌鳞毛蕨 *yi chang lin mao jue*

Plants 0.5–1 m tall. Rhizome erect, short, stout; scales of rhizome and lower part of stipe dense, brownish black, lanceolate. Fronds caespitose; stipe dark stramineous or fulvous, 20–60 cm \times 2–5 mm, subglabrous upward; lamina deltoid-oblong, 25–40 \times ca. 30 cm, once imparipinnate; pinnae 3–8 pairs, broadly lanceolate or oblong-lanceolate, 15–20 \times 2–3.5(–6) cm, base rounded or rounded-cuneate, slightly inequilateral, apex acuminate, basal pinnae with short stalks, terminal pinna similar to lower ones, with a large auriculate lobe at base, all pinnae undulate-dentate or lobed. Lamina papery, glabrous adaxially, rarely with linear scales; veins inconspicuous, pinnate, 4–6 in pinnate groups, acroscopic basal veinlet shorter, others extending to margin. Sori in 3 or 4 irregular rows along both sides of costa, nearer to margin than to costa; indusia reniform, entire.

• Forests, damp places; (200–)500–1900 m. Hubei, Taiwan, Zhejiang.

1a. Lateral pinnae 3 or 4 pairs; fertile pinnae 2.5–3.5(–6) cm wide, sterile pinnae 2.5–4(–6) cm wide; stipe with brownish black, narrowly lanceolate scales at base 3a. var. *enneaphylla*

1b. Lateral pinnae 4–8 pairs; fertile pinnae 2–2.5 cm wide, sterile pinnae ca. 4 cm wide; stipe with brown, narrowly lanceolate scales at base

..... 3b. var. *pseudosieboldii*

3a. *Dryopteris enneaphylla* var. *enneaphylla*

宜昌鳞毛蕨(原变种) *yi chang lin mao jue* (yuan bian zhong)

Nephrodium enneaphyllum Baker, J. Bot. 25: 170. 1887.

Stipe with brownish black, narrowly lanceolate scales at base; lateral pinnae 3 or 4 pairs; fertile pinnae 2.5–3.5(–6) cm wide, sterile pinnae 2.5–4(–6) cm wide.

• Forests, damp places; 500–1400 m. Hubei (Yichang), Taiwan, Zhejiang.

3b. *Dryopteris enneaphylla* var. *pseudosieboldii* (Hayata) Tagawa & K. Iwatsuki, Amer. Fern J. 50: 102. 1960.

大宜昌鳞毛蕨 *da yi chang lin mao jue*

Dryopteris pseudosieboldii Hayata, Icon. Pl. Formosan. 4: 171. 1914.

Stipe with brown, narrowly lanceolate scales at base; lateral pinnae 4–8 pairs; fertile pinnae 2–2.5 cm wide, sterile pinnae ca. 4 cm wide.

• (200–)900–1900 m. Taiwan.

Dryopteris heteroneura (Tagawa) Ching (Bull. Fan Mem. Inst. Biol., Bot. 8: 398. 1938; *D. sieboldii* var. *heteroneura* Tagawa, J. Jap. Bot. 12: 487. 1936, type from Taiwan (Taito)), is referable to *D. enneaphylla* var. *pseudosieboldii*.

4. *Dryopteris toyamae* Tagawa, Acta Phytotax. Geobot. 8: 167. 1939.

裂羽鳞毛蕨 *lie yu lin mao jue*

Dryopteris enneaphylla (Baker) C. Christensen var. *toyamae* (Tagawa) W. C. Shieh.

Plants ca. 60 cm tall. Rhizome ascending, stout, densely scaly. Fronds caespitose, dimorphic; stipe stramineous, (10–)20–30 cm, densely scaly at base; scales ferruginous, oblong-lanceolate to subulate, membranous, entire, acuminate, lower ones up to 2 cm \times 5 mm. Fertile fronds: lamina oblong, 20–30 \times 20–25 cm, leathery, rachis with sparse linear and fibriform scales, once imparipinnate; pinnae 5 or 6 pairs, spreading or oblique, remote, lanceolate, ca. 15 \times 2 cm, glabrous adaxially, with sparse fibriform scales abaxially, base cordate or truncate, with short stalk, margin deeply pinnatifid to coarsely crenate, apex acuminate; pinna lobes ovate-oblong, apex obtuse or rounded, entire or sparsely dentate, basal segments of pinnae remote, terminal pinna lanceolate, 10–15 cm, base up to 4 cm wide and lobed almost to pinna costa, deeply pinnate upward. Sterile fronds shorter than fertile ones; stipe 10–15 cm; lamina deltoid, 25–30 cm, base 30–40 cm wide; pinnae 4(–7) pairs, spreading, approximate, with short stalk, basal pinnae 15–20 \times 2.5–4 cm. Sori scattered on both sides of costa.

Forests on mountain slopes; 2000–2500 m. Taiwan (Hualian, Nantou, Taizhong) [Japan].

5. *Dryopteris podophylla* (Hooker) Kuntze, Revis. Gen. Pl. 2: 813. 1891.

柄叶鳞毛蕨 *bing ye lin mao jue*

Aspidium podophyllum Hooker, Hooker's J. Bot. Kew Gard. Misc. 5: 236. 1853; *Nephrodium podophyllum* (Hooker) Hooker.

Plants 40–60 cm tall. Rhizome erect, stout, densely scaly; scales of rhizome and lower part of stipe brownish black, subulate, apex fibrillose. Fronds caespitose; stipe stramineous, 15–20 cm, glabrous upward or rarely with scales; lamina ovate, 20–

25 × 15–20 cm, once imparipinnate; pinnae 4–8 pairs, oblique, shortly stalked, lanceolate, 10–13 × 1.5–2 cm, base rounded or subcordate, subentire or slightly undulate-dentate, with cartilaginous edges, apex acuminate, terminal pinna like other pinnae. Lamina papery or thinly leathery; rachis and costa sparsely brown, fibrillose scaly abaxially; veins pinnate, lateral veins forked, 3 or 4 in pinnate groups, developed only near margin except distal basal one. Sori irregularly scattered in 2 or 3 rows between costa and pinna margin, developed only near costa; indusia dark brown, reniform, thick, persistent.

• Forests, streamsides; 700–1500 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan.

2. *Dryopteris* subg. *Dryopteris*

平鳞亚属 *ping lin ya shu*

Wu Sugong (武素功), Xiang Jianying (向建英); David S. Barrington

Plants clothed with flat, lanceolate or fibrillose scales.

About 200 species: widely distributed in the N temperate zone; 92 species (27 endemic) in 13 sections in China.

This subgenus is apparently not monophyletic following a molecular analysis (Li Bing Zhang et al., BMC Evol. Biol. 12: 180. 2012).

1. *Dryopteris* sect. *Hirtipedes* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 190. 1986.

毛柄鳞毛蕨组 *mao bing lin mao jue zu*

Lamina 1-pinnate. Pinnae lanceolate, shallowly incised or pinnately lobed to middle of pinnae. Lateral veins single, basal pair or upper veinlets short, only reaching middle of pinnae. Sori with or without indusia.

About 23 species: E and S Asia, with China and Japan as the center of diversity; 22 species (nine endemic) in China.

1a. Sori exindusiate; scale margin entire.

2a. Pinnae usually ca. 10 pairs (sometimes fewer); stipe and rachis sparsely clothed with black or brown-black, linear-lanceolate scales 6. *D. scottii*

2b. Pinnae up to 20 pairs; stipe and rachis densely clothed with dark brown or brown, broadly lanceolate scales 7. *D. liangkhwangensis*

1b. Sori indusiate; scale margin fimbriate or entire.

3a. Sori in 1 or 2 rows on each side of costa.

4a. Pinna base cordate, apex rounded; stipe and rachis clothed with black, nodose setae 8. *D. cyclopettidiformis*

4b. Pinna base rounded, apex acuminate; stipe and rachis without nodose setae 9. *D. hangchowensis*

3b. Sori in more than 3 rows, rarely 1 or 2 rows.

5a. Sori marginal or submarginal.

6a. Sori marginal 10. *D. handeliana*

6b. Sori submarginal.

7a. Scales on stipe black, linear-lanceolate 11. *D. namegatae*

7b. Scales on stipe brown or pale brown 12. *D. dickinsii*

5b. Sori broadly distributed abaxially.

8a. Pinnae crenate to shallowly pinnatifid.

9a. Stipe with brown scales.

10a. Sori close to costa, with wide sterile belt on both sides of costa distal to sori; rachis densely clothed with scales 18. *D. pycnopteroides*

10b. Sori medial in segments, with narrow sterile belt on both sides of costa distal to sori; rachis sparsely clothed with scales 19. *D. subpycnopteroides*

9b. Stipe with black or brownish black scales.

11a. Lowest few pinnae shorter, often deflexed 13. *D. cycadina*

11b. Lowest pinnae not shorter or slightly shorter, not deflexed.

12a. Pinnae 30–40 pairs, crenulate 17. *D. stenolepis*

12b. Pinnae ca. 20 pairs, shallowly pinnatifid.

13a. Indusia vestigial, not covering sori; pinnae shortly stalked, herbaceous 16. *D. commixta*

13b. Indusia covering sori completely; pinnae sessile, papery.

- 14a. Pinnae acuminate, not auriculate at pinna base 14. *D. atrata*
 14b. Pinnae caudate, auriculate at both sides of pinna base 15. *D. wuyishanica*
- 8b. Pinnae pinnatifid and basally pinnatisect.
- 15a. Segments broadly triangular, with a cartilaginous margin; sori 5–7 pairs, arranged on both sides of costa in a V-pattern on each pinna 20. *D. thibetica*
- 15b. Segments oblong, without a cartilaginous margin; sori in 2–6 rows along pinna rachis.
- 16a. Scales on rachis almost black 21. *D. lunanensis*
 16b. Scales on rachis brown or dark brown.
- 17a. Scales on stipe and rachis subulate to narrowly lanceolate 22. *D. microlepis*
 17b. Scales on stipe and rachis lanceolate to linear.
- 18a. Pinnae ca. 17 pairs 25. *D. paralunanensis*
 18b. Pinnae 20–40 pairs.
- 19a. Pinnae serrate-dentate, only lower pinnae pinnatifid; rachis sparsely scaly 23. *D. subatrata*
- 19b. Pinnae usually lobed halfway to costa; rachis densely scaly.
- 20a. Lamina 50–60 × ca. 25 cm, base truncate; pinnae ca. 20 pairs 24. *D. pseudolunanensis*
- 20b. Lamina larger than 60 × 24 cm, narrowed at base; pinnae 20–40 pairs.
- 21a. Pinnae to 25 pairs; pinna lobes to 15(–20) pairs 26. *D. jiucaipingensis*
 21b. Pinnae 30–40 pairs; pinna lobes to 25 pairs 27. *D. conjugata*

6. *Dryopteris scottii* (Beddome) Ching ex C. Christensen, Bull. Dept. Biol. Sun Yatsen Univ. 6: 3. 1933.

无盖鳞毛蕨 wu gai lin mao jue

Polypodium scottii Beddome, Ferns Brit. India 2: t. 345. 1870; *Dryopteris hirtipes* (Blume) Kunze var. *exinvoluta* (C. B. Clarke) Panigrahi & S. K. Basu; *D. nigrisquama* Hayata; *D. nigrisquama* f. *subdecipiens* (Hayata) H. Itô; *D. subdecipiens* Hayata; *Nephrodium hirtipes* (Blume) Hooker var. *exinvoluta* C. B. Clarke; *Phegopteris scottii* (Beddome) Beddome.

Plants 50–80 cm tall. Rhizome erect, short, stout; scales of rhizome and lower part of stipe dense, brownish black, lanceolate, serrulate. Fronds caespitose; stipe stramineous, 18–35 cm, sparsely scaly from middle part of stipe to rachis; scales brownish black, subulate-lanceolate, crenulate; lamina oblong or deltoid-ovate, 25–45 × 15–25 cm, once pinnate, base not or slightly gradually narrowed, apex acuminate; pinnae 10–16 pairs, lanceolate or oblong-lanceolate, 10–12 × 1.5–3 cm, base rounded-truncate, shortly stalked or sessile, margin spreading sinuate-crenate, apex acuminate. Lamina herbaceous, glabrous adaxially, with 1 or 2 fibrillose scales on costa and veinlets abaxially, with brownish black or brown, linear, crenulate scales along abaxial side of rachis; veins slightly visible, lateral veins pinnate-forked, 3–7 in pinnate groups. Sori below middle of veinlets, in 2 or 3(or 4) irregular rows on both sides of costa, exindusiate.

Forests; 500–2400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Japan, Myanmar, Nepal, Thailand, Vietnam].

Phegopteris grossa Christ (Bull. Herb. Boissier 7: 13. 1899; *Dryopteris grossa* (Christ) C. Christensen), described from Yunnan (Mengtze), was placed here in FRPS.

7. *Dryopteris liangkwanensis* Ching, Icon. Filic. Sin. 4: t. 180. 1937 [*“liankwanensis”*].

两广鳞毛蕨 liang guang lin mao jue

Plants up to 1.5 m tall. Rhizome erect or creeping; scales of rhizome and lower part of stipe dense, dark brown, oblong-lanceolate, entire, acuminate. Fronds caespitose; stipe stramineous, ca. 50 cm, ca. 1 cm in diam. at base, densely clothed with brown, oblong-lanceolate or lanceolate scales; lamina oblong-lanceolate, 80–100 × ca. 40 cm, once pinnate, base not narrowed or slightly narrowed, apex acuminate; pinnae ca. 30 pairs, spreading, remote, lanceolate, middle pinnae 16–20 cm, widest at base, 2–3 cm wide, base truncate, sessile, margin incised or lobed, apex acuminate; lobe apices obtuse, entire. Lamina herbaceous, glabrous on both surfaces, with dark brown, lanceolate, fibrillose scales along rachis and costa; lateral veins pinnate, not forked, raised on both surfaces. Sori abaxial on veinlets, 3 or 4 pairs on each lobe, exindusiate.

Forests, wet ravines; 600–1700 m. Guangdong, Guangxi, SE Yunnan [Vietnam].

8. *Dryopteris cyclopeltidiformis* C. Christensen, Dansk Bot. Ark. 9: 60. 1937.

弯羽鳞毛蕨 wan yu lin mao jue

Plants ca. 40 cm tall. Rhizome widely creeping, scaly; scales brownish, subulate. Fronds caespitose; stipe dark brown, 15–20 cm × ca. 3 mm, slightly glossy with brownish and lanceolate scales and setae; lamina ovate-lanceolate, 20–25 × 8–9 cm, once pinnate, base not or slightly narrowed, apex acuminate; pinnae 10 or 11 pairs, oblique, falcate, 3–5 × ca. 1 cm, margin incised-dentate above, entire and slightly auriculate at base, apex acute; pinna stalks ca. 2 mm, basal pinnae sometimes shorter than others and slightly retroflexed. Lamina thinly to thickly papery, subglabrous on both surfaces; rachis clothed with linear, dark brown or brownish black, nodose, broad-based scales; veins pinnate, inconspicuous on both surfaces. Sori in 1 row on both sides of costa, indusiate but indusia small and falling off earlier, with rounded, stalked, peltate paraphyses.

Dense forests, wet ravines; 1100–1200 m. Hainan [Vietnam].

Dryopteris cyclopeltidiformis appears quite unusual in the genus as it differs from other species in having nodose setae on the stipe and rachis and sori with peltate paraphyses. The taxonomic position of this species needs further research.

9. *Dryopteris hangchowensis* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 414. 1938.

杭州鳞毛蕨 hang zhou lin mao jue

Plants 35–60 cm tall. Rhizome erect, short, densely scaly; scales brownish black, lanceolate. Fronds caespitose; stipe dark stramineous, 7–20 cm, densely clothed with black, linear-lanceolate scales; lamina lanceolate, 28–40 × 10–15 cm, once pinnate, not gradually narrowed to base, apex abruptly caudate-acuminate; pinnae 18–20 pairs, lanceolate, 5–8 × 1–1.2 cm, base rounded, shortly stalked, apex acuminate; segments obliquely oblong, apex with 2 or 3 sharp teeth, basal segments nearly free. Lamina herbaceous; rachis densely clothed with linear, black scales; rachis and veins sparsely clothed with black, fimbriate scales abaxially; veins pinnate, 3–5 pairs on each ultimate segment, simple, acropetal basal vein extending below sinus, others extending to margin. Sori abaxial on veinlets, in 2 irregular rows on both sides of costa; indusia brown, reniform, papery, persistent.

Forests, wet places; below 100–400 m. NE Zhejiang [Japan].

10. *Dryopteris handeliana* C. Christensen, Dansk Bot. Ark. 9: 62. 1937.

边生鳞毛蕨 bian sheng lin mao jue

Plants 35–60 cm tall. Rhizome erect; scales of rhizome and lower part of stipe dense, brown, lanceolate, entire. Fronds caespitose; stipe stramineous, 10–15 cm, sparsely scaly upward; lamina oblong-lanceolate, 20–40 × 10–15 cm, once pinnate, base slightly narrowed, apex abruptly caudate; pinnae 15–20 pairs, spreading, approximate, lanceolate, 5–8 × ca. 1.5 cm, apex acuminate or obtuse-acuminate, margin incised-dentate, teeth ascendant, with sharp apex. Lamina papery, both surfaces glabrous; rachis sparsely clothed with lanceolate, brown, entire scales; veins pinnate, not forked, one vein reaching sinus, others extending to margin, grooved adaxially, raised abaxially, conspicuous on both surfaces. Above middle of fertile frond, sori in 1 or 2 irregular rows, restricted to a narrow band along margin; indusia brown, orbicular-reniform.

Forests, wet places; 400–1000 m. Guizhou, Hubei, Hunan, Sichuan, Yunnan, Zhejiang [Japan].

11. *Dryopteris namegatae* (Sa. Kurata) Sa. Kurata, J. Geobot. 17: 87. 1969.

黑鳞远轴鳞毛蕨 hei lin yuan zhou lin mao jue

Dryopteris dickinsii (Franchet & Savatier) C. Christensen var. *namegatae* Sa. Kurata, J. Geobot. 7: 115. 1958; *D. infra-uberula* Ching, Boufford & K. H. Shing.

Plants 25–80 cm tall. Rhizome erect, short, densely clothed with broadly lanceolate, dark brown scales. Fronds caespitose; stipe dark stramineous or fulvous, 12–35 cm, clothed throughout rachis with lanceolate or narrowly lanceolate, black, dentate scales; lamina oblong-lanceolate, 15–45 ×

12–18 cm, widest at middle, once pinnate, base slightly narrowed, apex narrowed and shortly acuminate; pinnae 15–30 pairs, alternate, spreading, lanceolate, middle pinnae 6–9 × 1.1–1.4 cm, base rounded-truncate or truncate, sessile, margin coarsely dentate, apex acute to acuminate, several lower pinnae slightly shortened. Lamina papery, sparsely clothed with black scales on midrib abaxially; veins pinnate, lateral veins pinnate, not forked, grooved adaxially, raised abaxially, reaching margin. Sori in 2 or 3 irregular rows on each side of midrib, borne on upper part of veinlets and near margin; indusia brown, orbicular-reniform, entire.

Forests; 400–1200 m. Gansu, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan].

12. *Dryopteris dickinsii* (Franchet & Savatier) C. Christensen, Index Filic. 262. 1905.

远轴鳞毛蕨 yuan zhou lin mao jue

Aspidium dickinsii Franchet & Savatier, Enum. Pl. Jap. 2: 236, 629. 1879; *Nephrodium dickinsii* (Franchet & Savatier) Baker.

Plants up to 45 cm tall. Rhizome erect, short, densely clothed with lanceolate, brown scales. Fronds caespitose; stipe stramineous or brown, ca. 17 cm, basally with broadly lanceolate scales, gradually narrowed upward; lamina oblong-lanceolate, ca. 30 cm, 10–15 cm wide at base, once pinnate, apex acuminate; pinnae ca. 17 pairs, alternate, spreading, shortly stalked, lanceolate, middle pinnae 4–7 × 1–1.5 cm, base truncate, margin coarsely dentate to 1/3 pinnatifid, apex acute or acuminate, several lower pinnae slightly shortened. Lamina thin to thickly papery; rachis and pinna rachis sparsely clothed with linear-lanceolate, brown scales abaxially; veins pinnate, lateral veins 3–5 in groups, extending to margin. Sori in 2 or 3 irregular rows on each side of midrib, nearer to margin than costa, on middle to upper part of veinlets; indusia orbicular-reniform, entire.

Broad-leaved evergreen forests; 700–2500 m. Anhui, Fujian, Guangxi, Guizhou, Hubei, Jiangxi, Sichuan, NC Taiwan, Yunnan, Zhejiang [India, Japan].

13. *Dryopteris cycadina* (Franchet & Savatier) C. Christensen, Index Filic. 260. 1905.

桫欏鳞毛蕨 suo luo lin mao jue

Aspidium cycadinum Franchet & Savatier, Enum. Pl. Jap. 2: 236, 630. 1879; *Dryopteris fengyangshanensis* Ching & C. F. Zhang; *D. longirostrata* Ching ex K. H. Shing & J. F. Cheng; *D. pseudatrata* Ching; *D. rigidiuscula* Ching ex K. H. Shing & J. F. Cheng.

Plants up to 50 cm tall. Rhizome and stipe base erect, short, stout, densely clothed with linear-lanceolate, sparsely ciliate, brownish black scales. Fronds caespitose; stipe dark purplish brown, ca. 15 cm, sparsely clothed upward with scales similar to those on rhizome and stipe base; lamina lanceolate or elliptic-lanceolate, 30–35 cm, up to ca. 10 cm wide at middle, once pinnate, base slightly narrowed, apex acuminate; pinnae ca. 20 pairs, alternate, slightly oblique, falcate-lanceolate, middle pinnae longer than others, ca. 6 × 1.2 cm, base truncate,

very shortly stalked, margin pinnatifid to parted, apex acuminate, lowest several pinnae slightly shortened, slightly reflexed, basal pinna ca. 3.5 cm; segments suboblong, serrulate, rounded at apex. Lamina thinly papery, both surfaces subglabrous; rachis densely clothed with linear, brownish black, ciliate scales, pinna rachis sometimes sparsely scaly abaxially; veins pinnate, simple. Sori on middle of veinlets, scattered on each side of costa; indusia orbicular-reniform, entire.

Mixed forests; 1400–3200 m. Fujian, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan].

14. *Dryopteris atrata* (Wallich ex Kunze) Ching, *Sinensia* 3: 326. 1933.

暗鳞毛蕨 an lin lin mao jue

Aspidium atratum Wallich ex Kunze, *Linnaea* 24: 279. 1851; *Dryopteris hirtipes* (Blume) Kunze subsp. *atrata* (Wallich ex Kunze) Fraser-Jenkins; *D. hirtipes* var. *atrata* (Wallich ex Kunze) C. Christensen; *Nephrodium atratum* (Wallich ex Kunze) Handel-Mazzetti.

Plants 50–60 cm tall. Rhizome erect, short, densely clothed with lanceolate, brown scales. Fronds caespitose; stipe stramineous, 20–30 cm, base densely clothed with lanceolate, brownish black scales, upper portion toward rachis densely clothed with linear or subulate, brownish black, ciliate scales; lamina lanceolate or broadly lanceolate, up to 30 cm, ca. 15 cm wide at middle, once pinnate, base not narrowed; pinnae ca. 20 pairs, nearly spreading, lanceolate, middle pinnae 8–10 × 1.2–1.5 cm, base truncate, sessile, margin coarsely dentate to pinnately lobed, apex acuminate. Lamina papery; pinna rachis and veins sparsely clothed with brownish black scales abaxially; lateral veins simple. Sori on middle of veinlets, scattered on each side of costa; indusia orbicular-reniform.

Broad-leaved evergreen forests; 500–2300 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

15. *Dryopteris wuyishanica* Ching & P. S. Chiu, *Bot. Res. Acad. Sin.* 2: 34. 1987.

武夷山鳞毛蕨 wu yi shan lin mao jue

Plants up to 1 m tall. Stipe pale brown or stramineous, ca. 44 cm, ca. 2 mm in diam., base sparsely clothed with lanceolate, dark brown scales; lamina oblong-lanceolate, ca. 59 × 24 cm, once pinnate, not narrowed to base; pinnae ca. 25 pairs, spreading, approximate, sessile, middle pinnae lanceolate, ca. 11 × 1.7 cm, base rounded, margin pinnatifid, apex caudate, basal pinnae not shortened. Lamina papery, glabrous; rachis sparsely clothed with linear, black scales; lateral veins 4 or 5, simple, basal pair ending short of margin. Sori in 2 irregular rows on each side of costa; indusia brown, orbicular-reniform, thin, fugacious.

• Forests. Fujian (Wuyi Shan).

16. *Dryopteris commixta* Tagawa, *Acta Phytotax. Geobot.* 2: 190. 1933.

混淆鳞毛蕨 hun xiao lin mao jue

Dryopteris shangqianensis Ching & Z. Y. Liu; *D. sino-dickinsii* Ching ex K. H. Shing & J. F. Cheng.

Plants 50–90 cm tall. Rhizome creeping; scales of rhizome and stipe base dense, black or dark brown, lanceolate, subentire. Fronds approximate; stipe stramineous, ca. 25 cm, upper portion with sparse linear-lanceolate, dark brown scales; lamina lanceolate or elliptic-lanceolate, 35–50 cm, middle portion ca. 25 cm wide, slightly narrowed to base, apex acuminate, bipinnatifid; pinnae 15–20 pairs, alternate, slightly oblique, lanceolate, middle ones longest, ca. 15 × 1.2 cm, base rounded-truncate, sessile or subsessile, apex acuminate, lower ones slightly shortened and reflexed, 6–7 cm; segment apex entire, beak-shaped, sparsely serrulate. Lamina papery, glabrous adaxially, sparsely fibriform-scaly along lateral veins abaxially; rachis densely clothed with linear, ciliate, dark brown scales; veins pinnate, lateral ones simple, inconspicuous adaxially, distinct abaxially. Sori scattered on distal portion of veinlets; indusia orbicular-reniform, membranous, entire, fugacious.

Forests, shaded wet places; ca. 400 m. Fujian, Guangxi, Jiangxi, Sichuan, Zhejiang [Japan].

17. *Dryopteris stenolepis* (Baker) C. Christensen, *Index Filic.* 294. 1905.

狭鳞毛蕨 xia lin lin mao jue

Polypodium stenolepis Baker, *Bull. Misc. Inform. Kew* 1898: 231. 1898; *Dryopteris atrata* (Kunze) Ching var. *stenolepis* (Baker) Tagawa; *D. gamblei* (C. Hope) C. Christensen; *D. hirtipes* (Blume) Kunze var. *stenolepis* (Baker) C. Christensen; *Nephrodium gamblei* C. Hope; *Thelypteris stenolepis* (Baker) C. F. Reed.

Plants up to 1 m tall. Rhizome erect or obliquely ascending, apex with dense, linear to broadly lanceolate, entire, brown scales. Fronds caespitose; stipe ca. 40 cm, ca. 7 mm in diam., base gray-brown, distally pale brown, with dense lanceolate, brown or dark brown scales; lamina oblong-lanceolate, up to 70 × ca. 28 cm, once pinnate, base not shortened, apex acuminate; pinnae 30–40 pairs, lower ones opposite, upper ones alternate, narrowly lanceolate, ca. 15 × 2 cm, base rounded, margin coarsely dentate or lobed, apex caudate-acuminate. Lamina nearly papery, subglabrous adaxially, clothed with subulate, serrulate, brownish black scales along costa abaxially; veins pinnate, lateral ones simple, distinct on both surfaces. Sori in 3 or 4 rows on each side, nearer to costa than margin; indusia brown, membranous, readily deciduous.

Streamsides in forests, slopes; 700–2200 m. Gansu (Wenxian), Guangxi, Sichuan, C and NC Taiwan, Xizang, Yunnan [Bhutan, India, Nepal].

18. *Dryopteris pycnopteroides* (Christ) C. Christensen, *Index Filic., Suppl.* 1906–1912: 38. 1913.

密鳞毛蕨 mi lin lin mao jue

Aspidium pycnopteroides Christ, *Bull. Acad. Int. Géogr. Bot.* 16: 116. 1906.

Plants 60–100 cm tall. Rhizome erect, densely clothed

with ovate-lanceolate, brown scales. Fronds caespitose; stipe brown or stramineous at base, 20–30 cm, densely clothed with ovate, entire, glossy, brown scales, these usually appressed but lanceolate and spreading upward; lamina lanceolate, 40–70 × 15–20 cm, once pinnate, base slightly narrowed, apex acuminate; pinnae 18–30 pairs, remote (lower ones 3–4 cm apart), lanceolate, 10–13 × 1.5–2.5 cm, base truncate, shortly stalked, apex acuminate or caudate-acuminate; apex of segments with 1 or 2 beak-shaped teeth. Lamina herbaceous or papery, both surfaces glabrous; rachis and costa clothed with lanceolate or linear, brown scales abaxially; veins pinnate, 3 or 4 pairs on each segment, not forked, slightly grooved adaxially, distinctly raised abaxially. Sori 2 or 3 pairs on each segment, abaxial on veins, nearer to costa than to margin; indusia orbicular-reniform, membranous, entire, readily deciduous at maturity.

• Streamsides in forests; 1800–2800 m. Guizhou, Hubei, Sichuan, NE and NW Yunnan [Japan].

Dryopteris sunii Ching (Bull. Fan Mem. Inst. Biol., n.s., 1: 295. 1949), described from Sichuan, was treated as a synonym of *D. pycnopteroides* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 212. 1986).

19. *Dryopteris subpycnopteroides* Ching ex Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 199. 1986.

近密鳞毛蕨 jin mi lin lin mao jue

Plants 80–100 cm tall. Rhizome erect, densely clothed with ovate-lanceolate, brown scales. Fronds caespitose; stipe brown or stramineous at base, 1/4–1/3 as long as lamina, densely clothed with lanceolate, entire, brown scales, these usually appressed; lamina lanceolate, 40–70 × 15–25 cm, once pinnate, base not narrowed, apex acuminate; pinnae 18–30 pairs, remote (lower ones 3–4 cm apart), lanceolate, 10–13 × 1.5–2.5 cm, base truncate, shortly stalked, apex acuminate or caudate-acuminate; segment apices with 1 or 2 beak-shaped teeth. Lamina herbaceous or papery, both surfaces glabrous; rachis and costae clothed with lanceolate or linear, brown scales abaxially, much denser at base of costa; veins pinnate, 3 or 4 pairs per segment, slightly grooved adaxially, distinctly raised abaxially. Sori abaxial on veins and distant from costa; indusia orbicular-reniform, membranous, entire, readily deciduous at maturity.

• Broad-leaved evergreen forests; 2300–2800 m. NW Yunnan.

Dryopteris subpycnopteroides, now only found in NW Yunnan, is most closely related to *D. pycnopteroides* in general characters, from which it differs in its lamina not narrowed to the base and sori distant from the costa.

20. *Dryopteris thibetica* (Franchet) C. Christensen, Index Filic. 298. 1905.

陇蜀鳞毛蕨 long shu lin lin mao jue

Aspidium thibeticum Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 10: 118. 1887; *Lastrea thibetica* (Franchet) Beddome; *Nephrodium thibeticum* (Franchet) Baker.

Plants up to 50 cm tall. Rhizome erect or obliquely ascending, short, apex densely clothed with lanceolate, brownish black scales. Fronds caespitose; stipe brown when dry, ca. 10 cm × 3 mm, distally densely clothed with lanceolate, dentate,

brown scales; lamina oblong-lanceolate, ca. 40 × 20–25 cm, once pinnate-pinnatifid, narrowed toward base; pinnae ca. 20 pairs, lanceolate, middle ones 10–14 × 2–3 cm, base truncate, apex caudate-acuminate; segments 7–9 pairs, remote, margin narrowly hyaline-membranous, subentire, apex obtuse. Lamina subglabrous adaxially, with lanceolate, brown scales on costae abaxially. Sori 5–7 pairs on each segment nearly to margin, arranged in V-shape; indusia brown, orbicular-reniform, membranous, readily deciduous.

• Forests; 1800–2200 m. Gansu (Wenxian), Sichuan, Yunnan.

21. *Dryopteris lunanensis* (Christ) C. Christensen, Index Filic. 276. 1905.

路南鳞毛蕨 lu nan lin lin mao jue

Aspidium lunanense Christ, Bull. Herb. Boissier 6: 966. 1898; *Dryopteris semipinnata* Ching.

Plants up to 80 cm tall. Rhizome erect, short, densely clothed with lanceolate, brownish black scales. Fronds caespitose; stipe ca. 32 cm, ca. 5 mm in diam. at base, rachis densely clothed with linear-lanceolate, black scales throughout; lamina narrowly ovate, ca. 48 cm, ca. 30 cm wide at middle part, once pinnate-pinnatifid, narrowed toward base, apex acuminate; pinnae ca. 18 pairs, lanceolate, ca. 16 × 2.4 cm, base cuneate, subsessile, apex caudate-acuminate; ultimate segments ca. 7 × 5 mm, apex sharply dentate. Lamina herbaceous, glabrous; costa clothed with lanceolate, black scales abaxially; veins pinnate, simple, distal basal veins not reaching sinus. Sori abaxial on veins, in 1 row on each side of costa; indusia brown, membranous, readily deciduous.

Forests; ca. 900 m. Gansu (Wenxian), Guizhou, Sichuan, Yunnan [Japan].

22. *Dryopteris microlepis* (Baker) C. Christensen, Index Filic., Suppl. 1906–1912: 36. 1913.

细鳞毛蕨 xi lin lin mao jue

Nephrodium microlepis Baker, Bull. Misc. Inform. Kew 1906: 10. 1906; *Dryopteris nakanensis* Ching.

Plants 40–60 cm tall. Rhizome erect or creeping, apex densely clothed with subulate, entire, brown or dark brown scales. Fronds caespitose or approximate; stipe stramineous to pale brown, 10–20 cm × 2–3 mm, base densely clothed with scales; scales readily deciduous, brown, linear-lanceolate, dentate; lamina lanceolate, 25–50 × 10–20 cm, once pinnate, base slightly or not narrowed, apex acuminate or caudate-acuminate; pinnae 12–21 pairs, alternate, oblique, lanceolate, 5–6 × ca. 1 cm, base slightly auriculate or cuneate, shortly stalked, margin pinnately lobed or incised, apex acuminate. Lamina papery, subglabrous except rachis densely clothed with linear-subulate, brown scales and costae with small brown scales abaxially; veins pinnate, 2 or 3 pairs on each segment, simple, obscure on both surfaces. Sori in 2 rows, rarely 1 row on each side of costa; indusia ferruginous, fugacious.

• Broad-leaved evergreen forests; 1200–1600 m. Guizhou, Yunnan.

23. *Dryopteris subatrata* Tagawa, Acta Phytotax. Geobot. 9: 207. 1940.

近暗鳞毛蕨 jin an lin lin mao jue

Plants 30–50 cm tall. Rhizome erect-ascendant, short, densely scaly. Fronds caespitose; stipe stramineous, 25–30 cm, firm, densely scaly; scales fuscous-brown, broadly lanceolate to linear-lanceolate, ca. 1.5 cm, margin ciliate or entire, upper ones linear to filiform; lamina lanceolate to oblong-lanceolate, 30–50 × 10–17 cm, once pinnate, widest at middle, base slightly attenuate, apex acuminate to attenuate; pinnae 25–30 pairs, linear, falcate, base cordate-truncate, slightly auriculate, sessile, margin coarsely serrate-dentate, apex acuminate or acute, rarely obtuse, lower pinnae 5–10 × 1–10 cm, pinnatifid, cut 1/3–1/2 to costa; segments obliquely ovate, ca. 3 mm, slightly serrulate, apex subtruncate. Lamina subleathery, glabrous adaxially; rachis sparsely clothed with linear, brown or fuscous-brown, ciliate scales; veins simple. Sori in 2 or 3 rows on each side of costa; indusia orbicular-reniform, entire, membranous, persistent.

- Forests, steep rocky slopes; 1600–2100 m. C and NC Taiwan.

24. *Dryopteris pseudolananensis* Tagawa, Acta Phytotax. Geobot. 9: 145. 1940.

拟路南鳞毛蕨 ni lu nan lin mao jue

Plants up to 85 cm tall. Rhizome thick, erect, densely scaly. Fronds caespitose; stipe stramineous, ca. 40 cm, base incrassate, basal scales brown or dark brown, lanceolate to subulate, margin entire or remotely fimbriate, upper ones brown or fuscous, narrowly lanceolate to linear-subulate, margin sparsely shortly fimbriate; lamina oblong or ovate-oblong, 50–60 × ca. 25 cm, bipinnatifid, base truncate, apex shortly acuminate; pinnae horizontally patent, ca. 20 pairs, linear-lanceolate, 12–14 × 1.5–2.5 cm, pinnatifid, lobed halfway to costa, pinnatisect at base, base broadly truncate, sessile, apex long acuminate; segments oblong, base broad, margin sharply serrulate, apex obtuse or subtruncate-rounded. Lamina papery, glabrous adaxially, sparsely scaly on costa abaxially; veins 5–7 pairs, simple or bifurcate. Sori 4–8 on each segment, in irregular 2–4 rows on middle of lamina; indusia orbicular-reniform, glabrous, entire.

- Forests; 1500–1800 m. Taiwan (Taidong, Taizhong, Xinzhu).

25. *Dryopteris paralunanensis* W. M. Chu ex S. G. Lu, Guihaia 11: 225. 1991.

假路南鳞毛蕨 jia lu nan lin mao jue

Plants up to 50 cm tall. Rhizome obliquely ascending, clothed with linear-lanceolate, entire, dark brown scales. Fronds caespitose; stipe stramineous, ca. 16 cm, ca. 5 mm in diam. at base, densely clothed with lanceolate, fimbriate, dark brown scales; lamina narrowly ovate-lanceolate, ca. 30 cm, up to 16 cm wide at middle, once pinnate, apex acuminate; pinnae ca. 17 pairs, alternate, lanceolate, ca. 8 × 1.6 cm, shortly stalked, apex acuminate; segments ca. 8 × 5 mm, margin entire, apex dentate. Lamina herbaceous, subglabrous adaxially, with lanceolate, fimbriate, brown scales along rachis and costa; veins pinnate,

lateral ones simple, ca. 5 pairs on each segment. Sori abaxial on lateral veins, in 1 row on each side of costa; indusia pale brown, membranous, entire.

- Broad-leaved evergreen forests; ca. 2800 m. Yunnan (Xinping).

26. *Dryopteris jiucaipingensis* P. S. Wang, Q. Luo & Li Bing Zhang, Novon 22: 183. 2012.

韭菜坪鳞毛蕨 jiu cai ping lin mao jue

Plants perennial, caespitose, ca. 1.1 m tall or more. Rhizome erect, ca. 6 cm, 1.4–2 cm in diam., glabrous. Fronds 15–20 per rhizome; stipe dark brown and glabrate at base, light brown and scaly above, 44–45 cm, 0.8–1 cm wide at base; scales light brown, narrowly lanceolate and filiform, margins slightly ciliate; lamina oblong to narrowly ovate, 1-pinnate, 63–68 cm, 24–27 cm wide at middle, slightly contracted toward base, abruptly narrowed to pinnately acuminate apex; rachis light brown, 3–4 mm in diam., with dense, narrowly lanceolate to linear, filiform scales ca. 7 × 0.9 mm; pinnae 20–25 pairs, narrowly elliptic, herbaceous or thinly papery, slightly ascending, basal 2 or 3 pairs opposite, upper pairs alternate, symmetrical at base and broadly cuneate or shallowly cordate, stalked, lobed shallowly to halfway to pinna rachis (sometimes pinnatifid at pinna bases), acuminate at apex; pinnae at middle of lamina largest, 13–14 × 2.5–3 cm; pinnae in lower part of lamina slightly contracted; basalmost pinnae 10–12 × 2.5–3 cm; pinnae adaxially dark green when dry, glabrous, abaxially yellowish green, with sparse microscales; microscales brown, hair-like, ca. 0.4 mm; pinna rachis with sparse filiform scales; pinna lobes up to 15(–20) pairs, oblong, obtuse and toothed at apex, entire laterally; venation pinnate, lateral veins unbranched on lobes, those on adaxial surface glabrous, those on abaxial surface ± with filiform scales. Sori orbicular, 0.8–1.2 mm in diam., 1–2.8 mm apart from each other, in multiple rows on each side of pinna rachis, in 1 row on each side of vein on lobes, 2–5 per row; sporangia ca. 0.08 mm in diam.; indusia yellowish green when young, dark brown when mature, reniform, 0.4–0.8 mm in diam., thin, persistent.

- Sinkholes; ca. 2500 m. NW Guizhou (Hezhang).

27. *Dryopteris conjugata* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 63. 1941.

连合鳞毛蕨 lian he lin mao jue

Dryopteris subconjugata S. G. Lu.

Plants 80–120 cm tall. Rhizome creeping, densely scaly; scales ferruginous, lanceolate or linear-lanceolate, up to 3 cm. Fronds approximate; stipe dark stramineous, 20–35 cm, base ca. 8 mm in diam., densely scaly; scales dark brown, lanceolate, 2–3 cm, entire, apex fibrillose; lamina lanceolate, 60–70 cm, ca. 28 cm wide at middle, once pinnatifid, lobed halfway toward pinna rachis, base slightly narrowed, apex acuminate; pinnae 30–40 pairs, lanceolate, ca. 14 cm, up to 2 cm wide at middle, narrowed toward base; basal segment broadest, sessile, apex caudate-acuminate. Lamina thinly papery, both surfaces glabrous; rachis densely clothed with linear-lanceolate, entire, dark

brown, lucid scales, pinna rachis clothed with linear, subulate, brown scales widened at base; veins pinnate, simple or forked, barely visible adaxially, raised abaxially. Sori 2 or 3 pairs on each lobe, borne below middle of lobes, between pinna rachis

and margin and closer to former, lobe apex sterile; indusia orbicular-reniform, thin, readily deciduous.

Broad-leaved evergreen forests; 1100–2300 m. NW and SE Yunnan [NW India, Nepal].

2. *Dryopteris* sect. *Pandae* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 191. 1986.

大果鳞毛蕨组 da guo lin mao jue zu

Lamina 1-pinnate, shallowly pinnately lobed or deeply so (at least basal pairs). Lateral veins mostly forked. Indusia large, membranous or conchiform.

About 12 species: widely distributed in the N temperate zone; seven species in China.

- 1a. Stipe and rachis glabrous or with few ovate-lanceolate, brown scales 28. *D. panda*
 1b. Stipe and rachis with numerous pale brown or brown scales.
 2a. Sori in 2 rows close to costa.
 3a. Upper pinnae fertile, lower ones sterile, basal pairs tapered 29. *D. tokyoensis*
 3b. All pinnae fertile, basal pairs not gradually tapered 30. *D. costalisora*
 2b. Sori in many rows, not close to costa.
 4a. Abaxial surface of pinnae with glandular hairs 31. *D. woodsii*
 4b. Abaxial surface of pinnae without glandular hairs.
 5a. Lamina lanceolate, stipe with brown or dark brown scales 32. *D. himachalensis*
 5b. Lamina oblong-lanceolate or lanceolate, stipe with brown or paler brown scales.
 6a. Plants 20–30 cm tall; pinnules entire 33. *D. alpicola*
 6b. Plants up to ca. 80 cm tall; pinnules coarsely serrate 34. *D. chrysocoma*

28. *Dryopteris panda* (C. B. Clarke) Christ, Bull. Acad. Int. Géogr. Bot. 20: 176. 1909.

大果鳞毛蕨 da guo lin mao jue

Nephrodium filix-mas (Linnaeus) Richard var. *panda* C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 519. 1880; *Dryopteris bonatianae* (Brause) Fraser-Jenkins; *D. filix-mas* (Linnaeus) Schott subsp. *panda* (C. B. Clarke) C. Christensen; *D. yui* Ching; *Polystichum bonatianum* Brause.

Plants 60–80 cm tall. Rhizome creeping or ascending, with ovate-orbicular, dark brown scales. Fronds approximate or caespitose; stipe stramineous, 20–30 cm, base with appressed scales similar to those on rhizome, subglabrous upward or rarely membranous scaly; lamina ovate-lanceolate or lanceolate, 40–50 cm, 20–25 cm wide at middle, once pinnate, not narrowed to base, apex acuminate; pinnae 12–18 pairs, remote, oblique, lanceolate, 6–9(–14) × 2(–4) cm, base usually broadly cuneate, shortly stalked, apex acuminate, lower pinnae usually broader at base; segments 10–15 pairs, oblong, entire or incised at margin, rounded to truncate and deltoid-dentate at apex, basiscopic segments in basal pair of pinnae longer than acroscopic ones. Lamina papery, both surfaces glabrous, occasionally on rachis and costa base clothed with lanceolate, brown scales; veins pinnate, simple or 2-forked, obscure adaxially, raised abaxially. Sori in 1 row on each side of costa, or 2 or 3 pairs (especially basal segments), close to costa or costule; indusia brown, with pale-colored membranous margins, orbicular-reniform, thick.

Mixed forests; 1300–3100 m. Gansu, Guizhou, Sichuan, Xizang, Yunnan [India, Nepal, Pakistan].

29. *Dryopteris tokyoensis* (Matsumura ex Makino) C. Christensen, Index Filic. 298. 1905.

东京鳞毛蕨 dong jing lin mao jue

Nephrodium tokyoense Matsumura ex Makino, Bot. Mag. (Tokyo) 13: 81. 1899; *Dryopteris sanmingensis* Ching.

Plants 90–110 cm tall. Rhizome erect, short, apex densely clothed with broadly lanceolate, brown scales. Fronds caespitose; stipe stramineous, 20–25 cm, clothed with broadly lanceolate scales; scales sparse from middle of stipe upward; lamina oblong-lanceolate, 60–85 cm, 12–15 cm wide at middle, pinnate-bipinnatisect, gradually narrowed toward base, apex acuminate; pinnae 30–40 pairs, oblique, narrowly lanceolate, shortly stalked, middle pinnae 8–9.5 cm, 1.2–1.6 cm wide at base, broadly cuneate or rounded, pinnatifid, sometimes pinnatisect, acuminate, lower pinnae gradually shortened, basal pair ca. 4 cm, pinnatifid or pinnate; segments oblong, entire or serrulate, apex rounded. Lamina papery, both surfaces subglabrous, with only small fibriform scales on abaxial side of costa base; veins pinnate, lateral ones 2-forked, extending to lamina margin. Usually only upper pinnae fertile. Sori in 1 row and rather close to costa, borne on middle of veinlets; indusia orbicular-reniform, entire, persistent.

Forests, damp places, marshes; 1000–1200 m. Fujian, Hubei, Hunan, Jiangxi, Zhejiang [Japan].

30. *Dryopteris costalisora* Tagawa, Acta Phytotax. Geobot. 3: 88. 1934.

近中肋鳞毛蕨 jin zhong lei lin mao jue

Plants 40–60 cm tall. Rhizome obliquely ascending, densely scaly; scales ovate-lanceolate, denticulate, ferruginous or pale brown. Fronds approximate; stipe stramineous, ca. 20 cm, base brown, densely scaly; scales brown, ovate-lanceolate, 4–5 × 2–3 mm, entire, acuminate, sparser upward; lamina lanceolate, 13–18 × 5–8 cm, once pinnate-pinnatifid, base truncate,

apex acute or acuminate; pinnae spreading, narrowly elliptic, shortly stalked, apex obtuse. Lamina glabrous adaxially, with lanceolate or fibriform brown scales on abaxial side of costa. Sori in 1 (or 2) rows on each side of costa; indusia orbicular-reniform, entire.

Forests, roadsides, slopes; 2500–3400 m. Taiwan [NE India, Nepal].

The type specimen of *Dryopteris costalisora*, conserved in Kyoto University, bears immature sori. The above description is taken from the protologue.

31. *Dryopteris woodsii* Hayata, Icon. Pl. Formosan. 6: 158. 1916.

细叶鳞毛蕨 xi ye lin mao jue

Dryopteris neochrysocoma Ching; *D. taishanensis* F. Z. Li; *D. tenuissima* Tagawa; *D. woodsii* var. *tenuissima* (Tagawa) Li & J. Z. Wang; *D. zinongii* Z. R. Wang & Fraser-Jenkins.

Plants up to 60 cm tall. Rhizome erect or ascending, short, densely clothed with membranous, ovate, fimbriate, brown scales. Fronds caespitose; stipe stramineous, (4–)6–20 cm × ca. 3 mm, lower part sparsely clothed with broadly lanceolate, brown scales; lamina ovate-lanceolate or lanceolate, (9–)20–50 × (3.5–)6–17 cm, once pinnate-pinnatifid, slightly narrowed at base; pinnae 12–20 pairs, lanceolate to ovate-lanceolate, 2–9 × 1.5–2.5 cm, base slightly broad, sessile or shortly stalked, apex obtuse to shortly acuminate, basal 1 or 2 pairs slightly shortened; segments 5–10 pairs, oblong, margin slightly toothed, apex obtuse. Lamina papery, both surfaces glandular-pubescent, with sparse or few small scales on costa; veins pinnate, veinlets 2- or 3-forked. Sori abaxial on veinlets, 1–6 on each segment; indusia pale brown, slightly thick, entire, glandular-pubescent, perfectly covering sorus, persistent; spores 32 in each sporangia, elliptic, perispore granular.

Rock crevices; 1600–2800 m. Guangdong, Guizhou, Jiangxi, Liaoning, Shandong, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Nepal, Thailand].

A hybrid, *Dryopteris × daliensis* Z. R. Wang (Acta Phytotax. Sin. 23: 346. 1985), between *D. parachrysocoma* Ching & Z. R. Wang and *D. zinongii*, has been described from Yunnan (Dali).

32. *Dryopteris himachalensis* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 18(5): 367. 1989.

木里鳞毛蕨 mu li lin mao jue

Dryopteris pectinatopinnata Ching.

Plants up to 60 cm tall. Rhizome widely creeping, densely scaly; scales dark brown, linear or linear-lanceolate, up to 2 cm. Fronds approximate; stipe brown or amber, 1/4–1/3 as long as lamina, densely clothed with lanceolate to linear-lanceolate, dark brown scales; lamina lanceolate, ca. 45 cm, ca. 14 cm wide at middle, once pinnate-pinnatifid, base narrowed, apex acuminate; pinnae 15–24 pairs, lanceolate, ca. 7 × 1.5 cm, widest at base, truncate, sessile, apex acuminate; segments 10–13 pairs, oblong, both sides parallel, connected at base, with obtuse, sparsely dentate apices. Lamina papery, glabrous adaxially, rarely with linear scales near costa abaxially; rachis and costa

with linear-lanceolate, brown scales; veins pinnate, simple or 2-forked, evident on both surfaces. Sori 3 or 4 (or 5) pairs on each segment, in 1 regular row on each side of costa, nearer to costa than to margin, absent from apices; indusia slightly thick, perfectly covering sorus.

Picea or *Abies* forests; 3200–3400 m. SW Sichuan, NW Yunnan [W India].

33. *Dryopteris alpicola* Ching & Z. R. Wang, Acta Phytotax. Sin. 23: 349. 1985.

高山金冠鳞毛蕨 gao shan jin guan lin mao jue

Dryopteris chrysocoma (Christ) C. Christensen var. *alpina* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 438. 1938, not *D. alpina* Rosenstock (1913).

Plants 25–40 cm tall. Rhizome obliquely ascending, short, densely clothed with linear and linear-lanceolate scales. Fronds caespitose; stipe brown or dark stramineous or ferruginous, 5–10 cm, densely scaly; scales brown, lanceolate or narrowly lanceolate, entire; lamina narrowly elliptic, 20–30 cm, 8–10 cm wide at middle, once pinnate-pinnatifid, base narrowed, 3–5 cm wide, apex acuminate; pinnae 10–15 pairs, alternate, slightly ascending, lanceolate, middle pinnae 4–5 × ca. 1.5 cm, basal 2 or 3 pairs shortened, most basal pairs 2–3 cm, sessile, apex obtuse-acute; segments 6–8 pairs, oblique, oblong, ca. 7 × 4 mm, with obtuse, deltoid-dentate apex. Lamina herbaceous, thin, with sparse glandular hairs adaxially, with linear brown scales and glandular hairs abaxially, densely clothed with linear-lanceolate scales along rachis and costa; veins pinnate, 2-forked, impressed adaxially, raised abaxially with a distinct hydathode. Sori in 1 row on each side of costa or 2 or 3 pairs on apical part of basal veinlets; indusia slightly thick, completely covering sorus at maturity, with short glandular hairs and linear scales.

Alpine grasslands or *Picea* or *Abies* forests; 2800–3400 m. Sichuan (Muli), NW and W Yunnan [Nepal].

34. *Dryopteris chrysocoma* (Christ) C. Christensen, Index Filic. 257. 1905.

金冠鳞毛蕨 jin guan lin mao jue

Plants 30–120 cm tall. Rhizome erect, short, densely scaly; scales pale ferruginous, lanceolate, ca. 2 cm, apex hairlike, usually twisted. Fronds caespitose; stipe stramineous, 1/4–1/2 as long as lamina, with oblong-lanceolate or ovate-lanceolate, pale brown or dark brown scales, these gradually smaller toward rachis; lamina ovate-lanceolate, 20–80 × 10–35 cm, pinnate-pinnatifid, narrowed toward base, apex acuminate; pinnae ca. 20 pairs, lanceolate, ca. 15 × 2 cm, base truncate, sessile; pinnales ca. 13 pairs, oblong, with obtuse, crenate apex, slightly protruding on both sides of base, incised-serrate. Lamina sub-leathery or papery, with lanceolate, brown scales along costa; veins obscure adaxially, distinct abaxially, mostly 2-forked. Sori abaxial on veinlets on lower part of segments, 3 or 4 pairs on each segment; indusia large, orbicular-reniform, slightly thick, completely covering sorus at maturity.

Thickets, broad-leaved evergreen forests, forest margins; 2400–3000 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal].

- 1a. Stipe and rachis clothed with pale brown scales, stipe scales ovate-lanceolate 34a. var. *chrysocoma*
 1b. Stipe and rachis densely clothed with brown or dark brown scales, stipe scales oblong-lanceolate 34b. var. *squamosa*

34a. *Dryopteris chrysocoma* var. *chrysocoma*

金冠鳞毛蕨(原变种) jin guan lin mao jue (yuan bian zhong)

Aspidium filix-mas (Linnaeus) Swartz var. *chrysocoma* Christ, Bull. Herb. Boissier 6: 966. 1898; *A. chrysocoma* (Christ) Christ; *Dryopteris chrysocoma* var. *apina* Ching, p.p.; *D. chrysocoma* var. *gracilis* Ching, p.p., not *D. gracilis* (Heward) Domin (1929), nor *D. gracilis* (T. Moore ex Beddome) Ching (1938); *D. chrysocoma* var. *major* Ching; *D. fangii* Ching, Fraser-Jenkins & Z. R. Wang; *Nephrodium chrysocoma* (Christ) Handel-Mazzetti.

Stipe and rachis with pale brown scales, former with scales ovate-lanceolate.

Thickets, broad-leaved evergreen forests, forest margins; 2400–3000 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal].

34b. *Dryopteris chrysocoma* var. *squamosa* (C. Christensen) Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 438. 1938.

密鳞金冠鳞毛蕨 mi lin jin guan lin mao jue

Dryopteris cochleata (Buchanan-Hamilton ex D. Don) C. Christensen var. *squamosa* C. Christensen, Acta Horti Gothob. 1: 59. 1924.

Stipe and rachis densely clothed with brown or dark brown scales, former with scales oblong-lanceolate.

- Evergreen forests; 2600–3000 m. W Yunnan.

3. *Dryopteris* sect. *Fibrillosae* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 366. 1938.

纤维鳞毛蕨组 xian wei lin mao jue zu

Lamina 1-pinnate. Pinnae deeply incised to nearly 2-pinnate. Lateral veins mostly forked, few simple. Abaxial surface of rachis, costa, and pinnae clothed with fibrillose scales.

About ten species: mainly in the Himalaya; seven species (three endemic) in China.

- 1a. Pinnule with simple vein, not forked, sometimes 1- or 2-forked at basicopic side at base.
 2a. Stipe scales brown 35. *D. whangshangensis*
 2b. Stipe scales black or blackish brown 36. *D. pulcherrima*
 1b. Pinnule with forked vein, 2- or 3-forked.
 3a. Basal pinnae ± same length of medial 37. *D. yigongensis*
 3b. Basal pinnae 1/4–1/2 length of medial.
 4a. Pinnae crenate to pinnatifid 38. *D. squamifera*
 4b. Pinnae entire or almost entire.
 5a. Scales on stipe or rachis lanceolate, not twisted 41. *D. redactopinnata*
 5b. Scales on stipe or rachis narrowly lanceolate, often twisted.
 6a. Scales on stipe black or blackish brown 39. *D. sinofibrillosa*
 6b. Scales on stipe brown 40. *D. fibrillosissima*

35. *Dryopteris whangshangensis* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 421. 1938.

黄山鳞毛蕨 huang shan lin mao jue

Dryopteris crassirhizoma Nakai subsp. *whangshangensis* (Ching) Fraser-Jenkins; *D. huangangshanensis* Ching.

Plants 60–80 cm tall. Rhizome erect, densely scaly; scales dark brown, lanceolate, ca. 2.5 cm, entire. Fronds caespitose; stipe stramineous, ca. 20 × 3–4 mm, with lanceolate or linear-lanceolate, fimbriate-margined, brown scales; lamina lanceolate, 30–40 × 10–12 cm, widest at middle, once pinnate-pinnatifid, gradually narrowed toward base, apex acuminate; pinnae 20–22 pairs, spreading or ascending, lanceolate, 5–6 cm, ca. 1.2 cm wide at base, basal 3 or 4 pairs gradually shortened, shortest 3–3.5 cm, pinnatisect; segment ca. 16 pairs, oblong, 5–6 × 2–2.5 mm, apex truncate, coarsely 3- or 4-dentate. Lamina herbaceous; rachis densely clothed with linear or linear-lanceolate, fimbriate, brown scales adaxially and lanceolate, fimbriate, dark brown scales abaxially, costae and costules clothed with

ovate, basally fimbriate scales on both surfaces, upper ones pale; veins pinnate, not forked. Sori at apices of segments, 5 or 6 pairs on each segment, marginal, those on upper part of lamina often protruding out from margin at maturity; indusia pale brown, orbicular-reniform, entire.

- Forests; 1200–1800 m. Anhui, Fujian, Hubei, Jiangxi, Zhejiang.

Dryopteris submarginalis Ching, Boufford & K. H. Shing (J. Arnold Arbor. 64: 30. 1983, not (Langsdorf & Fischer) C. Christensen (1905), type from Hubei) was treated as a synonym of *D. crassirhizoma* subsp. *whangshangensis* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 212. 1986).

Dryopteris shuichangensis P. S. Chiu & G. Yao ex Ching (Bull. Bot. Res., Harbin 2(2): 63. 1982), described from Zhejiang (Shuichang), was treated as a hybrid between *D. crassirhizoma* subsp. *whangshangensis* and *D. dickinsii* by Fraser-Jenkins (loc. cit.: 206).

36. *Dryopteris pulcherrima* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 422. 1938.

豫陕鳞毛蕨 yu shan lin mao jue

Dryopteris canaliculata Ching.

Plants 35–60 cm tall. Rhizome erect, densely clothed with lanceolate, pale brown scales. Fronds caespitose; stipe 3–5 cm, with broadly lanceolate, black or blackish brown scales; lamina narrowly elliptic, 25–30 cm, 8–11 cm wide at middle, pinnatifid, gradually narrowed toward base, apex acuminate; pinnae ca. 25 pairs, spreading, contiguous, 1.3–2 cm apart, shortly stalked, middle pinnae lanceolate, 4–6 mm, ca. 1.5 cm wide at base, acuminate, lower several pairs gradually shortened, basal ones only 1.5–2 cm; ultimate segments ca. 13 pairs, slightly oblique, contiguous, oblong, basal ones 6–8 × 2.5–4 mm, margin entire or irregularly lobed, apex truncate or rounded. Lamina herbaceous, both surfaces glabrous; rachis densely scaly; scales pale brown, broadly lanceolate, apex subulate, costa scales linear or linear-lanceolate; veins pinnate, obscure on both surfaces, simple, rarely 2-forked. Sori 2 or 3 pairs on each segment, nearer to margin than to costa; indusia brown, orbicular-reniform.

• Forests, shaded wet places in valleys; 1500–2300 m. Anhui, Gansu, Hebei, Henan, Shanxi, Sichuan, Xizang.

Some specimens of *Dryopteris pulcherrima* have been misidentified as *D. polylepis* (Franchet & Savatier) C. Christensen (see FRPS 5(1): 136. 2000). It differs from *D. polylepis* by its narrowly elliptic lamina (vs. elliptic) and rachis with adpressed, pale brown scales (vs. scales not adpressed and dark brown). *Dryopteris polylepis* only occurs in Japan.

37. *Dryopteris yigongensis* Ching, Fl. Xizang. 1: 253. 1983.

易贡鳞毛蕨 yi gong lin mao jue

Plants 40–55 cm tall. Rhizome erect, short, densely scaly; scales ferruginous, lanceolate, upper part subulate, ca. 2.5 cm. Fronds caespitose; stipe dark brown, 10–14 cm, ca. 2 mm in diam., base densely clothed with lanceolate, dark brown or almost black scales 1.5–2 cm; lamina oblong, 35–40 cm, 15–17 cm wide at middle, bipinnate, base slightly narrowed, apex acuminate; pinnae ca. 25 pairs, spreading, shortly stalked, 2–2.5 cm apart, middle pinnae ca. 8 cm, base 1.5–1.8 cm wide, basal pair lanceolate, 5–6 cm, base truncate, apex long acuminate; pinules 14–16 pairs, nearly spreading, contiguous, 7–10 mm, basal pair not longer than upper ones, ca. 3.5 mm wide, narrowed toward truncate apex, entire or sparsely dentate, basal pinna lobes pinnatisect or fully pinnate. Lamina thinly papery, with many narrowly hairlike, fibrillose, pale brown scales on both surfaces, mainly on costae and costules. Fertile only in upper 1/3 of lamina. Sori 4 or 5 pairs on each segment, nearer to costa than to margin; indusia brown, somewhat thick, persistent.

Forests; 2500–2600 m. SE Xizang, NE Yunnan [India].

38. *Dryopteris squamifera* Ching & S. K. Wu, Fl. Xizang. 1: 250. 1983.

褐鳞毛蕨 he lin lin mao jue

Dryopteris discreta Ching & S. K. Wu; *D. incisulobata* Ching; *D. nyalamensis* Ching & S. K. Wu; *D. nyalamensis* var. *angustipinnata* Ching & S. K. Wu; *D. qandoensis* Ching; *D. zayuensis* Ching & S. K. Wu.

Plants 40–70 cm tall. Rhizome erect, densely scaly; scales

broadly lanceolate, brown. Fronds caespitose; stipe 10–12 cm, clothed with scales at base; scales brown, lanceolate to narrowly lanceolate, 1.5–2 cm × 2–5 mm, sharply dentate, subulate at apex; lamina oblong-lanceolate, 50–60 × 12–15 cm, widest at middle, bipinnatifid, gradually narrowed downward, apex acuminate; pinnae 18–25 pairs, oblique, lanceolate, base ca. 2.5 cm wide, apex shortly acute, middle pinnae up to 9 cm, basal pairs ca. 3 cm; segments 10–13 pairs, contiguous, ± spreading, oblong, ca. 1 cm × 4–5 mm, sparsely dentate, apex rounded-obtuse or truncate. Lamina herbaceous, clothed with narrowly hairlike, brown or brownish black scales or fibrillae on costa, lamina and costae with sparse, fibrillose, pale brown scales abaxially; veins pinnate, forked, evident on both surfaces. Sori in 2 regular rows between costa and margin; indusia ferruginous, orbicular-reniform, papery.

Abies forests; 2800–3900 m. Qinghai (Xunhua), Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Pakistan].

39. *Dryopteris sinofibrillosa* Ching, Bull. Fan Mem. Inst. Biol., Bot. 10: 180. 1940 [“*sino-fibrillosa*”].

纤维鳞毛蕨 xian wei lin mao jue

Nephrodium filix-mas (Linnaeus) Richard var. *fibrillosum* C. B. Clarke, Trans. Linn. Soc. London, Bot. 1(8): 520. 1880; *Dryopteris chingii* N. C. Nair, nom. illeg. superfl.; *D. fibrillosa* (C. B. Clarke) Handel-Mazzetti (1922), not (Baker) Christ (1905); *D. filix-mas* (Linnaeus) Schott subsp. *fibrillosa* (C. B. Clarke) C. Christensen; *N. clarkei* Baker var. *fibrillosum* (C. B. Clarke) Handel-Mazzetti; *N. parallelogrammum* (Kunze) C. Hope f. *fibrillosum* (C. B. Clarke) C. Hope.

Plants 40–70 cm tall. Rhizome erect, densely scaly; scales dark brown, lanceolate, dentate, apex subulate. Fronds caespitose; stipe 10–15 cm, base densely clothed with narrowly lanceolate, black or blackish brown scales with subulate, twisted apex; lamina lanceolate, 30–55 cm, ca. 15 cm wide at middle, bipinnate, gradually tapering toward a markedly narrow and slightly truncate base; pinnae ca. 25 pairs, spreading, alternate or subopposite, ca. 2 cm apart, lanceolate, subsessile, middle pinnae ca. 7 × 1.5 cm, basal pairs gradually shortened, basal pair only ca. 3 cm; segments 14–16 pairs, slightly oblique, approximate, oblong, ca. 1 × 3–4 mm, margin subentire, slightly reflexed, apex rounded-obtuse or truncate, dentate or undulate. Lamina thinly papery, glabrous adaxially, with pale brown scales abaxially; rachis with lanceolate, dark brown scales below, and with hairlike, brown scales above, costae with sparse hairlike scales; veins pinnate, forked, visible abaxially. Sori between costa and margin; indusia orbicular-reniform. *n* = 82.

Coniferous forests; 2800–4000 m. Sichuan, Xizang, Yunnan [India, Kashmir, Nepal, Pakistan].

40. *Dryopteris fibrillosissima* Ching, Fl. Xizang. 1: 254. 1983.

近纤维鳞毛蕨 jin xian wei lin mao jue

Plants 30–50 cm tall. Rhizome erect, short, densely scaly; scales ferruginous, lanceolate, upper part subulate, 1.5–2 cm. Fronds caespitose; stipe 7–14 cm, ca. 2 mm in diam., base densely scaly; scales brown, broadly lanceolate, 1–1.5 cm, dentate, acuminate; lamina lanceolate, 25–35 × 6–12 cm, bipinnate,

slightly narrowed at base, apex acuminate; pinnae 15–18 pairs, alternate, spreading, ca. 2 cm apart, lanceolate, base truncate, shortly stalked, apex acuminate, middle pinnae ca. 5.5 cm, ca. 1.5 cm wide at base, lower several pairs slightly shortened, basal pair ca. 3 cm; pinnules 8–11 pairs, nearly spreading, approximate, oblong, 5–7 × ca. 3.5 mm, apex rounded, regularly crenate, upper ones slightly joined at base. Lamina papery, both surfaces with sparse, pale brown, fibrillose scales; rachis with lanceolate, dark brown scales and brown fibrillose scales abaxially. Apical pinnae 5 or 6 pairs fertile. Sori 3 or 4 pairs on each pinnule, slightly nearer to costa than to margin; indusia ferruginous, orbicular-reniform, spreading at maturity, persistent.

• Thickets, *Pinus* forests; 1800–3400 m. Sichuan (Muli), Xizang (Bomi).

41. *Dryopteris redactopinnata* Soumen K. Basu & Panigrahi, Indian J. Forest. 3(3): 270. 1980.

藏布鳞毛蕨 zang bu lin mao jue

Dryopteris pseudofibrillosa Ching; *D. tsangpoensis* Ching.

Plants 50–70 cm tall. Rhizome erect, densely clothed with ovate-lanceolate, dark brown scales. Fronds caespitose; stipe amber, 10–15 cm, ca. 5 mm in diam., lower part of stipe very densely scaly, sparser upward; scales brownish black, glossy, lanceolate, fimbriate; lamina lanceolate, 30–40 × 8–12 cm, bipinnate, base narrowed; pinnae ca. 25 pairs, alternate, remote, lanceolate, base truncate, apex acuminate, middle pinnae 5–6 × 1–1.2 cm, lower ones gradually shortened, basalmost ca. 2 cm; pinnules 12–18 pairs, oblong, length ca. 3 × width, apex rounded, slightly dentate. Lamina herbaceous, densely clothed with brown scales on both surfaces, with sparse brown scales abaxially; veins pinnate, lateral veins simple or rarely 2-forked. Sori limited to upper part of lamina, terminal on veinlets, 3 or 4 pairs on each pinnule; indusia with brown centers and pale brown margins, often involute.

Picea or *Abies* forests; 2300–3800 m. Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Pakistan].

4. *Dryopteris* sect. *Dryopteris*

平鳞鳞毛蕨组 ping lin lin mao jue zu

Filix Séguier (1754), not Ludwig (1757), nor Adanson (1763).

Lamina once pinnate; pinnae deeply pinnatifid to bipinnate. Abaxial surface of costa clothed with flat, lanceolate, fimbriate scales.

About 20 species: widespread in the N temperate zone; 12 species (five endemic) in China.

The following species, recorded from Xizang (Fraser-Jenkins, New Sp. Syndr. Indian Pteridol. 138. 1997) and Taiwan (Knapp, Ferns Fern Allies Taiwan, 171, 453. 2011), is not treated here because no material was seen by the present authors: *Dryopteris edwardsii* Fraser-Jenkins (New Sp. Syndr. Indian Pteridol. 138. 1997; 爱德华鳞毛蕨 ai de hua lin mao jue). According to the protologue, this species is similar to *D. lepidopoda* but has broader stipe and rachis scales, longer lower basiscopic pinnules of lower pinnae, and larger spores. The chromosome number is $2n = 123$. It is found in mixed forests with *Cedrus deodara* and species of *Quercus* at 2800–3100 m. Described from India, it is also recorded from Nepal and Pakistan.

- 1a. Basal pairs of pinnae not tapered, ± same length of medial.
 - 2a. Rhizome creeping, with aristate teeth at their apices 42 *D. monticola*
 - 2b. Rhizome erect or ascending.
 - 3a. Stipe with linear-lanceolate or narrowly lanceolate scales 43. *D. lepidopoda*
 - 3b. Stipe with broadly lanceolate or lanceolate scales.
 - 4a. Scales on stipe and rachis brown or dark brown 44. *D. montigena*
 - 4b. Scales on stipe and rachis black 45. *D. latibasis*
- 1b. Basal pairs of pinnae tapered or gradually so, ca. 1/2 length of medial.
 - 5a. Lamina bipinnate, pinnules lanceolate.
 - 6a. Lamina ovate, rachis sparsely clothed with pale brown scales 46. *D. yungtzeensis*
 - 6b. Lamina oblanceolate, rachis densely clothed with pale brown scales 47. *D. habaensis*
 - 5b. Lamina once pinnate, pinnatifid, or pinnatisect.
 - 7a. Scales on rachis castaneous or dark brown.
 - 8a. Scales on rhizome apex to rachis black 52. *D. rosthornii*
 - 8b. Scales on rhizome apex brown, those on rachis brown to castaneous.
 - 9a. Stipe and rachis with sparse short lanceolate scales 53. *D. neorosthornii*
 - 9b. Stipe and rachis with dense long linear-lanceolate scales 50. *D. wallichiana*
 - 7b. Scales on rachis brown or red-brown.
 - 10a. Ultimate segments incised or crenate, sparsely clothed with narrow hairlike scales on abaxial surface of pinnae.
 - 11a. Lamina thinly papery, pinnae 2–3 cm wide, pinna lobes with obtuse pointed apices; sori and indusium small 48. *D. coreano-montana*
 - 11b. Lamina papery, pinnae 1.5–2 cm wide, pinna lobes with rounded apices; sori and indusium large 49. *D. filix-mas*

10b. Ultimate segments entire or subentire, densely clothed with narrow hairlike scales on abaxial surface of pinnae.

12a. Lamina leathery or thinly leathery, apices of ultimate segments with cartilaginous edges 50. *D. wallichiana*

12b. Lamina herbaceous, apices of ultimate segments without cartilaginous edges 51. *D. crassirhizoma*

42. *Dryopteris monticola* (Makino) C. Christensen, Index Filic. 278. 1906.

山地鳞毛蕨 shan di lin mao jue

Nephrodium monticola Makino, Bot. Mag. (Tokyo) 13: 80. 1899; *Aspidium monticola* (Makino) Christ; *Dryopteris submonticola* Nakai; *N. erythrosorum* (D. C. Eaton) Hooker var. *manshuricum* Komarov.

Plants 90–100 cm tall. Rhizome widely creeping, stout, densely scaly; scales of rhizome and lower part of stipe thick, dark brown, glossy, ovate, ca. 2 × 0.8 cm, entire. Fronds approximate; stipe stramineous, glossy, 28–40 cm, with lanceolate, entire, pale brown scales; lamina oblong or ovate-oblong, 30–55 × 18–30 cm, pinnatisect, base slightly narrowed or not, apex abruptly acuminate; pinnae 12–16 pairs, alternate, lanceolate or oblong-lanceolate, middle pinnae ca. 18 × 2.3–3.5 cm, base truncate, shortly stalked, apex acuminate or acute; segments approximate, narrowly oblong or oblong-lanceolate, 1.2–1.6 × 0.4–0.7 cm, margin sparsely dentate, each tooth with an aristate tip, apex obtuse and with an aristate tip. Lamina: rachis with linear, membranous, pale brown scales; veins pinnate, usually 3 grouped in segments, all extending to margin, acropetal one extending into arista. Sori in 1 row on each side of costa, slightly closer to costa; indusia orbicular-reniform, entire.

Hills, broad-leaved forests. Liaoning [Japan, Korea].

43. *Dryopteris lepidopoda* Hayata, Icon. Pl. Formosan. 4: 161. 1914.

黑鳞毛蕨 hei lin lin mao jue

Dryopteris filix-mas (Linnaeus) Schott subsp. *khasiana* (C. B. Clarke) C. Christensen; *D. junlianensis* H. S. Kung; *D. lepidopoda* var. *phaeocoma* Ching & S. K. Wu; *D. longistipes* Ching; *D. nigra* Ching; *D. neolepidopoda* Ching & S. K. Wu; *D. paleacea* (T. Moore) Handel-Mazzetti var. *khasiana* (C. B. Clarke) C. Christensen; *D. taiwanicola* Tagawa; *Nephrodium filix-mas* (Linnaeus) Richard var. *khasiana* C. B. Clarke; *N. parallelogrammum* (Kunze) C. Hope f. *khasianum* (C. B. Clarke) C. Hope.

Plants 80–90 cm tall. Rhizome erect or obliquely ascending, stout, densely clothed with lanceolate, entire, ferruginous scales. Fronds caespitose; stipe stramineous, 15–30 cm, base densely scaly; scales black or dark brown, linear-lanceolate, ca. 2 cm, sparser upward; lamina ovate-lanceolate or lanceolate, bipinnatisect, base slightly narrowed or not, apex acuminate; pinnae ca. 20 pairs, alternate, remote, middle pinnae lanceolate, 13–14 cm, widest at base, 2.5–3 cm wide, shortly stalked, apex acuminate; segments 15–20 pairs, oblique, margin denticulate, apex rounded, deltoid-dentate. Lamina papery, clothed with linear-lanceolate, black scales on abaxial side of rachis and costae; lateral veins pinnate, forked, distinct abaxially. Sori 4–6 pairs on each segment, between costa and margin; indusia brown, orbicular-reniform, caducous.

Broad-leaved forests; 1900–2500 m. W Sichuan, Taiwan, Xizang, NW Yunnan [Bhutan, India, Kashmir, Nepal].

44. *Dryopteris montigena* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 64. 1941.

丽江鳞毛蕨 li jiang lin mao jue

Dryopteris likiangensis Ching (1941), not *D. lichiangensis* (C. H. Wright) C. Christensen (1913).

Plants up to 80 cm tall. Rhizome erect, stout, densely clothed with lanceolate, entire, ferruginous or dark brown scales. Fronds caespitose; stipe stramineous, ca. 35 cm, ca. 4 mm in diam., base densely scaly; scales dark brown, lanceolate or linear-lanceolate, spiny-dentate, with capillary apex; lamina ovate-lanceolate, ca. 40 × 20 cm, bipinnatisect, base not narrowed, apex acuminate; pinnae ca. 18 pairs, alternate, contiguous, middle pinnae lanceolate, ca. 10 cm, widest at base, ca. 1.5 cm wide, shortly stalked, apex abruptly acuminate; segments ca. 10 pairs, slightly oblique, margin subentire or sparsely incised, apex rounded, sparsely deltoid-dentate; pinnae ca. 12 × 3 cm, widest at middle, gradually narrowed toward base to 1.8–2 cm wide. Lamina papery; rachis sparsely clothed with linear-lanceolate, brown, basally fimbriate scales, costae clothed with linear, brown scales; lateral veins pinnate, forked, obscure adaxially, with distinct hydathodes terminating apex, raised abaxially. Sori 3 or 4 pairs on each segment, between costa and margin; indusia brown, orbicular-reniform, caducous.

• Forests; 2900–3000 m. Yunnan (Dayao, Lijiang).

45. *Dryopteris latibasis* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 61. 1941.

阔基鳞毛蕨 kuo ji lin mao jue

Plants up to 90 cm tall. Rhizome erect, densely scaly; scales brown, linear-lanceolate or broadly lanceolate, 2–3 cm, entire. Fronds caespitose; stipe dark brown, ca. 38 cm, densely clothed with oblong-lanceolate or lanceolate, brownish black, dentate, and brown fibrillose scales; lamina ovate-lanceolate, ca. 50 × 25–30 cm, bipinnatisect, base not narrowed, apex acuminate; pinnae ca. 20 pairs, alternate, remote, middle pinnae ca. 10 cm, lanceolate, widest at base, 2–2.5 cm wide, sessile, apex acuminate; segments 15–20 pairs, oblong, margin incised, apex rounded, sparsely dentate, basal pinnae with lobed basiscopic segments. Lamina herbaceous; rachis clothed with lanceolate black, and brown fibrillose scales, costae and costules clothed with fibrillose scales on abaxial side; veinlets of segments forked, conspicuous and not impressed on both surfaces. Sori 4–6 pairs on each segment, in 1 regular row on each side of costa, nearer to costa than to margin; indusia brown, orbicular-reniform, caducous.

• Mixed forests, streamsides; 2400–2500 m. C, NE, and W Yunnan.

46. *Dryopteris yungtzensis* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 60. 1941.

永自鳞毛蕨 yong zi lin mao jue

Plants up to 65 cm tall. Rhizome erect or obliquely ascending, densely scaly; scales brown, lanceolate or narrowly lanceolate, ca. 2 cm, entire. Fronds caespitose; stipe brown, ca. 10 cm, with dense, lanceolate or oblong-lanceolate, brown scales; lamina elliptic, ca. 55 cm, ca. 24 cm wide at middle, bipinnatisect, base narrowed, apex acuminate; pinnae 20–25 pairs, alternate, contiguous, often somewhat imbricate, middle pinnae ca. 12 cm, widest at base, ca. 2 cm wide, sessile, apex acuminate or acute; segments ca. 14 pairs, contiguous, slightly overlapped, especially basal ones, elliptic, often wider at middle, incised on sides, apex rounded-obtuse, deltoid-dentate. Lamina herbaceous; veins pinnate, forked, obscure adaxially, distinct abaxially. Sori 3–5 pairs on each segment, in 1 row on each side of costa; indusia brown, orbicular-reniform, entire.

- Forests; 2800–3000 m. Yunnan (Dêqên, Weixi).

47. *Dryopteris habaensis* Ching, Sunyatsenia 6: 2. 1941.

哈巴鳞毛蕨 ha ba lin mao jue

Plants ca. 90 cm tall. Rhizome obliquely ascending, apex densely scaly; scales dark brown, oblong-lanceolate, 2–3 cm, entire. Fronds caespitose; stipe dark brown, 15–25 cm, clothed with oblong-lanceolate or linear-lanceolate, brown or dark brown, sparsely dentate scales; lamina oblong-lanceolate, ca. 70 cm, ca. 22 cm wide at middle, bipinnatisect, base narrowed, ca. 10 cm wide, apex acuminate; pinnae 25–30 pairs, alternate, oblique, remote, middle pinnae lanceolate, ca. 11 × 1–1.5 cm, widest at base, base truncate, subsessile, apex acuminate, lowest pinna pair deltoid-lanceolate, ca. 5 cm; segments ca. 16 pairs, oblique, approximate, oblong, apex obtuse, deltoid-serrate or incised-serrate on sides. Lamina herbaceous, both surfaces subglabrous; rachis and costa clothed with lanceolate and dark brown or linear-lanceolate and brown scales, costae and costules clothed with lanceolate, brown scales; veins pinnate, often simple, obscure adaxially, evident abaxially. Sori 4 or 5 pairs on each segment, in 1 regular row on each side of costule; indusia brown, orbicular-reniform, entire. Spores 32 per sporangium.

- Mixed forests, streamsides; 2800–3200 m. NW Yunnan.

48. *Dryopteris coreano-montana* Nakai, Bot. Mag. (Tokyo) 35: 132. 1921.

东北亚鳞毛蕨 dong bei ya lin mao jue

Dryopteris crassirhizoma Nakai var. *setosa* (Christ) Miyabe & Kudô; *D. filix-mas* (Linnaeus) Schott var. *setosa* Christ.

Plants 70–120 cm tall. Rhizome erect, stout; scales ferruginous, oblong-lanceolate, thin, entire. Fronds caespitose; stipe ebeneous or brown, glossy, 10–20 cm, densely scaly; scales dark brown, broadly lanceolate or lanceolate, 1.2–1.5 cm × 3–4 mm, entire, long acuminate; lamina elliptic-lanceolate, 60–80 cm, 20–25 cm wide at middle, bipinnate, gradually narrowed toward base, apex acuminate; pinnae ca. 30 pairs, oblique, alternate, 2–4 cm apart, lanceolate, ca. 13 × 2.5 cm, apex acuminate; pinnules ca. 18 pairs, spreading, approximate, lower 2 or 3 pairs

remote, rachis between winged, oblong, 1–1.5 cm × 4–6 mm, apex rounded, slightly narrowed deltoid-dentate. Lamina thinly papery, both surfaces subglabrous; rachis densely clothed with lanceolate, fibrillose, pale brown scales adaxially; veins pinnate, distinct on both surfaces. Sori in 1 regular row between costa and margin; indusia ferruginous, orbicular-reniform, papery.

Meadows, damp places. Heilongjiang, Jilin [Japan, Korea, E Russia].

49. *Dryopteris filix-mas* (Linnaeus) Schott, Gen. Fil. t. 9. 1834.

欧洲鳞毛蕨 ou zhou lin mao jue

Polypodium filix-mas Linnaeus, Sp. Pl. 2: 1090. 1753; *Aspidium filix-mas* (Linnaeus) Swartz; *Lastrea filix-mas* (Linnaeus) C. Presl; *Nephrodium filix-mas* (Linnaeus) Richard; *Polypodium filix-mas* (Linnaeus) Roth; *Polystichum polysorum* Todaro.

Plants 50–120 cm tall. Rhizome creeping, apex densely scaly; scales pale brown, ovate-lanceolate or lanceolate, membranous, entire, with a capillary apex. Fronds caespitose; stipe dark stramineous or ferruginous, 20–30 cm, 3–8 mm in diam., clothed with narrowly lanceolate, fimbriate, dark brown scales and fibrillose scales extending upward along rachis; lamina oblong-lanceolate, 50–60 × 20–30 cm, widest at middle, bipinnate, gradually narrowed toward base, apex acuminate; pinnae ca. 28 pairs, slightly oblique, lanceolate, 12–20 × 1.5–2.5 cm, base truncate, shortly stalked, apex acuminate, lowest pinnae far apart, and shortened, ca. 2/3 as long as middle pinnae, pinnatisect; ultimate segments 18 or 19 pairs, slightly oblique, separated, oblong, incised-dentate on sides, apex obtuse. Lamina papery; veins pinnate, forked, 6 or 7 pairs on each pinnule, obscure on both surfaces, glabrous except for a few filiform scales on costae. Sori 3 or 4 pairs on each pinnule, on each side of costa, nearer to costa than to margin; indusia pale brown, orbicular-reniform, papery, margin incised, persistent.

Coniferous forests, streamsides; 1500–1900 m. N and NW Xinjiang [NE Afghanistan, India, Kazakhstan, Pakistan, Russia (W Siberia); SW Asia (N Iran), Europe, North America].

50. *Dryopteris wallichiana* (Sprengel) Hylander, Bot. Not. 1953: 352. 1953.

大羽鳞毛蕨 da yu lin mao jue

Plants up to 1 m tall or more. Rhizome erect, stout, densely clothed with lanceolate to narrowly lanceolate, entire, red-brown or brown scales. Fronds caespitose; stipe stramineous, ca. 30 cm, ca. 8 mm in diam.; scales brown to dark brown usually with a black base, lanceolate, ca. 2 cm, with filiform apex; lamina ovate-lanceolate or lanceolate, bipinnatifid, base slightly narrowed, apex acuminate; pinnae 25–30 pairs, alternate, remote, middle pinnae lanceolate, 12–14 cm, widest at base, 2.5–3 cm wide, shortly stalked, apex acuminate; segments 13–22 pairs, slightly oblique, apex truncate or obtuse, seldom becoming rounded, with triangular-lanceolate, acute teeth, with translucent, cartilaginous edges. Lamina papery, with lanceolate and linear-lanceolate, dark brown or brown, hastate scales; costae clothed with linear, brown scales and

fibrillose scales; lateral veins pinnate, forked, prominent adaxially, apically with brown hydathodes. Sori 4–6 pairs on each segment, sorus position various; indusia brown, orbicular-reniform, caducous.

Tsuga or *Picea* forests, damp stream banks, crevices in stone walls; 1500–3600 m. Fujian, Guizhou, Jiangxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Japan, Malaysia, Myanmar, Nepal].

- 1a. Plants up to 1 m tall or more; sori close to costa 50a. var. *wallichiana*
 1b. Plants less than 1 m tall; sori not close to costa 50b. var. *kweichowicola*

50a. *Dryopteris wallichiana* var. *wallichiana*

大羽鳞毛蕨(原变种) da yu lin mao jue (yuan bian zhong)

Aspidium wallichianum Sprengel, Syst. Veg. 4(1): 104. 1827, based on *A. paleaceum* D. Don, Prodr. Fl. Nepal. 4. 1825, not Lagasca ex Swartz (1806); *A. donianum* Sprengel, nom. illeg. superfl.; *A. filix-mas* (Linnaeus) Swartz var. *paleaceum* Mettenius; *A. patentissimum* Wallich ex Kunze; *Dichasium patentissimum* (Wallich ex Kunze) Fée; *Dryopteris cyrtolepis* Hayata; *D. cyrtolepis* var. *doiana* (Tagawa) H. Itô; *D. doiana* Tagawa; *D. doniana* Ching, nom. illeg. superfl.; *D. filix-mas* (Linnaeus) Schott subsp. *patentissima* (Wallich ex Kunze) C. Christensen; *D. himalaica* (Ching & S. K. Wu) S. G. Lu; *D. pachyphylla* Hayata; *D. patentissima* (Wallich ex Kunze) N. C. Nair; *D. quatanensis* Ching; *D. wallichiana* var. *himalaica* Ching & S. K. Wu; *Lastrea filix-mas* (Linnaeus) C. Presl var. *patentissima* (Wallich ex Kunze) Beddome; *L. patentissima* (Wallich ex Kunze) J. Smith; *Nephrodium filix-mas* (Linnaeus) Richard var. *patentissimum* (Wallich ex Kunze) C. B. Clarke; *N. parallelogrammum* (Kunze) C. Hope f. *patentissimum* (Wallich ex Kunze) C. Hope; *N. patentissimum* (Wallich ex Kunze) C. B. Clarke.

Plants up to 1 m tall or more. Sori close to costa.

Tsuga or *Picea* forests; 1500–3600 m. Fujian, Guizhou, Jiangxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Japan, Malaysia, Myanmar, Nepal].

50b. *Dryopteris wallichiana* var. *kweichowicola* (Ching ex P. S. Wang) S. K. Wu, Fl. Reipubl. Popularis Sin. 5(1): 149. 2000.

贵州鳞毛蕨 gui zhou lin mao jue

Dryopteris kweichowicola Ching ex P. S. Wang, J. Arnold Arbor. 71: 119. 1990.

Plants less than 1 m tall. Sori not close to costa.

• Damp banks of streams and crevices in stone walls; 1700–2000 m. Guizhou (Fanjing Shan).

51. *Dryopteris crassirhizoma* Nakai, Cat. Sem. Spor. Hort. Bot. Univ. Imp. Tokyo, 32. 1920.

粗茎鳞毛蕨 cu jing lin mao jue

Plants up to 1 m tall. Rhizome erect or obliquely ascending, stout, densely scaly. Fronds caespitose; stipe amber, much shorter than lamina, densely scaly; scales pale brown to

dark brown, glossy, ovate-lanceolate or narrowly lanceolate, 1–3 cm, membranous or papery, sparsely dentate, lower scales larger, gradually narrowed upward, upper scales linear to subulate, twisted; lamina oblong to oblanceolate, 50–120 × 15–30 cm, bipinnate-pinnatifid, base narrowed, apex abruptly acuminate; pinnae often more than 30 pairs, linear-lanceolate, 8–15 × 1.5–3 cm, sessile, pinnae gradually shortened toward both ends, lower pinnae distinctly shortened; segments approximate, oblong, 0.8–1.5 cm × 2–5 mm, margin shallowly obtuse-dentate or subentire, apex rounded or obtuse. Lamina thinly to thickly papery; rachis clothed with linear to lanceolate, contorted, ferruginous scales, costa clothed with ovate-lanceolate, long-ciliate scales, both surfaces and margins of segments with sparse, contorted scales and fibrillose scales; veins pinnate, forked or rarely simple. Sori abaxial on upper 1/3–1/2 of segment on abaxial veinlets, 1–4 pairs on each segment; indusia brown, orbicular-reniform, subentire, membranous, not completely covering sorus. *n* = 41.

Forests, hills. Hebei, Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia].

52. *Dryopteris rosthornii* (Diels) C. Christensen, Index Filic. 289. 1905.

川西鳞毛蕨 chuan xi lin mao jue

Nephrodium rosthornii Diels, Bot. Jahrb. Syst. 29: 190. 1900; *Aspidium filix-mas* (Linnaeus) Swartz var. *omeiense* Christ; *A. xanthomelas* Christ; *Dryopteris centrochinensis* Ching; *D. filix-mas* (Linnaeus) Schott var. *rosthornii* (Diels) C. Christensen; *D. hupehensis* Ching; *D. omeicola* Ching; *D. xanthomelas* (Christ) C. Christensen.

Plants 60–80 cm tall. Rhizome erect, densely scaly; scales black or dark brown, lanceolate or linear-lanceolate. Fronds caespitose; stipe ca. 14 cm, ca. 4 mm in diam., base densely scaly; scales dark brown, broadly lanceolate, upper part and rachis clothed with linear-lanceolate and linear, dentate, glossy, amber scales; lamina elliptic-lanceolate, ca. 60 × 18 cm, widest at middle, tapered at base; pinnae ca. 20 pairs, broadly lanceolate, ca. 9 × 2.5 cm, widest at middle, base rounded, shortly stalked, apex caudate-acuminate; segments ca. 15 pairs, oblique, oblong, ca. 1.2 cm × 4 mm, apex obtuse, weakly dentate. Lamina herbaceous; costae with sparse, brown scales adaxially, and brownish black, linear-lanceolate scales abaxially; veins pinnate, 2-forked, acroscopic basal veinlet undivided. Sori on upper part of lamina, 4–6 pairs on each segment; indusia brown, orbicular-reniform, membranous.

• Forests; 1500–2500 m. Gansu (Xigu), Guizhou, Hubei, Shanxi, Sichuan, Yunnan.

53. *Dryopteris neorosthornii* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 62. 1941 [“*neorosthornii*”].

近川西鳞毛蕨 jin chuan xi lin mao jue

Plants 100–120 cm tall. Rhizome erect, with dense, lanceolate, brown scales. Fronds caespitose; stipe stramineous, ca. 20 cm, ca. 5 mm in diam., base densely scaly; scales dark brown, broadly lanceolate; lamina 60–80 cm, ca. 24 cm wide

at middle, base narrowed, ca. 14 cm wide; pinnae ca. 30 pairs, spreading, approximate, lanceolate, ca. 12 × 2.5 cm, often widest at middle, base truncate, shortly stalked, apex acuminate, pinnatifid; segments ca. 20 pairs, oblique, oblong, ca. 1.4 cm × 4 mm, apex obtuse, remotely dentate. Lamina herbaceous; rachis with lanceolate, dentate, dark brown scales; veins pin-

nate, 2-forked, acroscopic basal veinlet undivided, distinct abaxially. Sori on upper part of lamina, 4–6 pairs on each segment, nearer to costa than to margin; indusia brown, orbicular-reniform, membranous.

Forests; 1500–3100 m. Sichuan, Xizang, Yunnan [Bhutan, India, Nepal].

5. *Dryopteris* sect. *Caespitosae* S. G. Lu, Guihaia 10: 186. 1990.

高山鳞毛蕨组 gao shan lin mao jue zu

Lamina 2-pinnate-pinnatifid. Pinnules or lobes sharply serrate. Indusia small, membranous, lacerate or erose.

About ten species: mainly in high mountains above 3500 m of E Himalaya, eastward to S China, Russia, and one species in Europe and North America; seven species (one endemic) in China.

1a. Stipe and rachis clothed with dense brown or dark brown scales.

2a. Lamina ovate or oblong-lanceolate, basal pinna not tapered, with many very narrowly hairlike brown

scales 54. *D. barbiger*

2b. Lamina oblong-lanceolate, basal pinna tapered or slightly tapered.

3a. Stipe scales dark brown or castaneous-brown, often with pale yellow margin, apex of ultimate segments

truncate 55. *D. tingiensis*

3b. Stipe scales brown, without pale yellow margin, apex of ultimate segments rounded 56. *D. komarovii*

1b. Stipe and rachis clothed with sparse black or dark brown scales.

4a. Stipe and rachis clothed with yellow glands.

5a. Lamina oblanceolate, 2–3 cm wide, tapering to base, stipe scales serrate 57. *D. fragrans*

5b. Lamina oblong-lanceolate, to 5 cm wide, basal pinna barely shortened, stipe scales entire 58. *D. alpestris*

4b. Stipe and rachis without yellow glands.

6a. Pinnule margin serrate, serra apices obtuse; indusia with erose edges 59. *D. acutodentata*

6b. Pinnule margin biserrate, serra apices acuminate; indusia with lacerate edges 60. *D. serratodentata*

54. *Dryopteris barbiger* (T. Moore ex Hooker) Kuntze, Revis. Gen. Pl. 2: 812. 1891.

多鳞毛蕨 duo lin lin mao jue

Nephrodium barbigerum T. Moore ex Hooker, Sp. Fil. 4: 113. 1862; *Aspidium barbigerum* (T. Moore ex Hooker) Christ; *Dryopteris falconeri* (Hooker) Kuntze; *Lastrea barbigerum* (T. Moore ex Hooker) Beddome; *L. falconeri* (Hooker) Beddome; *N. falconeri* Hooker.

Plants 60–80 cm tall. Rhizome caespitose, rhizome and stipe base densely clothed with ovate or oblong-lanceolate, ferruginous scales. Fronds caespitose; stipe 20–30 cm, up to 1 cm in diam., densely clothed with scales and brown, fibrillose scales; lamina ovate or oblong-lanceolate, bipinnate-pinnatifid, not narrowed to base, apex obtuse; pinnae more than 20 pairs, lanceolate, ca. 13 × 3 cm, obtuse, shortly stalked; pinnules ca. 20 pairs, oblong, apex rounded; segments dentate, remote, reflexed when dried. Lamina: rachis, costa, and costule all densely clothed with brown fibrillose scales and narrowly lanceolate scales; veins distinct on both surfaces. Sori 1 on each pinnule, on each side of costule; indusia ferruginous, orbicular-reniform, often early deciduous.

Thickets, grasslands, slopes; 3600–4700 m. Qinghai, Sichuan, Yunnan [Bhutan, N India, Kashmir, Nepal].

Dryopteris barbiger is dominant in thicket-grasslands in the forest zone in W Sichuan, S and SE Xizang, and N Yunnan.

55. *Dryopteris tingiensis* Ching & S. K. Wu ex Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 202. 1986.

定结鳞毛蕨 ding jie lin mao jue

Plants ca. 30 cm tall. Rhizome erect. Fronds caespitose; stipe brown, 4–5 cm, densely clothed with brown scales often with a pale brown margin; lamina oblong-lanceolate, ca. 25 × 8–10 cm, bipinnatifid, gradually narrowed toward base, apex obtuse; pinnae 13–15 pairs, spreading, contiguous, middle pinnae 4–5 × ca. 1.5 cm, gradually shortened toward lamina base, basal pair 1–2 cm, lanceolate, base truncate, sessile, apex obtuse; segments 8–10 pairs, oblong, apex rounded, dentate, basal pair often free from costa, margin often reflexed. Lamina thinly to thickly papery; rachis and costae with lanceolate, dark brown scales; veins pinnate, distinct on both surfaces. Sori 2–4 on each segment, in middle; indusia brown, margin lacerate. Spores sometimes irregular.

• Thickets, forests, grasslands on slopes; 3600–4000 m. Xizang (Dinggyê).

56. *Dryopteris komarovii* Kossinsky, Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 2: 1. 1921.

近多鳞毛蕨 jin duo lin lin mao jue

Dryopteris barbiger (T. Moore ex Hooker) Kuntze subsp. *komarovii* (Kossinsky) Fraser-Jenkins; *D. subbarbiger* Ching.

Plants 30–50 cm tall. Rhizome erect, short; scales dense, ferruginous, oblong-lanceolate. Fronds caespitose; stipe dark brown, 8–18 cm, ca. 5 mm in diam., with large, ovate-orbicular, brown scales; lamina oblong-lanceolate, 20–35 × 8–10 cm, bipinnate, rarely tripinnate, base slightly narrowed, apex obtuse; pinnae 18–20 pairs, middle ones 3.5–5 × 1.2–2 cm, lanceolate,

widest at base, sessile, apex obtuse, basal pair 2.5–4 cm, ovate-lanceolate; pinnules 8–10 pairs, oblique, approximate, oblong, base adnate to costa, margin crenate, apex rounded, regularly deltoid-dentate, several basal pairs rarely pinnately lobed. Lamina papery; veins distinct on both surfaces; rachis and costa densely clothed with lanceolate and linear-lanceolate, brown scales, and sparse fibrillose scales; pinnae glabrous adaxially, with fibrillose scales abaxially. Sori 2–4 on each side of costule; indusia brown, membranous, with irregular teeth.

Thickets, rock crevices, forests, grasslands on slopes; 2800–4500 m. Gansu, Qinghai, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan, Russia].

57. *Dryopteris fragrans* (Linnaeus) Schott, Gen. Fil. t. 9. 1834.

香鳞毛蕨 xiang lin mao jue

Polypodium fragrans Linnaeus, Sp. Pl. 2: 1089. 1753; *Dryopteris fragrans* var. *remotiuscula* (Komarov) Komarov; *Nephrodium fragrans* (Linnaeus) Richardson var. *remotiusculum* Komarov; *Woodsia xanthosporangia* Ching.

Plants 20–30 cm tall. Rhizome erect or obliquely ascending, apex and stipe base scaly; scales ferruginous, ovate or ovate-lanceolate, membranous, sparsely dentate, shortly acuminate. Fronds caespitose; stipe stramineous, 1–2(–12) cm; scales ferruginous, oblong-lanceolate, with capitate golden glands, dentate; lamina oblong-lanceolate, 10–25 × 2–4 cm, widest at middle, bipinnate, gradually narrowed toward base, base less than 1 cm wide, apex shortly acuminate; pinnae ca. 20 pairs, oblique, lanceolate, apex obtuse or abruptly acuminate, middle pinnae 1.5–2 × 6–8 cm, widest at base, lower several pairs narrowed to auricles; pinnules oblong, dentate or lobed. Lamina herbaceous, glabrous on both surfaces; rachis and costa clothed with lanceolate, glossy, brown scales and glands; veins pinnate, obscure on both surfaces. Sori abaxial on veinlets; indusia orbicular or orbicular-reniform, membranous, sparsely dentate, close to each other at maturity and always exerted from frond margin, glandular; spores elliptic, tuberculate on epispore. $2n = 82$.

Forests; 700–2400 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang [Japan, Korea, Russia; Europe, North America].

58. *Dryopteris alpestris* Tagawa, Acta Phytotax. Geobot. 3: 88. 1934.

多雄拉鳞毛蕨 duo xiong la lin mao jue

Plants 9–25 cm tall. Rhizome erect, short, densely scaly; scales brown, ovate, entire. Fronds caespitose; stipe stramineous or dark brown, 3–10 cm, with sparse scales similar to those on rhizome; lamina oblong-lanceolate, 8–18 × 2–5 cm, bipinnate, slightly narrowed to base, apex obtuse; pinnae 8–10 pairs, oblique or spreading, approximate, shortly stalked, basal pair slightly shorter than next one, ovate or oblong, 2–2.5 cm, ca. 1.3 cm wide at base, apex obtuse; pinnules 3–5 pairs, approximate, spreading, ovate-orbicular, base broadly adnate to costa, apex rounded, strongly dentate, basal pair 5–7 mm in length and width. Lamina herbaceous, glabrous on both surfaces; veins obscure on both surfaces, one vein per tooth; rachis

with ovate, brown scales, rachis and stipe with dense, yellow glands (white when young). Sori limited to upper part of frond, 2 or 3 pairs on each pinnule; indusia brown, membranous, with sparse teeth.

Thickets, stone crevices, forests, grasslands on slopes; 3100–4200 m. Taiwan, Xizang, Yunnan [India (Sikkim), Nepal].

59. *Dryopteris acutodentata* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 432. 1938 [*“acuto-dentata”*].

尖齿鳞毛蕨 jian chi lin mao jue

Nephrodium kingii C. Hope, J. Bombay Nat. Hist. Soc. 12: 621. 1899, not *Dryopteris kingii* (Beddome) C. Christensen (1905); *Dryopteris filix-mas* (Linnaeus) Schott subsp. *kingii* (C. Hope) C. Christensen; *D. silaensis* Ching.

Plants 23–45 cm tall. Rhizome erect, short, densely scaly; scales dark brown, oblong-lanceolate or lanceolate, dentate. Fronds caespitose; stipe dark brown, 8–12 cm, with lanceolate, dark brown scales; lamina deltoid-lanceolate, 16–26 × ca. 10 cm, widest at middle, bipinnatipartite, slightly narrowed downward, base truncate, apex acuminate; pinnae 12–16 pairs, alternate, lower several pairs remote, middle pinnae 3.5–4 × ca. 1.5 cm; segments ca. 8 pairs, approximate, oblong, apex minutely dentate. Lamina: rachis with lanceolate, brown or dark brown scales. Sori in 1 row on each side of costa; indusia orbicular-reniform, with irregular teeth, deciduous.

Alpine *Pinus* forests, *Rhododendron* thickets; 3500–4500 m. W Sichuan, SE Xizang, NW Yunnan [Bhutan, N India, Kashmir, Nepal].

60. *Dryopteris serratodentata* (Beddome) Hayata, Icon. Pl. Formosan. 4: 179. 1914 [*“serrato-dentata”*].

刺尖鳞毛蕨 ci jian lin mao jue

Lastrea filix-mas (Linnaeus) C. Presl var. *serratodentata* Beddome, Suppl. Ferns Brit. Ind. 55. 1892 [*“serrato-dentata”*], based on *L. odontoloma* Beddome, Ferns S. India, 39, t. 114. 1863, not T. Moore (1858); *Dryopteris filix-mas* (Linnaeus) Schott subsp. *serratodentata* (Beddome) C. Christensen; *D. filix-mas* var. *serratodentata* (Beddome) Hayata; *D. serratodentata* (Beddome) Hayata; *Nephrodium serratodentatum* (Beddome) C. Hope; *Woodsia veitchii* Christ.

Plants 18–40 cm tall. Rhizome erect, short, scaly; scales brown or dark brown, ovate-lanceolate, serrate. Fronds caespitose; stipe 5–8 cm, basal scales similar to those of rhizome, distal ones sparse; lamina oblong-lanceolate, 14–32 cm, 5–12 cm wide at middle, bipinnate-pinnatifid, slightly narrowed downward, apex acuminate; pinnae 10–18 pairs, remote, oblong-lanceolate, sessile or shortly stalked, apex obtuse; segments 6–10 pairs, nearly spreading, oblong, apex rounded, doubly serrate. Lamina papery; veins pinnate, inconspicuous adaxially, raised abaxially; rachis and costae clothed with ovate-lanceolate, black or dark brown scales. Sori on lower half of pinnae, between costa and margin; indusia thin, lacerate.

Abies forests, also in exposed rock crevices; 3100–3800 m. W Sichuan, Taiwan, SE Xizang, NW Yunnan [Bhutan, N India, Kashmir, Myanmar, Nepal, Pakistan].

6. Dryopteris sect. **Pallidae** Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 192. 1986.

半育鳞毛蕨组 ban yu lin mao jue zu

Lamina 2-pinnate to 3-pinnatifid. Lamina fertile on upper portion, sterile on lower portion. Indusia thick, entire on margin.

About 17 species: NW Africa, Asia, Australia, N Europe, North America; 11 species (three endemic) in China.

- 1a. Lamina fertile throughout.
 - 2a. Pinnae with narrow, translucent membranous margin 67. *D. nobilis*
 - 2b. Pinnae without translucent membranous margin.
 - 3a. Indusia corneous, strobiliform, almost completely enveloping mature sori; stipe rough (with obvious marks when scales fall off).
 - 4a. Pinnules wide, often pinnatifid, ultimate segments sharply serrate at apex 68. *D. basisora*
 - 4b. Pinnules narrow, mostly entire or lobed, ultimate segments with 1 or 2 coracoid teeth at apex 69. *D. fructuosa*
 - 3b. Indusia membranous, flat, not enveloping mature sori.
 - 5a. Adaxial surface of pinnae pale green, scales on stipe papery, glossy dark brown 70. *D. juxtaposita*
 - 5b. Adaxial surface of pinnae dark green, scales on stipe membranous, dull, dark brown or brown 71. *D. lachoogensis*
- 1b. Lamina fertile on upper 1/3–1/2 of pinnae, sterile on lower pinnae.
 - 6a. Lamina densely clothed with glandular hairs on both surfaces 61. *D. sericea*
 - 6b. Lamina without glandular hairs.
 - 7a. Upper 1/3 of pinnae fertile, abruptly contracted, apices of pinnules acuminate 62. *D. lacera*
 - 7b. Upper 1/2 of pinnae fertile, slightly contracted, apices of pinnules obtuse.
 - 8a. Pinnules slightly narrowed apically, sharply dentate, basiscopic pinnule of basal pinna ± incised 63. *D. peninsulae*
 - 8b. Pinnules obtuse, entire to incised-dentate, basiscopic pinnule of basal pinna not incised.
 - 9a. Scales on stipe and rachis blackish, often with a narrow brown edge 64. *D. uniformis*
 - 9b. Scales on stipe and rachis mostly brown.
 - 10a. Scales on stipe brown, black on rachis 65. *D. nyingchiensis*
 - 10b. Scales on stipe and rachis brown 66. *D. sublacera*

61. Dryopteris sericea C. Christensen, Bot. Gaz. 56: 336. 1913.

腺毛鳞毛蕨 xian mao lin mao jue

Aspidium filix-mas (Linnaeus) Swartz var. *giraldii* Christ, p.p.

Plants 20–50 cm tall. Rhizome obliquely ascending, with lanceolate, brown scales. Fronds caespitose; stipe stramineous, 10–20 cm, ca. 2 mm in diam., densely clothed with glandular hairs and distally with sparse, lanceolate, brown scales; lamina ovate-oblong, 20–25 × 10–15 cm, bipinnate; pinnae 8–11 pairs, 2–4 cm from each other, broadly lanceolate, 6–10 × 2–3.5 cm, not tapered to base, base obtuse-cuneate, with 3–4 mm stalk; pinnules 6–8 pairs, oblong, 1.5–2.5 × 0.6–0.8 cm, base slightly auriculate on both sides, ± adnate to costa, margin lobed or roughly serrate, apex obtuse. Lamina herbaceous, glandular hairy throughout, more densely so adaxially; costa with sparse small scales abaxially; veins pinnate, lateral ones 2- or 3-forked, rather conspicuous abaxially. Sori terminating veins, 3–6 pairs on each pinnule, nearer to margin than to costa; indusia brown, orbicular-reniform, papery, with glandular hairs.

- Forests, rocks; 700–1600 m. Gansu, Hubei, Shaanxi, Shanxi.

62. Dryopteris lacera (Thunberg) Kuntze, Revis. Gen. Pl. 2: 813. 1891.

狭顶鳞毛蕨 xia ding lin mao jue

Polypodium lacera Thunberg, Fl. Jap. 337. 1784; *Aspidium filix-mas* (Linnaeus) Swartz var. *lacera* (Thunberg)

Christ; *A. lacera* (Thunberg) Swartz; *Nephrodium lacera* (Thunberg) Baker.

Plants 60–80 cm tall. Rhizome erect or obliquely ascending, short, stout. Fronds caespitose; stipe stramineous, much shorter than lamina, densely clothed with brown or ferruginous, membranous, entire or sharply serrate scales throughout rachis, basal scales large, ovate-oblong, up to 2 cm, apex acuminate; lamina elliptic to oblong, 40–70 × 15–30 cm, once pinnate-pinnatifid; pinnae ca. 10 pairs, spreading, broadly lanceolate to oblong-lanceolate, shortly stalked, apex long acuminate, lower pinnae barely shortened, upper pinnae fertile, withering after spores released; pinnules narrowly ovate-lanceolate to lanceolate, up to 2 × 0.5–1 cm, basal ones often free, margin serrate, apex acute. Lamina papery to leathery; rachis with lanceolate or linear-lanceolate scales, small scales persisting on abaxial side of costa; veins pinnate, lateral veins of pinnules impressed adaxially. Sori confined to upper pinnae; indusia orbicular-reniform, entire.

Upland open forests, rocky slopes; 1600–2500 m (in Taiwan). Heilongjiang, Hubei, Hunan, Jiangxi, Sichuan, C and NC Taiwan, Zhejiang [Japan, Korea].

The identity of *Aspidium lacera* var. *obtusum* Christ (Bull. Soc. Bot. France 52(Mém. 1): 39. 1905), described from Hubei, is not known as the authors have not seen the type.

63. Dryopteris peninsulae Kitagawa, Rep. First Sci. Exped. Manchoukuo 4(2): 54. 1935.

半岛鳞毛蕨 ban dao lin mao jue

Dryopteris apicisora Ching & Y. T. Hsieh; *D. cathayana* Ching & Z. Y. Liu; *D. lacera* (Thunberg) Kuntze subsp. *peninsulæ* Kitagawa; *D. lacera* var. *peninsulæ* Tagawa; *D. neolacera* Ching; *D. shensicola* Ching & Y. T. Hsieh.

Plants up to more than 50 cm tall. Rhizome suberect, short, stout. Fronds caespitose; stipe pale brown, up to 24 cm, grooved, densely clothed with linear-lanceolate or ovate-oblong, dark brown, membranous, acuminate scales, sparsely clothed with castaneous-brown scales above; lamina oblong or narrowly ovate-oblong, 13–38 × 8–20 cm, bipinnate, base ± cordate, apex shortly acuminate; pinnae 12–20 pairs, ovate-lanceolate or lanceolate, base asymmetrical, shortly stalked, apex falcate-acuminate, lower pinnae ca. 11 × 4.5 cm, obvious; pinnules or segments up to 15 pairs, oblong, apex obtuse with short, sharp teeth, basal several pairs of pinnules ± auriculate, with shallowly undulate teeth, upper segments subtire at base, with teeth at margins, and low sharp teeth at apices. Lamina papery; costae stramineous, sparsely scaly; scales linear, readily deciduous; veins of pinnules or segments pinnate, conspicuous. Sori confined to upper pinnae, in 1 row on each side of costule; indusia orbicular-reniform, subtire, imperfectly covering sori at maturity; epispore papillose.

• Shaded, wet grasslands. Gansu, Guizhou, Henan, Hubei, Jiangxi, Liaoning, Shaanxi, Shandong, Sichuan, NE Yunnan.

64. *Dryopteris uniformis* (Makino) Makino, Bot. Mag. (Tokyo) 23: 145. 1909.

同形鳞毛蕨 tong xing lin mao jue

Nephrodium lacerum (Thunberg) Baker var. *uniforme* Makino, Bot. Mag. (Tokyo) 17: 79. 1903; *Dryopteris decur-rentiloba* Ching & C. F. Zhang; *D. jiangshanensis* Ching & P. S. Chiu; *D. pseudouniformis* Ching; *D. uniformis* var. *rufomarginata* K. H. Shing.

Plants 30–60 cm tall. Rhizome erect, apex densely scaly; scales brown. Fronds caespitose; stipe stramineous, 15–25 cm, 3–4 mm in diam., densely scaly; scales dark brown or nearly black, broadly lanceolate to linear-lanceolate, entire or remotely dentate; lamina ovate-lanceolate, 40–70 cm, up to 20 cm wide, bipinnatifid or bipinnatisect, base not narrowed, subtruncate, apex acuminate; pinnae 17 pairs, basal pinnae similar to middle ones, not shortened, lanceolate, 9–11 × 1.5–2 cm, widest at base, up to 2.5 cm wide, truncate, sessile; pinnules or segments ca. 15 pairs, subovate or ovate-lanceolate, length 1–1.5 × width, with obscure teeth, apex obtuse, basal ones somewhat larger. Lamina thinly papery, both surfaces glabrous, except for sparse, linear, brown scales on costae abaxially, rachis densely clothed with linear-lanceolate, sparsely dentate, black scales; veins pinnate, mostly forked, conspicuous abaxially. Sori confined to upper part of lamina, 3–6 pairs on each pinnule or segment; indusia ferruginous, somewhat large, membranous, caducous.

Evergreen broad-leaved forests; 100–1200 m. Anhui, Fujian, Jiangsu, Jiangxi, Zhejiang [Japan, Korea].

65. *Dryopteris nyingchiensis* Ching, Fl. Xizang, 1: 262. 1983.

林芝鳞毛蕨 lin zhi lin mao jue

Plants 35–50 cm tall. Rhizome erect, short; scales of rhizome and stipe base dense, ferruginous or brown, ovate-lanceolate, up to 2.5 cm, apex narrowly subulate and twisted. Fronds caespitose; stipe amber or stramineous, 7–13 cm, 1.5–2 mm in diam., sparsely scaly above base; lamina oblong-lanceolate, 30–40 × 12–16 cm, bipinnate, not narrowed to base, apex acuminate; pinnae 15–20 pairs, alternate, lower ones subopposite, nearly spreading, approximate, basal pair similar and equal to upper pairs, middle pinnae oblong-lanceolate, 6–8 × 2–2.5 cm, widest at base, base truncate, symmetrical, shortly stalked, apex long acuminate; pinnules 10–15 pairs, approximate, oblong, usually ca. 1 cm, basal ones longer than others, ca. 4.5 mm wide, not narrowed upward, margin entire, apex rounded, with sharp teeth, basal pinnule separated from next, remainder connate by narrow wing. Lamina thinly papery, both surfaces subglabrous; costae smooth, with sparse, narrowly lanceolate, dark brown or black scales; veins 6 or 7 pairs, forked, obscure. Sori confined to upper part of lamina, at middle of pinnae, 2–4 pairs on each pinnule, sterile at apices; indusia orbicular-reniform, thickly papery, everted at maturity.

• Alpine *Pinus* forests or coniferous and broad-leaved mixed forests; 2900–3000 m. Xizang, Yunnan.

66. *Dryopteris sublacera* Christ, Notul. Syst. (Paris) 1: 43. 1909.

半育鳞毛蕨 ban yu lin mao jue

Dryopteris blepharolepis C. Christensen; *D. juxtaposita* Christ f. *mutica* C. Christensen; *D. minjiangensis* H. S. Kung; *D. schneideriana* Handel-Mazzetti.

Plants 60–80 cm tall. Rhizome erect, short, densely scaly; scales bright rufous-brown, oblong-lanceolate, margin spinulose, apex acicular, usually twisted. Fronds caespitose; stipe stramineous, 1/4–1/3 as long as lamina, clothed with oblong-lanceolate, brown or dark brown scales at base, these smaller distally, lanceolate, sparsely spinulose; lamina narrowly oblong-lanceolate, 40–60 × 15–25 cm, bipinnate, not narrowed toward base, apex acuminate; pinnae to 20 pairs, lanceolate, 7–10 × ca. 2 cm, base truncate, sessile, apex acuminate; pinnules 8–10 pairs, opposite or subalternate, oblong, margin incised-dentate, slightly raised on both sides at base, apex obtuse. Lamina papery; pinna rachis clothed with lanceolate, brown scales; veins mostly forked, obscure adaxially, conspicuous abaxially; upper 1/3–1/2 of lamina fertile. Sori between costa and margin, 3 or 4 pairs on each pinnule; indusia orbicular-reniform, strombuliform, not completely covering sorus at maturity.

Pinus forests or evergreen broad-leaved forests; 1800–3400 m. Hubei, Shaanxi, Sichuan, C Taiwan (Jiayi, Nantou), Xizang, Yunnan [Bhutan, India, Nepal].

67. *Dryopteris nobilis* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 65. 1941.

优雅鳞毛蕨 you ya lin mao jue

Plants up to 1 m tall. Rhizome erect, clothed with ovate, bright castaneous scales extending to stipe base. Fronds caespitose; stipe stramineous, ca. 1/2 as long as lamina, sparsely clothed with ovate-lanceolate, dark brown scales; lamina lan-

ceolate, oblong-lanceolate, or deltoid-lanceolate, (40–)60–80 × 10–20 cm, bipinnate-pinnatifid, narrowed or slightly narrowed to base, apex acuminate; pinnae ca. 24 pairs, oblique, approximate, sometimes pinnae overlapping, lanceolate, 14–16 × ca. 5 cm, widest at base, cordate, shortly stalked; pinnules ca. 20 pairs, oblique, oblong, basal ones ca. 2.5 × 1 cm, adnate to costa at base, margin incised-dentate, lobed or not, with white-membranous edges, usually revolute, apex obtuse. Lamina papery or thinly leathery; rachises and costae sparsely scaly, with lanceolate, brown scales; veins pinnate, distinct, impressed adaxially, raised abaxially. Sori in 1 regular row on each side of costa, borne on middle parts of veins, closer to costa than margin; indusia brown, orbicular-reniform, entire, persistent.

Mixed forests, streamsides, evergreen broad-leaved forests, mountain slopes; 1600–2500 m. NW Yunnan [India].

- 1a. Plants larger; lamina oblong-lanceolate or deltoid-lanceolate, 60–80 cm, papery; pinnules incised-dentate, lobed 67a. var. *nobilis*
- 1b. Plants smaller; lamina lanceolate, 40–50 cm, thinly leathery; pinnules not lobed, dentate or shallowly incised only 67b. var. *fengiana*

67a. *Dryopteris nobilis* var. *nobilis*

优雅鳞毛蕨(原变种) you ya lin mao jue (yuan bian zhong)

Plants 80–110 cm tall. Lamina oblong-lanceolate or deltoid-lanceolate, 60–80 cm, papery; pinnules incised-dentate, lobed.

Mixed forests, streamsides; ca. 2500 m. NW Yunnan [India].

67b. *Dryopteris nobilis* var. *fengiana* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 67. 1941.

冯氏鳞毛蕨 feng shi lin mao jue

Plants 60–70 cm tall. Lamina lanceolate, 40–50 cm, thinly leathery; pinnules not lobed, dentate or shallowly incised only.

- Evergreen broad-leaved forests; ca. 1600 m. NW Yunnan (Gongshan).

68. *Dryopteris basisora* Christ, Notul. Syst. (Paris) 1: 44. 1909.

基生鳞毛蕨 ji sheng lin mao jue

Plants 60–80 cm tall. Rhizome erect, short; scales of rhizome and stipe base dense, bright rufous-brown, ovate-lanceolate, apex hair-shaped, usually twisted. Fronds caespitose; stipe dark stramineous, 1/4–1/2 as long as lamina, longitudinally grooved, clothed with lanceolate, dark brown scales, leaving distinct scars, distally smaller, lanceolate, with sparse teeth; lamina oblong-lanceolate, 40–60 × 20–30 cm, widest at base, bipinnatifid to tripinnatifid, apex acuminate; pinnae ca. 20 pairs, oblong-lanceolate, 7–15 × 3–5 cm, widest at base, truncate, sessile, apex acuminate; pinnules 8–10 pairs, alternate, oblong-lanceolate, 2–3 × ca. 1 cm, apex obtuse, sides deltoid-dentate, basiscopic pinnules longer than acroscopic ones; segments 4–6 pairs, oblong, apex with sharp deltoid teeth. Lamina papery or thinly leathery; rachis clothed with lanceolate, brown scales; veins conspicuous on both surfaces, mostly forked. Sori

2–5 pairs on each pinnule, borne on upper parts of pinnules, nearer to costa than to margin; indusia ferruginous, orbicular-reniform, covering sorus at maturity, persistent.

Pinus forests, evergreen broad-leaved forest margins. Sichuan, Yunnan [Bhutan, India (Uttarakhand), Nepal].

Dryopteris tieluensis Ching & Y. P. Hsu (Fl. Tsinling. 2: 228. 1974), described from Gansu (Wenxian), was treated as a synonym of *D. basisora* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 213. 1986).

69. *Dryopteris fructuosa* (Christ) C. Christensen, Index Filic. 267. 1905.

硬果鳞毛蕨 ying guo lin mao jue

Aspidium varium (Linnaeus) Swartz var. *fructuosum* Christ, Bull. Herb. Boissier 6: 967. 1898; *A. fructuosum* (Christ) Christ; *A. pseudovarium* Christ; *Dryopteris adenorachis* C. Christensen; *D. apicifixa* Ching, Boufford & K. H. Shing; *D. cavaleriei* H. Léveillé; *D. fructuosa* (Christ) C. Christensen var. *integriloba* Ching; *D. hypophlebia* Hayata; *D. pseudosabaei* Hayata; *D. pseudovaria* (Christ) C. Christensen; *Nephrodium fructuosum* (Christ) Handel-Mazzetti.

Plants 60–80 cm tall. Rhizome erect, short; scales of rhizome and stipe base dense, bright rufous-brown, ovate-lanceolate, with acicular tips, usually twisted. Fronds caespitose; stipe dark stramineous, 1/4–1/2 as long as lamina, adaxially grooved, clothed with lanceolate, dark brown scales, leaving distinct scars, distally smaller, lanceolate, sparsely spinulose-dentate; lamina oblong-lanceolate, 40–60 × 20–30 cm, widest at base, bipinnatifid to tripinnatifid, apex acuminate; pinnae ca. 20 pairs, oblong-lanceolate, 7–15 × 3–5 cm, widest at base, truncate, sessile; pinnules 8–10 pairs, oblong-lanceolate, 2–3 × ca. 1 cm, apex obtuse, sides deltoid-dentate, basiscopic pinnules longer than acroscopic ones, pinnatifid; segments 4–6 pairs, oblong, apex with 1 or 2 acute teeth. Lamina papery or thinly leathery; rachis clothed with lanceolate, brown scales; veins conspicuous on both surfaces, mostly forked. Sori 2–5 pairs on each pinnule, borne on lower part of pinnules, nearer to costa than to margin; indusia ferruginous, horseshoe-shaped, not completely covering sorus at maturity, persistent.

Pinus forests or evergreen broad-leaved forest margins; 1800–3400 m. Hubei, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal].

70. *Dryopteris juxtaposita* Christ, Bull. Acad. Int. Géogr. Bot. 17: 138. 1907.

粗齿鳞毛蕨 cu chi lin mao jue

Plants 50–100 cm tall. Rhizome erect, short, with brown scales. Fronds caespitose; stipe stramineous, ca. 30 cm, ca. 2 mm in diam., clothed with lanceolate, entire, dark brown scales at base, gradually glabrous toward rachis; lamina ovate-oblong, ca. 30 × 13 cm, bipinnate-pinnatifid; pinnae ca. 13 pairs, subopposite, 3–4 cm apart, deltoid-lanceolate, shortly stalked, lower pinnae 7–9 × 2.5–3 cm, base cuneate, apex acuminate; pinnules 11–13 pairs, oblong, basal pair largest, up to ca. 2 cm × 7 mm, apex rounded, with sparse coarse teeth, tapered farther up. Lamina papery, both surfaces glabrous or with 1 or 2 small

scales on costa abaxially; veins pinnate, 6 or 7 pairs on each pinnule, forked. Sori 5 or 6(–8) pairs on each pinnule; indusia brown, orbicular-reniform, papery, entire, readily deciduous.

Valleys, riversides; 1500–2500 m. Gansu (Wenxian), Guizhou, Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Nepal].

Dryopteris juxtaposita is often misidentified as *D. odontoloma* (T. Moore) C. Christensen, which occurs in S India.

71. *Dryopteris lachoongensis* (Beddome) B. K. Nayar & S. Kaur, Companion Beddome's Handb. Ferns Brit. India, 61. 1974.

脉纹鳞毛蕨 mai wen lin mao jue

Lastrea filix-mas (Linnaeus) C. Presl var. *lachoongensis* Beddome, Suppl. Ferns Brit. Ind. 58. 1892; *Dryopteris pseudodontoloma* Ching; *D. venosa* Ching & S. K. Wu.

Plants 55–85 cm tall. Rhizome erect, stout; scales of rhizome and stipe base pale brown, broadly lanceolate, ca. 1 cm, apex narrowly subulate. Fronds caespitose; stipe dark stramineous,

25–28 cm, ca. 3 mm in diam., longitudinally grooved, glabrous above stipe base; lamina oblong-lanceolate or ovate-lanceolate, 35–45 × 20–35 cm, bipinnate, apex shortly acuminate, basal pinna pair rarely tripinnate; pinnae 8–11 pairs, remote, 5–7 cm apart, shortly stalked, basal pair largest, 12–16 cm, 5–7 cm wide at base, narrowly deltoid, base shortly stalked, double-serrate, approximate, apex blunt-acuminate, basiscopic pinnules longer than acroscopic ones, especially basal basiscopic one longest (2.5–4.5 × ca. 1.5 cm), shortly stalked, pinnatifid, upper pinnules with margin unlobed, only sharply double-serrate; second pair of pinnae similar to basal one but smaller. Lamina thickly leathery, both surfaces glabrous; rachis and costa sparsely clothed with dark brown, lanceolate scales; veins distinctly impressed on both surfaces. Sori 6–12 pairs on upper pinnae, 2 or 3 pairs on lower part of each pinnule, close to costa or costule, in 1 row on each side, approximate; indusia dark brown, orbicular-reniform, papery, persistent.

Mixed forests, ravines; ca. 2200 m. Xizang, Yunnan [Bhutan, India, Nepal].

7. *Dryopteris* sect. *Marginatae* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 194. 1986.

边生鳞毛蕨组 bian sheng lin mao jue zu

Plants tall. Lamina pinnatifid-tripinnate. Basiscopic pinnule at base of basal pinnae not elongated, equal to or slightly shorter than next pinnule.

About 26 species: E and S Asia, Africa; seven species in China.

1a. Lamina broadly triangular-lanceolate, widest at base.

2a. Pinnules becoming pinnate only near base of lamina; indusia somewhat thick, red-brown, persistent 76. *D. subimpressa*

2b. Pinnules mostly pinnate throughout lamina; indusia thin, pale brown or brown, deciduous.

3a. Lamina smooth on adaxial surface, ultimate segments rectangular, subentire, stipe base scales glossy and exserted 77. *D. marginata*

3b. Lamina dull, with impressed veins on adaxial surface, ultimate segments acute, serrulate, stipe base scales, adpressed 78. *D. caroli-hopei*

1b. Lamina oblong-lanceolate, often slightly tapering to base.

4a. Lamina markedly dimorphic; fertile lamina usually contracted; indusia strombuliform 72. *D. cochleata*

4b. Lamina monomorphic; fertile lamina usually not contracted; indusia flat.

5a. Lamina nearly leathery, with translucent narrow pinnule edges 73. *D. porosa*

5b. Lamina papery, without translucent narrow pinnule edges.

6a. Fronds arising from apices of rhizome, pinnules deeply pinnatifid 74. *D. pteridoformis*

6b. Fronds arising from rhizome at intervals, pinnules pinnate 75. *D. angustifrons*

72. *Dryopteris cochleata* (Buchanan-Hamilton ex D. Don) C. Christensen, Index Filic. 258. 1905.

二型鳞毛蕨 er xing lin mao jue

Nephrodium cochleatum Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 6. 1825; *Aspidium cochleatum* (Buchanan-Hamilton ex D. Don) Christ; *A. filix-mas* (Linnaeus) Swartz var. *cochleatum* (Buchanan-Hamilton ex D. Don) Christ; *Dryopteris filix-mas* (Linnaeus) Schott var. *cochleata* (Buchanan-Hamilton ex D. Don) Alderwerelt; *Lastrea cochleata* (Buchanan-Hamilton ex D. Don) T. Moore; *L. filix-mas* (Linnaeus) C. Presl var. *cochleata* (Buchanan-Hamilton ex D. Don) Beddome; *Nephrodium filix-mas* (Linnaeus) Richard var. *cochleatum* (Buchanan-Hamilton ex D. Don) Hooker.

Plants 60–70 cm tall. Rhizome creeping, densely clothed

with linear-lanceolate, entire, bright scales. Fronds approximate, dimorphic; stipe of sterile frond stramineous, 20–30 cm, sparsely clothed with linear and linear-lanceolate, brown scales; lamina ovate, 30–40 cm, widest (ca. 22 cm wide) at base, bipinnatifid, base cordate, apex acuminate; pinnae 10–12 pairs, remote, basal pair deltoid-lanceolate, 10–12 × 3–4 cm, shortly stalked, apex acuminate; pinnules (segments) 10–12 pairs, oblique, oblong or subfalcate, margin incised-serrate, apex obtuse, basiscopic pinnules longer than acroscopic ones, base of basiscopic side undeveloped; pinnae above second pair lanceolate, base cordate, shortly stalked, apex acuminate, basiscopic pinnules similar to acroscopic ones. Lamina herbaceous; rachis and costa subglabrous, with sparse, linear, brown scales; veins pinnate, not forked, obscure adaxially, distinct abaxially. Stipe of fertile frond stramineous, base clothed with linear-lanceolate, brown scales, glabrous upward. Fertile lamina oblong-lanceo-

late, bipinnate, base slightly narrowed or not, apex acuminate; pinnae 10–12 pairs, ca. 1 cm apart, barred, ca. 1.5 cm × 2–3 mm, stalked, apex obtuse. Sori in 2 regular rows on each pinna (segment); indusia ferruginous, orbicular-reniform, entire.

Broad-leaved forests; 1200–1600 m. Guizhou, Sichuan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Kashmir, Myanmar, Nepal, Philippines, Thailand].

73. *Dryopteris porosa* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 460. 1938.

微孔鳞毛蕨 *wei kong lin mao jue*

Plants 65–120 cm tall. Rhizome obliquely ascending, stout; scales of rhizome and stipe base brown, broadly lanceolate, 2–2.5 × ca. 1 cm, apex narrowly subulate. Fronds subcaespitose; stipe dark stramineous, 25–40 cm, 5–8 mm in diam., longitudinally grooved, glabrous distally; lamina deltoid-lanceolate or ovate-lanceolate, 50–80 cm, 40–50 cm wide at base, tripinnate or tripinnately parted, apex acuminate; lateral pinnae 8–11 pairs, oblique, approximate, basal pair largest, narrowly deltoid-lanceolate or lanceolate, 20–25 cm, 12–14 cm wide at base, with ca. 1 cm stalk, apex bluntly acuminate; pinnules 10–15 pairs, oblique, approximate, basiscopic pinnules equal to acroscopic ones, lanceolate, 7–9 × ca. 2 cm, base cordate, shortly stalked, apex bluntly acuminate; ultimate segments 7 or 8 pairs, suboblong, ca. 1 × 0.6 cm, margin translucent, softly cartilaginous, sparsely serrate, tapered upward, apex obtuse or truncate. Lamina thickly leathery, both surfaces glabrous; rachis dark brown, with lanceolate scales, pinna rachis subglabrous; veins impressed on both surfaces. Upper part of lamina fertile, lower part sterile. Sori in 1 row on each side of costa; indusia dark brown, orbicular-reniform, papery, persistent.

Mixed forests, ravines; 600–1500 m. Guizhou, Sichuan, Yunnan [Bhutan, India, Nepal, Thailand].

74. *Dryopteris pteridiformis* Christ, Bull. Acad. Int. Géogr. Bot. 17: 137. 1907.

蕨状鳞毛蕨 *jue zhuang lin mao jue*

Plants 60–80 cm tall. Rhizome creeping, ca. 10 cm in diam., apex densely clothed with broadly ovate-lanceolate, entire, acuminate, brown scales. Fronds approximate or remote, 2–4 cm apart; stipes brown at base, ca. 26 cm, with ovate-lanceolate scales, stramineous upward and sparsely scaly; lamina oblong-lanceolate, 40–55 cm, 30–35 cm wide at base, bipinnate-pinnatifid, apex long acuminate; pinnae 12–14 pairs, oblique, 3–5 cm apart, lanceolate, ca. 16 cm, ca. 6 cm wide at base, shortly stalked, apex long acuminate; pinnules 10–12 pairs, oblong-lanceolate, apex obtuse, 3- or 4-serrate; basal pinnae shortly stalked, upper ones sloped to cuneate base and adnate to costa, 2–2.5 × ca. 1 cm; basiscopic pinnules slightly longer than acroscopic ones or equal, pinnately lobed or incised-serrate, pinnatifid at base; segments suboblong, apex with 2 or 3 beak-shaped, exerted teeth. Lamina papery, both surfaces glabrous; rachis clothed with lanceolate or ovate-lanceolate, pale brown, membranous, transparent scales, clothed with linear-lanceolate, brown scales along costa; veins pinnate, simple, obscure adaxially, conspicuous abaxially. Sori in 1 regular row on each side of costa, nearer to costa than to margin; indusia ferruginous, orbicular-reniform, papery, entire.

Evergreen broad-leaved forests; 1900–2100 m. Guizhou, Yunnan [India, N Myanmar].

75. *Dryopteris angustifrons* (Hooker) Kuntze, Revis. Gen. Pl. 2: 812. 1891.

狭叶鳞毛蕨 *xia ye lin mao jue*

Nephrodium splendens Hooker var. *angustifrons* Hooker, Sp. Fil. 4: 126. 1862; *Lastrea angustifrons* (Hooker) Beddome; *N. angustifrons* (Hooker) Baker.

Plants up to 90 cm tall. Rhizome creeping, stout, densely clothed with ovate, pale brown scales. Fronds remote; stipe stramineous, ca. 30 cm, ca. 4 mm in diam., sparsely scaly at base; scales pale brown, ovate, entire, bluntly acuminate; lamina oblong, 50–55 × 12–17 cm, widest at middle, tripinnate-pinnatifid, base slightly shortened, apex acuminate; pinnae 12–14 pairs, oblique, remote, lowest 2 or 3 pairs deltoid-lanceolate, 10–13 cm, widest at base, 5–10 cm wide, with short stalk 6–8 mm, apex acuminate; pinnules oblong-lanceolate, basal pair 3–5 cm, widest at base, 1–1.5 cm wide, cuneate, shortly stalked, apex bluntly acuminate; segments 5–7 pairs, oblique, oblong, margin entire or incised-serrate, apex obtuse, remotely deltoid-serrate; pinnae above middle part oblong-lanceolate, bipinnately lobed. Lamina herbaceous; rachis sparsely clothed with oblong-lanceolate or deltoid-subulate, pale brown scales and nodose, hair-shaped scales; costa sparsely clothed with lanceolate scales; veins pinnate, forked, slightly conspicuous adaxially, convex abaxially, apex with conspicuous hydathode. Upper part of lamina fertile, sori in 1 row on each side of costule; indusia ferruginous, orbicular-reniform, thick, persistent.

Mixed *Pinus-Quercus* forests, by streams; 2100–2700 m. W Yunnan [India, C Myanmar, Nepal].

76. *Dryopteris subimpressa* Loyal, Nova Hedwigia 16(3–4): 467. 1969.

柳羽鳞毛蕨 *liu yu lin mao jue*

Dryopteris submarginata Loyal (1965), not Rosenstock (1914).

Plants more than 1 m tall. Rhizome creeping. Stipe stramineous, ca. 1/2 as long as lamina, base densely clothed with ovate, pale brown, adnate scales; lamina deltoid-lanceolate, ca. 70 cm, widest at base, 40–50 cm wide, twice pinnate-pinnatifid; pinnae ca. 20 pairs, oblong-lanceolate, basal pair ca. 25 cm, ca. 12 cm wide at base, bipinnate, becoming tripinnatifid deeply or halfway, apex acuminate, stalk ca. 1 cm, pinnae sessile upward; pinnules ca. 12 pairs, oblique, narrowly oblong-lanceolate, basal pinnule ca. 6 cm, 1–2 cm wide at base, cuneate, shortly stalked, apex acuminate, other pinnules sessile, pinnatifid (pinnatifid at base); segments (ultimate pinnules) 6–8 pairs, oblique, deltoid-oblong, margin serrate, generally revolute, apex obtuse or truncate, sharply deltoid-serrate. Lamina thinly leathery; rachis and costa glabrous or sparsely scaly; scales pale brown, lanceolate and nodose, moniliform; veins pinnate, impressed adaxially, raised abaxially. Upper part of lamina fertile, sori in 1 regular row on each side of costule and close to costule; indusia ferruginous, orbicular-reniform, thick, persistent; spores ellipsoid, with wrinkled epispore, forming slices or papilla protuberance.

Forests; 2000–2400 m. W Yunnan [Bhutan, India, Nepal].

77. *Dryopteris marginata* (C. B. Clarke) Christ, Philipp. J. Sci., C, 2: 212. 1907.

边果鳞毛蕨 *bian guo lin mao jue*

Nephrodium filix-mas (Linnaeus) Richard var. *marginatum* C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 521. 1880; *Aspidium filix-mas* (Linnaeus) Swartz var. *marginatum* (C. B. Clarke) Christ; *Dryopteris blinii* H. Léveillé; *D. chiui* Ching; *D. grandissima* Tagawa; *D. leveillei* Nakai (1952), not Christ (1909); *D. metcalfei* Ching; *N. marginatum* (C. B. Clarke) C. Hope; *Polystichum blinii* (H. Léveillé) H. Léveillé & C. Christensen.

Plants up to 1.7 m tall. Rhizome stout, creeping, densely clothed with lanceolate, dark brown scales. Fronds strictly caespitose, approximate; stipe stramineous, stout, ca. 80 cm, ca. 1 cm in diam., base densely scaly; scales dark brown, oblong, ca. 3.5 × 1 cm, margin entire, apex acuminate; lamina deltoid-ovate, ca. 90 cm, base ca. 80 cm wide, twice pinnate-pinnatifid, apex acuminate; pinnae ca. 10 pairs, remote, basal 1 or 2 pairs ovate-lanceolate, ca. 40 cm, widest at base, ca. 20 cm wide, with stalk ca. 2 cm, apex long acuminate; pinnules 12–14 pairs, oblique, remote, lanceolate, basal ones ca. 10 × 2.5 cm, base truncate, with stalk ca. 0.5 cm, apex acuminate; segments (tripinnate pinnules) ca. 10 pairs, oblique, remote, oblong, margin incised, apex obtuse, with deltoid teeth, base connected to costa by a narrow wing; pinnae above middle of lamina oblong, sessile, apex bluntly acuminate. Lamina herbaceous; rachis and costa subglabrous, sparsely clothed with lanceolate, pale brown scales and nodose, moniliform scales; veins pinnate, obscure adaxially, apex with hydathode, raised abaxially, conspicuous. Sori in 1 regular row on each side of center of pinnule or seg-

ment, not close to costa or costule; indusia ferruginous, orbicular-reniform, entire, persistent.

Forests, by streams; 900–2400 m. Guangxi, Guizhou, Jiangxi, Sichuan, Taiwan, Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

C. B. Clarke based his new taxon largely on “*Aspidium marginatum* Wallich” (Numer. List, no. 391. 1829, nom. nud.) but “not the type sheet.”

78. *Dryopteris caroli-hopei* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 18(5): 422. 1989.

假边果鳞毛蕨 *jia bian guo lin mao jue*

Aspidium dilatatum Smith var. *patuloides* Christ.

Plants up to 90 cm tall. Rhizome creeping, stout, clothed with ovate-lanceolate, brown scales. Fronds approximate; stipe brown or dark brown basally, ca. 30 cm, 4–8 mm in diam., clothed with ovate-lanceolate or lanceolate, entire, brown scales and fibrillose scales, glabrous upward; lamina broadly deltoid-lanceolate, ca. 60 × 40 cm, tripinnate, base not narrowed, apex acuminate; pinnae 6–8 pairs, oblique, broadly lanceolate, widest at base, long stalked, apex acuminate, basal pinnae with stalk 2.5–3 cm; pinnules 9–12 pairs, lanceolate, base with short stalk, apex bluntly acuminate; basal pinnules largest, 8–10 × ca. 2.5 cm, basalmost pinnule with ca. 0.5 cm stalk, segments narrowly elliptic, ca. 1.5 × 0.6 cm, adnate to costule, apex bluntly acuminate, deltoid-serrate. Lamina thinly leathery, glabrous on both surfaces; costa sparsely linear-lanceolate scaly, densely scaly at base of pinnule axis; lateral veins pinnate, mostly forked, slightly distinct adaxially, conspicuous abaxially. Sori 1 on each segment; indusia brown, orbicular-reniform, entire, persistent. Spores ca. 64 within sporangium.

Quercus forests; 2100–2300 m. SE Xizang, C Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal].

8. *Dryopteris* sect. *Lophodium* (Newman) C. Christensen ex H. Itô in Nakai & Honda, Nov. Fl. Jap. 4: 65. 1939.

长尾鳞毛蕨组 *chang wei lin mao jue zu*

Lophodium Newman, Phytologist 4: 371. 1851.

Plants similar to *Dryopteris* sect. *Marginatae*, but scales at base of stipe thicker, normally bicolorous, and margin of pinnules with sharply acute teeth.

About ten species: N temperate zone and Africa; two species in China.

- 1a. Stipe as long as lamina, scales concolorous, lamina bipinnate-pinnatifid, pinnae shortly acuminate; sori near apex of veinlet 79. *D. carthusiana*
 1b. Stipe shorter than lamina, scales bicolorous, lamina bipinnate-pinnatisect, pinnae acuminate; sori on middle of veinlet 80. *D. expansa*

79. *Dryopteris carthusiana* (Villars) H. P. Fuchs, Bull. Soc. Bot. France 105: 339. 1959.

刺叶鳞毛蕨 *ci ye lin mao jue*

Polypodium carthusianum Villars, Hist. Pl. Dauphiné 1: 292. 1786.

Plants 30–60 cm tall. Rhizome erect or obliquely ascending, short, stout, scaly; scales pale brown, ovate or ovate-lanceolate, membranous, dentate. Fronds caespitose; stipe

stramineous, as long as lamina, longitudinally grooved, with ovate, dentate scales; lamina deltoid or ovate-oblong, 20–30 cm, 15–16 cm wide at lower part, bipinnate-pinnatifid; pinnae 12 or 13 pairs, oblique, basal pair largest, shortly stalked, upper ones gradually shortened, connected by wing at base, lowest ones deltoid, 9–10 × 4–5 cm, base subtruncate, shortly stalked, apex acuminate; pinnules 8 or 9 pairs, basal pair largest, upper ones gradually shortened, connected by broad wing, basal pair opposite or subopposite, deltoid, 2.5–3 cm, base 1–1.5 cm wide, shortly stalked; acroscopic pinnules smaller than basispic

ones, nearly at right angle to costae, basiscopic one parallel to pinna rachis or slightly oblique, pinnatifid; segments 4 or 5 pairs, basal pair asymmetrical, basiscopic one smaller than others, oblique, acroscopic one oblong, 8–10 × ca. 2 mm, almost parallel to costa, aristate. Veins impressed adaxially, raised abaxially, pinnate, simple, extending into each tooth. Sori terminal on apex of lateral veins, in 2 rows along main vein of pinnales; indusia pale brown, membranous, with an incised margin, often deciduous at maturity.

Montane forests, open forests; ca. 2000 m. Xinjiang (Zhaosu) [Europe, E North America].

According to the treatment by Chang Y. Yang (Fl. Xinjiang. 1: 46. 1992), *Dryopteris carthusiana* was collected from Zhaosu, Xinjiang, in 1974. This collection has not been seen by the present authors.

80. *Dryopteris expansa* (C. Presl) Fraser-Jenkins & Jermy, Fern Gaz. 11(5): 338. 1977.

广布鳞毛蕨 *guang bu lin mao jue*

Nephrodium expansum C. Presl, Reliq. Haenk. 1: 38. 1825; *Dryopteris assimilis* S. Walker; *D. manshurica* Ching; *D. siranensis* Nakai; *D. spinulosa* (O. F. Müller) Watt subsp. *assimilis* (S. Walker) Schidl.ay.

9. *Dryopteris* sect. *Aemulae* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 194. 1986.

柄羽鳞毛蕨组 *bing yu lin mao jue zu*

Lamina deltoid-lanceolate, tripinnate. Basal pairs of pinnae with costa longer than 2 cm. Basiscopic pinnule at base of basal pinnae pinnatifid, longer than next pinnule.

About three species: E Asia, Europe; two species in China.

- 1a. Stipe and rachis glabrous or sparsely scaly, ultimate segments entire 81. *D. gymnophylla*
 1b. Stipe and rachis clothed with pale brown and brown scales, ultimate segments sparsely serrate 82. *D. chinensis*

81. *Dryopteris gymnophylla* (Baker) C. Christensen, Index Filic. 269. 1905.

裸叶鳞毛蕨 *luo ye lin mao jue*

Nephrodium gymnophyllum Baker, J. Bot. 25: 170. 1887; *Dryopteris sakurarii* (Rosenstock) Tagawa; *D. subtripinnata* (Miquel) Kuntze var. *sakurarii* Rosenstock.

Plants 50–65 cm tall. Rhizome creeping, short, apex along with base of stipe scaly; scales dark brown, oblong-lanceolate or lanceolate. Fronds approximate; stipe 30–40 cm, stipe as well as rachis and costa pale stramineous tinged with green, glabrous or sparsely scaly; lamina pentagonal, 25–40 cm, at least as wide as long, tripinnate-pinnatifid; pinnae 5–8 pairs, alternate or subopposite, oblique, falcate, stalk up to 5 cm, basal pair largest, deltoid-lanceolate, 10–25 × 6–18 cm, base asymmetrical, apex caudate-acuminate, basal basiscopic pinnule largest and longest, basal acroscopic pinnule equal to second one; pinnules 10–12 pairs, stalked, deltoid-oblong, basiscopic ones longer than acroscopic ones; ultimate segments sessile, base decurrent, apex obtuse, entire or serrate, more distal pinnae oblong-lanceolate to lanceolate. Lamina herbaceous; veins pinnate, simple. Sori terminal on apices of veinlets, nearer to margin than to costa; indusia brown, orbicular-reniform, thin, persistent.

Plants 40–100 cm tall. Rhizome obliquely ascending or creeping, short, stout. Fronds caespitose; stipe densely scaly; scales pale brown to castaneous with a pale brown margin, glossy, ovate to broadly lanceolate, ca. 1.5 cm, membranous, apex acute; lamina longer than stipe, oblong, ovate-oblong, or subdeltoid, 25–50 × 12–35 cm, bipinnate-pinnatifid, base not narrowed, apex acuminate; pinnae 6–11 pairs, opposite or subopposite, basal pinnae largest, obliquely deltoid, shortly stalked, basiscopic pinnules distinctly longer than acroscopic ones, remaining pinnae oblong-lanceolate, rarely oblong-ovate, shortly stalked, apex acuminate; pinnules oblong, shortly stalked, apex acute; segments oblong, 2–4 mm wide, apex with aristate teeth. Lamina herbaceous, glabrous; veins pinnate, not forked, 3 or 4 pairs on each segment. Sori on upper part of veinlets; indusia orbicular-reniform, entire or slightly incised.

Forests; 700–1800 m. Hebei (Wuling Shan), Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia (Far East); Europe, North America].

Dryopteris spinulosa var. *morrisonensis* Hayata (J. Coll. Sci. Imp. Univ. Tokyo 30: 422–423. 1911; *D. morrisonensis* (Hayata) Hayata), described from Taiwan, was treated as a synonym of *D. expansa* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 210. 1986).

Forests; 300–700 m. Anhui, Guizhou, Hebei, Henan, Hubei, Jiangsu, Jiangxi, Shandong, Zhejiang [Japan, Korea].

82. *Dryopteris chinensis* (Baker) Koidzumi, Fl. Symb. Orient.-Asiat. 39. 1930.

中华鳞毛蕨 *zhong hua lin mao jue*

Nephrodium chinense Baker in Hooker & Baker, Syn. Fil. 278. 1867; *Aspidium forbesii* Hance.

Plants 25–35 cm tall. Rhizome erect, short, stout; scales of rhizome and base of stipe dense, brown (sometimes dark brown in center), lanceolate. Fronds caespitose; stipe stramineous, 10–20 cm, ca. 2 mm in diam., glabrous or sparsely scaly upward; lamina as long as or longer than stipe, pentagonal, 8–18 cm wide, tripinnate-pinnatifid; pinnae 5–8 pairs, oblique, basal pair largest, 6–12 × 3–8 cm, widest at base, deltoid-lanceolate, base asymmetrical, upper side close to rachis, lower side obliquely extended, stalk 5–10 mm, apex acuminate; pinnules oblique, basiscopic ones larger than acroscopic ones, basal one largest, 2.5–5 × 1.5–2.5 cm, widest at base, deltoid-lanceolate, base subtruncate, stalk 1.5–3 mm, apex shortly acuminate; ultimate segments deltoid-ovate or lanceolate, apex obtuse, shallowly pinnatifid or sparsely serrate. Lamina papery, glabrous adaxially; rachis as well as costa abaxially covered with small, lanceolate, dark brown scales, sparsely brown pubescent along

vein; veins pinnate on ultimate segments, visible abaxially, veinlets forked or simple. Sori terminal on apex of veinlets, nearer to margin than to costa; indusia orbicular-reniform, subentire, persistent.

Forests; 200–1200 m. Anhui, Henan, Jiangsu, Jiangxi, Liaoning, Shandong, Zhejiang [Japan, Korea].

Fraser-Jenkins has identified the British Museum holotype of *Aspidium forbesii* as *Dryopteris chinensis*.

10. *Dryopteris* sect. *Remotae* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 192. 1986.

西域鳞毛蕨组 xi yu lin mao jue zu

Lamina bipinnate to tripinnatifid. Pinnae asymmetrical at base. Basiscopic pinnules longer than acroscopic ones. Segments sharply serrate at apex.

About five species: Europe and Sino-Himalayan region; three species (one endemic) in China.

- 1a. Pinnae equilateral, pinnules with blunt apices 85. *D. blanfordii*
 1b. Pinnae inequilateral, basiscopic pinnules longer, pinnules acute.
 2a. Rachis throughout clothed with linear or acicular scales 83. *D. goeringiana*
 2b. Rachis clothed with dense broadly lanceolate scales 84. *D. gonggaensis*

83. *Dryopteris goeringiana* (Kuntze) Koidzumi, Bot. Mag. (Tokyo) 43: 386. 1929.

华北鳞毛蕨 hua bei lin mao jue

Aspidium goeringianum Kuntze, Bot. Zeitung (Berlin) 6: 557. 1848; *Dryopteris laeta* (Komarov) C. Christensen; *D. laeta* var. *alpina* Ching; *D. laeta* var. *oblongifrons* Kitagawa; *D. oxyodon* (Franchet) Kitagawa var. *oblongifrons* (Kitagawa) Kitagawa; *Nephrodium laetum* Komarov.

Plants 50–90 cm tall. Rhizome creeping, stout. Fronds approximate; stipe pale brown, 25–50 cm, longitudinally grooved, scaly; scales pale brown, broadly lanceolate to linear, up to 1.5 cm, membranous, remotely serrate, rachis throughout clothed with linear or acicular scales; lamina ovate-oblong or deltoid-ovate, 25–50 × 15–40 cm, tripinnatifid, apex acuminate; pinnae alternate, lanceolate or oblong-lanceolate, shortly stalked, apex long acuminate, middle and lower pinnae longer, 11–27 × 2.5–6 cm, slightly narrowed toward base; pinnules approximate, basal basiscopic ones shortened, lanceolate or oblong-lanceolate, apex acute; segments oblong, 1–3 mm wide, often serrate at apex, sometimes also on margin. Lamina herbaceous to thinly papery, with acicular scales abaxially on costa and costule; veins pinnate, forked. Sori in 2 rows on each side of costa of pinnule; indusia orbicular-reniform, membranous, margin eroded.

Broad-leaved forests, thickets. Gansu, Hebei, Henan, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xinjiang [Japan, Korea, Russia].

The following names, *Dryopteris filix-mas* subsp. *oxyodon* (Franchet) C. Christensen (Index Filic. 266. 1905; *Aspidium oxyodon* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 7: 163–164. 1884, types from Hebei and Mongolia; *D. oxyodon* (Franchet) Kitagawa (1935), not (Baker) C. Christensen (1905)), *D. sublaeta* Ching & Y. P. Hsu (Fl. Tsinling. 2: 227. 1974, described from Henan), and *D. subramosa* Christ (Notul. Syst. (Paris) 1: 42. 1909, described from Shaanxi) were synonymized with *D. goeringiana* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 211, 212. 1986).

84. *Dryopteris gonggaensis* H. S. Kung, Li Bing Zhang & X. S. Guo, Acta Bot. Yunnan. 17: 159. 1995.

贡嘎鳞毛蕨 gong ga lin mao jue

Plants ca. 80 cm tall. Rhizome erect. Fronds caespitose; stipes ca. 22 cm, ca. 7 mm in diam. at base; scales blackish brown, concolorous, shiny, ovate-lanceolate, often ca. 0.9 × 0.5 cm, membranous, margins nearly entire or ciliate, apex acute or acuminate; lamina elliptic-lanceolate, ca. 58 cm, ca. 18 cm wide at middle, bipinnate, below middle contracted toward base and sterile, acuminate and fertile at apex; rachis ca. 3 mm in diam. at middle; rachis scales dense, blackish brown, broadly lanceolate; pinnae 18–20 pairs, spreading, alternate, shortly stalked, lanceolate, 5–11 cm, 1.8–2.6 cm wide at middle, pinnate, asymmetrical at base, acuminate at apex; pinnules sessile, 10–14 pairs, oblong, 1–1.4 × 0.4–0.5 cm, fibrillose on both surfaces, asymmetrical at base, dentate on margin, obtuse at apex. Lamina herbaceous, veins 8–11 pairs per pinnule, pinnate, distinct abaxially; lateral veinlets forked. Sori in 1 row on each side of costa, brown, orbicular; indusia brown, reniform, membranous.

• Shrubs under *Pinus* forests; ca. 3600 m. Sichuan (Kangding).

85. *Dryopteris blanfordii* (C. Hope) C. Christensen, Index Filic. 254. 1905.

西域鳞毛蕨 xi yu lin mao jue

Plants ca. 90 cm tall. Rhizome obliquely ascending or creeping, stout, clothed with oblong-lanceolate, brown scales. Fronds caespitose; stipe pale brown, ca. 30 cm, ca. 4.5 mm in diam., grooved, densely scaly; scales brown, dark brown, or black, oblong, serrate, apex long acuminate, scales sparser and smaller upward, lanceolate to linear; lamina ovate-oblong or deltoid-ovate, ca. 65 × 30 cm, widest at middle, tripinnatifid, base slightly narrowed, apex acuminate; pinnae ca. 15 pairs, alternate, spreading, lanceolate or oblong-lanceolate, shortly stalked, apex long acuminate, middle and lower pinnae longer, 11–15 × 2.5–4 cm, slightly narrowed toward base; pinnules approximate, basal basiscopic pinnule shortened, lanceolate or oblong-lanceolate, apex acute; other pinnules oblong, 1.5–2 × 6–8 mm, slightly oblique at base, apex sharply serrate; segments oblong, apex with or without 2 or 3 sharp teeth. Lamina herbaceous to thinly papery, with linear, brown scales on abaxial side of costae and costules; veins pinnate, forked, obscure adaxially, visible abaxially. Sori in 1 row on each side of costule; indusia orbicular-reniform, membranous, margin entire.

Picea or *Abies* forests; 2900–3500 m. Gansu, Sichuan, Xizang, Yunnan [Afghanistan, India, Kashmir, Nepal, Pakistan].

- 1a. Scales on stipe brown; segment apex with 2 or 3 sharp serratures 85a. subsp. *blanfordii*
- 1b. Scales on stipe dark brown or black; segment apex rarely sharply serrate 85b. subsp. *nigrosquamosa*

85a. *Dryopteris blanfordii* subsp. *blanfordii*

西域鳞毛蕨(原亚种) xi yu lin mao jue (yuan ya zhong)

Nephrodium blanfordii C. Hope, J. Bombay Nat. Hist. Soc. 12: 624. 1899; *Dryopteris gongboensis* Ching.

Scales on stipe brown; segment apex with 2 or 3 sharp serratures.

Picea or *Abies* forests; 2900–3500 m. W Sichuan, Xizang [Afghanistan, India, Kashmir, Nepal, Pakistan].

85b. *Dryopteris blanfordii* subsp. *nigrosquamosa* (Ching)
Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 18(5): 388. 1989.

黑鳞西域鳞毛蕨 hei lin xi yu lin mao jue

Dryopteris nigrosquamosa Ching, Bull. Fan Mem. Inst. Biol. 2: 194. 1931; *D. gushaingensis* Ching.

Scales on stipe dark brown or black; segment apex rarely sharply serrate.

Picea or *Abies* forests; 2900–3500 m. Gansu, Sichuan, Xizang, Yunnan [NC Nepal].

11. *Dryopteris* sect. *Splendentes* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 193. 1986.

华丽鳞毛蕨组 hua li lin mao jue zu

Plants usually tall. Lamina bipinnate to tripinnate. Stipe usually reddish or reddish brown. Base of pinnules asymmetrical, shortly serrate.

About six species: China, E Himalaya, New Guinea; five species (three endemic) in China.

- 1a. Plants 60–85 cm tall; lamina bipinnate to tripinnatifid, pinnules incised; stipe stramineous.
 - 2a. Lamina grass-green; pinnules incised ca. 1/2 of distance to midrib and dentate at apex; sori not limited to apical half of pinnules 86. *D. reflexosquamata*
 - 2b. Lamina dark green; pinnules deeply cut, incised at least 2/3 of distance to midrib and sharply serrate-dentate at apex; sori typically confined to apical half of pinnules 87. *D. kwanzanensis*
- 1b. Plants 1–2 m tall; lamina bipinnate-tripinnate; stipe dark brown or ebeneous.
 - 3a. Stipe and lower rachis with ovate-lanceolate to broadly ovate, glossy black scales 88. *D. sikkimensis*
 - 3b. Stipe and lower rachis with thin, lanceolate, appressed, brown scales.
 - 4a. Stipe and rachis ebeneous 89. *D. splendens*
 - 4b. Lower part of stipe dark brown, rachis stramineous 90. *D. rubrobrunnea*

86. *Dryopteris reflexosquamata* Hayata, Icon. Pl. Formosan. 4: 176. 1914.

倒鳞鳞毛蕨 dao lin lin mao jue

Dryopteris paludicola Ching & Z. Y. Liu.

Plants ca. 85 cm tall. Rhizome obliquely ascending, densely scaly; scales dark brown, lanceolate, entire. Fronds caespitose; stipe dull stramineous, 16–27 cm, ca. 5 mm in diam., base densely clothed with oblong-lanceolate to narrowly lanceolate, dark brown, fimbriate scales; lamina ovate-lanceolate, 30–50 × 20–30 cm, bipinnate, base slightly narrowed or not, apex acuminate; pinnae 10–12 pairs, alternate, spreading or barely ascending, remote, lanceolate, lower several pairs ca. 15 × 4 cm, base truncate, shortly stalked, apex acuminate; pinnules ca. 14 pairs, spreading, oblong-lanceolate, 2–3 × ca. 1 cm, apex obtuse, basicopic side cuneate, acroscopic side truncate or auriculate, basal basicopic pinnules often shortened, margin lobed. Lamina herbaceous; rachis and costa scaly, scales lanceolate, with ciliate acute teeth, costules below with few linear, dark brown scales; veins pinnate, forked, impressed adaxially, raised abaxially. Upper part of lamina fertile, sori in 1 regular row on each side of costule; indusia often caducous.

• Forests, streamsides; 1400–3000 m. Guizhou, Hunan, Sichuan, Taiwan, NE Yunnan.

87. *Dryopteris kwanzanensis* Tagawa, Acta Phytotax. Geobot. 7: 186. 1937.

拟倒鳞鳞毛蕨 ni dao lin lin mao jue

Plants up to 1 m tall. Rhizome erect, densely scaly. Fronds caespitose; stipe stramineous, ca. 35 cm, base scaly, scales castaneous, lanceolate to ovate, ca. 10 × 5 mm, margin denticulate, apex acuminate; lamina oblong, ca. 50 × 30 cm, ± tripinnate; pinnae subopposite, lanceolate, base truncate, shortly stalked, apex long acuminate, basal ones larger, ca. 20 × 5 cm; rachis stramineous, sulcate, glabrous adaxially, sparsely clothed abaxially with lanceolate, brown scales ca. 5 mm; pinnules suboblique, triangular-lanceolate, glabrous abaxially, sparsely clothed adaxially with linear or fibrillose scales ca. 3 × 1 mm, base broadly cuneate, shortly stalked, apex obtuse; segments oblong, margin incised-serrate, apex rounded or subtruncate, basicopic segments ca. 7 × 3 cm. Lamina subleathery, costa and veins impressed adaxially. Sori orbicular, in 1 row on each side of costa; indusia orbicular-reniform, persistent.

• Mountains, coniferous forests; 2700–3200 m. Taiwan (Taikou).

Dryopteris amoena Ching (Bull. Fan Mem. Inst. Biol., Bot. 8: 454. 1938), described from Taiwan (Mt. Arisan), was synonymized with *D. kwanzanensis* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 207. 1986).

88. *Dryopteris sikkimensis* (Beddome) Kuntze, Revis. Gen. Pl. 2: 813. 1891.

锡金鳞毛蕨 xi jin lin mao jue

Polystichum sikkimense Beddome, Ferns Brit. India 1: 127. 1866; *Aspidium sikkimense* (Beddome) Baker; *Dryopteris pseudosikkimensis* Ching & S. K. Wu; *Lastrea sikkimensis* (Beddome) Beddome.

Plants 75–80 cm tall. Rhizome erect, short, juvenile buds wrapped in ferruginous scales. Fronds caespitose; stipe dark brown, up to 30 cm, ca. 3 mm in diam., sparsely scaly; scales ovate-lanceolate to broadly ovate, usually appressed; lamina ovate, up to 50 × 35 cm, tripinnate-pinnatifid, apex acuminate; pinnae ca. 15 pairs, oblique, approximate, alternate or subopposite, shortly stalked, basal ones similar to upper ones, linear-lanceolate, ca. 17 × 3.5 cm, base symmetrical, rounded-truncate, apex caudate-acuminate; pinnules ca. 20 pairs, nearly spreading, approximate, oblong, sessile, basal pair ca. 2 × 8 mm, base slightly oblique, cuneate, apex rounded, with sparse teeth; segments 5 or 6 pairs, ascending, approximate, basal acroscopic one larger than next above, oblong, apex obtuse, with several obtuse teeth. Lamina herbaceous, glabrous on both surfaces; costa clothed with few broadly lanceolate, brown scales abaxially, rachis stramineous, sparsely clothed with appressed, broadly ovate, glossy black acute scales abaxially, rachis as well as costa with a broad groove adaxially; veins slightly visible, ca. 2 pairs on each segment, oblique, forked. Sori confined to upper half of pinnae, 2 or 3 pairs, 1 sorus on each segment; indusia brown, membranous, persistent.

Broad-leaved forests; ca. 2300 m. Xizang (Mêdog), Yunnan (Gongshan) [India (Sikkim)].

89. *Dryopteris splendens* (Hooker) Kuntze, Revis. Gen. Pl. 3: 813. 1891.

光亮鳞毛蕨 guang liang lin mao jue

Nephrodium splendens Hooker, Sp. Fil. 4: 126. 1862; *Aspidium splendens* (Hooker) Christ; *Lastrea splendens* (Hooker) Beddome.

Plants up to 1.2–1.8 m tall. Rhizome creeping. Fronds

approximate; stipe ebeneous, ca. 1/3 as long as lamina, stout, with raised ridges on base; scales appressed, brown, small, ovate-lanceolate, thin; lamina lanceolate or ovate-lanceolate, ca. 70 × 50 cm, bipinnate, base somewhat narrowed, truncate, apex acuminate; pinnae 25–32 pairs, oblique, remote, narrowly lanceolate, ca. 25 × 4 cm, apex caudate-acuminate, basal several pairs shortly stalked; pinnules 20–24 pairs, spreading, remote, oblong or orbicular-falcate, apex obtuse, basispic base cuneate, acroscopic margin slightly raised, sessile. Lamina herbaceous; rachis and pinna rachis similar in color to stipe, sparsely scaly; scales castaneous, lanceolate and linear-lanceolate, serrate, especially dense abaxially; veins pinnate, forked, conspicuous on both surfaces, apex with distinct hydathode adaxially. Sori in 1 row on each side of costa, nearer to costa than to margin, upper part of pinnae usually sterile; indusia castaneous, orbicular-reniform, entire.

Mixed forests (evergreen and deciduous broad-leaved forests); ca. 2400 m. Yunnan (Gongshan) [Bhutan, India, Nepal].

90. *Dryopteris rubrobrunnea* W. M. Chu, Acta Bot. Yunnan., Suppl. 5: 36. 1992.

红褐鳞毛蕨 hong he lin mao jue

Plants 1.2–1.8 m tall. Rhizome creeping. Fronds approximate; stipe dark rufous, ca. 1/3 as long as lamina, stout, with raised ridges on base; scales appressed, brown, small, ovate-lanceolate, thin; lamina lanceolate to ovate-lanceolate, ca. 70 × 50 cm, bipinnate, base somewhat narrowed, truncate, apex acuminate; pinnae 25–32 pairs, oblique, remote, narrowly lanceolate, ca. 25 × 4 cm, apex caudate-acuminate, basal several pairs shortly stalked; pinnules 20–24 pairs, spreading, remote, oblong or orbicular-falcate, apex obtuse, basispic base obliquely truncate, acroscopic side slightly protruding, asymmetrical, sessile, attached to costa, pinnatisect at base. Lamina herbaceous, sparsely scaly adaxially, densely so abaxially; scales castaneous, lanceolate and linear-lanceolate, serrate; veins pinnate, forked, conspicuous on both surfaces, apices with distinct hydathode adaxially. Sori in 1 row on each side of costule, not close to costule; indusia castaneous, orbicular-reniform, entire.

• Evergreen broad-leaved forests; 2000–2800 m. NW, SC, and SE Yunnan.

12. *Dryopteris* sect. *Purpurascentes* Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 197. 1986.

紫色鳞毛蕨组 zi se lin mao jue zu

Lamina 3- or 4-pinnate; pinnules far apart from each other. Base of stipe clothed with linear-lanceolate, wrinkled, golden scales.

About 13 species: mainly in S Asia, Australia, Pacific islands (including Hawaiian Islands), and Africa, one species in South America; one species in China.

91. *Dryopteris pulvinulifera* (Beddome) Kuntze, Revis. Gen. Pl. 2: 213. 1891.

肿足鳞毛蕨 zhong zu lin mao jue

Lastrea pulvinulifera Beddome, Ferns Brit. India 2: 333. 1870; *Dryopteris harae* H. Itô; *L. pulvinulifera* var. *zeylanica* Beddome; *L. sparsa* (D. Don) T. Moore var. *zeylanica* (Beddome) Beddome; *Nephrodium pulvinuliferum* (Beddome) Baker; *N. sparsum* D. Don var. *squamulosum* C. B. Clarke.

Plants up to 90 cm tall. Rhizome creeping, densely clothed with linear-lanceolate, bright golden scales. Fronds caespitose; stipe stramineous, 25–30 cm, base densely scaly; scales bright golden, narrowly lanceolate; lamina deltoid-lanceolate, 40–60 cm, widest at base, ca. 40 cm wide, lower part quadripinnate, upper part tripinnate, apex acuminate; pinnae 10–18 pairs, usually overlapping, 1 or 2 basal pairs deltoid-lanceolate, ca. 20 × 14 cm, widest at base, stalk ca. 6 mm, apex acuminate; pinnules 12–14 pairs, lanceolate, base oblique, cuneate, shortly stalked,

apex acuminate, basal basiscopic ones longest, up to 9 × 1.5–2 cm, widest at base, bipinnatifid or bipinnatifid, tertiary segments 8–10 pairs, oblique, approximate, oblong or subfalcate, base oblique, apex obtuse, basal one pinnatifid, adjacent one above lobed, apex acute; secondary pinnae oblong, pinnate or pinnatifid, base cuneate, sessile, apex obtuse-acute, tertiary segments entire, rarely incised. Lamina: rachis and costa with

few brownish black, subulate, small scales abaxially; veins pinnate, obscure adaxially, conspicuous abaxially. Sori terminating veinlets, in 1 regular row on each side of costa; indusia orbicular-reniform, thin, persistent.

Evergreen broad-leaved forests; 2200–2700 m. NW Yunnan (Gongshan) [Bhutan, India, Nepal, Philippines, Sri Lanka].

13. *Dryopteris* sect. *Nephrocystis* H. Itô, Bot. Mag. (Tokyo) 49: 437. 1935, p.p.

稀羽鳞毛蕨组 xi yu lin mao jue zu

Lamina 2- or 3-pinnate, basiscopic pinnule of basal pair of pinnae elongated as pinnatifid.

About ten species: mainly in Asia and Pacific islands; six species (two endemic) in China.

- 1a. Sori exindusiate 92. *D. polita*
- 1b. Sori indusiate.
 - 2a. Pinnae caudate-acuminate; indusia irregularly lacerate 93. *D. subexaltata*
 - 2b. Pinnae acuminate; indusia not lacerate.
 - 3a. Upper part of stipe and rachis glossy castaneous 94. *D. yoroi*
 - 3b. Upper part of stipe and rachis stramineous or purplish brown.
 - 4a. Stipe 15–17 cm, purplish brown; lamina ovate, 20–30 × 10–15 cm; pinnule apices obtuse 95. *D. cacaina*
 - 4b. Stipe 15–35 cm, brown in lower part, stramineous in upper part; lamina oblong-ovate, 30–50 × 15–25 cm; pinnule apices ± acute.
 - 5a. Basal pinnae bipinnatifid to bipinnate 96. *D. sparsa*
 - 5b. Basal pinnae bipinnate to tripinnatifid 97. *D. melanocarpa*

92. *Dryopteris polita* Rosenstock, Repert. Spec. Nov. Regni Veg. 13: 218. 1914.

蓝色鳞毛蕨 lan se lin mao jue

Dryopteris chapaensis C. Christensen & Ching ex Ching; *D. exindusiata* Ching & P. S. Chiu; *D. livida* Ching & Chu H. Wang; *D. viridis* Ching.

Plants ca. 75 cm tall. Rhizome erect, scaly; scales dark brown, glossy, linear, ca. 2.5 mm, entire, apex long acuminate. Stipe pale stramineous distally, brown basally, 30–35 cm, ca. 3 mm in diam., narrowly grooved, glabrous, sparsely scaly; scales ferruginous, lanceolate; lamina deltoid, ca. 20 × 20 cm, widest at base, upper part oblong-falcate, pinnatifid, apex narrowed, caudate, remotely serrate; pinnae 7–9 pairs, alternate, spreading, 3.5–5 cm apart, shortly stalked, middle pinnae linear-lanceolate, 5–8 × 1.5–2.5 cm, widest at base, slightly curved upward, base rounded-truncate, apex acuminate, shallowly serrate; segments obliquely oblong, obtuse, serrate, lower several pairs deltoid-lanceolate, 8–10 cm, base 3–4 cm wide, with 1 or 2 free pinnules at base, basal basiscopic pinnule largest; pinnules lanceolate, 2.5–3 cm, base 6–8 mm wide, rounded-truncate, sessile, apex obtuse, upper margin obtuse-serrate, lower margin lobed. Lamina herbaceous, glabrous; veins obscure adaxially, somewhat visible abaxially, pinnate, veinlets on upper part of lamina often simple, on lower part often forked. Sori 1–3 pairs on each segment, subapical on veinlets, exindusiate.

Evergreen broad-leaved forests; 600–2200 m. Hainan, Taiwan, Yunnan [Indonesia, Japan, Thailand, Vietnam].

93. *Dryopteris subexaltata* (Christ) C. Christensen, Index Filic. 295. 1905.

裂盖鳞毛蕨 lie gai lin mao jue

Aspidium subexaltatum Christ, Bull. Herb. Boissier, sér. 2, 4: 616. 1904; *Dryopteris hayatae* Tagawa.

Plants 30–40 cm tall. Rhizome erect, short, densely scaly; scales castaneous, broadly lanceolate, entire. Fronds caespitose; stipe stramineous, longer than lamina, 20–25 cm, base sparsely scaly; scales brown, lanceolate, entire, apex acicular; lamina ovate-oblong or deltoid-ovate, 15–25 × 10–15 cm, bipinnatifid to tripinnatifid, base not narrowed, apex acuminate; pinnae 7–9 pairs, opposite or subopposite, slightly obliquely ascending, shortly stalked, basal pair largest, deltoid-lanceolate, slightly falcate, 5–8 × 3–5 cm, apex shortly acuminate, remaining pinnae lanceolate; pinnules 7–9 pairs, alternate, oblong-lanceolate, base broadly cuneate, usually asymmetrical, basiscopic pinnule of basal pair longer than others, 3–4 × 1–2 cm, widest at base; segments oblong, apex obtuse and with several acute teeth. Lamina subpapery, both surfaces glabrous; veins pinnate, forked, obscure adaxially, conspicuous abaxially. Sori on middle of veinlets; indusia orbicular-reniform, often irregularly incised at maturity.

Subtropical broad-leaved forests, often on steep slopes; near sea level to 1100 m. Taiwan [Japan].

94. *Dryopteris yoroi* Serizawa, J. Jap. Bot. 46: 20. 1971.

栗柄鳞毛蕨 li bing lin mao jue

Acrorumohra yoroi (Serizawa) W. C. Shieh; *Aspidium nitidulum* Wallich ex Kuhn; *Dryopteris nitidula* (Wallich ex Kuhn) Mitsuta & S. K. Wu; *D. sparsa* (D. Don) Kuntze var. *nitidula* (Wallich ex Kuhn) C. Christensen; *Lastrea sparsa* (D. Don) T. Moore var. *nitidula* (Wallich ex Kuhn) Beddome; *Nephrodium sparsum* D. Don var. *nitidulum* (Wallich ex Kuhn) C. B. Clarke.

Plants 35–50 cm tall. Rhizome erect or obliquely ascending, short, densely scaly; scales brown, lanceolate, entire. Fronds caespitose, usually dimorphic; fertile frond with stipe 15–20 cm, castaneous, glossy, base sparsely clothed with ovate or ovate-lanceolate, entire, brown scales; lamina ovate-oblong or deltoid-ovate, 15–25 × 10–15 cm, bipinnate to tripinnatlobate, base not narrowed, apex acuminate; pinnae 7–9 pairs, opposite or subopposite, slightly obliquely ascending, shortly stalked, basal pair largest, deltoid-lanceolate, slightly falcate, 5–8 × 3–5 cm, apex acuminate, remaining pinnae lanceolate; pinnules 7–9 pairs, alternate, oblong-lanceolate, base broadly cuneate, usually asymmetrical, basispic pinnule of basal pair longer than others, 3–4 × 1–2 cm, widest at base; segments oblong, apices obtuse with several acute teeth. Sterile frond larger than fertile one, lamina with more teeth. Lamina subpapery, both surfaces glabrous; veins pinnate, forked, obscure adaxially, conspicuous abaxially. Sori on middle of veinlets; indusia orbicular-reniform, entire.

Forests, by streams, on wet rocks; 500–3200 m. Guangxi, Guizhou, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal].

95. *Dryopteris cacaina* Tagawa, Acta Phytotax. Geobot. 7: 155. 1937.

蓬菜鳞毛蕨 peng lai lin mao jue

Rhizome erect to ascending, densely scaly. Fronds caespitose; stipe purplish brown, subnitid, 15–17 cm, incrassate at base, sparsely scaly; scales brown, broadly ovate, ca. 5 × 3 mm, membranous, entire, acute or obtuse; lamina ovate, 20–30 × 10–15 cm, bipinnatifid, base cordate, apex abruptly acuminate; pinnae ca. 8 pairs, subopposite, remote, patent, middle pinnae lanceolate, 6–10 × 2.5–4 cm, shortly stalked, apex acuminate; pinnules oblong, base broadly adnate, margin crenate-serrulate, apex obtuse, lower ones ovate, pinnatifid, base broadly cuneate to truncate, shortly stalked, apex obtuse, basispic pinnules 1.5–2 × 1–1.5 cm; lower pinnae triangular-ovate, inequilateral, 8–15 × 5–8 cm, basispic pinnules 4–6 × 2–2.5 cm. Lamina rigidly herbaceous, both surfaces glabrous; rachis glabrous, subnitid. Indusia orbicular-reniform.

• Forests. Taiwan (Tainan).

96. *Dryopteris sparsa* (D. Don) Kuntze, Revis. Gen. Pl. 2: 813. 1891.

稀羽鳞毛蕨 xi yu lin mao jue

Nephrodium sparsum D. Don, Prodr. Fl. Nepal. 6. 1825;

Aspidium sparsum (D. Don) Sprengel; *Dryopteris parasparsa* Ching & S. K. Wu; *D. sinosparsa* Ching & K. H. Shing; *D. sparsa* subsp. *viridescens* (Baker) Fraser-Jenkins; *D. sparsa* var. *viridescens* (Baker) Ching; *D. viridescens* (Baker) Kuntze; *D. subtripinnata* (Miquel) Kuntze var. *bunkikiyensis* Rosenstock; *Lastrea sparsa* (D. Don) T. Moore; *N. viridescens* Baker; *Polystichum sparsum* (D. Don) Keyserling.

Plants 50–70 cm tall. Rhizome erect or obliquely ascending, short, rhizome and stipe base with abundant lanceolate, entire, brown scales. Fronds caespitose; stipe pale castaneous-brown or dark stramineous or amber above, 20–40 cm, scales absent from top of stipe and rachis; lamina ovate-oblong or deltoid-ovate, 30–45 × 15–25 cm, bipinnate to tripinnate below in large plants, not narrowed to base, apex long acuminate; pinnae 7–9 pairs, opposite or subopposite, slightly oblique, shortly stalked, basal pair largest, deltoid-lanceolate, slightly falcate, 10–18 × ca. 10 cm, apex caudate-acuminate, remaining pinnae lanceolate; pinnules 13–15 pairs, alternate, lanceolate or ovate-lanceolate, base broadly cuneate, usually asymmetrical, basispic pinnule of basal pair longer than others, 6–8 cm, ca. 2 cm wide at base; segments oblong, apices obtuse and with several acute teeth, sparsely serrulate. Lamina subpapery, both surfaces glabrous. Sori on middle of veinlets; indusia orbicular-reniform, entire.

Forests, by streams; 100–2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Myanmar, Nepal, Thailand, Vietnam].

97. *Dryopteris melanocarpa* Hayata, Icon. Pl. Formosan. 4: 163. 1914.

黑苞鳞毛蕨 hei bao lin mao jue

Rhizome erect to ascending. Fronds caespitose; stipe castaneous, 30–40 cm, scaly at base, lower scales ovate, ca. 7 × 3–4 mm, entire, base amplexicaul, apex acute, upper ones gradually narrowed; lamina ovate, ca. 34 × 25 cm, bipinnate to tripinnatifid, base cordate, apex acuminate; pinnae subopposite, triangular-lanceolate, falcate, base truncate, sessile, apex acuminate, basal ones largest, ca. 17 cm, bipinnatifid, shortly stalked, apex caudate-acuminate, basispic pinnules oblong, 9–10 × ca. 2.5 cm, base cuneate, margin duplicate-serrate, apex obtuse; segments oblong, ca. 1.5 × 0.6 cm, base cuneate, margin duplicate-serrulate, apex obtuse. Lamina herbaceous-membranous. Indusia orbicular-reniform.

• Taiwan (Alishan).

3. *Dryopteris* subg. *Erythrovariae* (H. Itô) Fraser-Jenkins, Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 195. 1986.

泡鳞亚属 pao lin ya shu

Lu Shugang (陆树刚), Dong Shiyong (董仕勇), He Hai (何海), Zhang Libing (张丽兵); David S. Barrington, Maarten J. M. Christenhusz

Dryopteris sect. *Erythrovariae* H. Itô, Bot. Mag. (Tokyo) 50: 32. 1936 [*“Erythro-variae”*].

Fronds without hairs or with multicellular hairs, segments catadromously arranged, rarely anadromously arranged. Stipe scales mostly confined to base of stipe, stiff and narrow; fronds with small, bullate or saclike scales on pinnule midribs and tips of pinna costae on abaxial surface, sometimes scales flat; grooves of pinna rachis and pinnule rachis connected or closed near their bases.

About 80 species: confined to Asia, but extending to the Pacific islands; 48 species (19 endemic) in five sections in China.

14. *Dryopteris* sect. *Erythrovariae* H. Itô, Bot. Mag. (Tokyo) 50: 33. 1936 [*“Erythro-variae”*].

泡鳞鳞毛蕨组 pao lin lin mao jue zu

Lu Shugang (陆树刚); David S. Barrington

Lamina lanceolate or ovate-lanceolate, usually pinnate to bipinnate; upper stipe with many small scales; scales on base of stipe brown or light brown, lanceolate; scales bullate or rarely flat.

About 20 species: confined to Asia; 11 species (three endemic) in China.

- 1a. Scales on rachis dense, ovate-lanceolate or linear-lanceolate, herbaceous, thin, toothed or entire.
 - 2a. Scales on rachis ovate, toothed.
 - 3a. Lamina bipinnate, pinnules entire or serrate; scales on rachis dark brown 104. *D. lepidorachis*
 - 3b. Lamina tripinnate or bipinnate, pinnules serrate to pinnatifid; scales on rachis brown 105. *D. tsoongii*
 - 2b. Scales on rachis lanceolate or linear-lanceolate, entire or toothed.
 - 4a. Upper stipe and rachis with only scattered scales 106. *D. kinkiensis*
 - 4b. Upper stipe and rachis densely scaly.
 - 5a. Scales on rachis usually entire 107. *D. simasakii*
 - 5b. Scales on rachis toothed 108. *D. championii*
- 1b. Scales on rachis sparse, linear-lanceolate, leathery, entire.
 - 6a. Lamina 1-pinnate; pinnae serrate or deeply lobed on margin but lobes sessile 98. *D. decipiens*
 - 6b. Lamina bipinnate or at least at lamina base; pinnules shortly stalked or sessile.
 - 7a. Lamina shorter than 28 cm; lower pinnae with 0–3 pairs of free lobes or pinnules; scales flat 99. *D. liboensis*
 - 7b. Lamina exceeding 30(–50) cm; lower pinnae with more than 10 pinnule pairs; scales bullate.
 - 8a. Pinnules triangular-ovate, serrate or pinnatifid, obtuse at apex.
 - 9a. Pinnules serrate; sori costal or subcostal 100. *D. fuscipes*
 - 9b. Pinnules pinnatifid; sori medial to submarginal 101. *D. ryo-itoana*
 - 8b. Pinnules lanceolate, pinnatisect or pinnately parted, acuminate at apex.
 - 10a. Pinnules pinnately lobed; bullate scales dense on costa and rachis; indusium dark red at center 102. *D. erythrosora*
 - 10b. Pinnules pinnate; bullate scales sparse on costa and rachis; indusium light red at center 103. *D. hondoensis*

98. *Dryopteris decipiens* (Hooker) Kuntze, Revis. Gen. Pl. 2: 812. 1891.

迷人鳞毛蕨 mi ren lin mao jue

Rhizome ascending or erect, ca. 3 cm in diam., with scales at apex. Fronds caespitose. Stipes stramineous, 15–25(–30) cm, base dark brown and densely clothed with scales, sparser above; scales dark brown, narrowly lanceolate, ca. 10 × 1 mm, entire. Lamina lanceolate, 20–30 × 8–15 cm, truncate, pinnate or rarely bipinnate, apex acuminate. Pinnae 10–15 pairs, alternate or opposite, lanceolate, 5–8 × 1–1.5 cm, with ca. 2 mm stalks or sessile, usually cordate, undulate or shallowly serrate, or pinnately lobed or divided, apex acuminate. Costa raised abaxially and grooved adaxially, veins pinnate; veinlets simple, nearly inconspicuous abaxially and obscure adaxially, terminating just inside margin. Lamina papery, gray-green, abaxial surface of rachis and costa with both bullate and hairlike scales. Sori usually in 1 row on either side of costa, rarely in 2 irregular rows, nearer to costa than to margin, orbicular; indusium reniform, entire. *n* = 123.

Subtropical broad-leaved evergreen forests. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Sichuan, Zhejiang [Japan].

- 1a. Lamina pinnate, pinnae serrate, shallowly cordate, stalked 98a. var. *decipiens*
- 1b. Lamina pinnate, pinnae pinnately lobed or pinnately divided, pinnules truncate and sessile 98b. var. *diplazioides*

98a. *Dryopteris decipiens* var. *decipiens*

迷人鳞毛蕨(原变种) mi ren lin mao jue (yuan bian zhong)

Nephrodium decipiens Hooker, Sp. Fil. 4: 86. 1862; *Aspidium decipiens* (Hooker) Luerssen.

Lamina pinnate; pinna serrate, shallowly cordate.

Subtropical broad-leaved evergreen forests. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan].

98b. *Dryopteris decipiens* var. *diplazioides* (Christ) Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 476. 1938.

深裂迷人鳞毛蕨 shen lie mi ren lin mao jue

Polystichum diplazioides Christ, Bull. Acad. Int. Géogr. Bot. 1902: 260. 1902; *Dryopteris cordipinna* Ching & K. H. Shing; *D. decipiens* var. *subbipinnata* Ching; *D. fuscipes* C. Christensen var. *diplazioides* (Christ) Ching; *D. integripinnula* Ching; *D. metafuscipes* Ching & C. F. Zhang; *D. mimetica* Ching & C. F. Zhang; *D. retrorsopaleacea* Ching & C. F. Zhang.

Lamina pinnate, pinna pinnately lobed or pinnately divided, pinnules sessile, or rarely pinna pinnatisect, so that lamina becomes pinnatifid to bipinnate.

Subtropical broad-leaved evergreen forests. Anhui, Fujian, Guizhou, Jiangsu, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan].

99. *Dryopteris liboensis* P. S. Wang, X. Y. Wang & Li Bing Zhang, *Novon* 22: 256. 2012.

荔波鳞毛蕨 li bo lin mao jue

Plants terrestrial, evergreen, 13–26 cm tall. Rhizomes erect or slightly ascending, 5–7 mm, together with stipe bases densely scaly; scales brown, narrowly lanceolate, 6–12 mm, 0.5–1.2 mm at base, stiff, not bullate, margins entire, apex filiform. Fronds caespitose; stipe brown at base and stramineous upward, 4–14 cm, 0.5–1.5 mm in diam., thin but tough, adaxially sulcate, with a tuft of scales at base, glabrate above; lamina narrowly deltoid to narrowly ovate or lanceolate, 7–14 × 3–7 cm, papery, cordate and 1-pinnate or 2-pinnate at frond base, acuminate and 1-pinnatifid at apex; rachis 0.3–0.5 mm in diam., sparsely scaly abaxially, sulcate adaxially; scales pale brown, narrowly lanceolate and filiform; pinnae 5–12 pairs, shortly stalked or sessile, alternate or opposite, often spreading, deltoid to narrowly ovate, ± falcate, rounded or slightly cordate at base, obtuse at apex; basalmost pinnae largest, 1.4–3.5 × 0.8–1.8 cm, pinnatifid or with basal pinnules sessile, free lobes in 1–3 pairs; pinnae adaxially glabrous, abaxially glabrate, with a few narrowly lanceolate to linear microscales; pinna rachis 0.5–0.8 mm in diam., slightly scaly abaxially; pinna lobes oblong, incised-serrate, obtuse at apex; veins in lobes pinnately branched, lateral veinlets often furcate. Sori orbicular, 1–9 on each side of midrib of fertile pinnae, abaxial or nearly terminal on veinlets, close to margins of pinnae or lamina; indusia brown, peltate, ca. 0.7 mm in diam., lacerate on margin, persistent.

• Shaded sandstone walls in forests by rivers; ca. 500 m. S Guizhou (Libo).

100. *Dryopteris fuscipes* C. Christensen, *Index Filic.*, Suppl. 2: 14. 1917.

黑足鳞毛蕨 hei zu lin mao jue

Dryopteris bipinnata C. Christensen, *Cat. Pl. Yun-Nan*, 102. 1916, not Copeland (1914); *D. confertipinna* Ching & K. H. Shing; *D. fuscipes* f. *major* Ching ex K. H. Shing & J. F. Cheng; *D. medialisora* Ching & P. S. Chiu; *D. multijugata* Ching & K. H. Shing; *D. parafuscipes* Ching & Z. Y. Liu (1984), not Ching & P. S. Chiu (1987); *D. persimilis* Ching & C. F. Zhang; *D. stenochlamys* Ching ex K. H. Shing & J. F. Cheng.

Rhizome ascending, ca. 3 cm in diam. Fronds caespitose. Stipes dark brown below, stramineous above, 20–40 cm, densely scaly at base; scales shiny, brown, lanceolate, 1.5–2 cm × 1–1.5 mm, entire, acuminate or with bristle at apex. Lamina ovate-lanceolate or deltoid-ovate, 30–40 × 15–25 cm, bipinnate. Pinnae 10–15 pairs, lanceolate, 10–15 × 3–4 cm, lowest pairs shortened, upper pinnae becoming smaller. Pinnules 10–12 pairs, deltoid-ovate, 1–2 cm × 8–10 mm, broadest at base, sessile or subsessile, shallowly serrate, obtuse; lowest basiscopic pinnule on lowest pinnae usually shorter than next. Rachis, pinna rachis, and costa grooved adaxially. Veins pinnate, obscure abaxially. Lamina herbaceous, dark green. Rachis densely clothed with lanceolate, linear-lanceolate, and bullate scales;

bullate scales on pinna rachis denser. Sori usually in 1 row on either side of costa, slightly closer to costa than to edge; indusium reniform, entire. $n = 123$.

Subtropical broad-leaved evergreen forests. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan (Mazu Liedao), Yunnan, Zhejiang [Japan, Korea, Vietnam].

Dryopteris tarningsensis Ching (*Wuyi Sci. J.* 1: 8. 1981), described from Fujian (Taining), was treated as a synonym of *D. fuscipes* by Fraser-Jenkins (*Bull. Brit. Mus. (Nat. Hist.)*, Bot. 14: 212. 1986).

101. *Dryopteris ryo-itoana* Kurata, *J. Geobot.* 15: 84. 1967.

阔羽鳞毛蕨 kuo yu lin mao jue

Dryopteris dispar Ching & C. F. Zhang; *D. kaihuaensis* Ching & C. F. Zhang; *D. lungshanensis* Ching & P. S. Chiu; *D. lushanensis* Ching & P. S. Chiu; *D. pseudofuscipes* Ching & P. S. Chiu; *D. triangularifrons* Ching.

Rhizome ascending. Fronds caespitose. Stipes dark or castaneous, ca. 30 cm, with lanceolate, dark brown, entire scales at base; upper part of stipe with sparse, smaller, light brown scales. Lamina deltoid-ovate, widest at base, 30–40 × 20–30 cm, bipinnate. Pinnae 10–12 pairs, subopposite; basal pair largest, 15–20 × 7–10 cm. Pinnules 7–10 pairs, lanceolate, pinnatifid or pinnatipartite; basiscopic pinnules on basal pinnae longer and larger than rest, 5–6 × 1.5–2 cm, proximally oblique. Segments obtuse with few acute teeth. Rachis and base of pinna rachises covered with lanceolate, light brown scales, abaxial surface of pinna rachis with sparse, light brown bullate scales. Costa grooved adaxially. Veins pinnate; veinlets simple or forked, obscure abaxially. Lamina herbaceous, yellowish green, glabrous adaxially, sparsely scaly abaxially. Sori in 1 row on either side of costa, slightly near a costa, indusiate; indusia reniform, entire. $n = 123$.

Subtropical broad-leaved evergreen forests. Jiangxi, Zhejiang [Japan].

102. *Dryopteris erythrosora* (D. C. Eaton) Kuntze, *Revis. Gen. Pl.* 2: 812. 1891.

红盖鳞毛蕨 hong gai lin mao jue

Aspidium erythrosorum D. C. Eaton in Perry, *Narr. Exp. China* 2: 330. 1856; *Aspidium filix-mas* (Linnaeus) Swartz var. *erythrosorum* (D. C. Eaton) Christ; *Dryopteris bulligera* Ching; *D. distantipinna* Ching & Z. Y. Liu; *D. linyingensis* Ching & C. F. Zhang; *D. oblongipinnula* Ching & P. S. Chiu; *D. oppositipinna* Ching & Z. Y. Liu; *D. paraerythrosora* Ching & C. F. Zhang; *D. pseudoerythrosora* Ching & C. F. Zhang (1983), not Kodama (1913); *D. remotipinnula* Ching & C. F. Zhang; *D. sinoerythrosora* Ching & K. H. Shing; *D. squamistipes* Ching & Z. Y. Liu (1984), not (C. B. Clarke) C. Christensen (1905); *Lastrea erythrosora* (D. C. Eaton) Moore; *Nephrodium erythrosorum* (D. C. Eaton) Hooker; *N. filix-mas* (Linnaeus) Richard var. *erythrosorum* (D. C. Eaton) Christ ex Matsumune.

Rhizome ascending, 3–4 cm in diam. Fronds caespitose. Stipes stramineous or light castaneous, 20–30 cm, 3–4 mm in diam., densely scaly at base; scales castaneous with a brown

margin, lanceolate, 1–1.5 cm × 1–2 mm, entire. Lamina oblong-lanceolate, 40–60 × 15–25 cm, bipinnate. Pinnae 10–15 pairs, opposite or subopposite, lanceolate, 15–20 × 4–6 cm, 6–8 cm apart, remote. Pinnules 10–15 pairs, ascending, lanceolate, 2–3 cm × 8–12 mm, serrulate or pinnatifid; basal basiscopic pinnules on lowest pinnae less than half as long as next. Segments distinctly ascending, 1- or 2-toothed at apex. Rachis sparsely covered with lanceolate, dark brown scales, pinna rachis and costa densely covered with brown, bullate scales. Veins pinnate, obscure abaxially. Lamina herbaceous, subglabrous adaxially, scaly abaxially. Sori in 1 row or scattered on either side of costa, nearer costa than to margin; indusia reddish at center, pale brown on edges, reniform, entire, persistent.

Subtropical broad-leaved evergreen forests. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

The correct placement of the following varieties is not known: *Aspidium erythrosorum* var. *amoyense* Christ (Monsunia 1: 80. 1900), *A. erythrosorum* var. *obtusum* Christ (Bull. Soc. Bot. France 52(Mém. 1): 40. 1905), and *A. erythrosorum* var. *souliei* Christ (Bull. Soc. Bot. France 52(Mém. 1): 39. 1905).

103. *Dryopteris hondoensis* Koidzumi, Acta Phytotax. Geobot. 1: 31. 1932.

桃花岛鳞毛蕨 tao hua dao lin mao jue

Dryopteris scabripes Ching.

Rhizome erect, densely covered with scales at apex. Fronds caespitose. Stipes stramineous, 25–35 cm, base densely covered with lanceolate, dark brown, entire scales. Lamina oblong, 40–50 × 20–30 cm, bipinnate. Pinnae 10–15 pairs, opposite or subopposite, ovate-lanceolate, 15–18 × 5–6 cm, usually shortened at base of lamina, acuminate. Pinnules 10–13 pairs, lanceolate, 3–4 × ca. 1 cm, pinnatifid to pinnatisect, acute or obtuse. Segments obtuse, usually 1- or 2-toothed at apex. Lamina herbaceous, yellowish green. Rachis and base of pinna rachis densely covered with lanceolate, dark brown scales; pinna rachis and costa covered with bullate scales abaxially. Veins pinnate, obscure. Sori in 1 row on either side of costa or scattered at base of pinnules, nearer to costa than to margin; indusia brown, reniform, entire. *n* = 123.

Subtropical or temperate forests. Sichuan, Zhejiang [Japan, Korea].

104. *Dryopteris lepidorachis* C. Christensen, Index Filic. 274. 1906.

轴鳞毛蕨 zhou lin lin mao jue

Polypodium rheosorum Baker, Ann. Bot. (Oxford) 5: 457. 1891, not Baker (1884); *Dryopteris basitripinnatifida* Ching & Z. Y. Liu; *D. championii* (Benth.) C. Christensen ex Ching var. *rheosora* K. H. Shing; *D. lepidocaulon* Ching & P. S. Chiu; *Nephrodium rheosorum* Handel-Mazzetti.

Rhizome ascending, densely covered with scales at apex. Fronds caespitose. Stipes 15–25 cm, densely scaly; scales at base dark brown, lanceolate, 1–1.5 cm; scales above ovate, 4–5 × 3–4 mm, caudate at apex, toothed at margin. Lamina ovate-lanceolate, 25–50 × 20–30 cm, bipinnate. Pinnae 10–12 pairs, subopposite below, alternate above, lanceolate, 8–15 × 2–4 cm, approximate. Pinnules 10–13 pairs, oblong-lanceolate, 1–2 cm

× ca. 5 mm, cordate, stalked, serrate or pinnatifid, apex obtuse and serrulate. Rachis densely covered with ovate scales like those on upper part of stipe; pinna rachis densely covered with lanceolate scales and bullate scales. Veins pinnate; veinlets simple or forked, obscure adaxially, visible abaxially. Lamina herbaceous, dark green, glabrous adaxially, with small scales abaxially. Sori nearer to margin than to costa; indusia brown, reniform.

• Subtropical broad-leaved evergreen forests. Anhui, Fujian, Jiangsu, Jiangxi, Zhejiang.

105. *Dryopteris tsoongii* Ching, Bot. Res. Acad. Sin. 2: 14. 1987.

观光鳞毛蕨 guan guang lin mao jue

Dryopteris wuyuanensis Ching.

Rhizome ascending or erect, ca. 4 cm in diam., apex densely covered with scales. Fronds caespitose. Stipes stramineous, 40–50 cm, 4–5 mm in diam., densely scaly; scales on base of stipe and on apex of rhizome brown, lanceolate, 1.5–2 cm × 1–2 mm; scales on middle of stipe ovate, 5–6 × 3–4 mm, serrulate, caudate. Lamina ovate-lanceolate, 50–70 × 35–45 cm, bipinnate. Pinnae 15–18 pairs, alternate, lanceolate, 15–20 × 4–5 cm, stalked. Pinnules 10–15 pairs, lanceolate, 2–3 × 1–1.5 cm, pinnatisect below, pinnatifid above, apex acute or obtuse. Segments obtuse, with an acute apical tooth. Veins pinnate, obscure adaxially, visible abaxially. Lamina herbaceous, dark green and glabrous adaxially, yellowish green and scaly abaxially; scales on rachis ovate; pinna rachis densely covered with broadly lanceolate scales and bullate scales; scales on costa hairlike. Sori in 1 row on either side of costa, nearer to margin than to costa, orbicular; indusia small, reniform, fugacious.

• Subtropical broad-leaved evergreen forests. Anhui, Jiangxi, Zhejiang.

106. *Dryopteris kinkiensis* Koidzumi ex Tagawa, Acta Phytotax. Geobot. 2: 200. 1933.

京鹤鳞毛蕨 jing he lin mao jue

Dryopteris championii (Benth.) C. Christensen ex Ching var. *tenuifrons* H. Itô; *D. neoassamensis* Ching; *D. zhenangensis* Ching & P. S. Chiu.

Rhizome erect, densely covered with scales; scales dark brown, lanceolate. Fronds caespitose. Stipes 20–40 cm, stramineous, densely covered with scales at base; scales light brown, lanceolate; scales on upper part of stipe sparse, toothed. Lamina ovate-lanceolate, 25–40 × 15–20 cm, bipinnate. Pinnae 10–15 pairs, ascending, lanceolate, subopposite or alternate, 10–15 × 4–5 cm. Pinnules 10–12 pairs, lanceolate, 2–3 × ca. 1 cm, cuneate, sessile or subsessile, pinnatifid, apex acute. Segments toothed at apex. Veins pinnate, obscure adaxially, distinct abaxially. Lamina herbaceous, dark green and subglabrous adaxially, yellowish green and scaly abaxially; scales on rachis and base of pinna rachis dense, light brown, lanceolate; scales on middle of pinna rachis bullate at base. Sori in 1 row on either side of costa, medial; indusia reniform, entire. *n* = 82.

Subtropical broad-leaved evergreen forests. Fujian, Guangdong, Jiangxi, Sichuan, Zhejiang [Japan].

Dryopteris hunanica Ching (Bull. Fan Mem. Inst. Biol., Bot. 10: 179. 1940), described from Hunan, was treated as a synonym of *D. kinkiensis* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 209. 1986).

107. *Dryopteris simasakii* (H. Itô) Kurata, J. Geobot. 18: 5. 1970.

高鳞毛蕨 gao lin mao jue

Rhizome ascending or erect, densely covered with scales; scales brown, lanceolate. Fronds caespitose. Stipes stramineous, 20–30(–57) cm, 3–4 mm in diam., densely scaly; scales at base lanceolate or broadly lanceolate to linear-lanceolate, up to 2 cm; scales on upper part fugacious or persistent and denser. Lamina ovate-lanceolate, 30–50 × 15–25 cm, bipinnate or tripinnate at base. Pinnae 12–15 pairs, subopposite, spreading below, oblong-lanceolate, 15–18 × 4–5 cm, narrowed at base and sessile, overlapping rachis, acuminate. Pinnules 10–15 pairs, lanceolate, 2–4 cm × 8–12 mm, shallowly cordate, shortly stalked, pinnatifid to pinnatisect, acute or obtuse. Segments 5–8 pairs, obtuse, with an acute apical tooth. Veins pinnate, simple or forked, obscure adaxially, visible abaxially. Lamina herbaceous, yellowish green, glabrous adaxially, scaly abaxially; scales on rachis brown, lanceolate, toothed; pinna rachis densely covered with bullate scales; costa covered with hairlike scales. Sori borne near edges; indusia reniform, entire. $n = 123$.

Subtropical broad-leaved evergreen forests. Guangxi, Guizhou, Sichuan, Yunnan, Zhejiang [Japan].

- 1a. Lamina tripinnate or bipinnate,
pinnules pinnatifid; scales
lanceolate 107a. var. *simasakii*
- 1b. Lamina bipinnate, pinnules pinnately
lobed; rachis and pinna rachis with
both broadly lanceolate and linear-
lanceolate scales 107b. var. *paleacea*

107a. *Dryopteris simasakii* var. *simasakii*

高鳞毛蕨(原变种) gao lin mao jue (yuan bian zhong)

Dryopteris indusiata (Makino) Makino & Yamamoto ex Yamamoto var. *simasakii* H. Itô, J. Jap. Bot. 9: 57. 1933; *D. erythrochlamys* Ching & Z. Y. Liu; *D. excelsior* Ching & P. S. Chiu; *D. labordei* (Christ) C. Christensen var. *simasakii* (H. Itô) H. Itô; *D. laodianensis* Ching & P. S. Chiu.

Scales on upper part of stipe fugacious, scales lanceolate. Lamina tripinnate or bipinnate, pinnules pinnatifid.

Subtropical broad-leaved evergreen forests. Guangxi, Guizhou, Sichuan, Yunnan, Zhejiang [Japan].

107b. *Dryopteris simasakii* var. *paleacea* (H. Itô) Kurata, J. Geobot. 18: 5. 1970.

密鳞高鳞毛蕨 mi lin gao lin mao jue

Dryopteris indusiata var. *paleacea* H. Itô, J. Jap. Bot. 9: 57. 1933; *D. labordei* f. *paleacea* (H. Itô) H. Itô; *D. paomowanensis* Ching & Z. Y. Liu; *D. rufosquamosa* Ching & P. S. Chiu.

Scales on upper part of stipe persistent, rachis and pinna rachis with both broadly lanceolate and linear-lanceolate scales. Lamina bipinnate, pinnules pinnately lobed.

Subtropical broad-leaved evergreen forests. Guangxi, Guizhou, Sichuan, Yunnan [Japan].

108. *Dryopteris championii* (Benth) C. Christensen ex Ching, Sinensia 3: 327. 1933.

阔鳞毛蕨 kuo lin lin mao jue

Aspidium championii Benth, Fl. Hongk. 456. 1861; *Dryopteris bullatipaleacea* Ching; *D. changii* Ching; *D. conferta* Ching & P. S. Chiu; *D. grandiosa* Ching & P. S. Chiu; *D. gutishanensis* Ching & C. F. Zhang; *D. huanglungensis* Ching; *D. infrahirtella* Ching & Z. Y. Liu; *D. laoshanensis* J. X. Li & S. T. Ma; *D. linganensis* Ching & C. F. Zhang; *D. nanchuanensis* Ching & Z. Y. Liu (1983), not Ching & Z. Y. Liu (Jul 1984) nor Ching & Z. Y. Liu (Oct 1984); *D. neofuscipes* Ching & Z. Y. Liu; *D. neofuscipes* Ching & P. S. Chiu (1987), not Ching & Z. Y. Liu (1984); *D. occidentalizhejiangensis* Ching & P. S. Chiu; *D. paleifera* Ching & Z. Y. Liu; *D. qinyuanensis* Ching & P. S. Chiu [“*chinyuanensis*”]; *D. wangii* Ching; *D. wuyishanensis* Ching; *D. wuyishanicola* Ching & P. S. Chiu; *D. yandongensis* Ching & C. F. Zhang; *D. zunyiensis* Ching.

Rhizome ascending or erect, densely covered with scales at apex; scales brown, lanceolate, entire. Fronds caespitose. Stipes stramineous, 30–40 cm, 4–5 mm in diam., densely covered with scales; scales broadly lanceolate, toothed, acuminate. Lamina ovate-lanceolate, 40–60 × 20–30 cm, bipinnate. Pinnae 10–15 pairs, subopposite below, alternate above, ovate-lanceolate, slightly narrowed at base, ascending at apex. Pinnules 10–13 pairs, lanceolate, 2–3 cm, base shallowly cordate or broadly cuneate, with short stalk, pinnatifid to pinnatipartite, apex obtuse and serrulate. Segments obtuse, toothed, basal segment distinctly larger, pinnules broadest at base. Veins pinnate, visible abaxially. Lamina herbaceous, dark green, subglabrous adaxially, scaly abaxially; rachis scales dense, broadly lanceolate, toothed, hairlike at apex; pinna rachis densely covered with bullate scales. Sori in 1 row on either side of costa, medial or nearer to margin than to costa; indusia brown, reniform, entire. $n = 123$.

Subtropical or temperate forests. Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

15. *Dryopteris* sect. *Indusiatae* S. G. Lu, Guihaia 19: 112. 1999.

黑鳞毛蕨组 hei lin lin mao jue zu

Lu Shugang (陆树刚); David S. Barrington

Lamina lanceolate or ovate-lanceolate, usually pinnate to bipinnate; upper stipe glabrous; scales on base of stipe black or very dark blackish brown, linear-lanceolate.

About 15 species: confined to Asia; 13 species (six endemic) in China.

- 1a. Upper portion of rachis with 1 or 2 proliferous buds on abaxial side 109. *D. gemmifera*
- 1b. Rachis without proliferous buds.
 - 2a. Sori exindusiate 110. *D. gymnosora*
 - 2b. Sori indusiate.
 - 3a. Pinnae sessile or subsessile; lower pinnae spreading.
 - 4a. Basal pinnules of lower pinnae shortened and parallel to rachis, amplexicaul 111. *D. indusiata*
 - 4b. Basal pinnules of lower pinnae not shortened and not parallel to rachis, not amplexicaul.
 - 5a. Lamina bipinnate; pinnules serrate with long aristate teeth; stipe usually purple 112. *D. tenuicula*
 - 5b. Lamina tripinnate; pinnules pinnatisect, ultimate segments not spiny-serrate; stipe stramineous 113. *D. submarginata*
 - 3b. Pinnae with distinct stalks; lower pinnae ascendant.
 - 6a. Pinnae pinnatisect 114. *D. guangxiensis*
 - 6b. Pinnae fully divided into pinnules with stalks or subsessile.
 - 7a. Pinnules oblong, rounded or truncate at apex, usually entire.
 - 8a. Scales on stipe and rachis black; pinnules rounded at apex, spiny-serrate; sori close to costa 115. *D. tenuipes*
 - 8b. Scales on upper stipe and rachis brown, pinnules rounded at apex, not spiny-serrate; sori medial.
 - 9a. Lamina broadly deltoid, basal pinnae much longer than those above 116. *D. subtriangularis*
 - 9b. Lamina ovate-lanceolate 117. *D. assamensis*
 - 7b. Pinnules deltoid-ovate, acuminate or obtuse at apex, pinnatilobate to pinnatisect.
 - 10a. Pinnules cordate, with stalks 2–3 mm.
 - 11a. Scales on rachis and pinna rachis black; sori slightly nearer margin 118. *D. integriloba*
 - 11b. Scales on rachis and pinna rachis brown; sori slightly nearer costa 119. *D. tahmingensis*
 - 10b. Pinnules rounded or cuneate, sessile or subsessile.
 - 12a. Scales on base of stipe black; proximal basal pinnules in basal pinnae much longer than those above, pinnatipartite to pinnatisect 120. *D. labordei*
 - 12b. Scales on base of stipe dark brown; proximal basal pinnules in basal pinnae slightly longer than those above, pinnatilobate to pinnatifid 121. *D. pseudosparsa*

109. *Dryopteris gemmifera* S. Y. Dong, Bot. Stud. (Taipei) 51: 537. 2010.

芽孢鳞毛蕨 ya bao lin mao jue

Rhizomes erect, short, with copious scales at apex; scales blackish, narrowly lanceolate, 3–6 × ca. 0.5 mm, entire at margin but with several short hairlike branches at base. Fronds tufted; stipes dark brown at base and stramineous upward, slender, 15–25 cm, with many blackish lanceolate scales at base and some minute fibrilliform scalelike hairs or scales on upper part of stipe and rachis; lamina ovate to deltoid-ovate, simple pinnate to deeply bipinnatifid at base, gradually narrowed and pinnatifid toward apex; free lateral pinnae 6–8 pairs, alternate or occasionally lowest pair opposite, 2 or 3 pairs of lower pinnae nearly equal in size, 8–10 × 2.2–3 cm, upper pinnae gradually shortened; pinnae lanceolate, base broadly cuneate, shortly stalked (1–3 mm) to sessile, margin crenate to deeply lobed, apex acuminate; large pinnae with 8–10 pinnules on each side of costa, basiscopic pinnules only slightly longer than acroscopic ones, nearly oblong, oblique to costa, 1–2 × 0.5–0.6 cm, sparsely and slightly serrate at margin, obtuse at apex. Veins 5 or 6 pairs per pinnule, simple or 1 or 2 times forked. Lamina papery, reddish when young but green when mature; rachis covered with many brown scales, or with blackish scales when young, with 1 or 2 scaly buds on abaxial side at upper part; costa abaxially with scales, some broadened and with several slender branches at base, flat or slightly convex, costae

adaxially with similar scalelike hairs and a few uniseriate hairs at base. Sori orbicular, medial or subterminal on veins, 3–5 pairs on each pinnule; indusia brown, orbicular-reniform, thick and firm, curling when old, persistent.

- Tropical mountain rain forests; 1000–1400 m. Hainan.

110. *Dryopteris gymnosora* (Makino) C. Christensen, Index Filic. 269. 1906.

裸果鳞毛蕨 luo guo lin mao jue

Nephrodium gymnosorum Makino, Bot. Mag. (Tokyo) 13: 64. 1899.

Rhizome ascending, densely covered with scales at apex; scales black, lanceolate, entire. Fronds caespitose. Stipes dark brown at base and stramineous upward, 20–30 cm, base black and covered with lanceolate, black scales, subglabrous upward. Lamina ovate-lanceolate, 30–40 × 20–30 cm, bipinnate. Pinnae 10–13 pairs, opposite or subopposite, broadly lanceolate, 10–15 × 3–5 cm, usually overlapping rachis at base, sessile. Pinnules ca. 10 pairs, oblong or ovate-lanceolate, 2–3 × ca. 1 cm, pinnatifid to pinnatipartite, obtuse and toothed at apex; lowest basiscopic pinnule on lowest pinna distinctly larger than next. Segments ascending, with toothed apex. Veins pinnate; veinlets simple, visible abaxially. Lamina herbaceous, light green, glabrous adaxially; rachis subglabrous; pinna rachis and costa sparsely covered with bullate scales. Sori exindusiate. *n* = 123.

Subtropical or temperate forests. Anhui, Fujian, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan].

111. *Dryopteris indusiata* (Makino) Makino & Yamamoto ex Yamamoto, Suppl. Icon. Pl. Formos. 5: 3. 1932.

平行鳞毛蕨 ping xing lin mao jue

Nephrodium gymnosorum Makino var. *indusiatum* Makino, Bot. Mag. (Tokyo) 13: 65. 1899; *Dryopteris gymnosora* (Makino) C. Christensen var. *indusiata* (Makino) Makino ex Bonaparte; *D. subfuscpes* Ching ex K. H. Shing & J. F. Cheng.

Rhizome ascending, ca. 3 cm in diam., densely covered with scales at apex. Fronds caespitose. Stipes dark brown at base and stramineous upward, 20–35 cm, 2–3 mm in diam., base densely covered with lanceolate, black scales, upward subglabrous. Lamina ovate-lanceolate, 25–40 × 20–25 cm, bipinnate. Pinnae 10–15 pairs, opposite, ovate-lanceolate, 12–17 × 3–5 cm, sessile or subsessile, slightly shorter at base. Pinnules 10–12 pairs, oblong-lanceolate, 2–3 × ca. 1 cm, truncate, sessile, pinnatifid to pinnatipartite, apex obtuse; basal pinnules parallel to rachis; lowest basiscopic pinnule on lowest pinna slightly shorter than next and parallel to rachis. Segments 5–7 pairs, entire, 1- or 2-toothed and rounded at apex. Veins pinnate; veinlets simple or forked, visible abaxially. Lamina herbaceous, dark green, glabrous adaxially, scaly abaxially; rachis covered with sparse, black, lanceolate scales; pinna rachis and costa covered with brown, bullate scales. Sori nearer to costa than to margin; indusia brown, reniform, entire. $n = 82(123)$.

Subtropical broad-leaved evergreen forests. Fujian, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan].

112. *Dryopteris tenuicula* C. G. Matthew & Christ in Lecomte, Notul. Syst. (Paris) 1: 51. 1909.

华南鳞毛蕨 hua nan lin mao jue

Dryopteris jiu lungshanensis P. S. Chiu & G. Yao ex Ching; *D. neglecta* Ching & Z. Y. Liu; *D. purplella* Tagawa; *D. rubristipes* Ching & Z. Y. Liu; *D. subchampionii* Ching; *D. subtenuicula* Ching & P. S. Chiu; *D. yaoi* Ching; *Nephrodium tenuiculum* (C. G. Matthew & Christ) Tutcher.

Rhizome ascending, 2–2.5 cm in diam., densely covered with scales at apex. Fronds caespitose. Stipes dark brown at base and stramineous upward, or reddish when young, 20–25 cm, ca. 2 mm in diam., base covered with black, lanceolate scales, upward scales sparse or upper stipe subglabrous. Lamina ovate-lanceolate, 30–40 × 20–25 cm, bipinnate. Pinnae 10–12 pairs, opposite or subopposite, ovate-lanceolate, 9–12 × 3–4 cm, subsessile, apex caudate. Pinnules 8–10 pairs, oblong-lanceolate, 2–3 cm × 7–10 mm, base broadly cuneate or truncate, margin pinnatifid, apex acute; basal pinnules on lowest pinna distinctly shortened, next 2 or 3 pairs of basiscopic pinnules distinctly larger. Segments ascending, with an acute apical tooth. Veins pinnate; veinlets simple, visible abaxially. Lamina herbaceous, dark green, glabrous adaxially, scaly abaxially; pinna rachis and costa covered with denser bullate scales. Sori slightly nearer to margin than to costa; indusia brown, reniform, entire.

Subtropical broad-leaved evergreen forests, warm-temperate broad-leaved forests; 1000–2100 m (in Taiwan). Guangdong, Guangxi,

Guizhou, Hunan, Sichuan, Taiwan, Zhejiang [Japan, Korea].

Dryopteris zhangii Ching (Bull. Bot. Res., Harbin 3(3): 26. 1983), described from Zhejiang (Jiangxian: Tiandong Shan), was treated as a synonym of *D. tenuicula* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 213. 1986).

113. *Dryopteris submarginata* Rosenstock, Repert. Spec. Nov. Regni Veg. 13: 132. 1914.

无柄鳞毛蕨 wu bing lin mao jue

Dryopteris nudistipes Ching & P. S. Chiu; *D. sessilipinna* Ching & P. S. Chiu.

Rhizome ascending, densely covered with scales at apex. Fronds caespitose. Stipe stramineous, 40–50 cm, 3–4 mm in diam., base densely scaly; scales black or black in center and white in margin, lanceolate, ca. 1 cm, hairlike at apex; scales sparse upward. Lamina ovate-lanceolate, 35–45 × 25–30 cm, tripinnate. Pinnae 8–12 pairs, opposite or subopposite, ovate-lanceolate, 12–15 × 3–4 cm, sessile or subsessile; basiscopic pinnule obliquely spreading; acroscopic pinnule overlapping rachis. Pinnules 10–12 pairs, ovate-lanceolate, base cuneate or subtruncate, margin pinnatipartite to pinnatisect, apex acute or obtuse; basiscopic pinnules larger than acroscopic pinnules; second basiscopic pinnule on lowest pinna largest, up to 5 × 3 cm. Segments 5–8 pairs, margin toothed, apex rounded. Veins pinnate; veinlets simple, obscure on both surfaces. Lamina herbaceous, pale green, glabrous adaxially, scaly abaxially; scales on rachis black, lanceolate; scales on pinna rachis and costa brown, bullate. Sori on either side of costa; indusia brown, reniform, entire.

• Subtropical broad-leaved evergreen forests. Fujian, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Zhejiang.

114. *Dryopteris guangxiensis* S. G. Lu, Guihaia 19: 27. 1999.

广西鳞毛蕨 guang xi lin mao jue

Dryopteris parafuscpes Ching & P. S. Chiu (1987), not Ching & Z. Y. Liu (1984).

Rhizome ascending, densely covered with scales at apex. Fronds caespitose. Stipe stramineous, 15–20 cm, 1–1.2 mm in diam., base densely covered with black, linear-lanceolate scales up to 1.2 cm, upward subglabrous. Lamina deltoid-ovate, 25–30 × 18–20 cm, pinnate. Pinnae 8–10 pairs, subopposite, ovate-lanceolate, 8–10 × ca. 3 cm, base broadly cuneate, pinnatipartite, apex acuminate. Segments 7–10 pairs, deltoid-ovate, 1.5–2 cm × 8–10 mm, margin subentire, apex acute. Veins pinnate; veinlets simple or forked, visible abaxially. Lamina herbaceous, green, glabrous adaxially, with black, bullate scales on abaxial surface of pinna rachis. Sori slightly nearer to margin than to costa; indusia brown, reniform, entire.

• Subtropical broad-leaved evergreen forests. Guangxi.

115. *Dryopteris tenuipes* (Rosenstock) Serizawa, J. Jap. Bot. 46: 19. 1971.

落叶鳞毛蕨 luo ye lin mao jue

Dryopteris erythrosora (D. C. Eaton) Kuntze var. *tenuipes* Rosenstock, Hedwigia 56: 341. 1915.

Rhizome ascending, densely covered with scales at apex. Fronds caespitose. Stipe stramineous, ca. 20 cm, 1.5–2 mm in diam., scaly throughout; scales black, lanceolate; scales on base of stipe much denser, sparse above. Lamina deltoid-ovate, 20–25 × 15–18 cm, bipinnate. Pinnae 8–10 pairs, subopposite or alternate, ovate-lanceolate, 8–10 × 2.5–3.5 cm, stalked, acuminate. Pinnules 7–10 pairs, oblong, 1–2 cm × 6–8 mm, base cuneate, margin serrate, apex rounded. Veins pinnate; veinlets forked or simple, visible abaxially. Lamina herbaceous, dark green, subglabrous adaxially, scaly abaxially; scales on rachis black, lanceolate; scales on pinna rachis and on costa black, bullate. Sori nearer to costa than to margin; indusia brown, reniform, entire.

- Subtropical broad-leaved forests; 400–600 m. N Taiwan.

116. *Dryopteris subtriangularis* (C. Hope) C. Christensen, *Index Filic.* 296. 1906.

三角鳞毛蕨 *san jiao lin mao jue*

Nephrodium subtriangulare C. Hope, *J. Bot.* 28: 327. 1890; *Dryopteris acutidens* Ching (1959), not C. Christensen (1905); *D. caudifrons* Ching; *D. subassamensis* Ching; *D. uropinna* Price; *Lastrea filix-mas* (Linnaeus) C. Presl var. *subtriangularis* (C. Hope) Beddome.

Rhizome ascending, 2–2.5 cm in diam., covered with scales at apex. Fronds caespitose. Stipes stramineous, 20–30 cm, 1–1.5 mm in diam., base dark brown and densely covered with scales; scales black or blackish brown, linear-lanceolate; scales upward smaller or subglabrous. Lamina deltoid-lanceolate, 30–35 × 20–25 cm, widest at base, bipinnate, with a somewhat caudate apex. Pinnae 5–7 pairs, broadly lanceolate; basal pinnae largest, up to 12–13 × 4–5 cm, stalked, other pinnae sessile. Pinnules distinct on lower part of lamina, usually 4–6 pairs on each pinna, oblong; pinnules on basiscopic side of lowest pinnae larger than those on acroscopic side, ca. 3 × 1 cm, truncate at base, pinnatifid, obtuse and toothed at apex. Veins pinnate; veinlets simple or forked, visible abaxially. Lamina herbaceous, dark green, glabrous adaxially, scaly abaxially; rachis subglabrous; pinna rachis and costa covered with bullate, brown scales. Sori orbicular, medial; indusia brown, reniform, entire.

Tropical, subtropical, or warm-temperate forests; 500–1500 m (in Taiwan). Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Xizang, Yunnan [India, Myanmar, Philippines, Thailand, Vietnam].

117. *Dryopteris assamensis* (C. Hope) C. Christensen & Ching, *Bull. Dept. Biol. Sun Yatsen Univ.* 6: 4. 1933.

阿萨姆鳞毛蕨 *a sa mu lin mao jue*

Nephrodium assamensis C. Hope, *J. Bot.* 28: 326. 1890; *Dryopteris filix-mas* (Linnaeus) Schott subsp. *assamensis* (C. Hope) C. Christensen; *Lastrea filix-mas* (Linnaeus) C. Presl var. *assamensis* (C. Hope) Beddome.

Rhizome ascending, 2.5–3 cm in diam., densely covered with scales at apex. Fronds caespitose. Stipes stramineous, 25–30 cm, 2–3 mm in diam., base very dark brown and densely covered with scales; scales stiff, black or nearly black, linear-lanceolate; upward scales becoming very small, black or dark brown, lanceolate. Lamina ovate-lanceolate, 25–30 × 20–25 cm,

base as wide as middle, bipinnate. Pinnae 10–13 pairs, opposite or subopposite, lanceolate, 10–13 × 2.5–3 cm, stalked, acuminate. Pinnules 8–10 pairs, oblong, 1–2 cm × 6–8 mm, cuneate at base, serrate or pinnatifid, rounded and with acute apical teeth; upper part adnate at base and decurrent at basiscopic. Segments with acute teeth at apex. Veins pinnate or forked, obscure abaxially. Lamina herbaceous, dark green, subglabrous adaxially, scaly on abaxial surface of pinna rachis and costa; scales black or dark brown, bullate; rachis subglabrous. Sori medial or slightly nearer to margin; indusia brown, reniform, curved over sorus, entire.

Tropical or subtropical forests. Guangdong, Guangxi, Guizhou, Yunnan [N India, Vietnam].

118. *Dryopteris integriloba* C. Christensen, *Bull. Dept. Biol. Sun Yatsen Univ.* 6: 5. 1933.

羽裂鳞毛蕨 *yu lie lin mao jue*

Dryopteris subintegriloba Serizawa.

Rhizome ascending, ca. 3 cm in diam., densely covered with scales. Fronds caespitose. Stipes dark brown at base and stramineous upward, 30–40 cm, ca. 3 mm in diam., black and densely covered with scales at base; scales black or dark brown, lanceolate, 1–1.5 cm × 1–1.5 mm; scales smaller or stipe subglabrous upward. Lamina ovate-lanceolate, 35–40 × 20–25 cm, bipinnate. Pinnae 10–12 pairs, opposite or subopposite below, alternate above, deltoid-lanceolate, 12–15 × 3–4 cm, stalked. Pinnules 10–12 pairs, lanceolate, 2–3 × ca. 1 cm, widest at base, up to 1.5 cm wide, cordate and stalked, pinnatifid or pinnatifid, obtuse or acute at apex. Segments obtuse at apex, or occasionally with an acute apical tooth. Veins pinnate or forked, visible abaxially. Lamina herbaceous, dark green adaxially, yellowish green abaxially, subglabrous adaxially, abaxial surface of pinna rachis and costa densely covered with black or dark brown bullate scales. Sori medial; indusia dark brown, entire.

Tropical or subtropical forests; 700–1100 m (in Taiwan). Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Vietnam].

119. *Dryopteris tahmingensis* Ching, *Bull. Fan Mem. Inst. Biol., Bot.* 8: 480. 1938.

大明鳞毛蕨 *da ming lin mao jue*

Dryopteris hwangii Ching.

Rhizome ascending or erect, ca. 2.5 cm in diam., densely clothed with linear-lanceolate, black or dark brown scales. Fronds caespitose. Stipes dark brown at base and stramineous upward, up to 40 cm, ca. 3 mm in diam., densely covered with lanceolate, dark brown scales at base, upward scales becoming small and sparse or stipe becoming subglabrous. Lamina ovate-lanceolate, 20–35 × 15–20 cm, bipinnate. Pinnae 8–10 pairs, opposite below, alternate above, deltoid-lanceolate, 9–10 × 3–4 cm, stalked. Pinnules 6–8 pairs, deltoid-ovate, 1.5–2 × ca. 1 cm, base widest, cordate and stalked, pinnatifid, obtuse at apex. Segments obtuse, with a sharp apical tooth. Veins pinnate; veinlets simple or forked, visible abaxially. Lamina herbaceous, yellowish green, subglabrous adaxially; rachis clothed with linear-lanceolate, dark brown scales; pinna rachis and costa densely covered with dark brown bullate scales. Sori slightly nearer to costa than to margin; indusia brown, reniform, entire.

• Subtropical broad-leaved evergreen forests. Fujian, Guangdong, Guangxi, Yunnan.

120. *Dryopteris labordei* (Christ) C. Christensen, *Index Filic.* 273. 1906.

齿果鳞毛蕨 *chi guo lin mao jue*

Aspidium labordei Christ, *Bull. Soc. Bot. France* 52(Mém. 1): 40. 1905.

Rhizome ascending, covered with scales at apex. Fronds caespitose. Stipes dark brown at base and stramineous or purple upward, 25–35 cm, 2–3 mm in diam., black and clothed with scales at base, scales black or blackish brown, lanceolate; upper stipe and rachis subglabrous. Lamina ovate or ovate-lanceolate, 25–30 × 20–25 cm, bipinnate; basal pinna largest and curved acropically, thus lamina rounded at base. Pinnae ca. 10 pairs, subopposite, 3 or 4 pairs on lower part distinctly enlarged, 15–20 × 5–10 cm, stalked, curved at apex. Pinnules 8–10 pairs, lanceolate; pinnules on basiscopic side of lowest pinnae distinctly larger than those on acropical side; lowest basiscopic pinnule on lowest pinna largest, 6–7 × ca. 2 cm, truncate at base, sessile, obtuse or acute at apex, pinnatifid or pinnatisect; all basiscopic pinnules curved to apex of pinna. Segments obtuse, with 1 or 2 apical teeth. Veins pinnate, ending short of margin. Lamina herbaceous, dark green, glabrous on both surfaces except abaxial surface of pinna rachis and costa sparsely clothed with brown, bullate scales. Rachis and pinna rachis stramineous.

Sori in 1 row on either side of costa, medial; indusia dark brown, reniform, entire.

Subtropical broad-leaved evergreen forests. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan].

121. *Dryopteris pseudosparsa* Ching, *Bull. Fan Mem. Inst. Biol., Bot.* 8: 489. 1938.

假稀羽鳞毛蕨 *jia xi yu lin mao jue*

Dryopteris cuneatiloba Ching & P. S. Chiu.

Rhizome ascending, ca. 3 cm in diam., clothed with scales. Fronds caespitose. Stipes stramineous, 25–30 cm, 3–4 mm in diam., black and densely covered with scales at base; scales black or dark brown, lanceolate, gradually sparser upward. Lamina ovate-lanceolate, 35–40 × 20–25 cm, bipinnate. Pinnae 10–13 pairs, ovate-lanceolate, 15–18 × 4–5 cm, stalked. Pinnules 10–13 pairs, lanceolate, 2–3 × ca. 1 cm, truncate at base, pinnatifid or pinnatisect, acute at apex. Segments with a sharp tooth at apex. Veins pinnate, distinct abaxially; veinlets reaching margins. Lamina herbaceous, pale green, subglabrous adaxially, scaly abaxially; scales on rachis black, lanceolate; pinna rachis and costa clothed with brown, bullate scales. Sori medial or nearer costa than margin; indusia reddish at center, reniform, entire.

• Subtropical broad-leaved evergreen forests. Guangxi, Guizhou, Sichuan, Yunnan.

16. *Dryopteris* sect. *Variae* Fraser-Jenkins, *Bull. Brit. Mus. (Nat. Hist.), Bot.* 14: 196. 1986.

变异鳞毛蕨组 *bian yi lin mao jue zu*

Lu Shugang (陆树刚); David S. Barrington

Lamina pentagonal-ovate, usually tripinnate; lowest basiscopic pinnule on lowest pinna markedly longest; pinnule apices caudate and acutely pointed.

About 15 species: confined to Asia; 12 species (four endemic) in China.

1a. Stalks of basal pinnae 3–4 cm.

2a. Sori exindusiate 124. *D. dehuaensis*

2b. Sori indusiate.

3a. Scales on stipe, rachis, and pinna rachis black; indusium entire 122. *D. sordidipes*

3b. Scales on stipe, rachis, and pinna rachis brown; indusium ciliate 123. *D. xunwuensis*

1b. Stalks of basal pinnae ca. 1 cm.

4a. Lamina pentagonal, as long as broad, tripinnate, ultimate pinnules pinnatifid.

5a. Scales on stipe light brown; pinnae and pinnules distinctly stalked 125. *D. amurensis*

5b. Scales on stipe black; pinnae and pinnules sessile 126. *D. formosana*

4b. Lamina deltoid-oblong or ovate, much longer than broad, bipinnate or tripinnate, ultimate pinnules entire or pinnatifid.

6a. Ultimate pinnules or segments ovate; stipe base densely scaly, scales brown, linear-lanceolate 127. *D. yongdeensis*

6b. Ultimate pinnules or segments lanceolate; stipe base with narrowly lanceolate scales, scales black, brown, or bicolorous.

7a. Scales on stipe base wholly black 128. *D. pacifica*

7b. Scales on stipe base brown or bicolorous.

8a. Scales on stipe base brown, hairlike at apex.

9a. Lamina bipinnate, caudate-acuminate; sori larger, usually in 1 row on either side of pinna rachis 129. *D. immixta*

9b. Lamina bipinnate to tripinnate, acute; sori smaller, scattered on either side of pinna rachis 130. *D. varia*

8b. Scales on stipe base bicolorous, brown on base and margin, black at center and apex.

10a. Scales on stipe and rachis deflexed 131. *D. saxifraga*

10b. Scales on stipe and rachis not deflexed, scattered or appressed.

11a. Rachis and pinna rachis densely covered with bullate scales 132. *D. setosa*

11b. Bullate scales sparse on rachis and pinna rachis 133. *D. sacrosancta*

122. *Dryopteris sordidipes* Tagawa, Acta Phytotax. Geobot. 3: 29. 1934.

落鳞毛蕨 *luo lin lin mao jue*

Rhizome ascending, densely covered with scales. Fronds caespitose. Stipes light brown, 25–35 cm, 3–4 mm in diam., densely covered with castaneous, lanceolate, shiny scales at base; upward scales becoming small or hairlike, black. Lamina pentagonal, 30–35 × 20–25 cm, tripinnate. Pinnae 8–12 pairs, subopposite or alternate, lanceolate, 13–15 × 8–10 cm, widest at base, with distinct stalks (up to 3.5 cm). Pinnules 8–10 pairs; lowest basicopic pinnule on lowest pinna much enlarged, 6–9 × 2–4 cm, stalked. Ultimate segments 8–10 pairs, ovate-lanceolate, 1–2 cm × 5–7 mm, serrate or pinnatifid, acute at apex. Veins pinnate; veinlets forked or simple, visible abaxially, reaching margin. Lamina subleathery, dark green; rachis and pinna rachis covered with black, lanceolate scales abaxially; pinnule rachis densely covered with dark brown, bullate scales abaxially, base of scale ciliate. Sori medial; indusia persistent, brown, reniform, stiff, entire. *n* = 41.

Forests; 100–1000 m. Taiwan [Japan].

123. *Dryopteris xunwuensis* Ching & K. H. Shing, J. Sci. Jiangxi 8(3): 48. 1990.

寻乌鳞毛蕨 *xun wu lin mao jue*

Rhizome ascending, ca. 2.5 cm in diam., densely clothed with castaneous, lanceolate scales at apex. Fronds caespitose. Stipes stramineous, 30–40 cm, 2–3 mm in diam., dark brown and densely covered with lanceolate, castaneous scales at base; upward scales becoming small and sparse, black or dark brown, ciliate at base. Lamina ovate-pentagonal, ca. 35 × 20–25 cm, usually soriferous only on upper part, tripinnate. Pinnae ca. 10 pairs, alternate, remote, ovate-lanceolate; basal pinnae largest, up to 15 × 8 cm, with stalks 1–3 cm. Pinnules 5–8 pairs, lanceolate; lowest basicopic pinnule on lowest pinna up to 7 × 2 cm, pinnatisect. Ultimate pinnules 6–8 pairs, ovate, ca. 1 cm × 4 mm, sparsely toothed above. Veins pinnate; veinlets forked or simple, reaching margins, visible abaxially. Lamina subleathery, dark green, subglabrous adaxially; rachis and pinna rachis densely covered with brown, hairlike scales ciliate at base; pinnule rachis with brown ciliate scales, distinctly saccate at base or not. Sori medial; indusia brown, ciliate.

• Subtropical broad-leaved evergreen forests. Guangxi, Jiangxi.

124. *Dryopteris dehuaensis* Ching, Fl. Fujian. 1: 601. 1982.

德化鳞毛蕨 *de hua lin mao jue*

Dryopteris gushanica Ching & K. H. Shing; *D. neosordidipes* Ching ex K. H. Shing & J. F. Cheng.

Rhizome ascending, densely covered with castaneous or black, linear-lanceolate scales at apex. Fronds caespitose. Stipes dark brown at base and stramineous upward, 25–35 cm, ca. 4 mm in diam., brown and densely covered with lanceolate,

black-purple scales at base; upward scales becoming small and black, appressed. Lamina pentagonal-lanceolate, 35–45 × 25–30 cm, deeply cordate, tripinnate, pinnatifid at apex. Pinnae 10–14 pairs, alternate or subopposite, broadly lanceolate, stalked; basal pinnae largest, up to 17 × 10 cm, with stalks 3–4 cm. Pinnules 15–18 pairs, lanceolate; lowest basicopic pinnule on lowest pinna distinctly enlarged, directed downward, pinnatisect; pinnules on upper part pinnatifid or pinnatifid. Ultimate pinnules oblong, entire on both sides, obtuse, with an apical tooth. Veins pinnate; veinlets simple or forked, visible abaxially. Lamina subleathery or papery, dark green; rachis and pinna rachis densely covered with linear-lanceolate, ciliate, black scales; pinnule rachis and costa covered with brown, bullate scales abaxially. Sori medial, exindusiate.

• Subtropical broad-leaved evergreen forests. Fujian, Jiangxi, Zhejiang.

125. *Dryopteris amurensis* Christ, Bull. Acad. Int. Géogr. Bot. 1909: 35. 1909.

黑水鳞毛蕨 *hei shui lin mao jue*

Rhizome erect, with stolons. Fronds caespitose. Stipes dark brown below, stramineous above, 20–30 cm, sparsely scaly; scales light brown, lanceolate. Lamina pentagonal, 20–23 × 20–22 cm, deeply cordate, tripinnate. Pinnae 5–7 pairs; lowest pinnae largest, deltoid, up to 10 × 8 cm. Pinnules 5–7 pairs; basicopic pinnules larger than those on acroscopic side; lowest basicopic pinnule on lowest pinna largest, 6–7 × 2–3 cm, pinnatisect, directed downward. Ultimate pinnules 5–7 pairs, deltoid-ovate, pinnatifid or pinnatifid. Segments or serrate with long aristate teeth. Lamina papery, green; rachis and pinna rachis sparsely covered with light brown, lanceolate scales; costa covered with light brown, bullate scales abaxially. Sori on either side of costa; indusia brown, reniform, entire. *n* = 41.

Temperate deciduous and needle-leaved forests. Heilongjiang, Jilin, Liaoning Nei Mongol [Japan, Korea, Russia].

126. *Dryopteris formosana* (Christ) C. Christensen, Index Filic. 266. 1906.

台湾鳞毛蕨 *tai wan lin mao jue*

Aspidium formosanum Christ, Bull. Herb. Boissier, sér. 2, 4: 615. 1904; *Dryopteris constantissima* (Hayata) Hayata; *D. kodamai* Hayata; *D. liui* Ching; *D. phaeolepis* Hayata; *Polystichum constantissimum* Hayata; *P. varium* (Linnaeus) C. Presl var. *eurylepidotum* Rosenstock.

Rhizome ascending, apex densely covered with castaneous, lanceolate scales. Fronds caespitose. Stipes stramineous, 25–35 cm, ca. 2 mm in diam., densely covered with castaneous, lanceolate 1–1.2 cm × ca. 2 mm, entire scales at base. Lamina pentagonal, 20–30 × 20–25 cm, deeply cordate, tripinnate, pinnatifid at apex. Pinnae 8–10 pairs, broadly lanceolate, 10–15 cm, widest at base, up to 10 cm wide. Pinnules ca. 10 pairs, those on basicopic side usually longer than those on acroscopic side, lowest basicopic pinnule on lowest pinna

much longer than next pinnule and directed downward. Ultimate pinnules on lowest basicopic pinnule 8–10 pairs, oblong, 1–1.5 cm × 4–5 mm, with sharp teeth, obtuse at apex. Veins obscure on both surfaces. Lamina papery, green; rachis and pinna rachis densely covered with scales; scales on rachis nearly black, lanceolate; scales on pinna rachis light brown, saccate. Sori on either side of costa; indusia brown, entire. $n = 123$.

Subtropical broad-leaved evergreen forests, warm-temperate forests; 900–2900 m (in Taiwan). Sichuan, Taiwan, Zhejiang [Japan].

127. *Dryopteris yongdeensis* W. M. Chu ex S. G. Lu, Acta Phytotax. Sin. 28: 473. 1990.

永德鳞毛蕨 yong de lin mao jue

Rhizome erect, apex densely covered with scales; scales russet-brown, shiny, linear-lanceolate, ca. 1.5 cm × 1 mm, entire. Fronds caespitose. Stipes 3–9 cm, base densely covered with scales like those on the rhizome, upper part subglabrous, stramineous. Lamina pentagonal-ovate, 9–14 × 8–10 cm, tripinnate. Pinnae 7–9 pairs; basal pinna largest, ca. 6 × 4 cm, stalked, curved at apex. Pinnules on basal pinna 5 or 6 pairs, ovate, pinnatisect, those on basicopic side usually larger than those on acroscopic side. Ultimate pinnules on lowest basicopic pinnule 3 or 4 pairs, oblong, with teeth at apex and margin. Veins pinnate; veinlets simple or forked, visible abaxially. Lamina papery, yellowish green; rachis and pinna rachis densely covered with dark brown bullate scales abaxially. Sori nearer to costa than to margin; indusia brown, reniform, entire or erose.

• Dense forests. Yunnan.

128. *Dryopteris pacifica* (Nakai) Tagawa, Coloured Ill. Jap. Pteridophyta, 211. 1959.

太平鳞毛蕨 tai ping lin mao jue

Polystichum pacificum Nakai, Bot. Mag. (Tokyo) 39: 119. 1925; *D. lungjingensis* Ching & P. S. Chiu [“*luntsingensis*”]; *D. pudouensis* Ching; *D. quadrifida* Ching ex K. H. Shing & J. F. Cheng; *D. varia* (Linnaeus) Kuntze var. *hikonensis* (H. Itô) Kurata; *D. yushanensis* Ching & P. S. Chiu; *P. hololepis* Hayata var. *hikonense* H. Itô.

Rhizome ascending, 3–4 cm in diam., apex densely covered with scales; scales black, lanceolate, 2–3 cm, hairlike at apex. Fronds caespitose. Stipes stramineous, 35–45 cm, ca. 4 mm in diam., base densely covered with scales like those on the rhizome; upward scales smaller, hairlike, black or brown, appressed. Lamina pentagonal-ovate, 40–60 × 25–35 cm, tripinnate. Pinnae 10–15 pairs, alternate; lowest pinnae largest, up to 20 × 10 cm. Pinnules 10–15 pairs, lanceolate; lowest basicopic pinnule on lowest pinna much longer than next, ca. 10 × 2 cm, directed downward, pinnatipartite or pinnatisect. Ultimate pinnules on lowest basicopic pinnule 10–12 pairs, lanceolate, 1–1.5 cm × 5–7 mm, acute and with sharp teeth at apex. Veins pinnate; veinlets forked or simple, visible abaxially. Lamina papery, green; rachis and pinna rachis densely covered with linear-lanceolate, basally brown, apically black scales; pinnule costa densely covered with brown bullate scales. Sori slightly nearer to margin than to costa; indusia brown, reniform, erose. $n = 123$.

Subtropical broad-leaved evergreen forests. Anhui, Fujian, Hunan, Jiangsu, Jiangxi, Zhejiang [Japan, Korea].

129. *Dryopteris immixta* Ching, Fl. Tsinling. 2: 225. 1974.

假异鳞毛蕨 jia yi lin mao jue

Rhizome ascending, apex densely covered with dark brown or nearly black, linear-lanceolate scales. Fronds caespitose. Stipes stramineous, 15–20 cm, 2–2.5 mm in diam., base densely covered with scales like those on rhizome; scales sparser upward. Lamina ovate-lanceolate, 15–25 × 15–18 cm, widest at base, bipinnate, acuminate. Pinnae 8–10 pairs; lowest pinnae largest, ca. 10 × 7 cm, ovate-lanceolate, stalked, acuminate; upper pinnae lanceolate, subsessile. Pinnules 5–8 pairs; lowest basicopic pinnule on lowest pinna largest, 5–6 × 1–1.5 cm, pinnatipartite. Segments toothed, acute. Veins pinnate; veinlets forked or simple. Lamina subleathery, yellowish green; rachis covered with brown, lanceolate scales; pinna rachis and costa covered with brown bullate scales abaxially. Sori nearer to margin than to costa; indusia brown, reniform, erose.

• Subtropical broad-leaved evergreen forests. Fujian, Gansu, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang.

130. *Dryopteris varia* (Linnaeus) Kuntze, Revis. Gen. Pl. 2: 814. 1891.

变异鳞毛蕨 bian yi lin mao jue

Polypodium varium Linnaeus, Sp. Pl. 2: 1090. 1753; *Aspidium opacum* (Hooker) Benth; *A. varium* (Linnaeus) Sweet; *Dryopteris caudifolia* Ching & P. S. Chiu; *D. consimilis* Ching; *D. fuyangensis* Ching & P. S. Chiu; *D. glabrescens* Ching & P. S. Chiu ex K. H. Shing & J. F. Cheng; *D. hololepis* (Hayata) Tagawa; *D. lingii* Ching; *D. matsuzoana* Koidzumi; *D. nanchuanensis* Ching & Z. Y. Liu (Oct 1984), not Ching & Z. Y. Liu (1983), nor Ching & Z. Y. Liu (Jul 1984); *D. ogawai* H. Itô; *D. sinovaria* Ching & Z. Y. Liu; *D. yabei* Hayata; *D. yabei* var. *hololepis* (Hayata) H. Itô; *D. yabei* f. *ogawai* (H. Itô) H. Itô; *D. yabei* var. *ogawai* (H. Itô) H. Itô; *Lastrea opaca* Hooker; *L. varia* (Linnaeus) T. Moore; *Nephrodium varium* (Linnaeus) C. Presl; *Polystichum hololepis* Hayata; *P. varium* (Linnaeus) C. Presl.

Rhizome ascending, apex densely covered with scales; scales dark brown, linear-lanceolate, 1.5–2 cm, hairlike at apex. Fronds caespitose. Stipes stramineous, 20–50 cm, 4–5 mm in diam., base densely clothed with dark brown or blackish, narrowly lanceolate scales; upward scales becoming brown, smaller and markedly narrow or hairlike. Lamina pentagonal-ovate, tripinnate or bipinnate; basal pinnules pinnatipartite, 30–40 × 20–25 cm, deeply cordate, caudate at apex. Pinnae 10–12 pairs, broadly lanceolate; lowest pinna largest, 15–20 × 10–15 cm, with stalks 0.5–1 cm, acuminate. Pinnules 6–10 pairs, lanceolate, basicopic pinnules usually larger than acroscopic; lowest basicopic pinnule on lowest pinna largest, up to 15 × 3 cm, pinnatisect on large fronds and pinnatifid on small fronds and farther up. Ultimate pinnules or segments on lowest pinnule lanceolate, pinnatifid or serrate, acute. Veins pinnate; veinlets simple or forked, visible abaxially. Lamina subleathery, green; rachis and pinna rachis covered with brown or nearly black

hairlike scales; pinnule rachis and costa covered with brown, bullate scales abaxially. Sori nearer margin than costa; indusia brown, reniform, entire, rarely fimbriate.

Subtropical and temperate forests; sea level to 2300 m (in Taiwan). Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Japan, Korea, Philippines, Vietnam].

See Knapp (Ferns Fern Allies Taiwan, 455. 2011) regarding Taiwanese specimens with a fimbriate indusia.

131. *Dryopteris saxifraga* H. Itô, Bot. Mag. (Tokyo) 50: 125. 1936.

虎耳鳞毛蕨 hu er lin mao jue

Dryopteris varia (Linnaeus) Kuntze subsp. *saxifraga* (H. Itô) Sugimoto; *D. varia* var. *saxifraga* (H. Itô) H. Ohba.

Rhizome ascending or erect, apex densely covered with brown, narrowly lanceolate scales. Fronds caespitose. Stipes stramineous, 10–15 cm, 1.5–2 mm in diam., base densely clothed with brown, lanceolate scales; scales hairlike and deflexed farther up. Lamina ovate-lanceolate, tripinnate or bipinnate; lowest basicopic pinnule pinnatifid, 20–35 × 10–15 cm, deeply cordate, acuminate. Pinnae 8–10 pairs, deltoid-ovate; basal pinna largest, 5–8 × 2–4 cm; basicopic one larger than on acroscopic side. Pinnules 5–8 pairs, ovate-lanceolate; lowest basicopic pinnule on lowest pinna markedly largest, pinnatifid or pinnatisect. Segments obtuse. Veins obscure on both surfaces. Lamina thickly papery, green; rachis covered with spreading, brown, saccate scales; pinna rachis densely covered with brown, bullate scales abaxially. Sori nearer costa than margin; indusia brown, reniform, entire.

Temperate deciduous and needle-leaved forests. Jilin, Liaoning [Japan, Korea].

132. *Dryopteris setosa* (Thunberg) Akasawa, Bull. Kochi Women's Univ., Ser. Nat. Sci. 7: 27. 1959.

两色鳞毛蕨 liang se lin mao jue

Polypodium setosum Thunberg, Fl. Jap. 337. 1784; *Aspidium setosum* (Thunberg) Sweet; *Dryopteris bissetiana* (Baker) C. Christensen; *D. paravaria* Ching & P. S. Chiu; *D. pseudo-bissetiana* Ching ex K. H. Shing & J. F. Cheng; *D. shanghaiensis* Ching & P. S. Chiu; *D. sinobissetiana* Ching & Z. Y. Liu; *D. thunbergii* Koidzumi; *D. varia* (Linnaeus) Kuntze subsp. *setosa* (Thunberg) Sugimoto; *D. varia* var. *setosa* (Thunberg) Ohwi; *Nephrodium bissetianum* Baker; *Polystichum bissetianum* (Baker) Nakai.

Rhizome ascending, apex densely covered with narrowly lanceolate, black or nearly black scales. Fronds caespitose. Stipes stramineous, 15–50 cm, densely clothed with lanceolate,

black, 1–2 cm, apically hairlike scales at base. Lamina ovate-lanceolate, 20–40 × 15–25 cm, cordate, tripinnate, acuminate. Pinnae 10–15 pairs, alternate, shortly stalked, acuminate; lowest pinnae largest, broadly lanceolate, ca. 15 × 7 cm. Pinnules 10–13 pairs, lanceolate, those on basicopic side usually larger than on acroscopic side; lowest basicopic pinnule on lowest pinna largest, ca. 6 × 1.5 cm, pinnatisect at base. Ultimate pinnules on lowest basicopic pinnule 5–8 pairs, lanceolate, 1–1.5 cm × 3–5 mm, toothed or entire, acute. Veins obscure on both surfaces. Lamina subleathery, yellowish green; rachis and pinna rachis densely covered with bicolorous scales, brown and saccate at base, black and narrowly lanceolate above; pinnule costa densely covered with brown, bullate scales abaxially. Sori nearer costa than to margin; indusia brown, large, reniform, entire or ciliate.

Subtropical or temperate forests. Anhui, Fujian, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

133. *Dryopteris sacrosancta* Koidzumi, Bot. Mag. (Tokyo) 38: 108. 1924.

棕边鳞毛蕨 zong bian lin mao jue

Dryopteris bissetiana (Baker) C. Christensen var. *sacrosancta* (Koidzumi) H. Itô; *D. tieanzuensis* Ching & P. S. Chiu; *D. varia* (Linnaeus) Kuntze subsp. *sacrosancta* (Koidzumi) Sugimoto; *D. varia* var. *sacrosancta* (Koidzumi) Ohwi; *Polystichum bissetianum* (Baker) Nakai var. *sacrosanctum* (Koidzumi) Nakai; *P. sacrosanctum* (Koidzumi) Koidzumi.

Rhizome ascending, apex densely covered with narrowly lanceolate, dark brown scales. Fronds caespitose. Stipes 15–20 cm, densely clothed with scales at base; scales black at center, brown on margin, lanceolate, 1–1.2 cm × 1–1.5 mm. Lamina ovate-lanceolate, 25–30 × 15–20 cm, cordate, tripinnate, acuminate. Pinnae 10–13 pairs, alternate or subopposite, ovate-lanceolate; lowest pinnae largest, 13–18 × 7–10 cm, with 8–10 mm stalks, acuminate and curved upward at apex. Pinnules 8–10 pairs, lanceolate; basal basicopic pinnules larger than acroscopic; lowest basicopic pinnule on lowest pinna largest, up to 7 × 2.5 cm, cordate and stalked. Ultimate pinnules on lowest basicopic pinnule 5–7 pairs, pinnatifid or serrate, acute or obtuse. Veins pinnate; veinlets simple or forked. Lamina thickly papery or subleathery; rachis covered with brown, lanceolate scales; pinna rachis and pinnule rachis covered with brown, bullate scales. Sori on either side of costa; indusia brown, reniform, entire or erose. *n* = 123.

Temperate forests. Liaoning, Shandong, Zhejiang [Japan, Korea].

Dryopteris kobayashii Kitagawa (Rep. Exped. Manchoukuo Sect. IV, Pt. 2, Contr. Cogn. Fl. Manshuricae, 56. 1935), described from N China, was treated as a synonym of *D. sacrosancta* by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 209. 1986).

17. *Dryopteris* sect. *Acrorumohra* (H. Itô) Li Bing Zhang & H. He, **comb. nov.**

假复叶耳蕨组 jia fu ye er jue zu

He Hai (何海), Zhang Libing (张丽兵); David S. Barrington

Basionym: *Rumohra* sect. *Acrorumohra* H. Itô, J. Jap. Bot. 11: 583. 1935; *Acrorumohra* (H. Itô) H. Itô.

Plants terrestrial, medium-sized. Rhizome erect, short, clothed with scales; scales linear to linear-lanceolate or ovate, margin entire. Fronds tufted; stipe base scales like those of rhizome, becoming glabrous above; lamina broadly lanceolate, ovate, or pentagonal, (2 or)3- or 4-pinnate; ultimate pinnules or segments obliquely ovate or elliptic, without aristate teeth along margin or at apices, basal acroscopic segment often slightly auriculate, \pm adnate to axes. Lamina herbaceous or papery, subglabrous on both surfaces; veins free, veinlets simple or 1(or 2) times forked, ending short of margin, tip not enlarged; arrangements of pinnules, segments, and veins anadromous throughout. Sori orbicular, terminal on acroscopic veinlet branches (occasionally subdorsal on veinlets); indusia reniform and entire, or absent; sporangia numerous, without glands on axes, annulus of 14–17 thickened cells. Spores ellipsoid; surface lophate. $x = 41$.

About four or five species: tropical and subtropical areas of S and SE Asia, extending to the Pacific islands; three species (one endemic) in China.

Although *Acrorumohra* is sometimes treated as a separate genus, it is part of *Dryopteris* as resolved in a recent molecular study (Li Bing Zhang et al., BMC Evol. Biol. 12: 180. 2012).

- 1a. Rachis straight; pinna stalks ascending toward frond apex 134. *D. hasseltii*
 1b. Rachis zigzag, pinna stalks deflexed toward base.
 2a. Rachis strongly zigzag; basicopic angles between pinna stalks and stipe or rachis up to 30° 135. *D. diffracta*
 2b. Rachis slightly zigzag; basicopic angles between pinna stalks and stipe or rachis up to 70° 136. *D. subreflexipinna*

134. *Dryopteris hasseltii* (Blume) C. Christensen, Index Filic. 269. 1905.

草质假复叶耳蕨 *cao zhi jia fu ye er jue*

Polypodium hasseltii Blume, Fl. Javae Filic. 195. 1851; *Acrorumohra hasseltii* (Blume) Ching; *Arachniodes hasseltii* (Blume) Ching; *Athyrium hasseltii* (Blume) Ching; *Byrsopteris hasseltii* (Blume) C. V. Morton; *Dryopteris adiantoides* T. Suzuki; *D. obovata* (Baker) C. Christensen; *D. psilosora* Tagawa; *Lastrea obovata* (Baker) Beddome; *Nephrodium obovatum* Baker; *Phegopteris hasseltii* (Blume) Mettenius; *Polystichopsis hasseltii* (Blume) Holttum; *Rumohra hasseltii* (Blume) Ching.

Rhizome apex densely covered with castaneous scales. Fronds 0.7–1.1 m; stipe stramineous, rather paler when dried, 30–60 cm, 2–4 mm in diam., base and lower parts densely scaly; scales dull brown, lanceolate, ca. 15 × 1.5 mm, upward glabrescent or with scattered smaller scales; lamina 3-pinnate, deltoid or ovate-oblong, 45–60 × 25–35 cm, rachis glabrescent; pinnae 10–16 pairs, alternate, stalked, obliquely spreading; lowest pinnae ovate-lanceolate, 18–25 × ca. 7 cm, base rounded-cuneate, apex acuminate; primary pinnules ca. 15 pairs, shortly stalked, lanceolate or oblong; basal basicopic ones larger, broadly lanceolate, 7–9 × 2.5–4.5 cm; secondary pinnules 9 or 10 pairs, shortly stalked or sessile distally, ovate-oblong, ca. 1.3 × 0.7 cm, slightly auriculate at base above, cuneate below, apex obtuse, margin shallowly pinnatifid with lobes blunt at apex, basal ones often with acroscopic lobe free and apex with 2 or 3 obtuse teeth; upper pinnae gradually reduced to pinnatifid lamina apex. Lamina herbaceous, yellowish green when dried; costae (axes of ultimate pinnules) sometimes with minute brown lanceolate scales abaxially. Sori terminal on veinlets, 1–5 pairs per ultimate segment, medially between midvein and margin, and exindusiate.

Broad-leaved forests, especially in valleys; 400–1800 m. Hainan, Taiwan, Yunnan [NE India, Indonesia, Japan, Malaysia, Nepal, New Guinea, Philippines, Singapore, Sri Lanka, Thailand, Vietnam; Pacific islands].

135. *Dryopteris diffracta* (Baker) C. Christensen, Index Filic. 262. 1905.

弯柄假复叶耳蕨 *wan bing jia fu ye er jue*

Nephrodium diffractum Baker, Bull. Misc. Inform. Kew 1898: 230. 1898; *Acrorumohra diffracta* (Baker) H. Itô; *Arachniodes diffracta* (Baker) Ching; *Aspidium diffractum* (Baker) Christ; *Dryopteris reflexipinna* Hayata; *Polystichum diffractum* (Baker) Masamune; *Rumohra diffracta* (Baker) Ching.

Rhizome with dense dark brown scales. Fronds 50–100 cm; stipe stramineous or dark brown basally, 20–55 cm and 2–4 mm in diam., base with brown linear-lanceolate and acuminate scales, glabrescent upward; lamina 4-pinnate, broadly ovate, 25–45 × 20–32 cm, base deeply cordate, apex acuminate, rachis glabrescent; pinnae 6–8 pairs, alternate, stalked, stalks deflexed and forming an angle of ca. 30° with extremely zigzag rachis downward from point of attachment; lowest pinna deltoid, ca. 18 × 15 cm, base asymmetrical, apex acute or acuminate; primary pinnules 7–9 pairs, stalked, spreading or deflexed, oblong-lanceolate, 9–11 × 4–5 cm, base unequal, apex caudate-acuminate; secondary pinnules 7 or 8 pairs, stalked, broadly ovate, 1.8–2.5 × 1.5–2.5 cm, base rounded, apex obtuse; tertiary pinnules 3 or 4 pairs, shortly stalked, broadly ovate, 1.2–1.8 × 0.8–1.5 cm, base cuneate, apex obtuse to acute, margin pinnatifid, proximal lobes often nearly free, broadly ovate, margin with 3–5 obtuse teeth; upper pinnae gradually reduced to a pinnatifid apex. Lamina herbaceous, green when dried; costae, costules, and veins occasionally with red-brown lanceolate minute scales or appressed articulate hairs abaxially. Sori small, terminal on veinlets, 1–3 pairs on each ultimate segment; indusia brown, papery, entire, fugacious.

Wet slopes in broad-leaved forests or bamboos; 700–2500 m. Guangxi, Guizhou, Hainan, Taiwan, Xizang, Yunnan [SE India, Myanmar, Thailand, Vietnam].

The occurrence of *Dryopteris diffracta* in Guizhou is questionable considering that no specimen has been collected there since the one gathered by Cavalerie.

136. *Dryopteris subreflexipinna* M. Ogata, J. Jap. Bot. 11: 30. 1935.

微弯假复叶耳蕨 *wei wan jia fu ye er jue*

Acrorumohra subreflexipinna (M. Ogata) H. Itô; *Arach-*

niodes subreflexipinna (M. Ogata) Ching; *Rumohra subreflexipinna* (M. Ogata) H. Itô.

Rhizome apex densely covered with brown lanceolate scales. Frond 65–85 cm; stipe dark brown when young and brownish with age, 40–45 cm and 2–4 mm in diam., base densely scaly as rhizome, upward with sparse scales throughout; lamina 4-pinnate, ovate-oblong, 25–40 × 22–37 cm, base rounded, apex acute, rachis with sparse scales; pinnae 7 or 8 pairs, alternate, approximate, stalked, stalks slightly deflexed and forming an angle of ca. 70° with somewhat zigzag rachis downward from point of attachment; lowest pinna narrowly deltoid, ca. 25 × 18 cm, base broadly cuneate, apex acuminate;

primary pinnules ca. 14 pairs, stalked, spreading or bent proximally, basal basicopic one elongated, deltoid-lanceolate, ca. 14 × 4–5 cm, base cuneate, apex acuminate; secondary pinnules ca. 10 pairs, stalked, basal basicopic one larger, narrowly deltoid, 1.8–2 × 0.8–1.2 cm, base rounded-cuneate, apex obtuse; tertiary pinnules 3 or 4 pairs (basal 1(or 2) pairs free, ovate, ca. 1 × 0.5 cm), base obliquely truncate, apex rounded; upper pinnae gradually reduced. Lamina herbaceous, green when dried; costae with brown lanceolate minute scales abaxially. Sori terminal on veinlets, 1–3 pairs on each ultimate segment; indusium brown, papery, entire, fugacious.

- Broad-leaved forests, often in ravines; 400–1400 m. Taiwan.

18. *Dryopteris* sect. *Dryopsis* (Holttum & P. J. Edwards) Li Bing Zhang, *Phytotaxa* 71: 18. 2012.

轴鳞鳞毛蕨组 zhou lin lin mao jue zu

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

Dryopsis Holttum & P. J. Edwards, *Kew Bull.* 41: 179. 1986.

Plants terrestrial, 25–150 cm. Rhizomes short, erect or rarely prostrate, apex covered by lanceolate scales. Fronds tufted; stipe stramineous, brown, or castaneous, scaly throughout; stipe scales brown or blackish brown, narrowly to ovate-lanceolate, never clathrate or iridescent (as those in *Ctenitis*). Lamina lanceolate to ovate, once pinnate with deeply lobed pinnae to amply 3-pinnate; basal pinnae oblong, lanceolate, or triangular, usually not or slightly longer than next pair, basal basicopic lobe or pinnule mostly not enlarged; distal pinnae adnate to rachis and ± decurrent at their bases; veins free; lamina papery, adaxial surface with thick multicellular hairs; rachises and costae grooved and densely covered with ctenitoid hairs or sometimes with hair-scales (structure intermediate between hairs and scales) on adaxial surface, various scale types present or not on abaxial surface. Sori terminal or dorsal on veins, medial to submarginal, one line on either side of costules; indusia present, persistent; spores ellipsoid to spheroidal, perispore echinate or coarsely tuberculate. $x = 41$.

Sixteen species: tropical and subtropical Asia, southwest to S India and Sri Lanka, east to Japan and the Philippines, south to Malaysia and Indonesia, most diverse in the S and SE Himalaya; nine species (five endemic) in China.

- 1a. Fronds 3-pinnate to 4-pinnatifid, with many free pinnules present; basal stipe scales broadly lanceolate or ovate-lanceolate, generally 2–5 mm wide; abaxial surface of costae with few scales except in *D. ×holttumii*; perispore coarsely tuberculate.
 - 2a. Rachis sparsely scaly; indusia poorly developed and difficult to see, but sometimes fully developed and persistent or fugacious 145. *D. sphaeropteroides*
 - 2b. Rachis densely scaly; indusia fully developed and persistent.
 - 3a. Sori throughout length of pinnules; abaxial surface of costae sparsely scaly 143. *D. maximowicziana*
 - 3b. Sori confined to distal parts of pinnules; abaxial surface of costae copiously scaly 140. *D. ×holttumii*
- 1b. Fronds 2-pinnate or rarely 3-pinnatifid, if present pinnules usually adnate to costae; scales on stipe base narrowly lanceolate, usually less than 1 mm wide; abaxial surface of costae copiously scaly; perispore sharply echinate.
 - 4a. Scales on abaxial surface of costae flat.
 - 5a. Pinnules or pinna lobes with conspicuous hyaline margins 138. *D. clarkei*
 - 5b. Pinnules or pinna lobes lacking hyaline margins 144. *D. transmorrisonense*
 - 4b. Scales on abaxial surface of costae ± bullate.
 - 6a. Scales on abaxial surface of costae slightly bullate; sori confined to distal parts of pinnules 137. *D. apiciflora*
 - 6b. Scales on abaxial surface of costae obviously bullate; sori throughout length of pinnules.
 - 7a. Stipe stramineous or rarely dark brown; pinna lobes entire, crenate, or shallowly lobed, rarely pinnatifid; abaxial surfaces of lobe costae without or with a few scales 142. *D. kawakamii*
 - 7b. Stipe castaneous and shiny; pinna lobes usually shallowly pinnate to deeply lobed, rarely entire; abaxial surfaces of lobe costae scaly.
 - 8a. Basal stipe scales few, ca. 0.5 cm; sori throughout length of pinnules 141. *D. heterolaena*
 - 8b. Basal stipe scales copious, ca. 1 cm; sori usually confined to distal part of pinnules 139. *D. dulongensis*

137. *Dryopteris apiciflora* (Wallich ex Mettenius) Kuntze, *Revis. Gen. Pl.* 2: 812. 1891.

顶果鳞毛蕨 ding guo lin mao jue

Aspidium apiciflorum Wallich ex Mettenius, *Abh. Senckenberg. Naturf. Ges.* 2: 338 (seors. 54). 1858; *Ctenitis apiciflora* (Wallich ex Mettenius) Ching; *Dryopsis apiciflora* (Wallich ex Mettenius) Holttum & P. J. Edwards; *Lastrea*

apiciflora (Wallich ex Mettenius) C. Presl; *Nephrodium apiciflorum* (Wallich ex Mettenius) Hooker.

Rhizomes erect. Stipe stramineous to dark brown, 20–40 cm; stipe scales blackish brown, lanceolate, 10–12 × 1(–2.5) mm. Lamina 2-pinnate, lanceolate, 40–80 × 14–40 cm; free lateral pinnae 18–35 pairs, continuous; basal pinnae slightly shortened, 7–15 × 1.5–2.5 cm, not reflexed; middle pinnae 7–18 × 2–4 cm; pinnules entire or rarely crenate, obtuse and entire at apex, hyaline margins lacking. Rachises and costae abaxially covered with many scales, scales on costae lanceolate near rachises and ± bullate distally, sometimes scales absent or few on costules. Veins of ultimate pinnules pinnate, with brown hairs and few glandular hairs on abaxial surface. Sori only on distal part of pinnules, contiguous, medial. Indusia distinct and persistent, entire or nearly so. Perispore echinate.

Forests; 1800–3200 m. Taiwan, Xizang, Yunnan [Bhutan, NE India, N Myanmar, Nepal].

138. *Dryopteris clarkei* (Baker) Kuntze, Revis. Gen. Pl. 2: 812. 1891.

膜边鳞毛蕨 mo bian lin mao jue

Nephrodium clarkei Baker in Hooker & Baker, Syn. Fil., ed. 2, 497. 1874; *Ctenitis clarkei* (Baker) Ching; *Dryopsis clarkei* (Baker) Holttum & P. J. Edwards; *Lastrea filix-mas* (Linnaeus) C. Presl subvar. *clarkei* (Baker) Beddome; *L. filix-mas* var. *clarkei* (Baker) Beddome.

Rhizomes erect. Stipe dark brown, 3–18 cm; stipe scales blackish brown, lanceolate, 5–12 × 0.5–1 mm. Lamina 2-pinnatifid to 2-pinnate, lanceolate, 25–90 × 7–17 cm; free lateral pinnae 20–40 pairs, ± spaced (i.e., not continuous); basal pinnae distinctly shortened, 1–4 × 0.5–1.5 cm, reflexed; middle pinnae 3.5–8.5 × 1–2 cm; pinnules entire or nearly so, hyaline margins present, obtuse or subtruncate and entire at apex. Rachises and costae abaxially covered with scales, scales on costae not very abundant, lanceolate, costules without scales. Veins of ultimate pinnules pinnate and veinlets once forked, without glands on abaxial surface. Sori on whole length of pinnules, separate, medial to submarginal. Indusia distinct, persistent or partly fugacious, entire or nearly so. Perispore echinate.

Mossy forests; 1300–3800 m. Guangxi, Guizhou, Sichuan, Xizang, Yunnan [Bhutan, NE India (Sikkim), N Myanmar, Nepal].

139. *Dryopteris dulongensis* (S. K. Wu & X. Cheng) Li Bing Zhang, Phytotaxa 71: 21. 2012.

独龙江鳞毛蕨 du long jiang lin mao jue

Ctenitis dulongensis S. K. Wu & X. Cheng, Acta Phytotax. Sin. 23: 402. 1985; *Dryopsis ×dulongensis* (S. K. Wu & X. Cheng) S. Y. Dong.

Rhizomes erect. Stipe reddish brown or castaneous, ca. 50 cm; stipe scales blackish brown, lanceolate, 10–12 × 0.8–1 mm. Lamina 2-pinnate to deeply 3-pinnatifid, linear-lanceolate, ca. 98 × 34 cm; free lateral pinnae 33–38 pairs, continuous; basal pinna not shortened, ca. 20 × 6 cm, not reflexed; middle pinnae ca. 20 × 4 cm; pinnules deeply lobed, entire at obtuse apex, hyaline margins lacking. Rachises abaxially covered by many

scales, scales on costae broadly lanceolate or ovate-lanceolate and bullate at distal part, many scales on abaxial surfaces of costules. Veins of ultimate pinnules pinnate and veinlets simple or forked, with light yellow glands on abaxial surfaces. Sori usually confined to distal part of pinnules, medial. Indusia distinct and persistent, entire or nearly so. Spores not developed.

• Evergreen broad-leaved forests; ca. 1700 m. Yunnan (Gongshan).

Dryopteris dulongensis is only known from the type specimen, which is morphologically intermediate between *D. apiciflora* and *D. heterolaena*. Its abortive spores indicate that this taxon may be of hybrid origin, probably between these species.

140. *Dryopteris ×holtumii* Li Bing Zhang, nom. nov.

霍氏鳞毛蕨 huo shi lin mao jue

Replaced synonym: *Dryopsis ×fauriei* Holttum & P. J. Edwards, Kew Bull. 41: 198. 1986; *Dryopteris ×fauriei* (Holttum & P. J. Edwards) Li Bing Zhang, Phytotaxa 71: 21. 2012, not *D. fauriei* Kodama, Icon. Pl. Koisikav. 2: 11. 1914.

Rhizomes erect. Stipe castaneous, > 30 cm; stipe scales dark brown, lanceolate, ca. 8 × 1.5 mm. Lamina 2-pinnate to 3-pinnatifid, lanceolate, ca. 90 × 50 cm; free lateral pinnae ca. 20 pairs, continuous; basal pinnae not shortened, ca. 26 × 4.5 cm, not reflexed; middle pinnae ca. 26 × 4.5 cm; pinnules entire to deeply lobed, hyaline margins lacking, obtuse at apex. Rachises and costae abaxially scaly, scales on costae ovate, costules without scales. Veins of ultimate pinnules pinnate. Sori confined to distal parts of pinnules. Indusia distinct and persistent. Spores ?not developed.

• Broad-leaved and mixed forests; 2000–2800 m. Taiwan (Jiayi, Nantou, Yilan).

Dryopteris ×holtumii is known from three counties in Taiwan. It is presumably a hybrid between *D. apiciflora* and *D. maximowicziana* (Holttum & Edwards, loc. cit.: 199, as *Dryopsis maximowicziana*). The latter hypothetical parent was originally not found in Taiwan but is now rediscovered there, although, according to reviewer Ralf Knapp, *Dryopteris ×holtumii* and *D. maximowicziana* have not been observed to occur at the same locations together.

141. *Dryopteris heterolaena* C. Christensen, Acta Horti Gothob. 1: 62. 1924.

异鳞鳞毛蕨 yi lin lin mao jue

Ctenitis chingii Z. Y. Liu & J. I. Chang; *C. fengiana* Ching; *C. heterolaena* (C. Christensen) Ching; *C. kwangsiensis* Ching & P. S. Chiu; *C. omeiensis* Ching & Chu H. Wang; *C. tibetica* Ching & S. K. Wu; *C. zhejiangensis* Ching & C. F. Zhang; *Dryopsis fengiana* (Ching) Holttum & P. J. Edwards; *D. heterolaena* (C. Christensen) Holttum & P. J. Edwards; *D. kwangsiensis* (Ching & P. S. Chiu) Holttum & P. J. Edwards.

Rhizomes erect. Stipe castaneous, 20–60 cm; stipe scales blackish brown, lanceolate, 5–8 × ca. 0.5 mm. Lamina 2-pinnate to 3-pinnatifid, lanceolate, 35–85 × 20–30 cm; free lateral pinnae 20–30 pairs, ± spaced; basal pinnae not shortened or slightly shorter than next pair, 10–15 × 2.5–5 cm, not reflexed; middle pinnae 10–15 × 2–4 cm; pinnules usually deeply lobed, or rarely entire, hyaline margins lacking, obtuse and serrate at

apex. Rachises and costae abaxially very scaly, scales on costae distinctly bullate, abaxial surfaces of costules also covered with bullate scales. Veins of ultimate pinnules pinnate, with dark brown or castaneous glands on abaxial surfaces. Sori not confined to distal part of pinnules, medial. Indusia distinct and persistent, entire or nearly so. Perispore echinate. $2n = 82^*$.

• Forests; 800–2400 m. Guangdong, Guangxi, Guizhou, Hunan, Sichuan, Xizang, Yunnan, Zhejiang.

142. *Dryopteris kawakamii* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30: 416. 1911.

泡鳞鳞毛蕨 pao lin lin mao jue

Ctenitis jiulongshanensis P. S. Chiu & G. Yao ex Ching [“*jiulongshanensis*”]; *C. kawakamii* (Hayata) Ching; *C. mariformis* (Rosenstock) Ching; *C. sacholepis* (Hayata) H. Itô; *C. truncata* Ching & H. S. Kung; *Dryopsis kawakamii* (Hayata) Holttum & P. J. Edwards; *D. mariformis* (Rosenstock) Holttum & P. J. Edwards; *D. truncata* (Ching & H. S. Kung) Holttum & P. J. Edwards; *Dryopteris mariformis* Rosenstock; *D. sacholepis* Hayata.

Rhizomes erect. Stipe dark brown to stramineous, 8–25 cm; stipe scales (blackish) brown, lanceolate, $3-6 \times ca. 0.5$ mm. Lamina 2-pinnatifid to 2-pinnate, (linear) lanceolate, 20–60 \times 8–15 cm; free lateral pinnae 20–32 pairs, \pm spaced, or sometimes continuous; basal pinnae distinctly shortened, $3-5 \times 1.2-1.8$ cm, slightly reflexed; middle pinnae $3.5-10 \times 0.9-2$ cm; pinnules entire to distinctly crenate, obtuse, entire, or sometimes only slightly crenate at apex, hyaline margins lacking. Rachises and costae abaxially covered with many scales, scales of costae distinctly bullate distally, costules without scales. Veins of ultimate pinnules pinnate and veinlets once forked, with pale yellow to castaneous glands on abaxial surfaces. Sori separate, distributed throughout, not confined to distal part of pinnules, medial to submarginal. Indusia distinct and persistent, entire or nearly so. Perispore echinate. $2n = 82^*$.

• (Bamboo) forests; 400–3100 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang.

143. *Dryopteris maximowicziana* (Miquel) C. Christensen, Acta Horti Gothob. 1: 63. 1924.

马氏鳞毛蕨 ma shi lin mao jue

Aspidium maximowiczianum Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 178. 1867; *Ctenitis aureovestita* (Rosenstock) Ching; *C. maximowicziana* (Miquel) Ching; *C. whankanshanensis* Ching & Chu H. Wang; *Dryopsis maximowicziana* (Miquel) Holttum & P. J. Edwards; *Dryopteris aureovestita* Rosenstock; *D. matsumurae* (Makino) C. Christensen; *Nephrodium matsumurae* Makino.

Rhizomes prostrate or ascending. Stipe stramineous, 18–50 cm; stipe scales brown, lanceolate or broadly lanceolate, ca. $15 \times 2-4$ mm. Lamina 3-pinnate to 4-pinnatifid, ovate, 40–70 \times 30–50 cm; free lateral pinnae 15–20 pairs, continuous; basal pinnae not shortened, 18–30 \times 7–11 cm, not reflexed; middle pinnae 18–25 \times 5–6 cm; pinnules entire to deeply lobed, hyaline margins lacking, obtuse and entire at apex. Rachises and

costae abaxially covered with many scales, scales on costae lanceolate; costules without scales. Veins of ultimate pinnules pinnate and veinlets simple or forked, with brown hairs on abaxial surfaces. Sori on basal half part of pinnules, or at least not on distal part, medial. Indusia distinct and persistent, eroded and with many minute glands. Perispore coarsely tuberculate. $2n = 82^*$.

Forests; 100–2200 m. Chongqing, Fujian, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan, Korea].

144. *Dryopteris transmorrisonense* (Hayata) Hayata, Icon. Pl. Formosan. 4: 187. 1914.

巢形鳞毛蕨 chao xing lin mao jue

Polystichum transmorrisonense Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30: 427. 1911; *Aspidium filix-mas* (Linnaeus) Swartz var. *nidus* (Baker) Christ; *Ctenitis contigua* Ching; *C. crassirachis* Ching; *C. crenata* Ching; *C. dentisora* Ching; *C. nidus* (Baker) Ching; *C. silaensis* Ching; *C. submariformis* Ching & Chu H. Wang; *C. transmorrisonensis* (Hayata) Tagawa; *C. wantsingshanica* Ching & K. H. Shing; *C. zayuensis* Ching & S. K. Wu; *Dryopsis contigua* (Ching) Holttum & P. J. Edwards; *D. crassirachis* (Ching) Holttum & P. J. Edwards; *D. crenata* (Ching) Holttum & P. J. Edwards; *D. dentisora* (Ching) Holttum & P. J. Edwards; *D. nidus* (Baker) Holttum & P. J. Edwards; *D. silaensis* (Ching) Holttum & P. J. Edwards; *D. submariformis* (Ching & Chu H. Wang) Holttum & P. J. Edwards; *D. transmorrisonensis* (Hayata) Holttum & P. J. Edwards; *D. wantsingshanica* (Ching & K. H. Shing) Holttum & P. J. Edwards; *Dryopteris crassirachis* (Ching) Li Bing Zhang; *D. filix-mas* (Linnaeus) Schott subsp. *nidus* (Baker) C. Christensen; *D. leiboensis* Li Bing Zhang; *D. nidus* (Baker) Li Bing Zhang; *D. nokoensis* Tagawa; *D. nushanensis* Li Bing Zhang; *D. submariformis* (Ching & Chu H. Wang) Li Bing Zhang; *D. wantsingshanica* (Ching & K. H. Shing) Li Bing Zhang; *Lastrea filix-mas* (Linnaeus) C. Presl subvar. *nidus* (Baker) Beddome; *L. filix-mas* var. *nidus* (Baker) Beddome; *Nephrodium apiciflorum* (Wallich ex Mettenius) Hooker var. *nidus* (Baker) C. B. Clarke; *N. filix-mas* (Linnaeus) Richard var. *nidus* Baker.

Rhizomes erect. Stipe stramineous to reddish brown, 15–26 cm; stipe scales blackish brown, lanceolate, $5-12 \times 0.5-1$ mm. Lamina 2-pinnate, lanceolate, 28–65 \times 10–19 cm; free lateral pinnae 16–35 pairs, \pm spaced; basal pinnae shortened or not, 4–10 \times 1.5–2 cm, reflexed or not; middle pinnae 5.5–10 \times 1.2–2.2 cm; pinnules entire to crenate at lateral margins, hyaline margins lacking, obtuse or subtruncate and crenate to serrate at apex. Rachises and costae abaxially covered with many scales, scales on costae lanceolate or ovate; costules without scales. Veins of pinnules pinnate, hairs, glands, or gland-hairs on veins present or not. Sori in middle, or sometimes confined to distal half of pinnules, separate, medial. Indusia distinct and persistent, entire or erose at margin, glands on indusia present or not. Perispore echinate.

Forests, thickets; 2000–3900 m. Guizhou, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, NE India, E Nepal].

Some characters of *Dryopteris transmorrisonense* vary immensely, e.g., pinnules entire to distinctly crenate or lobed halfway,

pinnules closely set to separated 1–2 mm apart, sori medial to marginal on pinnules, indusia entire to erose, glands present on abaxial surface of veinlets and indusia or absent.

Some authors (e.g., Knapp, Ferns Fern Allies Taiwan, 166. 2011; Li Bing Zhang, Phytotaxa 71: 23. 2012) recognize differences between *Dryopteris nidus* and *D. transmorrisonense*. Despite the name *D. nidus*, a more perfect “nest-plant” is *D. clarkei*. As a result, the two names are easily confused. *Dryopteris clarkei* is easily recognized by its hyaline pinna margins.

145. *Dryopteris sphaeropteroides* (Baker) C. Christensen, Index Filic. 293. 1905.

大鳞鳞毛蕨 da lin lin mao jue

Polypodium sphaeropteroides Baker, Bull. Misc. Inform. Kew 1895: 55. 1895; *Aspidium sphaeropteroides* (Baker) Christ; *Athyrium sphaeropteroides* (Baker) C. Christensen; *Ctenitis sphaeropteroides* (Baker) Ching; *Dryopsis sphaero-*

pteroides (Baker) Holttum & P. J. Edwards; *Phegopteris sphaeropteroides* (Baker) Christ.

Rhizomes erect. Stipe stramineous, 30–45 cm; stipe scales brown, ovate to broadly lanceolate, ca. 10 × 3–5 mm. Lamina 3-pinnate to 4-pinnatifid, ovate, 30–45 × 20–30 cm; free lateral pinnae 18–21 pairs, contiguous except basal ones; basal pinnae not shortened, 12–16 × 6–8 cm, not reflexed; middle pinnae 13–16 × 4–6 cm; pinnules entire or sometimes distinctly serrate, obtuse and serrate at apex, hyaline margins lacking. Rachises and costae abaxially covered with hairs but no scales; costules without scales. Veins of ultimate pinnules pinnate, with brown hairs on abaxial surface. Sori not confined to distal part of pinnules, medial to submarginal. Indusia distinct, persistent or partly fugacious, entire or nearly so. Perispore coarsely tuberculate.

• Forests; 2100–2800 m. Sichuan, Yunnan.

4. *Dryopteris* subg. *Nothoperanema* Tagawa, Acta Phytotax. Geobot. 7: 199. 1938.

肉刺鳞毛蕨亚属 rou ci lin mao jue ya shu

Wang Faguo (王发国), Xing Fuwu (邢福武), Wu Sugong (武素功), Xiang Jianying (向建英), Zhang Libing (张丽兵); David S. Barrington

Plants generally large. Fronds brown after drying, with non-glandular hairs; indusia orbicular or reniform, inferior or superior.

About 27 species: distributed mainly in tropical and subtropical areas of Africa, Asia, Madagascar, Papua New Guinea, and Pacific islands (including Hawaiian Islands); 22 species (11 endemic) in four sections in China.

Dryopteris subg. *Nothoperanema* can be divided into four sections. All four sections are strongly supported as monophyletic based on molecular and morphological evidence (Li Bing Zhang et al., BMC Evol. Biol. 12: 180. 2012). In fact, the four sections are strikingly different in morphology and are often treated as different genera.

Three of us (Wang, Xing, and Wu), however, prefer to keep the three sections, *Dryopteris* sect. *Acrophorus*, *D.* sect. *Diacalpe*, and *D.* sect. *Peranema*, as genera in the family Peranemataceae.

19. *Dryopteris* sect. *Nothoperanema* (Tagawa) Li Bing Zhang, Taxon 61: 1206. 2012.

肉刺鳞毛蕨组 rou ci lin mao jue zu

Wu Sugong (武素功), Xiang Jianying (向建英), Zhang Libing (张丽兵); David S. Barrington

Nothoperanema (Tagawa) Ching.

Plants terrestrial, medium-sized. Rhizome stout, erect or obliquely ascending. Fronds caespitose; stipe stout, with dense scales; scales lucid, ferruginous-brown or dark brown, ovate, lanceolate or subulate above, thick, entire, apex acuminate; lamina large, ovate-triangular, tripinnate or tripinnatifid; basal pinnae largest, subtriangular, base inequilateral; basiscopic pinnule largest, extending downward, pattern of pinnule arrangement such that basal pair anadromous; upper ones ± catadromous; from second pinnae lanceolate or broadly lanceolate, base equilateral; rachis with dense narrowly lanceolate or subulate scales; scales fuscous or nearly black, spreading; costa and costule glabrous on both surfaces, raised abaxially, grooved adaxially, with short, stout setae on each side of costae and at forking position of midribs; setae consisting of 3 rows of subquadrate stereids at base, 2 rows at middle, 1 row at apex. Venation free, same as *Dryopteris* type, veinlets not reaching margin, a hydathodal cell terminating veinlet. Lamina herbaceous or papery when dry, brown. Sori orbicular, terminating veinlets, 1 row on both sides of costa; indusia sometimes exindusiate, brown or dark brown, orbicular-reniform, firm, entire, attached by sinus, persistent or fugacious. Spores bilateral, reniform, surface verrucose or reticulate. $n = 41$.

About six species: C, E, and S Africa, E, NE, and S Asia, Himalaya, Indian Ocean islands (Mascarene Islands), Madagascar, New Guinea, and Pacific islands (including Hawaiian Islands); five species (two endemic) in China.

1a. Rachis scales lanceolate and linear-lanceolate.

2a. Sori indusiate; rachis scales reddish brown; ultimate segments serrate apically 149. *D. hendersonii*

2b. Sori exindusiate; rachis scales dark brown; ultimate segments entire or undulate apically 150. *D. shikokiana*

1b. Rachis scales long subulate.

- 3a. Plants 120–150 cm tall; basalmost pinnae up to 38 cm; primary segments up to 17 cm; secondary segments up to 2 cm 148. *D. grandifrons*
- 3b. Plants 60–110 cm tall; basalmost pinnae 14–21 cm; primary segments 5–7 cm; secondary segments 1–1.6 cm.
- 4a. Rachis scales nearly black when dried; pinnae acute apically 146. *D. squamiseta*
- 4b. Rachis scales brown to rust-colored when dried; pinnae acute or obtuse apically 147. *D. diacalpioides*

146. *Dryopteris squamiseta* (Hooker) Kuntze, Revis. Gen. Pl. 2: 813. 1891.

肉刺鳞毛蕨 rou ci lin mao jue

Nephrodium squamisetum Hooker, Sp. Fil. 4: 140. 1862; *Aspidium squamisetum* (Hooker) Kuhn; *Ctenitis thrichorachis* (Hayata) H. Itô; *Dryopteris atrossetosa* Rosenstock; *D. buchananii* (Baker) Kuntze; *D. thrichorachis* Hayata; *Lastrea buchananii* (Baker) Beddome; *N. buchananii* Baker; *Nothoperanema squamisetum* (Hooker) Ching.

Plants 90–110 cm tall. Rhizome erect, densely scaly; scales lucid, brown, ovate, entire. Fronds caespitose; stipe upper part stramineous, 38–50 cm, base 3–4 mm wide, adaxially with 2 grooves, reaching to rachis, densely clothed with brown, long subulate scales; lamina ovate, 52–60 × 34–42 cm, tripinnate, apex acuminate; pinnae up to 16 pairs, alternate, sometimes basal pair opposite, stipitate, obliquely spreading; basal pinnae larger, broadly lanceolate, ca. 21 × 10 cm, bipinnate, base inequilateral, apex acuminate; pinnules ca. 16 pairs, alternate, stalked; basal one (or two) oblong-lanceolate, 5–7 × 2–2.8 cm, larger than upper ones, pinnate, base subrounded, apex acute; ultimate pinnules 9 or 10 pairs; lower pairs subopposite, ovate-oblong, 1.4–1.6 cm × ca. 8 mm, pinnately lobed, base broadly cuneate, apex rounded; segments 3–5 pairs, basal pair oblong, entire, apex rounded; tapered from second pinnae upward, and from seventh (or eighth) pair up pinnae abruptly narrowed, ca. 6 × 2.2 cm. Veins in ultimate pinnules pinnate; veinlets forked or simple, running to frond margin, visible abaxially. Lamina herbaceous, green when dried, clothed with brown, subulate scales along costa and costule. Sori orbicular, located at end of veinlets, in 1 row on each side of costa; indusia brown, orbicular-reniform, thickly membranous, fugacious.

Forests, valleys; 1900–2900 m. Taiwan, Xizang, Yunnan [Bhutan, India; C and S Africa, Indian Ocean islands (Réunion), Madagascar].

147. *Dryopteris diacalpioides* (Ching) Li Bing Zhang, Taxon 61: 1206. 2012.

棕鳞毛蕨 zong lin lin mao jue

Nothoperanema diacalpioides Ching, Acta Phytotax. Sin. 11: 28. 1966.

Plants ca. 64 cm tall. Stipe stramineous, ca. 33 cm × 3 mm, clothed with brown, linear-lanceolate, thin scales along rachis. Lamina ovate, ca. 40 × 27 cm, tripinnate, widest at base, apex acute; pinnae ca. 16 pairs, basal 1 (or 2) pairs opposite; next upper ones alternate, subsessile, obliquely spreading; basal pinna larger than next upper ones, oblong-lanceolate, ca. 14.5 × 6.5 cm, bipinnate, base broadly cuneate, inequilateral, apex acute; pinnules ca. 16 pairs, alternate, basal pair larger than others; basal one oblong-lanceolate, ca. 5 × 1.6 cm, pinnate, inequilateral, apex acuminate; ultimate pinnules ca. 14 pairs,

oblong, ca. 1 × 3 mm, shallowly rounded-lobed, rounded and small serrate at apex; shortened gradually from second pinnae upward. Middle pinnae ca. 13 cm; pinnules 2–2.5 cm, veins in ultimate pinnules pinnate; veinlets forked or simple, running to lamina margin and distinct abaxially. Lamina herbaceous when dried, green, clothed with brown, linear-lanceolate scales on abaxial side of costa, costule with fleshy thorn on adaxial surface of vein. Sori orbicular, located on veinlets near costa, in 1 row on each side of costa; indusia brown, orbicular or oblong, thin, entire, deciduous.

• Forests, shaded wet places; ca. 2400 m. S Yunnan (Jinping, Pingbian).

148. *Dryopteris grandifrons* Li Bing Zhang, Taxon 61: 1207. 2012.

大叶鳞毛蕨 da ye lin mao jue

Nothoperanema giganteum Ching, Acta Phytotax. Sin. 11: 28. 1966.

Plants 1.2–1.5 m tall. Stipe 42–58 × 1–1.2 cm, lower part densely clothed with brown, ovate-lanceolate, entire scales, sparsely scaly upward throughout rachis. Lamina ovate-deltoid, 56–76 × 50–55 cm, tripinnate; pinnae ca. 15 pairs, basal 1 or 2 pairs opposite; upper ones alternate, stipitate, obliquely spreading; basal pair larger than others, broadly lanceolate, ca. 38 × 15 cm, bipinnate, base asymmetrical, apex caudate-acuminate; pinnules ca. 18 pairs, alternate, stipitate, slightly obliquely spreading, approximate; basiscopic basal pinnule larger than acroscopic one, oblong-lanceolate, ca. 17 × 4 cm, pinnate, base inequilateral, apex caudate-acuminate; ultimate pinnules ca. 12 pairs, oblong, ca. 2 × 1.2 cm, pinnatipartite; segments 6–8 pairs, obliquely spreading, oblong, 6–7 × ca. 3 mm, margin shallowly crenate or entire, apex rounded; second pinnae same size as basal pinnae, gradually shortened upward from third pair, lanceolate. Veins in ultimate pinnules pinnate; veinlets forked, running to lamina margin and visible abaxially. Lamina brown, papery, with brown, lanceolate scales on abaxial side of each rachis. Sori orbicular, terminal on veinlets, single, or 2 or 3 pairs on basal part of each segment, close to costa; indusia dark brown, orbicular, thickly membranous, persistent.

• Thickets, valleys; 1700–1800 m. NW Yunnan (Gongshan).

149. *Dryopteris hendersonii* (Beddome) C. Christensen, Index Filic. 270. 1905.

有盖鳞毛蕨 you gai lin mao jue

Lastrea hendersonii Beddome, Suppl. Ferns S. Ind. 17. 1876 [“*Hendersonii*”]; *Ctenitis hendersonii* (Beddome) H. Itô; *C. leptorachis* (Hayata) Ching; *C. mearnsii* Copeland; *Dryopteris leptorachia* Hayata; *Nephrodium spectabile* C. B. Clarke, nom. illeg. superfl. (1880), not (Blume) Hooker (1862); *Nothoperanema hendersonii* (Beddome) Ching.

Plants 48–75 cm tall. Rhizome ascending, short, stout, scaly. Stipe 15–30 mm in diam., lower part densely clothed with dark brown, lanceolate scales, sparsely scaly upward throughout rachis. Lamina ovate, 30–45 × 26–34 cm, quadripinnate, apex slightly acute; pinnae 4 or 5 pairs; basal 1(or 2) pinnae largest, opposite, oblong-lanceolate, 14–25 × 8–15 cm, base inequilateral, stipitate, apex acute; upper ones alternate, tripinnate; first pinnules 12–16 pairs, alternate, stipitate. Basiscopic pinnules larger than acroscopic ones; basal pinnule oblong-lanceolate, 5–12 × 2.6–5.2 cm, bipinnate, base inequilateral, apex acute; secondary pinnules ca. 15 pairs, oblong; basal pinnule ca. 3 × 1.1 cm, pinnate; ultimate pinnules 8 or 9 pairs, oblong, ca. 7 × 2 mm, obtusely dentate on upper margin and apex. Veins in ultimate pinnule pinnate; veinlets forked or simple, running to lamina margin, visible abaxially. Sori orbicular, abaxial on top of veinlets, at basal part of segment, in 1 row at each side of costa; indusia dark brown, orbicular, thickly membranous, fugacious.

Forests, thickets; 1000–2500 m. Guizhou, Taiwan, Yunnan [N India, S Japan, Malaysia, Myanmar, Nepal, Philippines].

150. *Dryopteris shikokiana* (Makino) C. Christensen, Index Filic. 292. 1905.

东亚鳞毛蕨 dong ya lin mao jue

Nephrodium shikokianum Makino, Bot. Mag. (Tokyo) 13:

62. 1899; *Ctenitis shikokiana* (Makino) H. Itô; *Nothoperanema shikokianum* (Makino) Ching.

Plants 56–120 cm tall. Rhizome erect, stout, scaly. Stipe 26–55 cm × ca. 3.5 mm, throughout rachis with dark brown, ovate-lanceolate scales. Lamina ovate-pentagonal, 30–65 × 26–30 cm, not tapered to base, tripinnate, apex shortly acuminate; pinnae ca. 16 pairs, basal 1(or 2) pairs opposite; upper ones alternate, stipitate, obliquely spreading, approximate; basal pair larger than others, lanceolate, ca. 15 × 7 cm, bipinnate, base inequilateral, apex caudate-acuminate; pinnules ca. 15 pairs, alternate, stipitate; basiscopic pinnules larger than acroscopic ones; basiscopic pinnule oblong-lanceolate, ca. 5 × 2 cm, pinnate, base rounded, equilateral, apex acute; ultimate pinnules ca. 10 pairs, oblong, ca. 1.4 cm × 5 mm, base broadly cuneate, margin lobed or deeply pinnatifid, apex obtuse; lobes 4 or 5, oblong, subtruncate at base, entire; secondary pair of pinnae similar to basal pair but shorter, bipinnate; tapered from third pinnae upward, from sixth (or seventh) pair abruptly narrowed, ca. 6 × 1.8 cm, apex triangular. Veins in ultimate pinnule pinnate; veinlets forked or simple, running to frond margin, visible abaxially. Lamina papery when dried, brown, abaxial side of rachis with brown, lanceolate scales. Sori orbicular, terminating veinlet, 4 or 5 pairs on each ultimate pinnule, between costa and lamina margin and in 1 row at each side of costa, exindusiate.

Bamboo forests, mixed forests; 400–1800 m. Guangxi, Guizhou, Hunan, Sichuan, Yunnan [Japan].

20. *Dryopteris* sect. *Acrophorus* (C. Presl) Li Bing Zhang, Taxon 61: 1207. 2012.

鱼鳞毛蕨组 yu lin lin mao jue zu

Wang Faguo (王发国), Xing Fuwu (邢福武), Zhang Libing (张丽兵); David S. Barrington

Acrophorus C. Presl, Tent. Pterid. 93. 1836.

Plants terrestrial; caudex erect or ascending, dictyostelic, thick, short, clothed with reddish brown or castaneous scales; scales ovate-lanceolate, entire or undulate. Fronds tufted; stipe stramineous, base covered with scales same as on rhizome, upper scales caducous, longitudinally grooved on adaxial side; lamina triangular-ovate, tripinnatifid to 4-pinnate, papery, green or brown when dry; pinnae always opposite, sessile; pinnules subopposite, vertical to rachis; ultimate pinnules sparsely covered with short nodose hairs adaxially, glabrous abaxially; rachis and rachillae stramineous, longitudinally grooved on adaxial side, densely covered with brown short nodose hairs at base, often with a cordate, brown large scale at base of each pinna and pinnule, rounded abaxially; venation free, pinnate, veinlets submarginal. Sori orbicular, terminal on basal acroscopic veinlets of lobes or ultimate pinnules; indusium semicircular or cup-shaped, membranous, inferior, attached by broad base, enclosing sori when young; receptacle elevated; annuli longitudinal and interrupted, consisting of 14–16 thickened cells, with long stipe; spores narrowly elliptic, with coarsely ribbed episporium. $x = 41$.

About 11 species: SE Asia, west to Papua New Guinea and Polynesia; seven species (four endemic) in China.

- 1a. Pinnae and segments of every order without a large cordate scale but with only a small ovate-lanceolate or broadly lanceolate scale at base 157. *D. exstipellata*
- 1b. Pinnae and segments of every order with a large cordate and often persistent scale at base.
- 2a. Secondary segments of upper pinnae rounded apically.
- 3a. Pinnules of middle pinnae 1–1.5 cm; lobes up to 2 mm wide; sori ca. 0.5 mm in diam. 155. *D. wusugongii*
- 3b. Pinnules of middle pinnae 1.5–3 cm; lobes up to 3 mm wide; sori ca. 1 mm in diam. 156. *D. wuzhaohongii*
- 2b. Secondary segments of upper pinnae acuminate or acute apically.
- 4a. Secondary segments elliptic-lanceolate, ultimate segments with a deciduous scale at base; scale trace visible if scale fallen off 154. *D. emeiensis*
- 4b. Secondary segments lanceolate, ultimate segments with a persistent scale at base.
- 5a. Rachis scabrous; sori ca. 0.8 mm in diam. 151. *D. nodosa*
- 5b. Rachis glabrous.

- 6a. Lobes elliptic; sori ca. 0.5 mm in diam. 152. *D. paleolata*
 6b. Lobes rectangular; sori ca. 1 mm in diam. 153. *D. acrophorus*

151. *Dryopteris nodosa* (C. Presl) Li Bing Zhang, Taxon 61: 1208. 2012.

节毛鳞毛蕨 jie mao lin mao jue

Acrophorus nodosus C. Presl, Tent. Pterid. 94. 1836, based on *Aspidium nodosum* Blume, Enum. Pl. Javae 2: 171. 1828, not Willdenow (1810); *Acrophorus blumei* Ching; *Peranema nodosa* (C. Presl) Fraser-Jenkins.

Rhizome erect or ascending, short, ca. 2 cm in diam., terminal part densely covered with dark brown scales; scales ovate-lanceolate, ca. 1 cm, thickly membranous, sometimes with short fibriform hairs, entire or undulate, acuminate. Stipes tufted, stramineous, 30–45 cm, 5–8 mm in diam. at base, densely covered with scales same as on rhizome, subglabrous upward; lamina brown-green when dry, ovate, 50–80 × 46–80 cm, always quadripinnatifid, papery, glabrous or with few nodose hairs along midvein abaxially, sparsely covered with short nodose hairs adaxially, apex acuminate; pinnae 9–12 pairs, opposite, basal pairs 4–18 cm apart, basal pair largest, with short stalk 3–4 mm, spreading, narrowly ovate, 35–45 × 28–32 cm, tripinnatifid, base slightly enclosing rachis, apex acuminate; pinnules 12–16 pairs, basal one opposite and shortened, alternate upward, with short stalk 1–2.5 mm, upper pinnules slightly ascending, basicopic pinnule longer than upper ones; ultimate pinnules 14–16 pairs, basal one opposite, alternate upward, subsessile, spreading, distant, narrowly elliptic, median ones longer, 2–3.4 × 0.8–1.5 cm, base truncate, close to rachillae, pinnatipartite to ultimate rachillae, apex acute or acuminate; lobes 6–8 pairs, spreading, close to each other, narrowly elliptic, 4–8 × 2–4 mm, base broadly cuneate, margin pinnatifid or undulate, apex rounded; veins obvious adaxially, pinnate on lobes, veinlets often simple, submarginal; rachis and rachillae stramineous, with narrow longitudinal groove adaxially, densely covered with nodose hairs at base, with 1 cordate brown scale. Sori orbicular, ca. 0.5 mm in diam., terminal on veinlet, 3–5 per lobe; indusium brown, semicircular or ovate-circular, membranous, attached at base, upper free margin somewhat erose.

Semi-shaded roadsides, wet shaded slopes, forest margins; 1300–2300 m. Taiwan [Indonesia, S Japan (Kyushu), Malaysia, Philippines; Pacific islands (Fiji, Polynesia)].

Dryopteris nodosa has often been regarded to be conspecific with "*Acrophorus stipellatus*" (here recognized as a synonym of the following species, *D. paleolata*; see comment below), but *D. nodosa* has more finely dissected fronds, scabrous rachis, and larger indusia. Molecular data show that these two are not even closely related phylogenetically and should be separated from each other (Li Bing Zhang et al., BMC Evol. Biol. 12: 180. 2012).

152. *Dryopteris paleolata* (Pichi Sermolli) Li Bing Zhang, Taxon 61: 1208. 2012.

鱼鳞鳞毛蕨 yu lin lin mao jue

Acrophorus paleolatus Pichi Sermolli, Webbia 31(1): 252. 1977; *Peranema paleolata* (Pichi Sermolli) Fraser-Jenkins.

Rhizome erect or ascending, short, ca. 2 cm in diam., terminal part densely covered with dark brown scales; scales ovate-lanceolate, ca. 1 cm, thickly membranous, sometimes with short fibriform hairs, entire or undulate, acuminate. Stipes tufted, 35–75 cm, 5–8 mm in diam. at base, densely covered with scales same as on rhizome, subglabrous upward; lamina brown-green when dry, ovate, 50–80 × 46–80 cm, always quadripinnatifid, papery, glabrous or with few nodose hairs along midvein abaxially, sparsely covered with short nodose hairs adaxially, apex acuminate; pinnae 9–12 pairs, opposite, basal pairs 4–18 cm apart, basal pair largest, with short stalk 3–4 mm, spreading, narrowly ovate, 35–45 × 28–32 cm, tripinnatifid, base slightly enclosing rachis, apex acuminate; pinnules 12–16 pairs, basal one opposite and shortened, alternate upward, with short stalk 1–2.5 mm, upper pinnules slightly ascending, basicopic pinnules longer than upper ones; ultimate pinnules 14–16 pairs, basal one opposite, alternate upward, subsessile, spreading, distant, narrowly elliptic, median ones longer, 2–3.4 × 0.8–1.5 cm, base truncate, close to rachillae, pinnatipartite to ultimate rachillae, apex acute or acuminate; lobes 6–8 pairs, spreading, close to each other, narrowly elliptic, 4–8 × 2–4 mm, base broadly cuneate, margin pinnatifid or undulate, apex rounded; veins obvious adaxially, pinnate on lobes, veinlets often simple, submarginal; rachis and rachillae stramineous, with narrow longitudinal groove adaxially, densely covered with nodose hairs at base, with 1 cordate brown scale. Sori orbicular, ca. 0.5 mm in diam., terminal on veinlet, 3–5 on each lobe; indusium brown, semicircular or ovate-circular, membranous, attached at base. 2x = 82.

Near streams in dense forests; 500–3300 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Japan, Nepal, Philippines, Vietnam].

The names "*Acrophorus stipellatus*" (T. Moore, Gard. Chron. 135. 1854) and "*Cystopteris stipellata*" (Alderwerelt, Bull. Jard. Bot. Buitenzorg, sér. 2, 1: 4. 1911), sometimes used for this taxon, were based on the nomen nudum "*Davallia stipellata*" (Wallich, Numer. List, no. 260. 1829). None was validly published (*Melbourne Code*, Art. 38.1(a)).

153. *Dryopteris acrophorus* Li Bing Zhang, Taxon 61: 1208. 2012.

滇缅鳞毛蕨 dian mian lin mao jue

Acrophorus diacalpioides Ching & S. H. Wu, Acta Phytotax. Sin. 21: 381. 1983.

Rhizome erect or ascending, short, ca. 2 cm in diam., terminal part densely covered with dark brown scales; scales ovate-lanceolate, ca. 1 cm, thickly membranous, sometimes with short fibriform hairs, entire or undulate, acuminate. Stipes tufted, 35–75 cm, 5–8 mm in diam. at base, densely covered with scales same as on rhizome, subglabrous upward; lamina brown-green when dry, ovate, 50–80 × 46–80 cm, always quadripinnate, papery, glabrous or with few nodose hairs along midvein abaxially, sparsely covered with short nodose hairs adaxially, apex acuminate; pinnae 9–12 pairs, opposite, basal pairs 4–18 cm apart, basal pair largest, with short stalk 3–4 mm,

spreading, narrowly ovate, 35–45 × 28–32 cm, tripinnate, base slightly enclosing rachis, apex acuminate; pinnules 12–16 pairs, basal one opposite and shortened, alternate upward, with short stalk 1–2.5 mm, upper pinnules slightly ascending, basiscopic pinnule longer than upper ones; ultimate pinnules 14–16 pairs, basal one opposite, alternate upward, subsessile, spreading, distant, narrowly elliptic, median ones longer, 2–3.4 × 0.8–1.5 cm, base truncate, close to rachillae, apex acute or acuminate; lobes 6–8 pairs, spreading, close to each other, rectangular, 5–7 × 3.5–5 mm, base broadly cuneate, margin pinnatifid or undulate, apex rounded; veins obvious adaxially, pinnate on lobes, veinlets often simple, submarginal, hydathodes not obvious; rachis and rachillae stramineous, with narrow longitudinal groove adaxially, densely covered with nodose hairs at base, with 1 cordate brown scale at base. Sori orbicular, ca. 1 mm in diam., terminal on veinlet, 3–5 per lobe; indusium brown, semicircular or ovate-circular, membranous, attached at base.

Dense forests. Yunnan [Myanmar].

154. *Dryopteris emeiensis* (Ching) Li Bing Zhang, Taxon 61: 1208. 2012.

峨眉鳞毛蕨 e mei lin mao jue

Acrophorus emeiensis Ching, Acta Phytotax. Sin. 21: 380. 1983.

Rhizome ascending, short, woody, terminal part densely covered with brown scales; scales ovate-lanceolate, ca. 1 cm, thickly membranous, entire, acuminate. Stipes tufted, 40–80 cm, ca. 1.2 cm in diam. at base, densely covered with scales same as on rhizome, subglabrous upward; lamina brown-green when dry, ovate, 60–85 × 45–70 cm, always quadripinnatifid, papery, glabrous abaxially, sparsely covered with short nodose hairs adaxially, apex acuminate; pinnae 13–15 pairs, opposite, spreading, basal pairs 4–18 cm apart, basal pair largest, subsessile, spreading, narrowly ovate, 35–45 × 28–32 cm, base narrower and slightly enclosing rachis, tripinnatifid; pinnules 14–16 pairs, basal one opposite and shortened, alternate upward, subsessile, basiscopic pinnule longer than upper ones; ultimate pinnules 8 or 9 pairs, elliptic, rounded at apex, broadly cuneate at base, slightly asymmetrical, lobed up to 1/3–2/3 on both sides; veins obvious adaxially, pinnate on lobes, veinlets often simple, submarginal; rachis and rachillae stramineous, with narrow longitudinal groove adaxially, densely covered with nodose hairs at base, with 1 cordate brown scale abaxially, often caducous. Sori orbicular, ca. 0.5 mm in diam., terminal on veinlet, 1 on each lobe; indusium brown, semicircular, membranous, attached at base.

• In shrubs, forests; 800–2700 m. Sichuan.

When *Dryopteris emeiensis* was transferred to *Dryopteris*, its original epithet *emeiensis* is available in spite of the existence of the name *D. omeiensis* (Baker) C. Christensen (Index Filic. 280. 1905). Although “*omeiensis*” and “*emeiensis*” refer to the same mountain (Emei Shan) in Sichuan, China, they are not confusingly similar because they are spelled with a different initial letter.

155. *Dryopteris wusugongii* Li Bing Zhang, Taxon 61: 1208. 2012.

素功鳞毛蕨 su gong lin mao jue

Acrophorus dissectus Ching, Acta Phytotax. Sin. 21: 382. 1983.

Rhizome erect, brown, short, 2–2.5 cm in diam., woody, terminal part densely covered with dark brown scales; scales ovate-lanceolate, ca. 5 mm, membranous, acuminate. Stipes tufted, dark brown, 60–70 cm, 6–8 mm in diam. at base, densely covered with scales same as rhizome, subglabrous upward; lamina brown-green when dry, ovate, 50–60 cm, quadripinnate, papery, glabrous abaxially, sparsely covered with short nodose hairs adaxially; pinnae 9 or 10 pairs, always opposite, spreading vertically to rachis, basal pair ca. 14 cm apart to second pair, subsessile, narrowly ovate and falcate, 32–35 × 22–25 cm, tripinnatifid, base slightly narrower, apex acuminate; pinnules 12–14 pairs, basal ones opposite and shortened, alternate or opposite upward, sessile, close together, upper pinnules 1/2–2/3 as large as basiscopic ones, second pinnule of basiscopic ones on base largest, 15–17 × 5–6 cm, elliptic-lanceolate, base truncate and slightly overlapping rachis, bipinnatifid, apex acuminate; ultimate pinnules 11–13 pairs, basal pair opposite and alternate upward, sessile, spreading, distant, narrowly elliptic, 1–1.5 × 0.5–0.8 cm, base asymmetrical, upper side truncate and close to rachillae, lower side cuneate and pinnatifid to rachillae, apex obtuse; lobes 5–7 pairs, elliptic, ca. 4 × 2 mm, lobed or undulate on both sides, apex rounded; veins obvious on abaxial surface, pinnate on lobes, veinlets simple, submarginal; rachis and rachillae stramineous, with narrow longitudinal groove adaxially, densely covered with nodose hairs at base, with 1 cordate brown scale abaxially. Sori orbicular, ca. 0.5 mm in diam., terminal on veinlet, 1–4 on each lobe; indusium brown, semicircular, membranous.

• Dense forests. Yunnan.

156. *Dryopteris wuzhaohongii* Li Bing Zhang, Taxon 61: 1208. 2012.

兆洪鳞毛蕨 zhao hong lin mao jue

Acrophorus macrocarpus Ching & S. H. Wu, Acta Phytotax. Sin. 21: 381. 1983.

Rhizome ascending, short, woody, terminal part densely covered with brown scales; scales lanceolate, ca. 1 cm, membranous, acuminate. Stipes tufted, 32–40 cm, 5–8 mm in diam. at base, brown, densely covered with scales same as on rhizome, subglabrous upward; lamina brown-green when dry, ovate, 35–60 × 25–40 cm, quadripinnatifid, papery, glabrous abaxially, sparsely covered with short nodose hairs adaxially; pinnae 6–9 pairs, always opposite, spreading, basal pairs 5–11 cm apart, basal pair largest, narrowly ovate, 25–40 × 13–18 cm, tripinnatifid, base rounded-truncate and slightly enclosing rachis, with short stalk 2–4 mm, apex acuminate; pinnules 10–12 pairs, basal ones opposite and shortened, alternate or opposite upward, basiscopic pinnule slightly longer than upper ones, bipinnatifid; ultimate pinnules 9–13 pairs, elliptic, spreading, distant, 1.5–3 × 0.6–1 cm, with 2 or 3 obtuse teeth, base broadly cuneate and close to rachillae, pinnatifid to ultimate rachillae, apex obtuse; lobes rectangular, ca. 5 × 3 mm, lobed to 1/2 and undulate on both sides, undulate and rounded at apex; veins obvious on both surfaces, pinnate on lobes, veinlets simple or furcate, submarginal; rachis and rachillae stramineous, with nar-

row longitudinal groove adaxially, densely covered with nodose hairs at base, with 1 cordate brown scale abaxially. Sori orbicular, ca. 0.5 mm in diam., terminal on veinlet, 1 or 2 on each lobe; indusium brown, circular, membranous, attached at base.

- Dense forests; 1900–3300 m. Taiwan, Yunnan.

157. *Dryopteris exstipellata* (Ching & S. H. Wu) Li Bing Zhang, *Taxon* 61: 1209. 2012.

峨边鳞毛蕨 e bian lin mao jue

Acrophorus exstipellatus Ching & S. H. Wu, *Acta Phytotax. Sin.* 21: 383. 1983.

Plants ca. 1 m tall. Rhizome erect or ascending, short, ca. 2 cm in diam., terminal part densely covered with dark brown scales; scales ovate-lanceolate, ca. 7 mm, thickly membranous, acuminate. Stipes tufted, dark brown, stramineous upward, lustrous, ca. 63 cm, ca. 5 mm in diam. at base, densely covered with scales same as on rhizome, upward subglabrous and with scale traces after scales fallen; lamina brown-green when dry, ovate, ca. 36 cm wide, always quadripinnate, papery, glabrous or with few nodose hairs along midvein abaxially, sparsely covered with short nodose hairs adaxially, apex acuminate; pin-

nae 9–12 pairs, opposite, basal pairs ca. 11 cm apart, basal pair largest, with short stalk ca. 4 mm, ascending, narrowly ovate, ca. 32 × 18 cm, tripinnate, base truncate and slightly enclosing rachis, apex caudate-acuminate; primary pinnules ca. 15 pairs, nearly opposite, with short stalk 2–3 mm, 3–4.4 mm apart, spreading, base truncate and close to rachis, apex caudate-acuminate, acroscopic ones ca. 2/3 as long as basal basiscopic ones, basalmost pairs longest and ca. 13 × 3.5–4 cm; secondary pinnules ca. 15 pairs, basal ones opposite, alternate upward, subsessile, spreading, close to each other, elliptic, 1.5–2 × 0.8–1 cm, bipinnate, base truncate, close to rachillae, apex obtuse; ultimate lobes 5 or 6 pairs, spreading, slightly separated from each other, elliptic, 4–5 × 2–3 mm, base broadly cuneate, margin undulate, apex rounded; veins obvious adaxially, pinnate on lobes, veinlets often simple, submarginal; rachis and rachillae stramineous, with narrow longitudinal groove adaxially, slightly covered with yellowish brown nodose hairs at base, occasionally with 1 cordate brown ovate-lanceolate or broadly lanceolate scale. Sori orbicular, ca. 1 mm in diam., terminal on veinlet, 1 on each veinlet; indusium brown, semicircular or ovate-circular, membranous, attached at base, persistent.

- Mixed forests; ca. 2300 m. Guangdong, Sichuan.

21. *Dryopteris* sect. *Diacalpe* (Blume) Li Bing Zhang, *Taxon* 61: 1209. 2012.

红腺鳞毛蕨组 hong xian lin mao jue zu

Wang Faguo (王发国), Xing Fuwu (邢福武), Zhang Libing (张丽兵); David S. Barrington

Diacalpe Blume, *Enum. Pl. Javae* 2: 241. 1828.

Plants terrestrial, moderate-sized. Rhizome short, ascending to erect, densely clothed with castaneous scales; scales broadly lanceolate, entire, with a few clavate, short hairs on adaxial side. Fronds tufted; stipe long and densely covered with brown scales, with thick longitudinal groove; lamina ovate or narrowly ovate, tripinnate to quadripinnatifid, papery, dark brown or green when dry, basal pinnae largest, pinnules anadromous; pinnae narrow, regular upward, pinnules catadromously arranged; ultimate pinnules with salmon pink or yellow globose glands along veins abaxially, sparsely covered with short nodose hairs adaxially; rachis and rachillae covered with small scales and short nodose hairs, grooved on adaxial side; veins free, pinnate, veinlets submarginal. Sori globose, basal or abaxial on basal acroscopic veinlets of ultimate pinnules, one in each ultimate pinnule; indusium inferior, globose, castaneous, leathery, enclosing sori when young, dehisced into 2 or 3 valves from top when mature; apophyses elevated, semicircular; sporangia with thin stipe, annuli longitudinal and interrupted, consisting of 14–16 thickened cells; spores bilateral, narrowly elliptic, with coarsely ribbed perispore. $x = 41$.

About eight species: tropical and subtropical Asia, Pacific islands, Caribbean islands, and South America; eight species (five endemic) in China.

- 1a. Primary segments of lower pinnae truncate apically and shallowly undulate on margin; ultimate segments rounded apically and entire or slightly toothed on margin 165. *D. annamensis*
- 1b. Primary segments of lower pinnae acuminate or obtuse apically and toothed, ± pinnatifid on margin.
 - 2a. Rachis and rachillae of every order abaxially glabrous or subglabrous; primary segments obtuse apically and with only 3–7 teeth 164. *D. medogensis*
 - 2b. Rachis and costae of every order abaxially with scales or scales fallen leaving scabrous surfaces; primary segments acuminate or mucronate and with only 2 or 3 teeth.
 - 3a. Plants slender; pinnae strongly angled upward; lamina nearly without glands.
 - 4a. Plants ca. 80 cm tall; lamina 40–45 cm, ca. 30 cm wide, basalmost pinnae 23–28 cm, angled slightly upward 162. *D. kungiana*
 - 4b. Plants 30–35 cm tall; lamina ca. 20 cm, 6–9 cm wide, basalmost pinnae ca. 10 cm, angled strongly upward 163. *D. adscendens*
 - 3b. Plants robust; pinnae slightly angled upward; lamina with glands along veins.
 - 5a. Acroscopic primary segments 1–1.5 cm apart from rachis; non-basal pinnae subsessile 158. *D. christensenae*
 - 5b. Acroscopic primary segments 3–5 mm apart from rachis; pinnae obviously stalked.
 - 6a. Pinnules ± right-angled with rachillae; sori ca. 1.5 mm in diam.; whole plant densely scaly 161. *D. diacalpe*

6b. Pinnules angled upward; sori ca. 0.8 mm in diam.; only lower portion of plant densely scaly.

7a. Pinnae with stalk 5–10 cm and pinnules shortly stalked 159. *D. pseudocaenopteris*

7b. Pinnae and pinnules sessile 160. *D. hookeriana*

158. *Dryopteris christensenae* (Ching) Li Bing Zhang, Taxon 61: 1209. 2012.

离轴鳞毛蕨 li zhou lin mao jue

Diacalpe christensenae Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 291. 1949.

Rhizome short, erect, 1–1.5 cm in diam., apex densely covered with dark red scales; scales ovate-lanceolate, 0.5–0.7 cm, membranous, entire, acuminate. Fronds tufted; stipe 40–45 cm, base 2.5–3.5 mm in diam., dark brown, densely covered with scales same as on rhizome, smaller upward; lamina dark green when dry, ovate to oblong, 25–35 × 20–23 cm, quadripinnatifid, papery, with salmon pink glands abaxially, sparsely covered with brown, short nodose hairs adaxially, apex acuminate; pinnae 18–20 pairs, opposite, basal ones with short stalk 1–1.8 cm, 5–7 cm apart from second pair, upper ones 3–4 cm apart, sessile, basal pair largest, 12–16 × 9–11 cm, triangular-lanceolate, tripinnatifid, base nearly truncate, apex acuminate; pinnules 17–20 pairs, alternate upward, anadromous, with short stalk 0.5–1 mm, 1.5–2 cm apart, basicopic 1 or 2 pinnules usually enlarged, 7–9 × 2–3.5 cm, lanceolate, bipinnatifid, base truncate, apex acuminate; ultimate pinnules 16–20 pairs, basal 1 or 2 pinnules opposite, alternate upward, with short stalk ca. 1 mm, distant, elliptic, 1.2–2.2 × 0.6–1.1 cm, base asymmetrical, pinnatifid to ultimate rachis, apex rounded, with 2 or 3 short teeth; lobes 5–7 pairs, distant, elliptic, 3.5–5 × 1.5–2 mm, apex rounded, terminal part subentire or with 2 or 3 teeth; median pinnae narrower, strongly catadromously arranged, basicopic pinnules slightly contracted and close to rachis, upper pinnules 1–1.5 cm apart to rachis; pinnules of upper pinnae opposite and symmetrical, ultimate pinnules entire or dentate-lobed; rachis and rachillae stramineous, sparsely covered with brown nodose hairs, with dense scales on joint; veins obvious abaxially, brown, pinnate on lobes, veinlets simple, submarginal. Sori globose, ca. 1 mm in diam., enveloped by indusium, 1 in each ultimate pinnule or lobe, dorsal on basal acroscopic veinlets; indusium brown, globose, leathery, dehisced into 2 or 3 irregular valves from top when mature; spores narrowly elliptic.

• Near streams in dense forests; 1800–2500 m. Yunnan.

159. *Dryopteris pseudocaenopteris* (Kunze) Li Bing Zhang, Taxon 61: 1209. 2012.

南亚鳞毛蕨 nan ya lin mao jue

Diacalpe pseudocaenopteris Kunze, Bot. Zeitung (Berlin) 4: 457. 1846; *Cyathea aspidioides* (Blume) Moritz; *D. aspidioides* Blume; *D. aspidioides* var. *minor* Ching & S. H. Wu; *Peranema aspidioides* (Blume) Mettenius; *Physematum aspidioides* (Blume) Kunze.

Rhizome short, erect, ca. 1 cm in diam., terminal part densely covered with dark brown scales; scales ovate-lanceolate, 8–10 mm, thickly membranous, entire, acuminate. Fronds

tufted; stipe 25–32 cm, base 2.5–3.5 mm in diam., dark brown, base covered with scales same as on rhizome, smaller and sparser upward; lamina dark brown when dry, ovate or narrowly ovate, 30–50 × 16–40 cm, quadripinnatifid, papery, with dark red globose glands along veins abaxially, sparsely covered with short nodose hairs adaxially, apex long acuminate; pinnae 16–20 pairs, basal ones subopposite, 5–7 cm apart, with stalk 0.6–1.2 cm, upper ones alternate, close together, basal pairs larger, 15–25 × 6.5–11 cm, triangular-lanceolate, falcate, tripinnatifid, base rounded-truncate, apex caudate-acuminate; pinnules 16–18 pairs, always alternate, anadromous, with short stalk 1–2 mm, 1.3–2.5 cm apart, basicopic longest, lanceolate, 5–10 × 1.5–2.6 cm, bipinnatifid, base symmetrical, rounded-truncate; ultimate pinnules 10–17 pairs, with short stalks, separate, elliptic, 1–2 cm, base asymmetrical, broadly cuneate, pinnatifid to ultimate rachillae, with 2–4 small teeth at apex; lobes 4 or 5 pairs, basal pair opposite, distant, elliptic, 3–6 × 1–2.2 mm, base asymmetrical, apex rounded, with 2–4 small teeth or entire; veins obvious abaxially, pinnate, veinlets simple or furcate, submarginal; rachis and rachillae dark brown, sparsely covered with brown scales and curly nodose hairs. Sori globose, ca. 0.8 mm in diam., 1 in each ultimate pinnule or lobe, dorsal on basal acroscopic veinlets; indusium inferior, leathery, brown, dehisced into 2 or 3 irregular valves from top when mature; spores narrowly elliptic, with fold. $2x = 82, 164$.

Near streams in forests; 1200–2600 m. Hainan, Taiwan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

When this species was transferred to *Dryopteris*, the earliest epithet *aspidioides* was blocked by *D. aspidioides* (Willdenow) C. Christensen (Index Filic. 253. 1905). The later epithet *pseudocaenopteris* had to be chosen.

160. *Dryopteris hookeriana* (T. Moore) Li Bing Zhang, Taxon 61: 1210. 2012.

虎克鳞毛蕨 hu ke lin mao jue

Diacalpe hookeriana T. Moore, Gard. Chron. 1854: 135. 1854; *D. aspidioides* Blume var. *hookeriana* (T. Moore) Ching & S. K. Wu.

Rhizome short, erect, ca. 1 cm in diam., terminal part densely covered with dark brown scales; scales ovate-lanceolate, 8–10 mm, thickly membranous, entire, acuminate. Fronds tufted; stipe 25–32 cm, base 2.5–3.5 mm in diam., dark brown, base covered with scales same as on rhizome, smaller and sparser upward; lamina dark brown when dry, ovate or narrowly ovate, 30–50 × 16–40 cm, quadripinnatifid, papery, with darkish red and globose glands along veins abaxially, sparsely covered with short nodose hairs adaxially, apex long acuminate; pinnae 16–20 pairs, basal ones subopposite, 5–7 cm apart, subsessile, upper ones alternate, close together, basal pairs larger, triangular-lanceolate, falcate, 15–25 × 6.5–11 cm, tripinnatifid,

base rounded-truncate, apex caudate-acuminate; pinnules 16–18 pairs, always alternate, anadromous, sessile, 1.3–2.5 cm apart, basicopic pinnule longest, lanceolate, 5–10 × 1.5–2.6 cm, bipinnatifid, base symmetrical, rounded-truncate; ultimate pinnules 10–17 pairs, sessile, separate, elliptic, 1–2 cm, base asymmetrical, broadly cuneate, pinnatifid to ultimate rachillae, apex with 2–4 small teeth; lobes 4 or 5 pairs, basal pair opposite, distant, elliptic, 3–6 × 1–2.2 mm, base asymmetrical, apex rounded, with 2–4 small teeth or entire; veins obvious abaxially, pinnate, veinlets simple or furcate, submarginal; rachis and rachillae dark brown, sparsely covered with brown scales and curly nodose hairs. Sori globose, ca. 0.8 mm in diam., 1 in each ultimate pinnule or lobe, dorsal on basal acroscopic veinlets; indusium inferior, brown, leathery, dehisced into 2 or 3 irregular valves from top when mature; spores narrowly elliptic, with fold.

Broad-leaved forests; 1600–2200 m. Xizang [India, Nepal].

None of the following related names are validly published: “*Dicalpe aspidioides* var. *himalayensis*” (Ching & S. K. Wu, Acta Phytotax. Sin. 21: 376. 1983, nom. nud.), “*Dicalpe aspidioides* var. *hookeriana* Wallich ex Ching & S. H. Wu” (Acta Phytotax. Sin. 21: 376. 1983, nom. nud.), and “*Sphaeropteris hookeriana*” (Wallich, Numer. List, no. 248. 1829, nom. nud.).

This species was sometimes treated as a variety of *Dryopteris pseudocaenopteris*. *Dryopteris hookeriana* differs from the latter in its subsessile pinnae and pinnules.

161. *Dryopteris dicalpe* Li Bing Zhang, Taxon 61: 1210. 2012.

红腺鳞毛蕨 hong xian lin mao jue

Dicalpe chinensis Ching & S. H. Wu, Acta Phytotax. Sin. 21: 376. 1983.

Rhizome short, erect, 1–1.5 cm in diam., apex densely covered with dark brown scales; scales lanceolate, 1–1.5 cm, thickly membranous, entire, acuminate. Fronds tufted; stipe stramineous or castaneous, 25–40 cm, middle 2.5–3.5 mm in diam., densely covered with ovate-lanceolate and dark brown scales; lamina dark brown when dry, ovate, 35–40 × 22–30 cm, quadripinnatifid, papery, with salmon pink glands abaxially, sparsely covered with brown, short nodose hairs adaxially, apex acuminate; pinnae 14–18 pairs, basal ones opposite, 6–7.5 cm apart, with short stalk 0.8–1.2 cm, upper ones close together, basal pair largest, triangular-lanceolate, 18–20 × 9–11 cm, tripinnatifid, base nearly truncate, apex acuminate; pinnules 15–18 pairs, alternate, anadromous, with short stalk 2.5–4 mm, 2–3 cm apart, first basicopic pinnules usually enlarged, lanceolate, 5.5–7 × 2–2.7 cm, bipinnatifid, base truncate, apex acute; ultimate pinnules 10–12 pairs, basal ones opposite, alternate upward, with short stalk ca. 1 mm, distant, narrowly elliptic, 1.2–1.5 × 0.6–0.8 cm, pinnatifid to ultimate rachis, apex rounded, with 3–4 short teeth; lobes 4 or 5 pairs, distant, elliptic, 3–5 × 1.5–2 mm, undulate or lobed on both sides, undulate and obtuse at apex; rachis and rachillae brown, stramineous, sparsely covered with brown and small scales and bristly curly nodose hairs; veins obvious abaxially, brown, pinnate on

lobes, veinlets simple, submarginal. Sori globose, ca. 1.5 mm in diam., 1 in each ultimate pinnule or lobe, dorsal on basal acroscopic veinlets; indusium brown, leathery, dehisced into 2 or 3 irregular valves from top when mature; spores narrowly elliptic.

• On rocks, dense forests; 2000–2400 m. Sichuan, Yunnan.

Dryopteris dicalpe is characterized by having large sori and is similar to *D. pseudocaenopteris* but differs by its pinnae not having ruby glands abaxially.

162. *Dryopteris kungiana* Li Bing Zhang, Taxon 61: 1210. 2012.

宪需鳞毛蕨 xian xu lin mao jue

Dicalpe omeiensis Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 293. 1949.

Rhizome short, erect, ca. 1.1 cm in diam., woody, apex densely covered with dark brown scales; scales lanceolate, ca. 1.8 cm, entire, acuminate. Fronds tufted; stipe 36–50 cm, base 3–4 mm in diam., stramineous, densely covered with scales same as on rhizome, sparser and smaller upward; lamina gray-green when dry, narrowly ovate, 38–45 × ca. 30 cm, quadripinnatifid, thinly papery, glabrous abaxially, covered with brown nodose hairs adaxially, apex acuminate; pinnae 12–15 pairs, basal ones subopposite, 7–9 cm apart, ascending, distant, basal pair larger, triangular-lanceolate, 23–28 × 10–11 cm, with stalk ca. 3 cm, tripinnatifid, apex acuminate; pinnules 16–19 pairs, alternate, anadromous, with short stalk 2.5–4 mm, 2–3 cm apart, close together, basicopic pinnules usually 2 × as large as upper ones, first basicopic pinnule lanceolate, 10–12 × 3–4.5 cm, bipinnatifid, base rounded-truncate, slightly narrowed, apex acuminate; ultimate pinnules 18–20 pairs, with short stalk ca. 1.2 mm, distant, elliptic, 1.4–1.5 × 0.6–0.8 cm, base truncate, pinnatifid to ultimate rachis, apex obtuse, with 3–5 obtuse teeth; lobes 5 or 6 pairs, distant, elliptic, 3–4 × 1.3–1.6 mm, undulate on both sides, apex rounded-truncate, with 2–4 small teeth; rachis and rachillae stramineous, sparsely covered with brown, short nodose hairs and small scales; veins invisible, pinnate on lobes, veinlets simple or furcate, submarginal. Sori globose, ca. 1 mm in diam., enveloped by indusium, 1 in each ultimate pinnule or lobe, dorsal on basal acroscopic veinlets; indusium brown, globose, leathery, dehisced into 2 regular valves from top when mature, entire; spores elliptic.

• Forests; 2500–2600 m. Sichuan.

Dryopteris kungiana is similar to *D. pseudocaenopteris* but differs by pinnae nearly without glands and indusium dehisced into 2 regular valves from top when mature.

163. *Dryopteris adscendens* (Ching ex S. H. Wu) Li Bing Zhang, Taxon 61: 1210. 2012.

小叶鳞毛蕨 xiao ye lin mao jue

Dicalpe adscendens Ching ex S. H. Wu, Acta Phytotax. Sin. 21: 378. 1983.

Rhizome short, erect, woody. Fronds tufted; stipe 12–15 cm, base 1.5–2 mm in diam., stramineous, densely covered with brown scales; scales lanceolate, 4–5 mm, membranous, entire,

acuminate; lamina narrowly ovate, 19–21 × 5–9 cm, quadripinnatifid, papery, brown-green when dry, sometimes with citrus or orange glands along veins abaxially, covered with brown nodose hairs adaxially, base cuneate, apex acuminate; pinnae 14–16 pairs, opposite or terminal alternate, close together, with short stalk 3–5 mm, basal pair larger, ca. 4 cm apart from second pair, broadly lanceolate, 9–10 × 2.5–3 cm, tripinnatifid, base cuneate, apex long acuminate; pinnules 16–19 pairs, always alternate, anadromous, with short stalk 1–2 mm, 1–1.5 cm apart, distant, basiscopic pinnules usually 2 × as large as upper ones, 1 or 2 basiscopic pinnules lanceolate, 2.6–3 × ca. 0.8 cm, bipinnatifid, base symmetrical, apex acuminate; ultimate pinnules 10–12 pairs, sessile, distant, elliptic, 4–5 × 2–3 mm, base asymmetrical, broadly cuneate, pinnatifid to ultimate rachis, apex obtuse, with 3–5 small teeth; lobes 3 or 4 pairs, distant, elliptic, 1.5–2 × 1–1.5 mm, apex rounded-obtuse, with 2 small teeth or entire; rachis and rachillae stramineous, sparsely covered with brown curly nodose hairs and small scales; veins pinnate on lobes, veinlets simple or furcate, submarginal. Sori globose, ca. 0.5 mm in diam., enveloped by indusium, 1 in each ultimate pinnule or lobe, dorsal on basal acroscopic veinlets; indusium brown, globose, leathery.

- Forests; ca. 2900 m. Yunnan (Wuliang Shan).

Dryopteris adscendens is similar to *D. pseudocaenopteris* but differs by fronds 30–35 cm; lamina elliptic, ca. 20 × 6–9 cm, basal pinnae ca. 10 cm, and indusium always undivided.

164. *Dryopteris medogensis* (Ching & S. K. Wu) Li Bing Zhang, Taxon 61: 1210. 2012.

墨脱鳞毛蕨 mo tuo lin mao jue

Diacalpe medogensis Ching & S. K. Wu, Fl. Xizang. 1: 196. 1983; *D. laevigata* Ching & S. H. Wu.

Rhizome short, erect, apex densely covered with brown scales; scales lanceolate, 0.4–0.7 cm, thickly membranous, entire, acuminate. Fronds tufted; stipe 22–32 cm, central part 1.5–3 mm in diam., brown, stramineous upward, densely covered with scales as on rhizome, smaller upward; lamina ovate, 20–40 × 18–22 cm, quadripinnatifid, papery, green when dry, apex acuminate; pinnae 14–22 pairs, basal ones opposite, with short stalk ca. 4 mm, close together, basal pair largest, ovate-lanceolate, 15–20 × 7–8 cm, 5–5.5 cm apart from second pinnae, tripinnatifid, apex acuminate; pinnules 13–21 pairs, alternate upward, with short stalk 0.5–1 mm, 1.5–1.8 cm apart, basiscopic 1 or 2 pinnules usually enlarged, lanceolate, 5–6 × 1–2 cm, bipinnatifid, base nearly symmetrical, apex obtuse, with 3–7 acute teeth; ultimate pinnules 8–11 pairs, elliptic, with short stalk ca. 1 mm, distant, elliptic, 0.8–1.2 × 0.4–0.6 mm, base cuneate, pinnatifid to ultimate rachis, apex rounded, with 3 or 4 short teeth; lobes 2–4 pairs, distant, elliptic, 3.5–5 × 1.5–2 mm, apex rounded, terminal part subentire or with 2 or 3 teeth;

rachis and rachillae brown stramineous, shallowly grooved on adaxial side, base sparsely covered with brown nodose hairs and small scales; veins obvious abaxially, brown, pinnate on lobes, veinlets simple or furcate, submarginal. Sori globose, ca. 1 mm in diam., enveloped by indusium, 1 in each ultimate pinnule or lobe; indusium brown, globose, leathery, dehisced into 2 or 3 irregular valves from top when mature.

- Broad-leaved forests; 1800–1900 m. Xizang, Yunnan.

Dryopteris medogensis is similar to *D. pseudocaenopteris* but differs by the rachis and each rachillae subglabrous and the pinnule apex obtuse, with 3–7 small acute teeth.

165. *Dryopteris annamensis* (Tagawa) Li Bing Zhang, Taxon 61: 1210. 2012.

中越鳞毛蕨 zhong yue lin mao jue

Diacalpe annamensis Tagawa, Acta Phytotax. Geobot. 14: 46. 1950; *D. caudifolia* Ching & S. K. Wu.

Rhizome short, erect, woody, 1–1.2 cm in diam., apex densely covered with dark brown scales; scales lanceolate, 0.6–0.8 cm, entire, acuminate. Fronds tufted; stipe 24–36 cm, base 2.5–3.5 mm in diam., dark brown, densely covered with scales as on rhizome, sparser and smaller upward; lamina brown or green when dry, ovate, 25–35 × 20–27 cm, quadripinnatifid, papery, sometimes with citrus-colored glands along veins abaxially, sparsely covered with brown, short nodose hairs adaxially, apex long acuminate; pinnae 19–22 pairs, subopposite, basal ones with short stalk 0.3–1.1 cm, 4.5–6 cm apart from second pair, upper ones sessile, basal pair largest, triangular-lanceolate, 14–16 × 8–10 cm, tripinnatifid, base nearly rounded-truncate, apex acuminate; pinnules 16–22 pairs, alternate, anadromous, with short stalk 0.5–2 mm, 1–2 cm apart, close together, basiscopic 1 or 2 pinnules usually enlarged, lanceolate, 6.5–7 × 2.2–2.7 cm, bipinnatifid, base asymmetrical, apex acute and undulate; ultimate pinnules 14–16 pairs, basal 1 or 2 pinnules opposite, alternate upward, with short stalk ca. 1.2 mm, distant, elliptic, 1–1.5 × 0.4–0.8 cm, base asymmetrical, pinnatifid to ultimate rachis, apex rounded; lobes 3–5 pairs, distant, elliptic, 3.5–5 × 1.7–2 mm, entire; median pinnae narrower than other pinnae, basiscopic pinnules longer than upper ones, catadromous, ultimate pinnules entire or dentate-lobed; rachis and rachillae stramineous, sparsely covered with brown nodose hairs and small scales. Veins obvious abaxially, brown, pinnate on lobes, veinlets simple, submarginal. Sori globose, ca. 1 mm in diam., enveloped by indusium, 1 in each ultimate pinnule or lobe, dorsal on basal acroscopic veinlets; indusium brown, globose, leathery, dehisced into 2 or 3 irregular valves from top when mature; spores narrowly elliptic.

Dense forests; 1600–2800 m. Hainan, Taiwan, Xizang, Yunnan [Vietnam].

22. *Dryopteris* sect. *Peranema* (D. Don) Li Bing Zhang, Taxon 61: 1210. 2012.

柄盖鳞毛蕨组 bing gai lin mao jue zu

Wang Faguo (王发国), Xing Fuwu (邢福武), Zhang Libing (张丽兵); David S. Barrington

Peranema D. Don, Prodr. Fl. Nepal. 12. 1825.

Plants terrestrial. Rhizome erect or oblique, short, robust, woody, covered with large scales; scales dark brown, with a few unicellular, clavate, short hairs on margin or abaxially. Fronds tufted; stipe with small scales, with coarse scale scar when fallen, with thick longitudinal groove adaxially; lamina narrowly ovate, tripinnate to quadripinnatifid, papery, brown when dry; ultimate pinnules sparsely covered with short castaneous nodose hairs adaxially; rachis or rachillae covered with small scales and short nodose hairs, grooved on adaxial side. Veins free, pinnate, veinlets submarginal, ends clearly swollen (hydathodes). Sori globose, with long thin stalk, abaxial on veinlets of ultimate pinnules, 1 in each ultimate pinnule; indusium inferior, castaneous, globose, leathery, terminal on thin stalk, enveloping sori when young, longitudinally dehisced into 2 or 3 irregular valves from top when mature; sporangium with short stalk, annuli longitudinal and interrupted, consisted of 11–15 thickened cells; spores narrowly elliptic, with fold. $x = 41$.

About two species: China, India, Myanmar, Nepal, and the Philippines; two species in China.

Sometimes the two taxa are treated as two varieties but they are highly different in morphology. Molecular data support the treatment of the two as different species (Li Bing Zhang et al., BMC Evol. Biol. 12: 180. 2012).

- 1a. Plants up to 1.8 m tall; rhizome, stipe, and rachis densely covered with dark brown subulate scales; scales on rhizome and stipe base up to 3.5 cm 166. *D. peranema*
 1b. Plants up to 1.5 m tall; rhizome, stipe, and rachis densely covered with dark brown to light brown ovate-lanceolate scales; scales on rhizome and stipe base up to 2 cm 167. *D. zhuweimingii*

166. *Dryopteris peranema* Li Bing Zhang, Taxon 61: 1211. 2012.

柄盖鳞毛蕨 bing gai lin mao jue

Peranema cyatheoides D. Don, Prodr. Fl. Nepal. 12. 1825.

Plants up to 1.8 m tall. Rhizome erect, short, robust, densely covered with scales; scales dark brown, subulate, up to 3.5 cm, ca. 2.5 mm wide at base, margins with clavate short hairs, thickly membranous, brown rufous, nitid. Fronds tufted; stipe 25–65 cm, 4–10 mm in diam., brown-stramineous, densely covered with scales same as on rhizome, sparser and smaller upward, longitudinally grooved on adaxial side; lamina dark brown when dry, narrowly ovate, 70–130 × 30–70 cm, tripinnate to quadripinnatifid, papery, subglabrous abaxially, sparsely covered with dark brown short nodose hairs adaxially, apex acuminate; pinnae 15–20 pairs, opposite, alternate upward, close together, with short stalk ca. 1 cm, basal 2 or 3 pairs 7–8 cm apart, elliptic or elliptic-lanceolate, slightly falcate, 22–28 × 8–10 cm, apex acuminate, basiscopic pinnules larger than upper ones, tripinnatifid; pinnules 15–20 pairs, with short stalk, basal ones subopposite, 1.5–2 cm apart, always slightly shortened, upper ones close together or slightly overlapping; ultimate pinnules 9–16 pairs, basal 2–4 pairs opposite, alternate upward, sessile, separate, elliptic, 1–1.5 × 0.4–0.5 cm, base rounded-truncate, pinnatifid almost to rachillae, apex obtuse and crenate; lobes 4 or 5 pairs, opposite, elliptic, 3–4 × ca. 2 mm, apex truncate, margin entire or with 2 or 3 indistinct obtuse teeth; rachis and rachillae covered with few long subulate brown scales and brown nodose hairs, shallowly longitudinally grooved on adaxial side; veins invisible, pinnate, fibriform, veinlets submarginal, apex with slightly swollen hydathodes. Sori globose, ca. 1 mm in diam., always 1 in each ultimate pinnule or lobe, 1 row on each side of rachillae; indusium brown, leathery, with long stalk, dehisced into 2 or 3 irregular valves from top when mature. $x = 41$.

Near streams, forests; 1800–3100 m. SE Xizang, NW Yunnan [Himalaya].

167. *Dryopteris zhuweimingii* Li Bing Zhang, Taxon 61: 1211. 2012.

维明鳞毛蕨 wei ming lin mao jue

Peranema luzonicum Copeland, Philipp. J. Sci., C, 4: 111. 1909 [“*luzonica*”]; *P. cyatheoides* D. Don var. *luzonicum* (Copeland) Ching & S. H. Wu; *P. formosanum* Hayata; *Pleopeltis luzonica* (Copeland) Alderwerelt.

Plants up to 1.5 m tall. Rhizome erect, short, robust, densely covered with scales; scales dark brown to light brown, ovate-lanceolate, up to 2 cm, ca. 5 mm wide at base, margin with clavate short hairs, thickly membranous, brown rufous, nitid. Fronds tufted; stipe 25–65 cm, 4–10 mm in diam., brown stramineous, densely covered with scales same as on rhizome, sparser and smaller upward, longitudinally grooved on adaxial side; lamina dark brown when dry, narrowly ovate, 70–130 × 30–70 cm, tripinnate to quadripinnatifid, papery, subglabrous abaxially, sparsely covered with dark brown short nodose hairs adaxially, apex acuminate; pinnae 15–20 pairs, opposite, alternate upward, close together, with short stalk ca. 1 cm, basal 2 or 3 pairs 7–8 cm apart, elliptic or elliptic-lanceolate, slightly falcate, 22–28 × 8–10 cm, apex acuminate, basiscopic pinnules larger than upper ones, tripinnatifid; pinnules 15–20 pairs, with short stalk, basal ones subopposite, 1.5–2 cm apart, always slightly shortened, upper ones close together or slightly overlapping; ultimate pinnules 9–16 pairs, basal 2–4 pairs opposite, alternate upward, sessile, separate, elliptic, 1–1.5 × 0.4–0.5 cm, base rounded-truncate, pinnatifid almost to rachillae, apex obtuse and crenate; lobes 4 or 5 pairs, opposite, elliptic, 3–4 × ca. 2 mm, apex truncate, margin entire or with 2 or 3 indistinct obtuse teeth; rachis and rachillae covered with few long subulate and brown scales and brown nodose hairs, shallowly longitudinally grooved adaxially; veins invisible, pinnate, fibriform, veinlets submarginal, apex with slightly swollen hydathodes. Sori globose, ca. 1 mm in diam., always 1 in each ultimate lobe, 1 row on each side of rachillae; indusium brown, leathery, with long stalk, dehisced into 2 or 3 irregular valves from top when mature.

Near streams in forests, forest margins; 500–2200 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Taiwan, Yunnan [Philippines].

Excluded taxa

The following names are not treated due to lack of information: *Dryopteris aducta* Rosenstock (Hedwigia 56: 341. 1915, type from Taiwan); *D. camusiae* Fraser-Jenkins (New Sp. Syndr. Indian Pteridol. 131. 1997, type from Yunnan); *D. chimingiana* Ching ex K. H. Shing & J. F. Cheng (Jiangxi Sci. 8(3): 47. 1990, type from Jiangxi); *D. glabrior* Ching & Z. Y. Liu (Bull. Bot. Res., Harbin 4(4): 11. 1984, type from Chongqing (Nanchuan), not Copeland (1910)); *D. hezhangensis* P. S. Wang (Pterid. Fl. Guizhou 315. 2001, type from Guizhou); *D. jinshanshanensis* Ching & Z. Y. Liu (Bull. Bot. Res. (Harbin) 6(1): 179. 1986; *D. daozenensis* P. S. Wang & X. Y. Wang; *D. nanchuanensis* Ching & Z. Y. Liu (Jul 1984), not Ching & Z. Y. Liu (1983), nor Ching & Z. Y. Liu (Oct 1984); type from Chongqing (Nanchuan)); *D. liyangensis* Ching & Y. Z. Lan (Fl. Jiangsu. 1: 466. 1977, type from Jiangsu); *D. lunghanensis* Ching ex K. H. Shing & J. F. Cheng (Jiangxi Sci. 8(3): 48. 1990, type from Zhejiang); *D. megacarpa* Ching & Z. Y. Liu (Bull. Bot. Res., Harbin 4(4): 3. 1984, type from Chongqing (Nanchuan)); *D. mollis* (Swartz) Hieronymus var. *subglabra* Hosokawa (Trans. Nat. Hist. Soc. Taiwan 26: 78. 1936, type from Taiwan); *D. parachinensis* Ching & F. Z. Li (Bull. Bot. Res., Harbin 5(1): 157. 1985, type from Shandong); *D. parachrysocoma* Ching & Z. R. Wang (Acta Phytotax. Sin. 23(5): 344. 1985 [*para-chrysocoma*]), type from Yunnan); *D. peregrina* C. Christensen (Index Filic. 284. 1905, based on *Nephrodium regulare* Baker, J. Bot. 13: 200–201. 1875, not Desvaux (1827), type

Shearer s.n. "China"); *D. polylepis* (Franchet & Savatier) C. Christensen var. *pallida* Ching (Bull. Fan Mem. Inst. Biol., Bot. 8: 422. 1938 [*pallidis*]), type from Hubei); *D. pseudocrepidata* Christ (Bot. Gaz. 51: 357. 1911, type from Sichuan); *D. shandongensis* J. X. Li & F. Li (Acta Phytotax. Sin. 26: 406. 1988, type from Shandong); *D. shanmenensis* Ching & P. S. Chiu (Bot. Res. Acad. Sin. 2: 2. 1987, type from Guangxi); *D. splendens* (Hooker) Kuntze var. *formosana* Rosenstock (Hedwigia 56(5): 343. 1915, type from Taiwan); *D. wenchuanensis* H. S. Kung (Acta Bot. Yunnan. 4(4): 342. 1982, type from Sichuan); *D. wuliangshanicola* W. M. Chu ex S. G. Lu (Guihaia 11: 221. 1991, type from Yunnan); *D. xiangxinensis* S. F. Wu & C. M. Zhang (Keys Vasc. Pl. Wuling Mount. 570. 1995, type from Hunan); *D. yepingensis* C. Christensen & Ching (Bull. Fan Mem. Inst. Biol., Bot. 8: 450. 1938, type from Fujian); *D. zhenfengensis* P. S. Wang & X. Y. Wang (Pterid. Fl. Guizhou, 337. 2001, type from Guizhou).

In addition, *Dryopteris nigropaleacea* (Fraser-Jenkins) Fraser-Jenkins (Bol. Soc. Brot., sér. 2, 55: 238. 1982; *D. pallida* Fomin subsp. *nigropaleacea* Fraser-Jenkins, Candollea 32(2): 316. 1977) and *D. barbellata* Fomin (Fl. Sibir. Orient. Extremi 5: 59. 1930), synonymized under *D. sichotensis* Komarov by Fraser-Jenkins (Bull. Brit. Mus. (Nat. Hist.), Bot. 14: 208. 1986), have been recorded from S China and N China, respectively. These two species are not treated here due to insufficient material examined.

5. LASTREOPSIS Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 157. 1938.

节毛蕨属 jie mao jue shu

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

Trichoneuron Ching.

Plants terrestrial, 40–120 cm tall. Rhizomes creeping or ascending, rhizome apices and stipe bases densely covered with lanceolate scales. Fronds approximate or 1–3 cm apart; stipe brown to stramineous, with scales only at base; scales lanceolate, brown or dark brown, without iridescence. Lamina ovate to pentagonal, 3–5-pinnate; basal pinna pairs largest, triangular, basal basiscopic pinnules of basal pinnae longest; distal pinnae or pinnules adnate to rachis or costae and decurrent at their bases; veins all free, veinlets on ultimate pinnules or lobes simple or forked, usually not reaching margin of leaf segments; lamina texture herbaceous, hairy on both surfaces; costae of pinnules prominent, densely covered with hairs. Sori usually terminal on veins and near margins of pinna lobes; indusia present or not; spores ellipsoid to spheroidal, perispore with inflated folds or tuberculate, sometimes broadly winged. $x = 41$.

About 35 species: pantropical, extending into S temperate regions, most diverse in Australasia; three species (two endemic) in China.

- 1a. Sori exindusiate 2. *L. subrecedens*
 1b. Sori indusiate.
 2a. Rhizomes less than 0.5 cm in diam., stipes approximate; lamina 3-pinnate to 4-pinnatifid at base, with abundant glands on abaxial surfaces; hairs on lamina consisting of 3–6 cells 3. *L. tenera*
 2b. Rhizomes up to 1.5 cm in diam., stipes distant (1–3 cm apart); lamina 4-pinnate to 5-pinnatifid at base, without glands on abaxial surfaces; hairs on lamina consisting of 10–25 cells 1. *L. microlepioides*

1. Lastreopsis microlepioides (Ching) W. M. Chu & Z. R. He, Acta Bot. Yunnan. 22: 259. 2000.

云南节毛蕨 yun nan jie mao jue

Trichoneuron microlepioides Ching, Acta Phytotax. Sin. 10: 119. 1965.

Plants 80–120 cm tall. Rhizomes creeping, ca. 1.5 cm in diam., sparsely covered with scales. Stipes distant, 1–3 cm apart on rhizome, dark stramineous, 40–60 cm, sparsely scaly at base; stipe and other parts densely clothed in soft hairs; hairs consisting of 10–25 cells, ca. 3 mm. Lamina 3- or 4-pinnate and

5-pinnatifid at base, narrowly ovate, 40–60 × 40–60 cm; pinnae 10–15 pairs, 2 pairs of basal pinnae stalked and others subsessile to sessile, pinnae subopposite at base and alternate upward, primary pinnules anadromous at basal pinnae and catadromous at upper pinnae; basal pinnae largest, 25–30 × 15–20 cm, obliquely deltoid; stalk 1.5–2 cm, with 14–20 pairs of primary pinnules and basal basiscopic pinnule longest; veins prominent on abaxial surface, obviously not reaching margins of pinna lobes, without glands on abaxial surface. Sori at ends of veins, usually medial between margin and midrib of pinna lobes; indusia large, glabrous but with short glandular hairs at margins.

- Forests; ca. 1600 m. Yunnan.

2. *Lastreopsis subcedens* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 160. 1938.

海南节毛蕨 hai nan jie mao jue

Plants 40–75 cm tall. Rhizomes creeping, 1–1.5 cm in diam., covered with lanceolate scales. Stipe approximate, dark stramineous to brown, 18–38 cm, densely scaly at base; stipe and other parts densely clothed in soft hairs; hairs consisting of 5–8 cells, ca. 0.7 mm. Lamina 3-pinnate and 4-pinnatifid at base, pentagonal, 25–35 × 25–40 cm; pinnae 8–10 pairs, only basal pinnae shortly stalked, all pinnae usually opposite to subopposite, basal primary pinnules anadromous or subopposite at basal pinnae and catadromous at upper pinnae; basal pinna largest, 15–25 × 10–18 cm, obliquely deltoid; stalk 0.7–1.5 cm, with 8–12 pairs of primary pinnules and basal basisopic pinnules longest; veins prominent on adaxial surface, not reaching margin of pinna lobes, with spheroid yellow glands on abaxial surface. Sori terminal on veins and near margin of pinna lobes, exindusiate.

- Forests; 700–1000 m. Hainan.

3. *Lastreopsis tenera* (R. Brown) Tindale, Vict. Naturalist 73: 181. 1957.

台湾节毛蕨 tai wan jie mao jue

Nephrodium tenerum R. Brown, Prodr. 149. 1810; *Aspidium gardnerianum* Mettenius; *Ctenitis simozawae* (Tagawa) Ching; *C. tenera* (R. Brown) Copeland; *Dryopteris simozawae* Tagawa; *D. tenera* (R. Brown) C. Christensen; *Lastreopsis simozawae* (Tagawa) Tagawa.

Plants 25–100 cm tall. Rhizomes creeping, ca. 0.5 cm in diam., covered with lanceolate scales. Stipes approximate, dark stramineous, 10–30 cm, sparsely scaly at base, stipe and other parts densely clothed in soft hairs; hairs consisting of 3–6 cells, ca. 0.5 mm. Lamina 2- or 3-pinnate and at most 4-pinnatifid at base, ovate, 15–20 × 20–25 cm; pinnae ca. 10 pairs, usually only basal pinnae shortly stalked, all pinnae usually opposite to subopposite, primary pinnules anadromous at basal pinnae and catadromous at upper pinnae with rare exceptions; basal pinnae largest, 7–10 × 10–18 cm, obliquely deltoid; stalk 0.3–0.4 cm, with 8–10 pairs of primary pinnules and basal basisopic pinnule longest; veins prominent on adaxial surface, not reaching or nearly reaching margins of pinna lobes, with abundant spheroid or shortly clavate orange glands on abaxial surfaces. Sori terminal or subterminal on veins and usually near margins of pinna lobes; indusia small or large, glabrous but with abundant spheroid glands at margin.

Forests; 100–900 m. Taiwan [India, Indonesia, Malaysia, Philippines, Sri Lanka; Australia].

6. POLYSTICHUM Roth, Tent. Fl. Germ. 3: 31, 69. 1799, nom. cons.

耳蕨属 er jue shu

Zhang Libing (张丽兵); David S. Barrington

Acropelta Nakai; *Cyrtomidictyum* Ching; *Hemesteum* H. Léveillé (1915), not Newman (1851); *Plecosorus* Fée.

Plants perennial, terrestrial, evergreen or summer-green. Rhizome short, erect or ascending, together with basal stipe often covered with scales; scales linear to ovate, rarely with hairs. Fronds caespitose, monomorphic or rarely nearly dimorphic; stipe stramineous to purplish brown, canaliculate adaxially, scaly; distal stipe scales sparser, similar to but smaller than basal stipe scales. Lamina linear-lanceolate, lanceolate, ovate-lanceolate, lorate, or oblong, pinnate, bipinnatifid, or bipinnate, rarely finely divided and tripinnatifid or tetrapinnatifid; frond texture thinly papery, papery, or leathery, with lanceolate, subulate, linear, or ovate microscapes abaxially and sometimes also adaxially, acroscopic base often auriculate, rarely auricles indistinct; rachis sulcate adaxially, with or without proliferous bulbils, rarely proliferous bulbils borne terminally on a prolonged flagelliform rachis; venation pinnate, free or rarely anastomosing to form 1 or 2 rows of areoles. Sori orbicular, terminal on veins of pinnae, sometimes abaxial or nearly terminal on veins, indusiate or rarely exindusiate; indusia orbicular, peltate, membranous, entire, erose, or irregularly toothed.

About 500 species: common in the temperate regions and subtropical lowlands and montane to alpine areas in the N Hemisphere, mostly in S and SW China, Himalaya, Japan, and Vietnam; a rich diversity of *Polystichum* also found in Central and South America; ca. 15 species in North America north of Mexico, 16 in Africa, eight in Madagascar and the Mascarenes, three in Macronesia, four in Europe, 12 in Australasia, and a few in New Guinea and the Pacific islands; 208 species (139 endemic) in two subgenera in China.

Chinese species can be classified into two subgenera and 23 sections.

The following taxa are excluded from the present treatment, pending further research: *Aspidium aculeatum* (Linnaeus) Swarz var. *veitchii* Christ (Bull. Herb. Boissier, sér. 2, 3: 513. 1903), described from W Hubei, *A. aculeatum* var. *yunnanense* Christ (Bull. Herb. Boissier 6: 964. 1898), described from Yunnan, and *A. braunii* Spenser var. *clarkei* Christ (Bull. Herb. Boissier 7: 15. 1899 [“*Clarkii*”]), described from Yunnan.

Key to sections

- 1a. Plants evergreen, rarely summer-green; lamina 1-pinnate; if lamina bipinnatifid to tetrapinnatifid then pinnae finely dissected (*P. sect. Sphaenopolystichum*) or rachis scales dark brown, ovate, and appressed (*P. excelsius*, *P. tonkinense*); venation free or rarely anastomosing to form 1 or 2 rows of areoles (*P. balansae*, *P. fraxinellum*, *P. hookerianum*, *P. lepidocaulon*, *P. ×rupestris*, *P. trapezoideum*, *P. uniseriale*) (*P. subg. Haplopolystichum*).

- 2a. Rachis with proliferous bulbils.
- 3a. Microscales broad-type; rachis prolonged at apex; sori exindusiate 15. *P.* sect. *Cyrtomiopsis*
- 3b. Microscales narrow-type; rachis prolonged or not prolonged at apex; sori indusiate.
- 4a. Indusia entire; rachis prolonged at apex 16. *P.* sect. *Mastigopteris*
- 4b. Indusia erose; rachis prolonged (*P. erosum*) or not prolonged at apex 17. *P.* sect. *Basigemmifera*
- 2b. Rachis without proliferous bulbils.
- 5a. Lamina with extraordinarily prolonged and 1-pinnate basal pinnae 18. *P.* sect. *Crucifilix*
- 5b. Lamina without extraordinarily prolonged basal pinnae.
- 6a. Lamina bipinnatifid to tetrapinnatifid, rarely 1-pinnate; pinnae finely dissected 19. *P.* sect. *Sphaenopolystichum*
- 6b. Lamina 1-pinnate; pinnae not finely dissected.
- 7a. Lamina leathery; if lamina papery then pinnae long spinulose on margin (*P. formosanum*); pinnae falcate-lanceolate, length more than $3 \times$ width, middle pinnae 0.9–2 cm wide; if middle pinnae 0.6–0.9 cm wide then pinnae obliquely oblong, up to 3.2 cm (*P. minimum*) or pinnae long spinulose on margin (*P. formosanum*); venation free or anastomosing to form 1 or 2 rows of areoles.
- 8a. Sori in 1 row on each side of midrib; pinnae symmetrical or nearly symmetrical at base; if pinnae asymmetrical at base then pinnae obliquely oblong, up to 3.2×0.9 –2 cm (*P. minimum*); venation free; if venation anastomosing to form 1 or 2 rows of areoles along midrib then pinnae up to 10 pairs (*P. fraxinellum*) 20. *P.* sect. *Cyrtogonellum*
- 8b. Sori in 2 or more rows on each side of midrib; if sori in 1 row on each side of midrib then sori close to pinna margin (*P. falcatilobum*, *P. formosanum*); pinnae asymmetrical at base; venation anastomosing to form 1 or 2 rows of areoles; if venation free then sori in 1 row on each side of midrib 21. *P.* sect. *Adenolepia*
- 7b. Lamina papery or thinly papery; pinnae oblong or lanceolate, length normally 1 – $2 \times$ width, middle pinnae much narrower than 1 cm except those of *P. acutidens*; venation free.
- 9a. Rachis scales ovate to lanceolate 22. *P.* sect. *Platylepia*
- 9b. Rachis scales linear, subulate or narrowly lanceolate 23. *P.* sect. *Haplopolystichum*
- 1b. Plants evergreen or summer-green; lamina bipinnate or bipinnatifid; if lamina 1-pinnate then microscales broad-type (*P.* sect. *Hecatoptera*, *P.* sect. *Stenopolystichum*; excl. *P.* sect. *Mastigopteris*) but rachis not prolonged at apex (excl. *P.* sect. *Cyrtomiopsis*) and rachis scales not ovate-lanceolate (excl. *P. loratum*); or if 1-pinnate then sori abaxial on veinlets (*P. chingiae*, *P. nepalense*); or if 1-pinnate then pinnae stiff and with open hard spinules on margin (*P. delavayi*, *P. lonchitis*); or if 1-pinnate then pinnae with long fine microscales and rachis without bulbils (*P. fimbriatum*, *P. muscicola*, *P. subfimbriatum*, *P. zayuense*, some species of *P.* sect. *Sorolepidium*), or pinnae ovate-deltoid and with broadly lanceolate microscales (*P. duthiei*, *P. glaciale*); venation free (*P.* subg. *Polystichum*).
- 10a. Lamina stiff, leathery or nearly leathery, often shiny adaxially; pinnae dentate and with hard spinules at apex and often also on margin.
- 11a. Lamina 1-pinnate; sori abaxial on veinlets 1. *P.* sect. *Polystichum*
- 11b. Lamina bipinnate, rarely 1-pinnate (*P. delavayi*) or tripinnatifid; sori terminal on veinlets 2. *P.* sect. *Xiphopolystichum*
- 10b. Lamina not stiff, papery; if lamina leathery then pinnae without hard spinules on margin (*P. fimbriatum*, *P. subfimbriatum*), dull or shiny adaxially; pinnae without hard spinules at apex or margin.
- 12a. Lamina 1-pinnate; rachis without proliferous bulbils; pinnae densely regularly long spinulose on margin 3. *P.* sect. *Hecatoptera*
- 12b. Lamina 1-pinnate or bipinnate; rachis with or without proliferous bulbils; if lamina 1-pinnate then pinnae shortly spinulose or entire on margin.
- 13a. Lamina 1-pinnate; rachis with proliferous bulbils 4. *P.* sect. *Stenopolystichum*
- 13b. Lamina bipinnate or 1-pinnate; rachis without or with proliferous bulbils; if lamina 1-pinnate then rachis without proliferous bulbils.
- 14a. Sori abaxial on veinlets; lamina green.
- 15a. Fronds up to 1 m or longer; lamina bipinnate 8. *P.* sect. *Neopolystichum*
- 15b. Fronds shorter than 50 cm; lamina 1-pinnate or bipinnatifid; if lamina bipinnatifid then pinnae and pinnules cartilaginous at margin.
- 16a. Lamina 1-pinnate or bipinnatifid; pinnae and/or pinnules cartilaginous at margin; sori in 1 row on each side of midrib 5. *P.* sect. *Achroloma*
- 16b. Lamina 1-pinnate; pinnae not cartilaginous at margin; sori in 2 or 3 rows on each side of midrib.
- 17a. Auricles well developed and deltoid, sharply pointed at apex 6. *P.* sect. *Chingiarum*

- 17b. Auricles less developed and rounded 7. *P.* sect. *Crinigera*
- 14b. Sori terminal on veinlets; if sori abaxial on veinlets then lamina dark green (*P. biaristatum*, *P. mucronifolium*, *P. parvifoliolatum*).
- 18a. Lamina 1-pinnate; fronds leathery.
- 19a. Pinnae oblong; auricles sharply pointed at apex 9. *P.* sect. *Fimbriata*
- 19b. Pinnae ovate; auricles obtuse at apex 10. *P.* sect. *Subfimbriata*
- 18b. Lamina bipinnate or bipinnatifid; fronds papery or thinly leathery; if lamina 1-pinnate then lamina papery.
- 20a. Fronds shorter than 40(–60) cm, thinly papery; lamina 1-pinnate or shallowly to deeply pinnatifid 11. *P.* sect. *Micropolystichum*
- 20b. Fronds often longer than (40–)60 cm and up to 1 m or longer, papery; lamina bipinnate.
- 21a. Plants summer-green; lamina 1-pinnate to bipinnatisect; microscales fibrillose or lanceolate, longer than 0.8 mm 12. *P.* sect. *Sorolepidium*
- 21b. Plants evergreen or summer-green; lamina bipinnate; microscales linear, shorter than 0.5(–0.6) mm; if microscales fibrillose and up to 1 mm then pinnules exauriculate.
- 22a. Plants evergreen; lamina dark green, shiny adaxially, up to 100 cm or longer; rachis with or without proliferous bulbils; pinnules lanceolate 13. *P.* sect. *Macropolystichum*
- 22b. Plants evergreen or summer-green; lamina green, normally shorter than 80 cm, dull adaxially; rachis without proliferous bulbils; pinnules ovate-lanceolate 14. *P.* sect. *Hypopeltis*

1. *Polystichum* subg. *Polystichum*

耳蕨亚属 *er jue ya shu*

Plants summer-green or evergreen. Lamina bipinnate or bipinnatifid; if lamina 1-pinnate then microscales broad-type but rachis not prolonged at apex; or if 1-pinnate then sori abaxial on veinlets; or if 1-pinnate then pinnae stiff and with open hard spinules on margin; or if 1-pinnate then pinnae with long fine microscales and rachis without bulbils, or pinnae ovate-deltoid and with broadly lanceolate microscales; venation free.

About 230 species: worldwide; 120 species (69 endemic) in 14 sections in China.

1. *Polystichum* sect. *Polystichum*

耳蕨组 *er jue zu*

Lamina papery or leathery, 1-pinnate to bipinnate. Pinna or pinnule spinulose or not spinulose on margin. Sori indusiate or exindusiate.

About 30 species: circumboreal regions (one species) and New World tropics; one species in China.

1. *Polystichum lonchitis* (Linnaeus) Roth, Tent. Fl. Germ. 3(1): 71. 1800.

矛状耳蕨 *mao zhuang er jue*

Polypodium lonchitis Linnaeus, Sp. Pl. 2: 1088. 1753;
Aspidium lonchitis (Linnaeus) Swartz.

Plants evergreen. 16–30 cm Rhizome erect, densely covered with lanceolate brown scales. Stipe stramineous, sometimes brown at base, 2–4 cm, 2–3 mm in diam. at base, densely scaly; scales lanceolate and ovate, toothed. Lamina 1-pinnate, linear-lanceolate or narrowly oblanceolate, 26–60 × 3.5–8 cm, gradually contracted toward base, apex acuminate; rachis lower

part scaly abaxially, without proliferous bulbils. Pinnae 30–34 pairs, alternate, subsessile, attached at right angles to rachis or slightly ascendant, lanceolate-falcate, lower pairs gradually contracted to deltoid-ovate, middle pairs 2–2.5 cm × 8–10 mm, bases oblique, acroscopic margins truncate, auricles deltoid, basicopic margins cuneate, with spinulose teeth, apices acuminate; abaxially with lanceolate microscales; frond texture leathery; venation pinnate, midrib slightly raised abaxially, concave adaxially; lateral veins forked, indistinct. Sori in 1 row on each side of midrib; indusia irregularly erose.

Picea forests; 1600–2000 m. Xinjiang [Afghanistan, NW India, Japan, Kashmir; C Asia, Europe, North America].

2. *Polystichum* sect. *Xiphopolystichum* Daigobo, Sci. Rep. Tokyo Kyoiku Daigaku, B, 15: 67. 1972.

刺叶耳蕨组 *ci ye er jue zu*

Polystichum sect. *Duropolystichum* Fraser-Jenkins.

Plants small to medium-sized, evergreen. Lamina lanceolate to narrowly ovate, stiff, leathery or thinly leathery, rarely papery, 1-pinnate to bipinnate, rarely tripinnatifid. Stipe scales brown or reddish brown, ovate and lanceolate. Rachis scales brown, reddish brown, blackish brown, or black, subulate to lanceolate, ciliate. Pinnae and pinnules asymmetrical at base, with hard spinules, with linear and ciliate microscales abaxially, shiny adaxially.

About 34 species: E Asia (33 species) and Hawaii (one species); 31 species (20 endemic) in China.

Polystichum sect. *Xiphopolystichum* as defined here is a combination of *P.* sect. *Xiphopolystichum* sensu Kung et al. (FRPS 5(2): 26. 2001) and *P.* sect. *Duropolystichum* Fraser-Jenkins. The latter section was called *P.* sect. *Scleropolystichum* Daigobo (FRPS 5(2): 36. 2001), but that name is a homotypic synonym of *P.* sect. *Hypopeltis* with *P. aculeatum* as its type.

Polystichum sect. *Xiphopolystichum* is apparently monophyletic according to molecular and morphological phylogenetic analyses.

- 1a. Rachis scales black or dark brown, linear or subulate.
 - 2a. Lamina 1-pinnate; pinnae not dissected or only shallowly dissected and with 1 or 2 free lobes at base.
 - 3a. Pinnae narrowly ovate or ovate, those of middle of lamina shorter than 2 cm 2. *P. otophorum*
 - 3b. Pinnae linear-lanceolate, those of middle of lamina longer than 3 cm.
 - 4a. Lamina green; pinnae shallowly toothed, basiscopic bases obliquely truncate; indusia bicolorous (blackish at center and light brown on margin) 3. *P. xiphophyllum*
 - 4b. Lamina yellowish green; pinnae entire, basiscopic bases rounded; indusia concolorous (brown) 4. *P. revolutum*
 - 2b. Lamina bipinnate, bipinnatifid, or rarely tripinnate.
 - 5a. Pinnae pinnatifid, with 0–2 free lobes at base.
 - 6a. Lamina narrowly ovate or broadly lanceolate; pinnae 16–25 pairs 5. *P. langchungense*
 - 6b. Lamina narrowly lanceolate; pinnae 25–32 pairs 6. *P. diffundens*
 - 5b. Pinnae with many free lobes at base.
 - 7a. Lamina tripinnate; pinnules deeply dissected 7. *P. incisopinnulum*
 - 7b. Lamina bipinnate; pinnules often not dissected.
 - 8a. Pinnules obviously auriculate; pinnules denticulate and spinulose on margin.
 - 9a. Lamina leathery; rachis scales narrowly lanceolate 14. *P. mayebarae*
 - 9b. Lamina thinly leathery; rachis scales linear, broadened and ciliate at base.
 - 10a. Pinnules lanceolate or narrowly elliptic, distant from each other 12. *P. herbaceum*
 - 10b. Pinnules oblong, ovate, or deltoid, approximate 13. *P. tsus-simense*
 - 8b. Except for basalmost acroscopic pinnule, pinnules exauriculate; pinnules often entire.
 - 11a. Pinnules obliquely oblong or ovate, those of lower part of lamina 8–18 mm.
 - 12a. Lamina shorter than 30 cm; rachis scales brown 8. *P. pseudosetosum*
 - 12b. Lamina up to 37 cm; rachis scales dark brown 9. *P. exauriforme*
 - 11b. Pinnules obliquely broadly ovate or broadly obovate, those of lower part of lamina 4–8 mm.
 - 13a. Lamina shorter than 20 cm; pinnae shortly acute 10. *P. sinotsus-simense*
 - 13b. Lamina up to 50 cm; pinnae caudate or long acuminate 11. *P. pseudoxiphophyllum*
 - 1b. Rachis scales brown or reddish brown, of various shapes.
 - 14a. Lamina 1-pinnate, linear-lanceolate, 1.8–2.5 cm wide, ratio of length to width larger than 5; pinnae not dissected or shallowly dissected, rarely deeply dissected; lobes fewer than 4 pairs.
 - 15a. Pinnae rhombic-ovate, not dissected (sometimes with 1 lobe at base) 15. *P. delavayi*
 - 15b. Primary pinnae pinnatifid, at least basiscopic bases with 1 lobe.
 - 16a. Lamina linear-lanceolate; pinnae of lower part of lamina with 1 or 2 lobes.
 - 17a. Pinnae acute to acuminate into a spine 16. *P. stimulans*
 - 17b. Pinnae obtuse or nearly rounded and with a spine at apex.
 - 18a. Lamina leathery, subglabrous adaxially 17. *P. rhomboideum*
 - 18b. Lamina thinly leathery, with fibrillose microscales adaxially 18. *P. adungense*
 - 16b. Lamina lanceolate or deltoid-lanceolate; primary pinnae pinnatifid or pinnate.
 - 19a. Lobes or pinnules entire or with forward-pointing small teeth.
 - 20a. Widest part of lamina located at base or below middle; rachis scales filiform 19. *P. cyclolobum*
 - 20b. Widest part of lamina located at middle; rachis scales not filiform 20. *P. mehrae*
 - 19b. At least lobes or pinnules of lower part of pinnae with open spinulose teeth.
 - 21a. Pinnae spreading, approximate, basal acroscopic pinnules broadly ovate or rhombic-ovate 21. *P. acanthophyllum*
 - 21b. Pinnae ascending, distant from each other, basal acroscopic pinnules ovate or narrowly ovate 22. *P. meiguense*
 - 14b. Lamina bipinnatifid to bipinnate, elliptic or broadly lanceolate, broader than (5–)6 cm, ratio of length to width smaller than 4; pinnae with 4–15 pairs of lobes or pinnules.
 - 22a. Primary pinnae not dissected to pinna rachis 23. *P. rigens*
 - 22b. Primary pinnae pinnate.
 - 23a. Pinnules of lower part of pinnae with obvious deltoid auricles.
 - 24a. Basalmost acroscopic pinnules unusually large, pinnatifid; lateral veins concave abaxially 24. *P. baoxingense*
 - 24b. Basalmost acroscopic pinnules often not dissected or partially dissected at most; lateral veins not concave or slightly raised abaxially.
 - 25a. Lamina longer than 40 cm; stipe and rachis scales brown or reddish brown 25. *P. squarrosus*
 - 25b. Lamina shorter than 30 cm; stipe and rachis scales brown, reddish brown, or dark brown 26. *P. orientalitibeticum*

- 23b. Pinnules without auricles.
 - 26a. Pinnules of middle pinnae rhombic or broadly lanceolate.
 - 27a. Rachis scales ovate-lanceolate, not twisted 27. *P. latilepis*
 - 27b. Rachis scales subulate to narrowly lanceolate, twisted.
 - 28a. Pinnules broadly lanceolate, with long sharp teeth 28. *P. neolobatum*
 - 28b. Pinnules rhombic, with short sharp teeth 29. *P. yigongense*
 - 26b. Pinnules of middle pinnae broadly ovate, obliquely oblong, or rhombic-ovate.
 - 29a. Pinnules entire or with few small teeth 30. *P. integrilimum*
 - 29b. Pinnules obviously sharply spinulose.
 - 30a. Lamina 25–60 cm; pinnules obliquely broadly ovate, most pinnules without open, long, sharp teeth 31. *P. garhwalicum*
 - 30b. Lamina 20–40 cm; pinnules rhombic, all pinnules with open, long, sharp teeth 32. *P. rhombiforme*

2. Polystichum otophorum (Franchet) Beddome, Handb. Suppl. Ferns Brit. Ind. 42. 1892.

高山耳蕨 gao shan er jue

Aspidium otophorum Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 10: 116. 1887.

Plants evergreen. Rhizome erect, densely scaly; scales light brown, narrowly ovate. Fronds 15–30 cm; stipe stramineous, 3–9 cm, ca. 2 mm in diam. at base, lower part densely covered with narrowly ovate and lanceolate brown scales, gradually sparser toward lamina apex, scale base ciliate. Lamina 1-pinnate, lanceolate or linear-lanceolate, 15–26 × 2.5–3.2 cm, base rounded-truncate, apex long acuminate; rachis without proliferous bulbils, scaly abaxially; scales brown, linear, ± curved, bases dilated and ciliate. Pinnae 28–36 pairs, alternate, attached at right angles to rachis, several lower pairs sometimes ascendant, shortly stalked, narrowly ovate or ovate, middle pairs 1.2–1.6 cm × 5–8 mm, acroscopic bases with 1 free pinnule, sometimes basispic bases also with 1 smaller pinnule, apex acute and spinulose. Pinnules obovate or rhombic, abaxially with few filiform yellowish brown microscales; frond texture thinly leathery; venation pinnate, lateral veins forked or twice dichotomously branched, slightly raised on both surfaces. Sori in 1 row on each side of midrib, close to pinna margin; indusia present, entire.

- Broad-leaved evergreen forests; 1100–2600 m. W Sichuan.

3. Polystichum xiphophyllum (Baker) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 189. 1899.

剑叶耳蕨 jian ye er jue

Aspidium xiphophyllum Baker, J. Bot. 26: 227. 1888; *A. monotis* Christ; *Polystichum glandiipinum* Tagawa [“*gladiipinum*”]; *P. monotis* (Christ) C. Christensen; *P. praelongum* Christ.

Plants evergreen. Rhizome erect, densely scaly; scales brown or blackish brown, narrowly ovate. Fronds 25–60 cm; stipe stramineous, 12–36 cm, 2–3 mm in diam. at base, densely covered with lanceolate blackish brown scales, lower part mixed with narrowly ovate scales, scale base ciliate. Lamina 1-pinnate, broadly lanceolate, 18–40 × 6–15 cm, base nearly truncate, apex acuminate; rachis without proliferous bulbils, densely scaly abaxially; scales often blackish brown, linear, with dilated base, margins ciliate. Pinnae 16–20 pairs, alternate, attached at

right angles to rachis, stalk ca. 1 mm, linear-lanceolate, sometimes slightly ascendant and falcate, middle pairs 3–10 cm × 7–16 mm, oblique at base, with acute teeth or subentire, sometimes lower part of pinnae pinnatilobate, apex acuminate; acroscopic bases deltoid-auriculate or with 1 free narrowly ovate pinnule, sometimes basispic bases also with 1 free smaller pinnule; abaxially sparsely scaly; microscales yellowish brown, ciliate with dilated bases; frond texture thinly leathery; venation pinnate on pinnae, lateral veins twice dichotomously branched, slightly distinct abaxially, indistinct adaxially. Sori in 1 row on each side of midrib; indusia subentire.

- Limestone soils in broad-leaved evergreen forests; 600–2200 m. S Gansu, Guizhou, W Hubei, W Hunan, Sichuan, C and SE Taiwan (Nantou, small area in the border region of Taidong and Pingdong), Yunnan (Suijiang).

4. Polystichum revolutum P. S. Wang, Pterid. Fl. Guizhou, 549. 2001.

外卷耳蕨 wai juan er jue

Plants evergreen. Rhizome erect, densely scaly; scales blackish brown at middle and brown on margin, narrowly ovate-lanceolate, subentire, acuminate; smaller scales brown, lanceolate. Fronds up to 79 cm; stipe stramineous, up to 36 cm, 3–4 mm in diam. at base, densely scaly; larger scales blackish brown to black, oblong-lanceolate, margins ciliate, apices caudate; smaller scales black, lanceolate or linear. Lamina 1-pinnate, light brown when dry, deltoid-lanceolate, 30–43 × 10–16 cm at middle, base truncate and not contracted, apex acuminate; rachis without proliferous bulbils, densely scaly abaxially; scales black, linear. Pinnae 14–17 pairs, alternate, ascendant and attached at a 70° angle with rachis, shortly stalked, falcate-lanceolate, basal pairs 8–12 cm × 1.3–2 mm, shallowly cordate and with 1 or 2 free pinnules, with rounded shallow teeth not spinulose apically, acuminate; acroscopic bases auriculate and with 1(or 2) free ovate pinnules, sometimes basispic bases also with 1 smaller free pinnule; margins revolute; abaxially sparsely scaly, adaxially glabrous and slightly shiny; microscales brown, filiform; frond texture leathery; venation pinnate on pinnae, lateral veins twice dichotomously branched, slightly distinct abaxially, indistinct adaxially. Sori in 2 or 3 rows on each side of midrib, all pinnae fertile; indusia present, entire, concolorous at middle and on margins, light brown, evanescent. Spores ca. 54.4 × 39.1 μm.

- On rocks by streams in forests; ca. 1000 m. N Guizhou (Jinsha), Sichuan (Emei Shan).

5. *Polystichum langchungense* Ching ex H. S. Kung, Chin. J. Appl. Environm. Biol. 3(2): 134. 1997.

浪穹耳蕨 lang qiong er jue

Plants evergreen. Rhizome erect, densely covered with brown or blackish brown scales. Fronds 30–50 cm; stipe stramineous, 14–28 cm, 3–4 mm in diam. at base, densely scaly; scales dark brown, narrowly lanceolate, lower part mixed with lanceolate and ovate scales, scale margins ciliate. Lamina bipinnatifidate, narrowly ovate or broadly lanceolate, 30–45 × 10–16 cm at middle, base rounded-cuneate or truncate, apex acuminate; rachis stramineous, without proliferous bulbils, abaxially scaly; scales dark brown, linear with dilated base, margins ciliate. Pinnæ 16–25 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, middle pairs 6.5–10 × 1.5–2 cm, bases oblique, acroscopic margins truncate, basiscopic margins broadly cuneate, pinnatifidate nearly to costa except acroscopic bases with 1 or 2 pairs of free pinnules, apices long acuminate or nearly caudate. Lobes 10–14 pairs, alternate, ascendant, oblong or ovate, lower pairs 8–13 × 4–5 mm, acroscopic bases almost exauriculate, margins with small acute teeth or subentire, apex acute and mucronate; sparsely scaly; scales yellowish brown, filiform with dilated base; frond texture leathery or thinly leathery; venation pinnate on lobes, lateral veins forked, slightly visible abaxially, indistinct adaxially. Sori in 1 row on each side of midrib; indusia present, irregularly obtusely toothed.

• Forests; 400–2200 m. Guizhou, Sichuan (margins of Sichuan Basin), C and W Yunnan.

“Polystichum fengjieense” (Ching in S. F. Wu in W. T. Wang, Keys Vasc. Pl. Wuling Mts. 58. 1995) belongs here but is a nomen nudum and was not therefore validly published (*Melbourne Code*, Art. 38.1(a)).

6. *Polystichum diffundens* H. S. Kung & Li Bing Zhang, Acta Bot. Yunnan. 17: 27. 1995.

铺散耳蕨 pu san er jue

Plants evergreen. Rhizome erect, densely covered with lanceolate dark brown scales. Fronds spreading, ca. 40 cm; stipe stramineous, 11–15 cm, ca. 2 mm in diam. at base, scaly, shallowly canaliculate adaxially; scales dark brown, lanceolate and linear, lower part mixed with larger narrowly ovate dark brown scales. Lamina bipinnatifid, narrowly lanceolate, 25–31 × 5–6 cm at middle, not or slightly contracted at base, acuminate; rachis stramineous, without proliferous bulbils, densely scaly abaxially; scales blackish brown, linear with dilated base, margins ciliate. Pinnæ 25–32 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate, middle pairs ca. 3 × 1 cm, bases oblique, acroscopic margins truncate, basiscopic side cuneate, pinnatifidate except acroscopic bases with 1 or 2 free pinnules, apices acuminate. Lobes 9–12 pairs, alternate, ascendant, obliquely oblong, 2–5 × ca. 2 mm, serrulate, acute; abaxially sparsely scaly, adaxially glabrous; scales yellowish brown, filiform with dilated base; frond texture papery; venation pinnate on lobes, slightly concave on both surfaces. Sori in 1 row on each side of pinnule midrib; indusia present, repand-serrate.

• Forests, by streams; ca. 2100 m. W Sichuan (Jiulong).

7. *Polystichum incisopinnulum* H. S. Kung & Li Bing Zhang, Acta Bot. Yunnan. 17: 25. 1995.

深裂耳蕨 shen lie er jue

Plants evergreen. Rhizome erect. Fronds 50–80 cm; stipe stramineous, 24–46 cm, ca. 4 mm in diam. at base, with linear dark brown scales and larger scales; larger scales dark brown, lanceolate and narrowly ovate, margins ciliate. Lamina tripinnatifid, deltoid-ovate or narrowly oblong, 40–42 × 12–26 cm at base, base rounded-cuneate or nearly truncate, apex long acuminate; rachis stramineous, without proliferous bulbils, densely scaly abaxially; scales dark brown, linear with dilated base, margins ciliate. Pinnæ 17–20 pairs, alternate or nearly opposite, ascendant, shortly stalked, lanceolate, lower pairs 10–16 × 3.5–6.5 cm, bases oblique, acroscopic margins truncate, basiscopic margins broadly cuneate, pinnate, apex slightly ascendant and caudate. Pinnules 14–16 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, 1.5–3 cm × 6–8 mm, basal part obliquely cuneate, apex acute, or acuminate and mucronate; acroscopic bases auriculate, pinnatifid, basal acroscopic pinnule largest, lanceolate, 3–4.5 cm × 4–8 mm; abaxially with few microscales, adaxially glabrous; microscales yellowish brown, filiform with dilated base; lobes oblong, entire or with few inconspicuous small teeth, mucronate; frond texture thinly leathery; venation pinnate on lobes, slightly raised abaxially, slightly concave adaxially. Sori in 1 row on each side of midrib of lobe or midrib of pinnule; indusia present, subentire.

• Broad-leaved evergreen forests; ca. 900 m. W Sichuan (Shimian).

8. *Polystichum pseudosetosum* Ching & Z. Y. Liu, Bull. Bot. Res., Harbin 4(4): 19. 1984.

假线鳞耳蕨 jia xian lin er jue

Plants evergreen. Rhizome erect, densely covered with lanceolate dark brown scales. Fronds ca. 40 cm; stipe stramineous, ca. 14 cm, ca. 3 mm in diam. at base, densely scaly; scales dark brown, linear and linear-lanceolate, lower part of stipe mixed with larger scales, larger scales brown, lanceolate. Lamina bipinnate, broadly lanceolate, 28–30 × 6.5–8 cm, slightly contracted and becoming rounded-cuneate toward bases, acuminate; rachis stramineous, densely scaly abaxially, without proliferous bulbils; scales brown, linear with dilated base, margins ciliate. Pinnæ 28 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, middle pairs 4–5 × 1–1.2 cm, bases oblique, acroscopic margins truncate, basiscopic side broadly cuneate, pinnate, apex acuminate. Pinnules 5–8 pairs, alternate, ascendant, lower pairs shortly stalked, obliquely oblong or ovate, 0.8–1.2 cm × 4–5 mm, obliquely cuneate, acroscopic bases exauriculate, entire, acute; basal acroscopic pinnule largest, deltoid-ovate, acroscopic margins almost entire; both surfaces glabrous; frond texture thinly leathery; venation pinnate on pinnules, indistinct on both surfaces or concave adaxially. Sori in 1 row on each side of pinnule midrib; indusia present, entire.

• Broad-leaved forests; ca. 1600 m. Chongqing (Nanchuan).

9. *Polystichum exauriforme* H. S. Kung & Li Bing Zhang, Acta Bot. Yunnan. 17: 27. 1995.

缺耳耳蕨 que er er jue

Plants evergreen. Rhizome erect. Fronds ca. 60 cm; stipe stramineous, 26–28 cm, ca. 4 mm in diam. at base, scaly; scales dark brown, linear and lanceolate, lower part of stipe mixed with larger scales; larger scales dark brown, ovate-lanceolate. Lamina bipinnate, oblong-lanceolate, 33–37 × 12–14 cm, slightly contracted toward base, apex acuminate; rachis stramineous, densely scaly abaxially, without proliferous bulbils; scales dark brown, linear with dilated bases, margins ciliate. Pinnae 20–24 pairs, alternate, attached at nearly right angles to rachis, shortly stalked, lanceolate, middle pairs 6.5–7 × 1.8–2.2 cm, bases oblique, acroscopic margins truncate, basiscopic margins broadly cuneate, pinnate, apices acuminate. Pinnules 6–9 pairs, alternate, ascendant, lower pairs shortly stalked, obliquely oblong, 1.2–1.8 cm × 5–8 mm, thinly leathery, obliquely cuneate, acroscopic bases exauriculate, margins entire, apices acute; basal acroscopic pinnules largest, obliquely ovate, acroscopic margins slightly toothed; both surfaces glabrous; venation pinnate on pinnule, abaxially concave, adaxially indistinct. Sori in 1 row on each side of pinnule midrib; indusia present, toothed.

- Forests on basic soils; ca. 2600 m. Sichuan (Jiulong).

10. *Polystichum sinotsus-simense* Ching & Z. Y. Liu, Bull. Bot. Res., Harbin 4(4): 18. 1984.

中华对马耳蕨 zhong hua dui ma er jue

Plants evergreen. Rhizome erect, densely scaly; scales dark brown or brown, narrowly ovate. Fronds 18–30 cm; stipe stramineous, 6–16 cm, ca. 2 mm in diam. at base, lower part scaly, gradually glabrous upward; scales dark brown, linear-lanceolate, margins ciliate. Lamina lanceolate to broadly lanceolate, 12–20 × 4–7 cm, base truncate and bipinnate, apex acuminate; rachis stramineous, sparsely scaly abaxially, without proliferous bulbils; scales dark brown, linear with dilated bases, margins ciliate. Pinnae 16–24 pairs, alternate, attached at right angles to rachis or slightly ascendant, sometimes basal pair angled basiscopically, shortly stalked, lanceolate, middle pairs 2–5 cm × 6–10 mm, bases oblique, acroscopic margins truncate, basiscopic margins broadly cuneate, pinnate, apices shortly acuminate. Pinnules 4–9 pairs, alternate, slightly ascendant, obliquely broadly ovate or broadly obovate, lower pairs 4–6 × 2–4 mm, bases obliquely broadly cuneate, acroscopic bases without conspicuous auricles, margins entire or with few inconspicuous small teeth, apices obtuse and mucronate; abaxially with few microscales; microscales yellowish brown, hairlike; frond texture thinly leathery; venation pinnate on pinnules, lateral veins free, simple or forked, slightly concave abaxially, indistinct adaxially. Sori in 1 row on one side or each side of pinnule midrib, 1–6 per pinnule; indusia present, repand.

- Forests; 1100–1800 m. Chongqing (Chengkou, Nanchuan), C Guizhou (Anshun), W Hunan (Shimen).

11. *Polystichum pseudoxiphophyllum* Ching ex H. S. Kung, Chin. J. Appl. Environm. Biol. 3(2): 135. 1997.

洪雅耳蕨 hong ya er jue

Polystichum xiphophyllum (Baker) Diels f. *bipinnata* Ching.

Plants evergreen. Rhizome erect, densely scaly; scales brown or dark brown, narrowly ovate. Fronds 30–60 cm; stipe stramineous, 18–40 cm, 3–4 mm in diam. at base, densely scaly; scales dark brown or blackish brown, linear-lanceolate, margins ciliate, sometimes upper part of stipe glabrous, lower part of stipe with lanceolate scales. Lamina bipinnate, broadly lanceolate to narrowly ovate, 25–50 × 10–14 cm, rounded-cuneate, acuminate; rachis without proliferous bulbils, densely scaly abaxially; scales blackish brown or brown, linear with dilated base, margins ciliate. Pinnae 18–20 pairs, alternate, attached at right angles to rachis or slightly ascendant, shortly stalked, linear-lanceolate, middle pairs 6–10 × 1.2–2 cm, bases obliquely cuneate, acroscopic margins shallowly cordate, basiscopic margins semi-orbicular, pinnate, apices long acuminate. Pinnules 6–12 pairs, alternate, slightly ascendant, lower pairs shortly stalked, obliquely broadly ovate or broadly obovate, lower pairs 6–8 × 4–5 mm, bases obliquely broadly cuneate, acroscopic bases without or only with inconspicuous auricles, margins entire or with few inconspicuous small teeth, apices obtuse, or acute and mucronate; basal acroscopic pinnule largest, often ovate, sometimes acroscopic side pinnatifidate; abaxially with few microscales, microscales yellowish brown, hairlike; frond texture thinly leathery; venation pinnate on pinnules, lateral veins often forked, indistinct on both surfaces or only slightly concave abaxially. Sori in 1 row on each side of pinnule midrib, 2–8 per pinnule; indusia present, repand.

- Under bushes; 1300–1900 m. Chongqing (Chengkou), Guangdong (Ruyuan), Guizhou, Hunan (Shimen), Jiangxi (Huanggang), Sichuan (Hongya, Xingwen), Yunnan (Maguan).

Polystichum pseudoxiphophyllum is tentatively recognized here pending further study. It is similar to *P. xiphophyllum*. One of us (Barrington) thinks it is more similar to *P. pseudosetosum* and *P. tsus-simense*.

12. *Polystichum herbaceum* Ching & Z. Y. Liu, Bull. Bot. Res., Harbin 4(4): 20. 1984.

草叶耳蕨 cao ye er jue

Plants evergreen. Rhizome erect, densely covered with narrowly ovate dark brown scales. Fronds 30–50 cm; stipe stramineous, 13–30 cm, 3–4 mm in diam. at base, lower part densely scaly; scales dark brown, lanceolate and linear, upper part of stipe with linear scales, sometimes glabrous, scale margins ciliate. Lamina bipinnate, ovate or narrowly ovate, 22–36 × 8–14 cm, rounded-cuneate, acuminate; rachis without proliferous bulbils, densely scaly abaxially; scales blackish brown or dark brown, linear with dilated bases, margins ciliate. Pinnae 20–26 pairs, alternate, slightly ascendant, approximate, stalked, linear-lanceolate, middle pairs 6–10 × 1.5–2.5 cm, bases oblique, acroscopic margins truncate, basiscopic margins broadly cuneate, pinnate, apices long acuminate or caudate. Pinnules 8–12 pairs, alternate, slightly ascendant, approximate, shortly stalked, broadly lanceolate or narrowly obliquely oblong, somewhat falcate, lower pairs 10–16 × 4–5 mm, bases obliquely cuneate, auricles sometimes deltoid, margins inconspicuously serrulate, apices acuminate and spinulose; basal

acroscopic pinnule largest, ovate or lanceolate, 1.2–2.5 cm × 5–6 mm, often pinnatifid; abaxially with few microscales; microscales yellowish brown, hairlike; frond texture papery or thinly leathery; venation pinnate on pinnules; lateral veins often forked, indistinct on both surfaces, sometimes slightly raised abaxially. Sori in 1 row on each side of pinnule midrib, 2–10 per pinnule; indusia present, entire.

• Forests; 1100–1700 m. Chongqing, Guizhou (Fanjing Shan), W Hunan.

13. *Polystichum tsus-simense* (Hooker) J. Smith, Hist. Fil. 219. 1875.

对马耳蕨 *dui ma er jue*

Aspidium tsus-simense Hooker, Sp. Fil. 4: 16. 1862; *A. aculeatum* (Linnaeus) Swartz var. *pallescens* Franchet; *Polystichum falcilobum* Ching; *P. tsus-simense* var. *pallescens* Franchet; *P. tsus-simense* var. *parvipinnulum* W. M. Chu.

Plants evergreen. Rhizome erect, densely scaly; scales dark brown, narrowly lanceolate. Fronds 30–60 cm; stipe stramineous, 16–30 cm, 2–4 mm in diam. at base, lower part densely scaly; scales blackish brown, lanceolate and linear, upper scales gradually linear, margins ciliate. Lamina broadly lanceolate or narrowly ovate, 20–42 × 6–14 cm, rounded-cuneate or truncate, bipinnate at lower part, long acuminate or caudate; rachis without proliferous bulbils, densely scaly abaxially; scales blackish brown or brown, linear with dilated base, margins ciliate. Pinnae 20–26 pairs, alternate, attached at right angles to rachis or slightly ascendant, shortly stalked, linear-lanceolate, middle pairs 4–9 × 1–1.5 cm, bases oblique, acroscopic margins truncate, basicopic margins broadly cuneate, pinnate, apices acuminate to caudate. Pinnules 7–13 pairs, alternate, strongly ascendant, approximate, shortly stalked, obliquely rounded, obliquely ovate or deltoid-ovate, lower pairs 5–10 × 4–6 mm, apex acute or obtuse, mucronate; basal acroscopic pinnule largest, ovate or deltoid-ovate, 7–15 × 4–6 mm, sometimes pinnatifid; abaxially with few microscales; microscales yellowish brown, filiform with dilated bases; frond texture thinly leathery; venation pinnate on pinnules, lateral veins often forked, abaxially slightly concave or raised, adaxially indistinct. Sori in 1 row on each side of pinnule midrib, 3–9 per pinnule; indusia present, entire.

Broad-leaved evergreen forests, shrubs; 200–3400 m. Anhui, Fujian, S Gansu, Guangxi, Guizhou, Henan (Xixia), Hubei, W Hunan, Jiangxi, Jilin (Mopan Shan), S Shaanxi, Shandong, Sichuan, Taiwan, E and S Xizang, Yunnan, Zhejiang [N and NW India, Korea, Japan, Vietnam].

Roux (Bull. Nat. Hist. Mus. London, Bot. 30(2): 33–130. 2000) treated *Polystichum tsus-simense* as a synonym of *P. luctuosum* (Kunze) T. Moore from Africa.

14. *Polystichum mayebarae* Tagawa, Acta Phytotax. Geobot. 3: 91. 1934 [*“mayebarai”*].

前原耳蕨 *qian yuan er jue*

Polystichum tsus-simense (Hooker) J. Smith var. *mayebarae* (Tagawa) Sa. Kurata.

Plants evergreen. Rhizome erect, densely scaly; scales dark brown, narrowly lanceolate. Fronds 45–60 cm; stipe stramineous, 22–30 cm, 4–5 mm in diam. at base, lower part densely scaly; scales dark brown, narrowly ovate, upper part of stipe densely scaly; scales brown, lanceolate and narrowly lanceolate, margins ciliate. Lamina narrowly ovate or broadly lanceolate, 28–48 × 8–14 cm, rounded-cuneate, bipinnate at lower part, acuminate; rachis without proliferous bulbils, densely scaly abaxially; scales linear with dilated base, margins ciliate, lower part of rachis with lanceolate scales; scales light brown to blackish brown. Pinnae 20–26 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, often falcate, middle pairs 6–10 × 1.5–2.5 cm, bases oblique, acroscopic margins nearly cuneate, basicopic margins rounded-cuneate, pinnate, apices acuminate. Pinnules 10–14 pairs, alternate, slightly ascendant, lower pairs shortly stalked, obliquely ovate or narrowly ovate, 8–15 × 5–8 mm, basal part obliquely broadly cuneate, acroscopic bases often with small deltoid auricles, margins with small acute teeth, apices acute and mucronate; basal acroscopic pinnule largest, often ovate, sometimes pinnatifid; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, slightly concave abaxially, indistinct adaxially. Sori in 1 row on each side of pinnule midrib, 6–12 per pinnule; indusia present, entire.

Forests; 800–2100 m. Gansu (Kangxian), Guizhou (Hezhang), Henan, Hubei (Junxian), Sichuan, Yunnan, Zhejiang [Japan].

Polystichum mayebarae is sometimes treated as a variety of *P. tsus-simense*.

15. *Polystichum delavayi* (Christ) Ching ex Li Bing Zhang & H. S. Kung, Acta Phytotax. Sin. 36: 468. 1998.

洱源耳蕨 *er yuan er jue*

Polystichum ilicifolium (D. Don) T. Moore var. *delavayi* Christ, Bull. Soc. Bot. France 52(Mém. 1): 31. 1905; *P. stimulans* (Kunze ex Mettenius) Beddome var. *delavayi* (Christ) H. S. Kung.

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 20–30 cm; stipe stramineous, 6–10 cm, ca. 2 mm in diam. at base, densely scaly; scales light brown, lanceolate and ovate. Lamina linear-lanceolate, 15–18 × 1.8–2.5 cm, not contracted at base, 1-pinnate but basal pinnae sometimes pinnatifid, acuminate or long acuminate; rachis without proliferous bulbils, densely scaly abaxially; scales light brown, lanceolate and linear, margins ciliate. Pinnae 24–35 pairs, alternate, slightly ascendant, rhombic-ovate, 8–12 × 5–8 mm, bases obliquely broadly cuneate, auricles deltoid, margins with small teeth, basal acroscopic margins of lower pinnae 1-lobed, apices acute and mucronate; abaxially scaly; microscales filiform; frond texture leathery; venation pinnate on pinnae, slightly raised abaxially, slightly concave abaxially. Sori in 1 row on each side of midrib; indusia present, concave at center, toothed.

• Broad-leaved forests, limestone cliffs; 2200–2300 m. NW Yunnan (Eryuan, Zhongdian).

Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 28. 1997) treated *Polystichum delavayi* as a synonym of *P. cyclolobum*.

16. *Polystichum stimulans* (Kunze ex Mettenius) Beddome, Ferns Brit. India, t. 31. 1865.

猫儿刺耳蕨 mao er ci er jue

Aspidium stimulans Kunze ex Mettenius, Abh. Senckenberg. Naturf. Ges. 2: 327. 1858; *A. ilicifolium* D. Don; *Dryopteris ilicifolium* (D. Don) Kuntze; *Polystichum ilicifolium* (D. Don) T. Moore (1858), not Fée (1850).

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 12–20 cm; stipe stramineous, 3–12 cm, 2–3 mm in diam. at base, scaly; scales brown or dark brown, lanceolate and filiform, denser at base of stipe. Lamina linear-lanceolate, 7–15 × 1.8–2.5 cm, not or slightly contracted at base, 1-pinnate but lower pinnae often pinnatifid, acuminate or long acuminate; rachis without proliferous bulbils, abaxially scaly; scales narrow, margins ciliate. Pinnae 10–16 pairs, alternate, attached at right angles to rachis, obliquely ovate nearly to deltoid, 8–14 × 6–8 mm, bases broadly obliquely cuneate, obliquely rounded-cuneate, or nearly cuneate, auricles deltoid, margins with small teeth, basal acroscopic margins of lower pinnae with 1 free pinnule or 1 or 2 pairs of lobes, apices acute, or acuminate and mucronate; lobes ovate, apex acute and mucronate; abaxially scaly; microscales filiform; frond texture hard leathery; venation pinnate on pinnae, indistinct on both surfaces. Sori in 1 row on each side of midrib; indusia present, toothed.

On rocks; 1700–3000 m. Sichuan, Xizang, Yunnan [Bhutan, N India, Nepal].

Polystichum stimulans was previously published by C. Presl (Tent. Pterid. 83. 1836) but as a nomen nudum and not therefore validly published (*Melbourne Code*, Art. 38.1(a)).

17. *Polystichum rhomboideum* Ching, Fl. Tsinling. 2: 157, 223. 1974.

菱羽耳蕨 ling yu er jue

Polystichum pseudorhomboideum H. S. Kung & Li Bing Zhang, nom. illeg. superfl.

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 10–18 cm; stipe stramineous, 4–8 cm, 1–2 mm in diam. at base, scaly; scales light brown, ovate and filiform. Lamina lanceolate or linear-lanceolate, 6–12 × 2–3 cm, not or slightly contracted at base, 1-pinnate, sometimes with 1 lobe on acroscopic bases of basal pinnae only, acuminate; rachis without proliferous bulbils, abaxially scaly; scales narrow, margins ciliate. Pinnae 8–16 pairs, alternate, attached at right angles to rachis, ovate or nearly deltoid, 1–1.8 × 0.8–1.4 cm, bases broadly cuneate or obliquely broadly cuneate, acroscopic bases auriculate, shortly stalked, margins spinulose-toothed, often with 1 or 2 lobes on acroscopic base, sometimes with free pinnules, apices nearly rounded and mucronate; lobes obovate or rhombic, obtuse and mucronate at apex; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnae, slightly raised on both surfaces. Sori in 1 row on each side of midrib; indusia present, toothed.

• On rocks; 1800–2000 m. S Gansu (Zhouqu), W Sichuan (Leibo).

Polystichum pseudorhomboideum is a nomen novum replacing *P. rhomboideum* Ching, but it was nomenclaturally superfluous when published because the supposed earlier homonym, “*Polystichum rhomboideum* Schott” (Gen. Fil. ad t. 9. 1834), is a nomen nudum and was not therefore validly published (*Melbourne Code*, Art. 38.1(a)).

Polystichum rhomboideum does not occur in Yunnan.

Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 28. 1997) treated *Polystichum rhomboideum* as a synonym of *P. cyclobum*.

18. *Polystichum adungense* Ching & Fraser-Jenkins ex H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 32: 370. 1994.

阿当耳蕨 a dang er jue

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 12–14 cm; stipe stramineous, 4–5 cm, 1–2 mm in diam. at base, scaly; scales brown, filiform and lanceolate. Lamina 1-pinnate, linear-lanceolate, 10–14 × 2–3 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, scaly on both surfaces; scales filiform, strongly ciliate at base. Pinnae 10–12 pairs, alternate, attached at right angles to rachis, 1–2 cm apart from one another, ovate or rhombic-ovate, 1–1.6 × 0.8–1 cm, papery, bases obliquely cuneate or nearly truncate, acroscopic bases with semi-orbicular auricles, sometimes with 1 or 2 free pinnules, margins biserrate, tips of teeth spinulose, apices obtuse; both surfaces densely scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnae, slightly raised abaxially, slightly concave adaxially. Sori in 1 row on each side of midrib; indusia present, margins irregular.

Broad-leaved evergreen forests; ca. 1600 m. Yunnan (Gongshan) [NE India (Assam), N Myanmar].

19. *Polystichum cyclobum* C. Christensen, Cat. Pl. Yun-Nan, 111. 1916.

圆片耳蕨 yuan pian er jue

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 12–25 cm; stipe stramineous, 2–12 cm, 1–4 mm in diam. at base, densely scaly; scales light brown, ovate and narrowly lanceolate. Lamina lanceolate, 8–25 × 1.8–5 cm, usually not contracted at base, bipinnatifid or rarely bipinnate and with 1 or 2 free pinnules, acuminate; rachis stramineous, without proliferous bulbils; scales light brown, linear-lanceolate or filiform, denser abaxially, linear-lanceolate scales with ciliate margins, filiform scales ciliate at base. Pinnae 15–26 pairs, alternate, slightly ascendant, ovate to narrowly ovate, 0.8–2.5 × 0.6–2 cm, obliquely truncate or nearly rounded, shortly stalked, pinnatifid or pinnate, acute or obtuse and mucronate. Lobes or pinnules 1–4 pairs, alternate, attached at right angles to rachis, obovate, rhombic-ovate, or oblong, basal acroscopic lobes or pinnules largest, margins entire or sometimes serrulate, apices obtuse and mucronate; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on lobes or pinnules, slightly raised abaxially, indistinct adaxially. Sori in 1 row on each side of midrib; indusia present, slightly incised.

On rocks, basic soils; 2100–3000 m. Guizhou, W Sichuan, SE Xizang (Zayü), Yunnan [Bhutan, India (Sikkim), Nepal].

Polystichum acanthophyllum (Franchet) Christ p.p. in S. K. Wu & X. Cheng (in W. T. Wang, Vasc. Pl. Hengduan Mts. 1: 144. 1993) is a misidentification of *P. cyclolobum*.

20. *Polystichum mehrae* Fraser-Jenkins & Khullar, Indian Fern J. 2(1, 2): 10. 1985.

印西耳蕨 yin xi er jue

Polystichum acanthophyllum (Franchet) Christ var. *indicum* Christ; *P. mehrae* f. *latifundus* H. S. Kung & Li Bing Zhang.

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 12–30 cm; stipe stramineous, 2–14 cm, 1–4 mm in diam. at base, scaly; scales brown, ovate and narrowly lanceolate. Lamina bipinnatifid or bipinnate, narrowly lanceolate, 10–26 × 2.5–5 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, abaxially scaly; scales brown, larger scales lanceolate, margins ciliate; smaller scales filiform, strongly ciliate at base. Pinnae 14–25 pairs, alternate, attached at right angles to rachis or slightly ascendant, ovate to narrowly ovate, 1.2–3 × 0.8–1.5 cm, obliquely cuneate to broadly cuneate, shortly stalked, pinnatifid or pinnate, acuminate. Lobes or pinnules 1–4 pairs, alternate, attached at right angles to rachis, broadly ovate or ovate, basal acroscopic lobes often free and largest, margins entire or sometimes serrulate, apices acuminate and spinulose; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on lobes or pinnules, slightly raised abaxially, indistinct adaxially. Sori in 1 row on each side of midrib; indusia present, slightly incised.

Forests, limestone rocks, basic soils; 2300–2500 m. W Sichuan (Daocheng, Kangding, Tianquan), E Xizang, Yunnan [Bhutan, N India, Kashmir, Nepal, Pakistan].

21. *Polystichum acanthophyllum* (Franchet) Christ, Bull. Soc. Bot. France 52(Mém. 1): 30. 1905.

刺叶耳蕨 ci ye er jue

Aspidium acanthophyllum Franchet, Bull. Soc. Bot. France 32: 28. 1885; *Polystichum aculeatum* (Linnaeus) Roth ex Mertens var. *acanthophyllum* (Franchet) Beddome; *P. horridipinum* Hayata; *P. spinulescens* Tagawa.

Plants evergreen. Rhizome erect, densely scaly; scales blackish or dark brown, lanceolate. Fronds 8–28 cm; stipe stramineous, 2–12 cm, 3–5 mm in diam. at base, scaly; scales brown or dark brown, narrowly ovate and lanceolate. Lamina bipinnate, lanceolate, 6–26 × 1.5–5 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, abaxially scaly; scales brown or dark brown; larger scales lanceolate, margins ciliate; smaller scales filiform, strongly ciliate at base. Pinnae 12–28 pairs, alternate, attached at right angles to rachis or slightly ascendant, deltoid-ovate, 0.6–2.5 cm, bases obliquely broadly cuneate to truncate, sessile, pinnate, apices acute and spinulose. Pinnules 1–3 pairs, alternate, attached at nearly right angles to rachis, broadly ovate, rhombic-ovate, or obovate, bases cuneate, margins with few open spinulose teeth, apices

acute and spinulose; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, slightly concave abaxially, indistinct adaxially. Sori in 1 row on each side of midrib; indusia present, slightly toothed.

Alpine coniferous forests, mixed broad-leaved coniferous forests; (2000–)2800–4100 m. W Sichuan, Taiwan, SE Xizang, NW and W Yunnan [N India, Nepal].

22. *Polystichum meiguense* Ching & H. S. Kung, Acta Bot. Boreal.-Occid. Sin. 9: 269. 1989.

美姑耳蕨 mei gu er jue

Plants evergreen. Rhizome unknown. Fronds ca. 30 cm; stipe stramineous, 12–20 cm, ca. 3 mm in diam. at base, sparsely scaly; scales light brown, ovate and lanceolate. Lamina lanceolate, 28–30 × 3.5–5 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, sparsely scaly; scales brown; larger scales lanceolate, margins ciliate; smaller scales filiform, strongly ciliate at base. Pinnae 20–22 pairs, alternate, ascendant, sparsely arranged, broadly lanceolate, 2–3.5 × 1–1.2 cm, bases obliquely broadly cuneate, sessile, pinnate, apices acuminate and spinulose. Pinnules 2 or 3 pairs, alternate, ascendant, ovate or narrowly ovate, bases cuneate, margins with few open spinulose teeth, apices acuminate and spinulose; abaxially sparsely scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on lobes, indistinct on both surfaces. Sori sparse, 1 or 2 per pinnule, on one side or both sides of midrib; indusia present, erose.

• Forests. SW Sichuan (Meigu).

23. *Polystichum rigens* Tagawa, Acta Phytotax. Geobot. 6(2): 91. 1937.

阔鳞耳蕨 kuo lin er jue

Polystichum platychlams Ching.

Plants evergreen. Rhizome erect, stout, densely scaly; scales brown or dark brown, lanceolate. Fronds 40–60 cm; stipe stramineous, 14–30 cm, 3–5 mm in diam. at base, densely scaly; scales brown to dark brown, ovate and lanceolate. Lamina bipinnatifid, ovate to narrowly oblong, 26–50 × 11–16 cm, rounded-cuneate or nearly truncate, acuminate; rachis without proliferous bulbils, abaxially densely scaly; scales light brown or brown, ovate and lanceolate, margins ciliate, not twisted. Pinnae 14–23 pairs, alternate, slightly ascendant or attached at right angles to rachis, linear-lanceolate, sometimes falcate, middle pairs 6–11 × 1.5–2.5 cm, obliquely cordate or rounded-cuneate, shortly stalked, bipinnatifid with 1 or 2 pairs of basal free pinnules, acuminate. Pinnules and lobes 10–15 pairs, alternate, ascendant, narrowly ovate or deltoid-ovate, basal acroscopic lobes largest, 1–2 cm × 5–6 mm, bases rounded, margins with spinulose forward-pointing teeth, apices acuminate and spinulose; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules and lobes, slightly concave abaxially, flat or slightly concave adaxially. Sori in 1 row on each side of midrib; indusia present, entire.

Forests; ca. 1200 m. Chongqing (Chengkou, Wushan), Gansu

(Kangxian, Tianshui), Hubei (Shennongjia, Zhuxi), Shaanxi (Baoji, S Wutai Shan) [Japan].

24. *Polystichum baoxingense* Ching & H. S. Kung, *Acta Bot. Boreal.-Occid. Sin.* 9: 271. 1989.

宝兴耳蕨 *bao xing er jue*

Plants evergreen. Rhizome erect, stout, densely scaly; scales brown, broadly lanceolate. Fronds 30–60 cm; stipe stramineous, 16–26 cm, 4–6 mm in diam. at base, densely scaly; scales brown, ovate and broadly lanceolate. Lamina bipinnate, narrowly ovate to narrowly oblong, 28–50 × 9–12 cm, rounded-cuneate, acuminate; rachis without proliferous bulbils, densely scaly on both surfaces; scales brown, lanceolate and linear, margins ciliate. Pinnae 23–24 pairs, alternate, slightly ascendant, approximate, narrowly lanceolate, sometimes falcate, middle pairs 5.5–8 × 1.5–2.5 cm, obliquely broadly cuneate or nearly truncate, shortly stalked, pinnate, acuminate. Pinnules 10–12 pairs, alternate, slightly ascendant, approximate, obliquely ovate or narrowly ovate, bases obliquely broadly cuneate, apices acute and spinulose; auricles deltoid; basal acroscopic pinnules largest, 1.2–2 cm × 6–8 mm, pinnatilobate, margins serrulate; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, slightly concave abaxially, indistinct adaxially. Sori in 1 row on each side of midrib, 3–7 per pinnule; indusia present, entire.

• Forests; 1200–2300 m. Guizhou, W Hubei (Hefeng), S Shaanxi (Pingli), Sichuan.

25. *Polystichum squarrosus* (D. Don) Fée, *Mém. Foug.* 5: 278. 1852.

密鳞耳蕨 *mi lin er jue*

Aspidium squarrosus D. Don, *Prodr. Fl. Nepal.* 4. 1825; *A. brachypterum* Kunze; *Polystichum apicisternale* Ching & S. K. Wu; *P. brachypterum* (Kunze) Ching; *P. integripinnulum* Ching.

Plants evergreen. Rhizome erect, densely covered with broadly lanceolate brown scales. Fronds 50–80 cm; stipe amber, 18–42 cm, up to 1 cm in diam. at base, densely scaly; scales brown or reddish brown, ovate and linear, basal stipe scales dark brown at middle. Lamina bipinnate, narrowly ovate or narrowly oblong, 45–62 × 9–16 cm, rounded-cuneate, sometimes slightly contracted at base, acuminate; rachis without proliferous bulbils, densely scaly; scales reddish brown or brown, lanceolate with ciliate margins or linear, apex twisted. Pinnae 30–40 pairs, alternate, slightly ascendant, linear-lanceolate or broadly lanceolate, middle pairs 5–10 × 1.5–2 cm, obliquely cuneate to broadly cuneate, with stalk 1–2 mm, pinnate, acuminate. Pinnules 8–18 pairs, alternate, slightly ascendant, approximate, obliquely ovate, broadly ovate, or nearly rhombic, auricles deltoid, bases obliquely broadly cuneate, margins entire or with few spinulose teeth, apices acute or acuminate and spinulose; basal acroscopic pinnules largest, 1.2–1.6 cm × 5–6 mm, not divided or acroscopic margins pinnatilobate; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, not concave or

slightly raised abaxially, slightly concave adaxially. Sori in 1 row on each side of midrib; indusia present, entire.

Forests; 1900–2400 m. S Xizang [Bhutan, N India, Kashmir, Nepal, Pakistan].

26. *Polystichum orientalitibeticum* Ching, *Fl. Xizang.* 1: 240. 1983.

藏东耳蕨 *zang dong er jue*

Plants evergreen. Rhizome erect, densely covered with broadly lanceolate dark brown scales. Fronds ca. 30 cm; stipe amber, 10–12 cm, ca. 2 mm in diam. at base, densely covered with linear reddish scales and narrowly ovate blackish purple scales. Lamina bipinnate, narrowly ovate, 22–30 × 7–8 cm, slightly rounded-cuneate, acuminate; rachis without proliferous bulbils, densely scaly on both surfaces; scales reddish brown, filiform and lanceolate, abaxially mixed with narrowly ovate blackish purple scales. Pinnae 18–22 pairs, alternate, attached at right angles to rachis, linear-lanceolate, middle pairs 3.5–4.5 × 1–1.2 cm, slightly oblique to rounded-cuneate, sessile, pinnate, acuminate. Pinnules 7–10 pairs, lower pairs opposite, upper pairs alternate, slightly ascendant, approximate, obliquely ovate or rhombic, auricles deltoid, bases obliquely cuneate, margins with spinulose teeth, apices acuminate and spinulose; basal acroscopic pinnules largest, ca. 7 × 3 mm; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, indistinct abaxially, slightly raised adaxially. Sori in 1 row on each side of midrib; indusia present, subentire.

• Broad-leaved forests; ca. 2000 m. E Xizang (Bomi).

27. *Polystichum latilepis* Ching & H. S. Kung, *Acta Bot. Boreal.-Occid. Sin.* 9: 273. 1989.

宽鳞耳蕨 *kuan lin er jue*

Plants evergreen. Rhizome erect, densely covered with lanceolate dark brown scales. Fronds 40–60 cm; stipe stramineous or amber, 18–28 cm, 4–6 mm in diam. at base, densely covered with ovate and lanceolate scales; scales brown to dark brown, not twisted. Lamina bipinnate, narrowly ovate to broadly lanceolate, 30–45 × 8–12 cm, rounded-cuneate, slightly contracted at base, acuminate; rachis without proliferous bulbils, abaxially densely scaly; scales light brown to dark brown, ovate and narrowly lanceolate, flat, not twisted. Pinnae 24–26 pairs, alternate, attached at right angles to rachis or slightly ascendant, linear-lanceolate, sometimes falcate, middle pairs 5–8.5 × 1.4–1.6 cm, obliquely broadly cuneate to rounded-cuneate, shortly stalked, pinnate, acuminate. Pinnules 6–12 pairs, alternate, ascendant, approximate, obliquely ovate or broadly lanceolate, bases obliquely cuneate, margins entire or with few small acute forward-pointing teeth, apices acuminate and spinulose; basal acroscopic pinnules largest, 1.2–1.8 cm × 3–6 mm; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, indistinct abaxially, flat or slightly concave adaxially. Sori in 1 row on each side of midrib; indusia present, entire.

• Forests; 900–1600 m. Anhui (Shucheng), Chongqing (Wushan), Hubei, Jiangxi, Zhejiang (Tianmu Shan).

28. *Polystichum neolobatum* Nakai, Bot. Mag. (Tokyo) 39: 118. 1925.

革叶耳蕨 *ge ye er jue*

Aspidium lobatum (Hudson) Swartz var. *chinense* Christ; *Polystichum assurgens* Ching & S. K. Wu; *P. lobatum* (Hudson) C. Presl var. *chinense* Christ; *P. neolobatum* Nakai var. *brevipinnum* Tagawa; *P. squarrosum* (D. Don) Fée var. *chinense* (Christ) C. Christensen.

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 30–60 cm; stipe stramineous, 12–30 cm, 4–6 mm in diam. at base, densely covered with scales; scales brown to dark brown, ovate and lanceolate, apex twisted. Lamina bipinnate, narrowly ovate to broadly lanceolate, 32–55 × 6–11 cm, base rounded-cuneate or nearly truncate, slightly contracted, apex acuminate; rachis without proliferous bulbils, abaxially densely scaly; scales lanceolate and narrowly lanceolate, brown to blackish brown, strongly twisted. Pinnae 26–32 pairs, alternate, slightly ascendant, approximate, lanceolate, sometimes falcate, middle pairs 3.5–10 × 1.2–2 cm, obliquely broadly cuneate or shallowly cordate, shortly stalked, pinnate, acuminate. Pinnules 5–10 pairs, alternate, slightly ascendant, approximate, obliquely ovate or broadly lanceolate, bases obliquely cuneate, margins entire or with few small acute forward-pointing teeth, apices acuminate and spinulose; basal acroscopic pinnules largest, 1–2 cm × 4–6 mm; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, concave abaxially, flat or slightly concave adaxially. Sori in 1 row on each side of midrib; indusia present, entire.

Broad-leaved forests; 1300–3100 m. Anhui, Chongqing, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangxi, ?Ningxia, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Japan, Nepal].

29. *Polystichum yigongense* Ching & S. K. Wu, Fl. Xizang. 1: 210. 1983.

易贡耳蕨 *yi gong er jue*

Plants evergreen. Rhizome erect, densely covered with broadly lanceolate brown or reddish brown scales; scales up to 1.5 × ca. 0.7 cm. Fronds up to 50 cm; stipe stramineous, ca. 15 cm, 4–6 mm in diam. at base, densely covered with broadly lanceolate scales; scales brown or reddish brown, apex twisted. Lamina bipinnate, lanceolate, ca. 37 × 9 cm, base rounded, slightly contracted, apex acuminate; rachis without proliferous bulbils, abaxially densely scaly; scales brown, lanceolate and linear-lanceolate, often strongly twisted. Pinnae ca. 25 pairs, alternate, spreading, approximate, lanceolate, middle pairs ca. 4.5 × 1.5 cm, obliquely broadly cuneate, shortly stalked, pinnate, acute. Pinnules 8–10 pairs, alternate, ascendant, approximate, rhombic, bases obliquely cuneate, margins entire or with few small forward-pointing acute teeth, apices acuminate and spinulose; basal acroscopic pinnules largest; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, concave abaxially, flat or slightly concave adaxially. Sori in 1 row on each side of midrib; indusia present, entire.

• Stone crevices; ca. 2400 m. Xizang (Yigong).

Polystichum yigongense, which was not recognized in FRPS (5(2): 49. 2001), is distinguished by its rhombic pinnules with short, sharp teeth as opposed to the nearly elliptic pinnules with long, sharp teeth in *P. neolobatum*. The two species have remarkably different spore sculptures.

Polystichum yigongense was treated as a synonym of *P. makinoi* (Indian Fern. J. 2: 9. 1985) and *P. neolobatum* (Himalayan Ferns (Guide to *Polystichum*), 27. 1997) by Fraser-Jenkins.

30. *Polystichum integrilimum* Ching & H. S. Kung, Acta Bot. Boreal.-Occid. Sin. 9: 275. 1989.

贡山耳蕨 *gong shan er jue*

Plants evergreen. Rhizome erect, densely covered with ovate brown scales. Fronds 20–25 cm; stipe stramineous, 3–10 cm, 2–3 mm in diam. at base, scaly; scales brown, narrowly ovate and lanceolate. Lamina bipinnate, narrowly ovate to narrowly oblong, 15–20 × 4.5–6 cm, base rounded-cuneate, slightly contracted, apex acuminate; rachis without proliferous bulbils, abaxially sparsely scaly; scales light brown, lanceolate, slightly twisted. Pinnae 18–20 pairs, alternate, attached at right angles to rachis, broadly lanceolate to narrowly deltoid, middle pairs 2.2–3 × 1–1.4 cm, obliquely broadly cuneate or nearly truncate, pinnate, acute. Pinnules 4 or 5 pairs, alternate, slightly ascendant, broadly ovate or rhombic-ovate, bases obliquely cuneate, margins entire or with few small teeth, apices acute and spinulose; basal acroscopic pinnules largest, 7–12 × 4–6 mm; abaxially sparsely scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, slightly concave abaxially, adaxially indistinct. Sori in 1 row on each side of midrib, 1–3 pairs per pinnule; indusia entire.

• Slopes, roadsides, rock crevices; 1500–2500 m. NW Yunnan (Gongshan).

31. *Polystichum garhwalicum* N. C. Nair & Nag, J. Jap. Bot. 51: 138. 1976.

喜马拉雅耳蕨 *xi ma la ya er jue*

Plants evergreen. Rhizome erect, stout, densely covered with ovate dark brown scales. Fronds 30–70 cm; stipe amber, 10–30 cm, 4–6 mm in diam. at base, densely covered with scales; scales brown to dark brown, ovate and lanceolate, apex twisted. Lamina bipinnate, narrowly ovate to broadly lanceolate, 25–60 × 6–14 cm, rounded-cuneate to truncate, acuminate; rachis without proliferous bulbils, abaxially densely scaly; scales brown to blackish brown, lanceolate and narrowly lanceolate, strongly twisted. Pinnae 22–32 pairs, alternate, attached at nearly right angles to rachis, middle pairs 3–9 × 1.2–2.4 cm, oblique and nearly truncate, with stalk up to 1 mm, pinnate, acuminate. Pinnules 5–10 pairs, alternate, slightly ascendant, approximate, obliquely ovate, rhombic ovate, or obliquely oblong, bases broadly cuneate, margins with small acute teeth, pinnules of lower pinnae with open spinulose teeth, apices acute to spinulose; basal acroscopic pinnules largest, 0.8–2.2 cm × 4–9 mm; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, flat or slightly concave on both surfaces. Sori in 1 row on each side of midrib; indusia present, entire.

Broad-leaved forests, alpine coniferous forests; 1500–3400 m. W Sichuan, Xizang, Yunnan [India, Nepal].

Polystichum garhwalicum was treated as a synonym of *P. squarrosum* (Himalayan Ferns (Guide to *Polystichum*), 27. 1997) by Fraser-Jenkins. *Polystichum garhwalicum* is similar to *P. neolobatum* but can be distinguished morphologically; the two also have different distributions, with *P. garhwalicum* occurring only in the West.

Polystichum garhwalicum is referred to as *P. brachypterum* (Kunze) Ching in FRPS (5(2): 50. 2001). The latter, with its type material from S India, is a synonym of *P. squarrosum*.

32. *Polystichum rhombiforme* Ching & S. K. Wu, Fl. Xizang. 1: 209. 1983.

斜方刺叶耳蕨 xie fang ci ye er jue

Plants evergreen. Rhizome erect, densely covered with lanceolate dark brown scales. Fronds 25–50 cm; stipe stramineous, 10–20 cm, 3–5 mm in diam. at base, densely covered with ovate and broadly lanceolate scales. Lamina bipinnate, broadly lanceolate, 20–40 × 5–9 cm, broadly cuneate or trun-

cate, acuminate; rachis without proliferous bulbils, both surfaces densely scaly; scales brown, lanceolate and linear, margins ciliate. Pinnae 24–30 pairs, alternate, slightly ascendant, approximate, oblong-lanceolate, middle pairs 2.5–5 × 1–2 cm, obliquely broadly cuneate, shortly stalked, pinnate, acute or acuminate. Pinnules 5–7 pairs, alternate, slightly ascendant, approximate, obliquely oblong or rhombic, bases cuneate, distal margins with open long spinulose teeth, apices acute and prolonged into spinules; basal acroscopic pinnules largest, 7–10 × 3–6 mm; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, midrib concave adaxially; lateral veins slightly concave abaxially, indistinct adaxially. Sori in 1 row on each side of midrib; indusia present, entire.

• Alpine mixed broad-leaved coniferous forests, alpine *Quercus* forests; 2200–3300 m. W Sichuan, Xizang, NW and W Yunnan.

3. *Polystichum* sect. *Hecatoptera* (L. L. Xiang) Li Bing Zhang, *stat. nov.*

芒刺耳蕨组 mang ci er jue zu

Basionym: *Polystichum* ser. *Hecatoptera* L. L. Xiang, Acta Phytotax. Sin. 32: 266. 1994.

Plants medium-sized, evergreen. Stipe scales brown, lanceolate. Lamina papery, 1-pinnate. Rachis without proliferous bulbils. Pinnae asymmetrical at base, densely regularly long spinulose on margin. Microscales broad-type.

• One species: W China.

33. *Polystichum hecatopterum* Diels, Bot. Jahrb. Syst. 29: 193. 1900.

芒刺耳蕨 mang ci er jue

Aspidium auriculatum (Linnaeus) Swartz var. *stenophyllum* Baker; *Hemesteum hecatopterum* (Diels) H. Léveillé; *Polystichum auriculatum* (Linnaeus) C. Presl var. *stenophyllum* (Baker) Matthew; *P. pseudomaximowiczii* Hayata.

Plants evergreen. Rhizome ascending to erect, short, 1–1.5 cm in diam. including stipe bases, apically densely scaly; scales brown, broadly lanceolate or lanceolate, up to 6 mm, membranous, entire. Fronds 25–60 cm; stipe stramineous to amber, 4–15 cm, covered with scales; scales brown, varying in size, membranous; large scales broadly lanceolate to narrowly lanceolate, entire; smaller scales lanceolate to ovate-lanceolate, sparsely toothed or ciliate. Lamina 1-pinnate, green or light brownish green, adaxially darker, narrowly elliptic-lanceolate, 17–43 × 2–4 cm at middle, gradually contracted below middle, apex pinnatifid and long acuminate. Pinnae 35–66 pairs, very shortly stalked; upper pinnae sessile, hardly remote or approximate, alternate or nearly opposite; pinnae above middle of lamina attached at right angles to rachis or slightly ascendant, lower pairs slightly reflexed, basal pairs strongly angled basiscopically, falcate or oblong-falcate, middle pinnae 1–2 cm

× 3–8 mm, bases asymmetrical, apices obtuse or acute and long spinulose; acroscopic base wider and with deltoid auricles, proximal margins of auricles truncate or slightly pointing to rachis, parallel or nearly parallel to rachis, sometimes overlapping rachis, distal part of acroscopic margins of pinnae nearly truncate, basal basiscopical margins narrowly cuneate, margins entire; distal basiscopical margins truncate and curved apically, all margins except basiscopical base with regular spinulose teeth, proximal margins of auricles shallowly toothed; abaxially sparsely covered with microscales, adaxially glabrous, microscales light brown, lanceolate, sparsely toothed; frond texture papery; venation visible abaxially, indistinct adaxially, pinnate, terminating in teeth; lateral veins on acroscopic side pinnate from base upward, dichotomous or simple, lateral veins on basiscopical side simple or dichotomous. Sori small, terminal on shorter lateral veinlets, in 1 row on each side of midrib of pinna, medial, up to 14 above midrib, less than 8 below midrib, basiscopical base sterile; indusia present, light brown, repand or shallowly erose, evanescent. Spores elliptic in polar view, semicircular in equatorial view; perispore sculpturing plicate with reticulate ornamentation.

• Montane broad-leaved and coniferous forests, bamboo forests, rock crevices, close to mountain streams; 1000–2300(–2800) m. Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, S Xizang, Yunnan, Zhejiang.

4. *Polystichum* sect. *Stenopolystichum* Daigobo, Sci. Rep. Tokyo Kyoiku Daigaku, B, 15: 63. 1972.

狭叶芽胞耳蕨组 xia ye ya bao er jue zu

Plants small to medium-sized, evergreen. Stipe scales brown, lanceolate. Lamina papery or thickly papery, 1-pinnate. Rachis with proliferous bulbils. Pinnae asymmetrical at base, with forward-pointing spinules on margin. Microscales broad-type.

About two species: Sino-Himalayan and Sino-Japanese regions; two species in China.

- 1a. Lamina thickly papery, pinnatifid at apex 34. *P. stenophyllum*
 1b. Lamina papery, with an apical pinna at apex 35. *P. atkinsonii*

34. *Polystichum stenophyllum* (Franchet) Christ, Bull. Soc. Bot. France 52(Mém. 1): 27. 1905.

狭叶芽胞耳蕨 xia ye ya bao er jue

Aspidium caespitosum Wallich ex Mettenius var. *stenophyllum* Franchet, Pl. David. 2: 155. 1888; *Polystichum conaense* Ching & S. K. Wu; *P. deversum* Christ; *P. niitakayamense* Hayata; *P. pseudostenophyllum* Tagawa; *P. stenophyllum* var. *abbreviatum* Tagawa; *P. stenophyllum* var. *conaense* (Ching & S. K. Wu) W. M. Chu & Z. R. He.

Plants evergreen. Rhizome erect, short, densely covered with thin scales; scales brown, lanceolate, margins ciliate. Fronds 15–60 cm; stipe stramineous or light purplish red, 1–12 cm, 1–2 mm in diam. at base, often densely covered with thin scales; scales large or small; large scales ovate, up to 8 × 5 mm, entire, shortly acuminate; small scales ovate-lanceolate, up to 4 × ca. 1 mm, margins fimbriate, apex long acuminate. Lamina pinnate, linear-lanceolate, 8–50 × 1–5 cm at middle, below middle gradually contracted toward base; rachis stramineous or light purplish red, densely scaly on both surfaces; scales similar to small scales on stipe; rachis with 1 proliferous bulbil near tip. Pinnae 20–60 pairs, alternate, approximate or slightly imbricate, falcate-oblong, middle pinnae larger, 0.5–2.5 cm × 3–10 mm, margins serrulate, apices acute and shortly spinulose; acroscopic bases auriculate, auricles deltoid with spinulose tip, adaxial lateral side truncate, parallel to rachis, basiscopic base cuneate, margins shortly spinulose-serrulate or eroded, pinnae gradually contracted toward base below middle part, ± reflexed toward lamina base; adaxially subglabrous, abaxially densely covered with brownish microscales; microscales peltate, ovate-lanceolate, sparsely toothed; frond texture thickly papery; venation pinnate, distinct or nearly indistinct abaxially, concave adaxially; lateral veins ascendant, nearly reaching pinna margin; acroscopic veinlets pinnate, forked or free from base to upper part; basiscopic veinlets often forked, sometimes basiscopic forked veinlets at middle forked again. Sori terminal on veinlets of pinnae, in 1 row on each side of midrib, medial or submedial between midrib and pinna margin; indusia present, brown or dark brown, subentire, often persistent.

Montane broad-leaved forests, mixed broad-leaved and coniferous forests, bamboo forests; 1700–3500 m. S Gansu, SW Henan, W Hubei, W Sichuan, Taiwan, Xizang, NE and NW Yunnan [Bhutan, India, Japan, N Myanmar, C Nepal].

Sometimes the pinna margins of *Polystichum stenophyllum* can

be roughly serrate or pinnatifid and the inner side of basal acroscopic auricles can be pinnatifid toward base (*P. stenophyllum* var. *conaense*). Some authors treat *P. pseudostenophyllum* separately (e.g., Knapp, Ferns Fern Allies Taiwan, 203, 474. 2011).

Polystichum stenophyllum has been placed in *P.* sect. *Polystichum* by Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 7. 1997).

35. *Polystichum atkinsonii* Beddome, Suppl. Ferns S. Ind. 14. 1876.

小狭叶芽胞耳蕨 xiao xia ye ya bao er jue

Polystichum franchetii Christ; *P. gracilipes* C. Christensen; *P. gracilipes* var. *gemmiferum* Tagawa; *P. morii* Hayata.

Plants evergreen. Rhizome erect, short, densely covered with lanceolate microscales; scales reddish brown, membranous, with few long teeth. Fronds 5–22 cm; stipe often light purple, slender, 0.5–10 cm, less than 0.5 mm in diam., with few small scales similar to those at rhizome apex. Lamina light green when dry, adaxially darker, light purple on both surfaces when young, often linear elliptic-lanceolate, widest at middle, sometimes nearly linear-lanceolate, base nearly as wide as middle, 3–10 × 0.5–2 cm at middle, 1-pinnate, apex with an apical pinna; rachis often light purple, with few small scales on both surfaces similar to those on stipe, often with 1 small proliferous bulbil near rachis tip. Pinnae 12–20 pairs, alternate or nearly opposite, ovate-oblong or oblong, shortly stalked, middle pinnae 2–10 × 1.5–10 mm, apices often obtuse, rarely acute, acroscopic base auriculate, adaxial lateral side truncate, parallel or nearly parallel to rachis, sometimes overlapping rachis, basiscopic base cuneate, margins often shallowly pinnatifid, sometimes pinnatifid, or serrate and slightly biserrate, teeth acute or with mucronate tips; adaxially glabrous, abaxially with brown microscales; microscales broadly ovate-lanceolate, toothed; frond texture papery; venation pinnate, indistinct, lateral veins mostly forked or unbranched, often unbranched on auricles. Sori terminal on veinlets of pinnae, medial on each side of midrib, 1–5 on acroscopic side, 1 or 2 or sterile on basiscopic side; indusia brown, large, thickly membranous, subentire, approximate or margins overlapping, persistent.

Rock crevices on mountains, often in alpine regions; 1500–4000 m. Chongqing, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Japan, Nepal].

Polystichum atkinsonii has been placed in *P.* sect. *Polystichum* by Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 7. 1997).

5. *Polystichum* sect. *Achroloma* Tagawa, Acta Phytotax. Geobot. 9: 122. 1940.

白边耳蕨组 bai bian er jue zu

Plants medium-sized, evergreen. Lamina thickly papery, 1-pinnate or bipinnatifid. Rachis without proliferous bulbils. Pinnae and/or pinnules without open hard spinules at apex or on margin, with cartilaginous margins. Sori in 1 row on each side of midrib, abaxial on veinlets.

About two species: Asia; two species in China.

- 1a. Lamina 1-pinnate 36. *P. nepalense*
 1b. Lamina bipinnatifid 37. *P. manmeiense*

36. *Polystichum nepalense* (Sprengel) C. Christensen, Index Filic. 84. 1905.

尼泊尔耳蕨 ni bo er er jue

Aspidium nepalense Sprengel, Syst. Veg. 4: 97. 1827; *Polystichum atroviridissimum* Hayata.

Plants evergreen. Rhizome erect, densely covered with linear-lanceolate brown scales. Fronds 30–90 cm; stipe stramineous, 16–46 cm, 2–4 mm in diam. at base, sparsely covered with linear and ovate brown scales. Lamina 1-pinnate, lanceolate or broadly lanceolate, 30–52 × 4.5–12 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, both surfaces sparsely covered with ovate scales. Pinnae 22–30 pairs, alternate, slightly ascendant, shortly stalked, falcate-lanceolate, middle pairs 2.5–7 × 0.8–1.8 cm, bases oblique, apices acuminate; acroscopic margins truncate, auricles deltoid, basicopic margins cuneate, margins cartilaginous and with small acute teeth or biserrate; abaxially with numerous brown microscales; microscales nearly rounded at base, caudate at apex; frond texture leathery; venation pinnate, midribs flat abaxially, concave adaxially, lateral veins dichotomous, visible on both surfaces. Sori in 1 row on each side of midrib; indusia entire.

Forests; 1500–3000 m. Sichuan, Taiwan, Xizang, C and W Yunnan [Bhutan, India, N Myanmar, Nepal, Philippines, Vietnam].

The distribution record for Vietnam is new.

Polystichum nepalense has been placed in *P.* sect. *Polystichum* by Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 7. 1997).

37. *Polystichum manmeiense* (Christ) Nakaike, Misc. Publ. Nat. Sci. Mus. Tokyo, 141. 1982.

镰叶耳蕨 lian ye er jue

Aspidium manmeiense Christ, Bull. Herb. Boissier 6: 965. 1898; *A. marginatum* Wallich ex Mettenius (1858), not Schkuhr (1809); *Polystichum falcitipinum* Hayata; *P. nepalense* (Sprengel) C. Christensen f. *subbipinnatum* (C. Christensen) Ching; *P. nepalense* var. *subbipinnatum* C. Christensen.

Plants evergreen. Rhizome erect, densely covered with linear-lanceolate dark brown scales. Fronds 16–45 cm; stipe stramineous, 18–26 cm, 2–4 mm in diam. at base, lower part densely covered with linear-lanceolate dark brown scales and larger ovate dark brown scales, upper part sparsely covered with lanceolate scales. Lamina bipinnatifid, oblong-lanceolate, 22–35 × 6–8 cm, truncate, acuminate; rachis without proliferous bulbils, sparsely covered with lanceolate scales. Pinnae 20–24 pairs, alternate, attached at right angles to rachis or slightly ascendant, extremely shortly stalked, falcate-lanceolate, middle pairs 3–5 × 1–1.5 cm, bases oblique, acroscopic margins truncate, basicopic margins cuneate, pinnatifid or pinnatifid, apices acute or acuminate. Lobes 4–6 pairs, alternate, ascendant, oblong or obovate, margins with several cartilaginous small teeth, apices rounded-obtuse or acute, mucronate; basal acroscopic lobes largest, often deeply lobed to pinna rachis, oblong or ovate, 8–12 × 5–6 mm; abaxially with ovate light brown microscales; frond texture leathery; venation pinnate on lobes, midribs indistinct abaxially, concave adaxially, lateral veins dichotomous, indistinct on both surfaces. Sori in 1 row on each side of midrib of lobe or pinna midrib; indusia entire.

Forests; 1600–2900 m. Guizhou (Leigong Shan), Taiwan, Xizang, Yunnan [Bhutan, N India, Nepal].

6. *Polystichum* sect. *Chingiarum* Li Bing Zhang, sect. nov.

秦氏耳蕨组 qin shi er jue zu

Sectio nova *Polysticho* sect. *Achrolomati affinis*, sed ab eo pinnis non cartilagineis atque soris 2- vel 3-seriatis utroque costae latere differt.

Type: *Polystichum chingiae* Ching.

Plants medium-sized, evergreen. Lamina thickly papery, 1-pinnate. Rachis without proliferous bulbils. Pinnae without open hard spinules at apex or on margin, without cartilaginous margins; auricles well developed. Sori in 2 or 3 rows on each side of midrib, abaxial on veinlets.

About one species: S China and N Vietnam.

38. *Polystichum chingiae* Ching, Icon. Filic. Sin. 4: t. 182. 1937 [*“chingae”*].

滇耳蕨 dian er jue

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds ca. 50 cm; stipe yellowish brown, 20–32 cm, 2–3 mm in diam. at base, lower part densely scaly; scales blackish brown at middle, lanceolate, with brown small teeth, mixed with larger broadly ovate brown scales. Lamina 1-pinnate, narrowly ovate or oblong-lanceolate, 28–36 × 10–16 cm, truncate or rounded-cuneate, acuminate; rachis without proliferous bulbils, both surfaces with filiform and lanceolate brown scales. Pinnae 10–16 pairs, alternate, attached at

right angles to rachis, extremely shortly stalked, falcate-lanceolate, lower pairs 5.5–10 × 1–2.5 cm, bases oblique, acroscopic margins truncate, basicopic margins cuneate, apices acuminate or long acuminate; auricles deltoid, margins with small forward-pointing acute teeth; abaxially with lanceolate yellowish brown microscales; frond texture leathery; venation pinnate, midribs slightly raised abaxially, concave adaxially, lateral veins multiple times dichotomously branched, indistinct on both surfaces. Sori abaxial on veinlets, in 2 or 3 rows on each side of midrib; indusia margins irregular.

Under bushes on acidic soils; 1400–2700 m. S Yunnan [Vietnam].

Polystichum chingiae is similar to *P. balansae*, but its veins are free.

7. *Polystichum* sect. *Crinigera* Li Bing Zhang, **sect. nov.**

毛发耳蕨组 mao fa er jue zu

Sectio nova Polysticho sect. Chingiarum *affinis*, sed ab eo pinnarum auriculis rotundatis minus evolutis differt.Type: *Polystichum crinigerum* (C. Christensen) Ching.

Plants medium-sized, evergreen. Lamina thickly papery, 1-pinnate. Rachis without proliferous bulbils. Pinnae without open hard spinules at apex or margin, without cartilaginous margins; auricles less developed and rounded. Sori in 2 or 3 rows on each side of midrib, abaxial on veinlets.

• About one species: China.

39. *Polystichum crinigerum* (C. Christensen) Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 495. 1938.

毛发耳蕨 mao fa er jue

Dryopteris crinigera C. Christensen, Index Filic., Suppl. 1: 31. 1913; *Polypodium crinitum* Baker (1906), not Poiret (1804).

Plants evergreen. Rhizome erect, short. Fronds ca. 70 cm; stipe stramineous, 26–36 cm, ca. 4 mm in diam. at base, densely covered with lanceolate and linear tortuous yellowish brown scales, scale margins fimbriate. Lamina 1-pinnate, narrowly ovate, 42–48 × 12–24 cm, base nearly truncate, apex cuspidate; rachis without proliferous bulbils, densely covered

with linear yellowish brown scales. Pinnae 12–16 pairs, alternate, attached at nearly right angles to rachis, extremely shortly stalked, linear-lanceolate, middle pairs 9–12 × 1.5–2.5 cm, bases rounded-cuneate or shallowly cordate, acroscopic margins slightly curved or with semicircular auricles, margins sparsely and inconspicuously serrulate, apices acuminate; abaxially with filiform yellowish brown scales, more densely so along midribs, adaxially glabrous; frond texture leathery; venation pinnate, midribs slightly raised abaxially, concave adaxially; lateral veins multiple times dichotomously branched, distinct abaxially. Sori in 2 or 3 rows on each side of midrib; indusia unknown.

• Forests; 2200–2700 m. S Yunnan (Jingdong, Luoping, Mengzi).

8. *Polystichum* sect. *Neopolystichum* Ching ex Li Bing Zhang & H. S. Kung, Acta Phytotax. Sin. 37: 81. 1999.

新生耳蕨组 xin sheng er jue zu

Plants large, evergreen. Lamina bipinnate, leathery or thickly papery. Microscales lanceolate (broad-type). Sori abaxial or nearly terminal on veinlets, indusiate or exindusiate; if sori indusiate then indusia small and falling off early.

About four species: subtropical lowland broad-leaved evergreen forests in SW China and one species extending to Guangxi and Taiwan, and Japan; four species (three endemic) in China.

Polystichum sect. *Neopolystichum* is tentatively recognized here pending more evidence. The relationship between *P.* sect. *Macropolystichum* and *P.* sect. *Neopolystichum* is unclear.

1a. Stipe without blackish brown scales.

2a. Rachis scales fimbriate on margin; sori exindusiate 40. *P. grandifrons*

2b. Rachis scales subentire; sori indusiate but indusia often small 41. *P. altum*

1b. Stipe with blackish brown scales in addition to brown scales.

3a. Rachis with blackish brown scales in addition to brown scales 42. *P. longispinosum*

3b. Rachis without blackish brown scales 43. *P. robustum*

40. *Polystichum grandifrons* C. Christensen, Index Filic., Suppl. 3: 163. 1934.

大叶耳蕨 da ye er jue

Polystichum grande Ching, Bull. Fan Mem. Inst. Biol. 2: 189. 1931, not Fée (1857); *P. kiusiuense* Tagawa.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear grayish brown scales. Fronds up to 1 m; stipe stramineous, 26–40 cm, 5–7 mm in diam. at base, densely covered with linear or lanceolate, grayish brown scales and larger scales; large scales grayish brown, ovate-lanceolate and broadly lanceolate, up to 12 × 4 mm, subentire or with few small teeth, caudate or long acuminate. Lamina bipinnate, oblong, 33–73 × 20–31 cm at middle, slightly contracted toward base, basal part fertile, apex acute, fertile; rachis without pro-

liferous bulbils, covered with linear or lanceolate grayish brown scales and larger scales; large scales dense, ovate-lanceolate to broadly lanceolate, up to 7 × 2.5 mm, margins fimbriate, apices long acuminate. Pinnae 9–15 pairs, opposite or nearly opposite, ascendant, shortly stalked, oblong-lanceolate, gradually contracted toward base, apex caudate, middle pinnae 11–17 × 2.5–3.2 cm, 1-pinnate; costa densely covered with linear grayish brown scales. Pinnules 15–17 pairs, alternate, shortly stalked, falcate-oblong, bases cuneate, acroscopic margins subentire, with deltoid auricles, apices acute; abaxially with dense lanceolate microscales, adaxially with few microscales; frond texture thinly leathery; venation pinnate on pinnules, lateral veins 6–9 pairs, dichotomous, distinct. Sori 8–11 pairs per pinnule, grayish brown, large, in 1 row on each side of midrib or more on acroscopic side, terminal on veinlets, exindusiate. $2n = 164$.

Broad-leaved forests; 500–2300 m. Guangxi (Yaoshan), Guizhou (Duyun), Taiwan (Yilan), S Yunnan [Japan (Kyushu)].

Polystichum squarrosom in Y. C. Wu et al. (Bull. Dept. Biol. Sun Yatsen Univ. 3: 86, t. 34. 1932) is a misidentification of *P. grandifrons*.

Its distribution in India as reported by Fraser-Jenkins (Aspects Pl. Sci. 13: 263. 1991) and Chandra et al. (Taiwania 53: 170–209. 2008) is doubtful.

Polystichum grandifrons has acute lamina apex and rachis scales with fimbriate margins and is exindusiate.

41. *Polystichum altum* Ching ex Li Bing Zhang & H. S. Kung, Acta Phytotax. Sin. 36: 465. 1998.

高大耳蕨 gao da er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear grayish brown scales. Fronds up to 1 m; stipe stramineous, 22–44 cm, 5–7 mm in diam. at base, densely covered with linear and lanceolate grayish brown scales and larger scales; large scales dense, grayish brown, ovate-lanceolate and broadly lanceolate, up to 14 × 4 mm, subentire or with few small teeth, long acuminate. Lamina bipinnate, oblong-lanceolate, 38–66 × 20–36 cm at middle, not or slightly contracted toward base, acute; rachis without proliferous bulbils, covered with linear and lanceolate grayish brown scales and larger scales; large scales dense, ovate-lanceolate and narrowly lanceolate, up to 10 × 2.2 mm, subentire or with few small teeth, caudate. Pinnae 14–18 pairs, opposite or nearly opposite, ascendant, shortly stalked, lanceolate, not contracted toward base, bases asymmetrical or ± asymmetrical, apices caudate, middle pinnae 12–20 × 2.5–3.4 cm, 1-pinnate; costa scaly; scales ovate-lanceolate, lanceolate, and linear. Pinnules 15–21 pairs, alternate, shortly stalked, narrowly falcate-oblong, 1.4–2.3 × 0.6–0.8 cm, bases cuneate, apices acute, acroscopic margins shallowly toothed, teeth shortly aristate at tip, pinnules with deltoid auricles, basispic margins entire, shortly aristate, basal pair largest, incised; abaxially densely covered with lanceolate microscales, adaxially glabrous; frond texture thinly leathery; venation pinnate on pinnules, lateral veins 6–9 pairs, dichotomous, distinct. Sori (4–)8–10 pairs per pinnule, in 1 row on each side of midrib or more on acroscopic margin, nearly terminal on veinlets, large, grayish brown; indusia not well developed, indistinct.

• Forests; 1100–1800 m. Sichuan, Yunnan (Suijiang).

42. *Polystichum longispinosum* Ching ex Li Bing Zhang & H. S. Kung, Acta Phytotax. Sin. 36: 467. 1998.

长刺耳蕨 chang ci er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 60–120 cm; stipe stramineous, 16–57 cm, 5–7 mm in diam. at base, sparsely covered with linear grayish brown scales and appressed scales; appressed scales blackish brown, lanceolate, subentire. Lamina bipinnate, deltoid-lanceolate, 54–92 × 19–40 cm, not contracted toward base, basal part sterile, apex acute, fertile; rachis without proliferous bulbils, covered with linear and lanceolate scales and larger scales; large scales sparse, bicolorous, middle part

castaneous brown, ovate, up to 7 × 4 mm, subentire, caudate. Pinnae 18–26 pairs, alternate, ascendant, shortly stalked, lanceolate, not contracted toward base, bases asymmetrical, apices caudate, basal pinnae 11–17 × 1.8–3.5 cm near base, 1-pinnate; costa scaly; scales linear or lanceolate and brown, or ovate and castaneous brown. Pinnules 18–23 pairs, alternate, shortly stalked, narrowly deltoid-ovate, 1.6–2.6 × 0.6–0.8 cm, bases cuneate, auricles deltoid, margins lobed, long spinulose, apices acute with acute tips; basal acroscopic pinnules largest, pinnatipartite; abaxially with lanceolate microscales, adaxially subglabrous; frond texture papery; venation pinnate on pinnules, lateral veins 6–9 pairs, dichotomous, distinct. Sori 6–8 pairs per pinnule, in 1 row on each side of midrib or more on acroscopic side, terminal on veinlets, brown; exindusiate, or indusia not well developed, caducous.

• Broad-leaved forests, mixed forests, shrubs; 1700–2400 m. Guizhou (Pu'an), Sichuan, Yunnan (Daguan, Zhenxiang).

Polystichum longispinosum is similar to *P. altum* in shape and size, but it differs in its stipe scales broadly lanceolate, blackish brown, and appressed, rachis scales ovate and dimorphic, and pinnule margins long spinulose.

43. *Polystichum robustum* Ching ex Li Bing Zhang & H. S. Kung, Acta Phytotax. Sin. 36: 468. 1998.

粗壮耳蕨 cu zhuang er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear reddish brown scales. Fronds 1–1.5 m; stipe stramineous, 60–75 cm, 7–10 mm in diam. at base, densely covered with linear and lanceolate brown scales and larger scales; large scales grayish brown and bicolorous, broadly ovate and broadly ovate-lanceolate; bicolorous scales dense, middle part dark brown to blackish brown, shiny, up to 18 × 10 mm, shortly serrulate, caudate. Lamina bipinnate, oblong, 66–96 × 24–47 cm at middle, slightly contracted toward base, apex abruptly narrowed, fertile; rachis without proliferous bulbils, densely covered with linear dark brown scales, and sparsely covered with lanceolate grayish brown scales, latter up to 10 × 3 mm, serrulate, acuminate. Pinnae 10–17 pairs, alternate, ascendant, shortly stalked, lanceolate, apices caudate, basispic margins slightly contracted toward base, bases asymmetrical, middle pinnae 14–20 × 4.6–5.7 cm, 1-pinnate; costa scaly; scales grayish brown or blackish brown, linear or lanceolate. Pinnules 15–19 pairs, alternate, shortly stalked, deltoid-ovate, 2.1–4 × 0.8–1.6 cm, bases cuneate, acroscopic bases with semi-orbicular auricles, apices acute and mucronate, margins with obtuse teeth, tips of teeth not aristate; basal acroscopic pinnules largest, pinnatipartite; abaxially with lanceolate microscales, adaxially subglabrous; frond texture leathery; venation pinnate on pinnules, lateral veins 8–10 pairs, dichotomous, distinct. Sori numerous per pinnule, in several rows on each side of midrib, terminal on veinlets, sometimes nearly terminal, brown, large; indusia small.

• Evergreen forests; ca. 900 m. NE Yunnan (Suijiang).

Polystichum robustum is the largest in the genus in Asia. It has stipe scales bicolorous, pinnule margins with obtuse teeth, and sori in several rows on each side of the midrib.

9. Polystichum sect. Fimbriata Li Bing Zhang, **sect. nov.**

流苏耳蕨组 liu su er jue zu

Sectio nova Polysticho *sect. Haplopolysticho similis, sed ab eo lamina atroviridi coriacea differt.*Type: *Polystichum fimbriatum* Christ.

Plants evergreen. Lamina 1-pinnate, dark green, leathery. Rachis without bulbils. Pinnae oblong; auricles sharp at apex. Microscales filiform.

About one species: S China and N Vietnam.

The type of the section, *Polystichum fimbriatum*, was placed in *P. sect. Scleropolystichum* Daigobo in FRPS (5(2): 37. 2001) based on its leathery lamina. However, *P. fimbriatum* does not belong to any existing sections of the genus and should be placed in a section of its own.**44. Polystichum fimbriatum** Christ, Bull. Acad. Int. Géogr. Bot. 16: 237. 1906.

流苏耳蕨 liu su er jue

Plants evergreen. Rhizome stout, densely covered with narrowly ovate brown scales. Fronds 40–50 cm; stipe stramineous, 15–18 cm, 3–4 mm in diam. at base, densely scaly; scales reddish brown, ovate and lanceolate, margins toothed. Lamina 1-pinnate, linear-lanceolate, 34–42 × 5–5.5 cm, base nearly truncate, apex acuminate; rachis without proliferous bulbils, abaxially densely scaly in lower part; scales reddish brown, ovate, gradually becoming lanceolate and linear upward, toothed. Pinnae 30–34 pairs, attached at right angles to rachis, shortly stalked, ± approximate, oblong, middle pinnae 2.4–2.8 × 1–1.2 cm, bases obliquely broadly cuneate, acroscopic

bases auriculate, margins spinulose-toothed, apices rounded, or slightly contracted to obtuse and mucronate; abaxially with dense microscales; microscales reddish brown, filiform; frond texture hard leathery; venation pinnate, lateral veins twice-forked, slightly concave abaxially, indistinct adaxially. Sori terminal or nearly terminal on shorter veinlets, in 1 row on each side of midrib of pinna, close to pinna margin, lower part of lamina and proximal part of lower fertile pinnae often sterile; indusia present, entire.

Limestone crevices in forests; 700–1100 m. NW Guangxi, S Guizhou (Huishui, Libo, Pingtang) [N Vietnam].

The distribution record for Vietnam is new.

“*Polystichum fimbriatum* C. Presl” (Epimel. Bot. 58. 1851), based on “*Aspidium fimbriatum* Wallich” (Numer. List, no. 339. 1829, nom. nud.), was not validly published (*Melbourne Code*, Art. 38.1(a)).**10. Polystichum sect. Subfimbriata** Li Bing Zhang, **sect. nov.**

拟流苏耳蕨组 ni liu su er jue zu

Sectio Polysticho *sect. Fimbriatis similis, sed ab eo pinnis ovatis atque auriculis apice obtusis differt.*Type: *Polystichum subfimbriatum* W. M. Chu & Z. R. He.

Plants evergreen. Lamina 1-pinnate, dark green, leathery. Rachis without bulbils. Pinnae ovate; auricles obtuse at apex. Microscales filiform.

● About one species: China.

The type of the section, *Polystichum subfimbriatum*, has been placed in *P. sect. Scleropolystichum* Daigobo in FRPS (5(2): 37. 2001) based on its leathery lamina. However, *P. subfimbriatum* does not belong to any existing sections of the genus and should be placed in a section of its own. The relationship between *P. fimbriatum* and *P. subfimbriatum* might not be close.**45. Polystichum subfimbriatum** W. M. Chu & Z. R. He, Acta Phytotax. Sin. 36: 382. 1998.

拟流苏耳蕨 ni liu su er jue

Plants evergreen. Rhizome erect, densely covered with broadly lanceolate brown scales. Fronds ca. 25 cm; stipe stramineous, 4–10 cm, ca. 2 mm in diam. at base, indistinctly canaliculate adaxially, densely scaly; scales brown, lanceolate and linear, toothed. Lamina 1-pinnate, lanceolate or linear-oblancoate, 13–20 × 1.5–3 cm, contracted at base, acuminate; rachis without proliferous bulbils, adaxially scaly, scales brown, linear or narrowly lanceolate, twisted, abaxially densely scaly, scales brown, narrowly lanceolate, twisted. Pinnae 22–30 pairs, alternate, lower pairs slightly angled basiscopically, other pairs

attached at right angles to rachis, shortly stalked, approximate, ovate, middle pinnae 8–15 × 6–8 mm, bases obliquely broadly cuneate, sometimes acroscopic bases with semi-orbicular auricles, margins slightly revolute with spinulose teeth, sometimes lower part shallowly lobed, apices rounded with acute tips; abaxially scaly; microscales yellowish brown, filiform, twisted; frond texture thin leathery, venation pinnate, lateral veins forked, indistinct on both surfaces. Sori in 1 row on each side of midrib; indusia present, margins irregular.

● Under bushes; ca. 2000 m. NE Yunnan (Yiliang, Zhenxiong).

Polystichum subfimbriatum is similar to *P. fimbriatum*, but it is smaller, its rachis scales are narrowly lanceolate and twisted, and its pinna auricles are semi-orbicular.

11. Polystichum sect. **Micropolystichum** Tagawa, Acta Phytotax. Geobot. 9: 122. 1940.

小形耳蕨组 xiao xing er jue zu

Polystichum ser. *Exgemmifera* W. M. Chu & Z. R. He.

Plants small-sized. Lamina lanceolate, 1-pinnate. Pinnae deeply or shallowly pinnatifid. Pinnae ovate or oblong, indistinctly toothed, mucronate. Sori abaxial or terminal on veinlets. Indusia large, membranous, erose.

About six species: montane to alpine regions in Asia; six species (five endemic) in China.

- 1a. Pinnae with clavate microscales on both surfaces 46. *P. zayuense*
 1b. Pinnae without clavate microscales.
 2a. Pinnae often pinnatifid to lobed 1/2 distance to midrib.
 3a. Stipe obviously shorter than lamina; lamina thickly papery; pinnae 25–45 pairs, approximate; mature sori distant from midrib 50. *P. setillosum*
 3b. Stipe nearly as long as lamina; lamina papery; pinnae 10–16 pairs, distant from each other; mature sori next to midrib 51. *P. costularisorum*
 2b. Pinnae often pinnatifid to pinnatisect.
 4a. Lamina acuminate; pinnae acute at apex 47. *P. jiucaipingense*
 4b. Lamina acuminate or long caudate; pinnae acuminate at apex.
 5a. Lamina long caudate at apex; pinnae with linear brown microscales 48. *P. thomsonii*
 5b. Lamina shortly acuminate or acute at apex; pinnae subglabrous on both surfaces 49. *P. longidens*

46. Polystichum zayuense W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 228. 2001.

察隅耳蕨 cha yu er jue

Plants summer-green. Rhizome erect, short, together with remnant stipe base up to 1 cm in diam., rhizome apex and stipe base densely scaly; scales brown, lanceolate, up to 5 mm, membranous, with few long teeth. Fronds ca. 25 cm; stipe grass-green, 6–7 cm, less than 1 mm in diam., distal stipe scales sparse, brown, narrowly lanceolate or linear, 1–2 mm, sparsely toothed. Lamina 1-pinnate, grass-green on both surfaces, adaxially darker, oblong-linear-lanceolate, up to 18 × 2–2.5 cm, apex pinnatifid and acuminate; rachis without proliferous bulbils, abaxially sparsely scaly, adaxially broadly and deeply sulcate; scales brown, clavate. Pinnae more than 25 pairs, obliquely oblong, 0.5–1.5 cm × 3–7 mm, pinnatifid to pinnatifid, acute or obtuse, basal acroscopic margins pinnatifid nearly to midrib and forming a pinnatifid obovate auriculate lobe, other lobes rectangular and bilobed apically, or shortly falcate and entire on margin, primary and secondary lobes acute; abaxially sparsely covered with clavate brown microscales; frond texture thinly papery; venation pinnate on pinnae, visible abaxially, indistinct adaxially, with only 1 veinlet per primary lobe or secondary lobe. Sori terminal or abaxial on veinlets, often only 1 per lobe, sometimes 2 on basal auriculate lobes; indusia present, large, as wide as lobes, thinly membranous, dark brown when mature, centers slightly concave, coarsely lobed. Spores semicircular in equatorial view.

- Rock crevices in *Picea* forests; ca. 3500 m. SE Xizang (Zayü).

Polystichum zayuense is similar to *P. thomsonii*, but its lamina apex is shortly acuminate (vs. often linear long caudate in *P. thomsonii*), its ultimate segments are acute at apex (vs. mucronate), its venation is indistinct adaxially (vs. distinct and concave), and its stipe scales are all lanceolate (vs. lanceolate and ovate).

47. Polystichum jiucaipingense P. S. Wang & Q. Luo, Bull. Bot. Res., Harbin 29: 134. 2009.

韭菜坪耳蕨 jiu cai ping er jue

Plants summer-green. Rhizome erect, short, together with basal stipe densely scaly; scales light brown, ovate or lanceolate, membranous, with short teeth, acuminate. Fronds 19–24 cm; stipe brown, 3–6 cm, 0.5–1.2 mm in diam., distal stipe scales sparser toward rachis apex, lanceolate or linear. Lamina bipinnatifid, abaxially yellowish green when dry, adaxially darker, narrowly lanceolate, 14–20 × 2.4–3.3 cm, lower 5–7 pairs of pinnae gradually contracted toward base, long acuminate; rachis brownish stramineous, without proliferous bulbils, sparsely scaly abaxially, scales similar to distal stipe scales. Pinnae 22–28 pairs, attached at nearly right angles to rachis, alternate, shortly stalked, ovate or deltoid-ovate, middle pinnae 1.3–1.7 cm × 7–12 mm, bases slightly asymmetrical, both acroscopic and basispic bases auriculate, pinnatifid, apices obtuse and shortly spinulose. Lobes 4–7 pairs, alternate, ascendant, approximate, obovate or oblong, basal acroscopic auriculate lobes largest, acroscopic margins often ± toothed, apex often obtuse but mucronate; both surfaces sparsely scaly; microscales light brown, linear or narrowly lanceolate; frond texture thinly papery; venation pinnate on lobes, visible on both surfaces, veinlets simple or forked. Sori 1–3 per lobe, abaxial on veinlets or terminal on shorter veinlets, medial, all pinnae fertile; indusia present, membranous, subentire.

- Limestone crevices; 2800–2900 m. NW Guizhou (Hezhang).

48. Polystichum thomsonii (J. D. Hooker) Beddome, Ferns Brit. India 1: t. 126. 1866.

尾叶耳蕨 wei ye er jue

Aspidium thomsonii J. D. Hooker, Cent. Ferns, t. 25. 1860; *Dryopteris thomsonii* (J. D. Hooker) Kuntze; *P. silaense* Ching.

Plants summer-green. Rhizome erect, short, densely scaly at apex; scales brown, broadly ovate and acute, or narrowly ovate or ovate-lanceolate and shortly acuminate, up to 7 × 4 mm, margins shortly fimbriate or only with short teeth. Fronds

8–50 cm; stipe stramineous, 2–20 cm, 0.5–1.5 mm in diam., large scales on basal stipe similar to rhizome scales; small scales brown, lanceolate or narrowly lanceolate, membranous, margins long fimbriate, distal stipe scales sparser toward rachis apex. Lamina 1-pinnate, abaxially light yellowish green when dry, adaxially darker, lanceolate, 5–33 × 1–5 cm, base often slightly contracted, apex long acuminate or caudate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales similar to distal stipe scales. Pinnae 10–25 pairs, attached at nearly right angles to rachis, alternate, shortly stalked, stalks with decurrent narrow wings on both sides, obliquely ovate, 0.5–2.5 cm × 2–12 mm, bases asymmetrical, acroscopic base auriculate, basiscopic margins oblique, pinnatifid to pinnatisect, apices acute. Lobes 2–7 pairs, basal acroscopic auriculate lobes largest, ovate, pinnatilobate to pinnatifid, basal basiscopic lobes and sometimes also second lobes of acroscopic base pinnatilobate, all lobes angled upward, apices acute, slightly recurved; both surfaces sparsely scaly; micro-scales brown, long acicular; frond texture papery; venation pinnate, distinct abaxially, slightly visible adaxially, veinlets simple or unequally forked on primary and secondary lobes, clavate apically. Sori abaxial on veinlets or terminal on shorter veinlets, close to midrib, basalmost pinnae often sterile; indusia present, large, membranous, with shallow rounded teeth or erose, centers slightly concave, brown when mature. Spores semicircular in equatorial view; perispore sculpturing plicate.

Cliffs and rock crevices in montane broad-leaved forests, mixed broad-leaved coniferous forests, *Abies* forests; 2000–3900 m. S Gansu, Guizhou (Fanjing Shan, Hezhang), W Sichuan, Taiwan, E Xizang, Yunnan [Afghanistan, Bhutan, NE and NW India, Kashmir, N Myanmar, Nepal, Pakistan].

49. *Polystichum longidens* Ching & S. K. Wu, Fl. Xizang. 1: 217. 1983.

长齿耳蕨 *chang chi er jue*

Plants summer-green. Rhizome erect, short, together with basal stipe densely scaly; scales light brown, ovate or ovate-lanceolate, subentire, acuminate. Fronds 20–35 cm; stipe stramineous, 5–12 cm, ca. 2 mm in diam., distal stipe scales sparser toward rachis apex, linear-lanceolate. Lamina bipinnate-partite, light green when dry, elliptic-lanceolate, 20–35 × ca. 5 cm at middle, below middle gradually contracted toward base, acute or shortly acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales similar to distal stipe scales, light brown, linear-lanceolate. Pinnae 25–35 pairs, attached at nearly right angles to rachis or angled slightly acroscopically, alternate, approximate or slightly approximate, shortly stalked, deltoid-lanceolate, middle pinnae 1.5–2 cm × 6–8 mm at base, bases asymmetrical, acroscopic base auriculate, basiscopic margins truncate, pinnatifid to pinnatisect, apices acute. Lobes 6–8 pairs, angled upward; basal acroscopic auriculate lobes largest, elliptic, pinnatilobate; all remaining acroscopic lobes elliptic, pinnatilobate, forked or entire, apices acute and shortly spinulose; basiscopic lobes entire, apex acuminate and shortly spinulose; both surfaces glabrous; micro-scales absent, but if present then micro-scales brown, long acicular; frond texture thinly leathery; venation pinnate, slightly

visible abaxially, indistinct adaxially, veinlets simple or forked. Sori terminal on shorter veinlets, 1 per lobe, but basal basiscopic 2 lobes sterile, 2 or 3 on auricles, close to midrib of pinnae, whole lamina fertile; indusia present, large, membranous, with shallow rounded teeth or erose, centers slightly concave, brown when mature.

- On rocks on slopes; ca. 4000 m. Xizang (Lhasa).

Polystichum longidens is similar to *P. thomsonii*, but its lamina apex is shortly acuminate and its pinnae are longer, more deeply lobed, and glabrous on both surfaces.

50. *Polystichum setillosum* Ching, Bull. Fan Mem. Inst. Biol. 2: 188. 1931.

刚毛耳蕨 *gang mao er jue*

Plants evergreen. Rhizome short, ascending, together with remnant stipe base up to 3 cm in diam. Fronds 30–60 cm; stipe base castaneous, stramineous upward, 3–15 cm, 1–1.5 mm in diam. at base, densely scaly; scales varying in size, light brown, membranous; largest scales ovate or broadly ovate, subentire, shortly acuminate; smaller scales ovate-lanceolate to lanceolate, with few fimbriate teeth, long acuminate. Lamina dark green adaxially when dry, light green abaxially, narrowly elliptic-lanceolate, 20–45 × 2.5–5 cm at middle, gradually contracted toward base, base ca. 1/2 as wide as middle, 1-pinnate, apex acuminate; rachis stramineous, without proliferous bulbils, densely scaly on both surfaces; scales similar to stipe scales, brown, lanceolate. Pinnae 25–45 pairs, overlapping or approximate, sometimes slightly imbricate, sessile, bases asymmetrical, apices acute and with short spinule slightly curved upward; acroscopic base obviously wider and auriculate, acroscopic margins recurved and forming an obtuse angle with rachis, basiscopic margins often forming ± right angles with rachis, margins of pinnae pinnatilobate to pinnatifid, or only incised and with shallow obtuse teeth; middle pinnae largest, attached at right angles to rachis, obliquely ovate or ovate-lanceolate, 1.5–3 × 0.5–1.5 cm, lower pinnae gradually contracted toward base and slightly reflexed; basal pinnae nearly deltoid, shorter than 1/2 width of middle largest pinnae; auricles deltoid, sparsely toothed, acute and shortly spinulose; lobes of pinnatifid pinnae up to 5 pairs, basal acroscopic auriculate lobes obliquely ovate, other lobes nearly oblong, margins mostly sparsely toothed, apices acute and shortly spinulose; micro-scales on abaxial surface light brown or grayish brown, lanceolate or subulate-lanceolate, membranous, entire; micro-scales on adaxial surface sparser, along midrib, brown, linear, margins entire; frond texture thinly leathery; venation bipinnate on pinnae, slightly visible abaxially, distinct adaxially, veinlets simple or forked. Sori abaxial on veinlets, close to pinna midrib, often in 1 row on each side of midrib, sometimes in 2 rows on each side of midrib of basal part of pinna, often in 1–3 rows on auricles and auriculate lobes; indusia present, brown when mature, membranous, centers concave, erose or shallowly lacerate.

- Forests, shrubs at forest margins; 2400–2900 m. W Sichuan (Kangding, Luding, Shimian).

The phylogenetic position of *Polystichum setillosum* is unclear. It is tentatively placed here.

51. *Polystichum costularisorum* Ching ex W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 224. 2001.

轴果耳蕨 *zhou guo er jue*

Plants evergreen. Rhizome ascending, short. Fronds ca. 20 cm; stipe stramineous, slender, ca. 9 cm, less than 1 mm in diam. at base, whole stipe scaly; scales yellowish brown, lanceolate, thin; basal stipe scales sparse, broadly ovate, with few long teeth or subentire. Lamina 1-pinnate, narrowly elliptic-lanceolate, ca. 13 × 2.5 cm, apex pinnatifid-acuminate; rachis stramineous, without proliferous bulbils, sparsely covered with remnant scales similar to stipe scales. Pinnae ca. 10 pairs, oblong-ovate, sessile, bases asymmetrical, margins pinnatifid to

pinnatilobate, apices acute; acroscopic base auriculate, basiscopic margins oblique, at right angles to rachis or slightly angled basiscopically; middle pinnae largest, up to 1.5 cm × 7 mm; basal pinnae contracted and rhombic, ca. 5 mm long and wide, lobes and teeth acute at apex; frond texture papery; venation slightly visible, pinnate on pinnae, veinlets often simple, rarely forked. Sori abaxial on lower part or base of veinlets, 2–8 per pinna, often close to midrib when mature; indusia present, light brown with dark brown centers, erose.

- Wet rocks; ca. 2500 m. W Sichuan (Luding).

Polystichum costularisorum is similar to *P. thomsonii*, but its stipe is nearly as long as its rachis and its lamina has only 10–16 pairs of pinnae, which are pinnatilobate to pinnatifid.

12. *Polystichum* sect. *Sorolepidium* (Christ) Tagawa, Acta Phytotax. Geobot. 9: 122. 1940.

高山耳蕨组 *gao shan er jue zu*

Sorolepidium Christ, Bot. Gaz. 51: 350. 1911; *Polystichum* sect. *Lasiopolystichum* Daigobo; *P. ser. Moupinensia* H. S. Kung & Li Bing Zhang.

Plants small, summer-green. Upper part of rhizome often with persistent stipe bases. Lamina 1-pinnate, lanceolate or elliptic-lanceolate. Pinnae deeply or shallowly pinnatifid. Pinnae ovate, deltoid, or oblong, indistinctly toothed, mucronate. Microscales linear or lanceolate. Sori abaxial or terminal on veinlets. Indusia large, membranous, erose.

About 16 species: alpine regions in Asia; 13 species (seven endemic) in China.

The currently defined *Polystichum* sect. *Sorolepidium* is comparable to *P. ser. Moupinensia* H. S. Kung & Li Bing Zhang, only a part of *P. sect. Lasiopolystichum* sensu H. S. Kung & Li Bing Zhang in FRPS (5(2): 60. 2001). Molecular data (Liu et al., Chin. Sci. Bull. 52: 631–638. 2007) show that *Sorolepidium* is nested within *Polystichum*.

- 1a. Basalmost pinnae pinnatilobate or pinnatifid but not pinnatipartite.
 - 2a. Stipe and rachis with light brown scales and scales with blackish brown centers 55. *P. paramoupinense*
 - 2b. Stipe and rachis scales light brown.
 - 3a. Rachis often subglabrous; pinnae glabrous adaxially 52. *P. lachenense*
 - 3b. Rachis with dense scales; pinnae with lanceolate microscales adaxially.
 - 4a. Indusia exindusiate 53. *P. glaciale*
 - 4b. Indusia indusiate 54. *P. duthiei*
- 1b. Basalmost pinnae pinnatipartite and with 1–7 nearly free lobes dissected nearly to midrib.
 - 5a. Only pinnae of lower part of lamina with 1 or 2 pairs of free lobes dissected to midrib.
 - 6a. Stipe and rachis with light brown scales and scales with blackish brown centers; pinnae below middle of lamina ovate or oblong 56. *P. castaneum*
 - 6b. Stipe and rachis scales concolorous; pinnae below middle of lamina deltoid-ovate or ovate.
 - 7a. Stipe stramineous, sometimes brown at base; pinnae acute or acuminate at apex 57. *P. moupinense*
 - 7b. Stipe brown; pinnae obtuse or rounded at apex 58. *P. habaense*
 - 5b. Pinnae with more than 3 pairs of free lobes dissected to midrib.
 - 8a. Stipe brown, with brown scales and scales with blackish brown centers 59. *P. melanostipes*
 - 8b. Stipe stramineous.
 - 9a. Stipe and rachis with light brown scales and scales with blackish brown centers.
 - 10a. Pinnae oblong or ovate, obtuse or rounded at apex 63. *P. salwinense*
 - 10b. Pinnae narrowly deltoid or narrowly ovate, acute at apex 64. *P. nigrum*
 - 9b. Stipe and rachis scales concolorous.
 - 11a. Stipe and rachis scales yellowish brown to fulvous 60. *P. integrilobum*
 - 11b. Stipe and rachis scales brown.
 - 12a. Lamina 11–30 cm; indusia flat 61. *P. shensiense*
 - 12b. Lamina 8–12 cm; indusia arc-shaped 62. *P. taizhongense*

52. *Polystichum lachenense* (Hooker) Beddome, Ferns Brit. India, t. 32. 1865.

拉钦耳蕨 *la qin er jue*

Aspidium lachenense Hooker, Sp. Fil. 4: 8. 1862; *Poly-*

stichum sinkiangense Ching ex Chang Y. Yang; *P. xinjiangense* Ching ex Chang Y. Yang.

Plants summer-green. Rhizome erect, densely covered with broadly lanceolate brown scales. Fronds 6–14 cm; stipe

stramineous, 2–6 cm, slender, ca. 0.5 mm in diam. at base, lower part persistent, covered with brown, linear and narrowly lanceolate scales. Lamina 1-pinnate, linear, 5–14 cm × 8–16 mm, contracted at base, acuminate; rachis without proliferous bulbils, both surfaces glabrous, or only with few scales; scales light brown, narrowly lanceolate. Pinnae 12–15 pairs, alternate, attached at right angles to rachis or slightly ascendant, sparsely arranged, sessile or shortly stalked, ovate, middle pairs 5–8 × 3–4 mm, bases broadly cuneate or rounded-cuneate, sometimes acroscopic bases slightly auriculate, margins with small acute teeth or pinnatilobate, apices rounded or rarely acute; both surfaces glabrous or with few microscales; microscales light brown, narrowly lanceolate; frond texture papery; venation pinnate on pinnules, lateral veins dichotomous, indistinct on both surfaces. Sori often on upper pinnae only, in 1 row on each side of midrib; indusia present, toothed.

Alpine meadows, rock crevices or foot of rocks; 3200–4500 m. Gansu, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Bhutan, N and NW India, Japan, Kashmir, Nepal].

A hybrid, *Polystichum* × *gemmilachenense* Miyamoto & T. Nakamura (J. Jap. Bot. 58: 149. 1983), possibly between *P. lachenense* and *P. stenophyllum*, was described from Taizhong, Taiwan.

53. *Polystichum glaciale* Christ, Bull. Soc. Bot. France 52(Mém. 1): 28. 1905.

玉龙耳蕨 yu long er jue

Sorolepidium glaciale (Christ) Christ; *S. ovale* Y. T. Hsieh.

Plants summer-green. Rhizome erect; scales dense, pale brown, ovate or broadly lanceolate, up to 5 mm, denticulate, acuminate. Fronds 4–9, 6–20 cm; stipe stramineous, 1–6(–8) cm, 1–2 mm in diam. at middle; basal stipe scales dense, reddish brown, ovate, broadly lanceolate, lanceolate, and linear, membranous, toothed, acuminate; distal stipe scales similar but smaller. Lamina 1-pinnate, yellowish green when dry, linear-lanceolate, 9–15 cm, 1.5–2.5 cm at middle, slightly contracted toward base, acute; rachis stramineous, without proliferous bulbils, densely scaly; scales similar to distal stipe scales, broadly lanceolate and linear, toothed, acuminate or caudate. Pinnae 14–28 pairs, alternate, attached at nearly right angles with rachis, sessile, deltoid-oblong, middle pairs 0.5–1.1 cm × 3–6 mm, bases nearly rounded and slightly asymmetrical, apices obtuse; acroscopic base auriculate, auricles semicircular, proximal margins of auricles slightly overlapping rachis, acroscopic margins subentire, basal basicopic margins truncate, forming a 90°–130° angle with rachis, entire, distal basicopic margins curved upward, entire; both surfaces densely scaly; microscales light brown, lanceolate, up to 2 mm; frond texture thinly leathery; venation pinnate on pinnae, lateral veins simple or forked, indistinct on both surfaces. Sori in 1 row on each side of midrib, 3–5 on each side of midrib, terminal on shorter veinlets, medial, whole lamina fertile, exindusiate. Spores elliptic in equatorial view; perispore sculpturing reticulate with echinate folds.

Frigid alpine mountains, calcareous rock crevices up to snow line or nearby glaciers; 3000–4700 m. Gansu, Qinghai, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, NE India].

54. *Polystichum duthiei* (C. Hope) C. Christensen, Index Filic. 72. 1905.

杜氏耳蕨 du shi er jue

Aspidium duthiei C. Hope, J. Bombay Nat. Hist. Soc. 12: 532. 1899; *Sorolepidium duthiei* (C. Hope) Ching; *Polystichum duthiei* var. *subbipinnatum* Tagawa; *P. tschuense* Ching.

Plants summer-green. Rhizome erect, densely covered with broadly lanceolate brown scales, with persistent stipe bases. Fronds 5–12 cm; stipe stramineous, 1–3 cm, ca. 1 mm in diam. at base, lower part persistent, densely covered with narrowly ovate and lanceolate scales; scales light brown, serrulate. Lamina 1-pinnate, linear, 6–13 × 1–1.2 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, adaxially scaly, scales light brown, linear-lanceolate and hairlike, abaxially densely covered with same scales. Pinnae 16–25 pairs, alternate, attached at right angles to rachis, approximate, sessile, ovate or deltoid-ovate, middle pairs 6–7 × 4–5 mm, bases broadly cuneate or nearly rounded, auriculate acroscopically and basicopically, margins with obtuse teeth or pinnatilobate, apices obtuse; abaxially with narrowly lanceolate light brown microscales, adaxially with hairlike white microscales; frond texture papery; venation pinnate on pinnules, indistinct on both surfaces. Sori on upper pinnae from middle of lamina upward, in 1 row on each side of midrib; indusia present, toothed.

Alpine meadows and rocks; 2800–4800 m. Gansu, Xizang, Yunnan [N and NW India, Nepal].

Polystichum duthiei is not distributed in Taiwan.

55. *Polystichum paramoupinense* Ching, Fl. Xizang. 1: 226. 1983.

拟穆坪耳蕨 ni mu ping er jue

Plants summer-green. Rhizome erect, densely covered with broadly lanceolate brown scales with blackish brown centers. Fronds ca. 12 cm; stipe stramineous, sometimes lower part brown, 2–3 cm, ca. 1 mm in diam. at base, lower part persistent, densely covered with narrowly ovate and lanceolate scales; scales light brown, sometimes brown at middle, serrulate. Lamina 1-pinnate, linear, 9–14 × 1.4–1.6 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils; adaxial scales light brown, linear-lanceolate and hairlike; abaxial scales dense, dimorphic; smaller scales light brown, linear; larger scales brown at middle and light brown on margin, lanceolate. Pinnae 20–28 pairs, alternate, attached at right angles to rachis, approximate, sessile, ovate or deltoid-ovate, middle pairs 6–7 × 4–5 mm, bases broadly cuneate or nearly rounded, auriculate acroscopically and basicopically, margins with obtuse teeth or pinnatilobate, apices obtuse; adaxial microscales white, hairlike; abaxial microscales light brown, narrowly lanceolate and hairlike; frond texture papery; venation pinnate on pinnules, lateral veins dichotomous, indistinct on both surfaces. Sori on upper pinnae from middle of lamina upward, in 1 row on each side of midrib; indusia present.

• Alpine meadows; ca. 4100 m. W Sichuan (Daocheng), Xizang (Bomi).

Polystichum paramoupinense is similar to *P. duthiei* but differs in its bicolorous stipe and rachis scales.

56. *Polystichum castaneum* (C. B. Clarke) B. K. Nayar & S. Kaur, Companion Beddome's Handb. Ferns Brit. India, 50. 1974.

栗鳞耳蕨 li lin er jue

Aspidium prescottianum Wallich ex Mettenius var. *castaneum* C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 510. 1880; *Polystichum prescottianum* (Wallich ex Mettenius) T. Moore var. *castaneum* (C. B. Clarke) Beddome.

Plants summer-green. Rhizome erect, densely covered with lanceolate dark brown scales. Fronds 24–30 cm; stipe stramineous, 6–9 cm, ca. 3 mm in diam. at base, lower part persistent, with lanceolate and linear light brown scales, mixed with ovate and lanceolate blackish brown scales. Lamina bipinnatifid, linear-lanceolate or linear-oblancoolate, 20–30 × 2–3 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, both surfaces with linear light brown scales, abaxially mixed with lanceolate blackish brown scales. Pinnae 24–38 pairs, alternate, attached at right angles to rachis, approximate, slightly distant from basal pairs, sessile, ovate or oblong, basal pairs deltoid-ovate, middle pairs ca. 1.6 cm × 7–8 mm, bases obliquely and broadly cuneate, auriculate acroscopically, pinnatifid to middle of pinnae or slightly more to pinna rachis, apices obtuse or nearly rounded. Lobes 4–6 pairs, nearly opposite, slightly ascendant, nearly approximate, broadly obovate to oblong, apices nearly rounded or acute; both surfaces with linear light brown microscales; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori on upper pinnae from middle of lamina upward, in 1 row on each side of pinna rachis; indusia present, subentire.

Alpine meadows, shrubs; 3200–4600 m. W Sichuan, Xizang, NW Yunnan [N India, N Myanmar].

57. *Polystichum moupinense* (Franchet) Beddome, Handb. Suppl. Ferns Brit. Ind. 42. 1892.

穆坪耳蕨 mu ping er jue

Aspidium moupinense Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 10: 115. 1887; *Polystichum macrochlaenum* Ching & S. K. Wu; *P. prescottianum* (Wallich ex Mettenius) T. Moore var. *moupinense* (Franchet) C. Christensen; *P. woodsiioides* Christ.

Plants summer-green. Rhizome erect, densely covered with broadly lanceolate brown scales. Fronds 12–20 cm; stipe stramineous, sometimes lower part brown, 4–9 cm, 1–2 mm in diam. at base, lower part persistent, covered with narrowly ovate and lanceolate brown scales. Lamina bipinnatifid, linear-lanceolate, 12–22 × 1.2–2.2 cm, base slightly contracted, apex attenuate; rachis without proliferous bulbils, scaly on both surfaces; scales light brown, lanceolate and linear. Pinnae 20–30 pairs, alternate, attached at nearly right angles to rachis, approximate, sessile, ovate or deltoid-ovate, upper pinnae narrower, middle pairs 6–10 × 4–6 mm, bases rounded-cuneate or nearly truncate, auriculate acroscopically and basiscopically, sometimes acroscopic auricles slightly longer, pinnatifid to middle of pinnae, immediate apex area obtuse. Lobes 3–5 pairs, but only 1 or 2 pairs lobed to rachis, alternate, slightly ascendant, approximate, broadly ovate to obovate, entire or serrulate, acu-

minate; abaxially with narrowly lanceolate light brown microscales, adaxially glabrous; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori on upper pinnae from middle of lamina upward, 1 or 2 on each side of midrib of lobe, or in 1 row on each side of pinna rachis; indusia present, toothed.

Alpine meadows, alpine coniferous forests; 2500–4500 m. S Gansu, Hubei (Shennongjia), Shaanxi (Taibai Shan), W Sichuan, Xizang, NW Yunnan [Bhutan, NW India, Nepal].

58. *Polystichum habaense* Ching & H. S. Kung, Bull. Bot. Res., Harbin 9(3): 4. 1989.

哈巴耳蕨 ha ba er jue

Plants summer-green. Rhizome erect, with broadly lanceolate dark brown scales. Fronds 22–28 cm; stipe brown, 10–14 cm, ca. 3 mm in diam. at base, lower part persistent; lower stipe scales brown, dark brown at middle, ovate. Lamina bipinnatifid, linear-lanceolate or linear-oblancoolate, 20–26 × 2.5–3 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, lower part purplish brown, sparsely covered with lanceolate and linear scales, abaxially sparsely scaly; scales light brown, lanceolate and linear, mixed with brown scales. Pinnae 24–30 pairs, alternate, overlapping or approximate, sessile, ovate or deltoid-ovate, upper pinnae narrower, middle pairs 1.2–1.5 cm × 7–9 mm, bases rounded-cuneate or nearly truncate, auriculate acroscopically and basiscopically, sometimes acroscopic auricles longer, pinnatifid, apices acute, obtuse, or rounded. Lobes 3–6 pairs, alternate, slightly ascendant, approximate, oblong to obovate, with several small teeth, acute or obtuse; abaxially with narrowly lanceolate and linear light brown microscales, adaxially glabrous; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori on upper pinnae, on each side of midrib, or in 1 row on each side of pinna rachis; indusia present, toothed.

• Margins of alpine coniferous forests, *Rhododendron* shrubs; 3700–4100 m. NW Yunnan (Zhongdian).

59. *Polystichum melanostipes* Ching & H. S. Kung, Bull. Bot. Res., Harbin 9(3): 10. 1989.

乌柄耳蕨 wu bing er jue

Plants summer-green. Rhizome erect, covered with lanceolate dark brown scales. Fronds ca. 25 cm; stipe brown, 6–8 cm, ca. 2 mm in diam. at base, covered with ovate and lanceolate bicolorous scales with blackish brown centers, and mixed with lanceolate brown scales. Lamina bipinnatifid, linear-lanceolate, 19–23 × 1.6–2.8 cm, gradually contracted at base, acuminate; rachis without proliferous bulbils, both surfaces covered with scales; scales light brown, lanceolate and linear, abaxially mixed with lanceolate dark brown scales. Pinnae 28–33 pairs, alternate, attached at right angles to rachis, approximate by a distance as wide as pinna width, sessile, narrowly deltoid-ovate, middle pairs 8–13 × 5–6 mm, bases rounded-cuneate or nearly truncate, auriculate acroscopically and basiscopically, pinnatifid to or nearly to costa pinna rachis, apices acuminate. Lobes 4–6 pairs, nearly opposite, slightly ascendant, approximate, obovate to elliptic, acroscopic margins with small teeth, apices acuminate; abaxially with few micro-

scales, adaxially glabrous or with hairlike light brown microscales; microscales light brown, narrowly lanceolate; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori often on upper pinnae, in 1 row on each side of pinna rachis, sometimes 2 or 3 on basiscopic lobes; indusia present, subentire.

- Alpine meadows; 3200–4000 m. NW Yunnan (Dêqên, Weixi).

60. *Polystichum integrilobum* (Ching ex Y. T. Hsieh) W. M. Chu ex H. S. Kung & Li Bing Zhang, *Acta Phytotax. Sin.* 36: 244. 1998.

钝裂耳蕨 *dun lie er jue*

Sorolepidium integrilobum Ching ex Y. T. Hsieh, *Bull. Bot. Res.*, Harbin 9(3): 48. 1989.

Plants summer-green. Rhizome erect, densely covered with lanceolate yellowish brown scales. Fronds 12–20 cm; stipe stramineous, 4–7 cm, ca. 2 mm in diam. at base, densely covered with narrowly ovate and linear yellowish brown scales. Lamina bipinnatifid, lanceolate, 12–20 × 2–4 cm, gradually narrower toward base, acuminate; rachis without proliferous bulbils, densely covered with scales on both surfaces; scales stramineous, lanceolate and linear. Pinnae 18–22 pairs, alternate, attached at right angles to rachis, sessile, deltoid-lanceolate, middle pairs 1–2 cm × 5–8 mm, bases obliquely broadly cuneate, auriculate acropically, pinnatifid, apices obtuse. Lobes 2–5 pairs, nearly opposite, slightly ascendant, approximate, oblong, entire; abaxially with many lanceolate yellowish brown microscales, adaxially subglabrous; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori in 1 row on each side of midrib; indusia present, serrulate.

- Shrubs, rock crevices; 2900–3900 m. NW Yunnan (Lijiang).

61. *Polystichum shensiense* Christ, *Bull. Acad. Int. Géogr. Bot.* 16: 113. 1906.

陕西耳蕨 *shan xi er jue*

Dryopteris lichiangensis (C. H. Wright) C. Christensen; *Nephrodium lichiangense* C. H. Wright; *Polystichum lichiangense* (C. H. Wright) Ching ex H. S. Kung; *P. obtusipinnum* Ching & H. S. Kung; *P. prescottianum* (Wallich ex Mettenius) T. Moore var. *shensiense* (Christ) C. Christensen.

Plants summer-green. Rhizome erect, densely covered with lanceolate brown or light brown scales. Fronds 12–24 cm; stipe stramineous, 3–10 cm, ca. 1 mm in diam. at base, lower part persistent, with few ovate and lanceolate light brown scales. Lamina bipinnatifid, linear-oblong or oblong, 11–30 × 1.2–2.4 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, both surfaces with few scales; scales light brown, lanceolate and linear. Pinnae 24–32 pairs, alternate, ascendant, slightly more distant from one another toward lamina base, sessile, narrowly ovate or narrowly deltoid-ovate, middle pairs 6–15 × 4–6 mm, bases broadly cuneate or rounded-cuneate, auriculate acropically and basiscopically, pinnatifid to or near to pinna rachis, apices acute or obtuse. Lobes 4–6 pairs, alternate, slightly ascendant, obovate to ovate, apices acuminate and often with several acute teeth;

both surfaces glabrous or with few lanceolate light brown microscales; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori on upper pinnae from middle of lamina upward, in 1 row on each side of costa or 1 or 2 on each side of midrib of lobe; indusia present, subentire.

Alpine meadows, alpine coniferous forests; 2600–4000 m. Chongqing (Wushan), S Gansu, Shaanxi, W Sichuan, S Xizang, NW and W Yunnan [Bhutan, N and NW India, Kashmir, Nepal, Pakistan].

62. *Polystichum taizhongense* H. S. Kung, *Acta Phytotax. Sin.* 35: 461. 1997.

台中耳蕨 *tai zhong er jue*

Plants summer-green. Rhizome unknown. Fronds 10–15 cm; stipe stramineous with brown base, 3–5 cm, 1–2 mm in diam. at base, densely covered with narrowly lanceolate and linear yellowish brown scales, mixed with narrowly ovate brown scales at stipe base. Lamina bipinnatifid, linear-lanceolate, 8–12 × 1.6–2.5 cm, slightly contracted at base, acuminate; rachis without proliferous bulbils, with linear yellowish brown scales on both surfaces. Pinnae 19–24 pairs, alternate, slightly angled basiscopically, shortly stalked, ovate or narrowly ovate, middle pairs 6–14 × 4–6 mm, broadly cuneate or rounded-cuneate, pinnatifid, broadly cuneate or rounded-cuneate. Lobes 2–4 pairs, nearly opposite, slightly ascendant, oblong, ca. 2 × 1 mm, upper part with small acute teeth; abaxially covered with many lanceolate microscales, adaxially sparsely covered with filiform microscales; frond texture papery; venation pinnate on lobes, slightly raised on both surfaces. Sori in 1 row on each side of pinna rachis, terminal on veinlets; indusia present, gibbous with concave centers, irregularly repand.

- Bushes, alpine meadows, rock crevices; 3200–3800 m. Taiwan (Taizhong).

63. *Polystichum salwinense* Ching & H. S. Kung, *Bull. Bot. Res.*, Harbin 9(3): 7. 1989.

怒江耳蕨 *nu jiang er jue*

Plants summer-green. Rhizome erect, covered with broadly lanceolate brown scales. Fronds 20–35 cm; stipe amber, 8–14 cm, ca. 3 mm in diam. at base, lower part persistent, densely covered with lanceolate and linear light brown scales, and mixed with ovate and lanceolate scales with blackish brown centers. Lamina bipinnatifid, linear-lanceolate, 28–30 × 3–3.5 cm, contracted at base, acuminate; rachis without proliferous bulbils, densely covered with scales on both surfaces; scales light brown, narrowly lanceolate and linear, abaxially mixed with lanceolate purplish brown scales. Pinnae 26–30 pairs, alternate, strongly ascendant, slightly approximate, but approximate on lower lamina, sessile, oblong or ovate, middle pairs 1.8–2 × 1–1.2 cm, broadly cuneate, pinnatifid to pinna rachis, rounded or acute. Lobes 3–5 pairs, nearly opposite, slightly ascendant, approximate, oblong, with several long acute teeth, apices acute or nearly rounded; both surfaces scaly; microscales denser abaxially, light brown, narrowly lanceolate; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori on upper pinnae, in 1 row on each side of pinna rachis, or 1 or 2 on each side of midrib of basiscopic lobes; indusia present, subentire.

• *Abies* forests, meadows; 3500–4000 m. NW Yunnan (Dali, Dêqên, Gongshan).

64. *Polystichum nigrum* Ching & H. S. Kung, Bull. Bot. Res., Harbin 9(3): 8. 1989.

黛鳞耳蕨 dai lin er jue

Plants summer-green. Rhizome erect, covered with broadly lanceolate dark brown scales. Fronds ca. 30 cm; stipe stramineous, 7–10 cm, 3–4 mm in diam. at base, lower part persistent, covered with lanceolate and linear light brown scales, and mixed with ovate purplish brown scales. Lamina bipinnatifid, oblanceolate, 26–30 × 3–3.8 cm, base gradually contracted, apex attenuate; rachis without proliferous bulbils, both surfaces covered with scales; scales light brown, lanceolate and linear, abaxially mixed with lanceolate purplish brown or dark brown

scales. Pinnae 26–34 pairs, alternate, attached at right angles to rachis, slightly approximate, sessile, narrowly deltoid-ovate to ovate, middle pairs 1.6–2 cm × 6–8 mm, bases broadly cuneate or nearly truncate, auriculate acroscopically and basiscopically, pinnatifid to or nearly to pinna rachis, apices acuminate. Lobes 4–7 pairs, nearly opposite, slightly ascendant, approximate, elliptic or oblong, distal margins with small teeth, acuminate; abaxially with lanceolate and narrowly lanceolate light brown microscales, adaxially glabrous or with few hairlike light brown microscales; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori on upper pinnae, 1–4 per lobe, sometimes in 1 row on each side of pinna rachis; indusia present, toothed.

• Alpine meadows, *Rhododendron* shrubs, *Abies* forests; 3000–3800 m. W Sichuan, NW Yunnan.

13. *Polystichum* sect. *Macropolystichum* Daigobo, Sci. Rep. Tokyo Kyoiku Daigaku, B, 15: 61. 1972.

深绿耳蕨组 shen lü er jue zu

Polystichum sect. *Prionolepia* Daigobo.

Plants medium-sized to large, evergreen. Lamina often bipinnate, occasionally 1-pinnate to bipinnatifid, broadly lanceolate, ovate-lanceolate, or narrowly deltoid, thinly leathery or leathery, often with 1 or 2 proliferous bulbils toward rachis tip, occasionally with 1 proliferous bulbil toward apex tip of pinna rachis, some species without bulbils on rachis. Scales dimorphic to trimorphic, stipe often covered with dimorphic scales, base densely covered with large scales; large scales ovate, narrowly ovate or ovate-lanceolate, mixed with lanceolate to linear-lanceolate small scales, upper stipe and rachis covered with small scales, with few large scales; scales brown, thickly membranous, middle part often thickened and bright blackish brown; microscales light brown, small, subulate, basal part fimbriate, thinly membranous, often sparse on pinnae and pinnules abaxially. Sori often small, indusia small, easily falling off when mature.

About 17 species: tropical Asia and subtropical mountains, individual species widely distributed, north up to S Japan (Yakushima Island), some species west up to NW India, S Himalayan slopes; 14 species (six endemic) in China.

- 1a. Rachis without proliferous bulbils.
 - 2a. Microscales lanceolate; sori abaxial on veinlets.
 - 3a. Stipe scales up to 3 cm; pinnae 16–27 pairs 73. *P. mucronifolium*
 - 3b. Stipe scales shorter than 2 cm; pinnae 8–17 pairs 74. *P. biaristatum*
 - 2b. Microscales filiform; sori terminal on veinlets.
 - 4a. Lamina acuminate and sterile at apex 75. *P. oreodoxa*
 - 4b. Lamina cuspidate at apex.
 - 5a. Rachis with linear scales; lamina fertile at apex; pinnules oblong and falcate-oblong 78. *P. longipinnulum*
 - 5b. Rachis with lanceolate scales at least at base of pinna rachis.
 - 6a. Lamina sterile at apex; pinnules deltoid-ovate or oblong 76. *P. semifertile*
 - 6b. Lamina fertile at apex; pinnules narrowly deltoid-ovate 77. *P. fugongense*
- 1b. Rachis with proliferous bulbils.
 - 7a. Lamina 1-pinnate to bipinnatifid.
 - 8a. Lamina broadly lanceolate, nearly dimorphic, fertile lamina smaller; stipe scales with irregular teeth, teeth often forked or irregularly pinnately branching 65. *P. prionolepis*
 - 8b. Lamina narrowly oblong-lanceolate, obviously monomorphic; stipe scales with regular simple teeth 66. *P. lentum*
 - 7b. Lamina bipinnate.
 - 9a. Lamina 1-pinnatifid to pinnatisect.
 - 10a. Stipe scales brown; pinnules with microscales linear adaxially; rachis with 2 bulbils 67. *P. bigemmatum*
 - 10b. Stipe scales mostly castaneous, at least castaneous at center; pinnules glabrous adaxially; rachis with 1(or 2) bulbils.
 - 11a. Pinnules and lobes of lower pinnae broadly rhombic-ovate or obovate, cuspidate aristate-spinulose 68. *P. chunii*
 - 11b. Pinnules and lobes of lower pinnae ovate or oblong, obtuse-acuminate to long acuminate 69. *P. attenuatum*
 - 9b. Lamina fully bipinnate.

- 12a. Lamina nearly dimorphic, pinnae and pinnules of fertile fronds narrower and smaller; sori coenosori when mature, fully covering abaxial surface of pinnules 70. *P. pycnopterum*
 12b. Lamina monomorphic; sori not coenosori when mature.
 13a. Pinnules shortly aristate-spinulose at apex and on distal margins 71. *P. disjunctum*
 13b. Pinnules not aristate-spinulose, shallowly toothed, incised to repand on margin 72. *P. scariosum*

65. *Polystichum prionolepis* Hayata, Icon. Pl. Formosan. 4: 197. 1914.

锯鳞耳蕨 ju lin er jue

Polystichum lentum (D. Don) T. Moore var. *gelida* Rosenstock; *P. rectipinnum* Hayata.

Plants evergreen. Rhizome ascending, short. Fronds 40–60 cm, nearly dimorphic, fertile fronds smaller; stipe amber, 13–23 cm, 1–1.5 mm in diam. at base, whole plant with large and small scales; all scale margins densely serrulate, teeth brown to dark brown, irregular, often forked or irregularly pinnately branched; large scales brown, ovate or ovate-lanceolate, up to 1 cm × 4 mm, thickly membranous, or middle part thickened and blackish castaneous, with broad brown margins; small scales brown to dark brown, lanceolate, apices long caudate or linear-subulate. Lamina 1-pinnate to bipinnatifid, broadly lanceolate, base slightly or not contracted, apex attenuate; sterile lamina up to 30 × 12 cm; fertile lamina up to 16 × 6 cm; rachis stramineous, abaxially densely scaly; scales brown or blackish castaneous, lanceolate or narrowly lanceolate, basiscopic margins with few long teeth; sometimes with 1 proliferous bulbil near rachis tip, bulbil densely covered with brown scales. Pinnae 8–20 pairs, green or yellowish green when dry, darker abaxially, acuminate; middle pinnae attached at right angles to rachis or slightly reflexed toward base, lanceolate, apices acuminate or acute; acroscopic base auriculate, basiscopic base cuneate, pinnatifid to pinnatilobate on both sides, margins of upper pairs of pinnae with only coarse and shallow teeth, sometimes acroscopic bases of basal 1–3 pairs of pinnae nearly pinnatisect, pinnae of sterile fronds larger, up to 6 × 1.5 cm; pinnae of fertile fronds up to 3 × 1 cm; lobes obliquely deltoid, with 1–5 acute teeth, auricles often slightly curved toward rachis; pinna midribs and abaxial surface of veins covered with numerous microscales; microscales light brown, subulate or narrowly lanceolate, membranous; frond texture thinly leathery; venation pinnate on lobes, midribs conspicuous adaxially, concave; lateral veins slightly visible abaxially, indistinct adaxially; veinlets free, veinlets on auricles dichotomous. Sori small, abaxial on veinlets, close to midrib, 1–5 on each group of lateral veins, up to 9 per auricle; indusia light brown when mature, shallowly lobed, caducous. Spores semi-orbicular in equatorial view; perispore sculpturing with finely reticulate ornamentation.

• On shaded rocks in montane cloud forests and *Cunninghamia lanceolata* forests; 2000–2400 m. Taiwan, SC Yunnan.

Polystichum prionolepis has special, densely serrulate scales with teeth often forked or irregularly branched pinnately. The specific epithet “prionolepis” (toothed scales) refers to this characteristic.

66. *Polystichum lentum* (D. Don) T. Moore, Index Fil. 86, 95. 1858.

柔软耳蕨 rou ruan er jue

Aspidium lentum D. Don, Prodr. Fl. Nepal. 4. 1825; *A. auriculatum* (Linnaeus) Swartz var. *lentum* (D. Don) C. B. Clarke; *A. auriculatum* var. *subbipinnatum* Hooker; *Polystichum auriculatum* (Linnaeus) C. Presl var. *lentum* (D. Don) Beddome; *P. auriculatum* var. *subbipinnatum* (Hooker) Beddome; *P. longipes* Ching & S. K. Wu (1983), not Maxon (1909); *P. medogense* Ching & S. K. Wu.

Plants evergreen. Rhizome erect, short, densely covered with large scales; scales narrowly ovate or ovate-lanceolate, middle part thickened, castaneous, with broad brown margins, densely serrulate. Fronds 40–100 cm; stipe stramineous, light brown, or light purple, 10–30 cm, 1.5–3 mm in diam., base densely covered with large scales similar to rhizome scales, mixed with brown small scales; small scales lanceolate to linear-lanceolate, toothed; upper stipe with few small scales similar to basal small scales. Lamina deeply or shallowly bipinnatifid or bipinnatifid, light green abaxially, darker adaxially when dry, sometimes white along midribs, narrowly lanceolate, 30–70 × 5–10 cm at middle, base slightly contracted, apex attenuate; rachis and pinna bases sparsely covered with small scales; small scales brown, lanceolate or linear-lanceolate, with 1 proliferous bulbil near rachis tip, bulbil densely covered with brown scales. Pinnae 25–40 pairs, alternate or nearly opposite, lower pairs reflexed toward base, middle pinnae attached at right angles to rachis, upper pairs attached at right angles to rachis or slightly ascendant, lanceolate or falcate, middle pinnae 3–5 × 1.3–1.5 cm above base, both surfaces glabrous, bases shortly stalked and asymmetrical, apices acute with mucronate tips; basiscopic side cuneate, acroscopic base auriculate, auricles parallel to rachis, pinnatilobate to pinnatifid on both acroscopic and basiscopic margins, bases nearly pinnatifid to midribs; lobes of middle pinnae 5–10 pairs, ascendant, nearly elliptic, with few slender, acute teeth, mucronate; lobes of acroscopic bases obviously largest, nearly free, oblong, toothed or incised or subentire; frond texture thinly leathery; veins indistinct on both surfaces, pinnate on lobes, veinlets mostly free, often forked on auricles. Sori 1–4 per lobe, up to 6 per auricle; indusia brown when mature, small, caducous.

On rocks in montane broad-leaved evergreen forests; 800–1600 m. Xizang (Médog) [Bhutan, NE India, Nepal].

67. *Polystichum bigemmatum* Ching ex L. L. Xiang, *Chenia* 3–4: 133. 1997.

双胞胎耳蕨 shuang bao er jue

Plants evergreen. Rhizome ascending, ca. 4 cm in diam. Fronds ca. 60 cm; stipe brownish stramineous, ca. 2 mm in diam., densely scaly; scales brown, membranous, dimorphic; large scales ovate, up to 1 cm × 5 mm, entire, acute; small scales lanceolate or broadly lanceolate, up to 7 × 1.5 mm, slightly toothed. Lamina narrowly elliptic-lanceolate, ca. 50 × 5 cm at middle, lower part bipinnate, apex pinnatifid and acumi-

nate; rachis amber, densely covered with small scales; small scales reddish brown, lanceolate or subulate, entire, rachis often with 2 proliferous bulbils near tip, bulbils densely covered with reddish brown scales. Pinnae ca. 50 pairs, basal pairs attached nearly at right angles with rachis, all other pinnae angled slightly acroscopically; pinnae shortly falcate, up to 3×1.5 cm, apices acute; acroscopic bases obviously auriculate, basicopic bases cuneate, lower part of lower pinnae pinnate, with 2 pairs of free pinnules; pinnules ovate or obovate-rhombic, upper part pinnatifid to pinnatifid; upper pinnae with 1 free pinnule or only pinnatifid at proximal base; margins of pinnules and lobes often reflexed toward base, apices with 1 spinulose tip, sometimes also with 1 or 2 lateral spinulose tips near apex, pinnules and lobes of basal acroscopic pinnae obviously largest; pinnules yellowish green when dry, scaly on both surfaces; microscales brown, linear, entire; frond texture thinly leathery; veins indistinct abaxially, visible adaxially, pinnate on pinnules and lobes; veinlets free, partial veinlets on basal pair of pinnae dichotomous to trichotomous. Sori small, abaxial on veinlets of pinnules, close to pinnule or lobe midrib, up to 5–7 per pinnule, 1–4 per lobe; indusia dark brown when mature, easily contracted and falling off.

• On rocks in dense *Tsuga* forests, uncommon; ca. 2600 m. SW Sichuan (Mianning).

68. *Polystichum chunii* Ching, *Sinensia* 1: 2. 1929.

陈氏耳蕨 *chen shi er jue*

Plants evergreen. Rhizome ascending, upper part and stipe densely scaly; large scales light brown or castaneous, ovate or narrowly ovate, 6–10 × 3–5 mm, thick in texture, margins membranous, apex caudate; or scales brown or light brown, membranous, middle part partially thickened, varying in size, castaneous, serrulate, teeth short, fimbriate, easily falling off; small scales brown, linear-lanceolate or lanceolate, membranous, margins also with fimbriate teeth. Fronds 40–50 cm; stipe stramineous to amber, 6–18 cm, ca. 1 mm in diam. at base, stipe scales gradually smaller upward, and easily falling off. Lamina bipinnate, yellowish green or light yellow when dry, adaxially darker, lanceolate, 20–30 × 4–7 cm, slightly contracted at base, long acuminate; rachis stramineous, densely scaly; scales lanceolate and linear-lanceolate, similar to small scales on stipe; rachis with 1 proliferous bulbil near tip, bulbil densely covered with brown scales. Pinnate pinnae less than 10 pairs, mostly attached at right angles to rachis, sometimes ascendant, basal pair (sometimes several basal pairs) angled basicopically with rachis, oblong, 1.5–4 cm × 5–10 mm, bases asymmetrical, apices acute; acroscopic pinnules obviously larger, auriculate, basicopic pinnules smallest, acroscopic lateral pinnae gradually contracted upward, oblong-lanceolate to oblong, pinnatifid or not pinnatifid. Pinnules rhombic-ovate, 1–4 pairs, bases sessile, ± decurrent to pinna rachis, margins sparsely toothed, teeth with aculeate tip, apices acute and spinulose; acroscopic auriculate pinnules sometimes shallowly lobed; lobes acute and spinulose at apex, broadly rhombic-ovate or obovate, apices and margins similar to those of pinnules; adaxially glabrous, sparsely covered with microscales; microscales light brown, linear or subulate; frond texture papery; veins visible abaxially, indistinct adaxially, pinnate on pinnules and lobes; veinlets free,

simple or forked, some basicopic forked veinlets on auricles and lobes of basal acroscopic pinnae further forked. Sori small, medial, abaxial on veinlets, 1–5 per pinnule or lobe, up to 8 per auricle or lobe of basal acroscopic pinnae; indusia present, small, entire.

• On rocks in broad-leaved evergreen forests in valleys; 800–1400 m. Guangxi, Guizhou, SW Hunan.

69. *Polystichum attenuatum* Tagawa & K. Iwatsuki, *Acta Phytotax. Geobot.* 23: 113. 1968.

长羽芽胞耳蕨 *chang yu ya bao er jue*

Polystichum attenuatum Tagawa & Z. Iwatsuki var. *subattenuatum* (Ching & W. M. Chu) W. M. Chu & Z. R. He; *P. mannii* Hope ex Fraser-Jenkins; *P. subattenuatum* Ching & W. M. Chu.

Plants evergreen. Rhizome ascending, short, densely scaly; scales dimorphic; large scales castaneous, ovate or oblong, up to 1 cm × 7 mm, thick in texture, margins brown and membranous, entire, acuminate; small scales brown or middle part castaneous, lanceolate or linear-lanceolate, or middle part narrowly thickened, serrulate, teeth dark brown. Fronds up to 1 m; stipe stramineous, up to 35 cm, ca. 3 mm in diam. at base, abaxially densely scaly; scales brown, dimorphic, similar to scales on rhizome apex, gradually sparser toward lamina apex, and thickened castaneous part on large scales gradually reduced upward, sometimes large scales membranous without thickened castaneous part at middle. Lamina bipinnate, green or yellowish green when dry, adaxially darker, narrowly deltoid or slightly broadly oblong-lanceolate, base not or slightly contracted, apex long acuminate; rachis stramineous, densely scaly on both surfaces; small scales brown to dark brown, subulate-linear, easily falling off, mixed with few large scales; large scales brown, broadly lanceolate, margins fimbriate, membranous; rachis with 1 proliferous bulbil near tip, bulbil densely covered with brown scales. Lateral pinnae more than 30 pairs, attached at right angles to rachis, pinnate pinnae up to 15 pairs, upper pairs gradually contracted, pinnatifid to pinnatifid or only toothed, obliquely ovate-lanceolate to obliquely ovate; larger pinnae up to 10 × 3 cm, lanceolate or slightly falcate-lanceolate, acuminate to long acuminate; middle pinnae shortly stalked, other pinnae sessile; costa with narrow green wings on each lateral side, adaxially green, stramineous or greenish stramineous, both surfaces scaly, scales similar to rachis scales. Pinnules fewer than 10 pairs, obliquely ovate, apices acuminate, obtuse, or mucronate, all acroscopic bases with distinct deltoid auricles, basicopic side curved, margins shallowly pinnatifid or toothed, lobes and teeth acute apically, basal acroscopic pairs obviously larger, oblong, acroscopic margins shallowly pinnatifid to pinnatifid, curved, basicopic only toothed or pinnatifid, often recurved, acroscopic side often overlapping rachis, basal basicopic pinnules often smaller, basal basicopic pinnules smallest; abaxially with few microscales; microscales light brown, subulate, thinly membranous; frond texture thickly papery; venation of pinnules and apical pinnae bipinnate, rarely 1-pinnate, visible abaxially, indistinct adaxially; veinlets free, simple or forked. Sori small, terminal on shorter veinlets, closer to midribs of pinnules, in 1 row on each side of midrib of upper

part of pinnules, often 2 or 3 pairs on pinnule auricles and lower lobes of basal acroscopic pinnules; indusia present, entire, centers concave, brown when mature, margins sometimes shallowly lobed.

Broad-leaved evergreen forests in valleys; 1400–2200 m. Guangxi, Guizhou, Yunnan [NE India, Myanmar, Thailand, Vietnam].

One of the important differences between *Polystichum attenuatum* and *P. lentum* is that the large scales of the former are entire while those of the latter are denticulate.

Polystichum subattenuatum should be conspecific with *P. attenuatum*. It has continuous distribution from Thailand to S China.

70. *Polystichum pycnopterum* (Christ) Ching ex W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 17. 2001.

密果耳蕨 mi guo er jue

Aspidium aculeatum (Linnaeus) Swartz var. *pycnopterum* Christ, Bull. Herb. Boissier 7: 14. 1899.

Plants evergreen. Rhizome erect, densely scaly; scales castaneous, lanceolate or broadly lanceolate, up to 2 cm × 5 mm, thick in texture, margins membranous, entire, brown. Fronds subdimorphic, fertile fronds slightly smaller, 65–90 cm; stipe stramineous or greenish stramineous, up to 40 cm, ca. 4 mm in diam. at base, base densely covered with large, medium-sized, and small scales; large scales castaneous, ovate or narrowly ovate, up to 2 × 1 cm, thick or partly thick in texture, membranous part brown, entire, only apical part slightly serrulate, acute; medium scales brown, lanceolate or linear-lanceolate, up to 2 cm × less than 1 mm, membranous, serrulate; small scales light brown, subulate, bases broadly rounded, long fimbriate, nearly appressed; distal stipe scales similar, but castaneous scales sparser and smaller, often lanceolate. Lamina bipinnate, green or yellowish green when dry, broadly lanceolate, up to 30–55 × 15–25 cm, base not or slightly contracted, apex abruptly contracted, acuminate; rachis stramineous, often with 1 proliferous bulbil near rachis tip, bulbil densely covered with brown scales; rachis densely covered with small scales abaxially as well as similar brownish membranous subulate scales on stipe; small scales castaneous or brown, lanceolate, margins fimbriate or only sparsely serrulate. Lateral pinnate pinnae 15–20 pairs, lanceolate or falcate-lanceolate, often slightly ascendant, sometimes basal pairs slightly reflexed toward base; pinnae of sterile fronds larger, up to 18 × 3 cm; pinnae of fertile fronds up to 10 × 2 cm, shortly stalked, acroscopic margins parallel with rachis, basiscopic margins often angled at less than 90° with pinna rachis, acuminate or long acuminate, often curved upward; apical pairs of pinnae obliquely ovate, not pinnatifid or with pinnatifid base, apex acute. Pinnules up to 20 pairs, attached at nearly right angles to rachis, ovate-lanceolate or obliquely ovate, apex acute; acroscopic bases auriculate, auricles acute, basiscopic margins broadly oblique or curved, margins acutely toothed, sometimes shallowly pinnatifid; basal acroscopic pinnules often larger, pinnatifid to pinnatifid, auricle lobes nearly rhombic; frond texture thinly leathery; veins of pinnules bipinnate, distinct abaxially, slightly visible adaxially, adaxial midrib obviously concave; veinlets angled strongly acroscopically, free. Sori medial, abaxial on veinlets, coenosori and fully covering abaxial surface of fertile pinnules

when mature; indusia membranous, entire, brown when mature, centers slightly concave, often persistent. Spores semi-orbicular in equatorial view; perispore sculpturing plicate to lamellate.

• Broad-leaved evergreen forests; 1500–2600 m. SE Yunnan.

71. *Polystichum disjunctum* Ching ex W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 226. 2001.

疏羽耳蕨 shu yu er jue

Plants evergreen. Rhizome erect, densely scaly; scales dark brown, narrowly lanceolate, up to 1.5 cm, only apical margins serrulate, subentire below apex. Fronds up to 1.5 m; stipe up to > 50 cm, up to 4 mm in diam. at base, basal stipe densely scaly; scales dimorphic (large and small), upper part only with few small scales; large scales dark brown or middle part castaneous and margins brown, broadly lanceolate to lanceolate, curved, up to 2 cm × 4 mm, or middle part thickened, with broad margins, margins membranous, upper margins serrulate, subentire below apex; small scales light brown at base, castaneous upward, narrowly lanceolate, or subulate-lanceolate to subulate-linear, bases broadly rounded. Lamina bipinnate, green or light green when dry, adaxially darker, ovate-lanceolate or narrowly deltoid, up to 60 × 30 cm, base slightly or not contracted, apex abruptly slightly contracted, attenuate; rachis and costa stramineous, abaxially covered with numerous small scales; small scales brown to castaneous, subulate-lanceolate to subulate-linear, persistent; rachis with 1 or 2 proliferous bulbils near tip, bulbils densely covered with lanceolate and brown small scales. Pinnae up to 20 pairs, slightly ascendant, or sometimes basal pairs attached at right angles to rachis, alternate or nearly opposite, approximate, apical pairs obliquely ovate-lanceolate to obliquely ovate, pinnatifid to pinnatifid, apex acute; other pairs lanceolate or oblong-falcate-lanceolate, up to 18 × 4 cm, bases slightly or not contracted, pinnate, apices pinnatifid-acuminate. Pinnules up to 15 pairs, connected or approximate, alternate or opposite, slightly ascendant, obliquely ovate, up to 2 × 1 cm at middle, apices slightly curved acroscopically, acute, spinulose; acroscopic bases truncate, slightly auriculate, parallel with rachis, basiscopic side curved, margins sparsely incised, often spinulose on upper part; abaxially densely scaly; micro-scales brown to dark brown, linear; frond texture papery; venation bipinnate, abaxially visible, slightly raised, adaxially slightly visible, midrib obviously concave, veinlets ascendant, nearly reaching pinnule margins. Sori terminal on shorter veinlets, medial or close to pinnule margins; indusia present, entire, centers concave and shallowly funnellform when mature, light brown. Spores semi-orbicular in equatorial view; perispore sculpturing thin, shallowly reticulate.

Montane broad-leaved evergreen forests; 1100–2100 m. W Guangxi, Yunnan [N Vietnam].

Polystichum disjunctum mostly resembles *P. biaristatum* but has 1 or 2 proliferous bulbils near the rachis tip.

72. *Polystichum scariosum* (Roxburgh) C. V. Morton, Contr. U.S. Natl. Herb. 38: 359. 1974.

灰绿耳蕨 hui lü er jue

Polypodium scariosum Roxburgh, Calcutta J. Nat. Hist. 4: 494. 1844; *Polystichum aculeatum* (Linnaeus) Roth ex Mertens

var. *variiforme* Hayata; *P. eximium* (Mettenius ex Kuhn) C. Christensen var. *minus* Tagawa; *P. fibrillosum* Ching; *P. gemmiferum* Tagawa; *P. indochinense* Tardieu & C. Christensen; *P. tialooshanense* Ching; *P. variiforme* (Hayata) Tagawa.

Plants evergreen. Rhizome ascending, short, thick, up to 4 cm in diam., upper part densely covered with dimorphic scales; large scales brown or partly castaneous, margins brown, ovate-oblong or ovate-lanceolate, up to 1.5 cm × 5 mm, thickly membranous, subentire, partly to mostly thickened, margins membranous, of different widths; small scales brown, lanceolate or narrowly lanceolate, membranous, sparsely toothed. Fertile fronds 0.7–2 m; stipe stramineous, 20–80 cm, 3–7 mm in diam. at base, scales gradually sparser and smaller upward, upper stipe with small scales only. Lamina bipinnate to 5/6 of lamina, grayish green, adaxially darker, various in shape, narrowly deltoid on fully developed plants, up to 1.2 m × 70 cm, not contracted at base, acuminate; lamina on small fertile plants broadly oblong-lanceolate, ca. 40 × 12 cm, base obviously contracted, bipinnate only below middle part, sometimes lamina 1-pinnate and only basal pinnae shallowly pinnatifid to pinnatifid, acuminate; rachis stramineous, scaly on both surfaces; scales small, rachis with 1 or 2 proliferous bulbils toward tip, bulbils densely covered with brown scales. Pinnate pinnae lanceolate or oblong-lanceolate, up to 16 pairs on large lamina, up to 35 × 8 cm, stalks of pinnae up to 1 cm, long acuminate, lateral pinnules up to 16 pairs on small lamina, largest pinnae ca. 8 × 3 cm, stalks of pinnae only ca. 1 mm, shortly acuminate, lateral pinnules 2 or 3 pairs only; 1-pinnate lamina long and narrow, 45–50 × ca. 12 cm; lateral pinnae up to 20 pairs, falcate-lanceolate, upward curved, up to 8 × 1.8 cm, acroscopic base obtuse-auriculate, basiscopic side obliquely dimidiate, apex acuminate; basal pinnae pinnatifid, upper pinnae shallowly pinnatifid to only incised; costa green adaxially, stramineous abaxially, scales densely clustered at base, rarely with proliferous bulbils on upper rachis. Pinnules dimidiate, large pinnules falcate-lanceolate or falcate-rhombic, apices acuminate or long acuminate, upward curved, shallowly pinnatifid, with lobes acute or obtuse, or sparsely toothed, teeth angled upward, obtuse, and coarse; pinnules up to 7 × 1.5 cm, auricles deltoid, acute, basiscopic bases cuneate or curved, pinnules of small lamina ovate-rhombic, margins only shallowly incised or undulate, apex acute; auricles short, obtuse, or indistinct, basiscopic margins curved, basiscopic proximal half entire, basal basiscopic pinnules of all pinnae often smaller, basal acroscopic pinnules sometimes larger and sometimes smaller; microscales light brown, thinly membranous, subulate; frond texture thinly leathery; venation bipinnate on both pinnules and upper pinnae, indistinct on both sides, veins free, rarely forked. Sori terminal or abaxial on veins of pinnae, submedial, often in 1 row on each side of midrib, up to 5(–7) pairs, but often 2 rows on each side of midrib on larger pinnules of large lamina, 2–4 pairs on auricles; indusia brown when mature, small, shallowly lobed, easily falling off. Spores reniform in equatorial view; perispore sculpturing plicate or reticulate with spinules.

Streamsides in broad-leaved evergreen forests; 200–1900 m. Guangxi, Guizhou, Hainan, Hong Kong, S Hunan, Jiangxi, S Sichuan, Taiwan, Yunnan, Zhejiang [S India, S Japan (Yakushima), Sri Lanka, Thailand, Vietnam].

In FRPS (5(2): 19. 2001), this species is referred to as *Polystichum eximium* (Mettenius ex Kuhn) C. Christensen.

Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 24. 1997) argued that *Polystichum scariosum* has long been misidentified as *P. eximium* (Mettenius ex Kuhn) C. Christensen (= *P. anomalum* (Hooker & Arnott) J. Smith), a S Indian and Sri Lankan endemic. However, more studies are needed. Notably, there are several ploidy levels involved.

73. *Polystichum mucronifolium* (Blume) C. Presl, Epimel. Bot. 55. 1851.

南亚耳蕨 nan ya er jue

Aspidium mucronifolium Blume, Enum. Pl. Javae 2: 164. 1828; *A. aculeatum* (Linnaeus) Swartz var. *mucronifolium* (Blume) C. B. Clarke; *A. tacticopterum* Kunze; *Polystichum aculeatum* (Linnaeus) Roth ex Mertens var. *formosanum* Kodama; *P. aculeatum* var. *mucronifolium* (Blume) Beddome; *P. heteropaleaceum* N. C. Nair & K. Nag; *P. kodamae* Tagawa; *P. tacticopterum* (Kunze) T. Moore.

Plants evergreen. Rhizome erect or ascending, short, densely scaly; scales brown, filiform. Fronds 40–60 cm; stipe stramineous, 11–26 cm, 4–6 mm in diam. at base, densely covered with linear and lanceolate brown scales and larger scales; large scales dense, bicolorous, middle part blackish brown, margins brown, shiny, broadly ovate and broadly ovate-lanceolate, up to 30 × 10 mm, subentire, long acuminate. Lamina bipinnate, deltoid-ovate, 21–47 × 11–22 cm near basal part, not contracted toward base, acute or slightly acuminate; rachis without proliferous bulbils, densely covered with linear, lanceolate brown scales and larger scales; large scales dense, shiny, broadly ovate and broadly lanceolate, up to 10 × 6 mm, subentire, caudate. Pinnae 16–27 pairs, alternate, ascendant, shortly stalked, lanceolate, not contracted toward base or only basiscopic side slightly contracted, bases asymmetrical, apices acuminate; middle pinnae 1–1.9 cm apart, basal pairs 8–16 × 1.8–2.8 cm, 1-pinnate; costa scaly; scales brown, linear or lanceolate. Pinnules 13–25 pairs, alternate, shortly stalked, oblong, 0.7–1.1 cm × 3–4.6 mm, bases cuneate, acroscopic margins obtuse-toothed, apices acute and mucronate; bases with rounded auricles, basiscopic margins shallowly toothed, tips of teeth shortly spinulose, basal acroscopic pinnules largest, pinnatilobate; abaxially with few lanceolate microscales, adaxially subglabrous; frond texture thinly leathery; venation pinnate on pinnules, lateral veins 6–8 pairs, dichotomous, distinct. Sori (2 or) 3–5 pairs per pinnule, in 1 row on each side of midrib, terminal on veinlets, dark brown; indusia brown, membranous, irregularly toothed.

Forests, streamsides on brown soils; 1600–2400 m. Taiwan, Yunnan [Bhutan, NE and S India, N Myanmar, E Nepal, Sri Lanka, Thailand, Vietnam].

In FRPS (5(2): 55. 2001), this species was referred to as *Polystichum tacticopterum*. Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 37. 1997) placed it in *P.* sect. *Metapolystichum* Tagawa.

Polystichum mucronifolium can easily be distinguished from all other species by having rather large broadly ovate and bicolorous stipe scales with blackish brown middle part, ovate and brown rachis scales, and pinnules with acroscopic margins bluntly toothed.

74. *Polystichum biaristatum* (Blume) T. Moore, Index Fil. 86. 1858.

二尖耳蕨 er jian er jue

Aspidium biaristatum Blume, Enum. Pl. Javae 2: 164. 1828; *A. aculeatum* (Linnaeus) Swartz var. *biaristatum* (Blume) C. B. Clarke; *Polystichum aculeatum* (Linnaeus) Roth ex Mertens var. *biaristatum* (Blume) Beddome; *P. aculeatum* var. *durissimum* Rosenstock; *P. subapiciflorum* Hayata.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds up to 1 m; stipe stramineous, 50–58 cm, ca. 6 mm in diam. at base, with linear and lanceolate brown scales and larger scales; large scales denser on lower stipe, bicolorous, middle part blackish brown, margins brown, shiny, ovate-lanceolate, up to 21 × 10 mm, subentire, caudate. Lamina bipinnate, deltoid-oblong, 57–61 × 27–29 cm at middle, slightly contracted toward base, acute; rachis and costa without proliferous bulbils, densely covered with linear dark brown scales and subulate scales, subulate scale margins fimbriate. Pinnae 8–12 pairs, alternate, ascendant, shortly stalked, lanceolate, 12–14 × 2.5–2.8 cm, 1-pinnate, apices caudate-acuminate and fertile, not contracted toward base. Pinnules 14–18 pairs, alternate, shortly stalked, oblong, 1.5–2(–3) × 0.6–0.8 cm, cuneate, acute; auricles deltoid, shallowly obtusely toothed, basal acroscopic pinnules largest; abaxially with few lanceolate microscales, adaxially subglabrous; frond texture thinly leathery; venation pinnate on pinnules, lateral veins 5–8 pairs, dichotomous, distinct. Sori dark brown, 6–8 pairs per pinnule, in 1 row on each side of midrib, terminal on veinlets, abaxial pinnule surface with sori obviously concave; indusia brown, membranous, entire.

Wet places in forests; 1100–2200 m. Taiwan [Indonesia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand, Vietnam].

Polystichum biaristatum has been reported as being much more widely distributed due to misidentification.

This species has laminae acute, rachis scales linear and subulate and brown, pinnae approximate, pinnules 1.5–2(–3) cm and toothed, and microscales lanceolate.

75. *Polystichum oreodoxa* Ching ex H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 33: 309. 1995.

假半育耳蕨 jia ban yu er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 60–120 cm; stipe brown, 24–56 cm, 3–7 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate or ovate-lanceolate, up to 30 × 10 mm, subentire, caudate. Lamina bipinnate, oblong-ovate, 43–67 cm, lower part 11–42 cm wide, slightly contracted toward base, base fertile, apex acuminate, often sterile; rachis without proliferous bulbils, abaxially sparsely or densely scaly; scales brown (rarely blackish), lanceolate or linear, subentire or sparsely toothed, acuminate. Pinnae often 13–25 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate, bases not contracted, asymmetrical, apices attenuate; lower pinnae 7–25 × 1.8–3.8 cm, 1-pinnate; costa abaxially covered with linear light brown to

brown scales, scales of costa lanceolate. Pinnules 10–20 pairs, alternate, shortly stalked, oblong or falcate-oblong, 1–2.3 × 0.5–1 cm, cuneate, with rounded auricles acroscopically, entire to lobed, shortly aristate, acute; basal acroscopic pinnules largest, pinnatipartite; abaxially sparsely covered with shortly filiform microscales, adaxially glabrous; frond texture thinly leathery to papery; venation pinnate, lateral veins 5–10 pairs, dichotomous, distinct. Sori large, 6–8 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets; indusia present, spinulose-lacerate.

• Forests; 2000–2400 m. W Yunnan.

Polystichum oreodoxa is especially similar to *P. semifertile*, but its lamina apex is not cuspidate.

76. *Polystichum semifertile* (C. B. Clarke) Ching, Lingnan Sci. J. 15(3): 398. 1936.

半育耳蕨 ban yu er jue

Aspidium aculeatum (Linnaeus) Swartz var. *semifertile* C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 509. 1880; *Polystichum aculeatum* (Linnaeus) Roth ex Mertens var. *semifertile* (C. B. Clarke) Beddome; *P. nyalamense* Ching; *P. yunnanense* Christ var. *submuticum* C. Christensen.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 60–100 cm; stipe brown, 26–60 cm, 4–7 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate or ovate-lanceolate, up to 30 × 10 mm, subentire, caudate. Lamina bipinnate, oblong-ovate, 45–68 × 13–40 cm near base, lower part slightly contracted, fertile, apex abruptly narrowed, sterile; rachis without proliferous bulbils, abaxially sparsely or densely scaly; scales brown, lanceolate or linear, rachis scales of some individuals blackish, subentire or sparsely toothed, acuminate. Pinnae 14–25 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate, lower part not contracted, bases asymmetrical, apices caudate or acuminate; pinnae near lamina base 8–26 × 2–3.8 cm, 1-pinnate; costa abaxially covered with linear light brown to brown scales; scales of basal costa lanceolate. Pinnules 10–20 pairs, alternate, shortly stalked, deltoid or oblong, 1–2.3 × 0.5–1 cm, bases cuneate, with rounded auricles acroscopically, margins entire to lobed, spinulose, apices acute; basal acroscopic pinnules largest, pinnatipartite; abaxially sparsely covered with shortly filiform microscales; frond texture thinly leathery to papery; venation pinnate, lateral veins 5–10 pairs, dichotomous, relatively distinct. Sori large, 6–8 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets; indusia present, spinulose-lacerate. $2n = 82$.

Broad-leaved forests, mixed forests, mossy forests on montane slopes, valleys; 1000–3000 m. Sichuan (Shimian, Yanbian), Xizang (Médog, Nyalam) [India, Myanmar, Nepal, Thailand, Vietnam].

77. *Polystichum fugongense* Ching & W. M. Chu ex H. S. Kung & Li Bing Zhang, Acta Bot. Yunnan., Suppl. 5: 49. 1992.

福贡耳蕨 fu gong er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds up to 100 cm;

stipe brown, 35–45 cm, 5–7 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate or ovate-lanceolate, up to 30 × 10 mm, subentire, caudate. Lamina bipinnate, oblong-ovate, 60–70 × 24–40 cm near base, lower part slightly contracted, fertile, apex acute, fertile; rachis without proliferous bulbils, abaxially sparsely or densely scaly; scales brown or blackish brown, rarely black, lanceolate or linear, margins sparsely ciliate, apex acuminate. Pinnae 18–24 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate; pinnae of basal lamina 16–20 × 2.6–3.2 cm, not contracted toward base, bases asymmetrical, 1-pinnate, apices caudate; costa abaxially scaly; scales light brown to dark brown, linear or lanceolate, scales of basal costa lanceolate. Pinnules 21–30 pairs, alternate, shortly stalked, narrowly deltoid-ovate, 1–2 cm × 4–7 mm, bases cuneate, with deltoid auricles acroscopically, margins with acute teeth or lobed, spinulose, apices acute; basal acroscopic pinnules largest, pinnatifid to midrib; abaxially sparsely covered with shortly filiform micro-scales, adaxially glabrous; frond texture thickly papery; venation pinnate, lateral veins 5–10 pairs, dichotomous, relatively distinct. Sori 6–8 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets; indusia present, aristate-lacerate. $2n = 82^*$.

- Forests; 1300–2300 m. Yunnan.

Polystichum fugongense is similar to *P. semifertile*, but its lamina apex is fertile and its pinnules are narrowly deltoid-ovate.

78. *Polystichum longipinnulum* N. C. Nair, Amer. Fern J. 64: 15. 1974.

长羽耳蕨 chang yu er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 60–100 cm; stipe yellowish brown, 33–58 cm, ca. 5 mm in diam. at base, sparsely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate-lanceolate, up to 18 × 7 mm, subentire, caudate. Lamina bipinnate, deltoid-ovate, 40–77 cm, lower part 20–45 cm wide, base slightly contracted, 1 or 2 pairs of basal pinnae sterile, apex acute, fertile; rachis without proliferous bulbils, abaxially sparsely covered with linear dark brown scales. Pinnae often 11–14(–17) pairs, alternate, ascendant, shortly stalked, lanceolate, bases slightly contracted and asymmetrical, apices caudate, sterile; lower pinnae 16–22 × 3–4 cm, 1-pinnate; costa abaxially with scales similar to rachis scales. Pinnules 20–24(–30) pairs, alternate, shortly stalked, falcate-oblong, 1.3–2.6 cm × 5–9 mm, bases cuneate, with deltoid auricles acroscopically, apices acute and mucronate, margins shallowly toothed, tips of teeth spinulose, middle acroscopic pinnules largest; abaxially sparsely covered with shortly filiform microscales, adaxially subglabrous; frond texture thinly leathery to papery; venation pinnate, lateral veins 6–9 pairs, dichotomous, distinct. Sori 8–10 pairs per pinnule, in 1 row on each side of midrib, slightly close to midrib, terminal on veinlets; indusia present, entire.

Forests; 1100–1700 m. Yunnan (Jingdong, Yingjiang) [India, Myanmar, C Nepal, Thailand, Vietnam].

Polystichum longipinnulum is similar to *P. semifertile*, but its lamina apex is fertile, its rachis lacks lanceolate scales, and its pinnules are narrower and longer.

14. *Polystichum* sect. *Hypopeltis* (Michaux) T. Moore, Index Fil. 84. 1857.

后生耳蕨组 hou sheng er jue zu

Hypopeltis Michaux, Fl. Bor.-Amer. 2: 266. 1803; *Polystichum* sect. *Aculeata* Christ; *P. sect. Metapolystichum* Tagawa; *P. sect. Scleropolystichum* Daigobo.

Plants medium-sized to large, evergreen or summer-green, rarely small. Lamina papery or thinly papery, rarely thickly papery, bipinnate, not finely dissected. Rachis without proliferous bulbils. Pinnules stalked or sessile. Microscales narrow-type.

About 70 species: worldwide; 42 species (25 endemic) in China.

It is a dilemma in which section to place *Polystichum aculeatum*, the type of *P. sect. Hypopeltis*. *Polystichum aculeatum* evidently originated as a hybrid between *P. lonchitis* and *P. setiferum* (Forsskål) Moore ex Woynar. The chloroplast data place it in *P. sect. Metapolystichum*, but its hard spinules on the frond margins and its frond texture resemble those of *P. lonchitis*, which, as the type of *Polystichum*, belongs to *P. sect. Polystichum*. FRPS (5(2): 52. 2001) placed *P. aculeatum* in *P. sect. Scleropolystichum* (= *P. sect. Xiphopolystichum*) based on its hard spinules on the frond margins and its hard frond texture. Here, we place it in *P. sect. Metapolystichum* based on its overall morphology and its maternal origin. Therefore, the correct name for this section becomes *P. sect. Hypopeltis*, which is earlier (1857) than *P. sect. Metapolystichum* (1940).

The currently defined *Polystichum* sect. *Hypopeltis* is possibly not monophyletic. The delimitation between *P. sect. Hypopeltis* and *P. sect. Sorolepidium* is not clear because there are polyploids in both sections that are intersectional hybrids. Some alpine species may need to be moved to *P. sect. Sorolepidium*.

The Chinese species of *Polystichum* sect. *Hypopeltis* can be divided into six series based on morphology.

- 1a. Plants evergreen; pinnae leathery, stiff, with hard spinules on margin (1. *P. ser. Hypopeltis*) 79. *P. aculeatum*
- 1b. Plants evergreen or summer-green; pinnae thinly papery, papery or thickly papery, not stiff, with soft spinules or without spinules on margin.
 - 2a. Microscales shorter than 0.6 mm (short-type).
 - 3a. Veins clavate and unusually swollen at ends (hydathodes) (3. *P. ser. Exauricula*) 98. *P. punctiferum*
 - 3b. Veins linear and not unusually swollen at ends.
 - 4a. Stipe with only linear and linear-lanceolate scales (5. *P. ser. Linearia*).

- 5a. Lower pinnae contracted toward lamina base; pinnules ca. 0.5 cm, nearly leathery 106. *P. tangmaiense*
- 5b. Lower pinnae not or slightly contracted toward lamina base; pinnules longer than 0.6 cm, papery.
- 6a. Lamina often 20(10–35) cm wide; pinnules with obvious aristate spinules on margin; rachis scales dark brown, linear and straight; apex of lamina often sterile; indusia lacerate 107. *P. discretum*
- 6b. Lamina often 10(<20) cm wide; pinnules with or without obvious aristate spinules on margin; rachis scales brown, linear and tortuous.
- 7a. Lamina oblong-lanceolate, ratio of length to width ca. 4; rachis scales sparse; pinnae strongly curved upward, caudate; lower basal pinnules of lower pinnae not contracted; sori in 1 or 1.5 rows per pinnule; indusia entire or almost entire 108. *P. oligocarpum*
- 7b. Lamina deltoid or broadly lanceolate, ratio of length to width ca. 2.3(–3.5); rachis scales dense; pinnae not or slightly curved upward, acute or acuminate; lower basal pinnules of lower pinnae contracted; sori in 2 rows per pinnule; indusia lacerate 109. *P. weimingii*
- 4b. Stipe with ovate, ovate-lanceolate, or broadly lanceolate scales (6. *P. ser. Makinoiana*).
- 8a. Rachis scales bicolorous: brown and blackish brown.
- 9a. Except rachis base, rachis without ovate-lanceolate scales; pinnules falcate-deltoid.
- 10a. Pinnules with open spinules; indusia shallowly toothed 110. *P. makinoi*
- 10b. Pinnules with forward-pointing spinules; indusia entire 111. *P. otomasui*
- 9b. Rachis with ovate-lanceolate scales.
- 11a. Lamina deltoid-lanceolate; pinnule falcate-deltoid; microscales lanceolate (broad-type) 112. *P. parvifoliolatum*
- 11b. Lamina oblong-lanceolate or elliptic; pinnule oblong or deltoid-ovate; microscales linear (narrow-type).
- 12a. Lamina oblong-lanceolate, ratio of length to width ca. 3:1; pinnae acuminate or acute, basalmost 1 or 2 pairs often sterile; pinnules oblong, acroscopic margins nearly not toothed but with long or short spinules; microscales dense abaxially 113. *P. piceopaleaceum*
- 12b. Lamina elliptic, ratio of length to width ca. 2.5:1; pinnae often caudate, basalmost 1 or 2 pairs often fertile; pinnules deltoid-ovate, acroscopic margins shallowly toothed or dissected halfway to midrib and with long spinules; microscales sparse abaxially 114. *P. yunnanense*
- 8b. Rachis scales concolorous.
- 13a. Sori marginal.
- 14a. Lamina deltoid-lanceolate; rachis scales linear and subulate; pinnules falcate-deltoid, acuminate at apex, auricles deltoid; indusia erose 115. *P. acutipinnulum*
- 14b. Lamina deltoid-ovate; rachis scales lanceolate and linear; pinnules oblong or oblong-ovate, obtuse at apex, auricles rounded.
- 15a. Whole lamina fertile; acroscopic margins of pinnules without or rarely with few short spinules; indusia entire 116. *P. pseudomakinoi*
- 15b. Only upper part of lamina fertile; acroscopic margins of pinnules with few short spinules; indusia irregularly lacerate 117. *P. shimurae*
- 13b. Sori medial or close to midrib.
- 16a. Nearly whole rachis with ovate-lanceolate scales; pinnules long spinulose on margin.
- 17a. Microscales long filiform, obviously present on adaxial surface of pinnules; acroscopic margins of pinnules shallowly toothed or incised, basal acroscopic pinnules prolonged and pinnatifid; indusia entire 118. *P. huae*
- 17b. Microscales shortly filiform, few or absent on adaxial surface of pinnules; acroscopic margins of subentire, basal acroscopic pinnules prolonged but not pinnatifid; indusia erose 119. *P. longiaristatum*
- 16b. Rachis without or only lower part with ovate-lanceolate scales; pinnules shortly spinulose on margin.
- 18a. Plants up to 80 cm tall; rachis scales not regularly reflexed 110. *P. makinoi*
- 18b. Plants up to 100 cm tall; rachis scales regularly reflexed 120. *P. subulatum*
- 2b. Microscales longer than 1 mm (long-type).
- 19a. Plants summer-green, lamina thinly papery, yellowish green, narrowly lanceolate or narrowly elliptic-lanceolate, rarely broadly deltoid-lanceolate (*P. bakerianum*, *P. rufopaleaceum*, *P. sinense*); stipe stramineous or brown when dry; pinnules or free lobes fewer than 6(–10) pairs (up to 15 pairs in *P. bakerianum*, *P. rufopaleaceum*, and *P. sinense*), sessile (2. *P. ser. Sinensia*).
- 20a. Pinnae or lobes obviously aristate-spinulose.
- 21a. Stipe brown or dark brown.
- 22a. Stipe brown; lamina oblanceolate 83. *P. bomiense*
- 22b. Stipe dark brown; lamina lanceolate or elliptic 84. *P. tibeticum*
- 21b. Stipe stramineous.
- 23a. Stipe and rachis scales bicolorous: brown with blackish brown centers 80. *P. pseudocastaneum*

- 23b. Stipe and rachis with brown scales only.
 24a. Middle pinnae 1.5–2 cm, not falcate 81. *P. prescottianum*
 24b. Middle pinnae 3–3.5 cm, slightly falcate 82. *P. yadongense*
- 20b. Pinnae or lobes only crenate to serrulate.
 25a. Stipe scales bicolorous: brown and blackish brown.
 26a. Stipe brown at lower part; pinnae obtuse or acute at apex 91. *P. saxicola*
 26b. Stipe stramineous.
 27a. Lamina bipinnate; large bicolorous scales ovate 92. *P. kangdingense*
 27b. Lamina bipinnatipartite; large bicolorous scales lanceolate.
 28a. Pinnae 26–32 pairs; lobes narrowly ovate or lanceolate 93. *P. frigidicola*
 28b. Pinnae 12–24 pairs; lobes obliquely oblong or rhombic-ovate 94. *P. submite*
- 25b. Stipe scales concolorous: brown or dark brown.
 29a. Stipe brown at least at lower part.
 30a. Pinnae deltoid-lanceolate, ratio of length to width ca. 2; lobes fewer than 4 pairs 85. *P. qamdoense*
 30b. Pinnae lanceolate, ratio of length to width 3 or larger; lobes 8–12 pairs 86. *P. gongboense*
- 29b. Stipe stramineous, sometimes brownish at base.
 31a. Lamina wider than 18 cm at middle; middle pinnae with 12 or more pairs of pinnules;
 stipe scales reddish brown or brown.
 32a. Stipe base with broadly lanceolate scales; pinnules with open teeth; sori indusiate 87. *P. bakerianum*
 32b. Stipe base with ovate scales; pinnules with forward-pointing teeth; sori exindusiate 88. *P. rufopaleaceum*
 31b. Lamina narrower than 14 cm at middle; middle pinnae with fewer than 10 pairs of
 pinnules or lobes; stipe scales yellowish brown or light brown.
 33a. Stipe with ovate scales; lamina papery; rachis with broadly lanceolate or narrowly ovate scales 89. *P. sinense*
 33b. Stipe scales lanceolate; lamina thinly papery; rachis with linear or filiform scales 90. *P. mollissimum*
- 19b. Plants evergreen or rarely summer-green (*P. braunii*); lamina green, broadly lanceolate, broadly
 deltoid-lanceolate, or broadly elliptic-lanceolate; stipe greenish when dry; pinnules 10–30 pairs, stalked.
 34a. Rachis scales broadly ovate to ovate-lanceolate; pinnules of upper pinnae exauriculate (3. *P. ser.*
Exauricula).
 35a. Large rachis scales relatively sparse, blackish brown to dark brown; stipe scales relatively sparse;
 lamina sterile at apex; sori indusiate 97. *P. pianmaense*
 35b. Large rachis scales dense, light brown to brown; stipe scales dense; lamina fertile at apex;
 sori exindusiate.
 36a. Stipe scales brown 95. *P. longipaleatum*
 36b. Stipe scales bicolorous: brown with blackish brown centers 96. *P. nudisorum*
- 34b. Rachis scales various forms; pinnules of upper pinnae obviously auriculate (4. *P. ser. Brauniana*).
 37a. Stipe (at least stipe base) with blackish brown scales; rachis scales light brown.
 38a. Sori medial or close to midrib 99. *P. braunii*
 38b. Sori marginal 100. *P. ningshenense*
- 37b. Stipe without blackish brown scales; rachis scales grayish brown.
 39a. Rachis scales obviously reflexed 101. *P. retrosopaleaceum*
 39b. Rachis scales not reflexed.
 40a. Rachis scales narrowly lanceolate or linear; sori medial or nearly marginal 102. *P. polyblepharum*
 40b. Rachis (at least lower part of rachis) with ovate and ovate-lanceolate scales; sori medial,
 marginal, submarginal, or close to midrib.
 41a. Lamina normally shorter than 45 cm; scales of upper part of rachis narrowly lanceolate;
 pinnules normally shorter than 1 cm 103. *P. parvipinnulum*
 41b. Lamina normally longer than 50 cm; upper part of rachis also with ovate and
 ovate-lanceolate scales; pinnules up to 1.5 cm.
 42a. Lamina oblong-lanceolate, ratio of length to width ca. 4; rachis scales caudate; pinnules
 narrowly deltoid, with numerous microscales adaxially 104. *P. sozanense*
 42b. Lamina elliptic-lanceolate, ratio of length to width ca. 2.4; rachis scales acuminate;
 pinnules oblong, with few microscales adaxially 105. *P. ovatopaleaceum*

1. *Polystichum* ser. *Hypopeltis*

后生耳蕨系 hou sheng er jue xi

Plants medium-sized, evergreen. Lamina leathery, stiff, with hard spinules on margin.

One species: Europe and SW Asia.

79. *Polystichum aculeatum* (Linnaeus) Roth ex Mertens, Tent. Fl. Germ. 3(1): 79. 1799.

欧洲耳蕨 ou zhou er jue

Polypodium aculeatum Linnaeus, Sp. Pl. 2: 1090. 1753; *Aspidium aculeatum* (Linnaeus) Swartz; *A. lobatum* (Hudson) Swartz; *P. lobatum* Hudson; *Polystichum lobatum* (Hudson) C. Presl.

Plants evergreen. Rhizome erect, densely covered with broadly lanceolate brown scales. Fronds ca. 60 cm; stipe amber, ca. 12 cm, ca. 5 mm in diam. at base, densely scaly; scales brown, ovate and lanceolate. Lamina bipinnate, broadly oblanceolate, ca. 60 × 12 cm, slightly contracted toward base, acuminate;

rachis without proliferous bulbils, scaly on both surfaces, scales lanceolate and linear, margins ciliate. Pinnae ca. 38 pairs, alternate, slightly ascendant, linear-lanceolate, middle pairs 6–7 × ca. 1.5 cm, obliquely broadly cuneate or nearly rounded, shortly stalked, pinnate, acuminate. Pinnules 8–12 pairs, alternate, slightly ascendant, approximate, obliquely oblong, acroscopic bases indistinctly auriculate, obliquely cuneate, margins with small spinulose forward-pointing teeth, apices acute and spinulose; basal acroscopic pinnules largest, 1–1.5 cm × 4–6 mm; abaxially scaly; microscales filiform, strongly ciliate at base; frond texture leathery; venation pinnate on pinnules, indistinct. Sori in 1 row on each side of midrib; indusia present, entire or incised.

Picea forests; ca. 1900 m. Xinjiang (Yili) [W Asia, Europe].

2. *Polystichum* ser. *Sinensia* H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 36: 244. 1998.

中华耳蕨系 zhong hua er jue xi

Plants small to medium-sized, summer-green. Lamina yellowish green, narrowly lanceolate, narrowly elliptic-lanceolate, rarely broadly deltoid-lanceolate, thinly papery. Stipe stramineous or brown when dry. Pinnules or free lobes fewer than 6(–10) pairs (rarely up to 15 pairs), sessile. Microscales long-type.

About 18 species: mainly in montane to alpine habitats in the Sino-Himalayan region, one species reaching Africa; 15 species (12 endemic) in China.

80. *Polystichum pseudocastaneum* Ching & S. K. Wu, Fl. Xizang. 1: 222. 1983.

拟栗鳞耳蕨 ni li lin er jue

Polystichum brunneum Ching & S. K. Wu.

Plants summer-green. Rhizome erect, covered with broadly lanceolate dark brown scales. Fronds 25–45 cm; stipe stramineous, 6–12 cm, 3–4 mm in diam. at base, lower part persistent, densely scaly; scales light brown, lanceolate and linear, sometimes gradually sparser toward lamina apex, and mixed with ovate scales, middle of scales dark brown. Lamina bipinnatifid, oblanceolate, 22–40 × 2.5–5.2 cm, gradually contracted at base, acuminate; rachis without proliferous bulbils, both surfaces covered with scales; scales light brown, linear and hairlike, abaxially mixed with lanceolate purplish brown scales. Pinnae 26–30 pairs, alternate, attached at right angles to rachis, nearly approximate, sessile, narrowly deltoid-ovate or deltoid-ovate, middle pairs 1.4–3.5 cm × 6–10 mm, bases slightly auriculate acroscopically and basiscopically, pinnatifid to or nearly to pinna rachis, apices acuminate or obtuse, aristate. Lobes 4–6 pairs, nearly opposite, slightly ascendant, nearly approximate, oblong, apices acute or obtuse and aristate, margins with small teeth, tips of teeth aristate; microscales on abaxial surface light brown, linear and filiform; microscales on adaxial surface light brown, hairlike; frond texture papery; venation pinnate on lobes, distinct abaxially, indistinct adaxially. Sori on upper pinnae, 1–4 per lobe, sometimes in 1 row on each side of pinna rachis; indusia present, subentire.

• *Abies* and *Betula* forests; 3500–3800 m. S Xizang (Gyirong, Nyalam).

81. *Polystichum prescottianum* (Wallich ex Mettenius) T. Moore, Index Fil. 101. 1858.

芒刺高山耳蕨 mang ci gao shan er jue

Aspidium prescottianum Wallich ex Mettenius, Abh. Senckenberg. Naturf. Ges. 2: 332. Aug 1858; *Polystichum erinaceum* Ching & S. K. Wu.

Plants summer-green. Rhizome erect, covered with broadly lanceolate dark brown scales. Fronds 30–40 cm; stipe 8–12 cm, ca. 3 mm in diam. at base, lower part persistent, stramineous, scaly; scales light brown, ovate, lanceolate, and linear. Lamina bipinnatifid, oblanceolate, 28–38 × 3–4 cm, gradually contracted toward base, acuminate; rachis without proliferous bulbils, adaxially covered with scales; scales light brown, lanceolate and hairlike. Pinnae 30–32 pairs, alternate, attached at right angles to rachis, hardly approximate, sessile, narrowly deltoid-ovate or deltoid-ovate, middle pairs 1.5–2 cm × 8–9 mm, bases slightly auriculate acroscopically and basiscopically, pinnatifid to or nearly to pinna rachis, apices acuminate or obtuse, aristate. Lobes 4–6 pairs, nearly opposite, slightly ascendant, hardly approximate, oblong, apices acuminate or obtuse, margins with small teeth, tips of teeth aristate; microscales on abaxial surface light brown, linear and filiform; microscales on adaxial surface sparse, brown, hairlike; frond texture papery; venation pinnate on lobes, indistinct abaxially, somewhat distinct adaxially. Sori on upper pinnae, often in 1 row on each side of pinna rachis; indusia present, subentire.

Alpine meadows, *Abies* forests; 3300–3900 m (in Xizang). Taiwan, Xizang (Cona, Nyalam) [Afghanistan, Bhutan, N India, Nepal].

Polystichum prescottianum is common in the Himalaya.

82. *Polystichum yadongense* Ching & S. K. Wu, Fl. Xizang. 1: 220. 1983.

亚东耳蕨 ya dong er jue

Plants summer-green. Rhizome unknown. Fronds ca. 50 cm; stipe stramineous, 10–17 cm, ca. 4 mm in diam. at base, scaly; scales light brown, ovate, lanceolate, and linear. Lamina bipinnatifid, oblanceolate, 38–40 × 6–7 cm, gradually contracted toward base, acuminate; rachis without proliferous bulbils, both surfaces densely covered with scales; scales light brown, lanceolate and linear. Pinnae 26–30 pairs, alternate, attached at right angles to rachis, nearly approximate, sessile, oblong-lanceolate, slightly curved upward and falcate, middle pinnae 3–3.5 × 1–1.4 cm, broadly cuneate, pinnatifid to pinna rachis, acuminate and aristate. Lobes 5–7 pairs, alternate, slightly ascendant, nearly approximate, oblong, apex acuminate, aristate, margins coarsely toothed, tips of teeth aristate; abaxially scaly, adaxially with few linear light brown scales; microscales light brown, lanceolate and filiform; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori on upper pinnae, often in 1 row on each side of pinna rachis, sometimes 2–4 on basiscopic pinnae; indusia present, subentire.

- Riverbanks; ca. 3800 m. Xizang (Yatung).

83. *Polystichum bomiense* Ching & S. K. Wu, Fl. Xizang. 1: 223. 1983.

波密耳蕨 *bo mi er jue*

Plants summer-green. Rhizome unknown. Fronds ca. 40 cm; stipe brown, longer than 8 cm, densely scaly; scales light brown, lanceolate and linear, mixed with few ovate brown scales. Lamina oblanceolate, 25–38 × 5–6 cm, gradually contracted toward base, bipinnatifid, acuminate; rachis without proliferous bulbils, lower part reddish brown, both surfaces covered with scales; scales light brown, lanceolate and linear, abaxially sparsely mixed with lanceolate brown scales. Pinnae 28–30 pairs, alternate, attached at right angles to rachis, nearly approximate, sessile, narrowly deltoid-ovate, sometimes slightly curved upward and falcate, middle pinnae 2.5–3 × 1.2–1.4 cm, bases broadly cuneate or truncate, auriculate acroscopically, pinnatifid to pinna rachis, apices obtuse and aristate. Lobes 5–7 pairs, alternate, slightly ascendant, approximate, oblong, apex rounded and aristate, acroscopic margins with obtuse teeth, teeth aristate at tip; microscales on abaxial surface light brown, linear and filiform; microscales on adaxial surface light brown, hairlike; frond texture papery; venation pinnate on lobes, distinct on both surfaces. Sori on upper pinnae, 1–4 per lobe; indusia present, incised.

- Forest margins; ca. 4000 m. Xizang (Bomi).

84. *Polystichum tibeticum* Ching, Fl. Xizang. 1: 219. 1983.

西藏耳蕨 *xi zang er jue*

Plants summer-green. Rhizome erect, covered with broadly lanceolate purple brown scales. Fronds ca. 40 cm; stipe purplish brown, 10–12 cm, ca. 3 mm in diam. at base, lower part persistent, densely scaly; scales brown, purple brown at middle, margins brown, lanceolate and linear, mixed with ovate scales. Lamina bipinnatifid, lanceolate to narrowly elliptic, 30–35 × 4.5–6 cm, gradually contracted toward base, acuminate; rachis without proliferous bulbils, purplish brown, adaxially densely scaly; scales light brown, linear; abaxially covered with linear

light brown scales and lanceolate scales, purplish brown at middle, margins brown. Pinnae 26–30 pairs, alternate, attached at right angles to rachis or slightly ascendant, approximate by distance as wide as pinna width, sessile, linear-lanceolate or narrowly deltoid-ovate, middle pairs 2.2–3.2 cm × 7–9 mm, bases broadly cuneate or rounded-cuneate, sometimes auriculate acroscopically, pinnatifid to or nearly to pinna rachis, apices acuminate. Lobes 6–9 pairs, nearly opposite, slightly ascendant, oblong or deltoid-ovate, apices acute and aristate, upper margins with small teeth, teeth aristate at tip; microscales on abaxial surface light brown, narrowly lanceolate and filiform; microscales on adaxial surface light brown, hairlike; frond texture papery; venation pinnate on lobes, indistinct abaxially, distinct adaxially. Sori on upper pinnae, 1 row on each side of pinna rachis; indusia present, subentire.

- *Abies* forests; 3600–4000 m. Xizang (Bomi, Nyingchi).

85. *Polystichum qamdoense* Ching & S. K. Wu, Fl. Xizang. 1: 227. 1983.

昌都耳蕨 *chang du er jue*

Polystichum qamdoense var. *elongatum* Ching & S. K. Wu; *P. tumbatzense* Ching.

Plants summer-green. Rhizome erect, densely covered with broadly lanceolate brown scales. Fronds 30–40 cm; stipe brown, 8–13 cm, ca. 2 mm in diam. at base, lower part persistent, scaly; scales brown, ovate and linear, gradually sparser toward lamina apex. Lamina bipinnatifid, lanceolate, 24–30 × 3–4 cm, gradually contracted to base, acuminate; rachis without proliferous bulbils, stramineous, lower part often brown, adaxially scaly; scales brown, lanceolate and linear. Pinnae 24–30 pairs, alternate, attached at right angles to rachis, sessile, deltoid-lanceolate, middle pairs 1.5–2 cm × 8–10 mm, bases oblique and nearly truncate, auriculate acroscopically, pinnatifid, apices acute. Lobes 3 or 4 (or 5) pairs, nearly opposite, slightly ascendant, approximate, oblong or obovate; abaxially with long-filiform microscales, distal margins toothed; frond texture papery; venation pinnate on lobes, flat abaxially, slightly raised adaxially. Sori in 1 row on each side of midrib of pinna; indusia present, toothed.

- Alpine coniferous forests, meadows; 3000–4200 m. Gansu, W Sichuan, E and SE Xizang, NW Yunnan.

The relationships between *Polystichum qamdoense* and *P. sinense* are unclear.

86. *Polystichum gongboense* Ching & S. K. Wu, Fl. Xizang. 1: 228. 1983.

工布耳蕨 *gong bu er jue*

Polystichum rarum Ching & S. K. Wu.

Plants summer-green. Rhizome erect, densely covered with narrowly lanceolate dark brown scales. Fronds 30–60 cm; stipe 14–24 cm, 3–4 mm in diam. at base, whole stipe or at least lower part brown, shiny, scaly; scales brown, ovate and linear, gradually sparser toward lamina apex. Lamina bipinnatifid or bipinnate, broadly oblanceolate or narrowly obovate, 30–46 × 8–12 cm, contracted at base, acuminate; rachis without pro-

liferous bulbils, stramineous, sometimes lower part brown, scaly on both surfaces; scales brown, lanceolate and linear. Pinnae 26–32 pairs, alternate, attached at right angles to rachis, sessile, lanceolate or linear-lanceolate, middle pairs $4-6 \times 1-15$ cm, bases oblique and nearly truncate, auriculate acroscopically, pinnatipartite or middle pinnae pinnate, apices acuminate. Lobes 8–12 pairs, nearly opposite, slightly ascendant, overlapping or nearly approximate, obliquely oblong or rhombic-ovate, $5-8 \times 3-4$ mm, bases obliquely cuneate and \pm decurrent to pinna rachis, with acute teeth on both sides, apices acute; abaxially with long-filiform microscales, adaxially subglabrous; frond texture papery; venation pinnate on lobes, distinct on both surfaces. Sori in 1 row on each side of midrib of lobe; indusia present, incised.

• Alpine shrubs, coniferous forests, meadows; 2500–4200 m. NW Hubei (Shennongjia), W Sichuan, S and SE Xizang, NW Yunnan.

It is possible that *Polystichum gongboense* is conspecific with *P. sinense*.

87. *Polystichum bakerianum* (Atkinson ex C. B. Clarke) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 191. 1899.

薄叶耳蕨 bao ye er jue

Aspidium prescottianum Wallich ex Mettenius var. *bakerianum* Atkinson ex C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 510. 1880 [“*Bakeriana*”]; *A. bakerianum* (Atkinson ex C. B. Clarke) Atkinson ex Baker; *Polystichum prescottianum* (Wallich ex Mettenius) T. Moore var. *bakerianum* (Atkinson ex C. B. Clarke) Beddome.

Plants summer-green. Rhizome erect or ascending, densely covered with lanceolate reddish brown scales. Fronds 60–80 cm; stipe stramineous, 24–35 cm, 4–5 mm in diam. at base, densely scaly; scales reddish brown, lanceolate and linear, lower part of stipe mixed with lanceolate large scales. Lamina bipinnate, narrowly lanceolate or narrowly elliptic, $60-72 \times 18-24$ cm, slightly contracted toward base, acuminate; rachis without proliferous bulbils, stramineous, both surfaces densely scaly; scales brown, linear and filiform. Pinnae 28–40 pairs, alternate, attached at nearly right angles to rachis, shortly stalked, linear-lanceolate, middle pairs $9-12 \times 1.8-2.5$ cm, bases obliquely broadly cuneate or nearly truncate, auriculate acroscopically, pinnate, apices long acuminate. Pinnules 16–20 pairs, nearly opposite, slightly ascendant, obliquely oblong or ovate, $0.8-1.4 \text{ cm} \times 5-6 \text{ mm}$, bases obliquely cuneate, auriculate acroscopically, margins with acute large teeth or pinnatilobate, apices obtuse or acute; filiform microscales on abaxial surface denser than on adaxial surface; frond texture thinly papery; venation pinnate, distinct on both surfaces. Sori in 1 row on each side of pinnule midrib; indusia present, toothed.

Alpine coniferous forests, alpine *Quercus* forests, meadows; 2900–4000 m. W Sichuan, S and SE Xizang, NW Yunnan [Bhutan, N India, Kashmir, Nepal, Pakistan].

88. *Polystichum rufopaleaceum* Ching ex Li Bing Zhang & H. S. Kung, Acta Phytotax. Sin. 36: 246. 1998.

红鳞耳蕨 hong lin er jue

Plants summer-green. Rhizome erect or ascending,

densely covered with lanceolate reddish brown scales. Fronds 40–70 cm; stipe stramineous, 22–34 cm, 4–5 mm in diam. at base, lower part often persistent, densely scaly; scales reddish brown, lanceolate and linear, lower part of stipe with larger ovate reddish brown scales. Lamina bipinnate, narrowly ovate or narrowly elliptic, $32-60 \times 18-26$ cm, slightly contracted toward base, acuminate; rachis without proliferous bulbils, stramineous, both surfaces densely scaly; scales reddish brown, lanceolate and linear. Pinnae 20–25 pairs, alternate, attached at nearly right angles to rachis, shortly stalked, linear-lanceolate, slightly ascendant, middle pairs $8-15 \times 2-2.5$ cm, bases obliquely broadly cuneate, auriculate acroscopically, pinnate, apices long acuminate and sometimes caudate. Pinnules 14–20 pairs, nearly opposite, slightly ascendant, obliquely oblong, $1-1.8 \text{ cm} \times 5-8 \text{ mm}$, bases obliquely cuneate, auriculate acroscopically, margins with acute small teeth, apices acute; pinnules of basal acroscopic pinnae largest and often pinnatilobate; filiform microscales on abaxial surface denser than on adaxial surface; frond texture papery; venation pinnate, abaxially distinct. Sori in 1 row on each side of pinnule midrib, exindusiate.

• Broad-leaved forests, alpine coniferous forests, forest margins; 2400–3500 m. W Sichuan (Luding, Shimian), SE Xizang (Zayü), NW and W Yunnan.

Polystichum rufopaleaceum is similar to the Japanese species *P. microchlamys* (Christ) Matsumura, but its lower pinnae are not contracted, its scales are reddish brown, and its sori are exindusiate.

Polystichum microchlamys sensu S. K. Wu & X. Chen (Vasc. Pl. Hengduan Mts. 1: 139. 1993) should be treated as this species.

89. *Polystichum sinense* (Christ) Christ, Bull. Soc. Bot. France 52(Mém. 1): 30. 1905.

中华耳蕨 zhong hua er jue

Aspidium prescottianum Wallich ex Mettenius var. *sinense* Christ, Boll. Soc. Bot. Ital. 10: 289. 1901; *Polystichum alatawshanicum* Chang Y. Yang; *P. atuntzeense* Ching; *P. austrotibeticum* Ching & S. K. Wu; *P. decorum* Ching & S. K. Wu; *P. ellipticum* Ching & S. K. Wu; *P. fukuyamae* Tagawa; *P. lhasaense* Ching; *P. parasinense* Chang Y. Yang; *P. wilsonii* Christ; *P. prescottianum* (Wallich ex Mettenius) T. Moore var. *wilsonii* (Christ) C. Christensen; *P. sinense* var. *lobatum* H. S. Kung.

Plants summer-green. Rhizome erect, densely covered with lanceolate brown scales. Fronds 20–70 cm; stipe stramineous, 5–34 cm, 2–5 mm in diam. at base, densely scaly; scales brown, ovate, lanceolate, and linear. Lamina bipinnatipartite or rarely bipinnate, narrowly elliptic or lanceolate, $25-58 \times 4-14$ cm, slightly contracted toward base, acuminate; rachis without proliferous bulbils, stramineous, both surfaces covered with linear brown scales, abaxially mixed with broadly lanceolate to narrowly ovate scales. Pinnae 24–32 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, middle pairs $2.5-7 \times 0.6-2$ cm, bases oblique and nearly truncate, auriculate acroscopically, pinnatipartite to pinna rachis, apices acuminate. Lobes 7–14 pairs, nearly opposite, slightly ascendant, obliquely ovate or obliquely oblong, $4-12 \times 2-5$ mm, bases obliquely cuneate and decurrent to pinna rachis, slightly auriculate acroscopically, margins with acute forward-pointing teeth, apices acuminate;

both surfaces covered with filiform microscales, microscales on abaxial surface denser; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori in 1 row on each side of midrib of lobe; indusia present, incised.

Alpine coniferous forests, meadows; 2500–4000 m. S Gansu (Minxian, Xigu), Qinghai (Yushu), Shaanxi, W Sichuan, Taiwan, Xinjiang (Urumqi), S Xizang, NW Yunnan [Bhutan, NW India, Kashmir, Nepal, Pakistan, ?Africa].

Polystichum sinense is often referred to *P. wilsonii*, a heterotypic synonym of *P. sinense*, by various authors. *Polystichum sinense* (Christ) Christ (1905) obviously has priority over *P. wilsonii* Christ (1911).

90. *Polystichum mollissimum* Ching, Fl. Xizang. 1: 232. 1983.

毛叶耳蕨 mao ye er jue

Polystichum mediocre Ching & S. K. Wu; *P. mollissimum* var. *laciniatum* H. S. Kung & Li Bing Zhang.

Plants summer-green. Rhizome erect, densely covered with lanceolate brown scales. Fronds 8–20 cm; stipe stramineous, 2–8 cm, ca. 2 mm in diam. at base, lower part persistent, densely scaly; scales yellowish brown or brown, lanceolate and linear. Lamina bipinnatifid, lanceolate, 7–18 × 1.5–3.5 cm, slightly contracted toward base, acuminate; rachis without proliferous bulbils, stramineous, both surfaces densely covered with linear scales. Pinnae 11–24 pairs, alternate, slightly ascendant or attached at right angles to rachis, sessile, lanceolate, middle pairs 0.8–2 cm × 4–8 mm, bases obliquely broadly cuneate, auriculate acroscopically, pinnatifid nearly to pinna rachis, apices acute. Lobes 3–6 pairs, nearly opposite, slightly ascendant, obliquely oblong, 1–3 × 0.5–1.5 cm, with forward-pointing teeth, acute; both surfaces covered with filiform microscales, microscales on abaxial surface denser; frond texture thinly papery; venation pinnate on lobes, indistinct on both surfaces. Sori in 1 row on each side of costa or midrib of lobe; indusia present, obtusely toothed.

• Alpine shrubs, dark coniferous forests, alpine meadows; 2600–3700 m. E Gansu (Xinglong Shan), Hebei (Xiaowutai Shan), Nei Mongol (Daqing Shan), Qinghai (Dongdu), Shaanxi (Taibai Shan), Shanxi (Huoxian, Ningwu), W Sichuan, Xizang (Banbar, Bomi), NW Yunnan.

91. *Polystichum saxicola* Ching ex H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 36: 250. 1998.

石生耳蕨 shi sheng er jue

Plants summer-green. Rhizome unknown. Fronds ca. 35 cm; stipe yellowish brown in lower part, ca. 18 cm, ca. 2 mm in diam. at base, scaly; scales ovate and linear, base of stipe covered with lanceolate scales, center of scales blackish brown, margins brown. Lamina bipinnatifid, oblanceolate, ca. 34 × 8 cm, slightly contracted toward base, acuminate; rachis without proliferous bulbils, stramineous, both surfaces covered with linear scales, abaxially mixed with lanceolate scales. Pinnae 24 pairs, alternate, attached at right angles to rachis, shortly stalked, oblong-lanceolate, middle pairs 3.5–4 × ca. 2 cm, bases oblique and nearly truncate, auriculate acroscopically, pinnatifid, apices obtuse or acute. Lobes 6 or 7 pairs, alternate, ascendant, obliquely oblong, 0.8–1 cm × 4–5 mm, bases obliquely cuneate and decurrent to costa forming narrow wings,

apices rounded; auricles inconspicuous, serrulate, abaxially covered with filiform microscales, adaxially glabrous; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori in 1 row on each side of midrib of lobe; indusia present, incised.

• Alpine meadows, rock crevices; ca. 3100 m. Sichuan (Emei Shan).

92. *Polystichum kangdingense* H. S. Kung & Li Bing Zhang ex Li Bing Zhang, Phytotaxa 60: 58. 2012.

康定耳蕨 kang ding er jue

Plants summer-green. Rhizome erect, densely covered with lanceolate brown scales. Fronds 35–60 cm; stipe stramineous, 14–28 cm, 3–4 mm in diam. at base, densely scaly; scales brown, lanceolate and linear, mixed with larger scales; large scales ovate, blackish brown at middle, margins brown. Lamina bipinnate, broadly lanceolate, 35–54 × 8–14 cm, slightly contracted toward base, acuminate; rachis without proliferous bulbils, stramineous, both surfaces densely covered with lanceolate and linear scales, abaxially mixed with ovate scales. Pinnae 20–30 pairs, alternate, attached at nearly right angles to rachis, shortly stalked, lanceolate or linear-lanceolate, middle pairs 4–7 cm × 1.2–2.4 mm, bases obliquely broadly cuneate, auriculate acroscopically, pinnate, apices acuminate. Pinnules 8–12 pairs, alternate, ascendant, obliquely ovate, 6–14 × 4–8 mm, bases obliquely cuneate and decurrent to pinna rachis, auricles deltoid, margins with small acute forward-pointing teeth, apices acute; abaxially more densely covered with filiform microscales, adaxially sparsely covered with filiform microscales; frond texture papery; venation pinnate on lobes, indistinct abaxially, slightly raised adaxially. Sori in 1 row on each side of pinnule midrib; indusia present, erose.

• Alpine dark coniferous forests, shrubs, bamboo forests; 2000–3800 m. W Sichuan.

“*Polystichum kangdingense* H. S. Kung & Li Bing Zhang” (Acta Phytotax. Sin. 36: 254, t. 3: f. 1–4. 1998) was not validly published because no type was indicated (*Melbourne Code*, Art. 40.1).

93. *Polystichum frigidicola* H. S. Kung & Li Bing Zhang, Acta Bot. Yunnan. 17: 28. 1995.

寒生耳蕨 han sheng er jue

Plants summer-green. Rhizome ascending, densely scaly; scales blackish brown at middle, margins brown, lanceolate. Fronds 40–50 cm; stipe stramineous, 16–20 cm, 3–4 mm in diam. at base, scaly; scales brown, lanceolate and linear. Lamina bipinnatifid, lanceolate, 30–32 × 5–8 cm, slightly contracted toward base, acuminate; rachis without proliferous bulbils, stramineous, both surfaces densely covered with lanceolate and linear brown scales, abaxially mixed with lanceolate dark brown scales with light brown margins. Pinnae 24–30 pairs, alternate, slightly ascendant, shortly stalked, lanceolate or linear-lanceolate, middle pairs 3.5–5 × 1.2–1.5 cm, bases obliquely broadly cuneate, auriculate acroscopically, pinnatifid, apices acuminate. Lobes 7–9 pairs, nearly opposite, ascendant, obliquely ovate or lanceolate, 8–12 × 4–5 mm, bases obliquely cuneate and decurrent to costa forming narrow wings, auricles

inconspicuous, with small acute forward-pointing teeth, acuminate; abaxially with denser microscales, adaxially sparsely covered with filiform brown microscales; frond texture papery; venation pinnate on lobes, slightly raised abaxially, distinct adaxially. Sori in 1 row on each side of midrib of lobe, or on each side of costa of upper pinnae; indusia present, erose.

• Alpine meadows, *Abies-Rhododendron* forests; 2900–4400 m. W Sichuan (Luding, Muli, Shimian).

94. *Polystichum submite* (Christ) Diels, Bot. Jahrb. Syst. 29(2): 192. 1900.

秦岭耳蕨 qin ling er jue

Aspidium submite Christ, Nuovo Giorn. Bot. Ital., n.s., 4: 93. 1897; *Polystichum paradoxum* Ching & Y. P. Hsu.

Plants summer-green. Rhizome erect, densely covered with lanceolate brown scales. Fronds 12–30 cm; stipe stramineous, 3–12 cm, 1–2 mm in diam. at base, scaly; scales brown, lanceolate and linear, mixed with larger scales; large scales lanceolate, blackish brown at middle, margins brown. Lamina bipinnatipar-

tite, lanceolate, 10–27 × 2–5 cm, slightly contracted toward base, long acuminate; rachis without proliferous bulbils, stramineous, both surfaces densely covered with lanceolate and linear brown scales, sometimes lower part mixed with lanceolate scales abaxially, dark brown at middle, margins brown. Pinnae 12–24 pairs, alternate, attached at right angles to rachis or slightly ascendant, shortly stalked, ovate or lanceolate, middle pairs 1–3 cm × 6–10 mm, bases obliquely broadly cuneate, auriculate acroscopically, pinnatipartite, apices acute, rarely acuminate. Lobes 2–10 pairs, alternate, ascendant, obliquely oblong or rhombic-ovate, 4–6 × 2–3 mm, bases obliquely cuneate and decurrent to costa forming narrow wings, auricles inconspicuous, with small acute forward-pointing teeth, acute or obtuse; abaxially covered with filiform brown microscales, adaxially glabrous; frond texture papery; venation pinnate on lobes, indistinct on both surfaces. Sori in 1 row on each side of midrib of lobe; indusia present, erose.

• Forests; 1200–2500 m. Gansu (Kangxian, Tianshui), Henan (Songxian), Shaanxi (Qinling), N and W Sichuan.

3. *Polystichum* ser. *Exauricula* H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 34: 71. 1996.

缺耳耳蕨系 que er er jue xi

Plants medium-sized to large, evergreen. Lamina green, broadly lanceolate, papery or thickly papery. Stipe greenish when dry. Rachis scales linear or lanceolate to ovate-lanceolate. Pinnules 10–30 pairs, stalked, pinnules of upper pinnae exauriculate or nearly so. Microscales long-type or short-type. Vein with or without hydathodes at end.

Four species: Sino-Himalayan region; four species (two endemic) in China.

95. *Polystichum longipaleatum* Christ, Notul. Syst. (Paris) 1(2): 35. 1909.

长鳞耳蕨 chang lin er jue

Aspidium aculeatum (Linnaeus) Swartz var. *setosum* C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 510. 1880; *Polystichum aculeatum* (Linnaeus) Roth ex Mertens var. *setosum* (C. B. Clarke) Beddome; *P. aculeatum* var. *setulosum* Rosenstock; *P. setosum* (C. B. Clarke) Khullar & S. C. Gupta (1980), not (Wallich) Schott (1834), nor C. Presl (1836).

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 50–120 cm; stipe yellowish brown, 16–48 cm, 4–7 mm in diam. at base, densely covered with linear, lanceolate, brown scales and larger scales; large scales dense, shiny, ovate and ovate-lanceolate, up to 13 × 6 mm, subentire or serrulate, caudate. Lamina bipinnate, oblong-lanceolate or oblong, 32–87 × 11–25 cm near base, not or slightly contracted toward base, base sterile, apex caudate or acuminate, fertile; rachis without proliferous bulbils, abaxially densely covered with linear, lanceolate, brown scales and larger scales; large scales sparse, ovate-lanceolate and broadly lanceolate, up to 10 × 4 mm, densely serrulate, long acuminate. Pinnae 25–40 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, bases not contracted, asymmetrical, apices caudate; pinnae near lamina base 7–14 × 1.7–2 cm, 1-pinnate; rachis without proliferous bulbils, abaxially covered with linear brown scales. Pinnules 16–38 pairs, alternate, subsessile, oblong, 0.5–1 × 0.3–0.5 cm, bases cuneate, acroscopic margins entire, not

spinulose, exauriculate (except for a few large individuals), apices acute and mucronate; basispic margins shortly spinulose, basal acroscopic pinnules largest, incised; both surfaces densely covered with long-filiform microscales; frond texture papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori (1 or) 2–5 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets, small, exindusiate.

Broad-leaved forests, coniferous forests, bamboo forests, shrubs; 1100–2600 m. Guangxi (Damiao Shan, Longsheng), Guizhou, Hunan (Xinning), Sichuan, Xizang (Dinggyê, Mêdog), Yunnan [Bhutan, India, Nepal].

96. *Polystichum nudisorum* Ching, Bull. Fan Mem. Inst. Biol., Bot. 11: 71. 1941.

裸果耳蕨 luo guo er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 30–100 cm; stipe yellowish brown, 9–47 cm, 3–7 mm in diam. at base, densely covered with linear, lanceolate, brown scales and larger scales; large scales dense, brown and bicolorous, ovate and ovate-lanceolate, middle of bicolorous scales blackish brown and margins brown, shiny, up to 12 × 6 mm, subentire or serrulate, caudate. Lamina bipinnate, oblong-lanceolate or oblong, 22–85 × 6–20 cm near base, not or slightly contracted toward base, base sterile, apex caudate, fertile; rachis without proliferous bulbils, abaxially densely covered with linear and lanceolate, brown scales and larger scales; large scales sparse, brown,

ovate-lanceolate and broadly lanceolate, up to 10×4 mm, densely serrulate, long acuminate. Pinnae 21–39 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, not contracted toward base, bases asymmetrical, apices caudate; lower pinnae $5-10 \times 1.4-2$ cm, 1-pinnate; costa abaxially covered with linear brown scales, adaxially sulcate. Pinnules 13–38 pairs, alternate, sessile, oblong, $0.4-1 \times 0.2-0.5$ cm, bases cuneate, acroscopic margins entire, not spinulose, bases exauriculate, basicopic margins shortly spinulose, apices acute and mucronate; basal acroscopic pinnules largest, margins incised; both surfaces densely covered with long-filiform microscales; frond texture papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori small, caducous, (1 or) 2–5 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets, exindusiate.

• Mixed broad-leaved and coniferous forests, forest margins; 1800–3000 m. Xizang (Mêdog), Yunnan.

Polystichum nudisorum differs from *P. longipaleatum* in its bicolorous stipe scales. It has narrower and higher distribution than *P. longipaleatum*.

This species might also occur in N India.

97. *Polystichum pianmaense* W. M. Chu, Acta Bot. Yunnan., Suppl. 5: 51. 1992.

片马耳蕨 pian ma er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds up to 80 cm; stipe yellowish brown, 11–32 cm, 4–6 mm in diam. at base, densely covered with linear and lanceolate and larger scales; large scales somewhat sparse, bicolorous, blackish brown to dark brown at center and brown on margin, shiny, ovate and ovate-lanceolate, up to 14×7 mm, subentire or serrulate, caudate. Lamina bipinnate, oblong-lanceolate or oblong, up to $27-60 \times 11-24$ cm near base, not or slightly contracted toward base, apex caudate, sterile; rachis without proliferous bulbils, abaxially densely covered with linear, lanceolate, brown scales and larger scales; large scales dense or somewhat sparse, blackish brown to dark brown, shiny, ovate-lanceolate and broadly lanceolate, up to 9×5 mm, densely serrulate, caudate. Pinnae 23–26 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, bases not contracted, asymmetrical, apices caudate; lower pinnae $7-10 \times 1.7-2$ cm, 1-pinnate; costa abaxially covered with linear brown scales, adaxially sulcate. Pinnules 16–25 pairs, alternate, sessile, oblong, $0.8-1 \times 0.3-0.4$ cm, bases cuneate, acroscopic margins entire, not spinulose, exauriculate, basicopic margins shortly spinulose, apices acute and mucronate; basal acroscopic pinnules largest, incised; both surfaces

densely covered with long-filiform microscales; frond texture papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori small, 1–3 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets; indusia present, brown, small, membranous, not well developed, irregularly erose.

• Forests; 2200–2600 m. Xizang (Mêdog, Zayü), Yunnan (Gongshan, Lushui).

98. *Polystichum punctiferum* C. Christensen, Contr. U.S. Natl. Herb. 26: 288. 1931.

中甸耳蕨 zhong dian er jue

Polystichum glingense Ching & Y. X. Lin; *P. virescens* Ching & S. K. Wu.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 60–120 cm; stipe yellowish brown, 34–62 cm, 4–6 mm in diam. at base, densely scaly; scales angled upward and slightly appressed to stipe, linear, subulate, or lanceolate and mixed with larger scales; large scales dense on lower stipe, dark brown, shiny, ovate and ovate-lanceolate, up to $20 \times 3-8.5$ mm, densely and regularly toothed and ciliate, caudate. Lamina bipinnate, deltoid-ovate, $48-74 \times 20-35$ cm near base, slightly contracted toward base, lower part sterile, apex acute, fertile; rachis without proliferous bulbils, densely scaly; scales dark brown, linear, subulate, and lanceolate, ciliate on margin, lanceolate scales caudate at apex. Pinnae 13–18 pairs, alternate, ascendant, shortly stalked, lanceolate, bases asymmetrical, apices caudate; lower pinnae $15-23 \times 3.5-5.5$ cm, 1-pinnate; costa scales dark brown, linear and subulate. Pinnules 12–20 pairs, alternate, shortly stalked, falcate-deltoid, bases cuneate, acroscopic bases with rounded auricles, margins with acute, shallow or deep teeth, apices acuminate; basal acroscopic pinnules (but not lowermost 3 or so) largest, pinnatifid; abaxially with dense long-filiform microscales, adaxially with sparse microscales; frond texture papery; venation pinnate, lateral veins 5–9 pairs, dichotomous, distinct, adaxially with oblong hydathode terminal on veinlets. Sori 5–20 per pinnule, in 1 row on each side of midrib, terminal on veinlets; indusia present, irregularly lacinate.

Broad-leaved forests, mixed forests; 1700–2700 m. Xizang (Mêdog: Gling), W Yunnan [Bhutan, India, Myanmar, Nepal].

Polystichum punctiferum was placed in *P. sect. Macropolystichum* by Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 7. 1997).

Polystichum punctiferum has hydathodes on adaxial surface of pinnules, which is unique in *P. sect. Hypopeltis*. Its rachis scales are linear, subulate, and lanceolate, and dark brown.

4. *Polystichum* ser. *Brauniana* H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 34: 73. 1996.

长小鳞耳蕨系 chang xiao lin er jue xi

Plants medium-sized to large, evergreen. Lamina papery, green, broadly lanceolate, gradually contracted toward base or not contracted. Stipe greenish when dry. Stipe scales ovate, ovate-lanceolate, or broadly lanceolate, concolorous or bicolorous. Rachis scales broadly ovate to ovate-lanceolate. Pinnules 10–30 pairs, stalked, pinnules of upper pinnae auriculate. Microscales long-type.

About ten species: mainly in the Sino-Japanese region, one species with circumboreal distribution; seven species (three endemic) in China.

99. *Polystichum braunii* (Spencer) Fée, Mém. Foug. 5: 278. 1852.

布朗耳蕨 bu lang er jue

Aspidium braunii Spencer, Fl. Friburg. 1: 9. 1825; *Polystichum shennongense* Ching, Boufford & K. H. Shing.

Plants summer-green. Rhizome erect or ascending, short, densely covered with scales; scales brown, linear. Fronds 40–70 cm; stipe brown at base, 13–21 cm, 4–5 mm in diam. at base, densely covered with scales; scales brown, linear and lanceolate or larger; large scales dense or somewhat sparse, light brown but below middle often blackish brown, shiny, ovate, ovate-lanceolate, or broadly lanceolate, up to 13 × 6 mm, subentire or slightly toothed, long acuminate or caudate. Lamina bipinnate, oblanceolate, 36–60 × 14–24 cm at middle, gradually contracted toward base, lower part sterile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially with dense light brown linear or lanceolate and larger scales; large scales ovate-lanceolate, up to 4.5 mm wide, subentire, caudate or long acuminate. Pinnae 19–25 pairs, alternate, ascendant, shortly stalked, lanceolate, bases asymmetrical, apices acuminate; middle pinnae 7–15 × 2.3–2.8 cm, 1-pinnate; costa narrowly winged, abaxially with linear light brown scales. Pinnules (2–)6–17 pairs, alternate, sessile, oblong, 0.9–1.7 × 0.5–0.9 cm, bases cuneate, decurrent, acroscopic margins entire, sometimes toothed and even shallowly pinnatifid on large plants, shortly or long aristate, apices acute with acute spine; auricles rounded, small, basispic margins aristate; basal acroscopic pinnules largest, incised or pinnatifid; both surfaces densely scaly; microscales brownish, filiform; frond texture thinly papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori large, (1–)3–6 pairs per pinnule, in 1 row along each side of midrib, close to midrib, terminal or sometimes abaxial on veins; indusia present, entire. $2n = 164$.

Forests, shaded or semi-shaded forest margins; 1000–3400 m. Anhui (Huangshan), S Gansu, Hebei (Dongling, Xinglong), Heilongjiang (Shangzhi), W Henan, NW Hubei, Jilin (Liangjiang, Xiaoxing'anling), Liaoning (Changbai Shan, Hengren, Kuandian), Shaanxi (Qinling), Shanxi (Ningwu, Yicheng), Sichuan (N and W basin), Xinjiang (Hejing), Xizang (Mainling) [Japan, Korea, Russia (Siberia); Europe, North America].

Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 35. 1997) treated *Polystichum shennongense* as a synonym of *P. makinoi*, which is incorrect.

Polystichum braunii is the most widely distributed species in the genus and widely distributed in temperate regions of the N Hemisphere. It occurs in most provinces of China.

100. *Polystichum ningshenense* Ching & Y. P. Hsu, Fl. Tsingling. 2: 223. 1974.

宁陕耳蕨 ning shan er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 50–70 cm; stipe yellowish brown, 25–40 cm, 4–5 mm in diam. at base, sparsely covered with linear, lanceolate, light brown scales and larger scales; large scales light brown and bicolorous, ovate and ovate-lanceolate; bicolorous scales sparse, castaneous at mid-

dle, shiny, up to 13 × 5 mm, with sparse irregular teeth or subentire, caudate. Lamina bipinnate, oblong, 30–40 × 20–25 cm at middle, gradually contracted toward base, lower part sterile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially sparsely or densely covered with linear, lanceolate, light brown scales and larger scales; large scales dense, ovate-lanceolate and broadly lanceolate, up to 9 × 3.5 mm, with dense small teeth, long acuminate to caudate. Pinnae 20–28 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate, bases asymmetrical, apices acuminate; middle pinnae 11–12 × 2.2–2.6 cm, 1-pinnate; costa narrowly winged, adaxially sulcate, abaxially covered with linear, subulate, brown scales. Pinnules 9–14 pairs, alternate, subsessile, oblong, 1–1.4 cm × 5–7 mm, bases cuneate and decurrent, acroscopic margins entire or subentire, shortly and finely spinulose, with rounded auricles, indistinct, basispic margins finely long spinulose, apices acute with acute tips; basal acroscopic pinnules largest, sometimes incised; both surfaces densely covered with long-filiform light brown microscales; frond texture thinly papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori (1 or)3–5 pairs per pinnule, in 1 row on each side of midrib, close to margins, terminal on veinlets; indusia present, entire.

• Forests; 1200–1600 m. Shaanxi (Ningshan, Zhen'an).

Polystichum ningshenense is similar to *P. braunii*; but only a few pinnae of lower lamina of the former are slightly contracted, and its sori are close to the pinnule margins.

101. *Polystichum retrosopaleaceum* (Kodama) Tagawa, J. Jap. Bot. 13(3): 187. 1937.

倒鳞耳蕨 dao lin er jue

Polystichum aculeatum (Linnaeus) Roth ex Mertens var. *retrosopaleaceum* Kodama, Bot. Mag. (Tokyo) 29: 330. 1915; *P. tsingkanshanense* Ching ex K. H. Shing & J. F. Cheng.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 50–80 cm; stipe yellowish brown, 24–52 cm, 4–5 mm in diam. at base, densely covered with linear, lanceolate, grayish brown scales and larger scales; large scales dense, grayish brown, ovate and ovate-lanceolate, up to 24 × 12 mm, densely serrulate, acute or acuminate to caudate. Lamina bipinnate, elliptic or elliptic-lanceolate, 36–63 cm, gradually contracted or slightly contracted toward base, lower part sterile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially densely covered with linear, lanceolate, light brown or grayish brown scales and larger scales; large scales dense, ovate-lanceolate and broadly lanceolate, up to 7.5 × 2.5 mm, with dense small teeth, acuminate to caudate, obviously pointing downward. Pinnae 20–24 pairs, alternate, ascendant, shortly stalked, lanceolate, bases asymmetrical, apices acuminate; middle pinnae 9–12 × 1.8–2.2 cm, 1-pinnate; costa shallowly winged at pinna tip, abaxially densely covered with linear light brown scales. Pinnules 18–22 pairs, alternate, shortly stalked, oblong or deltoid-ovate, 1–1.5 cm × 5–6 mm, bases cuneate and decurrent, acroscopic margins entire or repand, rarely lobed, not aristate, with rounded auricles, basispic margins spinulose, apices acute with acute tips; basal acroscopic pinnules largest, pinnatifid; long-filiform micro-

scales dense abaxially, sparse adaxially; frond texture papery or thinly papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori (1–)4–6 pairs per pinnule, in 1 row on each side of midrib, medial, terminal on veinlets; indusia present, subentire. $2n = 82$.

Forests; 600–1600 m. Anhui (Haozhai, Jiuhua Shan), Hubei (Wudang Shan), Jiangxi (Jinggangshan, Lushan), Zhejiang (W Tianmu Shan) [Japan, Korea].

The most important character of *Polystichum retrosopaleaceum* is that its rachis scales are ovate-lanceolate and broadly lanceolate and pointing downward.

102. *Polystichum polyblepharum* (Roemer ex Kunze) C. Presl, Epimel. Bot. 56. 1851.

棕鳞耳蕨 zong lin er jue

Aspidium polyblepharum Roemer ex Kunze, Bot. Zeitung (Berlin) 6: 572. 1848; *A. aculeatum* (Linnaeus) Swartz var. *japonicum* Franchet & Savatier; *Polystichum aculeatum* (Linnaeus) Roth ex Mertens var. *japonicum* (Franchet & Savatier) Diels.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear grayish brown scales. Fronds 40–80 cm; stipe yellowish brown, 14–22 cm, 4–5 mm in diam. at base, densely covered with linear, lanceolate, grayish brown scales and larger scales; large scales ovate-lanceolate and broadly lanceolate, up to 20×7 mm, with few irregular teeth, caudate. Lamina bipinnate, broadly elliptic-lanceolate, 37–70 \times 15–20 cm at middle, not or slightly contracted toward base, lower part sterile or not, apex acuminate, fertile; rachis without proliferous bulbils, abaxially densely covered with linear grayish brown scales and larger scales; large scales shiny, narrowly lanceolate, up to 12×2.5 mm, toothed, acuminate. Pinnae 20–26 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, gradually contracted toward base, bases asymmetrical, apices acuminate; middle pinnae 7–10 \times 1.4–2.2 cm, 1-pinnate; costa adaxially sulcate, abaxially densely covered with linear grayish brown scales. Pinnules 15–20 pairs, alternate, shortly stalked, oblong, 1–2 \times 0.5–0.75 cm, bases cuneate and decurrent at tip, acroscopic margins repand or subentire, with rounded auricles, basiscopic margins long spinulose, apices acute with acute tips; basal acroscopic pinnules largest, deeply incised; microscales long filiform, abaxially dense, adaxially sparse; frond texture papery; venation pinnate, lateral veins 4–6 pairs, dichotomous, distinct. Sori 3–7 pairs per pinnule, in 1 row on each side of midrib, close to margins or medial, terminal or nearly terminal on veinlets; indusia present, subentire. $2n = 164$.

Forests in montane valleys; 100–400 m. Jiangsu (Yixing), Zhejiang (Putuo Shan, Tiantai Shan) [Japan, Korea].

Polystichum polyblepharum has broadly elliptic-lanceolate laminae and grayish brown stipe scales; its large rachis scales are narrowly lanceolate, acuminate apically, and grayish brown, and its sori are medial or nearly marginal.

103. *Polystichum parvipinnulum* Tagawa, Acta Phytotax. Geobot. 6(3): 160. 1937.

尖叶耳蕨 jian ye er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with lanceolate grayish brown scales. Fronds 30–60 cm; stipe dark brown, 8–20 cm, 2.5–4 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales ovate and ovate-lanceolate, up to 14×7 mm, densely serrulate, caudate or acuminate. Lamina bipinnate, deltoid-ovate, deltoid-lanceolate, or lanceolate, 20–45(–60) \times 6–17 cm near base, base not contracted, lower part sterile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially densely covered with linear, lanceolate, grayish brown scales and larger scales; large scales ovate-lanceolate and narrowly lanceolate, up to 8×3 mm, with dense small teeth, caudate. Pinnae 14–29 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, gradually contracted toward base, bases asymmetrical, apices acuminate; lower pinnae 3.7–11 \times 1–1.5 cm, 1-pinnate; costa adaxially sulcate, abaxially densely covered with linear grayish brown scales. Pinnules 13–23 pairs, alternate, shortly stalked, oblong, 0.8–1.2 cm \times 3–4.5 mm, bases cuneate, acroscopic margins entire or slightly repand, with acute auricles, margins with only few (2 or 3) spinules, apices acute with acute tips; basal acroscopic pinnules largest, entire or incised; abaxially densely covered with long-filiform microscales, adaxially subglabrous; frond texture papery; venation pinnate, lateral veins 4–6 pairs, dichotomous, relatively distinct. Sori 3–6 per pinnule, in 1 row on each side of midrib, or only 1 row acroscopically, close to midrib, terminal on veinlets; indusia present, subentire.

- Forests; 700–2400 m. Taiwan.

Laminae of *Polystichum parvipinnulum* are often small, deltoid or deltoid-lanceolate, and nearly papery. Its pinnules are small and with very few spinules on the margins.

A hybrid, *Polystichum* \times *pseudoparvipinnulum* Miyamoto & T. Nakamura (J. Jap. Bot. 58: 146. 1983), possibly between *P. parvipinnulum* and *P. piceopaleaceum*, was described from Taizhong, Taiwan.

104. *Polystichum sozanense* Ching ex H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 33: 309. 1995.

草山耳蕨 cao shan er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear grayish brown scales. Fronds up to ca. 80 cm; stipe yellowish brown, 24–34 cm, 3–4 mm in diam. at base, densely covered with linear, lanceolate, yellowish brown scales and larger scales; large scales shiny, ovate and ovate-lanceolate, up to 8×6 mm, with dense small teeth, caudate. Lamina bipinnate, oblong-lanceolate, up to 63×17 cm at middle, not contracted toward base, lower part sterile, apex acute, fertile; rachis without proliferous bulbils, abaxially covered with linear, lanceolate, grayish brown scales and larger scales; large scales dense, shiny, ovate, ovate-lanceolate, and narrowly lanceolate, up to 10×4 mm, with dense small teeth, caudate or long acuminate. Pinnae up to 32 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, gradually contracted toward basiscopic base, bases asymmetrical, apices acuminate or caudate; middle pinnae ca. 12×1.3 cm, 1-pinnate; costa adaxially sulcate, densely covered with linear light brown

scales. Pinnules up to 23 pairs, alternate, shortly stalked, narrowly deltoid-ovate, $0.6-1 \times 0.3-0.4$ cm, bases cuneate, acroscopic margins slightly repand, with deltoid auricles, basicopic margins obviously spinulose, apices acute with acute tips; basal acroscopic pinnules largest, deeply incised; both surfaces densely covered with long-filiform light brown microscales; frond texture papery; venation pinnate, lateral veins 4-6 pairs, dichotomous, distinct. Sori 2-5 per pairs pinnule, in 1 row on each side of midrib, terminal on veinlets; indusia present, entire.

- Forests; 500-800 m. Taiwan.

Polystichum sozanense is often not accepted, but its stipe and rachis scales are much wider than *P. parvipinnulum*. It is possible that this species is extinct. More studies are needed.

105. *Polystichum ovatopaleaceum* (Kodama) Sa. Kurata, Sci. Rep. Yokosuka City Mus. 10: 35. 1964.

卵鳞耳蕨 luan lin er jue

Polystichum aculeatum (Linnaeus) Roth ex Mertens var. *ovatopaleaceum* Kodama, Bot. Mag. (Tokyo) 29: 328. 1915; *P. aculeatum* var. *coraiense* Christ; *P. ovatopaleaceum* var. *coraiense* (Christ) Sa. Kurata; *P. retrosopaleaceum* (Kodama) Tagawa var. *coraiense* (Christ) Tagawa; *P. retrosopaleaceum* (Kodama) Tagawa var. *ovatopaleaceum* (Kodama) Tagawa.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 48-67 cm; stipe yellowish brown, 19-25 cm, 3-4 mm in diam. at base, densely covered with linear, lanceolate, brown scales and larger

scales; large scales dense, brown, ovate and ovate-lanceolate, up to 11×9 mm, densely serrulate, caudate. Lamina bipinnate, elliptic or elliptic-lanceolate, $42-60 \times 18-25$ cm at middle, gradually contracted toward base, lower part sterile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially densely covered with linear, lanceolate, brown scales and larger scales; large scales dense, ovate or ovate-lanceolate, pointing laterally or randomly, up to 7×4.5 mm, with dense small teeth, acute or caudate. Pinnae 23-26 pairs, alternate or nearly opposite, attached at right angles to rachis, shortly stalked, lanceolate, gradually contracted toward basicopic base, bases asymmetrical, apices acuminate or slightly caudate; middle pinnae $9-12 \times 1.8-2.2$ cm, 1-pinnate; costa winged, adaxially sulcate, abaxially densely covered with linear, subulate, light brown scales. Pinnules 15-20 pairs, alternate, shortly stalked, oblong, $0.9-1.3$ cm \times 4-6 mm, bases cuneate and decurrent at tip, acroscopic margins entire or slightly repand, with rounded auricles, basicopic margins shortly spinulose, apices acute with acute tips; basal acroscopic pinnules largest, deeply incised; both surfaces densely covered with long-filiform microscales; frond texture papery; venation pinnate, lateral veins 5-7 pairs, dichotomous, distinct. Sori (1-4) 6 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets; indusia present, entire. $2n = 164$.

- Forests; 600-1200 m. Anhui (Huangshan) [Japan, Korea].

The rachis scales of *Polystichum ovatopaleaceum* are ovate and ovate-lanceolate, similar to those of *P. retrosopaleaceum* (Kodama) Tagawa, but pointing laterally or randomly.

5. *Polystichum* ser. *Linearia* H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 34: 69. 1996.

线鳞耳蕨系 xian lin er jue xi

Plants medium-sized, evergreen. Stipe greenish when dry. Stipe scales concolorous, linear to linear-lanceolate. Lamina green, broadly lanceolate or elliptic-lanceolate, papery. Rachis scales linear and tortuous. Pinnules of upper pinnae auriculate. Microscales short-type.

- Four species: Sino-Himalayan region; four species (three endemic) in China.

106. *Polystichum tangmaiense* H. S. Kung & Tateishi, Acta Phytotax. Sin. 32: 268. 1994.

通麦耳蕨 tong mai er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds ca. 25 cm; stipe yellowish brown, 9-12 cm, ca. 1.8 mm in diam. at base, sparsely covered with linear brown scales. Lamina bipinnate, oblong-lanceolate, $17-24 \times 6-7$ cm at middle, lower part gradually contracted, base fertile, apex acuminate, sterile; rachis without proliferous bulbils, abaxially covered with linear brown scales. Pinnae 8-10 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, middle pinnae $3-4 \times 0.8-1.5$ cm, not contracted at base, 1-pinnate, acuminate; costa adaxially sulcate, abaxially sparsely covered with linear brown scales. Pinnules 7-9 pairs, alternate, shortly stalked, oblong, $5-8 \times 2.5-4$ mm, bases cuneate, with deltoid auricles acroscopically, margins shallowly toothed, apices acute; basal acroscopic pinnules largest; abaxially with shortly filiform microscales, adaxially subglabrous; frond texture papery; venation pinnate, lateral

veins 5-8 pairs, dichotomous, distinct. Sori 2-4 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets; indusia present, repand.

- Forests; ca. 2000 m. Xizang (Bomi).

107. *Polystichum discretum* (D. Don) J. Smith, J. Bot. (Hooker) 3: 413. 1841.

分离耳蕨 fen li er jue

Aspidium discretum D. Don, Prodr. Fl. Nepal. 4. 1825; *Polystichum aculeatum* (Linnaeus) Roth ex Mertens var. *nigropaleaceum* Christ; *P. fuscopaleaceum* Alston; *P. indicum* Khullar & S. C. Gupta; *P. kathmanduense* Nakaike; *P. lobatum* (Hudson) C. Presl var. *discretum* (D. Don) C. Christensen; *P. nigropaleaceum* (Christ) Diels; *P. setiferum* (Forsskål) Moor ex Woyнар var. *crenatum* N. C. Nair; *P. setiferum* var. *fuscopaleaceum* (Alston) Schelpe; *P. setiferum* var. *nigropaleaceum* (Christ) Sledge.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 30-90 cm;

stipe brown, 13–40 cm, ca. 4 mm in diam. at base, sparsely scaly; scales brown to dark brown, linear. Lamina bipinnate, oblong to deltoid-ovate, 24–70 × 10–35 cm at middle, often 20 cm, lower part slightly contracted, base fertile, apex acuminate or slightly acute, sterile; rachis without proliferous bulbils, abaxially scaly; scales dark brown to blackish brown, linear, twisted. Pinnae 12–26 pairs, alternate, slightly ascendant, lanceolate, lower part not contracted, asymmetrical at base, shortly stalked, middle pinnae 12–17 × 2.6–3.5 cm, 1-pinnate, caudate or acuminate; costa adaxially sulcate, abaxially scaly; scales dark brown to blackish brown, linear, twisted. Pinnules 12–35 pairs, alternate, shortly stalked, oblong, 0.9–2.2 × 0.5–0.8 cm, bases cuneate, acroscopic bases with rounded auricles, margins deeply toothed or lobed, apices acute, apices of most lobes obviously spinulose; basal acroscopic pinnules largest, pinnatifid; abaxially with few shortly filiform microscales, adaxially subglabrous; frond texture papery; venation pinnate, lateral veins 5–8 pairs, dichotomous, distinct. Sori (3–)5–8 pairs per pinnule, in 1 row on each side of midrib, terminal on veinlets; indusia present, irregularly lacerate. $2n = 82$.

Forests; 1700–2900 m. Xizang (Médog, Nyingchi), Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan, Thailand].

108. *Polystichum oligocarpum* Ching ex H. S. Kung & Li Bing Zhang, *Acta Phytotax. Sin.* 33: 308. 1995.

疏果耳蕨 shu guo er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 25–60 cm; stipe yellowish brown, 8–21 cm, ca. 1.5 mm in diam. at base, covered with woolly reddish brown scales. Lamina bipinnate, oblong-lanceolate, 20–47 × 5–12 cm at middle, not contracted toward base, base often sterile, apex caudate, fertile; rachis without proliferous bulbils, abaxially sparsely covered with linear and tortuous, reddish brown scales. Pinnae 20–25 pairs, alternate, slightly ascendant, lanceolate, not contracted toward base, bases asymmetrical, sessile, apices caudate; middle pinnae 5–10 × 0.7–1.2 cm near base, 1-pinnate; costa adaxially sulcate, abaxially sparsely covered with linear and tortuous, reddish brown scales. Pinnules 9–20 pairs, alternate, closely arranged, sessile, rhombic, 0.7–1.6 cm × 3–6.5 mm, bases cuneate, with obtuse teeth acroscopically, not spinulose, with rounded auricles, apices acute; basal acroscopic pinnules largest; abaxially with few shortly filiform microscales, adaxially subglabrous; frond texture thinly papery to papery; venation pinnate, lateral veins 5–8 pairs, dichotomous, distinct. Sori small, (1 or)2–4 pairs per pinnule, 1 or 1.5 rows on each side of midrib, terminal on veinlets; indusia present, entire or subentire. $2n = 82^*$.

• Forests; 1700–2200 m. Yunnan (Jingdong, Zhenyuan).

6. *Polystichum* ser. *Makinoiana* H. S. Kung & Li Bing Zhang, *Acta Phytotax. Sin.* 34: 194. 1996.

黑鳞耳蕨系 hei lin er jue xi

Plants medium-sized, evergreen. Lamina green, broadly lanceolate or elliptic-lanceolate, papery, not gradually contracted toward base. Stipe greenish when dry. Stipe scales bicolorous, ovate, ovate-lanceolate, or broadly lanceolate. Rachis scales linear, subulate, or lanceolate. Pinnules of upper pinnae auriculate. Microscales short-type.

About 17 species: Sino-Himalayan and Sino-Japanese regions; 11 species (five endemic) in China.

Fraser-Jenkins (Taxon. Revis. Indian Subcontinental Pteridophytes, 332. 2008) suspected that *Polystichum oligocarpum* would be *P. tangmaense*. The latter has lower pinnae contracted toward lamina base and nearly leathery pinnules of ca. 0.5 cm, which are different from the former.

109. *Polystichum weimingii* Li Bing Zhang & H. He, *Syst. Bot.* 34: 13. 2009.

维明耳蕨 wei ming er jue

Plants evergreen. Rhizome erect, short; scales brown, linear-lanceolate. Fronds 30–50(–107) cm; stipe yellowish green, 6.5–18 cm, 1.5–2(–2.5) mm in diam. at middle; basal stipe scales brown, dull, linear-lanceolate, ca. 10 × 1 mm, papery, obtusely toothed, acuminate; distal stipe scales similar but narrower and shorter, brown, dull, linear-lanceolate to linear, tortuous, papery, sparsely shortly toothed, caudate. Lamina bipinnate, shiny green adaxially when fresh, deltoid-lanceolate, 24–33(–74) × 4.6–8.2(–28) cm, not contracted toward base, acuminate at apex; rachis ca. 1.5 mm in diam., without proliferous bulbils; rachis scales brown, linear and tortuous, 0.25–0.5 mm, deltoid at base. Pinnae 15–23(–27) pairs, alternate, attached at nearly right angles to rachis, slightly (or strongly) angled upward, lanceolate, shortly stalked, pinnate, acute or acuminate; middle pinnae 2.3–6.5(–22) × 1.2–2.8(–3.2) cm, basal second and third pairs of pinnae slightly larger than others, basalmost pairs of pinnae smallest; costa ca. 0.5 mm in diam.; costa scales brown, linear and tortuous. Pinnules 5–12(–24) pairs, basal two pairs 2–4 cm apart, alternate, attached at ca. 80° angle to rachis, falcate-deltoid, 0.6–1.1(–1.6) × 0.25–0.35(–0.7) cm, shortly stalked; basal acroscopic pinnules auriculate, cuneate, shallowly undulate, mucronate; abaxially scaly, adaxially glabrous; microscales on abaxial surface linear and tortuous; frond texture papery; midrib raised abaxially, concave adaxially; lateral veins free, once dichotomously branched, ca. 4(–8) pairs from midrib per pinnule, raised and obvious abaxially, indistinct adaxially. Sori terminal on veins, (3–)5–8(–14) sori per fertile pinnule, at middle between midrib and pinnule margin; indusia dark brown at middle, brown elsewhere, ca. 0.8 mm in diam., membranous, lacerate. Spores 40(26.4–57.1) × 46.4(35.7–78.6) × 42.9(28.6–68.6) μm (polar axis × long equatorial axis × short equatorial axis, respectively); perispore sculpturing striate with perforations.

• Open canopies of large *Caryota urens* in ravines, red soil on limestone walls in low light beneath dense papery plants; 1300–2100 m. S Yunnan (Gengma, Mengzi).

It is possible that *Polystichum weimingii* also occurs in parts of Laos, Myanmar, and Vietnam bordering Yunnan.

The fronds of the tallest individual of this species at the type locality can reach 107 × 28 cm.

110. *Polystichum makinoi* (Tagawa) Tagawa, Acta Phytotax. Geobot. 5: 258. 1936.

黑鳞耳蕨 hei lin er jue

Polystichum aculeatum (Linnaeus) Roth ex Mertens var. *makinoi* Tagawa, Acta Phytotax. Geobot. 1: 88. 1932; *P. aculeatum* var. *pinfaense* Rosenstock.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 40–60 cm; stipe yellowish brown, 15–23 cm, ca. 2.5 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle and yellowish brown on margin, shiny, ovate or ovate-lanceolate, up to 13 × 6 mm, subentire, caudate. Lamina bipinnate, deltoid-ovate or deltoid-lanceolate, 28–52 cm, near basal part 9–18 cm wide, base slightly contracted, lower 1 or 2 pairs often sterile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially covered with linear and lanceolate scales; lanceolate scales light brown to brown (rarely lower rachis scales bicolorous), subentire, acuminate. Pinnae 13–20 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate, bases not contracted, asymmetrical, apices acuminate; lower pinnae 3.5–8 × 1–2 cm, 1-pinnate; costa covered with linear light brown or brown scales. Pinnules 14–22 pairs, alternate, shortly stalked, falcate-deltoid to narrowly oblong, 0.8–1.3 cm × 4–7 mm, bases cuneate, with rounded auricles acroscopically, margins entire or subentire, apices acute, often shortly aristate; basal acroscopic pinnules largest, deeply incised or pinnatifid; adaxially subglabrous, abaxially sparsely covered with shortly filiform micro-scales; frond texture papery; venation pinnate, lateral veins 5–8 pairs, dichotomous, distinct. Sori 5 or 6 pairs per pinnule, in 1 row on each side of midrib, submarginal, terminal on veinlets; indusia present, shallowly toothed. $2n = 164$.

Wet places, on rocks in forests, bushes; 600–2500 m. Anhui, Fujian, S Gansu, Guangxi (Guilin), Guizhou, Hebei, S and W Henan, W Hubei, Hunan (Guidong, Longshan), Jiangsu (Liyang, Yixing), Jiangxi, ?Ningxia, N Shaanxi, Sichuan, SE Xizang (Zayü), NE and W Yunnan, Zhejiang [Bhutan, Japan, Nepal].

Polystichum makinoi is the most common species of *Polystichum*. Its lamina is deltoid-ovate to deltoid-lanceolate, and its rachis scales are lanceolate and brown, rarely blackish brown.

111. *Polystichum otomasui* Kurata, J. Geobot. 12: 67. 1963.

南碧耳蕨 nan bi er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 50–70 cm; stipe yellowish brown, 21–32 cm, up to 4.5 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate-lanceolate, up to 12 × 6 mm, subentire, caudate. Lamina bipinnate, broadly lanceolate, 32–43 cm, near basal part 12–16 cm wide, base very slightly contracted, lower 1–5 pairs of pinnae sterile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially covered with linear and lanceolate scales; lanceolate scales blackish brown, subentire, caudate. Pinnae 14–18 pairs, alternate, attached at ± right angles with rachis, shortly stalked, lanceolate, bases not contracted or lower pairs slightly

contracted on basicopic side, bases nearly symmetrical, apices acuminate; lower pinnae 8–11 × 2–2.4 cm, 1-pinnate; costa covered with linear brown scales. Pinnules 14–18 pairs, alternate, shortly stalked, falcate-deltoid to narrowly oblong, 0.9–1.3 cm × 5–7 mm, bases cuneate, with deltoid auricles acroscopically, margins subentire, often with short forward-pointing spinules, apex acute; basal acroscopic pinnules largest, deeply incised or pinnatifid; abaxially sparsely covered with shortly filiform microscales, adaxially subglabrous; frond texture papery; venation pinnate, lateral veins 5–8 pairs, dichotomous, distinct. Sori 1–13 per pinnule, in 1 row on each side of midrib or only in 1 row on acroscopic side of midrib, medial, terminal on veinlets; indusia present, shallowly toothed. $2n = 82$.

Wet places, slight slopes by streams, wet places along small streams in mixed *Phyllostachys heterocycla*, *Lithocarpus*, and *Tsuga* evergreen forests, secondary *Lithocarpus* forests; 1100–1800 m. Fujian (Wuyi Shan), Jiangxi (Lushan) [Japan].

Polystichum otomasui may have a wider distribution in China.

112. *Polystichum parvifoliolatum* W. M. Chu, Acta Bot. Yunnan., Suppl. 5: 49. 1992.

小羽耳蕨 xiao yu er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear dark brown scales. Fronds 50–60 cm; stipe stramineous, 18–34 cm, 2–3 mm in diam. at base, densely covered with linear, lanceolate brown scales and larger scales; large scales bicolorous, middle part blackish brown, margins brown, shiny, ovate, ovate-lanceolate, and broadly lanceolate, up to 13 × 6 mm, margins fimbriate, apices long acuminate. Lamina bipinnate, deltoid-lanceolate, 30–39 cm, 9–11 cm wide near basal part, slightly contracted toward base, lower part sterile, apex acuminate or caudate, fertile; rachis without proliferous bulbils, densely covered with linear, lanceolate brown scales and larger scales; large scales bicolorous, middle part blackish brown or dark brown, margins brown, shiny, ovate and ovate-lanceolate, up to 5 × 2.5 mm, margins regularly fimbriate, apices caudate. Pinnae 20–27 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, not contracted toward base, acuminate or caudate, basal pinnae 6–8 × 1.4–1.7 cm, 1-pinnate; costa with linear brown scales. Pinnules 16–20 pairs, alternate, shortly stalked, falcate-deltoid, 0.7–1.2 × 0.3–0.45 cm, thinly leathery, bases cuneate, auricles deltoid, apices acute, margins shallowly toothed, teeth indistinctly shortly spinulose at tip; basal acroscopic pinnules largest, pinnatifid; abaxially with few lanceolate microscales, adaxially subglabrous; venation pinnate on pinnules, lateral veins 5–7 pairs, dichotomous, distinct. Sori brown, small, (1–)3 or 4 pairs, in 1 row on each side of midrib, terminal on veinlets; indusia small.

• Montane broad-leaved evergreen forests, reddish brown soil; 1800–2600 m. Yunnan (Mile, Yiliang).

Polystichum parvifoliolatum was placed in *P.* sect. *Neopolystichum* in FRPS (5(2): 55. 2001) because it has broad-type microscales. Its phylogenetic relationships are unclear.

113. *Polystichum piceopaleaceum* Tagawa, Acta Phytotax. Geobot. 5: 255. 1936 [“*piceo-paleaceum*”].

乌鳞耳蕨 wu lin er jue

Polystichum aculeatum (Linnaeus) Roth var. *fargesii* Christ; *P. bicolor* Ching & S. K. Wu (1983), not A. R. Smith (1975); *P. doianum* Tagawa; *P. makinoidi* (Tagawa) Tagawa var. *chuanzangense* Ching & S. K. Wu; *P. setiferum* (Forsskål) Moore ex Woyнар var. *fargesii* (Christ) C. Christensen; *P. yunnanense* Christ var. *fargesii* (Christ) C. Christensen.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 48–95 cm; stipe yellowish brown, 16–32 cm, 2–3.5 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate, ovate-lanceolate, and broadly lanceolate, up to 13 × 5 mm, subentire, caudate. Lamina bipinnate, oblong-lanceolate, 32–63 cm, near basal part 10–22 cm wide, slightly or not contracted toward base, in lower part only 1 or 2 pairs sterile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially densely covered with linear, lanceolate brown scales and larger scales; large scales bicolorous, blackish brown at middle, shiny, linear and ovate-lanceolate, up to 8 × 2.5 mm, with irregular small teeth, caudate. Pinnae 17–26 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, not contracted toward base, bases asymmetrical, apices acuminate; pinnae of basal lamina 6–12 × 1.3–2.8 cm, 1-pinnate; costa abaxially covered with linear brown scales. Pinnules 9–16 pairs, alternate, shortly stalked, oblong, 0.8–1.6 cm × 4–7 mm, bases cuneate, with rounded auricles acroscopically, apices acute, margins subentire or shallowly toothed, teeth shortly spinulose at tip (or long spinulose in large individuals); basal acroscopic pinnules largest, deeply incised; adaxially with few and abaxially with many shortly filiform microscales; frond texture papery; venation pinnate, lateral veins 6–8 pairs, dichotomous, distinct. Sori 4–6 pairs per pinnule, in 1 row on each side of midrib, terminal on veinlets; indusia present, irregularly toothed. $2n = 164$.

Valleys, streamsides, cliffs, rock crevices; 1200–3400 m. Gansu (Kangxian, Wenxian), N Guizhou, S Shaanxi, Sichuan, Taiwan, SE Xizang, Yunnan [NE Afghanistan, Bhutan, India, Japan, Kashmir, Myanmar, Nepal, Pakistan, Sri Lanka].

The most important characters of *Polystichum piceopaleaceum* are that its lamina is oblong-lanceolate, its rachis scales are bicolorous, and its acroscopic pinnules are not toothed or only shallowly toothed.

A hybrid, *Polystichum* × *silviamontanum* Miyamoto & T. Nakamura (J. Jap. Bot. 58: 147. 1983, “*silvinmontanum*”), possibly between *P. piceopaleaceum* and *P. wilsonii* (*P. sinense*), was described from Taizhong, Taiwan.

114. *Polystichum yunnanense* Christ, Notul. Syst. (Paris) 1(2): 34. 1909.

云南耳蕨 yun nan er jue

Polystichum gyirongense Ching; *P. jizhushanense* Ching.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds up to 80 cm; stipe yellowish brown, 16–39 cm, 2–4 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate, ovate-lanceolate, and broadly lanceolate, up to 12 × 6 mm, subentire, caudate. Lamina bipinnate, oblong or elliptic-lanceolate,

30–60 cm, middle part 13–22 cm wide, base slightly or not contracted, lower part sterile, apex acuminate or slightly acute, fertile or sometimes apical tip sterile; rachis without proliferous bulbils, abaxially densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate-lanceolate or broadly lanceolate, up to 7 × 2.2 mm, irregularly serrulate, caudate. Pinnae 14–21 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate, not contracted toward base, bases asymmetrical, apices acuminate or caudate; middle pinnae 5–11 × 1.4–2.6 cm, 1-pinnate; costa abaxially covered with linear brown scales. Pinnules 10–18 pairs, alternate, shortly stalked, deltoid-ovate, 1–1.7 cm × 5–7 mm, bases cuneate, with rounded auricles acroscopically, apices acute, margins coarsely toothed to shallowly lobed or deeply lobed, teeth obviously spinulose at tip; basal acroscopic pinnules largest, deeply incised to pinnatipartite; abaxially sparsely covered with shortly filiform microscales, adaxially subglabrous; frond texture papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori 4–6 pairs per pinnule, in 1 row on each side of midrib, slightly close to midrib, terminal on veinlets; indusia present, irregularly toothed. $2n = 164$.

Streamsides, rocks in forests or wet places; 1400–3100 m. W Guizhou (Hezhang), SW Sichuan, SE Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan].

As discussed in Zhang and He (Syst. Bot. 34: 13. 2009), although Fraser-Jenkins and Khullar's (Indian Fern J. 2: 9. 1985) lectotypification of *Polystichum yunnanense* is contrary to Rec. 9A.4 (*Melbourne Code*), it cannot be rejected, and thus Zhang and Kung's (1996) re-designation of *A. Henry 9101* (PE) as the new lectotype of this species represented in the syntypes cannot be accepted.

This species has ovate-lanceolate to broadly lanceolate and bicolorous rachis scales, and its pinnules are deltoid-ovate and coarsely toothed to shallowly lobed or deeply lobed.

115. *Polystichum acutipinnulum* Ching & K. H. Shing, Wuyi Sci. J. 1(1): 9. 1981.

尖头耳蕨 jian tou er jue

Polystichum lobatopinnulum Ching, Boufford & K. H. Shing; *P. wuyishanense* Ching & K. H. Shing.

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 50–70 cm; stipe yellowish brown, 23–38 cm, ca. 3 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate-lanceolate or broadly lanceolate, up to 16 × 2.5–6 mm, subentire, caudate. Lamina bipinnate, oblong-lanceolate or deltoid-lanceolate, 36–45 cm, lower part 13–17 cm wide, base slightly contracted, 1 or 2 pairs of lower pinnae often sterile, apex acuminate, fertile; rachis often with blackish powder and becoming blackish brown, without proliferous bulbils, abaxially covered with linear and subulate scales; scales dark brown, subentire. Pinnae 14–16 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate; pinnae of basal lamina 5–10 × 1.7–2.2 cm, bases asymmetrical, 1-pinnate, apices acuminate, fertile; costa often with blackish powder and becoming blackish brown, abaxially covered with linear dark brown scales, adaxially sulcate. Pinnules 9–16 pairs, alternate, shortly stalked, fal-

cate-deltoid, 1.2–1.6 × 0.5–0.6 cm, bases cuneate, with conspicuous deltoid auricles, apices acuminate, margins subentire or shallowly toothed, teeth spinulose at tip, sometimes several pinnules near rachis sterile; basal acroscopic pinnules largest, nearly pinnatifid to midrib; abaxially sparsely covered with shortly filiform microscales, adaxially subglabrous; frond texture papery; venation pinnate, lateral veins 6–8 pairs, dichotomous, distinct. Sori 5–7 pairs per pinnule, in 1 row on each side of midrib, close to pinnule margins, terminal on veinlets; indusia present, erose. $2n = 82^*$.

• Forests; 800–3000 m. Fujian (Chong'an), Guizhou, Henan (Xinyang), W Hubei (Hefeng, Shennongjia, Xuan'en), Hunan, Sichuan, Yunnan (Daguan, Zhaotong).

Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 35, 1997) treated *Polystichum lobatopinnulum* as a synonym of *P. makinoi*, which is incorrect.

116. *Polystichum pseudomakinoi* Tagawa, Acta Phytotax. Geobot. 5: 257. 1936.

假黑鳞耳蕨 jia hei lin er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 50–80 cm; stipe yellowish brown, 20–30 cm, ca. 4 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate or ovate-lanceolate, up to 13 × 6 mm, subentire, caudate. Lamina bipinnate, deltoid-ovate, 32–60 × 14–23 cm near base, base slightly contracted, fertile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially covered with linear and lanceolate scales; lanceolate scales often blackish brown, entire, acuminate. Pinnae 14–21 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, not contracted toward base, bases asymmetrical, apices acuminate; lower pinnae 5–12 × 2.2–2.8 cm, 1-pinnate; costa adaxially sulcate, abaxially covered with linear brown scales. Pinnules 14–21 pairs, alternate, shortly stalked, oblong, 0.9–1.2 × 0.5–0.6 cm, bases cuneate, with inconspicuous rounded auricles, margins entire, or sparsely spinulose, apices obtuse and mucronate; basal acroscopic pinnules largest, deeply incised; both surfaces sparsely covered with shortly filiform microscales; frond texture papery to thinly papery; venation pinnate, lateral veins 5–8 pairs, dichotomous, relatively distinct. Sori 1–9 per pinnule, in 1 row on each side of midrib, or only in 1 row acroscopically, close to pinnule margins, terminal on veinlets; indusia present, entire. $2n = 164$.

Riversides, mountain slopes, roadsides in forests, forest margins; 200–2000 m. Anhui (Huangshan, Huoshan, Jixi), Fujian, N Guangdong, Guangxi (Damiao Shan, Lingshan), Guizhou (Kaili, Leishan, Yinjiang), Henan (Jigong Shan), Hunan, Jiangsu (Jurong, Yixing), Jiangxi, Sichuan, Zhejiang [Japan].

117. *Polystichum shimurae* Sa. Kurata ex Serizawa, J. Jap. Bot. 54: 139. 1979.

边果耳蕨 bian guo er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds stramineous, up to 52 cm; stipe ca. 20 cm, ca. 3 mm in diam. at base, densely covered with narrowly lanceolate and linear brown scales;

scales attached at right angles with stipe or slightly reflexed; basal scales of stipe dark brown, narrowly ovate. Lamina bipinnate, narrowly deltoid-ovate, ca. 32 × 15 cm, base slightly contracted, lower part sterile, apex acuminate; rachis without proliferous bulbils, abaxially densely scaly; scales reflexed, brown, linear. Pinnae 18 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, middle pairs ca. 8 × 2.5–3 cm, 1-pinnate, acuminate. Pinnules 10–12 pairs, alternate, slightly ascendant, oblong-ovate, 1–2 cm × 6–8 mm, bases cuneate, with rounded auricles acroscopically, margins sparsely dentate with short spinules, apices acute or obtuse and shortly aristate; basal acroscopic pinnules largest, often pinnatifid; abaxially covered with shortly filiform light brown microscales; frond texture papery; venation pinnate, lateral veins 4–6 pairs, dichotomous, indistinct on both surfaces. Sori brown, 5–10 per pinnule, in 1 row on each side of midrib, close to pinnule margins, terminal on veinlets; indusia present, irregularly erose.

Zhejiang (exact locality unknown) [Japan].

In comparison with *Polystichum pseudomakinoi*, *P. shimurae* is larger and only its upper pinnae are fertile, its pinnule margins have spinulose teeth, and its indusia margins are irregularly erose.

118. *Polystichum huae* H. S. Kung & Li Bing Zhang, Acta Phytotax. Sin. 33: 311. 1995.

川西耳蕨 chuan xi er jue

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 50–80 cm; stipe yellowish brown, 16–40 cm, 3–4 mm in diam. at base, densely covered with linear, lanceolate and larger scales; large scales bicolorous, dark brown at middle, shiny, ovate and ovate-lanceolate, up to 15 × 7 mm, irregularly toothed or ciliate, caudate or obtuse. Lamina bipinnate, elliptic or elliptic-lanceolate, 44–62 cm, middle part 17–21 cm wide, base slightly contracted, lower part fertile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially covered with linear, lanceolate brown scales and larger scales; large scales ovate-lanceolate and broadly lanceolate, up to 8 × 2.3 mm, margins ciliate, apices caudate. Pinnae 20–26 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate, bases not contracted, nearly asymmetrical, apices acuminate; middle pinnae 10–14 × 2.4–2.6 cm, 1-pinnate; costa abaxially covered with linear and subulate brown scales. Pinnules 15–19 pairs, alternate, shortly stalked, deltoid-ovate, 1.2–1.8 × 0.5–0.7 cm, bases cuneate, with rounded auricles acroscopically, apices acute, margins shallowly toothed and often incised, teeth aristate at tip; basal acroscopic pinnules largest, pinnatifid to midrib; adaxially sparsely and abaxially densely covered with long-filiform microscales; frond texture papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori brown, 5–8 pairs per pinnule, in 1 row on each side of midrib, close to midrib, terminal on veinlets; indusia present, entire.

• Forests in valleys, wet places; 1600–2600 m. Sichuan (Baoping, Tianquan).

Polystichum huae was named in honor of Dr. Shiu Ying Hu, collector of the type (*S. Y. Hu 1158*), who died in 2012 at 102 years of age and is remembered for her lifelong dedication to Chinese botany.

Polystichum huae is similar to *P. longiaristatum*, but its indusia are entire.

119. *Polystichum longiaristatum* Ching, Boufford & K. H. Shing, *J. Arnold Arbor.* 64(1): 33. 1983.

长芒耳蕨 *chang mang er jue*

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 60–70 cm; stipe yellowish brown, 22–26 cm, ca. 4 mm in diam. at base, covered with linear, lanceolate and larger scales; large scales bicolorous, blackish brown at middle, shiny, ovate or ovate-lanceolate, up to 15 × 7 mm, subentire or with ciliate teeth, caudate. Lamina bipinnate, oblong or oblong-lanceolate, 48–51 cm, middle part 16–20 cm wide, slightly contracted toward base, lower part fertile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially covered with linear, lanceolate light brown scales and larger scales; large scales sparse, ovate-lanceolate and broadly lanceolate, up to 10 × 2.5 mm, with ciliate teeth, caudate. Pinnae 20–24 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, slightly contracted toward basiscopic base except for basal basiscopic pinnules, bases asymmetrical, apices acuminate or caudate; middle pinnae 9–11 × 1.8–2.1 cm, 1-pinnate; costa abaxially covered with linear and subulate light brown scales. Pinnules 12–15 pairs, alternate, shortly stalked, deltoid-ovate or oblong, 0.8–1.2 cm × 4–6 mm, bases cuneate, with rounded auricles acroscopically, margins entire or with few shallow teeth, teeth especially long aristate at tip, apices acute; basal acroscopic pinnules largest, entire or sometimes with free auricles; abaxially densely covered with shortly filiform microscales, adaxially subglabrous; frond texture thickly papery; venation pinnate, lateral veins 5–7 pairs, dichotomous, distinct. Sori 3–5 pairs per pinnule, in 1 row on each side of midrib, medial, terminal on veinlets; indusia present, irregularly toothed.

• Forests; 1000–2600 m. S Gansu, Hubei (Shennongjia), Shaanxi (Shichai).

Polystichum longiaristatum is similar to *P. makinoi*, but it is larger,

its rachis has ovate-lanceolate scales, and its pinnules have long-aristate margins.

120. *Polystichum subulatum* Ching ex Li Bing Zhang, *Acta Bot. Yunnan.* 16: 133. 1994.

钻鳞耳蕨 *zuan lin er jue*

Plants evergreen. Rhizome erect or ascending, short, densely covered with linear brown scales. Fronds 60–80 cm; stipe yellowish brown, 30–38 cm, ca. 3.5 mm in diam. at base, covered with linear, lanceolate and larger scales; large scales dense on basal stipe, bicolorous, blackish brown at middle, shiny, ovate or ovate-lanceolate, up to 12 × 2.5–5 mm, subentire, caudate. Lamina bipinnate, elliptic-lanceolate, 50–64 cm, middle part 18–22 cm wide, slightly contracted toward base, lower part fertile, apex acuminate, fertile; rachis without proliferous bulbils, abaxially scaly; scales pointing downward, dark brown, linear and subulate; subulate scale margins fimbriate. Pinnae 18–26 pairs, alternate, attached at right angles to rachis, shortly stalked, lanceolate, bases not contracted, asymmetrical, apices acuminate; middle pinnae 8–12 cm, near basal pairs 2.6–2.8 cm wide, 1-pinnate; costa abaxially with scales similar to rachis scales. Pinnules 13–17 pairs, alternate, shortly stalked, falcate-deltoid, 1.2–1.5 cm × 5–6 mm, bases cuneate, with deltoid auricles acroscopically, margins shallowly toothed, teeth long spinulose at tip, apices acute; basal acroscopic pinnules largest, pinnatipartite to midrib; abaxially sparsely covered with shortly filiform microscales, adaxially subglabrous; frond texture papery; venation pinnate, lateral veins 6–8 pairs, dichotomous, distinct. Sori 5–7 pairs per pinnule, in 1 row on each side of midrib, medial between midrib and pinnule margins, terminal on veinlets; indusia present, subentire.

• Mountain slopes, valleys, broad-leaved forests, roadsides, coniferous forests, bamboo forests; 1300–1800 m. Guizhou (Yinjiang), Sichuan.

Polystichum subulatum is similar to *P. makinoi*, but it is larger and its rachis scales are linear to subulate.

2. *Polystichum* subg. *Haplopolystichum* (Tagawa) Li Bing Zhang, *stat. nov.*

半羽耳蕨亚属 *ban yu er jue ya shu*

Basionym: *Polystichum* sect. *Haplopolystichum* Tagawa, *Acta Phytotax. Geobot.* 9: 122. 1940.

Plants evergreen. Lamina 1-pinnate; if lamina bipinnatifid to tetrapinnatifid then pinnae finely dissected or rachis scales dark brown, ovate, and appressed; venation free or rarely anastomosing to form 1 or 2 rows of areoles.

Possibly around 270 species: the highest diversity in limestone areas in S China and dozens of species in the neighboring Himalaya (six species), Japan (11 species), Korea (four species), Myanmar (six species), Philippines (two species), Russian Far East (two species), Thailand (three species), and Vietnam (ca. 40 species); 88 species (70 endemic) in nine sections in China.

Polystichum subg. *Haplopolystichum*, corresponding to the so-called BCPC (Lu et al., *Syst. Bot.* 32: 26–33. 2007) or CCPC clade (Li et al., *J. Plant Res.* 121:19–26. 2008), or *P.* sect. *Haplopolystichum* Tagawa s.l. (Zhang & He, *Bot. Stud. (Taipei)* 50: 101–106. 2009), is one of the two subgenera of *Polystichum*.

15. *Polystichum* sect. *Cyrtomiopsis* Tagawa, *Acta Phytotax. Geobot.* 9: 121. 1940.

鞭叶耳蕨组 *bian ye er jue zu*

Plants medium-sized, evergreen. Lamina papery to leathery, 1-pinnate, monomorphic or nearly dimorphic. Rachis of sterile lamina often prolonged and viviparous. Stipe and rachis scales often ciliate on margin. Sori abaxial on veinlets. Indusia small and caducous.

About four species: E Asia; four species (three endemic) in China.

- 1a. Lamina monomorphic, linear-lanceolate, 2–4 cm wide, simple to 1-pinnate; pinnae or segments oblong-ovate, acute or obtuse at apex, up to 2.5 cm.
 2a. Lamina simple or usually pinnatifid down to rachis in lower part, with appressed segments; segments not auriculate at acroscopic side of base 121. *P. basipinnatum*
 2b. Lamina 1-pinnate in lower part, pinnae free, base nearly auriculate on acroscopic side 122. *P. conjunctum*
 1b. Lamina nearly dimorphic, broadly oblong-lanceolate, more than 5.5 cm wide, 1-pinnate; pinnae of fertile lamina lanceolate-falcate, acuminate at apex, normally over 4 cm.
 3a. Lamina thickly papery; pinnae of fertile lamina 6–10 × 1.2–1.8 cm, entire; acroscopic basal vein of each group not reaching pinna margin, sori in 2 rows on each side of midrib or 3 rows in auricle 123. *P. lepidocaulon*
 3b. Lamina leathery; pinnae of fertile lamina 4–5 cm, or rarely longer, 0.8–1 cm wide, with acute teeth; acroscopic basal vein of each group reaching pinna margin; sori in 1 row on each side of midrib or sometimes 2 rows in auricle 124. *P. putuoense*

121. *Polystichum basipinnatum* (Baker) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 189. 1899.

基羽鞭叶耳蕨 *ji yu bian ye er jue*

Aspidium basipinnatum Baker, J. Bot. 27: 176. 1889;
Cyrtomidictyum basipinnatum (Baker) Ching.

Plants evergreen. Rhizome erect, short, together with basal stipe densely scaly; scales brown, ovate and lanceolate, membranous, margins densely ciliate, apices filiform. Fronds dimorphic, 30–40 cm; stipe brownish stramineous, 6–16 cm, 1.5–2 mm in diam. at middle; distal stipe scales sparser and smaller. Fertile lamina dark brown when dry, linear-lanceolate, 15–20 × 2.2–3.5 cm at middle, base widest and nearly truncate or shallowly cordate, pinnatifid in lower part and gradually less pinnatifid toward lamina apex, apex long acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales similar to distal stipe scales, lanceolate or linear, margins toothed, apices filiform. Pinnae 10–25 or more pairs, alternate, angled slightly acroscopically; basalmost pairs oblong, attached at nearly right angles with rachis, sessile, 1.3–1.8 × ca. 1 cm, bases nearly rounded, acroscopic base not auriculate, margins entire or slightly repand, basal basicopic margins cuneate and forming a ± 80° angle with rachis, distal basicopic margins curved upward, apices obtuse; other lobes gradually smaller toward lamina apex, ascendant; abaxially densely scaly along costae and midribs, adaxially glabrous and slightly shiny; microscales light brown, ovate and linear, margins ciliate, apices filiform; frond texture thinly leathery; venation pinnate, lateral veins 2- or 3-forked, distinct on both surfaces, reaching lobe or lamina margins. Sori small, in 1 row on each side of midrib, abaxial on veinlets, medial, whole fertile lamina fertile or lower part of fertile lamina sterile, exindusiate. Sterile lamina similar to fertile lamina but less deeply pinnatifid, or simple; rachis apex often elongate and forming a long flagelliform nodding stolon with proliferous scaly bulbil.

• By streams in forests. Guangdong, Guangxi.

122. *Polystichum conjunctum* (Ching) Li Bing Zhang, Phytotaxa 60: 57. 2012.

卵状鞭叶耳蕨 *luan zhuang bian ye er jue*

Cyrtomidictyum conjunctum Ching, Acta Phytotax. Sin. 6: 263. 1957.

Plants evergreen. Rhizome erect, short, together with basal stipe densely scaly; scales brown, ovate or ovate-lanceolate, thickly membranous, margins ciliate, apices acuminate. Fronds dimorphic, 20–38 cm; stipe brownish stramineous, 10–20 cm, 1.5–2 mm in diam. at middle; distal stipe scales similar but sparser and smaller, ovate or lanceolate, margins ciliate, apices caudate. Fertile lamina 1-pinnate, yellowish green when dry, adaxially slightly shiny, lanceolate, 10–20 × 2.2–5 cm at base, apex pinnatifid-acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales similar to distal stipe scales, brown, ovate or lanceolate, margins ciliate, apices filiform. Pinnae 5–7 pairs, alternate, approximate, angled slightly acroscopically, ovate-deltoid or oblong, 1.5–2.5 × 1–1.2 cm, shortly stalked, bases obliquely rounded and asymmetrical, apices acute; acroscopic base auriculate, auricles deltoid, margins entire, proximal margins of auricles slightly curved and nearly parallel with rachis, acroscopic margins of pinnae subentire or shallowly toothed; basal basicopic margins rounded and forming a ± 45° angle with rachis, distal basicopic margins curved upward; abaxially densely scaly along midribs, adaxially subglabrous; microscales light brown, ovate-lanceolate, margins densely ciliate, apices filiform; frond texture thinly leathery; venation pinnate, 3 or 4 in pinnate groups, distinct abaxially, indistinct adaxially; lateral veins forked, reaching pinna margin. Sori small, in 1 row on basicopic side of midrib, often 2 rows on acroscopic side of midrib, terminal on veinlets, whole lamina fertile, exindusiate. Sterile lamina similar to fertile lamina and with fewer pairs of pinnae; rachis apex often elongate and forming a long flagelliform nodding stolon with proliferous scaly bulbil.

• Rock crevices by streams in broad-leaved forests; ca. 300 m. Jiangxi.

123. *Polystichum lepidocaulon* (Hooker) J. Smith, Ferns Brit. For. 286. 1866.

鞭叶耳蕨 *bian ye er jue*

Aspidium lepidocaulon Hooker, Sp. Fil. 4: 12. 1862;
Cyrtomidictyum lepidocaulon (Hooker) Ching; *C. lepidocaulon* var. *incisa* Ching.

Plants evergreen. Rhizome erect, short, together with basal stipe densely scaly; scales brown, ovate, ovate-lanceolate, or linear, membranous, margins densely ciliate, apices filiform. Fronds dimorphic, 28–48 cm; stipe fulvous, 10–23 cm, 2–2.5

mm in diam. at middle; distal stipe scales similar but sparser and smaller. Fertile lamina 1-pinnate, green when dry, adaxially slightly shiny, broadly lanceolate, 15–26 × 5–13 cm at base, base widest or nearly so and nearly rounded, apex pinnatifid-acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales similar to distal stipe scales, light brown, ovate or ovate-lanceolate, margins densely ciliate, apices filiform. Pinnae 5–12 pairs, alternate, approximate, ascendant, falcate-lanceolate, 4–8 cm × 8–16 mm, shortly stalked, bases obliquely rounded and asymmetrical, margins entire, apices acuminate; acroscopic base auriculate, auricles deltoid, margins entire, apices acute, proximal margins of auricles slightly curved and nearly parallel with rachis; basal basisopic margins rounded and forming a ± 45° angle with rachis, distal basisopic margins strongly curved upward; abaxially densely scaly along midribs, adaxially subglabrous; microscales light brown, ovate and linear, margins ciliate, apices filiform; frond texture thickly papery or thinly leathery; venation pinnate, 4–6 in pinnate groups, indistinct on both surfaces, lateral veins forked, basal acroscopic veinlets often stopping halfway to pinna margin, other veinlets reaching pinna margin, occasionally basal veinlets of same group on same side, or of adjacent groups joining, otherwise all free. Sori small, in 2 or 3 rows on each side of midrib, abaxial or terminal on veinlets, whole fertile lamina fertile, exindusiate. Sterile lamina narrower than fertile lamina and with fewer pairs of pinnae; rachis apex often elongate and forming a long flagelliform nodding stolon with proliferous scaly bulbil.

Forests; 300–1600 m. S Anhui, Fujian, Guangxi, Hunan, S Jiangsu, Jiangxi, Taiwan, Zhejiang [C and S Japan, Korea].

124. *Polystichum putuoense* Li Bing Zhang, *Phytotaxa* 60: 58. 2012.

普陀鞭叶耳蕨 pu tuo bian ye er jue

Nephrodium faberi Baker, *Ann. Bot. (Oxford)* 5: 316. 1891, not *Polystichum faberi* Christ (1909); *Cyrtomidictyum faberi* (Baker) Ching; *Dryopteris faberi* (Baker) C. Christensen.

Plants evergreen. Rhizome erect, short, together with basal stipe densely scaly; scales brown, ovate-lanceolate or lanceolate, membranous, margins densely ciliate, apices filiform. Fronds dimorphic, up to 52 cm; stipe brownish stramineous, 10–28 cm, ca. 2 mm in diam. at middle; distal stipe scales similar but sparser and smaller. Fertile lamina 1-pinnate, green when dry, adaxially slightly shiny, broadly lanceolate, 13–24 × 5.5–10 cm at base, base widest or nearly so and nearly rounded, apex pinnatifid-acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales similar to distal stipe scales, light brown, ovate-lanceolate or lanceolate, margins densely ciliate, apices filiform. Pinnae (5–)7–12 pairs, alternate, approximate, ascendant, falcate-lanceolate, 4–5 cm × 8–11 mm, shortly stalked, bases obliquely rounded and asymmetrical, margins with acute teeth, apices acuminate; acroscopic base auriculate, auricles deltoid, margins entire, apices acute, proximal margins of auricles slightly curved and nearly parallel with rachis; basal basisopic margins rounded and forming a ± 45° angle with rachis, distal basisopic margins strongly curved upward; abaxially densely scaly along midribs, adaxially subglabrous; microscales light brown, ovate and linear, margins ciliate, apices filiform; frond texture thin leathery; venation pinnate, 3 or 4 in pinnate groups, indistinct on both surfaces, lateral veins forked, reaching pinna margin. Sori small, in 1 row on each side of midrib and sometimes in 2 rows on auricles, abaxial or terminal on veinlets, whole fertile lamina fertile, exindusiate. Sterile lamina narrower than fertile lamina and with fewer pairs of pinnae; rachis apex often elongate and forming a long flagelliform nodding stolon with proliferous scaly bulbil.

• Rock crevices by streams in broad-leaved forests; ca. 500 m. Zhejiang.

Polystichum putuoense is very similar to *P. lepidocaulon*, but its pinna margins have acute teeth (vs. entire) and it has one row (vs. two rows) of sori on each side of the midrib. The *trnL-F* and *rbcL* sequences of the two species are slightly different, but *P. lepidocaulon* has 16-base pair insertion in the *rps4-trnS* sequence in comparison with *P. putuoense* (Liu et al., *Organisms Diversity Evol.* 10: 57–68. 2010).

16. *Polystichum* sect. *Mastigopteris* Tagawa, *Acta Phytotax. Geobot.* 9: 122. 1940.

鞭果耳蕨组 bian guo er jue zu

Plants small, calciphilous. Lamina 1-pinnate. Rachis prolonged and with proliferous bulbils at apex. Indusia entire.

About two species: Asia; two species (one endemic) in China.

- 1a. Pinnae oblong or deltoid-lanceolate, shorter than 2 cm; scales on stipe base lanceolate 125. *P. craspedosorum*
- 1b. Pinnae lanceolate, 2–2.5 cm; scales on stipe base narrowly ovate 126. *P. shandongense*

125. *Polystichum craspedosorum* (Maximowicz) Diels in Engler & Prantl, *Nat. Pflanzenfam.* 1(4): 189. 1899.

华北耳蕨 hua bei er jue

Aspidium craspedosorum Maximowicz, *Bull. Acad. Imp. Sci. Saint-Petersbourg* 15: 231. 1871; *A. craspedosorum* var. *japonicum* Maximowicz; *A. craspedosorum* var. *mandshuricum* Maximowicz; *Polystichum leucochlamys* Christ; *Ptilopteris craspedosora* (Maximowicz) Hayata.

Plants evergreen. Rhizome erect, densely covered with

lanceolate brown scales. Fronds 10–20 cm; stipe stramineous, 2–6 cm, 1–2 mm in diam. at base, densely covered with scales; scales brown, lanceolate, basal margins with outgrowths; outgrowths hairlike, tortuous and soft; upper margins sparsely fimbriate or subtire. Lamina pinnate, linear-lanceolate or narrowly oblanceolate, 10–20 × 2–4 cm, slightly contracted at base, acuminate; rachis with dense lanceolate scales abaxially, basal margins tortuous ciliate; apex flagelliform, with proliferous bulbil capable of growing into a new plant. Pinnae 14–26 pairs, lower pairs opposite, upper pairs alternate, angled at

90° with rachis or slightly so basiscopically, shortly stalked, oblong or narrowly oblong, middle pinnae 0.8–2 cm × 5–8 mm, bases asymmetrical, apices obtuse or rounded; acroscopic base truncate, distinctly or indistinctly auriculate, basiscopic base cuneate, margins with incurved acute teeth; abaxially scaly; microscales dense or sparse, brown, linear and hairlike, basal margins with outgrowths; outgrowths hairlike, tortuous and soft; frond texture papery; venation pinnate, lateral veins free, indistinct adaxially. Sori often in 1 row close to acroscopic margins, sometimes also on basiscopic side; indusia large, entire.

Shaded and dry limestone areas; below 2300 m. Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jilin, Liaoning, Ningxia (Jingyuan), Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang (Changhua, Lin'an) [Japan, Korea, Russia (Far East)].

Polystichum craspedosorum var. *giraldii* Christ (in Baroni & Christ, Nuovo Giorn. Bot. Ital., n.s., 4: 93. 1897) from Shaanxi (Taibai Shan), judging from the simple description, may be the same species; however, we did not see its type.

126. *Polystichum shandongense* J. X. Li & Y. Wei, Acta Phytotax. Sin. 22: 164. 1984.

山东耳蕨 shan dong er jue

Plants evergreen. Rhizome erect, densely covered with

scales; scales brown, lanceolate. Fronds 30–40 cm; stipe stramineous, 10–15 cm, ca. 2 mm in diam. at base, densely covered with scales; scales brown, narrowly ovate, basal margins with outgrowths; outgrowths hairlike, tortuous and soft; upper margins sparsely fimbriate or subentire. Lamina pinnate, linear-lanceolate, 20–30 × 4–5 cm, base cuneate, apex acuminate; rachis with dense scales abaxially; scales narrowly lanceolate, basal margins tortuous ciliate; apex flagelliform, with proliferous bulbil capable of growing into a new plant. Pinnae 30–34 pairs, alternate, angled at 90° with rachis, shortly stalked, lanceolate, middle pinnae 2–2.5 cm × 5–6 mm, bases oblique, apices obtuse; acroscopic base truncate, with distinct deltoid auricles, basiscopic base cuneate, margins with incurved acute teeth; abaxially scaly; microscales dense or sparse, brown, linear or hairlike, basal margins with outgrowths; outgrowths hairlike, tortuous and soft; frond texture papery; venation pinnate, lateral veins free, slightly raised abaxially, indistinct adaxially. Sori often in 1 row close to acroscopic margins, sometimes also in 1 row on basiscopic side; indusia large, raised at center, entire.

• Rock crevices in forests; below 1100 m. Shandong (Mengshan, Qingdao, Taishan).

Polystichum shandongense is tentatively recognized here. It is possibly conspecific with *P. craspedosorum*.

17. *Polystichum* sect. *Basigemmifera* (W. M. Chu & Z. R. He) Li Bing Zhang, stat. nov.

小芽胞耳蕨组 xiao ya bao er jue zu

Basionym: *Polystichum* ser. *Basigemmifera* W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 223. 2001.

Plants small, summer-green or evergreen. Lamina 1-pinnate to 3-pinnate. Rachis with proliferous bulbils at either base or near apex or at both positions. Indusia erose or lacerate.

About five species: Asia; five species (four endemic) in China.

Polystichum sect. *Basigemmifera* has been accommodated in *P.* sect. *Micropolystichum* (FRPS 5(2): 154. 2001) as *P.* ser. *Basigemmifera*. However, the type of *P.* sect. *Micropolystichum*, *P. thomsonii*, and its relatives (e.g., *P. costularisorum*, *P. jiucaipingense*, *P. longidens*, *P. zayuense*) lack bulbils on the rachis and are members of *P.* subg. *Polystichum*, while members of *P.* sect. *Basigemmifera* have bulbils on the rachis and are members of *P.* subg. *Haplopolystichum*.

Polystichum sect. *Basigemmifera* and *P.* sect. *Mastigopteris* are possibly paraphyletic in relation to *P.* sect. *Platyplepia*.

1a. Rachis with bulbil at apex only.

- 2a. Lamina 1-pinnate; pinnae oblong or oblong-lanceolate, obviously serrate; basal pairs of pinnae often reflexed; rachis ± with a non-foliose elongation below terminal bulbil 127. *P. erosum*
- 2b. Lamina 1-pinnate-pinnatifid; pinnae deltoid-lanceolate, pairs above middle serrate, lower pairs of pinnae profoundly pinnatifid with proximal pair of lobes nearly free; pinnae spreading or slightly ascending; rachis never elongated below rather small terminal bulbil 128. *P. kungianum*

1b. Rachis with bulbil at base or at both base and apex.

- 3a. Rachis with bulbil at both base and apex 131. *P. tiankengicola*
- 3b. Rachis with bulbil at base only.
- 4a. Lamina 1-pinnate with pinnae being deeply pinnatifid 129. *P. capillipes*
- 4b. Lamina 2- or 3-pinnate 130. *P. jiulaodongense*

127. *Polystichum erosum* Ching & K. H. Shing, Acta Phytotax. Sin. 10: 303. 1965.

蚀盖耳蕨 shi gai er jue

Polystichum lacerum Christ, Bot. Gaz. 51: 352. 1911, not C. Presl (1851).

Plants ?evergreen. Rhizome erect, densely covered with scales; scales dark brown, black in center, lanceolate. Fronds 5–15 cm; stipe stramineous, 1–5 cm, 1–2 mm in diam. at base, densely covered with scales; scales reddish brown, lanceolate, margins ciliate, cilia tortuous. Lamina pinnate, linear-lanceolate or oblanceolate, 5–16 × 1–2.6 cm, slightly contracted at base,

acuminate; rachis apex often with 1 proliferous bulbil, covered with dense or sparse scales abaxially; scales narrowly lanceolate, basal margins ciliate. Pinnae 14–25 pairs, lower pairs opposite, upper pairs alternate, angled at 90° with rachis or slightly so basiscopically, sessile, deltoid-ovate or oblong, middle pinnae 6–15 × 3–5 mm, bases asymmetrical, apices obtuse or rounded; acroscopic margins truncate, indistinctly auriculate, basicopic bases cuneate, pinna margin with incurved acute teeth; microscales on adaxial surface sparse, linear, brown; microscales on abaxial veins dense or sparse, brown, narrowly lanceolate and linear; frond texture papery; venation pinnate, lateral veins free, or forked at base, slightly raised abaxially, indistinct adaxially. Sori in 1 row on each side of midrib; indusia large, erose.

• On rocks in forests; 1400–2400 m. Chongqing, Guizhou, Henan, Hubei, Hunan (Sangzhi), Sichuan, NE Yunnan.

128. *Polystichum kungianum* H. He & Li Bing Zhang, Bot. Stud. (Taipei) 51: 396. 2010.

宪需耳蕨 xian xu er jue

Plants ?evergreen. Rhizome erect or slightly prostrate, 0.5–2 cm, 2–3 mm in diam., up to 1.5 cm in diam. with base of remnant old stipes; scales dull brown, linear-lanceolate, ca. 3 × 0.8 mm, subentire; roots up to 10 cm, 3–4 mm in diam. Fronds 12–16 cm; stipe stramineous, 1.5–4.5 cm, 1–2 mm in diam. at middle; scales on basal stipe brown, narrowly deltoid-lanceolate, 3–4 × 0.3–1.2 mm, thinly papery, margins at base with outgrowths; outgrowths hairlike, tortuous and soft; margins upward sparsely fimbriate or subentire, apices filiform; scales on distal stipe similar but narrower, brown, mostly linear-lanceolate, up to 3 × 0.5 mm, apices filiform. Lamina 1-pinnate-pinnatifid, yellowish green adaxially, slightly paler abaxially, lanceolate, 5.5–12.5 × 1.5–2.5 cm, slightly narrower at base, acuminate toward apex; rachis 0.5–1.2 mm in diam. at middle, apex with a small proliferous bulbil, without flagelliform prolongation. Pinnae 18–22 pairs, 0.5–1.5 × 0.3–0.6(–0.8) cm, shortly stalked, alternate, lower pairs deltoid-lanceolate, attached nearly at right angles to rachis, upper pairs shorter and rhombic-lanceolate, spreading to slightly ascending, acroscopic base auriculate, basicopic base cuneate, apices acute and terminating in a mucronate spine, several pairs of pinnae below middle of lamina deeply pinnatifid with their proximal pair of lobes nearly free, pairs above middle serrate with a mucronate tip at tooth apex and basal acroscopic auricle deltoid; lobes obliquely oblong to obovate, entire, mucronate; frond texture papery; abaxially moderately clothed with scattered microscales, adaxially with occasional articulate hairs especially along midrib; microscales brown, linear-subulate, up to 2.5 mm, usually with few tortuous hairlike outgrowths at margin of their broader base; frond texture thinly papery; venation pinnate, obvious abaxially, lateral veins free, 1–2 times forked. Sori terminal on distal branchlets of forked veinlets, 0.5–2.5 mm apart (when young), (1–)3–5(or 6) in 1 row on each side of midrib, submarginal; indusia irregularly lacerate, membranous, glossy brown later, adjacent ones often overlapping by 0.5–1.5 mm and extending over pinna margin when mature.

• Shaded wet limestone walls at edges of small NE-facing downward sloping karst caves; ca. 1800 m. Chongqing (Wuxi), Hunan (Shimen).

Polystichum kungianum has a similar stature and lacerate indusia to *P. erosum*, but the pinnae below middle of the lamina of the former are profoundly pinnatifid with the proximal pair of lobes nearly free from the other parts. Basal and adjacent pairs of pinnae of *P. kungianum* are attached nearly at right angles to rachis, whereas they are usually ± reflexed in *P. erosum*. Most importantly, *P. kungianum* has deltoid-lanceolate pinnae and a rather small terminal bulbil borne directly on the apex of the rachis which never elongates, while *P. erosum* has a much larger terminal bulbil on the rachis which usually elongates between the terminal bulbil and the uppermost part.

129. *Polystichum capillipes* (Baker) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 191. 1899.

基芽耳蕨 ji ya er jue

Aspidium capillipes Baker, J. Bot. 26: 228. 1888; *Dryopteris inaensis* Tagawa; *Polystichum inaense* (Tagawa) Tagawa; *P. michelii* Christ; *P. minusculum* Christ; *P. molliculum* Christ.

Plants summer-green, small. Rhizome erect, short, rhizome apex and basal stipe densely scaly; scales reddish brown, dimorphic; larger scales lanceolate, entire; smaller scales narrowly lanceolate, basal margins with few fimbriate long teeth. Fronds 5–30 cm; stipe light green, slender, 2–8 cm, less than 1 mm in diam. at base. Lamina narrowly elliptic-lanceolate, green when dry, darker adaxially, 4–17 × 0.7–2 cm, gradually contracted toward base, bipinnatifid or nearly bipinnate (basalmost pinnae with 1 pair of nearly free lobes), acuminate; rachis light stramineous, sparsely scaly on both surfaces; scales reddish brown, linear, margins entire or base with few filiform long teeth, often with 1 proliferous bulbil between basalmost pinnae. Pinnae 11–30 pairs, attached at nearly right angles to rachis or ascendant, alternate or nearly opposite, narrowly approximate, nearly oblong or oblong-lanceolate, shortly stalked, bases asymmetrical and cuneate, apices obtuse or acute; acroscopic margins forming a nearly right angle with rachis, basicopic margins forming an obtuse angle with rachis, bases pinnatipartite nearly to midrib, margins deeply pinnatifid to pinnatifid upward; middle pinnae largest, 0.5–1.4 cm × 2–4 mm; lower pinnae contracted toward base, basalmost pairs 2–7 mm, both surfaces sparsely covered with clavate brown microscales, more so abaxially. Lobes obovate or shortly lanceolate, apices with acute or sometimes obtuse tip, 1–5 lobes below midrib of middle pinnae, 2–6 above midrib; basal acroscopic lobes largest, nearly pinnatipartite to midrib, auriculate, apex with 2–4 coarse teeth or lobed to 2–4 smaller lobes; frond texture papery; venation indistinct on both surfaces, sometimes distinct adaxially, with only 1 veinlet on each lobe or coarse tooth. Sori abaxial on lower portions of veinlets, close to midrib, 1 per lobe, often 1–3 or sometimes sterile on basal acroscopic auriculate lobes; indusia present, large, brown when mature, thinly membranous, next to one another, shallowly lacerate. Spores semicircular in equatorial view; perispore sculpturing granulate with few shallow ridges.

Wet rock crevices and cliffs in subalpine forests; (1700–)2700–3900 m. Chongqing, NE and W Guizhou, W Hubei, SW and W Si-

chuan, Taiwan, SE Xizang, C, NE, and W Yunnan [Bhutan, NW India, Nepal].

130. *Polystichum jiulaodongense* W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 227. 2001.

九老洞耳蕨 *jiu lao dong er jue*

Plants summer-green. Rhizome erect, 3–5 mm tall, 1–2 mm in diam. Fronds 6–10 cm; stipe lower part castaneous, upper part green, slender, 1–8 cm, ca. 0.5 mm in diam., sparsely scaly; scales lanceolate or broadly lanceolate, thinly membranous, with few long teeth. Lamina bi- to tripinnatifid, lanceolate, 4–7 × 1–1.5 cm, slightly or not contracted toward base, acuminate; rachis grass-green, abaxially sparsely scaly; scales brown, narrowly lanceolate, basal margins with few long teeth, with 1 proliferous bulbil between basalmost pinnae, bulbil densely covered with brown scales. Pinnae 10–20 pairs, ovate, lower pairs slightly shortly stalked, ultimate segments slender, with only 1 veinlet, oblanceolate, 1–3 mm, 0.3–1 mm, acute; grass-green when dry, abaxially darker, abaxially sparsely scaly; microscales brown, narrowly lanceolate, entire, evanescent; frond texture thinly papery. Sori basal on ultimate segments; indusia brown, thinly membranous, irregularly peltate, coarsely lacerate, often larger than ultimate segments.

• Among moss on wet limestone cliffs, broad-leaved evergreen forests; ca. 1800 m. Sichuan (Emei Shan).

Polystichum jiulaodongense is a slender species, similar to a small individual of *P. caruifolium*, but it has a proliferous bulbil between the basalmost pinnae, its sori are basal on the ultimate segments, and its indusia are irregularly peltate with coarsely lacerate margins.

131. *Polystichum tiankengicola* Li Bing Zhang, Q. Luo & P. S. Wang, Novon 22: 186. 2012.

天坑耳蕨 *tian keng er jue*

Plants summer-green, 7–22 cm tall. Rhizome ascending, ca. 1 cm, sparsely or densely covered with scales; scales brown,

linear, ca. 0.1 mm; roots dark brown when dry, up to 12 cm, ca. 0.3 mm in diam. Fronds 5–10 per rhizome; stipe green, 3–9 cm, 0.3–0.9 mm in diam. at middle; basal stipe scales brown, dull, lanceolate, 1.2–3.5 × 0.1–0.8 mm, papery or membranous, composed of multiple cell layers, margins minutely ciliate, apices long caudate; distal stipe scales brown, dull, lanceolate, 1–2.8 × 0.1–0.3 mm, varying in size, composed of 1 or 2 cell layers, membranous, margins long ciliate, apices long caudate. Lamina 1-pinnate, lanceolate, slightly contracted toward base, 8–14 × 1.6–2.4 cm at middle, broadest part 1.8–2.7 cm wide near base, apex truncate; rachis 0.2–0.5 mm in diam. at middle, with 2 proliferous bulbils, one each at both base and apex of rachis, sometimes with only 1 bulbil at either base or apex, rarely without bulbils; scales of rachis similar to distal stipe scales but smaller, brown, dull, varying in size, papery, margins minutely ciliate, apices caudate. Pinnae 13–22 pairs, not overlapping, pointing slightly upward, basal two pairs 0.5–1.2 cm apart, alternate but nearly opposite at frond base, deltoid in lower part of lamina, oblong in upper part of lamina; middle pinnae 0.9–1.2 × 0.5–0.7 cm; largest pinnae in lower half of lamina, shortly stalked, asymmetrical at base, bipinnatifid. Lobes 2 or 3 pairs per pinna, alternate, elliptic or oblong, acute, basalmost pairs of lobes free or almost free; both surfaces scaly; microscales on both surfaces subulate without dilated base (narrow-type microscales), 0.9–2.25 mm, base ca. 0.1 mm wide, with few tortuous cilia on basal margin; frond texture papery; venation pinnate; midrib slightly raised abaxially, flat adaxially. Sori terminal on veinlets, entire abaxial lamina fertile, 2–5 sori per pinna, close to midrib, center of sorus 1.2–1.6 mm distant from pinna margin; indusia brown, 1–1.2(–1.5) mm in diam., membranous, erose.

• Wet basic soil among limestone rubble, limestone cliffs at entrances of caves at bottom of sinkholes; ca. 2500 m. NW Guizhou (Hezhang).

Polystichum tiankengicola can have two proliferous bulbils on each end of the rachis, distinguishing it from all other species in the genus.

18. *Polystichum* sect. *Crucifilix* Tagawa, Acta Phytotax. Geobot. 9: 122. 1940.

戟叶耳蕨组 *ji ye er jue zu*

Plants medium-sized. Lamina papery, bipinnate at base, 1-pinnate upward. Basal pinnae extraordinarily prolonged.

About four species: Asia; three species (one endemic) in China.

- 1a. Pinnae coarsely serrate, falcate-lanceolate, acuminate 132. *P. tripterum*
 1b. Pinnae toothed, oblong or almost rectangular, acute.
 2a. Basal pinnae 1-pinnate (at least some laminae of same plant with 1-pinnate basal pinnae); sori slightly closer to midrib; indusia much smaller than below; perispore with reticulate sculpture 133. *P. hancockii*
 2b. Basal pinnae rarely 1-pinnate; sori closer to pinna margin; indusia 0.6–0.8 mm in diam.; perispore with irregularly perforate sculpture 134. *P. normale*

132. *Polystichum tripterum* (Kunze) C. Presl, Epimel. Bot. 55. 1851.

戟叶耳蕨 *ji ye er jue*

Aspidium tripterum Kunze, Bot. Zeitung (Berlin) 6: 569. 1848; *Dryopteris triptera* (Kunze) Kuntze; *Polystichum tri-*

pterum f. *subbipinnatum* H. Itô; *Ptilopteris triptera* (Kunze) Hayata.

Plants evergreen. Rhizome erect, short, rhizome apex and stipe base densely scaly; scales dark brown, lanceolate, margins ciliate. Fronds 30–65 cm; stipe 12–30 cm, ca. 2 mm in diam.,

distal stipe stramineous, together with rachis and costa sparsely covered with lanceolate scales. Lamina green when dry, adaxially darker, hastate-lanceolate, 30–45 × 10–16 cm at base, with 3 elliptic-lanceolate pinnae; lateral pair smaller, 5–8 × 2–5 cm, shortly stalked, oblique, pinnate, pinnules 5–12 pairs; middle pinna much larger, 30–40 × 5–8 cm, long stalked, 1-pinnate, pinnules 25–30 pairs; all pinnules alternate, attached at nearly right angles to rachis, lower pairs shortly stalked, upper pairs subsessile, middle pairs 3–4 × 0.8–1.2 cm, falcate, apices acuminate; basicopic base oblique, acroscopic margins straight, acroscopic base with deltoid auricles, margins coarsely toothed or pinnatifid, teeth and lobes spinulose at apex; sparsely scaly along veins; microscales light brown, ovate-lanceolate or lanceolate; frond texture papery; venation pinnate on lobes, veinlets simple, rarely forked. Sori terminal on veinlets; indusia present, slightly erose, caducous. Spores elliptic in polar view, semicircular in equatorial view. $2n = 41$.

Rock crevices, on rocks in forests; 400–2300 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Sichuan, Zhejiang [Japan, Korea, Russia (Far East)].

133. *Polystichum hancockii* (Hance) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 191. 1899.

小戟叶耳蕨 xiao ji ye er jue

Ptilopteris hancockii Hance, J. Bot. 22: 139. 1884; *Aspidium hancockii* (Hance) Baker; *A. reductum* Baker; *Polystichum hancockii* var. *leptopteron* (Hayata) Suzuki; *P. leptopteron* Hayata; *P. longistipes* Hayata; *P. parahancockii* Ching; *P. simplicinnum* Hayata.

Plants evergreen. Rhizome erect, short, rhizome apex and stipe base densely scaly; scales dark brown, ovate-lanceolate, toothed at apex. Fronds 30–50 cm; stipe stramineous upward, 10–20 cm, sparsely scaly or subglabrous. Lamina hastate-lanceolate, green when dry, 20–25 × 8–12 cm at base, with 3 linear-lanceolate pinnae; lateral pairs shorter, 2–5 × 1–2 cm, shortly stalked, pinnate, shortly acuminate; pinnules 5 or 6 pairs; middle pinna much larger than lateral pinnae, 20–25 × 3–6 cm, long stalked, 1-pinnate, long acuminate, pinnules 20–25 pairs; all pinnules alternate, attached at nearly right angles to rachis, lower pairs shortly stalked, upper pairs subsessile, middle part 1.5–2 cm × 6–8 mm, obliquely rectangular, apices acute or obtuse, acroscopic base with deltoid auricles, margins coarsely toothed, teeth with small spinules at apex; both surfaces glabrous; frond texture thinly papery; venation pinnate on lobes, veinlets simple, rarely forked. Sori terminal on veinlets; indusia present, slightly erose, caducous. Spores elliptic in polar view, semicircular in equatorial view, perispore sculpturing reticulate. $2n = 41$.

Forests; 300–2100 m. Anhui, Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Taiwan, Zhejiang [Japan, Korea].

134. *Polystichum normale* Ching ex P. S. Wang & Li Bing Zhang, Novon 22: 250. 2012.

渝黔耳蕨 yu qian er jue

Plants evergreen. Rhizome ascending or erect, short, 0.5–2 cm; scales light brown to brown, ovate-lanceolate, 3–4 mm, papery; roots dark brown to brown when dry, up to 7 cm, 0.2–0.3 mm in diam., sparsely covered with hairlike scales. Fronds 4–7 per rhizome, (11–)16–33 cm; stipe green, stramineous when dry, (4–)6–17 cm, (0.4–)0.7–2.6 mm in diam. at middle; basal stipe scales dull, ovate-lanceolate, 5–7 × 1.2–1.5 mm, varying in size, thinly papery and brown at middle, membranous and light brown on margin, entire, acuminate or caudate; distal stipe scales similar but narrower and shorter toward rachis apex, light brown, dull, lanceolate or ovate-lanceolate, membranous, ciliate, caudate. Lamina 1-pinnate, lanceolate, (6–)9–27 × 1.9–3.3 cm at middle, slightly contracted toward base, acuminate; rachis 0.7–1.3 mm in diam. at middle, without proliferous bulbils; scales light brown, dull, 1.5–3 × 0.3–0.7 mm at base, varying in size, membranous, margins ciliate, apices caudate. Pinnae 14–28 pairs, approximate, angled acroscopically, basalmost pairs simple, pinnatifid or 1-pinnate, 8–35 × 3.5–12 mm, basal two pairs 0.7–1.4 cm apart, alternate, green, oblong to rectangular, middle pinnae 9–17 × 3.5–7.2 mm, shortly stalked, stalks ca. 1.2 mm; acroscopic base auriculate, basicopic base truncate and often forming a (90°–)100°–110° angle with rachis, apices acute or rounded but mucronate; acroscopic margins repand-serrate; abaxially scaly, adaxially glabrous; microscales on abaxial surface subulate without dilated base (narrow-type microscales), 0.1–0.23 mm, base 0.05–0.1 mm wide; frond texture papery; venation pinnate; midrib abaxially slightly raised, adaxially flat and invisible; lateral veins free, 4–7 pairs from midrib per pinna, each lateral vein further dichotomous, indistinct on both surfaces. Sori terminal on veins of pinnae, (1–)4–8 per fertile pinna, between midrib and pinna margin and 0.7–2.2 mm distant from pinna margin; all pinnae on fertile lamina fertile; indusia brown, 0.6–0.8 mm in diam., membranous, erose. Spores dark brown when fresh, circular in polar view, elliptic in equatorial view, ca. 50.5 × 41.3 μm (polar axis × equatorial axis); perispore sculpturing irregularly perforate with few ridges and numerous spinules.

• Thick acidic soils derived from sandstone in forests, shaded places in valleys; 600–1900 m. S Chongqing, NE and SE Guizhou, NW Hunan.

Polystichum normale is similar to *P. tripterum* and *P. hancockii*. *Polystichum normale* is distinguished from *P. tripterum* by its toothed, oblong or almost rectangular pinnae with acute apices and its basal pinnae that are simple, pinnatifid, or 1-pinnate. The basalmost pinnae of *P. normale* are almost as long as to twice as long as the median pinnae. In contrast, *P. tripterum* has coarsely serrate and falcate-lanceolate pinnae with acuminate apices and basal pinnae ca. six times as long as the median pinnae.

Polystichum normale differs from *P. hancockii* in having sori closer to the pinna margins (vs. slightly closer to the midrib) and indusia larger, 0.6–0.8 mm in diam. (vs. only 0.3–0.4 mm). In addition, the basal pinnae of *P. normale* can be simple or pinnatifid or 1-pinnate, while those of *P. hancockii* are consistently 1-pinnate (at least some laminae on any given plant of *P. hancockii* have 1-pinnate basal pinnae).

Material of *Polystichum normale* was included in *P. leveillei* in FRPS (5(2): 175. 2001). Genuine *P. leveillei* has simple basal pinnae and thin stipes and is a calciphilous member of *P.* sect. *Haplopolystichum* s.s. occurring in karst caves in S Guizhou (Luodian and Ziyun).

19. Polystichum sect. **Sphaenopolystichum** Ching ex W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 223. 2001.

细裂耳蕨组 xi lie er jue zu

Plants small to medium-sized, evergreen. Frond texture papery, thinly papery, or rarely thinly leathery. Stipe scales uniform, ovate to lanceolate, often appressed, rarely spreading. Lamina lanceolate, broadly lanceolate, ovate-lanceolate, or ovate, often bipinnatifid to bipinnatifid, bipinnatisect, tripinnatifid, rarely tetrapinnatifid. Ultimate lobes often narrow, linear to spatulate, entire, with 1 veinlet per lobe. Sori 1 per lobe or ultimate lobe, small, abaxial or terminal on veinlets. Indusia falling off early or sori without indusia.

About 12 species: China, India, Myanmar, and Vietnam; 12 species (nine endemic) in China.

Polystichum sect. *Sphaenopolystichum* is recognized here based on morphology.

- 1a. Scales on stipe and rachis open.
- 2a. Lamina tripinnate to tetrapinnatifid; stipe scales dense, up to 10 × 5 mm, reddish brown 144. *P. wattii*
- 2b. Lamina bipinnatifid to bipinnatisect, or lamina base bipinnate; stipe scales sparse, shorter than 2 mm, brown.
- 3a. Lamina elliptic-lanceolate, green 145. *P. martinii*
- 3b. Lamina deltoid-lanceolate, dark green 146. *P. cuneatifforme*
- 1b. Scales on stipe and rachis all or mostly appressed.
- 4a. Lamina tripinnate or tetrapinnate; ultimate lobes linear.
- 5a. Lamina narrowly elliptic or broadly elliptic-lanceolate, middle or upward broadest; pinnae approximate, up to 40 pairs, yellowish green, those below middle or above middle narrowed gradually toward lamina base; rachis scales narrowly lanceolate; pinna rachis stramineous or greenish stramineous; sori indusiate 135. *P. caruifolium*
- 5b. Lamina narrowly ovate, broadest below middle; pinnae often separate from each other, fewer than 25 pairs, dark green, those below middle not or only slightly narrowed toward lamina base; rachis scales broadly ovate; pinna rachis green; sori exindusiate 136. *P. alcorni*
- 4b. Lamina 1-pinnate to bipinnate; ultimate lobes not linear.
- 6a. Lamina 1-pinnate; pinnae pinnatifid to pinnatifid.
- 7a. Upper side of pinnae pinnatifid and often forming 1 or few free lobes 141. *P. auriculatum*
- 7b. Upper side of pinnae pinnatifid only and without free lobes.
- 8a. Pinnae 30–40 pairs, only a few basalmost pinnae slightly narrowed 142. *P. bifidum*
- 8b. Pinnae 15–23 pairs, those below middle of lamina gradually narrowed toward lamina base 143. *P. pseudolanceolatum*
- 6b. Lamina bipinnate; pinnules toothed or pinnatifid to pinnatifid.
- 9a. Lamina elliptic-lanceolate, 5–9 cm at widest (at middle); pinnae asymmetrical at base; pinnules toothed or pinnatifid to pinnatifid, narrowly cuneate, basal acroscopic ones largest and slightly auriculate.
- 10a. Pinnules pinnatifid to pinnatifid; ultimate lobes elliptic-clavate or spatulate 137. *P. christii*
- 10b. Pinnules only dentate-spinulose on margin, elliptic 138. *P. bissectum*
- 9b. Lamina ovate or ovate-lanceolate, (7–)10–23 cm at widest (below middle); pinnae symmetrical or nearly symmetrical at base; pinnules pinnatifid to pinnatifid, rarely pinnatifid, broadly cuneate, basal acroscopic ones same size as others; ultimate lobes ovate-deltoid, rarely clavate-oblong.
- 11a. Pinnae often acute; lower part of pinna rachis often not winged; pinnules up to 2 cm, wider than 5 mm; sori medial or nearly medial 139. *P. tonkinense*
- 11b. Pinnae often acuminate or long acuminate; lower part of pinna rachis often narrowly winged; pinnules up to 1 cm, ca. 3 mm wide; sori submarginal 140. *P. excelsius*

135. Polystichum caruifolium (Baker) Diels, Bot. Jahrb. Syst. 29: 194. 1900 [*“caruifolium”*].

峨眉耳蕨 e mei er jue

Aspidium caruifolium Baker, J. Bot. 26: 228. 1888; *Polystichum faberi* Christ, nom. illeg. superfl.; *P. omeiense* C. Christensen (1906), nom. illeg. superfl., not Christ (1906).

Plants evergreen. Rhizome ascending, short, densely scaly; scales brown, ovate, small, subentire, acuminate. Fronds 20–60

cm; stipe stramineous, 5–15 cm, up to 1 mm in diam., young stipe densely scaly; scales brown, ovate, membranous, acuminate, opening acroscopically or appressed, upper part of some scales thickened and castaneous; scales on old stipe sparser, appressed. Lamina tri- to tetrapinnatifid, yellowish green when fresh, grayish green when dry, narrowly elliptic or elliptic-oblong, 15–45 × 3–10 cm at middle, shallowly cordate, shortly acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales narrowly lanceolate, appressed. Pinnae 25–40 pairs, approximate, mostly alternate,

subsessile, attached at right angles to rachis or slightly ascendant, several basal pairs slightly contracted and reflexed, broadly lanceolate, apex acuminate or acute; lower pairs nearly ovate, bi- to tripinnatilobate; primary lobes 5–12 pairs per pinna on pinnae above middle of lamina, oblong-ovate, bases long cuneate and with narrow wings on both sides and decurrent connecting with wings of pinna rachis; secondary lobes 1–4 pairs, twice or once dichotomously branched, apical lobules simple; ultimate lobules linear, ca. 0.5 mm wide, margins entire, apices acute and spinulose; abaxially sparsely scaly; microscales brown, narrowly lanceolate; frond texture softly papery. Sori on upper part of ultimate lobules, terminal on veinlets; indusia present, membranous, entire, wider than ultimate lobules. Spores elliptic in polar view; perispore sculpturing granulate with few ridges but without perforations.

• Wet limestone rocks by streams, limestone cliffs, karst caves; 700–1800 m. Chongqing, W Guangxi (Leye), S and SW Guizhou (Dushan, Panxian), S and W Sichuan, NE and SE Yunnan.

136. *Polystichum alcicorne* (Baker) Diels, Bot. Jahrb. Syst. 29(2): 194. 1900.

角状耳蕨 jiao zhuang er jue

Polypodium alcicorne Baker, J. Bot. 26: 229. 1888; *Aspidium alcicorne* (Baker) Christ.

Plants evergreen. Rhizome ascending, short, rhizome apex and from stipe to rachis densely scaly; scales brown, ovate or broadly ovate, often appressed, membranous, margins fimbriate. Fronds 30–60 cm; stipe stramineous, 7–30 cm, 1–2 mm in diam. Lamina tri- to tetrapinnatilobate, green when fresh and dry, darker adaxially, narrowly ovate, 18–35 × 6–12 cm, base not or slightly contracted, apex shortly pinnatifid-acuminate; rachis stramineous, without proliferous bulbils, with numerous membranous scales abaxially; scales brown, appressed, broadly ovate, erose. Pinnae 18–25 pairs, ascendant, falcate-lanceolate, 2–7 × 1–3 cm, broadly cuneate, shortly stalked or sessile, shortly acuminate; costa green, with gradually narrowed wings from apex to base on both sides reaching below middle of pinnae, abaxially sparsely scaly, scales similar to rachis scales but smaller. Pinnules 6–10 pairs, slightly ascendant, oblong-ovate, 5–15 × 2–8 mm, bases cuneate and decurrent forming narrowly winged short stalk, pinnatifid or pinnate forming 2–5 pairs of oblong-ovate or obovate lobes, apices acute; basal acroscopic pinnules largest and often parallel to rachis; basal basicopic lobes largest, dichotomously lobed or shallowly lobed or pinnatifid and forming 2 pairs of secondary lobules, other lobes ± tri- or dichotomously lobed or not lobed, rarely second lobes of acroscopic base deeply lobed and forming 2 pairs of secondary lobules; sometimes basal acroscopic secondary lobules further lobed and forming 2 “lobulettes” in equal or unequal lengths; secondary lobules and apical lobules of pinnules lanceolate or oblanceolate, apex acute, with 1 veinlet per lobule not reaching lobule apex; abaxially sparsely scaly along veins; microscales brown, narrowly lanceolate; frond texture papery. Sori small, terminal on veinlets, exindusiate.

• Wet limestone crevices in montane broad-leaved evergreen forests; 600–1000 m. Chongqing (Jinfo Shan), NE Guizhou (Dejiang, Sinan, Yanhe), Sichuan (Emei Shan).

137. *Polystichum christii* Ching, Bull. Fan Mem. Inst. Biol. 2: 192. 1931.

拟角状耳蕨 ni jiao zhuang er jue

Plants evergreen. Rhizome ascending, short, rhizome apex and stipe densely scaly; scales light brown on margin, castaneous at middle, ovate, thickened at middle, membranous, entire, acuminate. Fronds 30–45 cm; stipe stramineous or light brownish stramineous, 6–16 cm, ca. 1 mm in diam. at base. Lamina tripinnatipartite to tripinnate, green or light green when dry, concolorous on both surfaces, elliptic-lanceolate, 18–32 × 5–6 cm, gradually and slightly contracted below middle, acuminate; rachis stramineous, without proliferous bulbils, adaxially glabrous, abaxially sparsely scaly; scales appressed, brown, ovate, membranous, long acuminate. Pinnae ca. 30 pairs, approximate, attached at right angles to rachis or slightly ascendant, opposite or alternate, sessile, falcate-lanceolate or oblong-lanceolate, bases asymmetrical, apices acute or shortly acuminate; basal acroscopic pinnules largest and parallel to rachis, basicopic margins of pinnae oblique, middle pinnae 2.5–4 × 1–1.5 cm, basalmost pinnae 1–2.5 cm; costa green, abaxially sparsely scaly; scales similar to rachis scales, brown, membranous, long acuminate. Pinnules 7–10 pairs, slender, elliptic or oblong-ovate, 4–8 × 1–3 mm, bases narrowly cuneate, pinnatifid and forming acute lacinate lobes, apices acute; basal acroscopic pinnules largest and slightly auriculate, proximal margins of basal acroscopic pinnules close to rachis. Lobes elliptic-clavate or spatulate, apices acute and shortly spinulose, sometimes shallowly bilobed, each lobule also shortly spinulose at apex; adaxially glabrous, abaxially sparsely scaly; microscales evanescent, short and slender; frond texture thinly papery; venation indistinct adaxially, slightly visible abaxially, slender, 1 veinlet per lobe, reaching base of spinule. Sori small, located on upper part of veinlets, close to lobe apex, 1 per lobe; indusia present, light brown, entire, nearly as wide as lobes, evanescent.

Wet limestone crevices in montane broad-leaved evergreen forests, karst caves; 800–1900 m. Guizhou, SE Yunnan [N Vietnam].

138. *Polystichum bissectum* C. Christensen, Index Filic., Suppl. 1906–1912: 64. 1913.

川渝耳蕨 chuan yu er jue

Polystichum omeiense Christ, Bull. Acad. Int. Géogr. Bot. 16: 114. 1906, not C. Christensen (1905).

Plants evergreen. Rhizome erect, short, ca. 1.5 cm in diam. including stipe bases. Fronds few, 40–80 cm; stipe stramineous, 15–30 cm, 1–2 mm in diam. at base; distal stipe and rachis sparsely scaly; scales appressed, dark brown, broadly ovate or ovate-lanceolate, membranous, apex long caudate. Lamina bipinnate, light green on both surfaces when dry, elliptic-lanceolate, 23–45 × 5–9 cm, contracted at base, acuminate; rachis stramineous, without proliferous bulbils, abaxially sparsely scaly; scales light brown, lanceolate. Pinnae 26–31 pairs, falcate-lanceolate, up to 5 × 1 cm at middle, bases obviously asymmetrical, acroscopic margins truncate, basicopic margins narrowly cuneate, margins of pinnae pinnatifid to pinnatifid, apices acuminate. Pinnules 10–13 pairs, basal acroscopic

pinnules obviously largest, slightly auriculate, elliptic, bases cuneate, margins toothed and spinulose; other lobes ascendant, elliptic, apex curved upward, upper part lobed and forming 2–4 secondary lobes, few basal basisopic lobes often smaller, apices acute and spinulose; adaxially glabrous, abaxially densely covered with fibrillose light brown microscales; frond texture papery; venation pinnate to dichotomous or simple on primary lobes. Sori small, ca. 1 mm in diam., abaxial or terminal on veinlets, located between midrib and pinnule margins; indusia present, dark brown, thickly textured, entire, evanescent.

- Wet limestone crevices in broad-leaved evergreen forests in valleys; 700–900 m. Chongqing (Jinfo Shan), Sichuan (Emei).

The description of *Polystichum bissectum* in FRPS (5(2): 171. 2001) is incorrect.

139. *Polystichum tonkinense* (Christ) W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 169. 2001.

中越耳蕨 zhong yue er jue

Aspidium aculeatum (Linnaeus) Swartz var. *tonkinense* Christ, Bull. Sci. France Belgique 28: 268. 1898.

Plants evergreen. Rhizome ascending, short, together with remnant stipe base 2–3 cm in diam. Fronds few, 35–105 cm; stipe stramineous, 12–60 cm, 2–3 mm in diam. at base, whole stipe to rachis with numerous scales, scales appressed, dark brown, ovate, membranous, entire, acute, evanescent. Lamina bipinnate, green when dry, adaxially darker, ovate or ovate-lanceolate, 18–47 × 7–23 cm at middle, slightly or not contracted at base, broadly cuneate, acuminate; rachis stramineous, without proliferous bulbils. Pinnae 10–15 pairs, alternate or opposite, slightly ascendant, sometimes basal pairs attached at nearly right angles to rachis, slightly shortly stalked, narrowly oblong or falcate-lanceolate, 2–15 × 1–3 cm, bases broadly cuneate, symmetrical on both sides, apices often acute or shortly acuminate, rarely long acuminate; costa stramineous, lower part often without narrow green wings, with conspicuous narrow green wings upward, adaxially glabrous, abaxially sparsely scaly; scales dark brown or reddish brown, ovate or narrowly ovate, membranous, margins entire, apices caudate and long acuminate, upper part not appressed. Pinnules 3–17 pairs, oblong or oblong-ovate, alternate, approximate, slightly ascendant, 0.5–2 cm × 3–8 mm, bases cuneate and decurrent forming narrowly winged stalk, bases asymmetrical, acroscopic base wider, slightly auriculate, basisopic margins narrowly cuneate, margins pinnatilobate to pinnatipartite, apices acuminate. Lobes 2–5 pairs, ascendant, often ovate-deltoid, rarely clavate-oblong, apices acute, often with curved upward and short spinules, often not lobed, margins entire, rarely lobed and forming 2 or 3 lobules; lobules coarsely toothed; adaxially glabrous, abaxially sparsely scaly; microscales brown, lanceolate; frond texture papery; venation slightly distinct on both surfaces, pinnate, lateral veins pinnate to forked from base to apex on acroscopic lobes, simple on lobe apex, not reaching lobe margins. Sori small, ca. 1 mm in diam., terminal on veinlets, medial or nearly medial on acroscopic part of pinnules (between midrib and margins); indusia present, brown or dark brown, thickly membranous, entire, evanescent. Spores semicircular in equatorial view, perispore sculpturing plicate.

Limestone hills, rocks in broad-leaved evergreen forests; 800–1500 m. Guangxi (Napo), Guizhou (Libo), Yunnan (Jinping, Xichou) [N Vietnam].

Polystichum tonkinense is similar to *P. excelsius*, but its pinnae are often acute (rarely acuminate) apically, its costa does not have green wings, its pinnules are approximate, larger, often 1–2 cm, and wider than 5 mm, the spinules of its lobe apex are shorter or inconspicuous, and its sori are medial or nearly medial.

140. *Polystichum excelsius* Ching & Z. Y. Liu, Bull. Bot. Res., Harbin 4(4): 16. 1984 [*“excelsior”*].

杰出耳蕨 jie chu er jue

Plants evergreen. Rhizome ascending, together with remnant stipe base 1.5–2 cm in diam. Fronds few, 45–80 cm; stipe stramineous, 15–30 cm, 1–2 mm in diam. at base, all stipe to rachis with numerous scales; scales appressed, light brown to reddish brown, ovate, membranous, entire, acute, evanescent. Lamina bipinnate, green when dry, adaxially darker, ovate or ovate-lanceolate, 25–45 × 9–18 cm at middle, often slightly contracted at base, broadly rounded, acuminate; rachis stramineous, without proliferous bulbils. Pinnae 15–25 pairs, alternate to opposite, slightly ascendant, or basal pairs sometimes attached at nearly right angles to rachis, slightly shortly stalked, falcate-lanceolate, 2–11 × 1–2 cm, bases broadly cuneate, symmetrical on both sides, apices acuminate or long acuminate, rarely basal pairs acute at apex; costa stramineous or light greenish stramineous, with narrow green wings, adaxially glabrous, abaxially sparsely scaly; scales dark brown or reddish brown, ovate or narrowly ovate, thinly membranous, margins entire, apices caudate and long acuminate, upper part not appressed. Pinnules 7–20 pairs, alternate, approximate, slightly ascendant, oblong, 0.5–1 cm × 2–4 mm, bases cuneate and decurrent forming narrow wings, bases asymmetrical, acroscopic side wider, slightly auriculate, basisopic margins narrowly cuneate, margins of pinnules pinnatilobate to pinnatifid, apices acute; lobes 2–4 pairs, ascendant, ovate-deltoid, apices often acute and with short spinules curved upward, not lobed or unequally shallowly bilobed; adaxially glabrous, abaxially sparsely scaly; microscales brown, lanceolate; frond texture papery; venation slightly distinct on both surfaces, pinnate, lateral veins simple or forked, 1 veinlet per lobe, veinlets forked on unequally shallowly bilobed lobes, veinlets not reaching pinnule margins. Sori small, ca. 1 mm in diam., terminal on veinlets, close to pinnule margins; indusia present, grayish brown or gray, thickly membranous, entire, evanescent. Spores semicircular in equatorial view, perispore sculpturing plicate.

- By streams in valleys in broad-leaved evergreen forests; 400–1400 m. Chongqing (Nanchuan, Wuling), Hubei, NW and W Hunan (Fenghuang, Sangzhi, Shimen).

141. *Polystichum auriculum* Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 309. 1949.

滇东南耳蕨 dian dong nan er jue

Plants evergreen. Rhizome erect, short, rhizome apex and stipe base densely scaly; scales mostly spreading, brown to dark brown or castaneous, ovate-lanceolate, thickly membranous, entire, some scales appressed and thinly membranous. Fronds

25–50 cm; stipe stramineous, 5–15 cm, ca. 1 mm in diam. at base; distal stipe scales sparser, similar to basal stipe scales but smaller. Lamina 1-pinnate, green when dry, adaxially darker, lanceolate, or narrowly elliptic-lanceolate, 15–30 × 2–8 cm, often slightly contracted at base, sometimes as wide as middle pinnae or wider, acuminate; rachis stramineous to light greenish stramineous, without proliferous bulbils, abaxially sparsely scaly; scales mostly appressed, brown or upper part castaneous, ovate-lanceolate, entire. Pinnae 30–45 pairs, attached at right angles to rachis, sometimes slightly ascendant or basiscopically, approximate, alternate or nearly opposite, oblong or oblong-lanceolate, bases asymmetrical, acroscopic side wider, basiscopic margins broadly oblique, obviously narrower, acroscopic base nearly lobed to midrib, distal margins pinnatilobate to pinnatisect, apices obtuse or acute, sometimes shortly acuminate. Lobes 5–10 pairs, basal acroscopic lobes obviously largest, auriculate, oblong or obovate, bases cuneate, margins biserrate with acute and shortly spinulose apex or pinnatilobate, apices rounded-obtuse; other lobes obovate, oblanceolate or nearly linear, bases cuneate or as wide as upper portions, acroscopic margins often lobed into 2–7 coarse teeth, teeth acute and spinulose; abaxially sparsely covered with brown microscales; frond texture thinly papery; venation pinnate on lobes from base to apex, dichotomous or simple, 1 veinlet on each tooth or lobe, veinlets not reaching lobe apex or tooth apex. Sori small, terminal on veinlets, close to pinna margin; indusia present, grayish brown, slightly wider than lobes, membranous, entire, evanescent. Spores elliptic in equatorial view; perispore sculpturing plicate with spinules and granules.

• Limestone crevices in montane broad-leaved evergreen forests; 1100–1800 m. SE Yunnan (Malipo, Xichou).

142. *Polystichum bifidum* Ching, Icon. Filic. Sin. 5: t. 242. 1958.

钳形耳蕨 qian xing er jue

Plants evergreen. Rhizome erect, short, ca. 2 cm in diam. including stipe bases. Fronds 25–50 cm; stipe stramineous, sparsely scaly on lower part; scales dark brown to castaneous at middle, ovate-lanceolate, finely toothed, acuminate; cells often rectangular, cell walls straight; lateral portions of scales light brown; areoles composed of irregularly curved cells. Lamina 1-pinnate, green when dry, adaxially darker, oblong-lanceolate, 20–35 × 3–4 cm at middle, slightly contracted below middle of lamina, shortly acuminate; rachis stramineous, without proliferous bulbils, abaxially sparsely scaly; scales brown, narrowly lanceolate, toothed. Pinnae 30–40 pairs, approximate, attached at nearly right angles to rachis, oblong or nearly falcate, 1–2 cm × ca. 5 mm at middle, pinnatilobate to pinnatifid, acroscopic margins of pinnae with auriculate lobes and 4–7 short lobes, each lobe shallowly further lobed at apex into 2 unequal secondary lobules, auriculate lobes with 4 or 5 secondary small lobules, basiscopic margins of pinnae with 4 or 5 short lobes equal to or longer than those on acroscopic margins, basalmost basiscopic lobes not further lobed; all lobes ascendant, apices acute and often shortly spinulose; adaxially glabrous, abaxially sparsely scaly; microscales linear; frond texture papery; venation distinct abaxially, visible adaxially, veinlets on auricles pinnate, others nearly dichotomous, rarely simple, only 1 veinlet

per lobe or secondary lobule, not reaching lobe apex. Sori small, terminal on veinlets, close to pinna margin; indusia evanescent.

• Limestone crevices in montane broad-leaved evergreen forests; ca. 1500 m. SE Yunnan (Pingbian, Xichou).

143. *Polystichum pseudolanceolatum* Ching ex P. S. Wang, Pterid. Fl. Guizhou, 548. 2001.

假亮叶耳蕨 jia liang ye er jue

Plants evergreen. Rhizome erect, short, ca. 1 cm in diam. including stipe bases. Fronds 7–17 cm; stipe stramineous, 2–5 cm, 0.5–1 mm in diam. at base, densely scaly; scales brown, ovate to broadly lanceolate, ca. 1.5 mm, membranous, margins fimbriate, apices acuminate; distal stipe scales sparser. Lamina 1-pinnate, green or light brownish green when dry, narrowly elliptic-lanceolate, 4–14 × 1–2.3 cm at middle, gradually slightly contracted below middle of lamina, 0.8–1.4 cm wide at base, acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly; scales similar to distal stipe scales, ovate, margins with outgrowths, apices filiform. Pinnae 15–25 pairs, alternate, middle pairs attached at nearly right angle with rachis, upper pairs angled slightly acroscopically, lower pairs angled slightly basiscopically, oblong or nearly broadly lanceolate, shortly stalked, pinnatilobate or pinnatipartite, middle pairs 0.5–1.1 cm × 2–4 mm, bases asymmetrical, apices acute and ascendant; acroscopic base auriculate, auricles obovate or oblong and with 3 acute spinulose teeth, proximal margins of auricles parallel to rachis, acroscopic margins with 3 or 4 coarse acute teeth, basal basiscopic margins cuneate, entire, distal basiscopic margins curved upward, with 2 or 3 coarse acute teeth. Lobes 3 or 4 on acroscopic margins, 2 or 3 on basiscopic margins, elliptic, apices acute and spinulose; adaxially glabrous, abaxially sparsely scaly; microscales light brown, subulate; frond texture papery; venation pinnate on pinnae, lateral veins dichotomous on auricles, free on lobes, slightly distinct abaxially, indistinct adaxially. Sori in 1 row on each side of midrib, terminal on shorter veinlets, nearly medial; indusia present, light brown, entire, evanescent.

• Limestone cliffs and floors of karst caves; ca. 1500 m. C Guizhou (Anshun).

144. *Polystichum wattii* (Beddome) C. Christensen, Index Filic. 98. 1905.

细裂耳蕨 xi lie er jue

Aspidium wattii Beddome, J. Bot. 26: 234. 1888; *Lastrea wattii* (Beddome) Beddome.

Plants evergreen. Rhizome ascending to erect, short, rhizome apex and stipe base densely scaly; large scales opening, dark brown, ovate or narrowly ovate, up to 1 cm × 5 mm, shallowly erose, acuminate. Fronds 30–85 cm; stipe stramineous, 3–25 cm, 1–4 mm in diam. at base. Lamina tri- to tetrapinnatilobate, green or dark green when dry, adaxially darker, narrowly elliptic-lanceolate, 20–60 cm, 3–20 cm wide at middle, 2–7 cm wide at base, acuminate; rachis stramineous, without proliferous bulbils, sparsely covered with linear scales. Pinnae 25–40 pairs, mostly alternate, slightly ascendant, sessile, lanceolate and often slightly curved upward and falcate, middle

pairs 1.5–13 × 0.5–2 cm, acuminate to caudate and long acuminate. Pinnules 5–15 pairs on middle pinnae, obliquely ovate, alternate, slightly ascendant, shortly stalked, acute; basal acroscopic pinnules largest; secondary pinnules obliquely rectangular or obovate, bases shortly stalked or narrowly cuneate and decurrent, apices acute or slightly obtuse, without spinulose tips; basal acroscopic secondary pinnules largest, apices forked-lobed or pinnate and forming 1 or 2 pairs of free obovate lobes, margins of other secondary pinnules entire or with 2 or 3 shallow lobes; costa green, abaxially scaly; scales similar to rachis scales but smaller; frond texture thinly papery; venation indistinct, 1 per lobe, reaching tip of lobe. Sori small, abaxial on veinlets, located at middle of secondary pinnules or lobes; indusia present, brown, small, entire, ca. 1/2 width of lobes. Spores semicircular in equatorial view, elliptic in polar view; perispore sculpturing reticulate with large lumina.

Rocks and rock crevices in montane broad-leaved evergreen forests; 1400–2000 m. SE Xizang (Médog), NW and W Yunnan (Dulongjiang region, Gaoligong Shan, Nushan) [N India, N Myanmar].

Polystichum wattii has been placed in *P.* sect. *Micropolystichum* by Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 7. 1997). It might be a member of *P.* sect. *Hypopeltis*.

145. *Polystichum martinii* Christ, Bull. Acad. Int. Géogr. Bot. 11: 263. 1902 [*“Martini”*].

黔中耳蕨 qian zhong er jue

Plants evergreen. Rhizome erect, short, ca. 1 cm in diam. including stipe bases. Fronds 12–40 cm; stipe stramineous, 2–10 cm, 0.5–1 mm in diam. at base, sparsely scaly; scales brown, narrowly ovate to ovate-lanceolate, ca. 1.5 mm, membranous, margins fimbriate. Lamina 1-pinnate, yellowish green or light brown when dry, nearly concolorous on both surfaces, narrowly elliptic-lanceolate, 10–25 × 2–3 cm at middle, gradually contracted below middle of lamina, 1–1.5 cm wide at base, acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly; scales similar to stipe scales. Pinnae 15–22 pairs, alternate, attached at right angle to rachis or angled slightly acropically, sometimes lower pairs angled slightly basiscopically, sessile or very shortly stalked, pinnatipartite to pinnatisect, obliquely ovate or nearly oblong, acroscopic margins forming a nearly right angle with rachis, basiscopical margins forming an obtuse angle with rachis, proximal margins of basal acroscopic pinnules or lobes nearly parallel to rachis, apices acute or obtuse and ascendant. Lobes 3–6 pairs, lobes ascendant, obovate, bases narrowly cuneate, apices 2–5-toothed-lobed or not lobed, apices of lobes acute apically, basal acroscopic lobes obviously largest; adaxially glabrous, abaxially

sparsely scaly; microscales brown, ovate-lanceolate to lanceolate, with few long teeth, smaller microscales light brown or grayish white, vermiform; frond texture papery; venation pinnate on pinnae, lateral veins dichotomous on auricles and other lobes, slightly distinct abaxially, indistinct adaxially. Sori small, less than 1 mm in diam. when mature, abaxial and terminal on veinlets, nearly medial; indusia present, light brown, entire, evanescent.

• Limestone cliffs at cave mouths; 1100–1300 m. C Guizhou.

The type of *Polystichum martinii* was collected from Pingba (Gan-pin) instead of Anshun.

146. *Polystichum cuneatiforme* W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 177. 2001.

楔基耳蕨 xie ji er jue

Polystichum cuneatum Ching ex P. S. Wang, Guizhou Sci. 12(2): 56. 1994, not Nakaike (1978).

Plants evergreen. Rhizome erect, short, rhizome apex and stipe base scaly; scales opening, brown, ovate, thick in texture, margins fimbriate, apices caudate-acuminate. Fronds 13–28 cm; stipe 2–12 cm, ca. 1 mm in diam. at base, distal stipe scales sparse, similar to basal stipe scales but smaller, thick in texture, margins fimbriate. Lamina lanceolate or deltoid-lanceolate, 6–17 × 2.5–5 cm, base not contracted or even slightly broad, bipinnatipartite to bipinnate or base bipinnate, apex acuminate; rachis without proliferous bulbils. Pinnae 10–15 pairs, shortly stalked, slightly ascendant, oblong-ovate and falcate, lower pinnae below middle of lamina 1.5–2.5 × 7–10 mm at base, bases asymmetrical, basiscopical margins rounded-cuneate, acroscopic margins truncate, pinnatisect to pinnate, apices acute. Pinnules and lobes adjacent to one another or imbricate, obovate or elliptic, basal acroscopic pinnules largest and pinnatilobate to pinnatipartite, other pinnules or lobes mostly entire apically or with only 1 shallow obtuse tooth, rarely forked-toothed or with 3 or 4 shallow lobes at apex; adaxially glabrous, abaxially sparsely scaly; microscales appressed, brown, broadly ovate-lanceolate, membranous, margins fimbriate; frond texture papery to thinly papery; venation pinnate, slightly distinct on both surfaces, veinlets simple or dichotomous on lobes. Sori small, terminal on veinlets, often 1 per pinnule or lobe; indusia present, brown, sparsely toothed.

• Limestone crevices in karst caves; ca. 1200 m. C Guizhou (Ziyun).

Polystichum cuneatiforme is similar to *P. martinii*, but its basal pinnae are not contracted and its pinnules and scales are densely arranged or imbricate.

20. *Polystichum* sect. *Cyrtogonellum* (Ching) Li Bing Zhang, **comb. et stat. nov.**

柳叶耳蕨组 liu ye er jue zu

Basionym: *Cyrtogonellum* Ching, Bull. Fan Mem. Inst. Biol., Bot. 8: 327. 1938.

Plants medium-sized. Lamina leathery, 1-pinnate. Rachis without proliferous bulbils. Pinnae falcate-lanceolate or obliquely oblong, length more than 3 × width or only ca. 1.5 × width, symmetrical or nearly symmetrical, rarely asymmetrical at base. Venation free, rarely anastomosing to form 1 or 2 rows of areoles. Sori in 1 row on each side of midrib.

About five species and one hybrid: S China and N Vietnam; five species and one hybrid (three species and one hybrid endemic) in China.

Polystichum sect. *Cyrtogonellum* is defined based on morphology but is possibly not monophyletic (Zhang & He, Syst. Bot. 35: 13–19. 2010).

- 1a. Lamina imparipinnate and with apical pinna of same shape as lateral pinnae.
 2a. Pinnae 13–24 pairs, obliquely ovate; veins free 147. *P. minimum*
 2b. Pinnae fewer than 8(–10) pairs, lanceolate; veins with few areoles along midrib 148. *P. fraxinellum*
 1b. Lamina pinnate and with pinnatifid apex.
 3a. Pinnae fewer than 8 pairs; veins with few areoles along midrib 149. *P. ×rupestris*
 3b. Pinnae obviously more than 10 pairs; veins free.
 4a. Pinnae narrowly lanceolate, symmetrical or nearly symmetrical at base 150. *P. tenuius*
 4b. Pinnae obliquely deltoid-falcate or falcate-lanceolate, obviously asymmetrical at base.
 5a. Pinnae fewer than 20 pairs, falcate-lanceolate, 3.5–5 cm 151. *P. simile*
 5b. Pinnae ca. 30 pairs, obliquely deltoid-falcate, shorter than 2.5 cm 152. *P. xichouense*

147. *Polystichum minimum* (Y. T. Hsieh) Li Bing Zhang, Phytotaxa 60: 58. 2012.

斜基柳叶耳蕨 xie ji liu ye er jue

Cyrtogonellum minimum Y. T. Hsieh, Bull. Bot. Res., Harbin 9(3): 17. 1989; *C. inaequale* (Christ) Ching; *Cyrtomium fraxinellum* (Christ) Christ var. *inaequale* Christ.

Plants evergreen. Rhizome erect or ascending, together with basal stipe densely scaly; scales dark brown or blackish brown, lanceolate, margins ciliate, apices acuminate. Fronds 14–54 cm; stipe stramineous, 6–26 cm, 2–2.5 mm in diam. at middle; basal stipe scales dense, blackish brown, lanceolate or subulate, membranous, margins ciliate, apices caudate, distal stipe scales sparser and smaller. Lamina imparipinnate, grayish green when dry, adaxially shiny, linear-lanceolate, 8–28 × 2.5–3.5 cm at middle, not or only basalmost pinnae slightly contracted toward base, cuspidate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales similar to distal stipe scales, appressed, brown, ovate-lanceolate, margins ciliate, apices filiform. Apical pinna with same shape as lateral pinnae but smaller; lateral pinnae 7–34 pairs, alternate, lower pairs approximate, upper pairs approximate, lower pairs attached at ± right angles with rachis, upper pairs slightly ascendant, shortly stalked, obliquely ovate, middle pairs 1.5–2.5 × 0.6–0.9 cm, bases asymmetrical, acroscopic base hardly auriculate, proximal acroscopic margins of pinnae curved and slightly overlapping rachis, acroscopic margins truncate or very slightly recurved, regularly shallowly incised-toothed, basal basispic margins cuneate, forming a ± 80° angle with rachis, entire, distal basispic margins curved upward, regularly shallowly incised-toothed, apices acute or shortly acuminate, rarely obtuse; adaxially glabrous, abaxially sparsely scaly; microscales light brown, subulate; frond texture thinly leathery; venation pinnate on pinnae, lateral veins 2- or 3-forked, slightly sunken on both surfaces. Sori in 1 row on each side of midrib, terminal on shorter veinlets, medial, lower lamina often sterile; indusia present, brown, thickly membranous, entire, evanescent. $2n = 123^*$.

• Limestone crevices in forests, rarely in limestone caves; 500–1500 m. Chongqing (Jinfo Shan), NW Guangxi (Tian'e), Guizhou.

Although *Cyrtogonellum inaequale* (Christ) Ching (1938) is older than *C. minimum* Y. T. Hsieh (1989), the epithet “*inaequale*” is blocked by *Polystichum inaequale* Von Keyserling (1873) when the species is transferred to *Polystichum*.

148. *Polystichum fraxinellum* (Christ) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 194. 1899.

柳叶耳蕨 liu ye er jue

Aspidium fraxinellum Christ, Bull. Herb. Boissier 7: 15. 1899; *Cyrtogonellum fraxinellum* (Christ) Ching; *C. omeiense* Ching ex Y. T. Hsieh; *Cyrtomium fraxinellum* (Christ) Christ.

Plants evergreen. Rhizome erect or ascending, together with basal stipe densely scaly; scales slightly castaneous, broadly lanceolate, sparsely toothed, acuminate. Fronds up to 60 cm; stipe stramineous, 14–35 cm, 2–2.5 mm in diam. at middle; basal stipe scales dense, castaneous, broadly lanceolate or lanceolate, thickly membranous, sparsely toothed, acuminate; distal stipe scales smaller, brown, lanceolate, membranous, margins ciliate, apices caudate. Lamina imparipinnate, grayish green when dry, adaxially shiny, oblong, 12–27 × 7–12 cm at middle, not contracted toward base, rounded, cuspidate to acute; rachis stramineous, without proliferous bulbils, abaxially sparsely scaly; scales similar to distal stipe scales, brown, lanceolate or subulate, margins ciliate, apices filiform. Apical pinna with same shape as lateral pinnae but smaller; lateral pinnae 3–6 pairs, alternate, approximate, ascendant, shortly stalked, ovate-lanceolate, basal pairs 5–9 × 1.4–2.5 cm, bases nearly symmetrical, acroscopic base hardly auriculate, proximal acroscopic margins of pinnae slightly curved and forming a ± 20° angle to rachis or nearly parallel with rachis, acroscopic margins very slightly recurved, regularly shallowly incised-toothed, basal basispic margins cuneate, forming a ± 60° angle with rachis, entire, distal basispic margins curved upward, regularly shallowly incised-toothed, apices acuminate; adaxially glabrous, abaxially sparsely scaly; microscales light brown, subulate; frond texture thinly leathery; venation reticulate, distinct on both surfaces, with 1 row of obliquely rectangular areoles on each side of midrib and a sporadic second row of areoles between major areoles, each areole with 1 included veinlet, veinlets outside of areoles free. Sori in 1 row on each side of midrib, terminal on included veinlets, medial, apical portions of lamina and pinnae sometimes sterile; indusia present, brown, membranous, entire, evanescent. $2n = 123$.

Crevices of limestone rocks in forests; 500–1800 m. Guangxi, Guizhou, Hunan, Sichuan, Taiwan, Yunnan [N Vietnam].

149. *Polystichum ×rupestris* P. S. Wang & Li Bing Zhang, Phytotaxa 60: 58. 2012.

石生柳叶耳蕨 shi sheng liu ye er jue

Cyrtogonellum ×rupicola P. S. Wang & X. Y. Wang, *Perid. Fl. Guizhou*, 242. 2001.

Plants evergreen. Rhizome erect or ascending, together with basal stipe densely scaly; scales dark brown, broadly lanceolate, thickly membranous, margins fimbriate, apices acuminate. Fronds 26–55 cm; stipe stramineous, 13–30 cm, 1.5–2 mm in diam. at middle, distal stipe scales smaller, brown, lanceolate or subulate, membranous, margins ciliate, apices caudate. Lamina 1-pinnate, grayish green or light green when dry, adaxially shiny, oblong, 13–25 × 6–10 cm at middle, not contracted toward base, base rounded, apex pinnatifid-acuminate; rachis stramineous, without proliferous bulbils, abaxially sparsely scaly; scales similar to distal stipe scales, brown, lanceolate to subulate, margins ciliate, apices filiform. Pinnae 4–8 pairs, alternate, approximate, ascendant, shortly stalked, narrowly elliptic, basal pairs 6–6.5 × 2–2.4 cm at middle, bases cuneate and nearly symmetrical, acroscopic base not auriculate, proximal acroscopic margins of pinnae slightly curved and forming a 0°–40° angle with rachis, acroscopic margins very slightly curved, regularly shallowly incised, basal basicopic margins cuneate, forming a 80°–120° angle with rachis, entire, distal basicopic margins curved upward, regularly shallowly incised-toothed, apices acuminate; adaxially glabrous, abaxially sparsely scaly; microscales light brown, filiform; frond texture thinly leathery; most veins free, distinct on both surfaces, with few or more obliquely rectangular areoles on each side of midrib, areoles not in a complete row, each areole with or without 1 included veinlet. Sori in 1 row on each side of midrib, terminal on free veinlets above acroscopic base of lateral veins, or on included veinlets, rarely on connections between veinlets, medial, lower part of lamina sometimes sterile; indusia present, brown, membranous, entire, evanescent.

- Limestone crevices in forests; ca. 1500 m. C Guizhou (Anshun).

When this hybrid is transferred to *Polystichum*, the original epithet is blocked by *Polystichum rupicola* Ching ex W. M. Chu (*Acta Bot. Yunnan.*, Suppl. 5: 51. 1992).

150. *Polystichum tenuius* (Ching) Li Bing Zhang, *Phytotaxa* 60: 59. 2012.

离脉柳叶耳蕨 *li mai liu ye er jue*

Cyrtogonellum tenuius Ching, *Bull. Fan Mem. Inst. Biol., Bot.* 8: 329. 1938 [*“tenuium”*]; *C. caducum* Ching; *C. falcilobum* Ching ex Y. T. Hsieh; *C. salicifolium* Ching ex Y. T. Hsieh.

Plants evergreen. Rhizome erect or ascending, together with basal stipe densely scaly; scales dark brown, ovate-lanceolate, thickly membranous, toothed, acuminate. Fronds 30–70(–100) cm; stipe stramineous, 15–25(–46) cm, 1.5–2.5 mm in diam. at middle; distal stipe scales smaller, brown, subulate, membranous, margins ciliate, apices filiform. Lamina 1-pinnate, grayish green when dry, adaxially shiny, broadly lanceolate, 15–30(–54) × 6–10 cm at middle, base truncate, not or only basalmost pairs contracted toward base, apex pinnatifid-acuminate; rachis stramineous, without proliferous bulbils, abaxially sparsely scaly; scales similar to distal stipe scales but smaller, brown, subulate, margins ciliate, apices filiform. Pinnae 13–24 pairs, alternate, approximate, attached at right angles

to rachis or angled slightly acroscopically or basicopically, shortly stalked, lanceolate or rarely falcate-lanceolate, basal pairs 3.5–7 × 0.8–1.8 cm, bases nearly symmetrical, acroscopic base hardly auriculate, proximal acroscopic margins of pinnae slightly curved and forming a 0°–30° angle with rachis, acroscopic margins truncate or very slightly recurved, subentire or shallowly incised-toothed, basal basicopic margins cuneate, forming a ± 45° angle with rachis, entire, distal basicopic margins slightly curved upward, shallowly incised-toothed, apices acuminate; adaxially glabrous, abaxially sparsely scaly; microscales light brown, filiform; frond texture thickly papery to thinly leathery; venation pinnate, distinct abaxially, indistinct adaxially; lateral veins 3- or 4-forked, not reaching pinna margin. Sori in 1 row on each side of midrib, terminal on veinlets, medial, basalmost pinnae often sterile; indusia present, brown, membranous, entire, evanescent. $2n = 123$.

Limestone crevices in forests; 300–1700 m. Chongqing, Guangxi, Guizhou, Hunan, Sichuan, Yunnan [N Vietnam].

The original epithet *“tenuium”* is a correctable error of *“tenuius.”*

Cyrtogonellum caducum and *C. tenuius* were published in the same paper and thus have the same priority. When the species is transferred to *Polystichum*, the epithet *“caducum”* is blocked by *Polystichum caducum* Diels (*Nat. Pflanzenfam.* 1(4). 194. 1899).

151. *Polystichum simile* (Ching ex Y. T. Hsieh) Li Bing Zhang, *Phytotaxa* 60: 59. 2012.

相似柳叶耳蕨 *xiang si liu ye er jue*

Cyrtogonellum simile Ching ex Y. T. Hsieh, *Bull. Bot. Res.*, Harbin 9(3): 16. 1989.

Plants evergreen. Rhizome erect or ascending, together with basal stipe densely scaly; scales dark brown or blackish brown, lanceolate, margins ciliate, apices acuminate. Fronds 45–55 cm; stipe stramineous, 18–28 cm, 2–2.5 mm in diam. at middle; basal stipe scales dense, blackish brown, lanceolate to subulate, membranous, margins ciliate, apices caudate; distal stipe scales sparser and smaller. Lamina imparipinnate, grayish green when dry, adaxially shiny, lanceolate, 25–30 × 6–9 cm at middle, not or only basalmost pinnae slightly contracted toward base, apex acute; rachis stramineous, without proliferous bulbils, abaxially sparsely scaly; scales similar to distal stipe scales, appressed, brown, ovate-lanceolate, margins ciliate, apices filiform. Pinnae 16–20(–22) pairs, alternate, lower pairs approximate, upper pairs approximate, lower pairs attached at ± right angles with rachis, upper pairs slightly ascendant, shortly stalked, falcate-lanceolate, middle pairs 3.5–5 × 0.8–1.5 cm, bases asymmetrical, acroscopic base hardly auriculate, proximal acroscopic margins of pinnae curved and slightly overlapping rachis, acroscopic margins straight or very slightly recurved, regularly shallowly incised-toothed, basal basicopic margins cuneate, forming a ± 80° angle with rachis, entire, distal basicopic margins curved upward, regularly shallowly incised-toothed, apices shortly acuminate; adaxially glabrous, abaxially sparsely scaly; microscales light brown, subulate; frond texture thinly leathery; venation pinnate on pinnae, entirely free, lateral veins 2- or 3-forked, slightly impressed on both surfaces. Sori in 1 row on each side of midrib, terminal

on shorter veinlets, medial, lower lamina often sterile; indusia present, brown, thickly membranous, entire, evanescent.

- Limestone crevices in forests; 900–1100 m. Guizhou, Yunnan.

It is possible that *Polystichum simile* is conspecific with *P. tenuius*.

152. *Polystichum xichouense* (S. K. Wu & Mitsuta) Li Bing Zhang, *Phytotaxa* 60: 59. 2012.

西畴柳叶耳蕨 xi chou liu ye er jue

Cyrtogonellum xichouense S. K. Wu & Mitsuta, *Acta Phytotax. Geobot.* 36: 25. 1985.

Plants evergreen. Rhizome erect or ascending; scales dense, fuscous brown, lanceolate, margins entire, apices filiform. Fronds 60–70 cm; stipe stramineous, 25–30 cm, ca. 3 mm in diam. at middle; basal stipe scales dense, fuscous brown, subulate-lanceolate, membranous, slightly toothed, caudate; distal stipe scales sparser and smaller. Lamina 1-pinnate, green or light green when dry, adaxially slightly shiny, lanceolate, up to 35 × 6 cm at middle, not or only basalmost pinnae slightly

contracted, apex pinnatifid-acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly; scales similar to distal stipe scales, lanceolate or linear, margins slightly toothed, apices filiform. Pinnae up to 30 pairs, alternate, angled slightly acroscopically, lower pairs attached at nearly right angles with rachis, shortly stalked, obliquely deltoid-falcate, middle pairs ca. 3 × 1 cm, bases asymmetrical, acroscopic bases auriculate, apices acute and ascendant; auricles rounded, proximal margins of auricles slightly overlapping rachis, acroscopic margins repand or obtuse-toothed, basal basisopic margins cuneate, forming a 50°–70° angle with rachis, entire, distal basisopic margins curved upward, repand or with 6–8 obtuse teeth; adaxially glabrous, abaxially sparsely scaly; microscales light brown, linear; frond texture papery; venation pinnate on pinnae, lateral veins 2- or 3-forked, distinct abaxially, indistinct adaxially. Sori in 1 row on each side of midrib, terminal on shorter veinlets, medial, whole lamina fertile; indusia present, brown, entire.

- Limestone crevices or cliffs in forests; ca. 1700 m. SE Yunnan (Xichou).

Polystichum xichouense is an apomict producing 32 spores per sporangium.

21. *Polystichum* sect. *Adenolepia* Daigobo, *Sci. Rep. Tokyo Kyoiku Daigaku*, B, 15: 61. 1972.

假贯众耳蕨组 jia guan zhong er jue zu

Cyrtomium subser. *Balansana* Ching & K. S. Shing ex K. S. Shing.

Plants medium-sized. Lamina leathery, rarely papery, 1-pinnate. Rachis without proliferous bulbils. Pinnae falcate-lanceolate, length more than 3 × width, asymmetrical at base. Venation free or anastomosing to form 1 or 2 rows of areoles. Sori in 2 or more rows, rarely in 1 row, on each side of midrib.

About six species: Asia; six species (three endemic) in China.

- 1a. Venation free; sori in 1 row on each side of midrib.
 - 2a. Lamina papery; pinnae long spinulose on margin; veins distinct; microscales with glandlike apices 153. *P. formosanum*
 - 2b. Lamina leathery; pinnae slightly spinulose on margin; veins indistinct; microscales without glandlike apices 154. *P. falcatilobum*
- 1b. Venation anastomosing to form 1 or 2 rows of areoles; sori in 2 or more rows on each side of midrib.
 - 3a. Pinnae much less asymmetrical at base, acroscopic bases nearly exauriculate 155. *P. hookerianum*
 - 3b. Pinnae strongly asymmetrical at base, acroscopic bases strongly auriculate.
 - 4a. Pinnae rhombic-ovate 156. *P. trapezoideum*
 - 4b. Pinnae broadly lanceolate.
 - 5a. Pinnae approximate, often with 1 row of areoles on each side of midrib; midrib strongly curved 157. *P. uniseriale*
 - 5b. Pinnae distant from each other, often with 2 or 3 rows of areoles on each side of midrib; midrib substraight 158. *P. balansae*

153. *Polystichum formosanum* Rosenstock, *Hedwigia* 56: 338. 1915.

台湾耳蕨 tai wan er jue

Polystichum iriomotense Tagawa; *P. obtuso-auriculatum* Hayata.

Plants evergreen. Rhizome ascending, short, up to 2 cm in diam. including stipe bases, rhizome apex and stipe base densely scaly; scales brown, lanceolate, up to 4 mm, membranous, with few fine teeth, acuminate. Fronds 30–50 cm; stipe pale greenish stramineous, 9–22 cm, ca. 1 mm in diam. at base, above base

glabrous. Lamina 1-pinnate, light green on both surfaces when dry, narrowly elliptic-lanceolate, 17–30 × 3.5–7.5 cm at middle, 2.5–4 cm wide at base, gradually or slightly contracted toward base, base broadly rounded-cuneate or nearly truncate, apex abruptly contracted and acuminate; rachis pale greenish stramineous, without proliferous bulbils; costa scaly abaxially; scales dark brown, linear, entire. Pinnae 15–20 pairs, alternate or nearly opposite, approximate by a distance wider than pinna width, attached at right angles to rachis or slightly ascendant, falcate or falcate-lanceolate, middle pairs 1.5–4 cm, 0.5–1.5 cm wide at base, bases asymmetrical, acroscopic base with deltoid or semicircular auricles, and proximal margins of auricles nearly

parallel to rachis or often overlapping rachis, basiscopic margins of pinnae narrowly cuneate, often \pm recurved, margins irregularly biserrate or toothed, teeth mostly long spinulose apically, apices shortly acuminate; abaxially sparsely covered with microscales; microscales dark brown, ciliate or not, with dilated bases, apices gland-shaped; frond texture leathery; venation distinct on both surfaces, pinnate, lateral veins pinnate, dichotomous or simple, rarely trifurcate, veinlets nearly reaching tips of teeth. Sori small, located on upper lamina, lower pinnae sterile, in 1 row on each side of midrib, medial or close to margins, terminal on shorter veinlets; indusia present, small, irregularly erose, caducous.

Cliffs by streams, mossy rocks, mountains at low elevations; 400–1400 m. Taiwan [S Japan (Ryukyu Islands)].

154. *Polystichum falcatilobum* Ching ex W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 227. 2001.

长镰羽耳蕨 chang lian yu er jue

Plants evergreen. Rhizome ascending, short, 1.5–2 cm in diam. including stipe bases, rhizome apex and stipe base scaly; scales brown, ovate-lanceolate, up to 5 mm, membranous, with few fine teeth. Fronds 2–6 per rhizome, 25–60 cm; stipe stramineous, 8–25 cm, 1–2 mm in diam. at base. Lamina 1-pinnate, adaxially dark green and abaxially light green when dry, lanceolate or narrowly elliptic-lanceolate, 15–40 \times 4–9 cm at middle, bases broadly rounded, apices pinnatifid and long acuminate; rachis stramineous, without proliferous bulbils, adaxially sparsely scaly; scales appressed, brown or dark brown, ovate, membranous, peltate, toothed, caudate with long acute tips. Pinnae 10–30 pairs, slightly ascendant, slightly curved upward and falcate-lanceolate, middle pairs 2–5 cm, 1–1.5 cm wide at base, lower pairs below middle of lamina gradually contracted or only slightly contracted, bases obviously asymmetrical, acroscopic base with deltoid or semicircular auricles, proximal margins of auricles nearly parallel to rachis or often overlapping rachis, acroscopic margins near auricles slightly biserrate, basal basiscopic margins narrowly cuneate, lower part of basiscopic margins curved, margins entire, distal basiscopic margins curved upward, toothed, teeth spinulose apically and often slightly recurved, apices acuminate; adaxially glabrous, abaxially sparsely scaly; microscales appressed, brown, lanceolate or with long caudate tips, membranous, margins toothed; frond texture leathery; venation pinnate, slightly distinct abaxially, indistinct adaxially; lateral veins pinnate above midrib from base to apex, dichotomous or simple, simple or dichotomous below midrib; veinlets not reaching pinna margin. Sori small, often limited to upper lamina, in 1 row on each side of midrib, close to margins, up to 30, lower part of pinnae below midrib sterile; indusia present, small, subentire, caducous.

• Wet sandstone crevices by streams, montane broad-leaved evergreen forests; 1000–1600 m. Chongqing (Jiangjin), N Guizhou (Chishui, Xishui), S Sichuan, NE Yunnan (Suijiang).

Polystichum falcatilobum is similar to *P. formosanum*, but its lamina is leathery, its veins are indistinct, its pinnae are longer and long falcate-lanceolate, and its microscales are lanceolate or ovate, caudate apically, toothed on the margins, appressed, and brown.

155. *Polystichum hookerianum* (C. Presl) C. Christensen, Index Filic. 67. 1905.

虎克耳蕨 hu ke er jue

Lastrea hookeriana C. Presl, Tent. Pterid. 77. 1836, based on *Aspidium caducum* Wallich ex Hooker & Greville (1831), not Kunth (1815); *Cyrtomium caducum* T. Moore; *C. hookerianum* (C. Presl) C. Christensen; *C. integripinnum* (Hayata) Copeland; *Phanerophlebia hookeriana* (C. Presl) Copeland; *Phanerophlebiopsis hookeriana* (C. Presl) Fraser-Jenkins; *Polystichum integripinnum* Hayata.

Plants evergreen. Rhizome erect, sparsely covered with lanceolate brown scales. Fronds 50–100 cm; stipe stramineous, 25–54 cm, 4–5 mm in diam. at base, scaly when young, gradually glabrous when mature; scales blackish brown at middle, ovate and lanceolate, gradually glabrous when mature. Lamina 1-pinnate, ovate-lanceolate, 42–78 \times 12–20 cm, contracted at base, acuminate; rachis sparsely covered with lanceolate brown scales. Pinnae 15–20 pairs, alternate, slightly ascendant, shortly stalked, lanceolate, middle pinnae 8–13 \times 1–2 cm, bases cuneate and asymmetrical but less strongly than following three species (*Polystichum balansae*, *P. trapezoideum*, and *P. uniseriale*), margins entire, sometimes slightly repand and distal margins near apex serrulate, apices acuminate and sometimes caudate; adaxially glabrous, abaxially with few lanceolate brown microscales; frond texture leathery; venation pinnate but with a marginal connecting vein, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 1 or 2 rows of areoles. Sori 1–3 rows on each side of midrib; indusia present, entire.

Forests; 600–2500 m. Guangxi (Longsheng), Guizhou, Hunan, Sichuan, Taiwan, Xizang (Médog), Yunnan [Bhutan, N India, Nepal, N Vietnam].

Polystichum hookerianum is variable morphologically and may be divided into several taxa. The Japanese species should be called *P. tachiroanum* (Luerssen) Tagawa.

Polystichum hookerianum is a sexual species.

156. *Polystichum trapezoideum* (Ching & K. H. Shing ex K. H. Shing) Li Bing Zhang, Phytotaxa 60: 59. 2012.

梯羽耳蕨 ti yu er jue

Cyrtomium trapezoideum Ching & K. H. Shing ex K. H. Shing, Acta Phytotax. Sin., Addit. 1: 15. 1965.

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 35–50 cm; stipe stramineous, 20–24 cm, 2–3 mm in diam. at base; basal stipe scales dense, brown, narrowly ovate and lanceolate, with small teeth; distal stipe scales similar but smaller, gradually sparser toward stipe apex. Lamina 1-pinnate, lanceolate, 22–40 \times 6–9 cm, slightly contracted at base, acuminate; rachis scales sparse, brown, linear. Pinnae 14–16 pairs, alternate, slightly ascendant, shortly stalked, rhombic-ovate, middle pinnae 3.5–5 \times 1.5–2 cm, bases oblique, acroscopic margins truncate and with auricles, basiscopic margins cuneate, margins with forward-pointing acute teeth, apices acute; both surfaces glabrous; frond texture thinly leathery; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 1 row of areoles. Sori in 2 rows on each side of midrib; indusia present, entire.

- Dense forests. Guangdong (Ruyuan), Sichuan.

No molecular studies have sampled *Polystichum trapezoideum* yet, but based on its pinnatifid and acuminate apex of lamina, it is a member of *Polystichum*.

157. *Polystichum uniseriale* (Ching ex K. H. Shing) Li Bing Zhang, *Phytotaxa* 60: 59. 2012.

单行耳蕨 dan hang er jue

Cyrtomium uniseriale Ching ex K. H. Shing, *Acta Phytotax. Sin.*, Addit. 1: 15. 1965; *C. uniseriale* f. *marginale* Ching ex K. H. Shing.

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 30–50 cm; stipe stramineous, 14–30 cm, 2–3 mm in diam. at base; basal stipe scales dense, brown, narrowly ovate and lanceolate, with small teeth; distal stipe scales similar but smaller, gradually sparser toward stipe apex. Lamina 1-pinnate, lanceolate, 22–42 × 5–10 cm, slightly contracted at base, acuminate; rachis scaly; scales brown, lanceolate and linear, curled. Pinnae 20–24 pairs, alternate, slightly ascendant, shortly stalked, falcate-lanceolate, lower pinnae 3.5–7 × 1–1.5 cm, bases oblique, acroscopic margins nearly truncate and with acute auricles, basicopic margins cuneate, margins with forward-pointing small blunt teeth, apices acuminate or nearly caudate; adaxially glabrous, abaxially with lanceolate brown microscales; frond texture thinly leathery; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 1 row of areoles. Sori in 1 row on each side of midrib; indusia present, entire. $2n = 164^*$.

- Under shrubs, bamboo forests; 400–1100 m. Chongqing, S and W Sichuan (Pingshan, Ya'an).

Polystichum uniseriale is a sexual tetraploid.

158. *Polystichum balansae* Christ, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 28: 193. 1908.

巴郎耳蕨 ba lang er jue

Cyrtomium balansae (Christ) C. Christensen; *C. balansae* f. *edentatum* Ching ex K. H. Shing; *C. kwantungense* Ching; *Polystichum anomophyllum* (Zenker) Nakai var. *miyajimense* (Kodama) Nakai; *P. miyajimense* Kodama.

Plants evergreen. Rhizome erect, densely covered with lanceolate brown scales. Fronds 25–60 cm; stipe stramineous, 12–35 cm, 2–4 mm in diam. at base; basal stipe scales brown, narrowly ovate and lanceolate, with small teeth; distal stipe scales similar but smaller, gradually sparser toward lamina apex. Lamina 1-pinnate, lanceolate or broadly lanceolate, 16–42 × 6–15 cm, slightly contracted at base, acuminate; rachis scaly; scales brown, lanceolate and linear, curled. Pinnae 12–18 pairs, alternate, slightly ascendant, shortly stalked, falcate-lanceolate, lower pinnae 3.5–9 × 1.2–2 cm, bases oblique, acroscopic margins truncate and with acute auricles, basicopic margins cuneate, margins with small forward-pointing blunt (rarely acute) teeth or sometimes entire or only distal margins with few incisions, apices acuminate or nearly caudate; adaxially glabrous, abaxially with lanceolate brown microscales; frond texture thinly leathery; venation pinnate, slightly raised abaxially, indistinct adaxially, veinlets anastomosing to form 2 rows of areoles, each areole with 1 or 2 included veinlets. Sori in 2 rows on each side of midrib; indusia present, entire.

Acidic soils in evergreen forests; 100–1600 m. Anhui, Fujian, Guangdong, Guangxi, E and SE Guizhou, Hainan, Hunan, Jiangxi, Zhejiang [Japan, Vietnam].

Polystichum balansae is a sexual diploid.

22. *Polystichum* sect. *Platylepia* Li Bing Zhang, **sect. nov.**

宽轴鳞耳蕨组 kuan zhou lin er jue zu

Sectio nova *Polysticho* sect. *Haplopolysticho similis*, sed ab eo squamis rhachidis ovatis vel late lanceolatis differt.

Type: *Polystichum yaanense* Liang Zhang & Li Bing Zhang.

Plants medium-sized, evergreen. Lamina 1-pinnate, yellowish green, thinly papery or papery. Rachis without bulbils. Rachis scales ovate to broadly lanceolate. Pinnae oblong. Microscales linear, oblong, or narrowly ovate.

- About two species: SW China.

Polystichum sect. *Basigemmifera*, *P.* sect. *Mastigopteris*, and *P.* sect. *Platylepia* together have been resolved as a monophyletic group (Zhang & He, *Syst. Bot.* 36: 854–861. 2011).

- 1a. Lamina lanceolate; pinnae stiff, nearly transparent when dry with veins visible adaxially, not cartilaginous on margin; microscales of pinnae subulate; sori indusiate 159. *P. yaanense*
 1b. Lamina linear; pinnae soft, not transparent when dry with veins indistinct adaxially, slightly cartilaginous on margin; microscales of pinnae oblong to narrowly ovate; sori exindusiate 160. *P. loratum*

159. *Polystichum yaanense* Liang Zhang & Li Bing Zhang, *Novon* 22: 244. 2012.

雅安耳蕨 ya an er jue

Plants evergreen, 8–15 cm tall. Rhizome ascending, short, 0.5–1 cm, 2–3 mm in diam.; scales light brown, ovate-lanceo-

late, 0.4–3.6 mm, papery; roots dark brown when dry, up to 10 cm, ca. 0.6 mm in diam., sparsely or densely covered with scales. Fronds 5–11 per rhizome; stipe green, 1.5–3 cm, 0.5–1.2 mm in diam. at middle; basal stipe scales brown at middle and light brown on margin, dull, ovate-lanceolate, 2.7–3.4 × 0.8–1.1 mm, varying in size, thinly papery at middle, membranous on

margin, margins subentire or ciliate, apices acuminate or caudate; distal stipe scales similar but narrower and shorter toward stipe apex, brown, dull, lanceolate or ovate-lanceolate, membranous, margins ciliate, apices caudate. Lamina 1-pinnate, shiny adaxially, lanceolate, 6–12 × 1.4–1.8 cm at middle, 1.6–2 cm wide at widest, contracted toward base, acute; rachis 0.7–1.2 mm in diam. at middle, without proliferous bulbils; rachis scales light brown, dull, narrowly ovate to lanceolate, 1.5–3.2 mm, base 0.3–1 mm wide, papery, margins slightly ciliate, apices caudate. Pinnae 10–26 pairs, approximate, angled acropically, basal two pairs 0.5–1.3 cm apart, alternate, yellowish green, oblong; largest pinnae 8.2–10.1 × 4.5–5.1 mm and located around lamina middle, shortly stalked, stalks ca. 1.5 mm, acropical base auriculate, basiscopic base truncate and often forming a 90°–120° angle with rachis, acropical margin repand-serrate and without aristate spinules, apices obtuse; abaxially scaly, adaxially glabrous; microscales on abaxial surface subulate without dilated base (narrow-type microscales), 0.3–0.9 mm, base 0.12–0.24 mm wide, ciliate on margin; frond texture leathery; venation pinnate; midrib slightly raised abaxially, flat but obviously visible adaxially; lateral veins free, 3 or 4 pairs from midrib per pinna, nearly opposite, each lateral vein further dichotomous, distinct on both surfaces. Sori terminal on veins of pinnae, (1 or) 2–5 per fertile pinna, close to and ca. 0.9 mm distant from pinna margin; all pinnae on fertile lamina fertile; indusia brown, 0.7–1.1 mm in diam., erose.

- Shallow acidic soils on wet shaded sandstone cliffs; 900–1100 m. Sichuan (Hongya, Ya'an).

Polystichum yaanense is unique in the whole *P.* subg. *Haplopolystichum* in having yellowish green fronds with a thin but hard texture and adaxially visible veins. *Polystichum yaanense* grows in acidic soils, which also distinguishes it from most species in the subgenus. Its ovate-lanceolate rachis scales are shared only by *P. loratum* in the subgenus.

160. *Polystichum loratum* Hai He & Li Bing Zhang, *Novon* 22: 166. 2012.

线叶耳蕨 xian ye er jue

Plants evergreen. Rhizome ascending, 0.5–2.2 cm, 0.4–1.6 cm in diam. together with remnant bases of old stipes, scaly; scales similar to stipe scales but much darker; roots dull brown when dry, 0.16–0.28 mm in diam., subglabrous or occasionally covered with linear and tortuous scales, longer ones once or twice branched with lateral rootlets, up to 1.8 cm. Fronds 8–18(–25) per rhizome, appressed to substrate or ascending, (5.9–)11.2–16.8 cm; stipe green, (0.5–)1.5–4.8 cm, 0.31–1.18 mm in diam. at middle, densely covered with spreading scales; scales brown, ovate to lanceolate, 2.52–4.05 × 0.85–1.25 mm, thinly papery, bases rounded and slightly peltate, margins with 0.5–0.8 mm curled hairlike outgrowths, apices caudate and

ending in a ca. 0.8 mm hairlike tip; mixed smaller scales (fewer and mostly adaxial) deltoid-lanceolate, ca. 2 × 0.5 mm, margins and apices with hairlike outgrowths, basal stipe scales mostly without marginal outgrowths and hairlike tips, thicker in texture and dark brown. Lamina 1-pinnate, linear, (4.5–)7.5–12.5 × 0.9–1.5 cm, ± narrowed toward base from below middle, apex acuminate; rachis 0.3–0.58 mm in diam. at middle, without proliferous bulbils, green (as in pinnae) when fresh, yellowish green when dry, abaxially densely covered with scales, adaxially sparsely scaly (especially at base of stalks); abaxial rachis scales ovate to broadly lanceolate, similar to those of stipe but smaller, lighter and thinner in texture; adaxial rachis scales dark brown, deltoid-subulate, up to 2 × 0.45 mm, hairlike outgrowths only at broadest base, subentire, caudate. Pinnae (16–) 25–55 pairs, alternate, 1–2 mm apart, approximate or imbricate (sometimes basal 1–6 pairs up to 3 mm apart, other pinnae imbricate), asymmetrically rectangular-oblong (or slightly falcate toward apex), 3.5–6.5 × 1.8–2.5 mm, lowest pairs usually 1/2–2/3 as long as middle pinnae, asymmetrically deltoid, or fan-shaped, shortly stalked (stalk up to ca. 1 mm, attached with rachis at an acropical angle of ca. 60°), basiscopic margins at angles of 75°–150° with rachis, base on acropical side cuneate, basiscopic side truncate (with a blunt auricle, sometimes auricle deeply incised to near midrib and forming a basal free cuneate-based lobe ca. 2 × 1.8 mm with 2 or more small teeth at apex), forming angles of 90°–120° at point where stalks attached, margins slightly cartilaginous, basiscopic side subentire, distally curved toward apex and with 1 or 2 small teeth (distal margins of some fronds curved with 2 or 3 undulations), acropical side with 3 or 4 shallow teeth between basal auricle teeth and pinna apex (sometimes this side also with 3 or more shallow or rarely deep undulations), apex rounded or acute (or acuminate) and ending in a blunt tooth, all teeth without aristate tips; adaxially glabrous (occasionally with 1–3 microscales), abaxially covered with microscales (especially along veins); microscales broad-type, light brown, oblong to narrowly ovate, 0.8–1.2 × 0.15–0.25 mm, membranous, margins irregularly erose, apices hairlike, broadest part consisting of 6–8 lines of cells; frond texture thinly leathery; venation pinnate, visible abaxially, indistinct adaxially; lateral veins free, simple or once forked. Sori terminal on lateral veins, 2–4(or 5) on acropical side, none or 1 on distal basiscopic side, 1.4–2.4 mm in diam., mostly medial (between pinna margins and midrib), proximal 1 or 2 sori closer to pinna margin, occasionally all sori close to pinna margin, centers ca. 1.5 mm apart from one another, approximate when mature; indusia absent.

- Shaded or unshaded damp limestone cliffs of small gorges, carbonate sediments at bottom of cave mouths; 1100–1300 m. N Guizhou (Zunyi).

23. *Polystichum* sect. *Haplopolystichum* Tagawa, *Acta Phytotax. Geobot.* 9: 122. 1940.

半羽耳蕨组 ban yu er jue zu

Plants medium-sized, evergreen. Lamina 1-pinnate, papery or rarely thickly papery. Rachis without bulbils; scales lanceolate, subulate, or linear. Pinnae oblong, lanceolate, or falcate-lanceolate. Microscales linear or subulate.

More than 200 (ca. 54 described) species: mainly in limestone areas in S China, a dozen of species in neighboring Asian regions, especially in N Vietnam; 48 species (43 endemic) in China.

Polystichum sect. *Haplopolystichum* in its current circumscription is possibly not monophyletic.

- 1a. Lamina with dense articulate hairs in addition to regular scales 161. *P. articulatifoliosum*
- 1b. Lamina with only scales.
- 2a. Veins clavate and unusually swollen at ends.
- 3a. Fronds 7–12 cm; pinnae up to 15 pairs 162. *P. liboense*
- 3b. Fronds up to 35 cm; pinnae up to 35 or more pairs.
- 4a. Pinnae undulate or shallowly toothed; all veins robust and obviously raised 163. *P. crassinervium*
- 4b. Pinnae irregularly toothed and often shortly spinulose at tips of teeth; veins raised more obviously at ends.
- 5a. Pinnae acute at apex; most pinnae spreading or ascending 164. *P. ichangense*
- 5b. Pinnae rounded at apex; most pinnae deflexed 165. *P. wulingshanense*
- 2b. Veins linear and not swollen at ends.
- 6a. Pinnae entire or repand (without spinules) on margin.
- 7a. Ratio of length to width of pinnae larger than 2.5; sori close to pinna margins.
- 8a. Ratio of length to width of pinnae ca. 3; pinnae acuminate or acute at apex 166. *P. peishanii*
- 8b. Ratio of length to width of pinnae 2.5–3; pinnae rounded at apex.
- 9a. Ratio of length to width of pinnae 2.5–2.7; whole lamina fertile; sori above midrib of middle pinnae fewer than 4 167. *P. hainanicola*
- 9b. Ratio of length to width of pinnae ca. 3; lower part of lamina sterile; sori above midrib of middle pinnae 6–11 168. *P. guangxiense*
- 7b. Ratio of length to width of pinnae smaller than 2; sori close to pinna margins or midrib or located between them.
- 10a. Fronds appressed to substrate or slightly ascending; pinnae dark green, entire, leathery 169. *P. dangii*
- 10b. Fronds slightly or obviously ascending; pinnae green, repand, papery.
- 11a. Pinnae sessile; sori closer to midrib than to pinna margin 170. *P. fengshanense*
- 11b. Pinnae stalked; sori closer to pinna margin than to midrib.
- 12a. Plants 1.6–4.1 cm tall; pinnae 6–8 pairs, middle pinnae 2.9–5.8 × 2.8–4.5 mm; lateral veins 2 or 3 pairs from midrib per pinna 171. *P. minutissimum*
- 12b. Plants 4–10 cm tall; pinnae 6–20 pairs, middle pinnae 3.7–7 × 2.5–6 mm; lateral veins (3 or) 4–6 pairs from midrib per pinna.
- 13a. Lamina of larger plants bipinnatifid to bipinnatipartite; pinnae of larger plants with free lobes 172. *P. leveillei*
- 13b. Lamina never bipinnatifid to bipinnatipartite; pinnae never with free lobes.
- 14a. Rachis scale 0.70–1.41 mm, 0.10–0.25 mm wide at base; pinnae acute at apex 173. *P. oblancoelatum*
- 14b. Rachis scale 1.6–4 mm, 0.3–1 mm wide at base; pinnae rounded at apex.
- 15a. Broadest part of lamina well above midpoint; rachis scales 0.4–1 mm wide at base; basiscopic base of pinnae and rachis often forming a 20°–60° angle; pinnae thickly papery, deltoid-ovate, approximate and often overlapping; acroscopic base rounded; microscales broad-type 174. *P. speluncicola*
- 15b. Broadest part of lamina near midpoint; rachis scales 0.3–0.6 mm wide at base; basiscopic base of pinnae and rachis often forming a 75°–120° angle; pinnae papery, oblong, normally not overlapping; acroscopic base auriculate; microscales narrow-type 175. *P. cavernicola*
- 6b. Pinnae ± toothed and spinulose at least on upper part of margin.
- 16a. Pinnae deltoid, those of lower part of lamina nearly equilateral-triangular; pinnae with 8–12 coarse and spinulose teeth 176. *P. subdeltodon*
- 16b. Pinnae various shapes but not deltoid, with or without teeth.
- 17a. Pinnae rounded, rounded-truncate or truncate at apex (with or without mucro).
- 18a. Pinnae aristate-spinulose on margin, truncate at apex.
- 19a. Pinnae thinly papery, acroscopic margins serrate and spinulose but not aristate-spinulose, basiscopic margins entire 181. *P. jinshoshanense*
- 19b. Pinnae leathery or nearly leathery, both acroscopic margins and upper portion of basiscopic margins or only acroscopic margins toothed and aristate-spinulose.
- 20a. Pinnae nearly leathery, dull adaxially, green; rachis scales lanceolate or broadly lanceolate, acuminate 182. *P. liui*
- 20b. Pinnae leathery, shiny adaxially, dark green; rachis scales ovate, caudate 183. *P. lanceolatum*
- 18b. Pinnae shallowly toothed or subentire but not aristate-spinulose on margin, rounded or rounded-truncate at apex.
- 21a. Lamina shorter than 12 cm, thinly papery; scales long fimbriate on margin 177. *P. oblongum*

- 21b. Lamina often longer than 20 cm, papery or nearly leathery; scales sparsely toothed, ciliate or entire on margin.
- 22a. Stipe scales ovate-lanceolate, dark brown, ciliate on margin; scales marginate (central cells narrow and straight while cells of margin irregularly curved) 178. *P. kwangtungense*
- 22b. Stipe scales lanceolate, dark brown to castaneous, entire or sparsely toothed on margin; scales conform (middle and marginal cells similar in shape).
- 23a. Auricles deltoid, well developed; only upper pinnae of lamina fertile 179. *P. dielsii*
- 23b. Auricles rounded, less well developed; most pinnae of lamina fertile 180. *P. pseudodeltodon*
- 17b. Pinnae acuminate or acute (*P. daguanense*, *P. huashanicola*) at apex.
- 24a. Nearly all pinnae obviously ascending; lamina with more than 20 pairs of pinnae.
- 25a. Pinnae acuminate; auricles narrowly deltoid, entire; nearly all pinnae fertile and sori located above midrib 184. *P. assurgentipinnum*
- 25b. Pinnae acute; auricles deltoid or nearly deltoid, with 1–3 teeth; only upper pinnae of lamina fertile and sori located above and mostly also below midrib 185. *P. submarginale*
- 24b. Most pinnae spreading or reflexed, only upper pinnae of lamina ascending; lamina with more or fewer than 20 pairs of pinnae.
- 26a. Most pinnae ± reflexed.
- 27a. Pinnae mostly falcate-oblong and bases as broad as upper portions of pinnae, acroscopic margins and distal basispic margins with regular open teeth 186. *P. houchangense*
- 27b. Pinnae oblong or ± falcate-oblong and obviously with broader bases.
- 28a. Pinnae falcate-oblong to oblong, crenate to repand 187. *P. deflexum*
- 28b. Pinnae oblong, sharply serrate.
- 29a. Stipe scales marginate (central cells narrowly rectangular while cells of margin irregularly curved); acroscopic margins and distal basispic margins of pinnae with regular shortly spinulose teeth 188. *P. consimile*
- 29b. Stipe scales conform; acroscopic margins and distal basispic margins of pinnae irregularly with shallow teeth, sometimes with shortly spinulose teeth 189. *P. yuanum*
- 26b. Most pinnae spreading or ascending.
- 30a. Ratio of length to width of pinnae lower than 2:1.
- 31a. Pinna margins spinulose.
- 32a. Fronds smaller than 20 × 1.8 cm; pinnae ovate or ovate-oblong, smaller than 1 × 0.6 cm, symmetrical or asymmetrical at base.
- 33a. Lamina 7–13 × 1–2 cm at middle; rachis scales lanceolate; pinnae shallowly toothed, weakly symmetrical at base 190. *P. muscicola*
- 33b. Lamina 2–6 × 0.85–1.25 cm at middle; rachis scales deltoid-ovate or ovate-lanceolate; pinnae serrate, strongly asymmetrical at base 191. *P. perpusillum*
- 32b. Fronds larger than 25 × 2 cm; pinnae oblong or shortly falcate, middle pinnae larger than 1.5 × 0.7 cm, obviously asymmetrical at base.
- 34a. Pinnae oblong, mostly rounded or acute 192. *P. rupicola*
- 34b. Pinnae falcate, falcate-oblong, oblong, or rarely nearly deltoid, usually acute 193. *P. deltodon*
- 31b. Pinna margins not spinulose, or if spinulose then pinnae rhombic-ovate.
- 35a. Basispic margins of pinnae attached at 30°–90° angles to rachis.
- 36a. Pinnae dark green, thickly papery, acuminate; sori approximate when mature 194. *P. puteicola*
- 36b. Pinnae green, papery, mostly acute; sori separate from each other when mature 195. *P. nanchurnicum*
- 35b. Basispic margins attached at 90°–110° angles to rachis; pinnae green or yellowish green, papery.
- 37a. Pinnae ovate, rhombic-ovate, or rarely oblong, 7–15 pairs; sori between midrib and pinna margin 196. *P. obliquum*
- 37b. Pinnae oblong or falcate-deltoid, 16–40 pairs; sori between midrib and pinna margin or close to pinna margin.
- 38a. Sori close to pinna margin; pinnae up to 40 pairs 197. *P. mengziense*
- 38b. Sori between midrib and pinna margin or slightly closer to pinna margin; pinnae fewer than 20 pairs 198. *P. paradeltodon*
- 30b. Ratio of length to width of pinnae ca. 3:1 or higher.
- 39a. Lamina linear-lanceolate or narrowly elliptic-lanceolate, often narrower than 3 cm; pinnae shorter than 1.7 cm, narrower than 5 mm.
- 40a. Lamina linear-lanceolate, slightly contracted toward lamina base; pinnae 40–100 pairs, narrowly deltoid or oblong-lanceolate, repand or bluntly toothed 199. *P. subacutidens*
- 40b. Lamina linear-lanceolate or narrowly elliptic-lanceolate, contracted or not contracted toward lamina base; pinnae 20–70 pairs, falcate-lanceolate or oblong, aristate-spinulose.

- 41a. Lamina narrowly elliptic-lanceolate, up to 52 cm, strongly contracted from lamina middle toward lamina base; pinnae 30–70 pairs, mostly falcate-lanceolate, shallowly toothed; auricles well developed, deltoid; sori exindusiate 200. *P. gymnocarpium*
- 41b. Lamina linear-lanceolate, up to 27 cm, slightly contracted toward lamina base; pinnae 20–40 pairs, often nearly rectangular, serrate; auricles weakly developed, rounded or deltoid; sori indusiate.
- 42a. Pinnae up to 40 pairs, ascendant; only ca. 1/3 of basiscopic margin of pinnae serrate; teeth on acroscopic margins 11–13; teeth on basiscopic margins 3; teeth on pinna margins forward-pointing or incurved; sori large, approximate or nearly so when mature 201. *P. daguanense*
- 42b. Pinnae up to 30 pairs, attached at right angles to rachis or reflexed; ca. half of basiscopic margin of pinnae serrate; teeth on acroscopic margins 7–9; teeth on basiscopic margins 4; teeth on pinna margins slightly open; sori small, obviously approximate when mature 202. *P. huashanicola*
- 39b. Lamina lanceolate or broadly lanceolate, 3–12 cm wide; at least some pinnae up to 2 cm, broader than 7 mm.
- 43a. Pinnae deltoid-lanceolate; basiscopic margins of pinnae substraight; pinnae with coarse teeth 203. *P. pseudoacutidens*
- 43b. Pinnae falcate-lanceolate or nearly so; basiscopic margins of pinnae obviously curved; pinnae with shallow or coarse teeth.
- 44a. Basiscopic margins of pinnae repand or bluntly and shallowly toothed but not spinulose.
- 45a. Stipe scales with conform cells; auricles well developed, deltoid; veins strongly raised abaxially; sori close to pinna margins 204. *P. elevatovenusum*
- 45b. Stipe scales marginate (central cells narrow and long while cells of margin irregularly curved); auricles less well developed, often rounded and with a mucro; veins only slightly raised abaxially; sori between pinna margin and midrib 205. *P. excellens*
- 44b. Basiscopic margins of pinnae toothed and spinulose.
- 46a. Proximal margins of pinnae overlapping rachis; pinnae with coarse teeth; sori closer to pinna margins 206. *P. nayongense*
- 46b. Proximal margins of pinnae parallel and not overlapping rachis; pinnae with shallow teeth on margin; sori medial or closer to pinna margins.
- 47a. Teeth of pinna margins \pm incurved or forward-pointing; sori marginal or medial 207. *P. acutidens*
- 47b. Teeth of pinna margins upward-pointing; sori medial 208. *P. longissimum*

161. *Polystichum articulatifoliosum* H. G. Zhou & Hua Li, Guihaia 16: 205. 1996.

节毛耳蕨 jie mao er jue

Plants evergreen. Rhizome short, ascending, 3–6 mm in diam., densely scaly; scales brown, narrowly lanceolate, subentire. Fronds 6–12 cm; stipe amber or light brown, 2–6 cm, 0.5–1 mm in diam.; basal stipe scales lanceolate, texture thick, entire or sparsely toothed, upward densely covered with slender brown articulate hairs from base to rachis, distal stipe scales sparse, brown, narrowly lanceolate. Lamina 1-pinnate, light green when dry, adaxially slightly darker, oblong-lanceolate, 2.5–8.5 \times 1.5–2.2 cm, base slightly or not contracted, apex obtuse and pinnatifid; rachis amber or light brown, without proliferous bulbils. Pinnae 4–11 pairs, alternate, approximate or remote, attached at right angles to rachis or slightly ascendant, shortly stalked, oblong or obliquely ovate-oblong, 5–11 \times 3–7 mm, bases asymmetrical, acroscopic base obviously auriculate, auricles deltoid, apex of auricle acute or obtuse, proximal margins of auricle parallel to rachis or slightly overlapping rachis, basiscopic margins of pinnae rounded-cuneate, distal part of pinnae nearly equal in width to base, margins repand; both surfaces densely covered with long brown articulate hairs; frond texture papery; venation slightly distinct abaxially, indistinct

adaxially, pinnate; lateral veins simple or dichotomous, not reaching pinna margin. Sori small, terminal on veinlets, close to pinna margin, exindusiate.

• Limestone walls in karst caves; 500–600 m. W Guangxi (Fengshan).

Polystichum articulatifoliosum is the only species in the genus with articulate hairs on its stipe, rachis, and pinnae.

162. *Polystichum liboense* P. S. Wang & X. Y. Wang, Guizhou Sci. 21: 109. 2003.

荔波耳蕨 li bo er jue

Plants evergreen. Rhizome ascending, ca. 0.8 cm, densely covered with scales; scales bicolorous, brown and blackish brown, lanceolate. Fronds ca. 7 per rhizome, 7–12 cm; stipe stramineous, 1.5–3 cm, ca. 0.6 mm in diam. at middle; basal stipe scales brown and blackish brown, shiny, lanceolate, papery, toothed, acuminate or caudate; distal stipe scales similar but narrower and shorter, varying in size, brown, shiny, lanceolate, papery, regularly toothed, caudate. Lamina 1-pinnate, shiny adaxially, lanceolate to linear-lanceolate, 6.5–10 \times 1.2–1.6 cm at middle, slightly contracted toward base, acuminate; rachis ca. 0.5 mm in diam. at middle, without proliferous bulbils; rachis scales brown, dull, ovate, varying in size, papery,

margins ciliate, apices caudate. Pinnae 12–15 pairs, approximate, spreading except reflexed in lowest pairs, basal two pairs ca. 4 mm apart, alternate, nearly rectangular, middle (largest) pinnae up to 9×4 mm, shortly stalked, proximal margins parallel with rachis, acroscopic base auriculate, auricles obtuse, basiscopic base cuneate and often forming an 80° – 120° angle with rachis, apices obtuse, acroscopic margin with 3–5 slightly forward pointing obtuse teeth; abaxially scaly, adaxially glabrous; microscales on abaxial surface subulate or linear (narrow-type microscales); frond texture papery; venation pinnate; midrib abaxially slightly raised, adaxially flat; lateral veins free, 2 or 3 pairs from midrib per pinna, alternate, each lateral vein again dichotomous or not, abaxially clavate and unusually swollen at ends (hydathodes), adaxially indistinct. Sori terminal on veins of upper pinnae, 1–3 above midrib and none or 1 below midrib, close to pinna margin; indusia brown, repand or shallowly toothed.

• Limestone rocks in dense forests; ca. 1000 m. S Guizhou (Libo).

163. *Polystichum crassinervium* Ching ex W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 224. 2001.

粗脉耳蕨 *cu mai er jue*

Plants evergreen. Rhizome ascending, 1.5–3 cm in diam. including stipe bases, upper part and basal stipes densely scaly; scales spreading, shiny, lanceolate or broadly lanceolate, ca. 7×1 – 1.5 mm, thickly membranous, entire. Fronds few, 25–65 cm; stipe pale greenish stramineous, 2.5–18 cm, 1–2 mm in diam. at base, sparsely covered with smaller scales above base; scales brown, lanceolate, membranous, margins fimbriate. Lamina 1-pinnate, narrowly elliptic-lanceolate, 15 – 45×2.5 – 6 cm at middle, gradually contracted below middle, 1–2.5 cm wide at base, acuminate or shortly acuminate; rachis pale greenish stramineous, without proliferous bulbils, abaxially sparsely scaly; scales brown, ovate-lanceolate, lower part peltate and appressed, membranous, margins fimbriate, apices caudate and long acuminate. Pinnae 20–50 pairs, alternate or nearly opposite, often obviously remote, upper pairs from middle of lamina upward attached at right angles to rachis, lower pairs \pm reflexed, oblong or falcate, rarely falcate-lanceolate, middle pairs 1.5 – 3 cm \times 4 – 7 mm, bases obviously asymmetrical, apices often obtuse-rounded, sometimes acute; acroscopic base with deltoid auricles, apex of auricles acute, proximal margins of auricles \pm parallel to rachis, basiscopic margins of pinnae narrowly cuneate, attached at right angles or nearly right angles with rachis, acroscopic margins curved, distal margins often shallowly obtusely toothed, rarely acutely toothed; abaxially sparsely covered with short light brown microscales, adaxially subglabrous; frond texture papery; venation pinnate, often prominent abaxially, distinct adaxially; lateral veins robust, thickened and clavate apically, nearly reaching pinna margin, mostly dichotomous, rarely simple, pinnate on auricles; clavate and unusually swollen at ends (hydathodes). Sori small, in 1 row on each side of midrib, more numerous on acroscopic side, medial or close to margins, terminal on shorter veinlets, sometimes only apical pinnae fertile; indusia present, brown, shallowly erose or sparsely obtusely toothed, rarely lacerate.

• Rock crevices on limestone hills; 200–400 m. N Guangdong (Ruyuan), Guangxi, S Guizhou (Libo), S Hunan (Xinning).

Polystichum crassinervium is similar to *P. gymnocarpium* in habit, but it does not have slender and filiform microscales on the abaxial surface of pinnae; as well, the sori are indusiate.

164. *Polystichum ichangense* Christ, Bull. Soc. Bot. France 52(Mém. 1): 28. 1905.

宜昌耳蕨 *yi chang er jue*

Plants evergreen. Rhizome ascending or nearly erect, short, 1.2–2.5 cm in diam. including stipe bases, apically densely scaly; scales brown to dark brown or castaneous, lanceolate, up to 8 mm, densely serrulate. Fronds 14–48 cm; stipe light stramineous, 3–10 cm, 0.5–1 mm in diam., whole stipe sparsely scaly; scales brown or dark brown or partially castaneous, ovate (acute apically) or ovate-lanceolate, often whole or lower part appressed, membranous, sparsely toothed. Lamina 1-pinnate, light green or grayish green when dry, adaxially slightly darker, narrowly elliptic-lanceolate, 10 – 34×1.5 – 3.5 cm at middle, gradually contracted below middle, 1–2 cm wide at base, long acuminate to caudate; rachis light stramineous, without proliferous bulbils, both surfaces sparsely scaly; scales similar to stipe scales but smaller, brown or dark brown, appressed. Pinnae 17–35 pairs, alternate or nearly opposite, sessile or slightly shortly stalked, approximate, sometimes slightly remote, most pinnae somewhat reflexed, nearly oblong, bases obviously asymmetrical, apices acute and slightly ascendant; acroscopic base auriculate, auricles deltoid, apex of auricles acute or mucronate, proximal margins of auricles truncate or slightly curved and parallel or nearly parallel to rachis, sometimes slightly overlapping rachis, margins of auricles entire or with 1 shallow tooth on each margin, distal margins of pinnae substraight and with 1–6 shallow or deep, acute, often shortly spinulose teeth, basal basiscopic margins oblique, margins entire, often straight, distal basiscopic margins curved and with 1–4 teeth similar to those on acroscopic margins; adaxially glabrous, abaxially sparsely covered with microscales; microscales light brown, lanceolate or narrowly lanceolate; frond texture papery; venation pinnate, distinct abaxially, visible adaxially; lateral veins thickened to clavate apically, nearly reaching pinna margin, acroscopic lateral veins pinnate, dichotomous (a few simple), basiscopic lateral veins simple, rarely dichotomous; clavate and unusually swollen at ends (hydathodes). Sori small, terminal on shorter lateral veinlets, 1–8 on acroscopic side, medial or slightly closer to pinna margin, often absent on basiscopic side, sometimes 1–3 on acroscopic side; indusia present, small, dark brown, often light castaneous at middle, repand, caducous.

• Rock crevices in montane broad-leaved forests; 1000–1600 m. Chongqing (Jinfo Shan, Pengshui), N Guizhou (Daozhen, Wuchuan, Yanhe), W Hubei (Yichang), N and NW Hunan (Sangzhi, Shimen).

165. *Polystichum wulingshanense* S. F. Wu, Keys Vasc. Pl. Wuling Mts. 568. 1995.

武陵山耳蕨 *wu ling shan er jue*

Plants evergreen. Rhizome erect, short, including stipe base densely scaly; scales brown, ovate, thickly membranous,

margins subentire. Fronds 13–20 cm; stipe stramineous, 2–6 cm, ca. 1 mm in diam., distal stipe scales similar to basal stipe scales but smaller and sparser, appressed. Lamina 1-pinnate, grayish green when dry, narrowly lanceolate, 11–14 × 1.6–1.8 cm at middle, slightly gradually contracted below middle, apex pinnatifid and acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales brown, ovate or ovate-lanceolate, membranous, sparsely toothed. Pinnae ca. 20 pairs, approximate, alternate, midribs attached at right angles to rachis or slightly ascendant, shortly stalked, reflexed, oblong, apices acute, pointing downward; acroscopic base auriculate or rounded, auricles nearly semicircular, with 1 or 2 sharp, shortly spinulose teeth, proximal margins of auricles slightly curved, overlapping or sometimes nearly parallel to rachis, basiscopic margins recurved, margins entire, basal basiscopic margins cuneate, distal basiscopic margins and whole acroscopic margins (including auricle margins) serrate or biserrate and with 8–10 (or 11) sharp teeth; adaxially glabrous, abaxially sparsely covered with lanceolate and light brown microscales; frond texture thinly papery; venation pinnate, visible abaxially, indistinct adaxially; lateral veins reaching tips of teeth, dichotomous or simple above midrib, often simple below midrib; clavate and unusually swollen at ends (hydathodes). Sori small, terminal on shorter veinlets, medial or slightly closer to pinna margin, 1–6 above midrib, 0–2 below midrib, lower part of lamina often sterile; indusia present, brown, erose, evanescent.

• Acidic soils of wet sandstone cliffs in valleys, roadsides, by streams; 400–500 m. W Hubei (Lichuan), NW Hunan (Sangzhi).

Polystichum wulingshanense is similar to *P. ichangense* in having hydathodes at vein ends, though slightly indistinct; it differs by its rounded pinna apex, thinner and mostly deflexed pinnae, and location in acidic soils.

166. *Polystichum peishanii* Li Bing Zhang & H. He, Bot. Stud. (Taipei) 50: 102. 2009.

培善耳蕨 *pei shan er jue*

Plants evergreen. Rhizome erect; scales dark brown, lanceolate. Fronds 36–75 cm; stipe yellowish green, 14–32 cm, 1.5–2 mm in diam. at middle; basal stipe scales brown, dull, broadly lanceolate, ca. 10 × 1.5–1.8 mm, papery, obtusely toothed, acuminate; distal stipe scales similar but narrower and shorter toward apex of stipe and base of rachis, dark brown, dull, varying in size, narrowly lanceolate to subulate, papery, margins shortly and sparsely ciliate, apices caudate or acute. Lamina simply pinnate, adaxially shiny, green when fresh, lanceolate, 22–43 × 4.5–6.5 cm, base slightly contracted, apex caudate; rachis ca. 1.5 mm in diam., without proliferous bulbils; rachis scales dark brown, narrowly lanceolate. Pinnae 18–38 pairs, two basal pairs 1.7–2.3 cm apart, alternate, attached at ca. 80° angle to rachis, oblong-deltoid, 2.4–3.3 × 1.1–1.3 cm, shortly stalked, acroscopic base auriculate, basiscopic base cuneate, margins entire, apices acute; abaxially scaly, adaxially glabrous; microscales present abaxially, subulate, up to 1 cm; frond texture thinly leathery; adaxial midrib concave, abaxially raised; lateral veins free, once dichotomous, ca. 11 pairs from midrib per pinna, prominent abaxially, indistinct adaxially. Sori terminal on veins of upper pinnae, 1–20 per fertile pinna, ca. 1

mm distant from pinna margin; indusia yellowish brown, ca. 1 mm in diam., membranous, repand.

• Broad-leaved evergreen forests dominated by *Cyclobalanopsis glauca* mixed with *Celtis sinensis* and *Zelkova serrata*, basic black soil derived from limestone in ravines; 700–1100 m. S Guizhou (Libo, Luodian, Pingtang).

Polystichum peishanii and *P. guangxiense* share ± oblong pinnae with entire margins and sori located close to the pinna margin. The two species differ in the following ways: *P. peishanii* has the lamina contracted toward the base, papery pinnae, acute apices, and larger scales on the stipe base. The lamina of *P. guangxiense* is not contracted toward the base, the pinnae are smaller (1.7–2 × 0.6–0.8 cm), nearly leathery, and with the apex obtuse; the scales at the base of the stipe are also smaller (5–6 × 1–1.5 mm).

167. *Polystichum hainanicola* Li Bing Zhang, Liang Zhang & X. F. Gao, Phytotaxa 85: 10. 2013.

海南耳蕨 *hai nan er jue*

Plants evergreen. Rhizome ascending, 0.8–1.8 cm, ca. 7 mm in diam., with remnant bases of old stipes, scaly; scales brown, ovate-deltoid or broadly lanceolate, 1.15–1.85 × 0.50–0.85 mm, subentire, with few short outgrowths and shortly ciliate; roots dull brown when dry, up to 17 cm, 0.22–0.43 mm in diam., subglabrous or densely covered with short linear and tortuous hairs. Fronds 4–10 per rhizome, appressed to substrate or slightly ascending, (13.5–)20.1–35.6 cm; stipe green, (3.6–)6.7–10.5 cm, 0.63–1.22 mm in diam. at middle, scaly; basal stipe scales brown, concolorous, ovate-deltoid or lanceolate, papery, 1.8–3.15 × 0.6–0.95 mm, subentire or slightly ciliate, with irregular dentate outgrowths, caudate; distal stipe scales similar to basal stipe scales but narrower, brown, 1.2–2.8 × 0.4–0.7 mm, papery, margins with short outgrowths, apices caudate. Lamina 1-pinnate, adaxially green when fresh, dull green when dry, oblanceolate, (8.7–)12.9–24.3 × 3.1–4.3 cm, slightly narrowed toward base from below middle of lamina, apex acute or rounded; rachis green (same color as pinnae) when fresh, turning yellowish green when dry, 0.59–0.84 mm in diam. at middle, apex without proliferous bulbils, abaxially scaly; rachis scales light brown, nearly transparent, lanceolate or narrowly lanceolate, 1.25–2.65 mm, base 0.25–0.58 mm wide, unequal in length, membranous, sparsely toothed, caudate. Pinnae (8–)18–22 pairs, oblong, 16.9–18.6 × 7.1–9.4 mm, basalmost pairs slightly narrowed, nearly 2/3–4/5 as long as middle ones, shortly stalked, basiscopic margins at angles of 95°–120° with rachis, alternate, apices rounded, bases broadly cuneate with basiscopic side being narrower and forming an 80° angle with acroscopic side, distal acroscopic margins shallowly undulate, undulations 3 or 4, ca. 0.2 mm tall at middle and non-mucronate, acroscopic base auriculate, auricles deltoid, 3.7–5.1 × 3.1–3.4 mm, basiscopic margins entire, curved; adaxially almost glabrous, abaxially sparsely covered with microscales; microscales narrow-type, brown, linear or subulate, 1.1–2.9 × 0.11–0.18 mm at base; frond texture papery; venation pinnate, visible abaxially, slightly obscure adaxially; lateral veins free, simple or forked. Sori terminal on lateral veins, 4–8 on acroscopic side, 1–4 on distal basiscopic side, 1.4–2.4 mm in diam., close to pinna margins (centers of sori 0.6–0.8 mm from pinna margins, 1.8–3.1 mm from midrib), centers ca. 1.2 mm apart

from one another; indusia brownish, (0.3–)0.8–1.2 mm in diam., membranous, irregularly lacerate, caducous.

- Wet limestone cliffs in rain forests; ca. 800 m. Hainan (Dongfang).

Polystichum hainanicola is most similar to *P. guangxiense* but differs in having a lower length to width ratio of the pinnae, completely fertile laminae, and fewer sori on each pinna.

168. *Polystichum guangxiense* W. M. Chu & H. G. Zhou, *Guihaia* 16: 205. 1996.

广西耳蕨 *guang xi er jue*

Plants evergreen. Rhizome ascending, brown, short, 1.5–2 cm in diam. including stipe bases, apically densely scaly; scales dark brown, lanceolate, membranous, with fine teeth. Fronds 17–42 cm; stipe stramineous or light greenish stramineous, 8–17 cm, 1–1.5 mm in diam.; basal stipe scales dense, spreading, shiny, dark brown, lanceolate or broadly lanceolate, 5–10 × 1–3 mm, membranous, finely toothed, long acuminate; distal stipe scales dense, smaller, appressed, dark brown, lanceolate to subulate, membranous, peltate, toothed. Lamina 1-pinnate, both surfaces light green or slightly grayish green when dry, linear-lanceolate, 12–27 × 2.5–3.6 cm, base nearly truncate and as wide as middle, apex abruptly contracted and pinnatifid-acuminate; rachis stramineous or light greenish stramineous, without proliferous bulbils, with numerous small scales abaxially; small scales appressed, brown, lanceolate or narrowly subulate, membranous, peltate, sparsely toothed. Pinnae 13–28 pairs, alternate, approximate, sometimes slightly imbricate, attached at right angles to rachis or slightly ascendant above middle of lamina, sessile or very shortly stalked, oblong, 1.7–2 cm × 6–8 mm, bases asymmetrical, margins entire or acroscopic margins shallowly repand, apices obtuse-rounded or slightly ascendant and obtusely rounded-truncate; acroscopic bases with broadly deltoid auricles, apex of auricles acute or obtuse, proximal margins of auricles truncate and parallel to rachis, basal basicopic margins cuneate, slightly curved or nearly truncate, distal basicopic margins curved; adaxially glabrous, abaxially with few microscales; microscales light brown, linear or filiform; frond texture thickly papery or nearly leathery; venation prominent abaxially, indistinct adaxially, pinnate, midrib obviously raised abaxially, slightly concave adaxially; lateral veins dichotomous, pinnate on auricles. Sori small, terminal on veinlets, close to pinna margin, sometimes medial; indusia present, light brown, membranous, entire or slightly repand.

- Limestone ridges, rock crevices in broad-leaved evergreen forests; 1200–1400 m. W Guangxi (Napo).

169. *Polystichum dangii* P. S. Wang, *Pterid. Fl. Guizhou*, 531. 2001.

成忠耳蕨 *cheng zhong er jue*

Plants evergreen. Rhizome erect, short, 2–4 cm in diam. including stipe bases, upper part densely scaly; scales black or blackish brown, shiny, broadly lanceolate, 3–5 × 0.6–0.8 mm at base, papery, with few short teeth, caudate. Fronds 8–22 cm, sometimes only 5 cm under dry conditions; stipe stramineous, 1–4 cm, 1–2.5 mm in diam., densely scaly; scales black or blackish brown, shiny, lanceolate and linear, with few short

teeth, caudate. Lamina 1-pinnate, light green when dry, adaxially darker, shiny, lanceolate or oblong, 2.5–13 × 1.6–3.7 cm at middle, base not or slightly contracted, apex obtuse; rachis light stramineous, without proliferous bulbils, sparsely scaly; scales dark brown or black, lanceolate, margins sparsely toothed. Pinnae 5–21 pairs, sessile, usually approximate or imbricate, alternate, basicopic margins forming 45°–80° angles to rachis, most pinnae ± angled basicopically, oblong or obliquely oblong, middle pairs largest, 1–1.5 cm, 5–9 mm, bases asymmetrical, acroscopic base nearly non-auriculate or slightly curved, proximal acroscopic margins of pinnae truncate, parallel to rachis, distal part of acroscopic margins truncate, basal basicopic margins cuneate, truncate or curved, distal basicopic margins curved, margins of pinnae entire, apices obtuse; adaxially glabrous, abaxially sparsely covered with dark brown, linear microscales; frond texture leathery; venation indistinct abaxially, distinct adaxially, pinnate, lateral veins dichotomous or simple. Sori large, on distal part of pinnae, lower pinnae sterile, terminal on shorter veinlets, close to pinna margin, up to 4 above midrib, 0–3 below middle midrib; indusia brown, small, repand, evanescent.

- Wet or dry limestone crevices and walls, around cave mouths; 700–800 m. N Guangxi (Huanjiang), S Guizhou (Libo).

170. *Polystichum fengshanense* Li Bing Zhang & H. He, *Syst. Bot.* 36: 859. 2011.

凤山耳蕨 *feng shan er jue*

Plants evergreen. Rhizome ascending, 0.5–1.3 cm, ca. 3 mm in diam. or ca. 7 mm in diam. with remnant bases of old stipes, sparsely scaly; scales brown, ovate-deltoid or lanceolate, ca. 0.2 × 0.5 mm, entire; roots dull brown when dry, up to 16 cm, 0.2–0.3 mm in diam., subglabrous or densely covered with short and linear tortuous hairs. Fronds 8–17 per rhizome, appressed to substrate or slightly ascending, (2.5–)4.3–18 cm; stipe green, (0.7–)1.5–3.5 cm, 0.25–0.45 mm in diam. at middle, densely scaly; basal stipe scales dark brown, concolorous, lanceolate or subulate, 0.7–3.5 × 0.28–0.43 mm, papery, margins with ca. 0.07 mm irregular dentate outgrowths, apices caudate; distal stipe scales similar to basal stipe scales but narrower, dark brown, up to 2.5 × 0.35 mm, papery, margins with short outgrowths, apices caudate. Lamina 1-pinnate, adaxially shiny green when fresh, dull green when dry, oblanceolate, (2.1–)3.5–18 × 0.9–2.5 cm, gradually narrowed toward base from below middle of lamina, acute or rounded; rachis green (same color as pinnae) when fresh, turning yellowish green when dry, 0.59–0.71 mm in diam. at middle, apex without proliferous bulbils, abaxially densely scaly; rachis scales dark brown or lighter, subulate, 2.1–4.6 mm, base 0.35–0.61 mm wide, differing in length, papery, sparsely toothed, caudate. Pinnae (4–)8–24 pairs, oblong, 4.9–13 × 3–7 mm, basalmost pairs nearly fan-shaped and 1/4–1/3 as long as middle ones, approximate, sessile or almost so, basicopic margins at 100°–120° angles with rachis, alternate, apices rounded or acute, not mucronate, bases broadly cuneate with basicopic side wider and forming an 80° angle with acroscopic side, distal acroscopic margins shallowly undulate or almost entire, undulations 4, ca. 0.4 mm tall at middle and non-mucronate, acroscopic base auriculate; auricles rounded or slightly deltoid, 1.1–1.4 ×

2.4–2.8 mm; basiscopic margins entire, curved; adaxially almost glabrous, abaxially dull and slightly paler, sparsely covered with microscales; microscales narrow-type, brown, linear or subulate, 0.35–1.1 × 0.07–0.18 mm at base; frond texture papery; venation pinnate, visible abaxially, slightly obscure adaxially; lateral veins free, simple or forked. Sori terminal on lateral veins, 1–4 on acroscopic side, 0–2 on distal basiscopic side, 1.4–2.4 mm in diam., close to midrib (centers of sori 0.88–1.4 mm (small individuals) to 0.9–3.1 mm (large individuals) from midrib, 0.95–2.3 mm from pinna margin), centers ca. 2.1 mm apart from one another; indusia brownish, (0.7–)1.2–1.5 mm in diam., irregularly lacerate. Sporangia orbicular, ca. 0.28 mm in diam., walls ca. 0.018 mm thick, dark brown when mature; annuli with ca. 15 thickened cells; stalks ca. 0.32 mm. Spores elliptic or slightly trapezoid in equatorial view; perispore sculpturing granulate with blunt folds.

• Wet weathered soil on cave walls, stalagmites, limestone crevices inside caves; (400–)500–700(–800) m. N Guangxi (Bama, Fengshan).

171. *Polystichum minutissimum* Li Bing Zhang & H. He, Bot. Stud. (Taipei) 50: 353. 2009.

微小耳蕨 wei xiao er jue

Plants evergreen. Rhizome erect, 0.3–0.5 cm, sparsely covered with scales; scales brown, lanceolate, ca. 1.4 mm; roots 1–1.5 cm, ca. 0.23 mm in diam. Fronds 6–9 per rhizome, 1.6–4.1 cm; stipe green, 3.4–8 mm, 0.23–0.45 mm in diam. at middle; basal stipe scales brown, dull, lanceolate, 1–1.5 × 0.35–0.55 mm, papery, margins slightly ciliate, apices acuminate to caudate; distal stipe scales similar but narrower and shorter toward apex of rachis, varying in size, brown, dull, narrowly lanceolate to subulate, papery, margins sparsely shortly ciliate, apices caudate. Lamina 1-pinnate, broadly lanceolate, 1.3–3.8 × 0.7–1.1 cm at middle, contracted toward base, apex obtuse; rachis 0.23–0.45 mm in diam. at middle, without proliferous bulbils; scales of rachis brown, dull, subulate to linear, 0.7–1.2 mm, varying in size, papery, margins ciliate, apices caudate. Pinnae 5–8 pairs, 2 basal pairs 2.3–4.8 mm apart, alternate, attached at ca. 70° angles to rachis, middle pinnae 2.9–5.8 × 2.8–4.5 mm, nearly rectangular, shortly stalked, acroscopic base auriculate, bases cuneate, margins bluntly toothed, apices obtuse; abaxially scaly, adaxially glabrous; microscales on abaxial surface linear, 1.1–2.9 mm; frond texture thinly papery; venation pinnate; midrib slightly raised abaxially, flat adaxially; lateral veins free, 2 or 3 pairs from midrib per pinna, slightly raised and nearly indistinct abaxially, indistinct adaxially. Sori terminal on veins of upper pinnae, 1–3(or 4) per fertile pinna, close to and ca. 0.7 mm distant from margin of pinna; indusia yellowish brown, ca. 0.7 mm in diam., erose.

• Inside karst caves; ca. 800 m. S Guizhou (Libo).

Polystichum minutissimum is similar in stature to *P. liboense*, which is also found in limestone areas of Libo Xian, Guizhou, but *P. liboense* is larger with lamina 6.5–10 × 1.2–1.6 cm and the middle pinnae ca. 9 × 4 mm. Most importantly, *P. liboense* has hydathodes near the margin of the pinnae, while *P. minutissimum* does not. Both species have nearly rectangular pinnae without spinules on margin.

172. *Polystichum leveillei* C. Christensen, Bull. Acad. Int. Géogr. Bot. 23: 143. 1913.

莱氏耳蕨 lai shi er jue

Type: China. Guizhou: Ta'tsing [Luodian Xian], alt. 630 m, Sep 1910, *J. H. Esquirol 2223* (**lectotype, designated here**, NY! [barcode 00128155]; isolectotypes, BM! [barcode 001048675], UC! [barcode 394190]; fragments of type material, PE!).

Plants evergreen. Rhizome ascending, short, ca. 8 mm in diam. including stipe bases. Fronds few, 9–35(–40) cm; stipe stramineous, 6–16 cm, slender, 0.6–0.9 mm in diam. at base; basal stipe scales sparse, dark brown, lanceolate and subulate, membranous, margins irregularly ciliate; distal stipe scales sparser. Lamina 1-pinnate, yellowish green or green, adaxially shiny, narrowly elliptic-lanceolate, 7–22 × 3–8 cm at middle, slightly contracted toward base, 1.5–3 cm wide at base, acute; rachis stramineous, without proliferous bulbils, sparsely scaly; scales similar to stipe scales but smaller. Pinnae 8–12 pairs, alternate, approximate by a distance equal to or narrower than pinna width, rarely approximate, ascendant, sometimes lower pairs angled slightly basiscopically, stalked, oblong, deltoid, deltoid-lanceolate, or ovate, middle pairs 2.6–4.5 × 1–1.6 cm, basalmost pairs 1.5–3.4 cm × 1–1.3 mm, margins irregularly lobed, incised to pinnatisect with free lobes, apices obtuse; acroscopic margins forming a 60° angle with rachis, basiscopic margins forming a 120° angle with rachis. Lobes 0–3 pairs, obovate, bases broadly cuneate, apices acute or acuminate; basal acroscopic lobes obviously largest, free or nearly free, other lobes not free, margins repand, without teeth or spinules; adaxially glabrous, abaxially sparsely scaly; microscales light brown, nearly linear; frond texture thickly papery. Sori small, ca. 1 mm in diam., terminal on veinlets, closer to lobe or pinna margin; indusia small, slightly erose.

• Limestone cliffs or floors at cave mouths; ca. 600 m. C and S Guizhou (Luodian, Ziyun).

The record for *Polystichum leveillei* in FRPS (5(2): 175. 2001) was based on material of the separate, newly described species, *P. normale*. *Polystichum normale* and *P. leveillei* are indeed similar in pinna form. However, *P. normale* often has extraordinarily prolonged basalmost pinnae, is a member of *P. sect. Crucifilix*, grows in (sandstone) acidic soils, and occurs in S Chongqing, NE and SE Guizhou (but not in S Guizhou), and NW Hunan, while *P. leveillei* does not have extraordinarily prolonged basalmost pinnae, is a member of *P. sect. Haplopolystichum*, grows in (limestone) basic soils, and occurs in S Guizhou only.

Although often cited as a homotypic synonym of *Polystichum leveillei*, *Hemesteum leveillei* Christ (in Lévillé, Fl. Kouy-Tchéou, 497. 1915; cited as "*Hemesteum leveillei* (C. Christensen) H. Lévillé" in FRPS 5(2): 175. 2001) did not include the type specimen of *P. leveillei* (*J. Esquirol 2223*), which instead was cited by H. Lévillé for *H. obliquum* (loc. cit.: 498). This suggests that H. Lévillé considered *H. leveillei* Christ and *P. leveillei* C. Christensen to be different species.

The diagnostic characters of *Polystichum leveillei* include its slender stipe, thin but hard pinnae often with 1 or more free lobes, and complete absence of teeth or spinules on lobe.

173. *Polystichum oblanceolatum* H. He & Li Bing Zhang, Novon 22: 160. 2012.

倒披针耳蕨 dao pi zhen er jue

Plants evergreen, (2.8–)6.5–9.5 cm tall. Rhizome erect, ca. 4.25 mm, ca. 2.7 mm in diam., up to 4.3 mm in diam. with bases of remnant old stipes, sparsely scaly; scales dark brown, lanceolate, ca. 0.7×0.12 mm, entire; roots dull brown when dry, up to 11.5 cm, 0.2–0.35 mm in diam. Fronds 5–12 fronds tufted around rhizome, (2.7–)6.3–9.4 cm; stipe stramineous, 0.8–1.4 cm, 0.65–0.98 mm in diam. at middle, moderately scaly; scales on basal stipe dark brown with narrow lighter-colored margins when fresh, but becoming entirely brown when dry, deltoid-lanceolate, $1.42\text{--}1.69 \times 0.51\text{--}0.68$ mm, papery, margins subentire, apices subulate; scales on distal stipe similar but thinner and narrower, brown, up to 1.61×0.37 mm, thinly papery, margins mostly with small irregular dentate outgrowths especially below, apices subulate. Lamina 1-pinnate, adaxially shiny green when fresh, dull stramineous when dry, abaxially paler and dull, oblanceolate, (2.3–)4.5–8.5 \times 0.9–1.7 cm, gradually narrowed toward base from below middle, apex acute or shortly acuminate; rachis green (same color as pinnae) when fresh, turning stramineous when dry, 0.51–0.69 mm in diam. at middle, apex without proliferous bulbils, abaxially sparsely scaly; rachis scales pale brown, linear-lanceolate, 0.70–1.41 mm, base 0.10–0.25 mm wide, varying in size, thinly papery, margins entire, apices subulate. Pinnae (5–)10–16 pairs, 4.45–7.82 \times 2.95–4.57 mm, upper middle ones approximate or slightly imbricate, firmly papery, shortly stalked, (stalk 0.3–0.8 mm), at angles of 70°–90° with rachis, alternate, basal 1–3 pairs nearly fan-shaped, base rounded to broadly cuneate with acroscopic side slightly wider, distally repand or with 3–5 broad teeth, teeth occasionally shortly mucronate, upper pairs mostly oblong but asymmetrical, acroscopic sides much broader and slightly auriculate at base, both acroscopic and basispic bases substraight and forming a \pm right angle at base of pinna, apices acute, distal acroscopic side repand or with 3 wavelike teeth, distal basispic side mostly with 1 or 2 short broad teeth; adaxially glabrous, abaxially sparsely covered with microscales along veinlets; microscales brown, linear, 0.35–0.55 \times 0.01–0.07 mm at base; frond texture papery; venation pinnate, visible abaxially, slightly obscure adaxially; lateral veins free, simple or forked. Sori terminal on lateral veins, (1–)3–4(–6) in 1 row on acroscopic side, usually 1 sorus on distal basispic side, 0.70–1.25 mm in diam., 0.55–1.12 mm apart, submarginal, center of sorus 0.3–1.1 mm from pinna margin; indusia pale brown, ca. 0.8 mm in diam., membranous, irregularly lacerate. Sporangia dark brown when mature, almost orbicular, ca. 0.29 mm in diam., walls ca. 0.018 mm thick; annuli with 11–14 thickened cells; stalks ca. 0.35 mm.

• Weathered crust of limestone rocks on floors of karst caves; ca. 900 m. N Guangxi (Tian'e).

174. *Polystichum speluncicola* Li Bing Zhang & H. He, *Sys. Bot.* 35: 13. 2010.

岩穴耳蕨 *yan xue er jue*

Plants evergreen. Rhizome ascending, 0.4–0.7 cm; roots brown when dry, up to 4.3 cm, 1–1.3 mm in diam., densely covered with scales; scales brown, linear or subulate, 1–1.3 mm. Fronds 3–8 per rhizome, 4–8 cm; stipe green, 1–3 cm, 1.3–1.9 mm in diam. at middle; basal stipe scales fuscous, dull, lanceolate, 2–4.5 \times 0.5–1.2 mm, papery, margins slightly ciliate

or erose, apices acuminate or caudate; distal stipe scales fuscous, dull, lanceolate with dilated bases, papery, margins ciliate, apices caudate. Lamina 1-pinnate, shiny adaxially, oblanceolate, 4–7 \times 1–1.6 cm at middle, 1.3–1.7 cm wide at broadest part, contracted toward base, apex obtuse; rachis 1.2–1.6 mm in diam. at middle, without proliferous bulbils; scales of rachis fuscous, dull, lanceolate with dilated base, 1.8–4 \times 0.4–1 mm at base, varying in size, papery, margins ciliate, apices caudate. Pinnae 6–14 pairs, approximate to often overlapping, basal two pairs 4–9 mm apart and strongly reflexed toward lamina base, alternate, deltoid-ovate, middle pinnae 5–7 \times 4–6 mm, largest pinnae 5.3–7.5 \times 4.2–6.3 mm and near lamina apex, sessile, acroscopic base rounded, basispic base and rachis often forming 20°–60° angle, apices obtuse, bases truncate, margins repand, not mucronate; abaxially scaly, adaxially glabrous; microscales on abaxial surface subulate with dilated bases (broad-type microscales), 0.5–1.1 mm, base 0.16–0.28 mm wide, with few tortuous cilia on margin of base; frond texture thinly leathery; venation pinnate; midrib slightly raised abaxially, flat adaxially; lateral veins free, 3 or 4 pairs from midrib per pinna, nearly opposite; each lateral vein dichotomous, slightly raised and distinct abaxially, indistinct adaxially. Sori terminal on veins of upper pinnae, 2–5 per fertile pinna, close to (ca. 0.7 mm from) pinna margin; indusia brown, ca. 0.7 mm in diam., membranous, erose. Spores orbicular in polar view, elliptic in equatorial view, ca. 40.9 \times 53.7(48.9–59.2) \times 44.4(39.8–49.1) μ m (polar axis \times long equatorial axis \times short equatorial axis, respectively); perispore sculpturing cristate with numerous spinules shorter than 3 μ m.

• Inside karst caves; ca. 700 m. S Guizhou (Libo).

Polystichum speluncicola is special in *P.* sect. *Haplopolystichum* in having broad-type microscales and deltoid-ovate pinnae. It is \pm similar to *P. dielsii*, *P. liboense*, and *P. minutissimum*, but *P. speluncicola* has nearly leathery and close-set pinnae, and basal pinnae reflexed. In addition, *P. speluncicola* can be distinguished from *P. dielsii* by having lamina smaller, oblanceolate, apex obtuse, and with 6–14 pairs of pinnae, and sori fewer per pinna; from *P. liboense* by having lamina oblanceolate and pinnae without hydathodes; and from *P. minutissimum* by having stature larger and lamina with 6–14 pairs of pinnae.

175. *Polystichum cavernicola* Li Bing Zhang & H. He, *Bot. Stud. (Taipei)* 52: 122. 2011.

洞生耳蕨 *dong sheng er jue*

Plants evergreen. Rhizome ascending, 0.4–0.8 cm, densely covered with scales; scales brown, linear or subulate, 1–1.3 mm; roots brown when dry, up to 9 cm, 0.2–0.5 mm in diam. Fronds 3–7 per rhizome, (4–)6–10 cm; stipe green, 1–2.5(–4.5) cm, 0.2–0.9 mm in diam. at midpoint; basal stipe scales brown, dull, lanceolate, 3–4.5 \times 0.4–0.9 mm, papery, margins with few cilia, apices acuminate or caudate; distal stipe scales similar but narrower, varying in size, brown, dull, lanceolate with dilated bases, papery, margins regularly shortly ciliate, apices caudate. Lamina 1-pinnate, shiny adaxially, oblanceolate, 4.2–9.4 \times 1.1–1.4 cm at midpoint, 1.2–1.7 cm wide at broadest part, contracted toward base, acute; rachis 0.3–1 mm in diam. at midpoint, without proliferous bulbils; scales of rachis brown, dull, subulate with dilated bases, 1.6–3.6 \times 0.3–0.6 mm at base, varying in size, papery, margins regularly shortly ciliate, apices

caudate. Pinnae 10–20 pairs, approximate, ascendant, basal two pairs 5–8 mm apart, basal pinnae deltoid-ovate, median pairs $3.7\text{--}6.2 \times 2.5\text{--}5$ mm, largest pairs $4\text{--}7 \times 2.6\text{--}5.3$ mm and located slightly above middle of lamina, alternate, oblong, shortly stalked with stalks 0.2–0.5 mm, acroscopic base slightly auriculate, basiscopic base straight and often forming a $75^\circ\text{--}120^\circ$ angle with rachis, apices obtuse, acroscopic margin repand; abaxially scaly, adaxially glabrous; microscales on abaxial surface subulate without dilated base (narrow-type microscales), (0.3–)0.5–1.8 mm, base ca. 0.1 mm wide, with few tortuous cilia on margin of base; frond texture papery; venation pinnate; midrib slightly raised abaxially, flat adaxially; lateral veins free, 4 or 5 pairs from midrib per pinna, nearly opposite; each lateral vein further dichotomous, slightly raised and distinct abaxially, indistinct adaxially. Sori terminal on veins of distal pinnae, (1–)4–8 per fertile pinna, close to pinna margin, center of sorus 1–1.6 mm from pinna margin; indusia brown, ca. 0.9 mm in diam., fimbriate. Spores circular in polar view, elliptic in equatorial view, dark brown when fresh, ca. 39.1×40.6 μm (polar axis \times equatorial axis): perispore sculpturing verrucate.

- Inside karst caves; ca. 800 m. S Guizhou (Libo).

Polystichum cavernicola and *P. speluncicola* share similar stature, but they can be easily distinguished from each other. *Polystichum cavernicola* has narrow-type microscales on the abaxial laminar surface, its pinnae are papery and have rounded acroscopic bases, and the broadest part of the lamina is located medially, whereas *P. speluncicola* has broad-type microscales on the abaxial laminar surface, its pinnae are nearly leathery and have auriculate acroscopic bases, and the broadest part of the lamina is located above the midpoint.

176. *Polystichum subdeltodon* Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 308. 1949.

粗齿耳蕨 cu chi er jue

Polystichum grossidentatum Ching.

Plants evergreen. Rhizome ascending, short, ca. 1 cm in diam. including stipe bases, apically densely scaly; scales dark brown, small, sometimes thicker at middle and slightly blackish, ovate, with hairlike fine teeth, caudate to long acuminate; scales marginate, cells of margin irregularly curved. Fronds 30–40 cm; stipe light stramineous, 8–14 cm, ca. 1 mm in diam., sparsely covered with scales similar to rhizome scales, gradually becoming glabrous upward. Lamina light brownish green when dry, linear-lanceolate, $18\text{--}30 \times$ ca. 2.5 cm below middle, base not contracted, 1-pinnate, apex pinnatifid-acuminate; rachis light stramineous, without proliferous bulbils, both surfaces glabrous. Pinnae 30–45 pairs, alternate or nearly opposite, remote below, approximate above, lower pairs nearly attached at right angles with rachis, upper pairs slightly ascendant, sessile or lower pinnae shortly stalked, nearly right-triangular, lower pairs often slightly larger, up to $1.5 \times$ ca. 1 cm at base, apices acute, bases asymmetrical; auricles deltoid and with up to 5 acute coarse teeth, proximal margins of auricles truncate or slightly curved, parallel to rachis, apex of auricles acute, distal margins of pinnae with up to 7 irregular deltoid coarse teeth with acute tips, basal basiscopic margins narrowly cuneate, margins entire, distal basiscopic margins slightly curved acroscopically and with 2–5 acute shallow teeth; frond texture pa-

pery; venation pinnate, distinct abaxially, slightly visible adaxially; lateral veins nearly reaching pinna margin, lateral veins on acroscopic side pinnate from base upward, dichotomous or simple, lateral veins on basiscopic side simple or dichotomous. Sori large, terminal on shorter lateral veinlets, close to pinna margin, up to 6 above midrib, 1–3 or absent below midrib; indusia small, reddish brown, caducous.

- Limestone walls; ca. 700 m. Chongqing (Youyang).

The types of *Polystichum subdeltodon* and *P. grossidentatum* are the same.

177. *Polystichum oblongum* Ching ex W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 228. 2001.

镇康耳蕨 zhen kang er jue

Plants evergreen. Rhizome erect, short, rhizome apex and basal stipe scaly; scales reddish brown, lanceolate, membranous, margins long fimbriate. Fronds 5–12 cm; stipe stramineous, short and slender, shorter than 2 cm, less than 1 mm in diam. Lamina dark brownish green when dry, narrowly elliptic-lanceolate, up to 10×1.5 cm, gradually contracted below middle, 1-pinnate, apex pinnatifid and shortly obtuse, with only 3–5 (or 6) lobes; rachis stramineous, without proliferous bulbils, abaxially covered with a few lanceolate brown scales. Pinnae fewer than 20 pairs, approximate or slightly imbricate, alternate, oblong, shortly stalked, up to 7×5 mm, apices obtuse, truncate, or rounded-truncate; acroscopic margins with few (no more than 5) repand obtuse teeth, acroscopic base auriculate, auricles with obtuse tips, proximal margins truncate, parallel to rachis, basiscopic margins narrowly cuneate, nearly vertical to rachis, often \pm curved inward, apices with 1–3 repand and obtuse teeth; both surfaces glabrous; frond texture thin papery; venation pinnate, slightly distinct abaxially, inconspicuous adaxially; lateral veins dichotomous or simple, not reaching pinna margin, 3–5 on acroscopic side, only 1 or 2 on basiscopic side. Sori small, nearly medial on each side of pinna, slightly close to pinna margin, 1–5 terminal on veinlets; indusia present, dark brown, small, thickly membranous, coarsely lobed.

- Rock crevices in dense *Quercus* forests; ca. 2000 m. SW Yunan (Zhenkang).

Polystichum oblongum is similar to *P. jinshoshanense*, but its scale margins are long fimbriate and its pinnae are thinly papery with a few obtuse teeth on the margin.

178. *Polystichum kwangtungense* Ching, Icon. Filic. Sin. 5: t. 236. 1958.

广东耳蕨 guang dong er jue

Plants evergreen. Rhizome erect, short, rhizome apex and stipe base sparsely scaly; scales dark brown, ovate-lanceolate, margins with shortly filiform teeth; scales marginate, central cells rectangular and each side substraight, marginal cells irregularly curved. Fronds 30–42 cm; stipe stramineous, 10–12 cm, ca. 1 mm in diam.; distal stipe scales sparser, similar to basal stipe scales but smaller. Lamina light brownish green when dry, nearly linear-lanceolate, $20\text{--}30 \times$ ca. 2.5 cm at middle, base slightly contracted, 1-pinnate, apex shallowly pinnatifid-acuminate or shortly acuminate; rachis stramineous, without

proliferous bulbils. Pinnae 30–35 pairs, alternate, sessile or lower pinnae slightly shortly stalked, apical pairs attached at nearly right angles to rachis or slightly ascendant, all other pinnae ± reflexed, oblong, lower pairs ca. 1.2 cm × 6 mm at base, apices obtuse and mucronate, bases asymmetrical, acroscopic base wider, slightly acute-auriculate or with 1 small acute tip, proximal margins of auricles slightly, curved or truncate, parallel to rachis, distal pinna margin shallowly repand or shallowly toothed, teeth with short and fine acute tip, distal basicopic margins curved and with 2 or 3 shallow teeth, basal basicopic margins entire, truncate, straight or slightly concave and curved; adaxially glabrous, abaxially with few linear to lanceolate microscales; frond texture papery; venation pinnate, conspicuous on both surfaces, lateral veins close to pinna margin, pinnate above midrib from base upward, simple or dichotomous below midrib, veinlets rarely twice dichotomously branched. Sori small, terminal on shorter veinlets, relatively close to pinna margin, up to 9 above midrib, 1–3 below midrib on distal part of pinnae, sometimes missing below midrib; indusia large, entire, falling off when mature.

- Rock crevices; ca. 900 m. Guangdong (Ruyuan).

Polystichum kwangtungense is similar to *P. yunnanum* (NW Yunnan), but the latter has conform scales that are slightly toothed. Also, the latter often has only 3 or 4 sori, 6 at the most, above the midrib of the pinnae.

179. *Polystichum dielsii* Christ, Bull. Acad. Int. Géogr. Bot. 16: 238. 1906.

圆顶耳蕨 yuan ding er jue

Polystichum craspedocarpium Ching & W. M. Chu ex L. L. Xiang; *P. deltodon* (Baker) Diels var. *marginale* (Christ) C. Christensen; *P. hecatopterum* Diels var. *marginale* Christ.

Plants evergreen. Rhizome erect, short, 1–2 cm in diam. including stipe bases, upper part densely scaly; scales brown to dark brown or castaneous, lanceolate, up to 4 mm, thick, entire or with few short teeth. Fronds up to 50 cm, sometimes only 6 cm under dry conditions; stipe light stramineous, (0.5–)3–10(–18) cm, (0.6–)1–2 mm in diam., all covered with numerous scales similar to rhizome apex scales, but spreading and easily falling off. Lamina light green or light brownish green when dry, adaxially darker, narrowly elliptic-lanceolate, (4–)15–30(–33) cm, middle (1–)2–3.5(–4) cm wide, with pinnae below middle slightly or obviously contracted, 1-pinnate, apex pinnatifid to pinnatifid, obtuse or shortly acuminate to long acuminate; rachis light stramineous, without proliferous bulbils, sparsely scaly; scales brown to dark brown or nearly castaneous, subulate-lanceolate, sparsely toothed; often covered with small appressed scales. Pinnae (8–)30–50(–60) pairs, sessile, usually approximate or imbricate, sometimes lowest pairs remote, alternate, rarely nearly opposite, attached at right angles to rachis or most pinnae ± angled basicopically, few pairs ascendant, nearly oblong, lower pairs nearly right-triangular, middle pairs largest, 0.5–2 cm, 2.5–8 mm, apices obtuse-rounded or acute and slightly curved acroscopically, sometimes mucronate, bases asymmetrical, acroscopic base slightly auriculate, auricles deltoid with acute or shortly spinulose tip, proximal margins of auricles nearly truncate, parallel to rachis or slightly over-

lapping rachis, distal part of acroscopic margins nearly truncate, shallowly repand, sometimes apex with 1 or 2 teeth, sometimes with spinules, sometimes acroscopic base obtuse and without conspicuous auricles, basal basicopic margins narrowly cuneate, truncate, margins entire, distal basicopic margins curved, basicopic margins repand or with 3 or 4 teeth similar to those on acroscopic margins; adaxially glabrous, abaxially sparsely covered with light brown or grayish white short and narrowly lanceolate microscales; frond texture papery; venation visible or distinct abaxially, indistinct adaxially, pinnate; lateral veins nearly reaching pinna margin, above midrib pinnate from base upward, dichotomous or simple, below midrib simple or dichotomous. Sori small, terminal on shorter veinlets, close to pinna margin, up to 9 above midrib, 1–3 or sterile below middle midrib, lower part of lamina often sterile; indusia present, grayish brown, entire, evanescent. Spores semicircular in equatorial view, perispore sculpturing sparsely plicate.

Broad-leaved evergreen forests, wet limestone and rock crevices around caves, rarely in dry limestone crevices at forest margins; 500–1600 m. W Guangxi, C and S Guizhou (Guiding, Wangmo), SE Yunnan (Xichou) [N Vietnam].

The name *Polystichum pinfaense* Christ is often treated as a synonym of *P. dielsii*. However, original material of *P. pinfaense* needs to be studied before any conclusions can be reached.

Polystichum dielsii is probably not distributed in Sichuan or NW Guizhou.

180. *Polystichum pseudodeltodon* Tagawa, Acta Phytotax. Geobot. 6: 159. 1937.

拟对生耳蕨 ni dui sheng er jue

Polystichum deltodon (Baker) Diels var. *pseudodeltodon* (Tagawa) Tagawa.

Plants evergreen. Rhizome ascending to erect, short, 1–2 cm in diam. including stipe bases, rhizome apex and basal stipe densely scaly; scales brown to dark brown, ovate or ovate-lanceolate, up to 6 × 2 mm, thickly membranous, subventre, acuminate. Fronds 27–57 cm; stipe stramineous, 10–20 cm, 0.5–1.5 mm in diam., upper stipe base sparsely scaly; scales brown to dark brown, ovate-lanceolate or lanceolate, varying in size, membranous, margins with a few long teeth, apices caudate or long acuminate, evanescent; remnant scales often appressed. Lamina light green or light brownish green when dry, lanceolate or narrowly elliptic-lanceolate, 17–37 × 2–4 cm at middle, base slightly contracted or not, 1-pinnate, apex pinnatifid and acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly on both surfaces; scales brown to pale dark brown, ovate, membranous, with a few long teeth, caudate. Pinnae 18–38 pairs, often alternate, rarely nearly opposite, approximate, lower pairs obviously approximate, often nearly spreading, sometimes upper pairs slightly ascendant, sometimes most pinnae or those below middle of lamina slightly angled basicopically, oblong, middle pairs 11–21 × 4–8 mm at base, apices slightly curved upward, rounded and shortly spinulose, bases asymmetrical, acroscopic base auriculate, auricles deltoid or nearly deltoid, apex of auricles acute or acuminate and shortly spinulose, proximal margins of auricles truncate or

slightly curved, entire or with 1 or 2 shallow obtuse teeth, parallel to rachis or slightly overlapping rachis, distal margins of auricles often with 1 or 2 shallow incised rounded teeth or shallowly spinulose or sometimes acute coarse teeth, acroscopic margins of pinnae truncate or slightly recurved and coarsely toothed or biserrate, basal basicopic margins narrowly cuneate, straight, margins entire, distal basicopic margins curved upward, with coarse and often shortly spinulose teeth; adaxially glabrous, abaxially sparsely covered with narrowly lanceolate light brown microscales; frond texture thickly papery; venation slightly distinct abaxially, distinct adaxially, pinnate; lateral veins pinnate above midrib from base to apex, dichotomous or simple, simple or dichotomous below midrib, sterile veinlets reaching tooth base. Sori small, terminal on veinlets, close to pinna margin, often 1 row above midrib, up to 10, only 1–3 below midrib on apical part or sterile; indusia present, brown, erose, caducous.

- Grassy slopes in forests; 700–2300 m. Taiwan.

Polystichum pseudodeltodon is often synonymized with *P. deltodon*, but the former has rounded pinna apex, while the latter has acute pinna apex. Preliminary molecular analysis confirmed their separation into two species (Zhang et al., unpublished data).

181. *Polystichum jinfoshanense* Ching & Z. Y. Liu, Bull. Bot. Res., Harbin 3(4): 29. 1983.

金佛山耳蕨 jin fo shan er jue

Plants evergreen, small. Rhizome ascending or erect, short, 4–8 mm in diam. including stipe bases, rhizome apex and basal stipe scaly; scales brown, broadly lanceolate, membranous, sparsely toothed. Fronds 4–12 cm; stipe stramineous or pale greenish stramineous, 0.5–4 cm, less than 0.5 mm in diam., distal stipe scales similar to basal stipe scales in shape and color but smaller. Lamina light green when dry, adaxially darker, narrowly elliptic-lanceolate, 2.5–10 × 1–2 cm at middle, gradually slightly contracted below middle, 7–15 mm wide at base, 1-pinnate, apex obtuse or nearly acute, rarely shortly acuminate, often pinnatifid to pinnatifid. Pinnae 5–22 pairs, alternate or nearly opposite, often approximate or imbricate, sometimes slightly remote, lower pairs very shortly stalked, upper pairs sessile, attached at right angles to rachis or slightly angled basicopically, oblong, middle pinnae 4–11 × 2.5–7 mm, apices rounded-truncate or truncate, mucronate or shortly spinulose, bases asymmetrical, above midrib wider, bases without distinct auricles, margins with fewer than 10 coarse teeth; teeth irregular, acute or shortly spinulose apically, or shallowly lobed; basal basicopic margins narrowly cuneate, margins entire, straight or slightly angled inward and curved, distal basicopic margins nearly truncate and with 1–3 coarse teeth similar to those on acroscopic margins; adaxially glabrous, abaxially sparsely covered with light brown lanceolate and shortly linear microscales; frond texture papery; venation pinnate, slightly distinct on both surfaces, midrib slender, slightly zigzag, lateral veins dichotomous or simple, acroscopic base sometimes trifurcate, nearly reaching pinna margin. Sori terminal on shorter veinlets, close to pinna margin, 1–4 above midrib, 1 or 2 or sterile on upper part of pinnae below midrib; indusia present, dark brown, repand. Spores semicircular in equatorial view, orbicular or nearly orbicular in polar view; perispore sculpturing plicate.

- Shaded limestone crevices in montane broad-leaved evergreen forests; 800–2000 m. Chongqing (Jinfo Shan), Guizhou (Zhenning), Sichuan (Emei Shan, Pengzhou), NE Yunnan (Yiliang, Zhenxiang).

Polystichum jinfoshanense is often hard to identify. It is similar to *P. liui* but has fewer and larger pinnae, shorter laminae, and no spinules on the pinna margin except for the pinna tip.

182. *Polystichum liui* Ching, Bull. Bot. Res., Harbin 3(4): 28. 1983 [“*liuii*”].

正宇耳蕨 zheng yu er jue

Plants evergreen. Rhizome erect, short, 0.7–2 cm in diam. including stipe bases, rhizome apex and basal stipe scaly; scales reddish brown (sometimes partially blackish purple), ovate-lanceolate, up to 3 mm, membranous, with dense small teeth. Fronds 7–25 cm; stipe stramineous, 1–4 cm, 0.5–1 mm in diam., upper base sparsely scaly, scales similar to basal stipe scales. Lamina green when dry, narrowly elliptic-lanceolate, 4.5–18 × 0.8–2 cm at middle, below middle often gradually ± contracted toward base, 1-pinnate, apex pinnatifid to pinnatifid, often shortly acuminate; rachis stramineous, without proliferous bulbils, abaxially sparsely scaly; scales reddish brown, lanceolate or broadly lanceolate, membranous, sparsely toothed. Pinnae 16–45 pairs, approximate or imbricate, alternate or nearly opposite, attached at right angles to rachis or slightly ascendant, lower pairs shortly stalked, upper pairs sessile, nearly oblong, apices acute, slightly curved upward, acroscopic base auriculate; auricles nearly deltoid, with aristate spinules, proximal margins of auricles truncate or slightly curved, parallel to rachis or overlapping rachis, basicopic margins narrowly cuneate, truncate, margins entire, distal basicopic margins and whole acroscopic margins (including auricle margins) with up to 10 teeth, tips of teeth with aristate spinules; adaxially glabrous, abaxially sparsely covered with lanceolate and linear light brown microscales; frond texture papery; venation visible on both surfaces, pinnate, lateral veins reaching tips of teeth, dichotomous or simple above midrib, simple below midrib. Sori small, terminal on shorter veinlets, close to pinna margin, 5 at most above midrib, 1–3 or none below midrib, often merging when mature; indusia present, dark brown, erose, evanescent. Spores reniform in equatorial view; perispore sculpturing sparsely plicate.

- Shaded wet limestone crevices in broad-leaved evergreen forests or in limestone caves; 600–1700 m. Chongqing (Fengjie, Jinfo Shan), ?Guangxi, Guizhou (Anshun, Daozhen, Jiangkou), Hunan (Fenghuang, Sangzhi, Shimen).

183. *Polystichum lanceolatum* (Baker) Diels, Bot. Jahrb. Syst. 29: 193. 1900.

亮叶耳蕨 liang ye er jue

Aspidium lanceolatum Baker, Gard. Chron. n.s., 14: 494. 1880; *Polystichum neoliui* D. S. Jiang; *P. parvulum* Christ.

Plants evergreen. Rhizome erect, short, 3–5 mm in diam. including stipe bases, rhizome apex scaly; scales dark brown, ovate, sparsely toothed, acuminate. Fronds 4–10 cm; stipe light brownish stramineous, sometimes light greenish stramineous, 3–10 mm, less than 0.5 mm in diam., sparsely scaly; scales similar to rhizome scales. Lamina shiny adaxially, linear-lan-

ceolate, 4–9 × 0.5–1.2 wide, base not or slightly contracted, 1-pinnate, apex pinnatifid and shortly acuminate or nearly obtuse; rachis light brownish stramineous, sometimes light greenish stramineous, without proliferous bulbils, abaxially sparsely scaly; scales brown, ovate, with a few long teeth, caudate and long acuminate. Pinnae 15–20 pairs, alternate or nearly opposite, attached at right angles to rachis or slightly ascendant, approximate or imbricate, shortly stalked, deltoid to oblong, apex truncate, with 1–3 short hard spinules, bases asymmetrical, acroscopic base wider, with weakly developed auricles, apex of auricles aristate-spinulose or acute, sometimes nearly obtuse, proximal margins of auricles nearly truncate, parallel to rachis, margins of auricles with 1 or 2 teeth, tips of teeth aristate-spinulose or with short hard spinules, basicopic margins narrowly cuneate, truncate, entire; both surfaces concolorous, often light brownish green when dry, sometimes slightly grayish green, adaxially glabrous, abaxially sparsely covered with light brown short microscaly; frond texture leathery; venation pinnate, sparse, slightly visible on both surfaces, lateral veins simple or dichotomous, nearly reaching tips of teeth. Sori small, terminal on shorter veinlets, 1–3 above midrib, submarginal, none or rarely 1 below midrib; indusia present, dark brown, entire, evanescent.

• Limestone crevices in wet valleys; 900–1800 m. Guizhou, Henan, Hubei, Hunan, Jiangxi, Sichuan (Emei Shan).

Polystichum nanum Christ (Bull. Acad. Int. Géogr. Bot. 16: 238. 1906) is often treated as a synonym of *P. lanceolatum* (e.g., FRPS 5(2): 134. 2001), but it might be a different species judging from the morphology of its type material (China. Guizhou: Pin-fa (Guiding Xian), 10 Nov 1904, *P. Julien Cavalerie 1945* (lectotype, designated here, NY! [barcode 00128158]; isocotypes, BM! [barcode 001048650], S-P! [barcode 16336]). However, a detailed type locality is not given in the protologue; thus, any field observations and a molecular analysis of *P. nanum* are not possible unless it can be refound.

184. *Polystichum assurgentipinnum* W. M. Chu & B. Y. Zhang, Fl. Reipubl. Popularis Sin. 5(2): 224. 2001.

上斜刀羽耳蕨 shang xie dao yu er jue

Plants evergreen. Rhizome ascending, ca. 1.5 cm in diam. including stipe bases. Fronds ca. 48 cm; stipe light stramineous, ca. 13 cm, ca. 1 mm in diam., whole stipe sparsely scaly; scales appressed, dark brown, broadly ovate or ovate-lanceolate, membranous, margins ciliate. Lamina light green when dry, adaxially darker, linear-lanceolate, base slightly contracted, 1-pinnate, apex pinnatifid and caudate to long acuminate; rachis light stramineous, without proliferous bulbils, sparsely scaly; scales pale brown, ovate, sometimes only with appressed, thinly membranous scales at base. Pinnae 30–35 pairs, alternate or nearly opposite, approximate or slightly imbricate, sessile or subsessile, strongly ascendant, oblong-falcate, apices acute, aristate-spinulose, obviously curved upward, bases obviously asymmetrical, acroscopic base raised forming an acuminate auricle, apex of auricles long aristate-spinulose, entire on both sides of auricles, acroscopic margins of pinnae straight, weakly toothed, basicopic margins of pinnae truncate, straight and entire except curved apical part with 2 or 3 short teeth, basal basicopic margins narrowly cuneate; adaxially glabrous, abaxially sparsely covered with narrowly lanceolate light brown and linear micro-

scales; frond texture papery; venation slightly visible abaxially, distinct adaxially; lateral veins not reaching pinna margin, pinnate above pinna midrib from base upward, dichotomous or simple, simple and rarely dichotomous below pinna midrib. Sori small, (1–)4–6 above pinna midrib, terminal on shorter veinlets, slightly closer to pinna margin than to midrib, none or rarely 1 on apical part below midrib; indusia evanescent.

• Valleys; ca. 1500 m. Chongqing (Qijiang).

Polystichum assurgentipinnum is similar to *P. submarginale*, but its auricles are narrowly deltoid and its pinnae are entire on both acroscopic and basicopic margins and are almost completely sterile below pinna midrib.

185. *Polystichum submarginale* (Baker) Ching ex P. S. Wang, Pterid. Fanjing Mt. 129. 1992.

近边耳蕨 jin bian er jue

Aspidium auriculatum (Linnaeus) Swartz var. *submarginale* Baker, J. Bot. 26: 227. 1888; *Polystichum deltodon* (Baker) Diels var. *submarginale* (Baker) C. Christensen.

Plants evergreen. Rhizome erect, short, 1.5–2 cm in diam. including stipe bases, rhizome apex and basal stipe densely scaly; scales brown to dark brown, lanceolate or broadly lanceolate, membranous, margins with short cilia or shallowly erose, and mixed with smaller scales; smaller scales brown to dark brown, ovate or ovate-lanceolate, thinly membranous, margins fimbriate. Fronds 15–55 cm; stipe light stramineous, 2–20 cm, 0.5–1.5 mm in diam., distal stipe scales similar to basal stipe scales but smaller and mostly appressed. Lamina 1-pinnate, light green or light brownish green when dry, linear-lanceolate, slightly contracted at base, caudate to long acuminate. Pinnae 15–35 pairs, alternate, shortly stalked, ± ascendant, approximate to slightly remote, falcate-oblong, middle pinnae 1–2.5 cm × 4–10 mm at base, apices slightly ascendant, acute and with or without short spinules, bases asymmetrical, auricles deltoid, apex of auricles acute or shortly spinulose, proximal margins of auricles truncate or slightly curved, entire or with 1–3 shallow teeth, parallel to rachis, distal margins of auricles with 1–3 acute or obtuse coarse teeth, distal part of acroscopic margins of pinnae truncate or slightly recurved and curved, with acute tips or short spinules, or slightly irregular teeth, basal basicopic margins narrowly cuneate, margins entire, distal basicopic margins curved upward, margins with teeth similar to those on acroscopic margins; adaxially glabrous, abaxially sparsely covered with microscaly; microscaly ovate and long caudate or lanceolate, light brown, margins toothed; frond texture papery; venation slightly visible abaxially, indistinct adaxially, pinnate; lateral veins reaching tips of teeth, pinnate above pinna midrib from base upward, dichotomous or simple, simple or dichotomous below pinna midrib. Sori small, terminal on shorter veinlets, close to pinna margin, 1–7 above pinna midrib, 1–4 below midrib, only on upper part of pinnae; indusia present, dark brown, entire. Spores hemispherical in equatorial view; perispore sculpturing granulate.

• Wet limestone crevices and cliffs; 1100–1400 m. Sichuan (Emei Shan, Erlang Shan).

Polystichum submarginale is only known from Sichuan.

186. *Polystichum houchangense* Ching ex P. S. Wang, Guizhou Sci. 12(2): 55. 1994.

猴场耳蕨 hou chang er jue

Plants evergreen. Rhizome erect, short, 2–4 cm in diam. including stipe bases, rhizome apex and basal stipe densely scaly; scales brown, ovate-lanceolate, up to 5 mm, membranous, weakly serrulate. Fronds 40–70 cm; stipe stramineous, 7–20 cm, 1–1.5 mm in diam., sparsely scaly from basal stipe to rachis; scales similar to basal stipe scales but gradually becoming smaller, and mixed with smaller scales; smaller scales brown, appressed, narrowly lanceolate, bases cuneate, margins with a few long teeth, apices long caudate. Lamina 1-pinnate, grayish green when dry, adaxially darker, narrowly elliptic-lanceolate, 20–45 × 2–3.8 cm at middle, slightly contracted toward base, acuminate; rachis without proliferous bulbils, stramineous. Pinnae 30–60 pairs, alternate, sessile, lowest pairs remote, otherwise contiguous to imbricate, ± reflexed except near apex, oblong-lanceolate, 1–2 cm × 3–7 mm at middle, basal part of pinnae as wide or nearly as wide as upper part, apices acute, bases obviously asymmetrical, acroscopic base wider and with ± deltoid auricles, apex of auricles acute and shortly spinulose, proximal margins of auricles truncate, parallel to rachis or slightly overlapping rachis, margins of pinnae regularly toothed, teeth open, apices obtuse or acute, shortly spinulose or sometimes only repand, basispic margins entire below middle, cuneate, angled upward above middle, toothed, teeth acute or obtuse apically; adaxially glabrous, abaxially sparsely scaly, microscales appressed or not, light brown, lanceolate, margins slightly toothed; frond texture thickly papery. Sori small, terminal on shorter veinlets, 1 row on each side of midrib of pinna, close to margins, often 4–10 above midrib, 1–3 below midrib near apex; indusia present, light brown, thick, subentire, evanescent.

• Wet cliffs inside limestone caves; ca. 1200 m. C Guizhou (Anshun, Ziyun).

Polystichum houchangense is similar to *P. consimile*, but it has conform stipe scales, longer laminae, and sessile pinnae up to 60 pairs.

187. *Polystichum deflexum* Ching ex W. M. Chu, Acta Bot. Yunnan., Suppl. 5: 47. 1992.

反折耳蕨 fan zhe er jue

Plants evergreen. Rhizome ascending or erect, short, 1–2 cm in diam. including stipe bases, rhizome apex and basal stipe densely scaly; scales acuminate ovate or ovate-lanceolate, up to 7 × ca. 2.5 mm, margins fimbriate, membranous or thickly membranous, marginate, central cells longitudinally arranged (long axes of cells in longitudinal direction), sides of marginal cells irregularly curved, basal stipe scales mixed with smaller scales; smaller scales reddish brown, membranous, broadly ovate, margins fimbriate, apices caudate, cells undulate, not rectangular. Fronds 20–55 cm; stipe light stramineous, 2–15 cm, 0.5–1.5 mm in diam., sparsely scaly from basal stipe to rachis; scales similar to basal stipe scales but smaller and often appressed. Lamina green or grayish green when dry, sometimes light brown, darker adaxially, narrowly elliptic-lanceolate, 15–40 × 2.5–5.5 cm at middle, 1–3 cm wide at base,

widest at middle, gradually contracted downward, 1-pinnate, apex pinnatifid and long acuminate; rachis without proliferous bulbils, light stramineous. Pinnae 15–45 pairs, alternate or nearly opposite, sessile, remote to contiguous below, sometimes upper pinnae imbricate, pinnae reflexed, except apical pinnae sometimes attached at right angles with rachis or slightly angled acroscopically, oblong-falcate to oblong, apices acute, bases obviously asymmetrical, acroscopic base with deltoid auricles, apex of auricles acute, crenate, proximal margins of auricles truncate, parallel to rachis, or raised outward and curved, sometimes slightly overlapping rachis, distal part of acroscopic margins of pinnae truncate or slightly curved inward and crenate, or sometimes with regular or irregular obtuse or acute teeth, teeth sometimes with short acute tips, basal basispic margins narrowly cuneate, truncate or slightly recurved, margins entire, distal basispic margins slightly angled acroscopically and curved; adaxially glabrous, abaxially sparsely scaly, microscales light brown to brown, narrowly lanceolate; frond texture papery. Sori small, terminal on shorter veinlets, close to pinna margin; indusia present, light brown or nearly gray, entire or slightly shallowly repand, evanescent.

• On rocks in broad-leaved evergreen forests; 1000–2600 m. NW and SW Yunnan.

188. *Polystichum consimile* Ching, Icon. Filic. Sin. 5: t. 237. 1958.

涪陵耳蕨 fu ling er jue

Plants evergreen. Rhizome erect, short, rhizome apex and basal stipe sparsely scaly; scales ascending and appressed, dark brown, ovate, bases peltate, margins with short cilia, marginate, apices shortly acuminate; cells mostly narrowly rectangular with straight sides, sides of marginal cells irregularly curved. Fronds 30–40 cm; stipe grayish stramineous, 10–12 cm, distal stipe subglabrous. Lamina 1-pinnate, dark brown when dry, narrowly elliptic, 20–28 × ca. 3 cm at middle, slightly contracted toward base, acuminate; rachis stramineous, without proliferous bulbils, glabrous abaxially. Pinnae 30–35 pairs, shortly stalked, alternate, basal pairs remote, remaining pairs contiguous or slightly imbricate, broadly oblong and slightly curved, apices acute or obtuse, bases asymmetrical, acroscopic base weakly auriculate, whole margin except for proximal half of basispic side with sparse irregular spinulose teeth, proximal margins of auricles truncate or slightly curved outward, basal basispic margins cuneate, margins entire, often slightly recurved, distal part of basispic margins angled acroscopically and curved, with 2–4 spinulose teeth; both surfaces glabrous; frond texture papery; venation indistinct, pinnate; lateral veins nearly reaching pinna margin, pinnate above pinna midrib from base upward, dichotomous or simple, simple or dichotomous below pinna midrib. Sori small, terminal on shorter veinlets, close to pinna margin, 2–8 above pinna midrib, 1–3 below pinna midrib on apical part; indusia present, entire.

• Limestone cliffs inside karst caves; ca. 200 m. Chongqing (Fuling).

Polystichum consimile has shortly acuminate lamina apices. The illustration in the protologue is incorrect in having apical free pinnae homomorphic with lateral pinnae.

Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 13. 1997) reduced this species to a synonym of *Polystichum shensiense*, a member of *P.* sect. *Sorolepidium*.

This species might be extinct.

189. *Polystichum yuanum* Ching, Icon. Filic. Sin. 5: t. 235. 1958.

倒叶耳蕨 *dao ye er jue*

Plants evergreen. Rhizome erect, or slightly ascending, short, together with stipe base 1–2.5 cm in diam., rhizome apex and stipe densely scaly; scales dark brown, up to 4 mm, membranous, margins with irregular ciliate teeth, apices rounded-acuminate. Fronds 12–38 cm; stipe stramineous or pale greenish stramineous, 1–15 cm, ca. 1 mm in diam., distal stipe scales mostly caducous. Lamina 1-pinnate, light brown or light brownish green, adaxially darker, narrowly elliptic-lanceolate, 8–30 × 1.8–3.5 cm at middle, 1.3–2 cm wide at base, slightly contracted below middle, long acuminate; rachis stramineous or light green stramineous, without proliferous bulbils, sparsely scaly abaxially, especially on pinna bases; scales dark brown, ovate or lanceolate, with sparse irregular long teeth. Pinnae 20–30 pairs, often alternate, sometimes nearly opposite, often remote, rarely contiguous or hardly imbricate, very shortly stalked, mostly ± reflexed, rarely attached at right angles or nearly so with rachis above middle, oblong, middle pinnae 8–15 × 5–7 mm, basal pinnae 5–10 × 4–6 mm, apices acute, bases asymmetrical, acroscopic side much wider, acroscopic margins nearly truncate, base widest and with 1 acute weakly spinulose auricle, margins of auricles with sparse, unequally sized, shallow teeth, tips of teeth obtuse, basal basispic margins narrowly cuneate, truncate or slightly recurved, margins entire, distal part of basispic margins nearly obliquely truncate and with 2–4 shallowly spinulose teeth; adaxially glabrous, abaxially sparsely covered with microscales, microscales light brown, ovate-lanceolate or lanceolate or hairlike; frond texture papery; venation pinnate, distinct abaxially, slightly distinct adaxially; lateral veins not reaching pinna margin, pinnate above pinna midrib from base upward, dichotomous or simple, simple or dichotomous below pinna midrib. Sori small, terminal on shorter veinlets of upper pinnae from middle of lamina upward, close to pinna margin; indusia present, dark brown, entire, caducous.

• Rock crevices in limestone valleys in broad-leaved forests and mixed broad-leaved coniferous forests; 2200–2900 m. NW Yunnan (Zhongdian).

190. *Polystichum muscicola* Ching ex W. M. Chu & Z. R. He, *sp. nov.*

伴藓耳蕨 *ban xian er jue*

Type: China. Sichuan: Luding County, Feiyueling, alt. 2800 m, 16 Nov 1934, *H. Smith 13456* (holotype, PE!).

Validating Latin diagnosis: that of “*Polystichum muscicola* Ching ex W. M. Chu et Z. R. He” (Ching ex W. M. Chu & Z. R. He in Kung et al., Fl. Reipubl. Popularis Sin. 5(2): 140–141, 228; t. 45: 1–2. 2001).

Plants evergreen. Rhizome erect, short, together with per-

sistent stipe base ca. 1.5 cm in diam. Fronds 10–20 cm; stipe stramineous, 2–6 cm, thinner than 1 mm in diam., whole stipe sparsely scaly; scales brownish yellow, broadly lanceolate or broadly ovate-lanceolate, thinly membranous, with a few long teeth. Lamina 1-pinnate, yellowish green when dry, narrowly elliptic-lanceolate or only linear-lanceolate, 7–13 × 1–2 cm, base slightly contracted or gradually contracted below middle, apex long acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly; scales similar to basal stipe scales. Pinnae 10–23 pairs, attached at nearly right angles to rachis, ovate or ovate-oblong, apices acute, sessile, margins pinnatilobate or only sparsely toothed, teeth shortly spinulose, bases asymmetrical, acroscopic base ± auriculate, auricles of lower pinnae with 2 or 3 acute teeth, acroscopic margins mostly attached at acute angles to rachis and ascendant, basispic margins obliquely truncate, attached at nearly right angles to rachis and angled basispically, middle pinnae 5–9 × ca. 4 mm, basal pinnae often obviously contracted and ca. 3 mm long and wide; margins of lower lobes often with 2 or 3 acute teeth; frond texture thinly papery. Sori abaxial on veinlets, medial or closer to pinna margin, mostly 2–4 per pinna; indusia small, evanescent.

• Wet moss-covered rocks in forests; 2000–2800 m. W Hubei (Badong), W Sichuan (Emei Shan, Luding).

“*Polystichum muscicola* Ching ex W. M. Chu & Z. R. He” was not validly published because the herbarium in which the type is conserved was not specified (*Melbourne Code*, Art. 40.7).

Polystichum muscicola is similar to *P. atkinsonii* in habit and lamina texture, but its rachis lacks proliferous bulbils and its lower pinnae below the middle of the lamina are gradually contracted and attached at right angles to the rachis or slightly angled basispically.

191. *Polystichum perpusillum* Li Bing Zhang & H. He, Ann. Bot. Fenn. 49: 68. 2012.

极小耳蕨 *ji xiao er jue*

Plants evergreen. Rhizome ascending, 0.3–0.5 cm, densely covered with scales; scales brown, deltoid-ovate, 0.9–1.4 mm; roots brown when dry, up to 4 cm, ca. 0.3 mm in diam. Fronds 4–7 per rhizome, 3.3–9.5 cm; stipe green, 1.2–4 cm, 0.4–0.9 mm in diam. at middle; basal stipe scales brown, dull, deltoid-ovate, 2–2.5 × 0.5–1.2 mm, papery, margins slightly long ciliate, apices acuminate or caudate; distal stipe scales similar but narrower and shorter, varying in size, brown, dull, ovate-lanceolate, papery, margins regularly shortly ciliate, apices caudate. Lamina 1-pinnate, shiny adaxially, lanceolate, slightly contracted toward base, 2.1–6.1 × 0.85–1.25 cm at middle, acute; rachis 0.4–0.7 mm in diam. at middle, without proliferous bulbils; rachis scales brown, dull, deltoid-ovate or ovate-lanceolate, 0.5–1.3 × 0.25–0.31 mm at base, varying in size, papery, margins regularly ciliate, apices caudate. Pinnae 5–12 pairs, not overlapping, ascendant except lowest pairs, basal two pairs 2.5–6 mm apart, alternate, oblong, middle (largest) pinnae 3.2–7.3 × 2–3.5 mm, shortly stalked (stalk 0.2–0.4 mm), acroscopic base auriculate, basispic base cuneate and often forming an 80°–120° angle with rachis, apices acute, acroscopic margin with 1–4 teeth; abaxially scaly, adaxially glabrous; microscales on abaxial surface subulate or linear (narrow-type microscales), 0.13–0.54 mm, base 0.05–0.07 mm wide; frond texture papery;

venation pinnate; midrib slightly raised abaxially, flat adaxially; lateral veins free, 2 or 3 pairs from midrib per pinna, alternate; each lateral vein again dichotomous or not, slightly raised and distinct abaxially, indistinct adaxially. Sori terminal on veins of upper pinnae, 1–3 per fertile pinna, close to pinna margin (center of sorus 0.4–0.6 mm distant from pinna margin); indusia brown, ca. 0.6 mm in diam., membranous, erose. Spores orbicular in polar view, elliptic in equatorial view, ca. $38.1 \times 45.2 \mu\text{m}$ (polar axis \times equatorial axis); perispore sculpturing granulate with few verrucae.

- Cave entrances; ca. 600 m. S Guizhou (Libo).

In comparison with the morphologically most similar species *Polystichum minutissimum*, *P. perpusillum* has a lamina with an acute apex and up to 12 pairs of pinnae per lamina and its rachis scales are deltoid-ovate or ovate-lanceolate, while *P. minutissimum* has a lamina with a rounded apex and 5–8 pairs of pinnae per lamina and its rachis scales are subulate or linear.

192. *Polystichum rupicola* Ching ex W. M. Chu, Acta Bot. Yunnan., Suppl. 5: 51. 1992.

岩生耳蕨 yan sheng er jue

Plants evergreen. Rhizome erect, short, together with stipe base 1–1.5 cm in diam., rhizome apex scales and basal stipe scales dark brown, broadly lanceolate, thickly membranous, sparsely toothed. Fronds 15–32 cm; stipe stramineous, 3–8 cm, less than 1 mm in diam., sparsely scaly from stipe base to rachis; scales dark brown, lanceolate to narrowly lanceolate, mixed with few smaller scales; smaller scales appressed, dark brown, ovate, thinly membranous, with sparse short to long teeth. Lamina 1-pinnate, light brownish green or grayish green when dry, adaxially darker, linear-lanceolate, 15–25 \times 2–3 cm at middle, broader at middle, base slightly contracted, apex pinnatifid and long acuminate, sometimes pinnatilobate and shortly acuminate; rachis stramineous, without proliferous bulbils. Pinnae 15–20 pairs, mostly widely remote, slightly angled acroscopically or attached at nearly right angles with rachis, very shortly stalked, oblong, apex rounded-truncate, middle pinnae 1–2 cm \times 4–7 mm, basal pinnae 8–11 \times 4–6 mm, apices acute and with short spinule angled acroscopically, bases asymmetrical, acroscopic base auriculate, auricles nearly semicircular and with 1 short acute tip at apex or 1–3 low spinulose teeth on margin, acroscopic margins nearly truncate and with 4–6 deep or shallow obtuse teeth, basal basicopic margins truncate, margins entire, distal basicopic margins abruptly curved upward, with 3 or 4 shallow teeth (sometimes repand), teeth obtuse or shortly spinulose at apex; pinnae or lobes near lamina apex strongly angled acroscopically, almost parallel to rachis, apex often hooked and pointing to rachis, basicopic margins nearly semicircular; adaxially glabrous, abaxially sparsely scaly; microscales appressed, light brown, ovate, thinly membranous; frond texture papery or thinly leathery. Sori small, terminal on shorter veinlets, close to pinna margin, 1–4(–6) above midrib, 1–3 below midrib and only on upper part; indusia present, dark brown, subentire, evanescent.

- Montane wet limestone crevices; 1500–2800 m. NW Yunnan (Gongshan, Lijiang) [?N Myanmar].

193. *Polystichum deltodon* (Baker) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 191. 1899.

对生耳蕨 duì shēng ěr jué

Aspidium deltodon Baker, Gard. Chron., n.s., 14: 494. 1880; *Hemesteum deltodon* (Baker) H. Léveillé; *Polypodium submarginale* Langsdorff & Fischer; *Polystichum deltodon* (Baker) Diels var. *cultripinum* W. M. Chu & Z. R. He; *P. pseudodeltodon* Ching & Z. Y. Liu (1984), not Tagawa (1937).

Plants evergreen. Rhizome ascending to erect, short, together with stipe base 1–2 cm in diam., rhizome apex and basal stipe densely scaly; scales brown to dark brown, ovate or ovate-lanceolate, up to 6 \times 2 mm, thickly membranous, subentire, acuminate. Fronds 13–42 cm; stipe stramineous, 3–16 cm, 0.5–1.5 mm in diam., stipe above base sparsely scaly; scales brown to dark brown, ovate-lanceolate or ovate, varying in size, membranous, with sparse long teeth, caudate and long acuminate, evanescent; remnant scales mostly appressed. Lamina light green or light brownish green when dry, lanceolate or narrowly elliptic-lanceolate, 9–30 \times 2–4.5 cm at middle, base not or slightly contracted, 1-pinnate, apex pinnatifid and acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly on both surfaces; scales brown to pale dark brown, ovate, membranous, with sparse long teeth, caudate. Pinnae 18–40 pairs, often alternate, rarely nearly opposite, contiguous, lower pairs remote, often attached at nearly right angles with rachis, sometimes upper pairs slightly angled acroscopically, sometimes most pinnae or those below middle of lamina slightly angled basicopically, oblong or falcate-oblong, middle pairs 8–22 \times 4–10 mm at base, apices slightly curved upward, acute and shortly spinulose, bases asymmetrical, acroscopic base auriculate; auricles deltoid or nearly deltoid, apex of auricles acute or acuminate and shortly spinulose, proximal margins of auricles truncate or slightly curved, entire or with 1 or 2 shallow obtuse teeth, parallel to rachis or slightly overlapping with rachis, distal margins of auricles often with 1 or 2 shallow incised rounded teeth or sometimes acute coarse teeth; acroscopic margins of pinnae truncate or slightly recurved and crenate, basal basicopic margins narrowly cuneate, straight, margins entire, distal basicopic margins curved upward, with coarse and often shortly spinulose teeth; adaxially glabrous, abaxially sparsely covered with narrowly lanceolate light brown microscales; frond texture papery; venation slightly distinct abaxially, distinct adaxially, pinnate; lateral veins pinnate above midrib from base to apex, dichotomous or simple, simple or dichotomous below midrib, sterile veinlets reaching base of teeth. Sori small, terminal on veinlets, close to pinna margin, often in 1 row above midrib, up to 10, only 1–3 below midrib on apical part or none; indusia present, brown, erose, caducous. Spores reniform in equatorial view; perispore sculpturing plicate with granules and perforations.

- Acidic or basic soils in limestone crevices or limestone walls in broad-leaved evergreen forests; 1000–2600 m. Chongqing, Guizhou, Hubei, Hunan, Sichuan, Yunnan.

Polystichum pseudodeltodon from Taiwan is a distinct species, not closely related to *P. deltodon*. *Polystichum tosaense* (Makino) Makino from Japan is a second distinct species that has been treated as a synonym of *P. deltodon*. The distribution of *P. deltodon* in Anhui, Taiwan,

and Zhejiang, as well as Japan, Myanmar, and the Philippines, is doubtful.

194. *Polystichum puteicola* Li Bing Zhang, H. He & Q. Luo, Bot. Stud. (Taipei) 51: 128. 2010.

吞天井耳蕨 *tun tian jing er jue*

Plants evergreen. Rhizome ascending, 0.5–1 cm; scales brown, linear, 0.2–3.6 mm; roots dark brown when dry, up to 9 cm, ca. 0.6 mm in diam., sparsely or densely covered with scales. Fronds 4–7 per rhizome, 5–14 cm; stipe green, 2–6 cm, 0.6–1.2 mm in diam. at middle; basal stipe scales ovate-lanceolate, 3.6–4.5 × 1.1–2.3 mm, papery, abaxially brown and dull, adaxially flat, dark brown and shiny, margins ciliate or erose, apices acuminate or caudate; distal stipe scales brown, ovate-lanceolate, 2.7–3.7 × 1.1–2.1 mm, varying in size, membranous, composed of 1 layer of cells, margins regularly ciliate or with outgrowths, apices caudate, matte. Lamina 1-pinnate, shiny adaxially, lanceolate, 3.5–9.5 × 1.2–2.6 cm at middle, 1.3–2.7 cm wide and broadest at base, apex acute; rachis 0.7–1.2 mm in diam. at middle, without proliferous bulbils; scales of rachis similar to distal stipe scales but smaller, varying in size, margins regularly ciliate, apices caudate, matte. Pinnae 6–14 pairs, remote, strongly reflexed toward lamina base, basal two pairs 0.7–1.5 cm apart, alternate, oblong, middle pinnae 7.5–12 × 3.5–5.5 mm, basal pinnae slightly larger, shortly stalked, acroscopic base slightly auriculate, basiscopic base cuneate, forming 30°–90° angle with rachis, apices acute, margins crenate or subentire, without spinules; abaxially scaly, adaxially glabrous; microscales on abaxial surface subulate with dilated base (broad-type microscales), 0.5–1.1 mm, base 0.13–0.26 mm wide, with few tortuous outgrowths on margin of base; frond texture thinly leathery; venation pinnate; midrib slightly raised abaxially, flat adaxially; lateral veins free, 4 or 5 pairs from midrib per pinna, each lateral vein further dichotomous, indistinct on both surfaces. Sori terminal on veins of pinnae, 5–9 (1–3 below midrib, 4–6 above midrib) per fertile pinna, located approximately at middle between midrib and pinna margin and 0.9–1.6 mm distant from pinna margin; all pinnae on fertile lamina fertile; indusia brown, 0.8–1.2 mm in diam., erose. Spores subglobose in polar view, elliptic in equatorial view, ca. 32.5(28–37) × 43.5(36–48) × 34.2(31–38) μm (polar axis × long equatorial axis × short equatorial axis, respectively); perispore sculpturing cristate with numerous spinules ca. 0.5 μm.

• Limestone walls inside karst sinkholes; ca. 1700 m. NW Guizhou (Bijie).

Polystichum puteicola is most similar to *P. obliquum* in stature, pinna shape, and pinna size, but *P. puteicola* has the lamina widest at the base, stipe scales blackish brown adaxially, rachis scales up to 3.6 × 0.8 mm, pinnae oblong, dark green, nearly leathery, shiny adaxially, and slightly repand-serrate or subentire, and microscales brown and up to 2 × 0.5 mm. In contrast, *P. obliquum* has a narrowly oblanceolate lamina with the basal pair of pinnae contracted, stipe scales brown adaxially, rachis scales up to 2.3 × 0.5 mm, pinnae rhombic-ovate or rarely oblong, green, papery, dull adaxially, and serrulate, and microscales brownish and 0.5–0.8 × 0.2–0.3 mm.

Polystichum puteicola is also similar to *P. paradeltodon* in stature and pinna size but differs in having fronds thicker and dark green and

pinnae oblong, ± reflexed, with basiscopic base attached at 30°–90° angle with rachis (vs. fronds thinner, green or yellowish green, and pinnae falcate-triangular, attached at 100°–110° angle with rachis).

195. *Polystichum nanchurnicum* Ching, Bull. Fan Mem. Inst. Biol., n.s., 1: 310. 1949.

南川耳蕨 *nan chuan er jue*

Plants evergreen. Rhizome erect, short, together with stipe base 1–2 cm in diam., upper part densely scaly; scales brown, broadly lanceolate, membranous. Fronds few, 14–19 cm; stipe light stramineous, 4–5 cm, ca. 1 mm in diam.; stipe scales rufous, broadly lanceolate, toothed, acuminate. Lamina 1-pinnate, light green when dry, adaxially darker, lanceolate, 10–14 × 2–2.7 cm, slightly contracted downward, acuminate; rachis light stramineous, without proliferous bulbils, sparsely scaly; scales brown, lanceolate or linear, sparsely toothed. Pinnae 14–18 pairs, alternate, lower pairs contiguous, upper pairs remote, shortly stalked, attached at nearly right angles with rachis but lower pairs angled basiscopically, rhomboid-oblong, basal pairs 0.7–1 cm, middle pairs 1–1.3 cm wide, apices obtuse but with a spinule and slightly curved acroscopically, bases asymmetrical, acroscopic base auriculate, auricles semicircular or almost triangular with ca. 3 small obtuse low teeth, proximal margins of auricles slightly curved and slightly overlapping with rachis, distal part of acroscopic margins toothed, teeth 4 or 5, obtuse or weakly spinulose, basal basiscopic margins cuneate, truncate, margins entire, distal basiscopic margins curved upward and with 4 obtuse weakly spinulose teeth; adaxially glabrous, abaxially sparsely covered with light brown linear microscales; frond texture papery; venation visible or distinct abaxially, indistinct adaxially, pinnate; lateral veins nearly reaching pinna margin, pinnate from base upward above midrib, dichotomous or simple, simple or dichotomous below midrib. Sori terminal on shorter veinlets, close to pinna margin, up to 7 above midrib, 2–4 below middle midrib; indusia present, grayish brown, erose, evanescent.

• Wet limestone crevices; ca. 1200 m. Chongqing (Jinfo Shan).

Polystichum nanchurnicum was not treated in FRPS. Its relationship with *P. deltodon* is unclear.

196. *Polystichum obliquum* (D. Don) T. Moore, Index Fil. 87. 1858.

斜羽耳蕨 *xie yu er jue*

Aspidium obliquum D. Don, Prodr. Fl. Nepal. 3. 1825; *A. auriculatum* Wallich ex Mettenius var. *caespitosum* Wallich ex C. B. Clarke; *A. auriculatum* var. *obliquum* (D. Don) Baker; *A. caespitosum* Wallich ex Mettenius; *Polystichum caespitosum* (Wallich ex Mettenius) Beddome (1865), not Schott (1834); *P. subobliquum* Tagawa.

Plants evergreen. Rhizome erect, short, densely scaly apically; scales reddish brown, membranous, central part of scales hardened and bright castaneous, ovate-lanceolate, ca. 3 × 1 mm, margins shortly fimbriate or with dense and short cilia, apices acuminate. Fronds 6–32 cm; stipe light stramineous, 0.5–12 cm, 0.5–1 mm in diam., sparsely scaly; scales dimorphic; larger scales similar to rhizome apex scales, reddish brown, membra-

nous; smaller scales lanceolate, sparsely toothed, reddish brown or light brown. Lamina 1-pinnate, green or grayish green when dry, adaxially darker, lanceolate, $3.5\text{--}21 \times 1\text{--}5$ cm at middle, not or slightly contracted at base, acuminate or shortly acuminate to obtuse; rachis light stramineous, without proliferous bulbils, sparsely scaly adaxially; scales brown, lanceolate or nearly subulate. Pinnae 7–15 pairs, alternate or nearly opposite, shortly stalked, distant to contiguous, sometimes hardly imbricate, most pinnae attached at right angles with rachis or slightly angled acroscopically, basal 1 or 2 pairs angled basiscopically, sometimes \pm angled basiscopically below middle of lamina or most pinnae, rhombic-ovate or nearly oblong, apices acute or obtuse, bases obviously asymmetrical, acroscopic base often with deltoid or nearly deltoid auricles, sometimes only weakly developed, apex of auricles acute, margins of auricles entire or with 1 or 2 shallow obtuse teeth, acroscopic margins of pinnae nearly truncate or slightly raised toward rachis and curved, sparsely toothed, teeth acute, obtuse or weakly repand, rarely with acute and spinulose teeth, basal basiscopic margins cuneate, straight, margins entire, distal basiscopic margins slightly curved upward, toothed same as on acroscopic margins but with fewer teeth; adaxially glabrous, abaxially sparsely covered with lanceolate or subulate, light brown or brown microscales; frond texture thinly leathery; venation pinnate, slightly distinct abaxially, visible adaxially; lateral veins nearly reaching pinna margin, pinnate above midrib from base to apex, trifurcate, dichotomous or simple, simple or dichotomous below midrib. Sori small, medial on each side of midrib of pinna, up to 9 above midrib, less than 4 or sometimes sterile below midrib; indusia present, light brown, entire.

Montane wet limestone crevices or limestone walls; (900–)1700–2800 m. W Guangxi, W Guizhou, W Sichuan, Taiwan, C, NW, and SW Yunnan [Bhutan, N India, Kashmir, Myanmar, Nepal, ?Vietnam].

Polystichum obliquum has been placed in *P. sect. Polystichum* by Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 7. 1997).

197. *Polystichum mengziense* Li Bing Zhang, Phytotaxa 60: 58. 2012.

蒙自耳蕨 *meng zi er jue*

Polystichum deltodon (Baker) Diels var. *henryi* Christ, Bull. Soc. Bot. France 52(Mém. 1): 1: 27. 1905.

Plants evergreen. Rhizome ascending to erect, short, apex densely scaly; scales bicolorous, blackish brown at middle, dull brown on margins, lanceolate, up to 5×1 mm at base, thickly membranous, subentire, acuminate. Fronds 18–25 cm; stipe stramineous, 3–8 cm, ca. 1.5 mm in diam. at middle; basal stipe scales dense, light brown, ovate-lanceolate, membranous, subentire, acuminate; distal stipe scales appressed, light brown, ovate or ovate-lanceolate, irregularly shortly denticulate, caudate. Lamina 1-pinnate, light green or light brownish green when dry, lanceolate, $14\text{--}19 \times 1.8\text{--}2.2$ cm at middle, base slightly contracted, apex pinnatifid and acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly on both surfaces, scales similar to distal stipe scales. Pinnae 24–35 pairs, often alternate, rarely nearly opposite, approximate, midribs often attached at nearly right angles with rachis, sometimes lower pairs angled slightly basiscopically, rectangular or nearly

deltoid, middle pairs $10\text{--}13 \times 3\text{--}4$ mm at base, apices slightly curved upward, acute and shortly spinulose, bases asymmetrical, acroscopic base slightly auriculate; auricles mucronate or nearly semicircular, apex of auricles acute and spinulose, proximal margins of auricles truncate or slightly curved, parallel to or slightly overlapping rachis, distal margins of auricles rounded, acroscopic margins of pinnae with 7–9 acute spinulose teeth, basal basiscopic margins narrowly cuneate, margins entire, distal basiscopic margins curved upward and with 1 sharp tooth; both surfaces glabrous; frond texture papery; venation pinnate, slightly distinct abaxially, indistinct adaxially, lateral veins dichotomous or simple. Sori small, terminal on veinlets, close to pinna margin, 1 row above midrib, 5–8 above midrib, often sterile below midrib, all pinnae fertile; indusia present, brown, erose, caducous.

- Rock crevices; ca. 1800 m. SE Yunnan (Mengzi).

When raising this taxon to specific rank, the original varietal epithet “*henryi*” is blocked by *Polystichum henryi* Christ (Notul. Syst. (Paris) 1(2): 36. 1909).

198. *Polystichum paradeltodon* L. L. Xiang, Acta Phytotax. Sin. 32: 265. 1994.

新对生耳蕨 *xin dui sheng er jue*

Plants evergreen. Rhizome erect, short. Fronds 10–30 cm; stipe stramineous, 3–10 cm, stipe base sparsely scaly; scales brown, narrowly ovate or broadly lanceolate, membranous, toothed, sparsely mixed with smaller scales; small scales broadly ovate at base, membranous, becoming glabrous upward, margins toothed, apices linear and narrowly caudate. Lamina green or grayish green when dry, lanceolate, $7\text{--}20 \times 2\text{--}4.5$ cm at middle, base truncate, not or slightly contracted, 1-pinnate, apex pinnatifid and acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly adaxially; scales light brown, ovate-lanceolate or broadly ovate, membranous, bases peltate and appressed. Pinnae 12–20 pairs, alternate, shortly stalked or sessile, nearly oblong, $0.8\text{--}2$ cm \times $5\text{--}8$ mm at middle, apices slightly curved upward, rounded or acute, bases asymmetrical, acroscopic base auriculate; auricles low and deltoid or nearly semicircular, apices acute or obtuse, proximal margins of auricles truncate or slightly curved, parallel to rachis or slightly overlapping with rachis, basal basiscopic margins narrowly cuneate, nearly truncate, coarsely dentate or with slightly recurved teeth; adaxially glabrous, abaxially sparsely covered with short light brown microscales; frond texture papery; venation pinnate, distinct on both surfaces; lateral veins pinnate above midrib from base to apex, dichotomous or simple, simple or dichotomous below midrib. Sori small, terminal on shorter veinlets, medial or close to pinna margin, in 1 row on each side of midrib of pinna, more numerous above midrib, sometimes absent below midrib; indusia present, light brown, repand. Spores brown, orbicular in equatorial view; perispore sculpturing reticulate.

- Wet limestone crevices in valleys; ca. 800 m. S Yunnan (Mengla).

199. *Polystichum subacutidens* Ching ex L. L. Xiang, Acta Phytotax. Sin. 32: 261. 1994.

多羽耳蕨 *duo yu er jue*

Polystichum deltodon (Baker) Diels var. *cultratum* Christ.

Plants evergreen. Rhizome erect, short, together with stipe base 1.5–3 cm in diam., rhizome apex densely scaly; scales shiny, yellowish brown, linear-lanceolate, ca. 1.5 cm × 1–1.5 mm, thickly membranous, entire. Fronds 35–60 cm; stipe light stramineous or greenish stramineous, 4–15 cm, 1–1.5 mm in diam., lower part densely scaly; scales yellowish brown to dark brown, ovate-lanceolate, up to 1 cm × ca. 3 mm, thickly membranous, finely toothed, appressed or opening in upper part; scales gradually sparser toward lamina apex, mixed with membranous and thinly membranous scales; scales appressed, ovate-lanceolate, lanceolate, narrowly lanceolate, or broadly ovate, sulcate, varying in size, margins erose to nearly fimbriate, bases of partial scales peltate. Lamina 1-pinnate, green or yellowish green when dry on both surfaces, narrowly elliptic-lanceolate, 25–50 × 1.8–3 cm at middle, often gradually contracted below middle of lamina, 1–1.5 cm wide at base, acuminate; rachis green or pale greenish stramineous, without proliferous bulbils, with denser small scales adaxially; small scales brown, filiform, evanescent. Pinnae 40–110 pairs, alternate or nearly opposite, sessile or shortly stalked, attached at right angles with rachis or upper pairs sometimes slightly angled acroscopically, basal one to several pairs or sometimes upper pairs above middle of lamina ± reflexed, oblong-deltoid or right triangular, 7–15 × 3–5 mm at middle, apices obtuse-rounded or acute, bases asymmetrical, acroscopic base auriculate; auricles deltoid with acute tips, proximal margins of auricles truncate or slightly curved outward, parallel to rachis, acroscopic margins of pinnae repand to coarsely crenate, rarely pinnatifid with acute lobes, basal basicopic margins narrowly cuneate, straight or slightly recurved, margins entire, distal basicopic margins weakly repand or with 2 or 3 coarse obtuse teeth; adaxially glabrous, abaxially sparsely covered with linear light brown microscales; frond texture papery; venation pinnate, distinct abaxially, slightly visible adaxially; all lateral veins ending short of pinna margin, pinnate above midrib from base to apex, dichotomous or simple, simple or dichotomous below midrib. Sori small, terminal on shorter veinlets, close to pinna margin; indusia present, light brown, darker at center, entire, caducous. Spores orbicular in equatorial view; perispore sculpturing plicate.

Limestone crevices in montane broad-leaved evergreen forests, limestone caves; 700–1500 m. S Guizhou (Changshun, Ziyun), NW Guangxi (Leye, Nandan), SE Yunnan [N Vietnam].

Polystichum subacutidens has a narrow, long lamina with up to 110 pairs of pinnae.

200. *Polystichum gymnocarpium* Ching ex W. M. Chu & Z. R. He, Fl. Reipubl. Popularis Sin. 5(2): 227. 2001.

闽浙耳蕨 min zhe er jue

Plants evergreen. Rhizome ascending, short, rhizome apex and stipe base densely scaly; scales brown, lanceolate, up to 1 cm × 1.5 mm, membranous, weakly shortly serrulate or entire, long acuminate. Fronds 25–65 cm; stipe stramineous, 6–14 cm, 1–2 mm in diam. at base, upper stipe base covered with lanceolate and filiform scales. Lamina 1-pinnate, narrowly elliptic-lanceolate, 15–52 × 2–3.5 cm at middle, often gradually contracted below middle of lamina, 1–2 cm wide at base, acumi-

nate; rachis stramineous, without proliferous bulbils. Pinnae 30–70 pairs, alternate or nearly opposite, remote, upper pairs from middle of lamina upward attached at right angles with rachis, lower pairs ± reflexed, falcate or falcate-lanceolate, basal pairs often forming nearly right angles with each other, up to 1.8 cm × ca. 5 mm at middle, apices shortly spinulose, bases obviously asymmetrical, acroscopic base auriculate; auricles deltoid, apices acute and spinulose, margins of auricles with sparse shallow teeth, proximal margins of auricles nearly parallel to rachis; basicopic base cuneate, margins of pinnae toothed, teeth often spinulose or sometimes obtuse at apex; abaxially sparsely scaly, microscales brown, filiform, up to 3 mm; frond texture papery; venation slightly distinct abaxially, indistinct adaxially, pinnate; lateral veins often dichotomous but pinnate on auricles, apex of veinlets thickened, nearly reaching pinna margin. Sori terminal on shorter veinlets, in 1 row on each side of midrib, medial, exindusiate.

● On rocks in forests, forest margins; 300–700 m. N Fujian (Pucheng), SW Zhejiang (Songyang, Suichang, Wuyi).

Polystichum gymnocarpium is similar to *P. hecatopterum*, but the pinna margins are spinulose instead of aristate, the microscales are filiform, and the sori are exindusiate.

201. *Polystichum daguanense* Ching ex L. L. Xiang, Acta Phytotax. Sin. 32: 263. 1994.

大关耳蕨 da guan er jue

Plants evergreen. Rhizome erect, short. Fronds 18–30 cm; stipe pale greenish stramineous, 2.5–7 cm, ca. 1 mm in diam. at base, upper stipe base to rachis sparsely scaly; scales dark brown, often appressed, ovate, membranous, with irregular fine teeth. Lamina 1-pinnate, narrowly elliptic-lanceolate, 10–27 × 1.5–2.5 cm at middle, truncate or slightly broadly cuneate, nearly shallowly cordate, acuminate; rachis pale greenish stramineous, without proliferous bulbils. Pinnae 20–40 pairs, alternate or nearly opposite, slightly angled acroscopically or attached at right angles with rachis, approximate to contiguous, sessile, nearly rectangular, middle pairs 7–15 × 2–4 mm, basal pairs 5–10 × 2–4 mm, apices acute, bases asymmetrical, acroscopic base with deltoid auricles, proximal acroscopic margins of pinnae parallel with rachis, acroscopic margins substraight, basicopic base narrowly cuneate, distal basicopic margins curved, acroscopic margins of pinnae with 11–13 regular coarse teeth, only ca. 1/3 of basicopic margins of pinnae serrate and with 3 teeth, teeth shortly spinulose and forward-pointing or slightly recurved; adaxially glabrous, abaxially sparsely scaly; microscales light brown, appressed, ovate or lanceolate, membranous; frond texture papery; venation distinct on both surfaces, pinnate, lateral veins often dichotomous above midrib, simple below midrib, veinlets nearly reaching pinna margin. Sori relatively large, contiguous or nearly so when mature, terminal on shorter veinlets, close to pinna margin, 1–5 above midrib, 1 or 2 below midrib and on apical part, auricles and lower part of basicopic margins without sori; indusia present, light brown, subentire, persistent. Spores orbicular in equatorial view; perispore sculpturing plicate with granules.

● Wet rock crevices in bushes in limestone valleys; 1500–2000 m. NE Yunnan (Daguan, Yongshan).

202. *Polystichum huashanicola* (W. M. Chu & Z. R. He) Li Bing Zhang, *Phytotaxa* 60: 58. 2012.

花山耳蕨 hua shan er jue

Polystichum daguanense Ching ex L. L. Xiang var. *huashanicola* W. M. Chu & Z. R. He, *Acta Bot. Yunnan.* 22: 257. 2000 [*“huashanicolum”*].

Plants evergreen. Rhizome erect, short. Fronds 19–33 cm; stipe pale greenish stramineous, 2.5–6.7 cm, ca. 1 mm in diam. at base, upper stipe base sparsely scaly to rachis; scales often appressed, dark brown, ovate, membranous, with irregular fine teeth. Lamina 1-pinnate, narrowly elliptic-lanceolate, 10–25 × 1.5–2.4 cm at middle, truncate or slightly broadly cuneate, sometimes slightly becoming shallowly cordate, acuminate; rachis pale greenish stramineous, without proliferous bulbils. Pinnae up to 30 pairs, alternate or nearly opposite, attached at right angles with rachis, approximate, subsessile, nearly rectangular, middle pairs 7–15 × 2.5–5 mm, basal pairs 5–11 × 2.4–5 mm, apices acute, bases asymmetrical, acroscopic base with deltoid auricles, proximal acroscopic margins of pinnae overlapping rachis, acroscopic margins substraight, basicopic base narrowly cuneate, distal basicopic margins curved, acroscopic margins of pinnae with 7–9 regular coarse teeth, ca. 1/2 of basicopic margins of pinnae serrate and with 4 teeth, teeth shortly spinulose and slightly open; adaxially glabrous, abaxially sparsely scaly; microscales light brown, appressed, ovate or lanceolate, membranous; frond texture papery; venation distinct on both surfaces, pinnate; lateral veins often dichotomous above midrib, simple below midrib, veinlets nearly reaching pinna margin. Sori small, obviously not contiguous when mature, terminal on shorter veinlets, close to pinna margin, 1–5 above midrib, 1 or 2 below midrib and on apical part, auricles and lower part of basicopic margins without sori; indusia present, light brown, subentire, persistent.

• Wet rock crevices in bushes in limestone valleys, limestone sinkholes; 1900–2100 m. NE Yunnan (Zhengxiong).

Polystichum huashanicola was treated as a variety of *P. daguanense* in FRPS (5(2): 147. 2001). The two taxa are different in a number of aspects (see key) and should be treated as two species. It remains unclear if they are closely related.

203. *Polystichum pseudoacutidens* Ching ex W. M. Chu & Z. R. He, *Acta Bot. Yunnan.* 22: 257. 2000.

文笔峰耳蕨 wen bi feng er jue

Plants evergreen. Rhizome short, ascending or erect, 1.5–2 cm. Fronds more than 10, 40–50 cm; stipe stramineous, 12–18 cm, 1.5–2 mm in diam. at base, sparsely covered with large and small scales; large scales brown, not appressed, lanceolate or broadly lanceolate, up to 5 mm, membranous, entire; small scales appressed, brown, membranous, toothed. Lamina 1-pinnate, light green when dry, adaxially darker, lanceolate, 20–32 × 3.5–4.5 cm, base nearly truncate, not or slightly contracted, apex acuminate or long acuminate; rachis stramineous, without proliferous bulbils, sparsely covered with scales abaxially; scales appressed, brown, ovate, membranous, sparsely toothed, caudate with long acute tip. Pinnae 20–30 pairs, alternate or nearly opposite, shortly stalked, attached at right angles to

rachis or slightly ascendant, nearly right triangular, up to 2.5 cm × 6 mm at middle, apices shortly acuminate, shortly spinulose, bases obviously asymmetrical, acroscopic base auriculate, auricles deltoid, apices spinulose, sparsely shallowly toothed on both margins, acroscopic margins often straight or substraight, with regular coarse teeth, teeth mostly shortly spinulose at apex, basal basicopic margins narrowly cuneate, basicopic margins substraight or slightly curved upward, distal basicopic margins sparsely toothed; adaxially glabrous, abaxially sparsely scaly; microscales light brown, lanceolate; frond texture papery; venation visible abaxially, indistinct adaxially, pinnate; lateral veins above midrib pinnate from base to apex, dichotomous or simple, simple or dichotomous below midrib, lateral veins mostly reaching teeth. Sori small, terminal on shorter veinlets, located at bases of teeth, close to pinna margin, up to 10 above midrib, fewer than 4 below midrib and located on upper part; indusia present, dark brown, membranous, subentire, caducous.

• Limestone crevices in broad-leaved forests; 2500–2800 m. NW Yunnan (Lijiang).

Polystichum pseudoacutidens is similar to *P. acutidens* but differs in having more (more than 10) fronds per rhizome, pinnae nearly right triangular, with basicopic margins often straight and marginal teeth often opening, and sori close to pinna margin.

204. *Polystichum elevatovenusum* Ching ex W. M. Chu & Z. R. He, *Fl. Reipubl. Popularis Sin.* 5(2): 226. 2001.

凸脉耳蕨 tu mai er jue

Plants evergreen. Rhizome ascending or erect, short, 2–2.5 cm including stipe bases, rhizome apex densely scaly; scales brown, lanceolate, up to 8 × 1 mm, thickly membranous, subentire. Fronds few per rhizome, 45–70 cm; stipe stramineous, 12–20 cm, 1.5–2 mm in diam., base densely scaly; scales similar to rhizome scales or wider, slightly spreading, distal stipe with similar but appressed membranous brown scales. Lamina 1-pinnate, both surfaces grayish green when dry, adaxially slightly shiny, narrowly elliptic-lanceolate, 33–50 × 3.5–6 cm at middle, slightly contracted toward base from middle, 2–4 cm wide at base, apex acuminate; rachis stramineous, without proliferous bulbils, abaxially sparsely scaly; scales similar to stipe scales but smaller, appressed, thin. Pinnae 30–45 pairs, alternate or nearly opposite, upper pairs contiguous to imbricate, often attached at right angles with rachis, lower pairs or only basal-most pairs ± reflexed, falcate or oblong, apices slightly angled acroscopically, acute, bases obviously asymmetrical, acroscopic base with deltoid auricles with acute tips, proximal margins of auricles truncate or slightly curved, parallel to rachis, basal basicopic margins narrowly cuneate, straight or substraight, margins entire, distal part of basicopic margins curved upward, both margins with shallow obtuse teeth or with incised shallow rounded teeth; adaxially glabrous, abaxially sparsely scaly; microscales light brown, lanceolate, small; frond texture thinly leathery; venation pinnate, obviously raised abaxially, distinct adaxially; lateral veins often dichotomous, rarely simple, pinnate on auricles, nearly reaching pinna margin. Sori small, in 1 row on each side of midrib, more above midrib, terminal on shorter veinlets, close to pinna margins; indusia present, brown, caducous.

• Wet limestone crevices, red soils derived from limestone, in forests or under bushes; 1200–2400 m. NW, S, and W Yunnan.

Polystichum elevatovenusum is similar to *P. acutidens*, but its lamina texture is thicker, i.e., thickly papery, its pinna margins have rounded, non-spinulose teeth, its veins are obviously raised abaxially, and its sori are close to the pinna margin.

205. *Polystichum excellens* Ching, Icon. Filic. Sin. 5: t. 234. 1958.

尖顶耳蕨 *jian ding er jue*

Plants evergreen. Rhizome erect, short, 1–2.5 cm, rhizome apex and stipe base densely scaly; scales reddish brown, ovate or ovate-lanceolate, up to $5 \times$ ca. 2 mm, thickly membranous, with short fine teeth, acuminate. Fronds 23–55 cm; stipe stramineous, 7–20 cm, 0.8–1.2 mm in diam., distal stipe sparsely scaly; scales varying in size, reddish brown, membranous; larger scales similar to basal stipe scales; smaller scales lanceolate or broadly ovate, margins with irregular thick cilia, apices long acuminate or shortly caudate; scales marginate with cells along margins often irregularly curved. Lamina 1-pinnate, grayish green when dry, adaxially darker, linear-lanceolate or nearly linear-lanceolate, rarely nearly narrowly deltoid, $11\text{--}30 \times 3\text{--}10$ cm at middle, slightly contracted or not at base, acuminate or long acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; microscales reddish brown, narrowly lanceolate or broadly ovate, with sparse long teeth, long caudate. Pinnae 9–30 pairs, nearly falcate or oblong-lanceolate, middle pairs $1.5\text{--}5 \text{ cm} \times 7\text{--}15$ mm at middle, apices acuminate and spinulose, bases asymmetrical, acroscopic base obviously wider, slightly raised and auriculate; auricles low and broadly deltoid, with 1–3 shallow teeth and only 1 or 2 teeth spinulose, sometimes only weakly acute or obtuse at apex of teeth, acroscopic margins of pinnae substraight, with sparse low obtuse teeth or nearly repand, basal basiscopic margins narrowly cuneate, truncate or slightly curved, margins entire, distal basiscopic margins curved upward, with sparse low obtuse teeth; adaxially glabrous, midrib concave, abaxially sparsely covered with lanceolate light brown microscales; frond texture papery; venation pinnate, distinct and slightly raised abaxially, indistinct adaxially; lateral veins nearly reaching pinna margin, pinnate above midrib from base to apex, dichotomous or simple, simple or dichotomous below midrib. Sori terminal on shorter veinlets, in 1 row on each side of midrib, medial, 1–15 above midrib, fewer than 8 or absent below midrib; indusia present, reddish brown, with regular fine teeth, evanescent.

Limestone crevices in montane broad-leaved evergreen forests, limestone caves; 800–1700 m. NW, SW, and W Guangxi, C Guizhou (Qingzhen, Ziyun), W Hunan (Baojing), SE Yunnan [N Vietnam].

The distribution record for Vietnam is new.

206. *Polystichum nayongense* P. S. Wang & X. Y. Wang, Acta Bot. Yunnan. 19: 41. 1997.

纳雍耳蕨 *na yong er jue*

Plants evergreen. Rhizome erect, short, together with stipe base ca. 2 cm in diam. Fronds sparsely caespitose, 30–60 cm; stipe stramineous, 5–17 cm, 1–2 mm in diam., basal stipe scales denser, slightly spreading, brown, broadly ovate, thickly mem-

branous, with irregular fine teeth or subentire, caudate; distal stipe scales sparser, similar to basal stipe scales but smaller, mostly appressed, brown, membranous. Lamina 1-pinnate, grayish when dry, adaxially darker, lanceolate or narrowly elliptic-lanceolate, $20\text{--}44 \times 3\text{--}5$ cm at middle, 2–4 cm wide at base, base truncate and slightly contracted or not, apex caudate and long acuminate; rachis stramineous, without proliferous bulbils. Pinnae 25–38 pairs, alternate or nearly opposite, lower pairs remote, attached at right angles with rachis, basal pinnae rarely slightly angled basiscopically, upper pairs contiguous or slightly imbricate, slightly angled acroscopically, falcate or oblong-falcate, $1\text{--}2.5 \text{ cm} \times 4\text{--}8$ mm at middle, apices slightly angled upward, with aristate tip, bases obviously asymmetrical, acroscopic base auriculate, auricles deltoid or nearly semicircular, apex of auricles acute and aristate, proximal margins of auricles truncate or slightly curved, parallel to rachis or slightly overlapping rachis, acroscopic margins substraight or slightly recurved, with regular, acute, curved upward, aristate teeth, basal basiscopic margins narrowly cuneate, truncate, margins entire, distal basiscopic margins curved upward from middle upward, with regular, acute, often incurved, and aristate teeth; adaxially glabrous, abaxially sparsely scaly; microscales appressed, light brown, ovate, thinly membranous; frond texture papery or thickly papery. Sori terminal on shorter veinlets, in 1 row on each side of midrib, nearly medial, often 5–9 above midrib, 1–4 below midrib and on upper part only; indusia present, light brown, entire or slightly repand, evanescent.

• Limestone sinkholes; ca. 1500 m. W Guizhou (Nayong).

207. *Polystichum acutidens* Christ, Bull. Acad. Int. Géogr. Bot. 11: 259. 1902.

尖齿耳蕨 *jian chi er jue*

Polystichum deltodon (Baker) Diels var. *acutidens* (Christ) C. Christensen; *P. subauriculatum* Tagawa.

Plants evergreen. Rhizome erect, up to 10 cm, together with remnant old stipe base up to 3 cm in diam., rhizome apex and stipe base densely scaly; scales brown or dark brown, ovate or ovate-lanceolate, up to 8×3 mm, thickly membranous, entire. Fronds 25–100 cm; stipe stramineous, 5–40 cm, 1–2 mm in diam. at base, sparsely scaly upward, a few distal stipe scales similar to basal stipe scales; more distal stipe scales gradually narrower toward rachis apex, brown or dark brown, lanceolate or narrowly subulate, mostly appressed, membranous, with sparse long teeth. Lamina 1-pinnate, green or grayish green when dry, adaxially darker, lanceolate, $18\text{--}65 \times 2.5\text{--}12$ cm, slightly contracted or not at base, acuminate; rachis stramineous, without proliferous bulbils, sparsely scaly abaxially; scales often appressed, brown or dark brown, lanceolate, linear, or narrowly subulate, sparsely toothed, membranous. Pinnae 25–45 pairs, sessile, alternate or opposite, lower pairs more remote and sometimes angled acroscopically, upper pairs contiguous, falcate-lanceolate, $1\text{--}6 \text{ cm} \times 3\text{--}10$ mm at middle, apices acuminate, often spinulose, bases obviously asymmetrical, acroscopic base with deltoid auricles, proximal margins of auricles truncate or slightly curved outward, parallel to rachis, basal basiscopic margins narrowly cuneate, straight or slightly recurved, both acroscopic and basiscopic margins toothed, tips of

teeth often ± recurved and shortly or long spinulose; adaxially glabrous, abaxially sparsely covered with narrowly lanceolate light brown or brown microscales; frond texture papery or thinly papery; venation pinnate, visible or distinct abaxially, indistinct adaxially; lateral veins pinnate above midrib from base to apex, dichotomous or simple, simple or dichotomous below midrib. Sori small, terminal on shorter veinlets, in 1 row on each side of midrib, medial or nearly medial, veinlets of lower part below midrib often without sori; indusia present, dark brown, small, subtentire, caducous. Spores reniform in equatorial view, narrowly elliptic in polar view; perispore sculpturing plicate with numerous granules.

Montane broad-leaved evergreen forests, often in wet limestone valleys; 600–2400 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [N India, Myanmar, Thailand, N Vietnam].

Polystichum acutidens was placed in *P. sect. Polystichum* by Fraser-Jenkins (Himalayan Ferns (Guide to *Polystichum*), 7. 1997).

208. *Polystichum longissimum* Ching & Z. Y. Liu, Bull. Bot. Res., Harbin 4(4): 16. 1984.

长叶耳蕨 chang ye er jue

Plants evergreen. Rhizome ascending to erect, short, together with stipe base ca. 2 cm in diam., rhizome apex scaly; scales dark brown, ovate-oblong, thickly membranous. Fronds 50–70 cm; stipe light stramineous, 15–20 cm, 1–1.5 mm in diam., abaxially sparsely scaly; scales appressed, dark brown,

acuminately ovate and broadly lanceolate, varying in size, membranous, erose. Lamina 1-pinnate, green or grayish green when dry, adaxially darker, linear or linear-lanceolate, 30–48 × 3.5–6 cm at middle, base slightly contracted or not, apex pinnatifid-caudate and long acuminate; rachis light stramineous, without proliferous bulbils, sparsely scaly on both surfaces; scales brown or light castaneous, ovate or narrowly lanceolate, erose, acuminate. Pinnae 40–50 pairs, alternate or nearly opposite, attached at right angle with rachis, sessile, lower pairs obviously remote, upper pairs contiguous, nearly falcate, apices slightly angled acroscopically, acute and shortly spinulose, middle pairs 1.5–3 cm × 5–8 mm, bases obviously asymmetrical, acroscopic base with deltoid and spinulose auricles, proximal margins of auricles nearly truncate, parallel or nearly parallel to rachis, acroscopic margins substraight, with regular coarse obtuse spinulose teeth, basal basispic margins cuneate, truncate, margins entire, distal basispic margins curved upward, toothed, teeth similar to those on acroscopic margins but sparser; adaxially glabrous, abaxially sparsely covered with lanceolate light brown or grayish white microscales; frond texture thinly papery; venation pinnate, visible abaxially, indistinct adaxially; lateral veins often reaching pinna margin, pinnate above midrib from base to apex, dichotomous or simple, simple or dichotomous below midrib. Sori terminal on shorter veinlets, often in 1 row on each side of midrib, up to 8, nearly medial, absent or only 1 or 2 below midrib; indusia present, grayish white, shallowly erose, evanescent.

• Wet cliffs in montane broad-leaved evergreen forests; 700–1400 m. Chongqing (Nanchuan), Guizhou (Jinsha, Xifeng).

2. Subfam. ELAPHOGLOSSOIDEAE

舌蕨亚科 she jue ya ke

Xing Fuwu (邢福武), Wang Faguo (王发国), Dong Shiyong (董仕勇); Kunio Iwatsuki, John T. Mickel, Masahiro Kato, Michael G. Gilbert

Fronds weakly to strongly dimorphic. Sporangia evenly covering fertile parts of fronds abaxially.

About eight genera and 700 species: nearly cosmopolitan, but highest diversity found in the New World; four genera and 34 species (16 endemic) in China.

Subfamily Elaphoglossoideae as defined here is supported as monophyletic by both molecular and morphological evidence.

7. *BOLBITIS* Schott, Gen. Fil. t. 14. 1835.

实蕨属 shi jue shu

Xing Fuwu (邢福武), Wang Faguo (王发国); Kunio Iwatsuki

Egenolfia Schott; *Poecilopteris* C. Presl.

Plants small to medium-sized, terrestrial or creeping on rocks or riverbanks or small trees. Rhizome creeping or shortly erect, dorsiventral, covered with ovate to linear-lanceolate, brown or blackish scales. Fronds dimorphic, evergreen, simple, pinnate, or rarely bipinnate. Sterile fronds: stipe with ovate or lanceolate brown scales at base; lamina mostly ± herbaceous, apex usually with a bulbil, margin entire or crenate to deeply lobed, with or without teeth or spines, veins either free or variously anastomosing, with or without included free veinlets. Fertile fronds similar in shape to sterile ones, usually with longer stipe and narrower lamina. Sori acrostichoid, without indusia. Spores globose or nearly so, with thick epispores.

About 80 species: pantropical, mainly in Asia and Pacific islands; 25 species including three putative hybrids (twelve endemic) in China.

1a. Veins free.

- 2a. Sterile fronds pinnate, base asymmetrical (except *B. hookeriana*), apex obtuse or acute.
- 3a. Bulbil terminal on lamina 1. *B. rhizophylla*
- 3b. Bulbil subterminal on lamina.
- 4a. Stipe and rachis densely scaly; base of pinnae symmetrical; sporangia on all sides of costa and costules, arrangement usually moniliform 4. *B. hookeriana*
- 4b. Stipe and rachis subglabrous; base of pinnae asymmetrical; sporangia spreading throughout abaxial surface, arrangement fully acrostichoid.
- 5a. Sterile pinnae usually obtuse or rounded at apex; fertile pinnae 8–10 × 2–3 mm 2. *B. appendiculata*
- 5b. Sterile pinnae acute at apex; fertile pinnae 40–60 × ca. 8 mm 3. *B. medogensis*
- 2b. Sterile fronds bipinnatifid, base symmetrical, apex acuminate.
- 6a. Pinna lobes rounded at apex, 0–1 mm apart.
- 7a. Rachis with a narrow wing except for lowest part; base of lowermost pinnae symmetrical 5. *B. sinensis*
- 7b. Rachis without wing; base of lowermost pinnae asymmetrical 6. *B. longiaurita*
- 6b. Pinna lobes obtuse-acute at apex, 2–3 mm apart.
- 8a. Stipe and rachis densely scaly; pinna lobes falcate, 1–1.5 cm 7. *B. tonkinensis*
- 8b. Stipe and rachis subglabrous; pinna lobes triangular, 0.5–0.6 cm 8. *B. fengiana*
- 1b. Veins ± anastomosing.
- 9a. Venation pattern ± irregular, veins along costae usually anastomosing and others free or rarely uniting; rachis narrowly winged or not.
- 10a. Pinnae pinnatifid; rachis wingless 23. *B. ×multipinna*
- 10b. Pinnae subentire or crenate; rachis narrowly winged.
- 11a. Pinnae crenate; veins usually free except those along costae 24. *B. ×laxireticulata*
- 11b. Pinnae subentire; veins anastomosing including those along costae 25. *B. ×nanjenensis*
- 9b. Venation pattern regular, veins variously anastomosing; rachis wingless.
- 12a. Lateral veins with 5–8 veinlets on each side in sterile pinnae; fronds often dark brownish when dry.
- 13a. Rhizome with 4 rows of fronds; scales on base of stipe with obvious brown margin 19. *B. confertifolia*
- 13b. Rhizome with 2 or 3 rows of fronds; scales on base of stipe without obvious brown margin.
- 14a. Fronds 1–3 cm apart; lamina thinly herbaceous; rhizome 3–6 mm in diam.; plants terrestrial or climbing on bases of tree trunks, sometimes rheophytic or cultivated as a submerged aquatic 21. *B. heteroclita*
- 14b. Fronds close together; lamina thickly papery; rhizome 4–15 mm in diam.; plants terrestrial or climbing up tree trunks.
- 15a. Rhizome 10–15 mm thick, climbing to 2–3 m; sterile fronds with stipe 16–20 cm; fertile fronds 40–60 cm 20. *B. scandens*
- 15b. Rhizome 4–10 mm thick, short, erect; sterile fronds with stipe 32–51 cm; fertile fronds 85–112 cm 22. *B. changjiangensis*
- 12b. Lateral veins with 1–4 veinlets on each side in sterile pinnae; fronds green or purplish when dry.
- 16a. Venation without included free veinlets.
- 17a. Fertile pinnae linear; lateral pinnae 15–24 pairs 9. *B. angustipinna*
- 17b. Fertile pinnae lanceolate; lateral pinnae 6–15(–17) pairs.
- 18a. Bubbils terminal; lateral pinnae ca. 15(–17) pairs; stipe sparsely scaly 11. *B. tibetica*
- 18b. Bubbils subterminal; lateral pinnae 6–12 pairs; stipe densely scaly.
- 19a. Sterile stipe 30–40 cm; pinnae truncate to subcordate at base 10. *B. christensenii*
- 19b. Sterile stipe 8–17 cm; pinnae rounded at base 12. *B. hekouensis*
- 16b. Venation with included free veinlets.
- 20a. Lateral pinnae 6–15 pairs; terminal segment triangular 13. *B. subcordata*
- 20b. Lateral pinnae 2–7 pairs; terminal segment similar to central pinnae.
- 21a. Fertile pinnae linear, 14–45 × as long as wide.
- 22a. Fronds purplish when dry; veinlets 5–8 arising from either side of lateral veins uniting in sterile pinnae 17. *B. costata*
- 22b. Fronds greenish when dry; veinlets 4 arising from either side of lateral veins uniting in sterile pinnae 18. *B. virens*
- 21b. Fertile pinnae lanceolate, 3–8 × as long as wide.
- 23a. Sterile pinnae 2 or 3 pairs; sporangia arrangement acrostichoid 14. *B. hainanensis*
- 23b. Sterile pinnae 5–7 pairs; sporangia arrangement not acrostichoid.
- 24a. Fronds purplish or purplish brown when dry; veinlets 2 or 3 arising from lateral veins, free veinlets without thickened ends 15. *B. scalpturata*
- 24b. Fronds stramineous when dry; veinlets 4 or 5 arising from lateral veins, free veinlets with thickened ends 16. *B. deltigera*

1. *Bolbitis rhizophylla* (Kaulfuss) HENNIPMAN, *Blumea* 18: 148. 1970.

根叶刺蕨 gen ye ci jue

Gymnogramma rhizophylla Kaulfuss, *Enum. Filic.* 78. 1824; *Egenolfia rhizophylla* (Kaulfuss) Fée; *Polybotrya duplicatoserrata* Hayata.

Rhizome shortly creeping, 4–6 mm in diam., with 2 or 3 rows of fronds, densely scaly; scales brown, ovate-lanceolate, subclathrate. Fronds close together; sterile fronds pinnate, 20–90 cm; stipe 10–20 cm, base 2–3 mm in diam.; lamina green to blackish, dark green when dry, lanceolate, pinnate, 40–80 × 5–13 cm, herbaceous, both surfaces glabrous; stipe and lower side of basal part of rachis usually with small, blackish, spreading scales; terminal segment 1–6 cm; rachis with a narrow wing except for lowest part; pinnae 20–35 pairs, alternate to opposite, sessile, up to 3.5 cm apart, elliptic-lanceolate, 2.5–4 × 1–1.5 cm, base rounded-truncate, ± symmetrical, margin finely serrate, or serrately lobed to 1/3 toward costa, apex rounded or acuminate, lowermost 2 pinnae deflexed or not; veinlets 2–4 pairs, simple pinnate. Fertile fronds 16–30 cm; lamina lanceolate, 16–20 × 1.5–2.5 cm, widest usually near middle; pinnae 20–25 pairs, ca. 1.5 cm apart, elliptic, 6–12 × 3–4 mm, margin entire or irregularly undulate, apex obtuse. Sporangia inserted throughout abaxial surface. $2n = 82^*$.

• On rocks in dense forests; 200–1000 m. Taiwan.

2. *Bolbitis appendiculata* (Willdenow) K. Iwatsuki, *Acta Phytotax. Geobot.* 18: 48. 1959.

刺蕨 ci jue

Acrostichum appendiculatum Willdenow, *Sp. Pl.* 5: 114. 1810; *Egenolfia appendiculata* (Willdenow) J. Smith; *E. crenata* Ching & P. S. Chiu.

Rhizome shortly creeping, up to 3 mm in diam., with 2 or 3 rows of fronds, densely scaly; scales blackish, lanceolate, 2–3 × 1–1.5 mm, opaque or subclathrate, margin with irregular small teeth. Fronds close together; sterile fronds pinnate, 15–40 cm; stipe 5–15 cm, ca. 1 mm in diam., sparsely scaly near base; lamina dark green when dry, lanceolate, 12–25 × 3.5–6 cm, herbaceous; terminal segment triangular, apex acuminate, sometimes somewhat prolonged; rachis usually with a narrow wing; pinnae 15–30 pairs, opposite or alternate, up to 3 cm apart, elliptic-linear, 2–3.5 × 5–8 cm, base asymmetrical, usually oblique, margin ± entire, finely serrate, or lobed to 1/3 toward costa, apex usually obtuse or rounded, lowermost 2 pinnae 1–2 mm stalked; secondary veins on either side with 2 or 3 tertiary veins. Fertile fronds pinnate, 25–40 cm; stipe 20–25 cm; pinnae 10–30 pairs, 8–10 × 2–3 mm, lowermost 2 pinnae 1–9 mm stalked. Sporangia inserted throughout abaxial surface, arrangement fully acrostichoid.

Creeping on rocks in dense forests, on soil in evergreen forests; 100–1300 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

3. *Bolbitis medogensis* (Ching & S. K. Wu) S. Y. Dong, *Acta Phytotax. Sin.* 43: 105. 2005.

墨脱刺蕨 mo tuo ci jue

Egenolfia medogensis Ching & S. K. Wu, *Fl. Xizang.* 1: 278. 1983.

Rhizome shortly creeping, densely scaly; scales brown, linear-lanceolate, margin entire. Fronds close together or tufted; sterile fronds pinnate, ca. 75 cm; stipe 20–35 cm, sparsely scaly; lamina green when dry, broadly lanceolate, ca. 48 × 20–25 cm, both surfaces glabrous, apex caudate-acuminate, bulbil subterminal; pinnae ca. 12 pairs, alternate, shortly stalked, 3–5 cm apart, 10–13 × ca. 3.5 cm, base subtruncate, margin crenate-serrate, with a fleshy spine in each sinus, apex acute; secondary veins slightly obvious, dichotomous. Fertile fronds pinnate; stipe ca. 50 cm; lamina narrowly lanceolate, ca. 46 × 10–12 cm; pinnae 10–12 pairs, subsessile, linear, 4–6 × ca. 0.8 cm, margin entire. Sporangia inserted throughout abaxial surface.

• Evergreen forests on slopes; 700–900 m. Xizang (Mêdog).

4. *Bolbitis hookeriana* K. Iwatsuki, *Acta Phytotax. Geobot.* 18: 49. 1959.

虎克实蕨 hu ke shi jue

Bolbitis appendiculata (Willdenow) K. Iwatsuki subsp. *vivipara* (Buchanan-Hamilton ex Hooker) HENNIPMAN; *Polybotrya vivipara* Buchanan-Hamilton ex Hooker.

Rhizome long creeping, 5–12 cm in diam., with usually 3 rows of fronds, without or with few sclerenchyma strands. Sterile fronds pinnate, 20–100 cm; stipe and rachis usually throughout with spreading scales or sometimes glabrescent; stipe 5–25 cm; lamina 20–85 × 4–20 mm, terminal segment 3–10 cm; pinnae 33–60 pairs, 3.5–10 × 1.2–2.5 cm, base ± symmetrical, margin usually entire, sometimes lobed to 1/5 toward costa; lobes 3–5 pairs, alternate, linear-lanceolate, usually widest at (to below) middle, 15–25 × 2–3 cm, base ± symmetrical, broadly attenuate or truncate, margin slightly serrate-crenate, with a short spine in each sinus, apex acuminate, lowermost 2 pinnae with short stalk; secondary veins on either side with 2 or 3 tertiary veins. Fertile fronds pinnate, 40–90 cm; stipe 16–45 cm; lamina 14–40 × 4–10 cm; pinnae 35–50 pairs; central pinnae 2–8.5 cm, lowermost 2 pinnae 0–4 mm stalked. Sporangia inserted on all sides of costa and costules, usually arrangement moniliform.

On rocks in dense forests; ca. 500 m. Yunnan (Yingjiang) [Bangladesh, Cambodia, India, Laos, Malesia, Myanmar, Thailand, Vietnam].

5. *Bolbitis sinensis* (Baker) K. Iwatsuki, *Acta Phytotax. Geobot.* 18: 49. 1959.

中华刺蕨 zhong hua ci jue

Acrostichum sinense Baker, *Bull. Misc. Inform. Kew* 1906: 14. 1906; *Campium sinense* (Baker) C. Christensen; *Egenolfia crassifolia* Ching; *E. sinensis* (Baker) Maxon; *Polybotrya sinense* (Baker) C. Christensen.

Rhizome shortly creeping, ca. 1 cm in diam., with 2 or 3 rows of fronds; scales brownish or blackish, ovate-lanceolate, ca. 3 mm, subclathrate. Fronds close together; sterile fronds pinnate, 20–110 cm; stipe 10–35 cm, base ca. 3 mm in diam., grooved adaxially; lamina green to blackish, dark green when

dry, ovate-lanceolate, 40–110 × 10–35 cm, herbaceous, both surfaces glabrous; terminal segment 8–30 cm; rachis with a narrow wing except for lowest part, with sparse dark brown, ovate scales; pinnae 14–30 pairs, alternate to opposite, sessile, 2–3 cm apart, elliptic, 10–14 × 2–2.5 cm, base truncate, ± symmetrical, margin lobed to 1/3–2/3 toward costa, apex rounded or acuminate; lobes 16–20 pairs, ca. 1 mm apart, 8–12 × 4–5 mm, margin usually entire or finely crenate-serrate, apex rounded, with a spine in each sinus; veinlets 6 or 7 pairs, pinnate, simple or bifurcate. Fertile fronds 16–80 cm; stipe as long as sterile ones; lamina lanceolate, 22–30 × 4–5 cm, apex caudate; pinnae 10–14 pairs, 2–3 cm apart, narrowly lanceolate, 4–5 × ca. 0.5 cm, base truncate to slightly cordate, apex acuminate, basal pairs 3–4 mm stalked. Sporangia inserted throughout abaxial surface. $2n = 82$.

In soil or on rocks in dense forests; 600–1900 m. Guizhou, Hong Kong, Yunnan [Bangladesh, Cambodia, India, Indonesia, Lesser Sunda Islands, Myanmar, Thailand, Vietnam].

6. *Bolbitis longiaurita* F. G. Wang & F. W. Xing, *Novon* 16: 434. 2006.

长耳刺蕨 chang er ci jue

Acrostichum appendiculatum Willdenow var. *costulatum* Hooker; *Bolbitis bipinnatifida* (J. Smith) K. Iwatsuki (1959), not (Mettenius) Ching (1934); *B. sinensis* (Baker) K. Iwatsuki var. *costulata* (Hooker) Tagawa & K. Iwatsuki; *Egenolfia bipinnatifida* J. Smith.

Rhizome shortly creeping, ca. 1 cm in diam., densely scaly; scales dark brownish, ovate-lanceolate, ca. 3 mm. Fronds close together; sterile fronds bipinnate, 40–70 cm; stipe 11–15 cm, base ca. 3 mm in diam., grooved adaxially, sparsely scaly; lamina dark green when dry, elliptic, 50–60 × 10–35 cm, widest at base, papery, both surfaces glabrous; terminal segment long attenuate to flagelliform; rachis shallowly grooved, glabrous; pinnae ca. 20 pairs, lanceolate, 14–16 × 2.5–3.5 cm, basal pairs subopposite, with short stalk, lowermost 2 pinnae 3–6 mm stalked, apex caudate-acuminate, base asymmetrical with basiscopic 2 or 3 lobes undeveloped, other lobes longer than acroscopic ones; other pairs of pinnae lobed to 1/2 to costa, base truncate and symmetrical; lobes 18–20, elliptic, 1–1.5 × ca. 0.6 cm, margin sparsely rounded dentate, with a spine in each sinus; veinlets 6 or 7 pairs, free, bifurcate or simple. Fertile fronds pinnate: stipe 20–40 cm; lamina lanceolate, 18–20 × 4–5 cm; pinnae 12–14 pairs, elliptic, 2–3 × ca. 0.5 cm, base rounded-truncate, apex obtuse, basal pairs with short stalk. Sporangia inserted throughout abaxial surface.

- On rocks in dense forests; ca. 1200 m. Yunnan.

This species is similar to *Bolbitis sinensis* but differs in its rachis without wing, base of the lowermost 2 pinnae asymmetrical with basiscopic 2 or 3 lobes undeveloped, and the other lobes longer than the acroscopic ones.

7. *Bolbitis tonkinensis* (C. Christensen ex Ching) K. Iwatsuki, *Acta Phytotax. Geobot.* 18: 49. 1959.

镰裂刺蕨 lian lie ci jue

Egenolfia tonkinensis C. Christensen ex Ching, *Bull. Fan Mem. Inst. Biol.* 2: 306. 1931.

Rhizome shortly creeping, ca. 1 cm in diam., densely scaly; scales fuscous, ovate, ca. 3 mm, margin erose. Fronds close together; sterile fronds bipinnate, ca. 80 cm; stipe 20–30 cm, ca. 3 mm in diam. at base, grooved adaxially, covered with ovate-lanceolate fuscous scales; lamina dark green when dry, triangular-ovate, 50–60 × 20–30 cm, both surfaces glabrous, apex caudate-acuminate; pinnae 12–16 pairs, alternate, with short stalk 2–4 mm, lanceolate, 13–15 × 3–3.5 cm, base rounded-truncate and slightly asymmetrical, margin lobed to 2/3 to costa, apex caudate-acuminate, bulbil subterminal and small; terminal segment prolonged to flagelliform and pinnatifid, bulbil subterminal and large; lobes 16–18 pairs, 2–3 mm apart, elliptic-lanceolate, falcate, 10–15 × 5–6 mm, with a long spine in each sinus; veinlets 6 or 7 pairs, pinnate, simple or bifurcate. Fertile fronds pinnate; stipe 40–45 cm; lamina narrowly lanceolate, ca. 25 × 6 cm; pinnae ca. 10 pairs, elliptic-lanceolate, 2.5–3 × ca. 0.5 cm, margin entire. Sporangia inserted throughout abaxial surface.

On wet rocks in forests; 200–1200 m. S Yunnan [Thailand, Vietnam (Tonkin)].

8. *Bolbitis fengiana* (Ching) S. Y. Dong, *Acta Phytotax. Sin.* 43: 107. 2005.

疏裂刺蕨 shu lie ci jue

Egenolfia fengiana Ching, *Acta Phytotax. Sin.* 21: 215. 1983.

Rhizome long creeping, 4–6 mm in diam., densely scaly; scales blackish brown, lanceolate, ca. 2 mm. Fronds close together; sterile fronds bipinnate, 40–60 cm; stipe 15–25 cm, base 2–3 mm in diam., grooved adaxially, sparsely scaly; lamina dark green when dry, broadly lanceolate, 22–30 × 10–15 cm, herbaceous, both surfaces glabrous, base rounded-truncate, apex long caudate, bulbil subterminal and small; rachis with a narrow wing; pinnae 10–15 pairs, alternate, ca. 1 cm apart, linear-lanceolate, 5–9 × 1–1.5 cm, base truncate, lobed to 1/3 toward costa, basal pairs with short stalk 2–3 mm; lobes 8–12 pairs, triangular, 5–6 × 5–6 mm, margin with sparse short teeth, with long acute spine in each sinus; veinlets 3 pairs, simple pinnate. Fertile fronds pinnate; stipe 25–40 cm; lamina lanceolate, ca. 16 × 4–5 cm; pinnae 10–12 pairs, 1.5–2 cm apart, elliptic to elliptic-lanceolate, 2–2.5 × ca. 0.6 cm, base broadly cuneate, margin subentire or slightly undulate, apex obtuse, basal pairs subopposite and 3–4 mm stalked. Sporangia inserted throughout abaxial surface.

- Dense forests; 1300–1800 m. Yunnan.

9. *Bolbitis angustipinna* (Hayata) H. Itô, *J. Jap. Bot.* 14: 443. 1938.

多羽实蕨 duo yu shi jue

Leptochilus angustipinnus Hayata, *Icon. Pl. Formosan.* 5: 297. 1915; *Bolbitis contaminans* Ching; *Campium angustipinum* (Hayata) Copeland; *L. cuspidatus* (C. Presl) C. Christensen var. *crenatus* Rosenstock.

Rhizome long creeping, 10–16 cm, robust, 1–2 cm in

diam., with 2–4 rows of fronds, densely scaly; scales dark brown or blackish, lanceolate, 4–6 mm, subclathrate. Fronds close together; sterile fronds pinnate, 55–145 cm; stipe 40–60 cm, near base ca. 8 mm in diam., sparsely scaly, with 7–16 vascular bundles; lamina gray-green when dry, elliptic, 60–85 × 30–45 cm, widest somewhat below middle, hard herbaceous; pinnae 12–20 pairs, alternate, linear-lanceolate, usually widest at (to below) middle, 15–25 × 2–3 cm, base ± symmetrical, broadly attenuate or truncate, margin slightly serrate-crenate, with a short spine in each sinus, apex acuminate, lowermost 2 pinnae with short stalk; terminal segment joined to rachis, usually narrowly triangular, ± similar to central pinnae, 10–20 cm, bulbil subterminal; rachis not winged; secondary veins prominent; veins forming a costal areole and 3 rows of distal areoles, without included free veinlets. Fertile fronds 50–150 cm; stipe 30–85 cm; lamina 70–90 × 15–25 cm; pinnae 80–120 × 5–8 mm. Sporangia inserted usually throughout abaxial surface, arrangement fully acrostichoid, sometimes with a sterile strip along costa.

On rocks or near streams in dense forests; 200–1400 m. Hainan, Taiwan, Yunnan [Bhutan, India, Myanmar, Nepal, Sri Lanka, Thailand].

10. *Bolbitis christensenii* (Ching) Ching in C. Christensen, *Index Filic.*, Suppl. 3: 47. 1934.

贵州实蕨 *gui zhou shi jue*

Campium christensenii Ching, *Bull. Fan Mem. Inst. Biol.* 2: 214. 1931.

Rhizome shortly creeping, robust, ca. 1 cm in diam., densely scaly; scales blackish brown, lanceolate, ca. 9 mm, margin maple-colored, entire. Fronds tufted; sterile fronds pinnate; stipe 30–40 cm, base ca. 4 mm in diam., base densely covered with lanceolate scales; lamina grayish brown when dry, elliptic, 40–60 × 20–25 cm, thinly herbaceous, apical part pinnatifid into lanceolate lobes, bulbil subterminal; rachis not winged, densely covered with lanceolate brown scales especially when young; pinnae 6–10 pairs, lanceolate, 6.5–12 × 1.2–2 cm, base truncate to subcordate, margin crenate-serrate, sometimes with an obtuse tooth in each sinus, apex long acuminate, basal pairs subopposite, with short stalk 2–3 mm; secondary veins inconspicuous; veins forming 3 rows of long and narrow areoles, without included free veinlets. Fertile fronds as long as sterile fronds; lamina obviously narrower, linear-lanceolate; pinnae subsessile, 3–4 × ca. 5 mm, base rounded-cuneate, margin entire, apex acuminate. Sporangia inserted throughout abaxial surface.

Near streams in forests; 400–1100 m. Guangxi, Guizhou [Vietnam (Tonkin)].

11. *Bolbitis tibetica* Ching & S. K. Wu, *Fl. Xizang.* 1: 276. 1983.

西藏实蕨 *xi zang shi jue*

Rhizome short and robust, ca. 1.5 cm in diam., densely scaly; scales nut-brown, narrowly lanceolate, 4–5 mm, margin entire. Fronds tufted, 80–110 cm; sterile fronds pinnate; stipe stramineous, ca. 25 cm, base 4–5 mm in diam., grooved adaxially, sparsely scaly; lamina sap-green when dry, broadly lan-

ceolate, 50–65 × 25–30 cm, herbaceous, both surfaces glabrous, apex pinnatifid and elongate to flagelliform, bulbil terminal; rachis not winged, with sparse nut-brown scales; pinnae ca. 15 pairs, alternate, 1–1.5 cm apart, lanceolate, 16–18 × 2.5–3 cm, base truncate, margin with obtuse tooth, apex caudate-acuminate, lower pairs of pinnae shortly stalked, upper pairs basally connate with rachis; veins prominent on both surfaces, forming a costal areole and 3 or 4 rows of tetragonal to hexagonal areoles, without included free veinlets. Fertile fronds 95–115 cm; stipe 50–55 cm; lamina 50–60 × 10–12 cm, apex pinnatifid; pinnae narrowly lanceolate, 6–8 × 1.5–1.8 cm, base rounded-truncate, apex acuminate. Sporangia inserted throughout abaxial surface.

• Broad-leaved forests; ca. 800 m. Xizang (Mêdog).

12. *Bolbitis hekouensis* Ching, *Acta Phytotax. Sin.* 21: 212. 1983.

河口实蕨 *he kou shi jue*

Rhizome robust and shortly creeping, 1–1.5 cm in diam., densely scaly; scales dark brown, lanceolate, ca. 4 mm, margin entire. Fronds close together, 28–51 cm; sterile fronds pinnate; stipe pale brown, 8–17 cm, base ca. 3 mm in diam., grooved adaxially, densely covered with lanceolate, brown scales; lamina grayish brown when dry, elliptic, 18–32 × 9.5–15 cm, thickly papery, apical part pinnatifid into lanceolate lobes, bulbil subterminal; rachis not winged, densely covered with lanceolate, brown scales especially when young; pinnae 6–10 pairs, lanceolate, 6.5–12 × 1.2–2 cm, base rounded, margin crenate-serrate, sometimes with an obtuse tooth in each sinus, apex long acuminate, basal pairs subopposite, with short stalk 2–3 mm; secondary veins inconspicuous; veins forming 3 rows of long and narrow areoles, without included free veinlets. Fertile fronds as long as sterile fronds; lamina obviously narrower, linear-lanceolate; pinnae subsessile, 3–4 × ca. 5 mm, base rounded-cuneate, margin entire, apex acuminate. Sporangia inserted throughout abaxial surface.

• Rocky limestone crevices in rain forests; 400–1100 m. Hainan, Yunnan.

13. *Bolbitis subcordata* (Copeland) Ching in C. Christensen, *Index Filic.*, Suppl. 3: 50. 1934.

华南实蕨 *hua nan shi jue*

Campium subcordatum Copeland, *Philipp. J. Sci.* 37: 369. 1928; *Bolbitis formosana* Tagawa; *B. media* Ching & Chu H. Wang; *B. nakaii* H. Itô; *B. subcordata* var. *media* (Ching & Chu H. Wang) S. H. Wu.

Rhizome shortly creeping, 8–15 mm in diam., covered with lanceolate, clathrate, subentire, brown or blackish scales. Fronds ± close together, 60–120 cm; sterile fronds pinnate, 20–110 × 15–28 cm; stipe 8–45 cm, densely scaly near base, bearing small scales at apex, with 5–9 vascular bundles; lamina dark green or brownish, 12–65 cm, widest below middle, herbaceous, terminal segment narrowly triangular, longer to shorter than central pinnae, base trifid; rachis not winged; pinnae 6–15 pairs, opposite below middle, base broadly cuneate to subcordate, margin usually lobed to 1/3 toward costa, crenate-serrate,

with a prominent tooth in each sinus, apex acuminate; secondary veins slightly prominent; veins forming a costal areole and distal areoles, part of areoles with usually 1 simple, excurrent free vein. Fertile fronds 30–125 cm; stipe 15–70 cm; pinnae 6–25 pairs, 2–6 cm apart, 4–8 × ca. 1 cm, lowermost 2 pinnae 1–7 mm stalked. Sporangia inserted throughout abaxial surface, arrangement acrostichoid. $2n = 82$.

Forests, near streams; below 100–600 m. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan, Yunnan, Zhejiang [Japan, Vietnam].

14. *Bolbitis hainanensis* Ching & Chu H. Wang, Acta Phytotax. Sin. 21: 214. 1983.

厚叶实蕨 hou ye shi jue

Bolbitis yunnanensis Ching.

Rhizome shortly creeping, 5–9 cm, 1–1.5 cm in diam., densely scaly; scales dark brown, lanceolate, ca. 3 mm, margin entire. Fronds close together, 4–7 mm apart; sterile fronds pinnate; stipe 20–40 cm, near base ca. 3.5 mm in diam., densely scaly, glabrous upward; lamina grayish brown when dry, ovate, 25–35 × 20–25 cm, hard papery, both surfaces glabrous; pinnae 3–5 pairs, alternate, elliptic-lanceolate, 16–25 × 4.5–6 cm, base narrowly cuneate, margin wrinkled-undulate, apex caudate-acuminate, lower 2 pairs of pinnae with stalk ca. 1 cm; terminal segment ± similar to central pinnae; rachis not winged; secondary veins tenuous, prominent abaxially; veins inconspicuous, forming a costal large areole and 3 rows of small areoles, sometimes with included free short veinlets. Fertile fronds 35–75 cm; stipe 30–55 cm; lamina narrowly ovate, 12–25 × 10–14 cm; pinnae 2–5 pairs, lanceolate, 6–10 × 1–1.5 cm, base narrowly cuneate, apex acuminate. Sporangia inserted usually throughout abaxial surface, arrangement acrostichoid.

• Dense forests; 700–1100 m. Hainan, Yunnan.

15. *Bolbitis sculpturata* (Fée) Ching in C. Christensen, Index Filic., Suppl. 3: 50. 1934.

红柄实蕨 hong bing shi jue

Heteroneuron sculpturatum Fée, Mém. Foug. 2: 95. 1845.

Rhizome long creeping, up to 10 cm, up to 10 mm thick, with 2 rows of fronds, densely scaly; scales blackish, lanceolate, subclathrate. Fronds close together; sterile fronds pinnate; stipe 15–24 cm, sparsely scaly near base, with 5–9 vascular bundles; lamina purplish or purplish brown, 20–55 × 7–30 cm, widest below middle, herbaceous to subleathery, terminal segment usually subarticulate, 9–20 cm, bulbil subterminal; rachis not winged; pinnae 2–12 pairs, opposite or alternate, 1.5–4.5 cm apart, 10–12 × 2–2.5 cm, base ± symmetrical, narrowly to broadly cuneate, margin ± entire or serrate-crenate, without spines, apex acute to acuminate; veins forming a costal areole and 1 to few transverse rows of distal areoles, part of areoles with 1(or 2) included free veinlet, veinlets 2 or 3 arising from lateral veins. Fertile fronds 30–60 cm; stipe 15–40 cm; pinnae 5–20 pairs, 2–6 cm apart, 4–8 × ca. 1 cm, lowermost 2 pinnae sessile or up to 6 mm stalked. Sporangia inserted throughout abaxial surface, or along margin only, arrangement pteridoid.

On rocks in forests; sea level to 1200 m. Hainan, Taiwan [Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

16. *Bolbitis deltigera* (Beddome) C. Christensen, Index Filic., Suppl. 3: 48. 1934.

间断实蕨 jian duan shi jue

Poecilopteris costata (C. Presl) Beddome var. *deltigera* Beddome, Ferns Brit. India 1: t. 114. 1865; *Bolbitis virens* (Wallich ex Hooker & Greville) Schott var. *deltigera* (Beddome) Hennisman.

Rhizome 10–15 cm, up to 14 mm in diam., with 2 or 3 rows of fronds, covered with lanceolate (5–7 × ca. 1.5 mm), subclathrate, blackish scales. Sterile fronds pinnate, 40–115 cm; stipe 20–60 cm, 2–7 mm in diam. near base, with 7–14 vascular bundles; lamina purplish or purplish brown, 20–75 × 15–50 cm, widest at or below middle, herbaceous to leathery, terminal segment 14–40 cm, subarticulate or joined to rachis, bulbil subterminal; rachis not winged; pinnae 6–20 pairs, opposite or alternate, up to 6 cm apart, 10–30 × 2.5–6 cm, base ± symmetrical, usually narrowly, sometimes broadly attenuate or cuneate, margin usually ± entire or serrate-crenate, apex acuminate, lowermost 2 pinnae 1–10 mm stalked; veins forming a costal areole and several equally large distal areoles, veinlets 4 or 5 arising from each side of lateral veins anastomosing. Fertile fronds 40–120 cm; stipe 25–60 cm; pinnae 7–18 pairs, up to 6 cm apart, central pinnae 5–17 × 1.5–4.5 cm, lowermost 2 pinnae 1–9 mm stalked. Sporangia inserted on veins and near margin only, arrangement not acrostichoid.

Rain forests in valleys or on slopes; 300–700 m. Hainan, Yunnan [Bangladesh, Bhutan, India, Myanmar, Nepal, Thailand].

17. *Bolbitis costata* (C. Presl) Ching in C. Christensen, Index Filic., Suppl. 3: 47. 1934.

紫轴实蕨 zi zhou shi jue

Campium costatum C. Presl, Tent. Pterid. 239. 1836.

Rhizome up to 10 cm, up to 15 mm in diam., with 2–4 rows of fronds, covered with lanceolate (ca. 5 × 1 mm), subclathrate, light brown scales. Sterile fronds pinnate, 55–120 cm; stipe 20–60 cm, 2–7 mm in diam. near base, with 5–20 vascular bundles; lamina purplish when dried, 35–75 × 20–40 cm, widest at or below middle, subleathery, terminal segment 20–40 cm, bulbil subterminal on terminal segment or pinnae; rachis not winged; pinnae 3–19 pairs, opposite or alternate, up to 8 cm apart, 16–45 × 4–9 cm, base symmetrical, acute to subcordate, margin entire or crenulate, sometimes crisped, apex rather abruptly narrowing into acute or acuminate tip, lowermost 2 pinnae 1–6 mm stalked; veins for greater part forming 4 or more regular rows of areoles, part of areoles with 1(or 2) included free veinlet, veinlets 5–8 arising from either side of lateral veins. Fertile fronds 40–170 cm; stipe 20–100 cm; lamina 15–85 × 7–30 cm, terminal segment 8–20 cm; pinnae 5–18 pairs, up to 11 cm apart, linear, ca. 22 × 0.6–2 cm, lowermost 2 pinnae 1–6 mm stalked. Sporangia inserted mainly on veins, arrangement usually acrostichoid, rarely gymnochromoid.

Forests near streams; sea level to 1200 m. Yunnan [Bangladesh, India, Myanmar, Nepal, Thailand].

Bolbitis costata is similar to *B. sculpturata* in its fronds usually turning purplish when dry; it differs by having broader sterile pinnae (to

4–9 cm), 5–8 veinlets arising from each side of lateral veins, and fertile pinnae linear (14–16 × as long as wide).

18. *Bolbitis virens* (Wallich ex Hooker & Greville) Schott, Gen. Fil. ad t. 13. 1834.

宽羽实蕨 kuan yu shi jue

Acrostichum virens Wallich ex Hooker & Greville, Icon. Filic. 2: t. 221. 1832; *Bolbitis latipinna* Ching; *Campium virens* (Wallich ex Hooker & Greville) C. Presl.

Rhizome up to 10 cm, up to 13 mm in diam., with 2 or 3 rows of fronds, densely scaly; scales brownish, narrowly lanceolate, ca. 4 × 1.5 mm, subclathrate. Sterile fronds pinnate, 40–110 cm; stipe 20–60 cm, 2–7 mm in diam. near base, with 7–14 vascular bundles; lamina 25–75 × 20–50 cm, widest at or below middle, herbaceous to leathery, terminal segment 15–40 cm, subarticulate or joined to rachis, somewhat prolonged, bulbil subterminal on terminal segment or pinnae; rachis not winged; pinnae 6–22 pairs, opposite or alternate, up to 6.5 cm apart, 10–30 × 2.5–6 cm, base ± symmetrical, sometimes broadly attenuate or cuneate, margin entire or serrate or serrate-crenate, apex acuminate, lowermost 2 pinnae 1–10 mm stalked; veins forming a costal areole and several to many equally large distal ones, veinlets 4 arising from either side of lateral veins. Fertile fronds 40–120 cm; stipe 25–70 cm; lamina 15–65 × 7–30 cm, terminal segment 4–19 cm; pinnae 7–18 pairs, up to 6 cm apart, 4–20 × 0.2–4.5 cm, lowermost 2 pinnae 1–6 mm stalked. Sporangia inserted throughout abaxial surface, arrangement various.

On rocks in forests; 800–900 m. Yunnan [Bangladesh, Myanmar, Thailand].

19. *Bolbitis confertifolia* Ching, Acta Phytotax. Sin. 21: 211. 1983.

密叶实蕨 mi ye shi jue

Rhizome robust and long creeping, ca. 12 cm, ca. 1.5 cm in diam., densely scaly; scales medium brown, ovate-lanceolate, ca. 3 cm, margin brown, subentire. Fronds densely clustered on upper side of rhizome; sterile fronds pinnate; stipe 20–25 cm, densely covered with scales as on rhizome, grooved adaxially; lamina dark green when dry, 35–45 × ca. 15 cm, herbaceous, terminal segment elongate to long flagelliform, terminal part with bulbil; pinnae 4 or 5 pairs, subsessile, lanceolate, 12–15 × 2.5–3 cm, base cuneate, margin repand, apex long acuminate; secondary veins prominent abaxially; veins forming nearly hexagonal areoles, without included free veinlets. Fertile fronds not seen.

• Rain forests. Yunnan (Jinghong).

20. *Bolbitis scandens* W. M. Chu, Acta Phytotax. Sin. 21: 213. 1983.

附着实蕨 fu zhuo shi jue

Rhizome climbing on tree trunks more than 2–3 m in height, 1–1.5 cm in diam., densely scaly; scales nut-brown, lanceolate, 3–4 mm, margin maple-colored, entire. Fronds close together; sterile fronds pinnate; stipe 16–20 cm, near base ca. 4 mm in diam., grooved adaxially, sparsely scaly below middle;

lamina gray-brown when dry, ovate, 35–40 × 20–25 cm, widest somewhat below middle, thickly papery; pinnae 2- or 3-paired, subsessile, elliptic-lanceolate, 15–18 × 4–5 cm, base rounded-cuneate, margin slightly undulate, apex caudate-acuminate, lowermost 2 pinnae subopposite, terminal segment larger than central pinnae; secondary veins prominent abaxially, parallel and 6–7 mm apart; veins inconspicuous on both surfaces, forming a narrow costal areole and 3 or 4 rows of distal areoles, sometimes with included free veinlets. Fertile fronds 40–60 cm; lamina narrowly ovate, 25–30 × 10–12 cm; pinnae 3 or 4 pairs, subsessile, broadly lanceolate, 10–12 × 2–2.5 cm, apex acuminate. Sporangia inserted throughout abaxial surface, arrangement fully acrostichoid.

• Climbing on tree trunks in forests; ca. 700 m. S Yunnan.

Bolbitis scandens is similar to *B. heteroclita*; it differs in having the rhizome climbing on tree trunks, lateral pinnae of sterile fronds usually 3-paired, terminal pinnae never obviously prolonged, and lamina texture thickly papery.

21. *Bolbitis heteroclita* (C. Presl) Ching in C. Christensen, Index Filic., Suppl. 3: 48. 1934.

长叶实蕨 chang ye shi jue

Acrostichum heteroclitum C. Presl, Reliq. Haenk. 1: 15. 1825; *Bolbitis annamensis* Tardieu & C. Christensen; *Leptochilus heteroclitus* (C. Presl) C. Christensen.

Rhizome robust and long creeping, 3–6 mm in diam., densely scaly; scales brownish or blackish, ovate-lanceolate, 3–9 × 0.5–1.5 cm, usually subclathrate, margin subentire. Fronds 1–3 cm apart; sterile fronds simple or pinnate, 15–80 cm; stipe 10–30(–40) cm, sparsely scaly, grooved adaxially; lamina blackish when dry, 10–60 × 5–25 cm, thinly herbaceous, apex elongate to long flagelliform, terminal part with bulbil; rachis not winged, with sparse nut-brown scales; pinnae 1–6 pairs, alternate to opposite, subsessile, broadly lanceolate, 10–19 × 3–6 cm, base rounded-cuneate, margin subentire or crenate-serrate, apex caudate-acuminate; secondary veins prominent on both surfaces; veins forming 3 rows of regularly tetragonal to hexagonal areoles, without included free veinlets. Fertile fronds 15–70 cm; stipe 10–45 cm; lamina 10–26 × 5–20 cm. Sporangia inserted throughout abaxial surface. $2n = 82$.

On rocks or at base of trees near streams in broad-leaved forests; sea level to 1500 m. Chongqing, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Bangladesh, India, Indonesia, Japan (including Ryukyu Islands), Malesia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam].

Bolbitis heteroclita is often grown as a submerged aquarium plant.

22. *Bolbitis changjiangensis* F. G. Wang & F. W. Xing, Novon 18: 115. 2008.

昌江实蕨 chang jiang shi jue

Plants terrestrial, to 111 cm tall; rhizome short, erect, 2–4 cm, 4–10 mm in diam., with 2 or 3 rows of fronds, sparsely scaly; scales brown or blackish, lanceolate or spatulate, 4–5 × 2.5–3 mm, subclathrate, margin sparsely dentate on upper part, apex acuminate. Fronds close together; sterile fronds pinnate, 70–90 cm; stipe stramineous, 32–51 cm, sparsely scaly or glabrous near base; lamina oblong or ovate-oblong, 36–55 ×

24–29 cm, thickly stiffly papery; terminal segment similar to lateral pinnae, longer than remaining lamina, somewhat more deeply incised than central pinnae, 25–30 × 2.5–4 cm, apex long flagellate, usually with a bulbil below tip; pinnae 2–4 pairs, alternate, with stalk 0.1–0.4 cm, narrowly oblong-lanceolate, 17–19 × 3.5–4.6 cm, base asymmetrical, rounded to truncate, margin usually slightly crenate, without spines in sinuses, apex long flagellate; costae prominent abaxially and adaxially, secondary veins slightly prominent and with sparse scales; veins forming a costal areole and several to many distal areoles, veins toward margin free, excurrent, areoles with 1 or usually more, or irregular excurrent veinlets. Fertile fronds 85–112 cm; lamina usually narrower than in sterile fronds; pinnae 2 or 3 pairs, 7–8 × ca. 1.5 cm, base asymmetrical, rounded to truncate, apex obtuse to acuminate, terminal pinna 12–13.5 × 1.5–1.8 cm. Sporangia inserted usually throughout abaxial surface, arrangement acrostichoid, sporangia also inserted on abaxial surface of contracted pinnae in sterile fronds.

• Sandy soil near rivers in evergreen seasonal rain forests, in humid shaded conditions; 500–600 m. Hainan.

Putative Hybrids

23. *Bolbitis* × *multipinna* F. G. Wang, K. Iwatsuki & F. W. Xing, Amer. Fern J. 98: 97. 2008.

云南刺蕨 *yun nan ci jue*

Egenolfia × *yunnanensis* Ching & P. S. Chiu, Acta Phytotax. Sin. 21: 216. 1983, not *Bolbitis yunnanensis* Ching, Acta Phytotax. Sin. 21: 214. 1983.

Rhizome creeping, 1–1.5 cm in diam., densely scaly; scales dark brownish, ovate-lanceolate, 2–3 mm. Fronds close together; sterile fronds bipinnate, 70–90 cm; stipe 10–35 cm, base covered with scales, ca. 3 mm in diam., grooved adaxially; lamina dark green when dry, ovate-lanceolate, 50–65 × 15–20 cm, papery, glabrous, terminal segment prolonged to flagelliform, bulbil subterminal and large; rachis with a narrow wing on upper part; pinnae ca. 20 pairs, alternate, 1–1.5 cm apart, lanceolate, 20–22 × ca. 3 cm, base broadly cuneate, margin lobed to 1/2 toward costa, apex long caudate, basal pairs with short stalk 3–4 mm; lobes 22–26 pairs, ca. 1 mm apart, elliptic, 8–12 × ca. 5 mm, margin usually entire or slightly undulate, apex rounded, with a long spine in each sinus; veinlets 5 or 6 pairs, simple pinnate, sometimes veins forming a costal areole. Fertile fronds: stipe ca. 35 cm; lamina ca. 20 cm; pinnae lanceolate, 4–6 × 0.6–0.9 cm, with short stalk, apex obtuse. Sporangia inserted throughout abaxial surface.

• In soil in dense rain forests; 800–900 m. Guangxi, Yunnan.

Bolbitis × *multipinna* is believed to be a hybrid between *B. angustipinna* and *B. sinensis* (see Hennisman, Leiden Bot. Ser. 2: 1–323. 1977).

24. *Bolbitis* × *laxireticulata* K. Iwatsuki, Acta Phytotax. Geobot. 18: 50. 1959.

网脉实蕨 *wang mai shi jue*

Egenolfia laxireticulata (K. Iwatsuki) C. M. Kuo.

Rhizome shortly creeping, ca. 4 mm in diam., with sclerenchyma strands, sparsely scaly; scales brown-black, ovate-lanceolate to lanceolate, 3–4 × 1.5–2 mm, subclathrate. Sterile fronds pinnate, 30–75 cm; stipe 14–30 cm, densely scaly; lamina grayish green when dry, oblong-elliptic, widest at or below middle, 20–30 × 10–13 cm, papery, with a spherical subterminal bulbil; rachis sparsely scaly, with a narrow wing; pinnae 12–20 pairs, alternate or opposite, 4.5–7 × 1.5–2 cm, both surfaces glabrous, base sometimes symmetrical, variously cuneate, usually asymmetrical, margin ± entire to lobed to 2/5 toward costa, lobes finely crenate-serrate, with a distinct spine in each sinus, apex acute to acuminate, lowermost 2 pinnae up to 1.5 mm stalked, terminal segment triangular; veins very irregular, usually free except those along costae, forming a costal areole at least in part of pinnae of one plant. Fertile fronds: stipe 25–40 cm; lamina 14–28 cm; pinnae 10–12 pairs, oblong-lanceolate, ca. 2 × 0.4 cm, entire or undulate. Sporangia inserted mainly on veins.

On rocks along streams in rain forests; 100–900 m. Guangdong, Hainan, Taiwan [Japan (Ryukyu Islands)].

Bolbitis × *laxireticulata* is a hybrid between *B. appendiculata* and *B. subcordata*.

25. *Bolbitis* × *nanjenensis* C. M. Kuo, Stud. Ferns Ken-Ting Natl. Park, 53. 1986.

南仁实蕨 *nan ren shi jue*

Rhizome creeping, ca. 4 mm in diam., densely scaly; scales dark brown, ovate-lanceolate, ca. 3 × 1 mm, margin subentire, apex long acuminate. Sterile fronds pinnate, stramineous, 30–35 cm, sparsely scaly; rachis usually with a narrow wing; pinnae 11–13 pairs, sessile, oblong-lanceolate, ca. 5 × 1–1.2 cm, abaxially sparsely scaly, adaxially glabrous, base asymmetrical, usually oblique and broadly cuneate, margin ± entire, apex acute; superior pair of pinnae connate, terminal part with a bulbil; veins reticulate and forming a costal areole. Fertile fronds not seen.

• Ravines in semi-primary dwarf forests, on outermost mountain slopes, on seaside exposed to wind. Taiwan (Pingdong).

Bolbitis × *nanjenensis* is a hybrid between *B. appendiculata* and *B. heteroclita*. *Bolbitis* × *nanjenensis* is very close to *B. laxireticulata*, both with rachis narrowly winged, but the latter differs by its sterile pinnae larger (4.5–7 × 1.5–2 cm) and margin ± entire to lobed to 2/5 toward costa, with a distinct spine in each sinus.

8. ELAPHOGLOSSUM Schott ex J. Smith, J. Bot. (Hooker) 4: 148. 1841, nom. cons.

舌蕨属 *she jue shu*

Xing Fuwu (邢福武), Wang Faguo (王发国); John T. Mickel

Plants small to medium-sized, epiphytic, rarely terrestrial or epilithic. Rhizome shortly to long creeping, bearing roots ventrally

and fronds in 2 dorsal rows, dictyostelic, scales narrow or broad, usually cordate, dark or pale, margins bearing short teeth or hairs, often glandular. Fronds tufted, rarely remote, dimorphic, variously scaly or glabrous; stipes usually terete, articulate or subarticulate to scaly phyllopodia; sterile lamina simple, entire, mostly thick and leathery, margin often thin and colorless to stramineous, strongly thickened, narrowly revolute; veins mostly immersed free, simple or forked and parallel almost to margin, sometimes connected by an intramarginal vein at their tips, rarely copiously anastomosing; fertile lamina often longer, contracted and with longer stipe. Sporangia acrostichoid, entirely covering abaxial surface of lamina, exindusiate, paraphyses lacking, annulus longitudinal, interrupted, of ca. 12 thickened cells. Spores brown, elliptic, monolete, with a thick folded perispore. $n = 41$.

More than 400 species: throughout wetter parts of tropical and temperate zones, with greatest diversity in the Andes of South America; six species (one endemic) in China.

Knapp (Ferns Fern Allies Taiwan, 272. 2011) records *Elaphoglossum commutatum* (Mettenius ex Kuhn) Alderwerelt (Malayan Ferns Fern Allies Suppl. 427. 1917; *Acrostichum commutatum* Mettenius ex Kuhn, Ann. Mus. Bot. Lugduno-Batavi 4: 292. 1869; *E. subellipticum* Rosenstock) from Taiwan. It would key out below as *E. marginatum* but differs by the rhizome scales, which have the apex hairlike, twisted and often tangled, not acuminate or attenuate.

1a. Rhizomes long creeping; fronds distant.

2a. Sterile lamina orbicular to elliptic, apex rounded; stipes of fertile fronds 5–10 cm 1. *E. sinii*

2b. Sterile lamina lanceolate to elliptic-lanceolate, apex acute; stipes of fertile fronds 15–20 cm 2. *E. angulatum*

1b. Rhizomes shortly creeping; fronds tufted or close together.

3a. Apex of sterile lamina rounded; margins of young fronds with conspicuous lanceolate to ovate scales 3. *E. luzonicum*

3b. Apex of sterile lamina acuminate or acute.

4a. Sterile lamina gradually decurrent nearly to base of stipes, with short stalk or subsessile 4. *E. yoshinagae*

4b. Sterile lamina shortly decurrent, with long stalk.

5a. Sterile lamina 2.5–6 cm wide, apex shortly acuminate or acute, secondary veins inconspicuous 5. *E. marginatum*

5b. Sterile lamina 1.2–3.2 cm wide, apex long acuminate, secondary veins visible 6. *E. yunnanense*

1. *Elaphoglossum sinii* C. Christensen in Y. C. Wu et al., Bull. Dept. Biol. Sun Yatsen Univ. 3: 346. 1932.

圆叶舌蕨 yuan ye she jue

Rhizomes long creeping, ca. 2 mm thick, densely scaly; scales dark brown, ovate or ovate-lanceolate, 2–4 mm, membranous, base rounded, margin entire, sometimes slightly ciliate, apex acuminate. Fronds remote; sterile fronds 4–13 cm overall, stipe brownish stramineous, 2–8 cm, base densely covered with scales similar to those of rhizome, sparser upward; lamina orbicular to elliptic, 2.5–6 × 2–3.5 cm, leathery, brown when dry, with sparse, small, brown, stellate scales, base rounded-cuneate, decurrent nearly to middle of stipe, margin entire, thickened and slightly reflexed, apex rounded; midrib obvious, prominent on both surfaces, thinly grooved above, secondary veins inconspicuous, simple or once forked, terminating at margin; fertile fronds: stipe 5–10 cm, lamina 2.5–6 × 1–2 cm.

• On wet rocks or tree trunks; 1100–1900 m. Guangxi, Yunnan.

2. *Elaphoglossum angulatum* (Blume) T. Moore, Index Fil. 5. 1857.

爪哇舌蕨 zhao wa she jue

Acrostichum angulatum Blume, Enum. Pl. Javae 2: 101. 1828; *Elaphoglossum ogatai* C. Christensen.

Rhizomes long creeping, 3–5 mm thick, densely scaly; scales brown, ovate, 4–7 mm, membranous, margin entire or slightly ciliate, apex acute. Fronds remote; sterile fronds 11–30 cm, stipe stramineous, 5–15 cm, sparsely scaly; lamina lanceolate to elliptic-lanceolate, 6–15 × 1.5–3 cm, leathery, brown when dry, with very sparse, small, brown, stellate scales, base cuneate, margin entire, thickened and slightly reflexed, apex

acute; midrib obvious, prominent on both surfaces, with occasional brown, linear scales, thinly grooved above, secondary veins inconspicuous, forked, terminating at margin; fertile fronds: stipe 15–20 cm, lamina somewhat narrower.

On moss-covered rocks or tree trunks; 1600–2400 m. Hainan, Taiwan [S India, Indonesia, Malaysia, Philippines, Sri Lanka, Vietnam; E Africa, Madagascar].

Hayata (Icon. Pl. Formosan. 5: 293, f. 117. 1915) treated the collections from Taiwan as *Elaphoglossum laurifolium* (Thouars) Moore.

3. *Elaphoglossum luzonicum* Copeland, Leafl. Philipp. Bot. 1: 235. 1907.

吕宋舌蕨 lü song she jue

Rhizomes shortly creeping, 3–4 mm thick, densely scaly; scales brown, ovate-lanceolate, ca. 5 mm, membranous, margin entire or slightly ciliate, apex acuminate. Fronds close together; sterile fronds: stipe brownish stramineous, 4–8 cm, base sparsely or densely covered with scales similar to those of rhizome, distally often with sparse, small, stellate scales; lamina elliptic-lanceolate, 14–20 × 2–4 cm, leathery, dark brown when dry, with sparse, small, brown, stellate scales, base cuneate, decurrent to stipe, margin entire, or with few or no spreading scales, thickened and slightly reflexed, apex acute; midrib obvious, prominent on both surfaces, grooved above, secondary veins inconspicuous, forked, terminating at margin; fertile fronds: stipe 14–16 cm, lamina 12–18 × 1.5–2 cm.

On rocks or tree trunks in forests; 500–1500 m. Guangdong, Hainan, Taiwan [Malaysia, New Guinea, Philippines].

1a. Lamina margin entire, base cuneate or broadly cuneate 3a. var. *luzonicum*

1b. Lamina margin with sparser or no

spreading scales, base narrowly
cuneate 3b. var. *mcclurei*

3a. *Elaphoglossum luzonicum* var. *luzonicum*

吕宋舌蕨(原变种) lü song she jue (yuan bian zhong)

Elaphoglossum lepidopodum C. Christensen ex Ogata.

Rhizome scales with margin entire or slightly ciliate. Sterile fronds: stipe 4–8 cm, base densely covered with scales, distally with sparse, small, stellate scales; lamina 15–20 × 2–3 cm, base cuneate or broadly cuneate, margin entire; midrib prominent on both surfaces.

On rocks or tree trunks in forests; 500–1100 m. Taiwan (?Nantou, Pingdong, Taidong) [Malaysia, New Guinea, Philippines].

3b. *Elaphoglossum luzonicum* var. *mcclurei* (Ching) F. G. Wang & F. W. Xing, Novon 18: 542. 2008.

华南吕宋舌蕨 hua nan lü song she jue

Elaphoglossum mcclurei Ching, Sinensia 1: 55. 1930; *E. spongophyllum* Bell ex Holttum.

Rhizome scales with margin slightly ciliate. Sterile fronds: stipe 4–7 cm, base sparsely covered with scales; lamina 14–20 × 2.5–4 cm, base narrowly cuneate, margin with sparser or no spreading scales; midrib slightly prominent on both surfaces.

- Creeping on moss-covered tree trunks. Guangdong, Hainan.

One of us (Mickel) is doubtful of a close relationship between *Elaphoglossum luzonicum* and *E. mcclurei* such as to make them conspecific and notes that *E. luzonicum* has lanceolate scales at the lamina margin and abundant broad scales on the stipe, whereas *E. mcclurei* has only stellate trichomidia (minute hairs) on the lamina (lacking in *E. luzonicum*) and narrowly lanceolate stipe scales.

Matsumura and Hayata (Enum. Pl. Formosa, 640. 1906) treated collections from Taiwan as *Elaphoglossum latifolium* (Swartz) J. Smith.

4. *Elaphoglossum yoshinagae* (Yatabe) Makino, Phan. Pter. Jap. Icon. t. 51–52. 1901.

华南舌蕨 hua nan she jue

Acrostichum yoshinagae Yatabe, Bot. Mag. (Tokyo) 5: 109. 1891; *A. austrosinicum* (C. G. Matthew & Christ) Tutcher; *Elaphoglossum austrosinicum* C. G. Matthew & Christ; *E. parvum* Copeland.

Rhizomes shortly creeping, stout, densely scaly; scales brown, ovate or ovate-lanceolate, ca. 5 mm, membranous, margin ciliate, apex acuminate or acute. Fronds close together; sterile fronds 15–45 cm overall, stipe almost absent or short, 5–8 cm; lamina elliptic, 10–30 × [1.5–]3–4.5 cm, leathery, brown when dry, with sparse, small, brown, stellate scales, base cuneate, decurrent nearly to base of stipe, margin entire, thickened and slightly reflexed, apex acute; midrib broad, flat abaxially, secondary veins simple or once forked; fertile fronds: stipe 7–10 cm, lamina somewhat narrower.

On moss-covered rocks or tree trunks; 300–1800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Taiwan [Japan].

5. *Elaphoglossum marginatum* T. Moore, Index Fil. 11. 1857.

舌蕨 she jue

Rhizomes shortly creeping, densely scaly; scales dark brown, lanceolate or linear, 4–10 mm, membranous, margin ciliate, sometimes with projecting arms especially near base, apex acuminate or attenuate. Fronds close together; sterile fronds: stipe (5–)7–13 cm, base densely covered with scales similar to those of rhizome, distal scales smaller and narrower; lamina lanceolate, 10–30 × 2–6 cm, leathery, both surfaces with small, brown, stellate scales, denser abaxially, base cuneate, shortly decurrent along stipe, margin entire or somewhat undulate, thickened and slightly reflexed, apex acuminate or acute; secondary veins somewhat hidden, simple or once forked; fertile fronds: stipe 10–20 cm, lamina narrower.

On moss-covered rocks and tree trunks in forests; 100–2600 m. Guangxi, Guizhou, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, NE India, Indonesia, Malaysia, Nepal, Philippines, Vietnam].

Elaphoglossum marginatum has been included within *E. conforme* (Swartz) Schott, but Mickel (Fl. Trop. E. Afr. Lomariopsidaceae, 14. 2002) restricts *E. conforme* to Africa, excluding collections from Asia. *Elaphoglossum conforme* is differentiated by its creeping rhizome; rhizome scales with isodiametric cells; and lamina with scattered minute resinous dots, or rarely with minute peltate scales or glabrous abaxially, adaxially less so, and apex rounded to acute.

- 1a. Sterile lamina 2–2.5 cm wide; rhizome scales lanceolate, 4–5 mm 5a. var. *marginatum*
- 1b. Sterile lamina 4–6 cm wide; rhizome scales linear, to 10 mm 5b. var. *callifolium*

5a. *Elaphoglossum marginatum* var. *marginatum*

舌蕨(原变种) she jue (yuan bian zhong)

Acrostichum marginatum Wallich ex Fée, Mém. Foug. 2: 31. 1845, not Linnaeus (1759), nor Schkuhr (1809); *Elaphoglossum fuscopunctatum* Christ; *E. pendulifolium* Tagawa.

Rhizome scales dark brown, lanceolate, 4–5 mm, membranous, margin ciliate. Sterile fronds: stipe 7–10 cm, base with thin, brown, ovate scales, distal scales smaller and narrower; lamina 15–30 × 2–2.5 cm, surface with scattered branched or stellate hairs, apex acuminate or acute; midrib abaxially scaly when young, secondary veins somewhat hidden.

On moss-covered rocks and tree trunks in forests; 400–2600 m. Guangxi, Guizhou, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, NE India, Nepal].

5b. *Elaphoglossum marginatum* var. *callifolium* (Blume) F. G. Wang, F. W. Xing & Mickel, **comb et stat. nov.**

南海舌蕨 nan hai she jue

Basionym: *Acrostichum callifolium* Blume, Enum. Pl. Javae 2: 100. 1828 [“*callaefolium*”]; *Elaphoglossum callifolium* (Blume) T. Moore.

Rhizome scales linear, to 10 mm, margins with projecting arms especially near base, apex attenuate. Sterile fronds: stipe

6–12 cm, terete, base sparingly scaly; lamina elliptic, 20–30 × 4–6 cm, apex shortly acuminate; secondary veins hardly visible.

On trunks in dense forests; (100–)400–1800 m. Taiwan (Hualian, Pingdong, Taidong) [Indonesia, Malaysia, Philippines, Vietnam].

6. *Elaphoglossum yunnanense* (Baker) C. Christensen, Contr. U.S. Natl. Herb. 26: 327. 1931.

云南舌蕨 *yun nan she jue*

Acrostichum yunnanense Baker, Bull. Misc. Inform. Kew 1898: 233. 1898.

Rhizomes shortly creeping, 3–7 mm thick, densely scaly; scales dark brown, subulate or narrowly lanceolate, ca. 4 mm,

thickly membranous, margin irregularly serrate, apex acuminate and aristiform. Fronds close together; sterile fronds: stipe 4–16 cm, with dense stellate or subulate scales distally, partly deciduous when old; lamina narrowly lanceolate, 12–35 × 1.2–3.2 cm, leathery, brown when dry, both surfaces with sparse, small, brown, stellate scales, base narrowly cuneate, slightly decurrent along stipe, margin entire or somewhat undulate, thickened and slightly reflexed, apex long acuminate; midrib prominent on both surfaces, grooved above, veins visible, simple or once forked; fertile fronds sometimes shorter than sterile; stipe 8–22 cm, densely scaly; lamina linear-lanceolate, 13–21 × ca. 1 cm.

On tree trunks in secondary forests; 400–1800 m. Hainan, Yunnan [India, Malaysia, Vietnam].

9. LOMAGRAMMA J. Smith in Hooker, J. Bot. 3: 402. 1841.

网藤蕨属 *wang teng jue shu*

Xing Fuwu (邢福武), Wang Faguo (王发国); Masahiro Kato

Climbers, large or medium-sized. Rhizome long creeping, stout, bearing roots ventrally and fronds in 2–4 dorsal rows, dictyostelic with large channeled ventral strand producing root traces; scales black, lanceolate, clathrate. Fronds papery; stipe long; lamina 1-pinnate, all pinnae or pinnules articulate to rachis, pinnae or pinnules often equal, lanceolate, margins entire or serrate; veins anastomosing in 2 or 3 rows of areoles or free in submarginal part of pinna, without included free veinlets; fertile pinnae contracted, sometimes strongly so, linear to linear-oblong. Sporangia acrostichoid; annulus consisting of 14–20 thick-walled cells. Spores elliptic, translucent, smooth to granular, without perispore.

About 15 species: S and SE Asia and Polynesia; two species (both endemic) in China.

In a recent classification, *Lomagramma* was excluded from Lomariopsidaceae and, along with *Bolbitis* and allied genera, placed in Dryopteridaceae (Smith et al., Taxon 55: 705–731. 2006).

The authors have not seen material of *Lomagramma medogensis* Ching & Y. X. Lin (Acta Phytotax. Sin. 22: 399. 1984), described from Xizang (Mêdog).

- 1a. Apical pinna of sterile lamina not articulate to rachis 1. *L. matthewii*
 1b. Apical pinna of sterile lamina articulate to rachis 2. *L. yunnanensis*

1. *Lomagramma matthewii* (Ching) Holttum, Gard. Bull. Straits Settlem. 9: 206. 1937.

网藤蕨 *wang teng jue*

Campium matthewii Ching, Bull. Fan Mem. Inst. Biol. 1: 158. 1930; *Aspidium sorbifolium* Willdenow; *Lomagramma sorbifolia* (Willdenow) Ching.

Rhizomes dark brown, 0.3–0.8 cm in diam., covered with gray scales, naked when old; scales lanceolate, vermiform, ca. 1.5 cm. Fronds grass-green when dry, thinly papery, with sparse dark brown scales on rachis abaxial surface; stipe 15–30 cm, iridescent, grooved above, with sparse lanceolate, dark brown scales (ca. 1 mm); sterile lamina pinnate, elliptic-lanceolate, 30–80 × 8–20 cm; pinnae 17–34 pairs, lower pinnae 2–5 cm apart, central pinnae close, linear-lanceolate, 3.5–10 × 1–2.3 cm, articulate to rachis, base rounded-truncate, margin crenate, apex acuminate; apical pinna narrowly lanceolate, not articulate; distal part of rachis with narrow wing; veins forming costal, irregular, triangular or pentagonal areoles and 3 distal rows of areoles, without included free veinlets. Fertile fronds with stipe 10–15 cm; lamina pinnate, elliptic, 50–60 × 15–20 cm; pinnae 22–28 pairs, sessile, 2–3 cm apart, linear, 70–90 × 3–5 mm,

base broadly cuneate, margin entire, apex long acuminate. Sori acrostichoid.

• Creeping on rocks or tree trunks in dense forests; 300–700 m. Fujian, Guangdong, Hainan, Yunnan.

2. *Lomagramma yunnanensis* Ching, Acta Phytotax. Sin. 21: 217. 1983.

云南网藤蕨 *yun nan wang teng jue*

Rhizomes dark brown, ca. 1 cm in diam., covered with gray scales; scales lanceolate, vermiform, ca. 1.5 cm. Fronds dark green when dry, papery, with sparse, dark brown, vesicular scales along rachis abaxial surface; stipe stramineous, 25–30 cm, grooved above, with sparse, narrowly lanceolate, dark brown scales (ca. 2 mm); sterile lamina pinnate, elliptic, 45–55 × 18–20 cm; pinnae 20–25 pairs, close, sessile, ca. 2 cm apart, lanceolate, 10–12 × 2–2.4 cm, articulate to rachis, base rounded-truncate, margin basally entire, apically sparsely serrate, apex long acuminate; rachis dark green when dry, distal part of rachis narrowly winged; veins forming costal, irregular, triangular areoles and 3 distal rows of areoles, without included free veinlets. Fertile fronds not seen.

• Creeping on rocks or tree trunks in dense forests. SE Yunnan.

10. TERATOPHYLLUM Mettenius ex Kuhn, Ann. Mus. Bot. Lugduno-Batavi 4: 296. 1870

符藤蕨属 fu teng jue shu

Dong Shiyong (董仕勇); Michael G. Gilbert

Plants initially terrestrial, climbing up tree trunks. Rhizome long creeping, stout, dorsiventrally compressed, bearing roots ventrally and 2 rows of fronds, often spiny; apex and frond primordia densely scaly; scales brown, peltate, deciduous. Fronds widely spaced, dimorphic with contrasting juvenile and adult sterile fronds; stipe stramineous, terete, base swollen and \pm articulate; sterile lamina 1 (or 2)-pinnate, juvenile fronds oblong-lanceolate to ovate-triangular in outline, papery; juvenile and lower fronds (bathyphylls) adpressed to substrate, pinnae lobed to pinnatifid; mature upper fronds (acrophylls) held away from substrate, pinnae lanceolate, all pinnae or pinnules articulate to rachis; costae and sometimes veins with small lanceolate or stellate scales; margins entire or serrate; veins free, reaching or nearly reaching margin; costae not grooved adaxially, sparsely scaly, scales lanceolate or stellate. Fertile pinnae linear to linear lanceolate, veins anastomosing but not normally visible. Sporangia acrostichoid; small stalked scales among sporangia. Spores ellipsoid to globose, echinate, reticulate or with short folds.

Thirteen species: China, Indonesia, Malaysia, Myanmar, Philippines, Thailand; Australia, east to Tahiti, New Caledonia; one species (endemic) in China.

The climbing habit of *Teratophyllum* is similar to that of *Lomagramma*, but the genera are easily distinguished by the venation of the sterile leaves, anastomosing in *Lomagramma* and free in *Teratophyllum*. Several species of *Teratophyllum*, including the Hainan species, are further distinguished by the distinctive basal juvenile fronds which are adpressed to the substrate and with crenate to pinnatifid pinnae. Fertile fronds are only produced when the fern reaches well-lit upper parts of the canopy by which time the lower parts of the rhizome with the juvenile fronds have been lost.

1. *Teratophyllum hainanense* S. Y. Dong & X. C. Zhang, Novon 15: 104. 2005.

海南符藤蕨 hai nan fu teng jue

Rhizomes dark brown, 3–4 \times ca. 2 mm, apex covered with scales; scales brown, lanceolate, ca. 8 mm. Sterile fronds: lower, juvenile fronds (bathyphylls) asymmetrically pinnate, more pinnules on basiscopic side, 3–10 \times 0.5–1.5 cm; rachis narrowly winged; pinnules flabellate to ovate-rhomboid, 0.5–1.5 \times ca. 0.5 cm, base basiscopically cuneate, acroscopically subtruncate, margin crenate, apex rounded, both surfaces scaly, scales substellate; mature sterile fronds (acrophylls): stipe stramineous, 8–13 cm, swollen at base, rachis straw-colored, not winged, rachis and stipe scaly, scales brown, adpressed, substellate, ca. 0.2 mm in diam.; lamina pinnate, 50–65 \times 18–

23 cm, pinnae 8–11 each side, all articulate, with stalks 2–7 mm, oblong-lanceolate, 11–16 \times 2.5–3.4 cm, papery, sparsely scaly scales as in bathyphylls, base basiscopically cuneate, acroscopically rounded or rounded-truncate, margin entire or slightly crenate, apex long acute; veins free, forked once or twice, reaching margin or within 0.2 mm of margin. Fertile fronds with stipe 5–8 cm; lamina pinnate, ca. 30 \times 15–20 cm; pinnae ca. 10 pairs, with stalk ca. 6 mm, linear, 13–18 cm \times 0.8–1.5 mm. Sori acrostichoid, apparently covering entire pinna. Spores globose; perispore folded echinate.

- Primary rain forests on northern mountain slopes; 500–800 m. Hainan.

Teratophyllum hainanense is only known from two, small populations in the SC mountains of Hainan.