

## HYMENOPHYLLACEAE

膜蕨科 mo jue ke

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Plants epiphytic, petrophilous, or terrestrial, small to medium-sized. Rhizome sometimes short and erect, but usually slender and long creeping, often covered with hairs when young, simple or sometimes irregularly branching. Lamina simple to pinnately decomposed, or flabellate, digitate, dichotomous, or even irregularly divided. Segments with a single veinlet, cells in one layer, or rarely with 2–4 cell layers without intercellular spaces and stomata. Sori terminal on veins, solitary, at apex of ultimate segments, or marginal on simple to pinnatifid fronds; involucre cup-shaped to deeply 2-cleft nearly to base; receptacles terminating a vein, short, capitate or clavate, or long and projecting; sporangia shortly stalked to (sub)sessile, maturing basipetally; annulus oblique, not interrupted; dehiscence irregular; spores globose-trilete, tetrahedral, containing chloroplasts, usually short-lived.  $x = 8, 11, 12, 13, 17, 21, 22, 26, 28, 36, 54$  (base numbers  $x = 8, 54$  are doubtful).

Nine genera and ca. 600 species: tropical, subtropical, and temperate regions of both the Old and New Worlds; seven genera and 50 species (six endemic) in China.

Traditionally, only two genera—*Hymenophyllum* with bivalved involucre and *Trichomanes* Linnaeus with tubular involucre—have been recognized in this family. This scheme was expanded by Morton (*Contr. U.S. Natl. Herb.* 29: 139–202. 1968) who hierarchically placed many subgenera, sections, and subsections under two larger genera, *Hymenophyllum* and *Trichomanes*, and recognized four monotypic genera, *Cardiomanes* Morton, *Serpyllopsis* Morton, *Hymenoglossum* Morton, and *Rosenstockia* Morton, all of which have specialized fronds. Conversely, Copeland (*Gen. Fil.* 31–44. 1947) split the family into 34 genera, basing his work on herbarium specimens as well as his field observations of Asian material. Taking into account these past studies plus recent investigations including molecular data, Ebihara et al. (*Blumea* 51: 221–280. 2006) proposed a modern scheme of classification on which the system of this treatise is based.

Ching Ren-chang, Fu Shu-hsia, Wang Chu-hao & Shing Gung-hsia. 1959. Hymenophyllaceae. In: Ching Ren-chang, ed., *Fl. Reipubl. Popularis Sin.* 2: 132–196, 350–357, 379.

- 1a. Rhizomes shortly creeping or erect.
  - 2a. Fronds once pinnate to bipinnatifid ..... 3. *Cephalomanes*
  - 2b. Fronds bipinnate or more divided.
    - 3a. Stipes and rachises with long bristlelike light reddish hairs.
      - 4a. Laminal cells reduced, less than 3 rows of cells between midribs and margins ..... 1. *Abrodictyum*
      - 4b. Laminal cells not reduced, more than 3 rows of cells between midribs and margins ..... 2. *Callistopteris*
    - 3b. Stipes and rachises without long bristlelike light reddish hairs.
      - 5a. Laminal cell walls thin and straight; fronds usually more than 25 cm ..... 4. *Crepidomanes*
      - 5b. Laminal cell walls slightly thick or very thick, wavy or pitted; fronds usually less than 25 cm ..... 1. *Abrodictyum*
- 1b. Rhizomes long creeping.
  - 6a. Rhizomes subglabrous or with sparse light-colored hairs; involucre usually bivalvate ..... 5. *Hymenophyllum*
  - 6b. Rhizomes covered with reddish to dark-colored hairs; involucre usually not bivalvate.
    - 7a. Roots absent or replaced by rootlike shoots.
      - 8a. Continuous false veinlets parallel to true veins present; blade venation catadromous ..... 6. *Didymoglossum*
      - 8b. Continuous false veinlets parallel to true veins absent; blade venation anadromous ..... 4. *Crepidomanes*
    - 7b. Roots present.
      - 9a. Stipes and rachises with minute clavate hairs ..... 7. *Vandenboschia*
      - 9b. Stipes and rachises without minute clavate hairs ..... 1. *Abrodictyum*

### 1. ABRODICTYUM C. Presl, Hymenophyllaceae, 20. 1843.

长片蕨属 chang pian jue shu

*Macroglena* (C. Presl) Copeland; *Selenodesmium* (Prantl) Copeland; *Trichomanes* subg. *Macroglena* C. Presl; *T.* sect. *Selenodesmium* Prantl.

Plants epiphytic or terrestrial. Rhizome short, erect or shortly creeping, bearing several fronds in a tuft or fronds closely spaced; hairs on rhizome multicellular, dense or not. Stipe columnar, wingless, hairy at base and glabrous or very sparsely hairy upward. Lamina small to medium-sized, pendulous or erect, bipinnate to tripinnatifid, membranous to papery, semitransparent to coarse; ultimate segments narrowly linear, with a single veinlet, entire at margin; veins dichotomous, internal cells not specialized, or trans-

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versely elongate in obliquely longitudinal rows (marginal cells not so elongate), walls conspicuously coarsely pitted. Sori apical on short acroscopic segments; involucre funnel-shaped or tubular, with dilated mouth, entire; receptacles long projecting, slender.

About ten species: tropics and subtropics in Asia to Oceania; three species in China.

- 1a. Laminar cells transversely elongate and arranged along long cell walls, forming lines along shorter walls ..... 1. *A. cumingii*  
 1b. Laminar cells not so elongate.  
     2a. Rhizome long creeping ..... 2. *A. clathratum*  
     2b. Rhizome erect ..... 3. *A. obscurum*

**1. *Abrodictyum cumingii*** C. Presl, Hymenophyllaceae, 20–21, 63. 1843.

长片蕨 *chang pian jue*

*Cephalomanes cumingii* (C. Presl) K. Iwatsuki; *Haplo-dictyum cumingii* (C. Presl) Bosch; *Trichomanes cumingii* (C. Presl) C. Christensen; *T. smithii* Hooker.

Plants 8–12 cm tall. Rhizome ca. 0.5 mm in diam., hairs on rhizome reddish brown, lustrous, with fibrous rootlets. Stipe 2–4 cm, slender, ca. 0.3 mm in diam. Rachis brown, zigzag, glabrous, winged in upper part. Lamina bipinnate, hazel-colored when dry, elliptic, 5–10 × ca. 2 cm, glabrous, base and apex acuminate; pinnae 8–12 pairs, sessile, alternate, ovate, 5–20 × 3–6 mm, base decurrent, upper pinnae adjacent, lower ones 3–6 mm apart, several basal ones reduced to simple or furcate segments; ultimate segments narrowly linear, 5–15 × ca. 0.7 mm, with a single veinlet, entire at margin, apex acuminate. Veins dichotomous, obviously raised on each surface, brown, glabrous. Sori on upper 2/3 part of frond, apical on short acroscopic segments; involucre tubular, ca. 1 mm, winged, with dilated mouth, entire and slightly crisped at margin, lobes not constricted below base of involucre; receptacles brown, 4–5 mm.

Mountain forests, growing on *Cyathea*; 300–1100 m. E and SE Taiwan [Indonesia (Moluccas, Sulawesi), New Guinea, Philippines].

Elongate hemitropous internal cells are distinct in *Abrodictyum cumingii*.

**2. *Abrodictyum clathratum*** (Tagawa) Ebihara & K. Iwatsuki, Blumea 51: 243. 2006.

窗格长片蕨 *chuang ge chang pian jue*

*Trichomanes clathratum* Tagawa, Acta Phytotax. Geobot. 8: 164. 1939; *Cephalomanes clathratum* (Tagawa) K. Iwatsuki.

Rhizome long creeping, densely covered by dark brownish, multicellular hairs. Stipe 1.5–5 cm, terete or very narrowly winged in upper portion, hairy throughout. Lamina tripinnate to quadripinnatifid, oblong, 5–11 × 2–4 cm, apex rounded to acute; rachis winged throughout; middle pinnae larger, subdeltoid to ovate-oblong, up to 2 × 1.5 cm, base cuneate and very shortly stalked, apex rounded; larger pinnules often arranged in cubic form, with up to 12 segments, shortly stalked, ultimate segments entire at margin, apex rounded to acute; lamina cells larger, surface clathrate; internal cell walls thick, coarsely pitted. Sori solitary at apex of basal acroscopic segments of pinnules of upper pinnae; involucre shallowly cup-shaped, ca. 1 mm, with truncate mouth; receptacles long projecting.

On tree trunks or forest floor in wet conditions; 1500–1900 m. NC and S Taiwan [Philippines (N Luzon)].

**3. *Abrodictyum obscurum*** (Blume) Ebihara & K. Iwatsuki, Blumea 51: 244. 2006.

线片长片蕨 *xian pian chang pian jue*

Plants 8–30 cm tall. Rhizome suberect or creeping, 2–3 mm in diam., densely covered with brown or reddish brown hairs, with several fronds in a tuft. Stipe dark or light brown, columnar, 3–12 cm, ca. 1 mm in diam., stiff, usually with grooves, with sparse multicellular hairs at base, wingless. Lamina tripinnate to quadripinnatifid, triangular-ovate or ovate-lanceolate, 4–14 × 2–6 cm, herbaceous; pinnae 6–14 mm apart, oblong-lanceolate or oblong-ovate, 1–3 cm × 8–12 mm, base cuneate, apex obtuse or acuminate, upper pinnae alternate, basal ones subopposite, sessile or with short stalks, spreading; pinnules oblong to oblong-lanceolate or ovate, 3–4 mm, base decurrent or cuneate, apex acute or rounded. Veins pinnate, brown, obviously raised on each surface. Sori apical on short acroscopic segments; involucre cylindric, narrowly winged, with non-dilated or slightly dilated mouth; receptacles projecting.  $2n = 66$ .

On wet rocks, near streams in dense forests. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [S India, Indonesia (Borneo), Japan, Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

- 1a. Rhizome suberect; stipe dark brown, 3–12 cm; lamina 6–14 cm, tripinnate to quadripinnatifid; pinnae 2–3 cm; pinnules acute at apex ..... 3a. var. *obscurum*  
 1b. Rhizome creeping; stipe light brown, 4–6 cm; lamina 4–6 cm, tripinnatifid; pinnae 1–2 cm; pinnules rounded at apex ..... 3b. var. *siamense*

**3a. *Abrodictyum obscurum* var. *obscurum***

线片长片蕨(原变种) *xian pian chang pian jue* (yuan bian zhong)

*Trichomanes obscurum* Blume, Enum. Pl. Javae 2: 227. 1828; *Cephalomanes obscurum* (Blume) K. Iwatsuki; *Selendesmium obscurum* (Blume) Copeland; *S. recurvum* Ching & P. S. Chiu.

Plants 8–30 cm tall. Rhizome suberect, densely covered with brown multicellular hairs at apex. Stipe dark brown, 3–12 cm. Lamina tripinnate to quadripinnatifid, 6–14 × 2–6 cm; pinnae oblong-lanceolate, 2–3 cm × 8–12 mm; pinnules oblong or oblong-lanceolate, apex acute. Involucre with non-dilated mouth.

On wet rocks; 200–1500 m (in Taiwan). Hainan, Taiwan, Yunnan [S India, Indonesia (Borneo), Japan, Malaysia, New Guinea, Philippines, Sri Lanka].

**3b. *Abrodictyum obscurum* var. *siamense*** (Christ) K. Iwatsuki, *Blumea* 51: 244. 2006.

广西长筒蕨 *guang xi chang tong jue*

*Trichomanes siamense* Christ, *Bot. Tidsskr.* 24: 103. 1901; *Cephalomanes obscurum* var. *siamense* (Christ) K. Iwatsuki;

*Selenodesmium siamense* (Christ) Ching & Chu H. Wang; *S. tereticaulum* (Christ) Copeland; *T. tereticaulum* Ching.

Plants 10–12 cm tall. Rhizome creeping, densely covered with short reddish brown hairs. Stipe light brown, 4–6 cm. Rachis dark brown, glabrous, winged throughout. Lamina tripinnatifid, 4–6 × 2–2.5 cm; pinnae oblong-ovate, 1–2 cm × 8–10 mm; pinnules oblong or subovate, apex rounded. Involucres with slightly dilated mouth.

On wet rocks near streams in dense forests; 900–1200 m. Guangdong, Guangxi, Hainan [Japan, Thailand, Vietnam].

## 2. CALLISTOPTERIS Copeland, *Occas. Pap. Bernice Pauahi Bishop Mus.* 14: 49. 1938.

毛杆蕨属 *mao gan jue shu*

Plants epiphytic or terrestrial. Rhizome stout, erect or ascending, bearing several fronds in a tuft. Stipe and rachis columnar, both covered with long hairs. Lamina large, tripinnate to quadripinnatifid, soft in texture, internal cell walls thin, straight; ultimate segments narrowly linear, entire. Sori apical on short acroscopic segments; involucres obconic or urn-shaped, with truncate mouth, mouth entire or sometimes bilabiate; receptacles projecting.

Five species: mostly in Asian tropics, from Malaysia and Indonesia (Sumatra) across China to Polynesia, south to Australia; one species in China.

**1. *Callistopteris apiifolia*** (C. Presl) Copeland, *Philipp. J. Sci.* 67: 65. 1938.

毛杆蕨 *mao gan jue*

*Trichomanes apiifolium* C. Presl, *Hymenophyllaceae*, 16, 44. 1843; *Cephalomanes apiifolium* (C. Presl) K. Iwatsuki.

Plants 30–40 cm tall. Rhizome densely covered with multicellular long reddish brown hairs at apex, with dense wirelike roots at base. Stipe dark brown, 8–13 cm × ca. 1.5 mm, with dense multicellular long hairs, hairs caducous. Rachis dark brown, slightly zigzag, covered with reddish brown multicellular long hairs, narrowly winged in upper part. Lamina ovate-lanceolate, 20–30 × 8–10 cm, apex acuminate; pinnae ca. 15 pairs, closely spaced or slightly imbricate to neighboring ones, alternate, shortly stalked, spreading, oblong-lanceolate, 3–5 ×

1–2 cm, base unequally cuneate, apex obtuse, lower pinnae usually slightly shortened; pinnules 5–8 pairs, often 1–2 mm apart, alternate, sessile, ovate, oblique, 8–10 × 4–6 mm, base unequally cuneate, apex obtuse; ultimate segments on axis at angles of 10°–20°, closely spaced, 3–5 × 0.5–0.7 mm, with a single veinlet, margin entire, apex rounded. Veins dichotomous, dark brown, stout, obviously raised on each surface, glabrous. Sori on upper parts of frond; involucres obconic, ca. 1 × 0.6 mm, wingless, lobes sharply constricted below base of involucre, not or slightly dilated at mouth; receptacles brown. *2n* = 72.

Usually near streams in dense forests, mountain forests; low elevations to 1500 m. Hainan, Taiwan [Japan (Ryukyu Islands), Malaysia, Thailand, Vietnam; Pacific islands (Melanesia, Micronesia, Polynesia)].

## 3. CEPHALOMANES C. Presl, *Hymenophyllaceae*, 17. 1843.

厚叶蕨属 *hou ye jue shu*

Plants terrestrial. Rhizome erect or ascending, stout, densely covered with fibrous rootlets, with several fronds in a tuft. Stipe stiff, with setae. Lamina 1-pinnate, or rarely pinnatifid, usually lanceolate, rough in texture, internal cells large, cell walls thin, wavy; pinnae unequally sided, acropetally somewhat incised or lacerate; veins nearly flabellate, stout. Sori terminal on constricted segments or at margin of normal pinnae; involucres tubular or rarely obconic; receptacles long projecting, stout, sometimes dilated at apex.

About ten species: from India across Malesia to Polynesia; one species in China.

**1. *Cephalomanes javanicum*** (Blume) C. Presl, *Abh. Königl. Böhm. Ges. Wiss.*, ser. 5, 5: 334. 1848.

爪哇厚叶蕨 *zhao wa hou ye jue*

*Trichomanes javanicum* Blume, *Enum. Pl. Javae* 2: 224. 1828; *Cephalomanes javanicum* var. *sumatranum* (Alderwerelt) K. Iwatsuki; *C. laciniatum* (Roxburgh) De Vol; *C. rhomboideum* Bosch; *C. sumatranum* (Alderwerelt) Copeland; *C. zollingeri* Bosch; *T. laciniatum* Roxburgh; *T. sumatranum* Alderwerelt.

Plants 10–18 cm tall. Rhizome densely covered with dark brownish multicellular hairs at apex. Stipe dark brown, 2–5 cm × ca. 1 mm, with sparse spreading multicellular hairs. Rachis brown, narrowly winged at apex, with sparse reddish brown multicellular hairs. Lamina 1-pinnate, linear-lanceolate, 8–15 × 1.5–2 cm, papery, glabrous; pinnae 15–20 pairs, closely spaced or imbricate to neighboring ones, rhomboid, 1.5–2.5 cm × 5–8 mm, smaller upward, decurrent on rachis, alternate, sessile, base cuneate, margin lacerate, apex rounded to obtuse. Veins

obviously raised on each surface, light brown, each tooth containing a single veinlet. Sori on acroscopic to distal side of pinnae, rarely basiscopic distal portion; involucre tubular, ca. 2 mm, narrowly winged, mouth truncate or slightly wavy; recep-

tacles projecting, brown, ca. 5 mm, slightly bent.  $2n = 64$ .

On rocks or near streams in forests, shaded and very wet habitats; 200–800 m. Hainan, E and S Taiwan [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, New Guinea, Thailand, Vietnam].

#### 4. CREPIDOMANES C. Presl, Epimel. Bot. 258. 1851.

假脉蕨属 jia mai jue shu

*Crepidophyllum* C. F. Reed (1948), not Herzog (1926); *Crepidopteris* Copeland; *Gonocormus* Bosch; *Nesopteris* Copeland; *Reediella* Pichi Sermolli.

Plants small to medium-sized, epiphytic, epilithic, or terrestrial. Rhizome wiry and filiform to rather thick, short or long creeping, with dense to sparse short hairs, rootless or with wiry roots (*Crepidomanes* subg. *Nesopteris* (Copeland) Ebihara & K. Iwatsuki). Rachis winged throughout or wingless near base. Lamina pinnately decompose or rarely digitate to fan-shaped by reduction, entire, glabrous, with intramarginal or irregularly placed false veinlets or lacking these. Sori axillary or apical on short acroscopic segments; involucre conical to campanulate or funnel-shaped, rounded to acuminate at apex, with bilabiate or truncate mouth; lips circular or triangular, dilated or truncate; receptacles projecting.

About 30 species: Old World tropics and subtropics, from Africa to Japan and Polynesia; 11 species in China.

*Crepidomanes grande* (Copeland) Ebihara & K. Iwatsuki (Blumea 51: 239. 2006; *Trichomanes grande* Copeland, Philipp. J. Sci. 6: 70–71. 1911; *Nesopteris grandis* (Copeland) Copeland; *Trichomanes elatum* Bosch (1861), not G. Forster (1786), nor Desvaux (1827); described from the Philippines) was recorded from Hainan and Taiwan in FRPS (2: 195. 1959), but it has not been possible to confirm these records.

*Crepidomanes intramarginale* (Hooker & Greville) Copeland (Philipp. J. Sci. 67: 59. 1938; *Trichomanes intramarginale* Hooker & Greville, Icon. Filic. 2: t. 211. 1831; described from Sri Lanka) was recorded from Guangdong and Hong Kong in FRPS (2: 163. 1959), but it has not been possible to confirm these records.

*Crepidomanes acuto-obtusum* (Hayata) K. Iwatsuki (Acta Phytotax. Geobot. 17: 71. 1958; *Trichomanes acuto-obtusum* Hayata, Icon. Pl. Formosan. 4: 135. 1914) was described from Taiwan but is excluded from the present treatment.

1a. False veinlets present.

2a. Submarginal false veinlets absent, but internal false veinlets present.

3a. Fronds more than 3 cm ..... 3. *C. latealatum*

3b. Fronds less than 3 cm ..... 4. *C. parvifolium*

2b. Submarginal false veinlets distinct, internal false veinlets present or absent.

4a. Fronds more than 3 cm ..... 1. *C. bipunctatum*

4b. Fronds less than 3 cm.

5a. One row of normal cells present outside submarginal false veinlets; segments up to 0.7 mm wide ..... 5. *C. kurzii*

5b. Two rows of normal cells present outside submarginal false veinlets; segments usually 1–1.2 mm wide.

6a. Submarginal false veinlets continuous, seldom interrupted ..... 2. *C. latemarginale*

6b. Submarginal false veinlets often interrupted and duplicate ..... 6. *C. rupicola*

1b. False veinlets absent.

7a. Rhizomes erect ..... 11. *C. thysanostomum*

7b. Rhizomes creeping.

8a. Marginal cells of lamina elongate and transparent ..... 7. *C. humile*

8b. Marginal cells of lamina not specialized elongate.

9a. Lamina pinnate.

10a. Rachises winged throughout ..... 10. *C. schmidianum*

10b. Rachises not winged ..... 8. *C. minutum*

9b. Lamina simple, forked, or flabellate.

11a. Lamina flabellate ..... 8. *C. minutum*

11b. Lamina simple or forked ..... 9. *C. vitiense*

**1. *Crepidomanes bipunctatum*** (Poiret) Copeland, Philipp. J. Sci. 67: 59. 1938.

南洋假脉蕨 nan yang jia mai jue

*Trichomanes bipunctatum* Poiret in Lamarck, Encycl. 8: 69. 1808; *Crepidomanes bilabiatum* (Nees & Blume) Copeland;

*C. dilatatum* Ching & Chu H. Wang; *C. liboense* P. S. Wang; *Didymoglossum bipunctatum* E. Fournier; *T. bilabiatum* Nees & Blume.

Plants up to 10 cm tall. Rhizome creeping, wiry or filiform, 0.2–0.5 mm in diam., irregularly branching, densely covered with reddish brown or dark brown short hairs. Stipes

remote, 0.5–4 cm apart, 1–3 cm × 0.6–0.8 mm, narrowly winged throughout or up to middle, wings ciliate. Rachis and costae winged throughout, glabrous or abaxial surface with club-shaped hairs. Lamina 2- or 3-pinnate, oblong or narrowly to broadly ovate, 1.5–7 × 1–3 cm; pinnae 4–6 pairs, closely spaced, alternate, subsessile, ovate to oblong, 1–1.5 × 0.5–1 cm; pinnules 3 or 4 pairs, closely spaced, alternate, sessile, obovate to broadly cuneate, base unequally cuneate, apex subtruncate; ultimate segments closely spaced, narrowly linear, 2–5 × 0.6–0.8 mm, margin entire or slightly crisped, apex obtuse or acute. Veins dichotomous, stout, slightly raised on each surface, glabrous; submarginal false veinlets continuous, other striae few, 1 or 2 rows of cells present between false veinlets and margin of lamina. Sori apical on short acroscopic segments, 1–4 per pinna; involucre narrowly elliptic, ca. 2 × 0.8–1 mm, winged, mouth bilabiate, lips triangular; receptacles projecting, dark brown, 2–3 mm.  $2n = 72$ .

On wet rocks or tree trunks in dense forests; 100–900 m (in Taiwan). Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan, Taiwan, Yunnan [India, Japan, Malaysia; Africa, Madagascar, Pacific islands (Melanesia, Micronesia, Polynesia)].

**2. *Crepidomanes latemarginale*** (D. C. Eaton) Copeland, Philipp. J. Sci. 67: 60. 1938.

阔边假脉蕨 kuo bian jia mai jue

*Trichomanes latemarginale* D. C. Eaton, Proc. Amer. Acad. Arts 4: 111. 1858; *Crepidomanes hainanense* Ching; *C. palmifolium* (Hayata) De Vol; *C. pinnatifidum* Ching & P. S. Chiu; *T. namum* Bosch (1863), not (Bory) Hooker (1844); *T. palmifolium* Hayata.

Plants 1–3 cm tall. Rhizome brown or dark brown, 0.2–0.3 mm in diam., densely covered with short brown hairs. Stipes remote, 2–6 mm apart, brown, 1–10 mm, with short hairs at base, glabrous upward, narrowly winged at apex. Rachis dark brown, broadly or narrowly winged throughout, glabrous. Lamina 1-pinnate to bipinnatifid or digitate, narrowly linear to oblong-ovate or nearly fan-shaped, 0.5–2 × 0.4–1 cm, base cuneate, apex obtuse or truncate to acuminate; ultimate segments 1–3 mm apart, alternate, simple or forked, linear-oblong, 2–10 × 0.4–2 mm, membranous and semitransparent, glabrous, margin entire or slightly wavy, apex obtuse. Veins dichotomous, dark brown, slightly raised on each surface, glabrous, with a single veinlet, false veinlets marginal, continuous, with 2 rows of marginal cells outside false veinlets, with 1 or 2 rows of false veinlets present. Sori terminal on long lobes or apical on short acroscopic segments; involucre ca. 1.2 × 1 mm, broadly winged, tubular or urn-shaped with bilabiate mouth, mouth dilated; receptacles projecting, dark brown, slender, 2–3 mm.  $2n = 108$ .

On muddy or moss-covered rocks in mixed or evergreen forests; low elevations to 2000 m. Fujian, Guangdong, Hainan, Hunan, Taiwan, SE Yunnan [India (Andaman Islands, Assam), Japan (Ryukyu Islands), Malaysia, Thailand, Vietnam].

**3. *Crepidomanes latealatum*** (Bosch) Copeland, Philipp. J. Sci. 67: 60. 1938.

长柄假脉蕨 chang bing jia mai jue

*Didymoglossum latealatum* Bosch, Ned. Kruidk. Arch. 5: 138. 1863; *Crepidomanes chui* Ching & P. S. Chiu [“*chiuii*”]; *C. insigne* (Bosch) Fu; *C. makinoid* (C. Christensen) Copeland; *C. omeiense* Ching & P. S. Chiu; *C. paucinervium* Ching; *C. plicatum* (Bosch) Ching; *C. racemosum* (Bosch) Ching; *C. smithiae* Ching; *C. tagawanum* K. Iwatsuki; *C. tiendongense* Ching & C. F. Zhang; *C. yunnanense* Ching & P. S. Chiu; *D. insigne* Bosch; *D. plicatum* Bosch; *D. racemosum* Bosch; *Trichomanes acutilobum* Ching; *T. acutum* Makino ex Christ (1892), not C. Presl (1843); *T. bipunctatum* Poir. var. *insigne* (Bosch) Beddome; *T. bipunctatum* var. *latealatum* (Bosch) C. B. Clarke; *T. bipunctatum* var. *plicatum* (Bosch) Beddome; *T. insigne* (Bosch) Beddome; *T. latealatum* (Bosch) Christ; *T. makinoid* C. Christensen.

Plants 2–14 cm tall. Rhizome dark brown, 0.5–1.2 mm in diam., densely covered with dark brown short hairs, irregularly branching. Stipes remote, 0.8–5 cm apart, dark brown or green-brown, 0.5–3 cm × ca. 0.5 mm, wingless or winged throughout, wings usually ciliate. Rachis and costae light brown to light black or dark green, winged throughout, slightly zigzag, glabrous. Lamina bipinnate to tripinnatifid, ovate to oblong or triangular, 2–10 × 1–5 cm, membranous, glabrous, base cuneate to subcordate, apex acuminate to obtuse; pinnae 5–12 pairs, closely spaced or slightly imbricate to neighboring ones, alternate, sessile, ovate to oblong-lanceolate or triangular-ovate, 0.5–3 cm × 4–18 mm, base unequally cuneate, margin parted, apex obtuse; ultimate segments closely spaced, linear to lanceolate or broadly cuneate, 1–5 × 0.4–3.5 mm, margin entire, somewhat crisped, apex obtuse to acuminate. Veins dichotomous, obviously raised on each surface, dark brown, light black, or green, glabrous. Sori on upper parts of frond, apical on short acroscopic segments, 1–6 per pinna; involucre tubular, elliptic, or obconic, 1.5–2 × 0.5–1 mm, acute at apex, winged or wingless, dilated at mouth, lobed to 1/3, lips triangular or broadly circular; receptacles projecting, brown, 2–3 mm.

On wet rocks or on tree trunks in forests; 100–2800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, N India, Japan, Malaysia, Nepal, Sri Lanka, Vietnam; Australia].

*Crepidomanes latealatum* is a widespread, variable species, especially in the form and size of the fronds; thus, many names have been proposed. No material of *C. zayuense* Ching & S. K. Wu (Fl. Xizang. 1: 51. 1983, from Zayü) has been seen by the present authors, but the description in the protologue suggests that it belongs within this species.

**4. *Crepidomanes parvifolium*** (Baker) K. Iwatsuki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 535. 1985.

纤小单叶假脉蕨 xian xiao dan ye jia mai jue

*Hymenophyllum parvifolium* Baker, J. Linn. Soc., Bot. 9: 340. 1866; *Microgonium parvifolium* (Baker) Tagawa & K. Iwatsuki; *Trichomanes parvifolium* (Baker) Copeland.

Rhizome ca. 0.2 mm in diam., densely covered with brownish hairs. Stipe less than 3 mm, with caducous hairs like those on rhizome, winged only at apex. Lamina cuneate or oval, small, 0.5–2.5 cm, less than 0.5 cm wide, with a simple distinct vein, margin wavy, apex rounded or obtuse. Sori solitary,

terminal on ultimate segment; involucre obconic or tubular, included, mouth dilated, entire at margin.

On moss-covered rocks in forests. Guangxi, Yunnan [NE India, Myanmar, Nepal, Thailand].

**5. *Crepidomanes kurzii*** (Beddome) Tagawa & K. Iwatsuki, *Acta Phytotax. Geobot.* 26: 169. 1975.

柯氏假脉蕨 ke shi jia mai jue

*Trichomanes kurzii* Beddome, *Ferns Brit. India*, t. 286. 1868; *Crepidomanes nanophyllum* Tagawa.

Rhizome long creeping, irregularly branching, filiform, ca. 0.1 mm in diam., with dense blackish hairs. Stipe greenish, dark at base, up to 3 mm, winged nearly to base. Rachis winged throughout, wings of lower portion up to 0.2 mm wide, entire, flat, broader in upper portion. Fronds pinnate-bipinnatifid, oblong to oblong-lanceolate, up to 1.5 cm × 6 mm, base cuneate, apex rounded; lateral pinnae simple or 2-forked, or extremely large ones with 3 or 4 lobes; simple pinnae or ultimate segments elongate, sometimes up to 5 × ca. 0.7 mm, margin entire and flat, apex acute; surface clathrate, pale bluish green, thin in texture; submarginal false veinlets continuous, with a single row of normal cells outside these. Sori at apex of ultimate segments, often gathered at apical portion of frond; involucre tuberosus with dilated mouth, ca. 1.2 mm, up to 1 mm wide in pressed specimens; mouth dilated and with very narrow lips; receptacles projecting.

Epilithic on wet rocks often along streams in dense dark forests; 100–500 m. Hong Kong, Taiwan [India (including Andaman Islands), Japan (Ryukyu Islands), Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand; Australia (NE Queensland), Pacific islands (Fiji, New Caledonia)].

**6. *Crepidomanes rupicola*** (Raciborski) Copeland, *Philipp. J. Sci.* 67: 59. 1938.

石生假脉蕨 shi sheng jia mai jue

*Trichomanes rupicola* Raciborski, *Pteridoph. Buitenzorg*, 24. 1898; *T. formosanum* Y. Yabe.

Rhizome long creeping, filiform, less than 0.1 mm in diam., densely covered with dark brownish hairs, thus appearing ca. 0.3 mm in diam. Stipe greenish, filiform, terete, very short, 1–3 mm, hairy or glabrescent. Fronds with up to 6 lobes, seemingly digitately arranged, or simple, simple fronds like lobes of multi-lobed fronds that are orbicular in outline, up to slightly more than 1 cm × 1 mm, base rounded to cuneate, apex rounded to obtuse; pinnae simple or at most forked, all lobes 1-veined; ultimate segments or simple fronds narrowly oblong to linear, up to nearly 1 cm × 2 mm, margin entire and flat, apex rounded or slightly notched; surface thin, pale green (green even on specimens after many years), nearly transparent; submarginal false veinlets usually obsolete, or sometimes present but interrupted and duplicated to next row, many oblique striae present. Sori at apices of ultimate lobes, solitary, campanulate; involucre with tuberosus basal portion and dilated mouth, tuberosus portion completely immersed in lobe apex, ca. 1.8 mm, ca. 0.7 mm in diam., broadly winged by lobes, or of same width as lobes, dilated mouth up to 1.7 mm in diam., ca. 0.5 mm in width; receptacles elongate, projecting from dilated mouth.

Petrophilous on reverse slope of large boulders, often overhanging streams but above reach of floods, on moss-covered rocks in ravines, rarely on base of large trees; 100–400 m. SE Taiwan (Lan Yu) [Indonesia (Flores, Java), Philippines].

**7. *Crepidomanes humile*** (G. Forster) Bosch, *Versl. Meded. Kon. Akad. Wetensch., Afd. Natuurk.* 9: 16. 1861.

厚边蕨 hou bian jue

*Trichomanes humile* G. Forster, *Fl. Ins. Austr.* 8: 84. 1786; *Crepidophyllum humile* (G. Forster) C. F. Reed; *Crepidopteris humilis* (G. Forster) Copeland; *Reediella humilis* (G. Forster) Pichi Sermolli.

Plants 2–8 cm tall. Rhizome dark brown, ca. 0.4 mm in diam., densely covered with short hairs. Stipes remote, 1–2 cm apart, light brown, slender, 4–10 cm × 0.3–0.5 mm, with dark brownish short hairs in lower part, winged in upper part. Rachis dark brown, winged throughout, with sparse brown short hairs, hairs caducous. Rachis and costa slightly zigzag. Lamina bipinnatifid, ovate to ovate-lanceolate, 2–7 × 1.5–2 cm, base cuneate or subcordate, apex obtuse; pinnae 5–10 pairs, closely spaced, alternate, sessile, oblong-ovate, 8–12 × 3.5–6 mm, base unequally cuneate, apex obtuse; ultimate segments oblong to linear, 1.5–3.5 × 1–1.2 mm, decurrent to costa and rachis forming wings, slightly crisped, simple or rarely forked, with a single veinlet, apex rounded to obtuse. Veins dichotomous, slightly raised on each surface, dark brown, with sparse brown short hairs, hairs caducous. Sori on upper parts of frond, apical on short acroscopic segments; involucre tubular, ca. 2 × 0.5 mm, winged, lobes not constricted below base of involucre; mouth broadly dilated, nearly circular as seen from above; receptacles projecting, ca. 4 mm, slender.  $2n = 72$ .

On moss-covered rocks in forests; near sea level to 300 m. E and S Taiwan [Indonesia, Japan (Ryukyu Islands), Malaysia, Philippines, Thailand; Pacific islands (Melanesia, Micronesia, Polynesia)].

**8. *Crepidomanes minutum*** (Blume) K. Iwatsuki, *J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot.* 13: 524. 1985.

团扇蕨 tuan shan jue

*Trichomanes minutum* Blume, *Enum. Pl. Javae* 2: 223. 1828; *Gonocormus australis* Ching; *G. matthewii* (Christ) Ching; *G. minutus* (Blume) Bosch; *G. prolifer* (Blume) Prantl; *T. matthewii* Christ; *T. proliferum* Blume; *T. saxifragoides* C. Presl.

Plants up to 5 cm. Rhizome dark brown or black, filiform, 0.2–0.3 mm in diam., densely covered with reddish brown or dark brown short hairs, irregularly branching. Stipes remote, 3–12 mm apart, dark brown to dark green, filiform, 1–10 mm, densely hairy at base, subglabrous upward. Lamina flabellate or ovate, 1–2 × 0.5–1.5 cm, base cordate or cuneate; ultimate segments linear, 1.5–8 × 0.3–2 mm, margin entire, apex obtuse. Sori terminal on lobes; involucre funneliform or bottle-shaped, winged, dilated at mouth.  $2n = 72, 108, 144$ .

On muddy rocks in forests and valleys, or wet rocks near streams, on moss-covered tree trunks, in tropical evergreen forests; near sea level to 1600 m (in Taiwan). Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, NE India, Indonesia, Japan, Korea, Malaysia, Nepal, Philip-

pinus, Russia (Siberia), Sri Lanka, Thailand, Vietnam; Africa, Australia, Pacific islands (Melanesia, Micronesia, Polynesia)].

**9. *Crepidomanes vitiense*** (Baker) Bostock, Fl. Australia 48: 706. 1998.

斐济假脉蕨 *fei ji jia mai jue*

*Trichomanes vitiense* Baker, J. Linn. Soc., Bot. 9: 338. 1866.

Rhizome long creeping, very densely covered with blackish hairs, ca. 0.8 mm in diam. including hairs. Stipe filiform, very short, usually up to 5 mm, terete, naked except for hairy base. Fronds simple, forked, or at most with 4 digitately arranged lobes, when forked then with lobes similar to a simple frond, or in more-divided case with 3 or 4 lobes similar to each other; simple fronds or lobes of divided form narrowly oblong or ± quadrangular in outline, largest ones up to 2 cm × 7 mm, base rounded, margin entire and flat or undulate, apex rounded or more commonly notched, reddish brown in dried condition; costae (or veins) simple in simple fronds, or 1-veined in each lobe; forked fronds with 2 lobes similar to simple fronds, or just consisting of 2 simple fronds. Sori solitary at apices of lobes, campanulate; involucre with tuberous lower half and dilated mouth, tuberous portion immersed nearly halfway to frond apex, ca. 1.5 mm, ca. 0.8 mm in diam., distal dilated portion ca. 2.2 mm in diam., distinctly dilated, entire; receptacles elongate, long projecting from lips.  $2n = 72$ .

Epilithic on wet rocks in dense dark forests, or rarely epiphytic on tree trunks in mountain forests; 800–1300 m. S and SE Taiwan [Malaysia; Australia, Pacific islands (Melanesia)].

**10. *Crepidomanes schmidianum*** (Zenker ex Taschner) K. Iwatsuki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 526. 1985.

西藏瓶蕨 *xi zang ping jue*

Plants 3–5 cm tall. Rhizome ca. 0.5 mm in diam., densely covered with deep brown short hairs. Stipes remote, 0.8–2 cm apart, ca. 1 cm × 0.3 mm, wingless or narrowly winged. Lamina bipinnate, dark green, oblong-ovate, 2–4 × 1–1.8 cm, membranous, glabrous; pinnae 4–14 pairs, 1–1.4 cm × 3–4 mm, oblique; ultimate segments oblong, apex acuminate. Sori terminal on lobes; involucre obconical, narrowly winged, entire, apex broadly rounded, lips usually dilated; receptacles long projecting.  $2n = 72, 108$ .

On rocks or steep slopes in forests; 1800–2600 m. Guangxi, Guizhou, Taiwan, Xizang, Yunnan [Bhutan, Himalaya, N India, Japan, Nepal].

The epithet has frequently been given as "*schmidtianum*" but this is not correct, as the original spelling was "*schmidianum*."

1a. Fronds up to 8 cm; segments more compactly placed ..... 10a. var. *schmidianum*

1b. Fronds more than 8 cm when fully mature; segments rather remote ..... 10b. var. *latifrons*

**10a. *Crepidomanes schmidianum* var. *schmidianum***

西藏瓶蕨(原变种) *xi zang ping jue (yuan bian zhong)*

*Trichomanes schmidianum* Zenker ex Taschner, Duab. Trichom. Sp. 34. 1843; *Vandenboschia schmidiana* (Zenker ex Taschner) Copeland; *V. titibuensis* H. Itô.

Fronds up to 8 cm; segments more compactly placed.

On rocks in forests; ca. 2300 m. Guangxi, Xizang [Bhutan, N India, Japan, Nepal].

**10b. *Crepidomanes schmidianum* var. *latifrons*** (Bosch) K. Iwatsuki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 527. 1985.

宽叶假脉蕨 *kuan ye jia mai jue*

*Trichomanes latifrons* Bosch, Ned. Kruidk. Arch. 5[3]: 209. 1863; *Crepidomanes latifrons* (Bosch) Ching; *T. cupressifolium* Hayata; *Vandenboschia latifrons* (Bosch) Copeland.

Fronds more than 8 cm when fully mature; segments rather remote.

Moss-covered rocks, steep slopes in forests; 1800–2600 m (in Taiwan). Guizhou, Taiwan, Yunnan [Himalaya].

**11. *Crepidomanes thysanostomum*** (Makino) Ebihara & K. Iwatsuki, Blumea 51: 240. 2006.

球杆毛蕨 *qiu gan mao jue*

*Trichomanes thysanostomum* Makino, Bot. Mag. (Tokyo) 13: 46. 1899; *Cephalomanes thysanostomum* (Makino) K. Iwatsuki; *Nesopteris thysanostoma* (Makino) Copeland.

Plants 30–40 cm tall. Rhizome ca. 5 mm in diam.; hairs brown, multicellular, ca. 3 mm; rootlets wiry, blackish, rather thick. Stipe fuscous, columnar, 6–16 cm × 1–1.5 mm, firm, narrowly winged, with multicellular hairs at base; hairs dense, dark brown. Lamina ovate, 10–30 × 5–15 cm, base subcordate, apex acuminate; pinnae 10–12 pairs, closely spaced, somewhat imbricate to neighboring ones, alternate, ovate-oblong, 4–8 × 1.5–3 cm, oblique, apex acuminate; basal ones usually somewhat shortened; pinnules 8–10 pairs, closely spaced, alternate, spreading, subdeltoid-ovate, 1–2.5 × 1–1.5 cm, base unequally cuneate, apex obtuse; ultimate segments closely spaced, 0.3–0.5 mm wide, with a single veinlet, apex obtuse, straight or somewhat curved. Veins dichotomous, obviously raised on each surface, brown; lobes not constricted below base of involucre; mouth truncate, not dilated, ciliate; receptacles long projecting, brown, straight, up to 1 cm.  $2n = 108$ , triploid.

On wet shaded rocks or cliffs; 300–400 m. S and SE Taiwan [Japan (Ryukyu Islands), Philippines].

## 5. HYMENOPHYLLUM J. Smith, Mém. Acad. Roy. Sci. (Turin) 5: 418. 1793.

膜蕨属 *mo jue shu*

*Mecodium* C. Presl ex Copeland; *Meringium* C. Presl; *Microtrichomanes* (Mettenius) Copeland; *Pleuromanens* C. Presl; *Trichomanes* sect. *Microtrichomanes* Mettenius.

Plants small, epiphytic or petrophilous. Rhizome long creeping, or short and erect, slender, filiform. Fronds small to medium-sized. Lamina pinnately decompose, semitransparent, entire or toothed at margin; rachis and/or lamina covered with reddish brown long hairs to glabrescent or glabrous. Involucres bivalvate, deeply cleft nearly halfway to base, or tubular with bivalvate mouth, entire or serrate at apex; receptacles included or projecting.  $2n = 22, 26, 36, 42, 44$ .

About 250 species: throughout the tropics to temperate regions; 22 species (four endemic) in China.

*Meringium acanthoides* (Bosch) Copeland (Philipp. J. Sci. 67: 42. 1938; *Didymoglossum acanthoides* Bosch, Pl. Jungh. 1: 560. 1856; *Hymenophyllum acanthoides* (Bosch) Rosenstock) was an accepted name in FRPS (2: 151. 1959). It was described from Java, Indonesia, and was presumably a misidentification.

The following taxa could not be treated here because no material was seen by the present authors: *Hymenophyllum dilatatum* (G. Forster) Swartz var. *amplum* Christ (Bull. Herb. Boissier 7(1): 2–3. 1899), described from Yunnan, and *H. henryi* Baker (J. Bot. 27: 176. 1889), described from Hubei.

- 1a. Fronds whitish; involucres tubular ..... 22. *H. pallidum*
- 1b. Fronds green; involucres usually bivalvate.
  - 2a. Fronds covered with stellate hairs ..... 21. *H. pilosissimum*
  - 2b. Fronds not covered with stellate hairs.
    - 3a. Margins of frond serrate or minute hairs present.
      - 4a. Minute hairs present at margins of frond.
        - 5a. Margins of frond with stiff, dark brown setae ..... 19. *H. digitatum*
        - 5b. Margins of frond with very sparse, whitish hairs ..... 20. *H. nitidulum*
      - 4b. Minute hairs absent at margins of frond.
        - 6a. Rachis wingless or winged only near apex ..... 16. *H. blandum*
        - 6b. Rachis winged, at least in upper half of rachis.
          - 7a. Lamina crisped ..... 17. *H. denticulatum*
          - 7b. Lamina flat.
            - 8a. Lips of involucres entire ..... 18. *H. holochilum*
            - 8b. Lips of involucres serrate.
              - 9a. Ultimate segments 2–4 mm wide ..... 3. *H. simonsianum*
              - 9b. Ultimate segments less than 2 mm wide.
                - 10a. Rachis narrowly winged on upper part of frond ..... 2. *H. devolii*
                - 10b. Rachis winged nearly to base ..... 1. *H. barbatum*
  - 3b. Margins of frond entire and hairs absent.
    - 11a. Lamina hairy or with scales.
      - 12a. Lamina linear to ovate, with lanceolate multicellular scales as on rachis, usually less than 1 cm wide ..... 7. *H. levingei*
      - 12b. Lamina oblong to lanceolate, with acicular hairs like rachis, usually more than 1.5 cm wide.
        - 13a. Fronds less deeply dissected, costae with wings usually more than 1 mm, ultimate segments at most 3 mm; sori on basal acroscopic pinnules or usually arranged along rachis ..... 6. *H. exsertum*
        - 13b. Fronds more deeply dissected, costae winged less than 1 mm, ultimate segments often up to 5 mm; sori gathering at apical portion of frond ..... 9. *H. oligosorum*
    - 11b. Lamina glabrous.
      - 14a. Stipe broadly winged throughout, wings more than 0.6 mm on one side.
        - 15a. Involucres entire at mouth ..... 4. *H. badium*
        - 15b. Involucres toothed at mouth.
          - 16a. Lips of involucres fimbriate ..... 14. *H. fimbriatum*
          - 16b. Lips of involucres minutely toothed.
            - 17a. Fronds larger, more than 15 cm ..... 12. *H. javanicum*
            - 17b. Fronds smaller, less than 15 cm ..... 13. *H. riukiense*
      - 14b. Stipe wingless or narrowly winged, wings less than 0.4 mm on one side.
        - 18a. Wings of rachis and ultimate segments crisped.
          - 19a. Wings of rachis and ultimate segments sharply crisped ..... 5. *H. corrugatum*
          - 19b. Wings of rachis and ultimate segments slightly crisped ..... 8. *H. longissimum*
        - 18b. Wings of rachis and ultimate segments flat.
          - 20a. Stipe narrowly winged and decurrent nearly to base ..... 15. *H. stenocladum*
          - 20b. Stipe wingless or narrowly winged at apex, sometimes decurrent.
            - 21a. Involucres subtruncate and serrate at apex; ultimate segments remotely spaced ..... 11. *H. productum*
            - 21b. Involucres obtuse and entire to slightly wavy at apex; ultimate segments normally to closely spaced ..... 10. *H. polyanthos*



**1. *Hymenophyllum barbatum*** (Bosch) Baker in Hooker & Baker, Syn. Fil. 68. 1867.

华东膜蕨 hua dong mo jue

*Leptocionium barbatum* Bosch, Ned. Kruidk. Arch. 5[3]: 416. 1863; *Hymenophyllum denticulatum* Swartz var. *flaccidum* (Bosch) C. B. Clarke; *H. fastigiosum* Christ; *H. khasianum* Baker; *H. minutidenticulatum* Ching & P. S. Chiu; *H. okadai* Masamune; *H. omeiense* Christ; *H. oxyodon* Baker; *H. rufifibrillosum* Ching & Z. Y. Liu; *H. spicatum* Christ; *H. spinosum* Ching; *H. suprapaleaceum* Ching; *H. taiwanense* De Vol (1975), not (Tagawa) C. V. Morton (1968); *H. urofrons* Ching & C. F. Zhang; *H. whangshanense* Ching & P. S. Chiu; *L. flaccidum* Bosch; *Mecodium okadai* (Masamune) Shieh.

Plants 1–15 cm tall. Rhizome brown to dark brown or reddish brown, 0.2–0.5 mm in diam., with sparse brownish hairs or subglabrous, with hairy roots. Stipes remote, 1–4 cm apart, dark brown or brown, filiform, 0.5–6 cm, wingless or narrowly winged at apex, with sparse reddish brown hairs. Rachis dark brown, winged throughout or at apex. Lamina 1–3-pinnate, ovate or oblong to lanceolate, 1.5–12 × 1–4 cm, membranous and semitransparent, glabrous, base subcordate or rounded-cuneate, apex obtuse; pinnae 3–12 pairs, slightly imbricate to neighboring ones, alternate, sessile, widely spreading, oblong to obovate or oblong-ovate, 0.5–2.5 cm × 3–11 mm; ultimate segments linear or oblong, 2–6 × 0.6–2 mm, with 1 (or 2) veinlets, margin subentire to serrulate, apex obtuse. Veins dichotomous, dark brown, obviously raised on each surface. Sori on upper parts of frond, terminal on short segments; involucre ovate to oblong, 1.5–2 × ca. 1 mm, slightly serrate and obtuse or rounded at apex; receptacles usually included.  $2n = 42$ .

On moss-covered tree trunks or on wet rocks in subtropical or tropical evergreen forests, near streams; 400–2300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Himalaya, India, Japan (including Ryukyu Islands), Korea, Myanmar, Thailand, Vietnam].

*Hymenophyllum barbatum* is a widespread, very variable species, especially in the form and size of the fronds and shape of the involucre; thus, many names have been proposed.

**2. *Hymenophyllum devolii*** Lai, Taiwania 21: 82. 1976.

台湾膜蕨 tai wan mo jue

Rhizome long creeping, filiform, with sparse yellow multicellular hairs. Stipes remote, wingless, 1.5–4 cm; stipes, rachis, and costae with same type of multicellular yellowish brown hairs. Rachis narrowly winged on upper part of frond, margin entire, lower section of rachis wingless or nearly so. Lamina deeply bipinnatifid, 4–7 × 1.5–2 cm; lower pinnae somewhat shortened, margins of fertile pinnae entire or nearly so; lobes of pinnae denticulate, 1–1.5 mm wide; walls of laminar cells thin, straight. Sori shortly stalked, borne on upper pinnae at end of acroscopic veinlets, 1 or 2 per pinna; involucre ovate, entire; receptacles included; sporangia sessile.

- Wet places in forests, epiphytic; 1000–1500 m. S Taiwan.

*Hymenophyllum devolii* seems to be very much like *H. barbatum* but differs in its metallic glossy color of the adaxial lamina.

**3. *Hymenophyllum simonsianum*** Hooker, Sec. Cent. Ferns, t. 13. 1860.

宽片膜蕨 kuan pian mo jue

*Hymenophyllum alishanense* De Vol.

Plants 4–10 cm tall. Rhizome dark brown, ca. 0.3 mm in diam., subglabrous, with filiform rootlets. Stipes remote, 1–3 cm apart, dark brown, filiform, columnar, 1–3 cm, subglabrous, narrowly winged at apex. Rachis dark brown, broadly winged throughout, slightly zigzag, glabrous or nearly so. Lamina pinnate to bipinnatifid, linear-oblong to linear-lanceolate, (3–)5–8 × 1.5–2.5 cm, membranous and semitransparent, glabrous; pinnae (3–)5–8 pairs, 2–3 mm apart, alternate, sessile, obdeltoid to obovate, 1–1.5 cm × 6–8 mm; ultimate segments oblong, short, 1.5–2 × 2–4 mm, with 1 or 2 veinlets, margin irregularly serrate, apex obtuse or truncate. Veins dichotomous, dark brown, filiform, obviously raised on each surface. Sori terminal on ultimate segments; involucre oblong to oval, deeply cleft to base, irregularly serrate and obtuse at apex; receptacles clavate, usually included.

Wet places in forests; 1600–3000 m. Taiwan, Xizang, Yunnan [Bhutan, NE India, Nepal].

**4. *Hymenophyllum badium*** Hooker & Greville, Icon. Filic. 1: t. 76. 1828.

落蕨 lu jue

*Hymenophyllum crispato-alatum* Hayata; *H. crispatum* Hooker & Greville; *H. flexile* Makino; *H. javanicum* Sprengel var. *badium* (Hooker & Greville) C. B. Clarke; *H. retusilobum* Hayata; *Mecodium badium* (Hooker & Greville) Copeland; *M. crispato-alatum* (Hayata) Copeland; *M. crispatum* (Hooker & Greville) Copeland; *M. flexile* (Makino) Copeland; *M. pro-pinquum* Ching & P. S. Chiu; *M. tenuifrons* Ching.

Plants 10–30 cm tall. Rhizome brown, ca. 0.8 mm in diam., subglabrous, with sparse rootlets. Stipes remote, ca. 2 cm apart, brown or green-brown, 5–10 cm × ca. 1 mm, glabrous, winged nearly to base, wings flat to crisped. Rachis and costae broadly winged throughout, glabrous, slightly zigzag. Lamina bipinnate to tripinnatifid, lanceolate, ovate-lanceolate, or ovate, 10–15 × 4–6 cm, membranous, glabrous; pinnae 10–12 pairs, closely spaced, alternate, spreading, triangular-ovate to ovate, 1.5–4 × 1–2.5 cm, base unequally cuneate, apex obtuse; pinnales 3 or 4 pairs, closely spaced, alternate, sessile, spreading, oblong, 1–1.5 cm × 5–8 mm, base decurrent, apex obtuse; ultimate segments simple or forked, oblong to linear, 2–5 × 1–1.5 mm, with a single veinlet, margin entire, apex obtuse. Veins dichotomous, obviously raised on each surface, brown, glabrous. Sori apical on short acroscopic segments; involucre subcircular or ovate, bivalvate, entire or slightly serrate, lobes slightly constricted below base of involucre.

On wet rocks near streams in forests, on moss-covered trunks of trees; 600–3000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Jiangxi, Sichuan, Taiwan, Yunnan [Bhutan, India, Japan, Malaysia, Nepal, Sri Lanka, Vietnam].

The authors have not seen material of *Hymenophyllum crispato-alatum* f. *remotipinum* Hayata (Icon. Pl. Formosan. 5: 257. 1915).

**5. *Hymenophyllum corrugatum*** Christ, Bull. Herb. Boissier, sér. 2, 3: 508. 1903.

皱叶蕨 *zhou ye lu jue*

*Mecodium corrugatum* (Christ) Copeland; *M. gongboense* Ching.

Plants 8–10 cm tall. Rhizome brown, ca. 0.2 mm in diam., with sparse brown short hairs, with sparse hairy rootlets. Stipes remote, 1–1.5 cm apart, brown, filiform, 2–5 cm, subglabrous, narrowly winged at apex, wings decurrent. Rachis and costae winged throughout, wings sharply crisped. Lamina bipinnate to tripinnatifid, triangular-ovate, 4–6 × 2–2.5 cm, membranous, glabrous, base subcordate, apex obtuse; pinnae 8–10 pairs, closely spaced, alternate, subsessile, linear to lanceolate, 1.5–5 cm × 5–8 mm, base unequally cuneate, apex acuminate; pinules 4–14 pairs, closely spaced, alternate, sessile, oblong to ovate, 4–6 × 3–4 mm, base decurrent, apex obtuse; ultimate segments simple or forked, narrowly linear, 0.5–0.8 mm wide, margin entire, sharply crisped, apex obtuse. Veins dichotomous, slightly raised on each surface, brown, glabrous, with a single veinlet. Sori on upper parts of frond, terminal on ultimate segments; involucre subcircular, oblong, or ovate, deeply cleft, entire or somewhat wavy at apex.

• On rocks or on tree trunks; 1800–2600 m. Hubei, Sichuan, Xizang.

The authors have not seen material of *Hymenophyllum corrugatum* var. *elongatum* Christ (Bull. Acad. Int. Géogr. Bot. 16: 101. 1906; *Mecodium corrugatum* (Christ) Copeland var. *elongatum* (Christ) H. S. Kung).

**6. *Hymenophyllum exsertum*** Wallich ex Hooker, Sp. Fil. 1: 109. 1844.

毛蕨 *mao lu jue*

*Hymenophyllum austrosinicum* Ching; *H. delavayi* Christ; *Mecodium exsertum* (Wallich ex Hooker) Copeland.

Plants 3–12 cm tall. Rhizome brown, with sparse light brownish short hairs or subglabrous, with sparse dark brown rootlets. Stipes remote, 1–2 cm apart, brown, filiform, 1–5 cm, sparsely hairy or subglabrous, wingless. Rachis winged throughout or narrowly winged at apex, with acicular hairs. Lamina bipinnate to tripinnatifid, oblong or ovate, 3–9 × 1.5–4 cm, membranous and opaque; pinnae 3–12 pairs, sessile, spreading, ovate to oblong or triangular-ovate, 3–18 × 5–15 mm, base decurrent, margin parted, apex obtuse; ultimate segments simple or forked, linear-oblong, 1–3 × 0.8–1 mm, with a single veinlet, margin entire or serrate, apex obtuse. Veins dichotomous, slightly raised on each surface, dark brown, zigzag, with acicular hairs on each surface. Sori on upper parts of frond; involucre circular to oval, 1–1.5 mm, often with teeth at apex; receptacles slender, included.  $2n = 42$ .

On wet rocks or moss-covered tree trunks in tropical evergreen forests; middle or high elevations. Fujian, Guangdong, Hainan, Sichuan, Xizang, Yunnan [Bhutan, Cambodia, N India, Laos, Malaysia, Thailand, Vietnam].

**7. *Hymenophyllum levingei*** C. B. Clarke, Trans. Linn. Soc. London, Bot. 1: 439. 1880.

鳞蕨 *lin lu jue*

*Mecodium levingei* (C. B. Clarke) Copeland.

Plants 4–6 cm tall. Rhizome brown, subglabrous, with sparse hairy rootlets. Stipes remote, 1–2 cm apart, brown, filiform, 1.5–2 cm, subglabrous, or with lanceolate multicellular scales at apex, wingless. Rachis brown, narrowly winged throughout, densely covered with lanceolate multicellular scales. Lamina once pinnate to bipinnatifid, green-brown, flat, linear to narrowly lanceolate, 2–3 × 0.5–1 cm, membranous; pinnae 6–10 pairs, 1–2 mm apart, alternate, sessile, ovate, 3–4 × 2–3 mm, base decurrent, apex obtuse; ultimate segments simple or slightly forked, less than 1 mm apart, linear-oblong, 1–2.5 × ca. 0.5 mm, with a single veinlet, margin with sparse teeth, apex obtuse. Veins dichotomous, slightly raised on each surface, brown, with dense lanceolate multicellular scales. Sori on upper parts of frond, apical on long acroscopic segments; involucre subcircular or oval, small, deeply cleft nearly to base, glabrous, entire or slightly toothed at apex.

On rocks near rivers, on tree trunks in forests; 2000–2600 m. Guizhou (Daozhen), Sichuan, Xizang, NW Yunnan [Bhutan, N India, Nepal].

**8. *Hymenophyllum longissimum*** (Ching & P. S. Chiu) K. Iwatsuki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 522. 1985.

线叶蕨 *xian ye lu jue*

*Mecodium longissimum* Ching & P. S. Chiu, Fl. Reipubl. Popularis Sin. 2: 350. 1959; *M. lineatum* Ching & P. S. Chiu.

Plants 10–30 cm tall. Rhizome dark brown, with sparse short multicellular hairs, with sparse rootlets. Stipes remote, 1–2 cm apart, brown, filiform, 2–10 cm, with brown multicellular hairs at base, glabrous upward, wingless, or only with decurrent wings at apex. Rachis and costae brown, glabrous, slightly zigzag, broadly winged throughout, wings flat, ca. 1 mm on each side. Lamina bipinnate to tripinnatifid, narrowly linear, 6–15 × 1–1.5 cm, membranous and semitransparent, glabrous; pinnae 10–16 pairs, closely spaced or slightly imbricate to neighboring ones, alternate, sessile, oblong-ovate, 6–10 × 4–5 mm, base decurrent, apex obtuse; ultimate segments simple or usually forked, closely spaced or imbricate to neighboring ones, flat, oblong, 1–3 × 1–1.2 mm, with a single veinlet, margin entire, apex obtuse or sometimes subtruncate. Veins dichotomous, brown, glabrous. Sori on upper parts of frond, 1 per pinna, apical on short acroscopic segments; involucre oval, ca. 1.5 mm, entire, deeply cleft to base and obtuse at apex.

• On wet rocks or on tree trunks in forests; 1800–3700 m. Hubei, Sichuan, Xizang, NW Yunnan.

**9. *Hymenophyllum oligosorum*** Makino, Bot. Mag. (Tokyo) 13: 44. 1899.

长毛蕨 *chang mao lu jue*

*Mecodium oligosorum* (Makino) H. Itô.

Rhizome long creeping, glabrescent. Stipe 5–10 mm, wingless except at base of lamina. Rachis winged to base, wings flat, entire. Lamina bipinnatifid to tripinnatifid, ovate to lanceolate, 1–5 cm. Fronds abaxially with persistent long hairs along stipe, rachis, and veins. Involucre ovate or rounded, apex slightly toothed.  $2n = 42$ .

Usually on tree trunks in forests; 600–1600 m. Jiangxi, Taiwan [Japan, Korea].

**10. *Hymenophyllum polyanthos*** (Swartz) Swartz, J. Bot. (Schrader) 1800(2): 102. 1801.

长柄蕨 *chang bing lu jue*

*Trichomanes polyanthos* Swartz, Prodr. 137. 1788; *Hymenophyllum constrictum* Hayata; *H. hayatae* Masamune; *H. microsorum* Bosch; *H. osmundoides* Bosch; *H. paniculiflorum* C. Presl; *H. parallelocarpum* Hayata; *H. paramnioides* (H. G. Zhou & W. M. Chu) X. C. Zhang; *Mecodium acrocarpum* Ching; *M. hainanense* Ching; *M. jinshoshanense* Ching & Z. Y. Liu; *M. kansuense* Ching & Y. P. Hsu; *M. likiangense* Ching & P. S. Chiu; *M. lofoushanense* Ching & P. S. Chiu; *M. lushanense* Ching & P. S. Chiu; *M. microsorum* (Bosch) Ching; *M. osmundoides* (Bosch) Ching; *M. ovalifolium* Ching & P. S. Chiu; *M. paniculiflorum* (C. Presl) Copeland; *M. paramnioides* H. G. Zhou & W. M. Chu; *M. polyanthos* (Swartz) Copeland; *M. szechuanense* Ching & P. S. Chiu; *M. wangii* Ching & P. S. Chiu; *M. wenshiense* Ching & Y. P. Hsu.

Plants 5–15 cm tall. Rhizome brown or black, 0.2–0.3 mm in diam., with sparse brownish hairs, hairs caducous, with sparse rootlets. Stipes remote, 0.5–4 cm apart, columnar, 0.4–8 cm, slender, rarely decurrent to base, wingless or narrowly winged at apex, wings flat. Lamina 1- or 2-pinnate to quadripinnatifid, brown-green or brown when dry, triangular-ovate or obovate to linear, 1–13 × 0.3–5 cm, membranous, glabrous, base cuneate, cordate, or rounded, apex acuminate or obtuse; pinnae 4–15 pairs, alternate, spreading, oblong to ovate or narrowly ovate, base cuneate to cordate, apex obtuse to acuminate; ultimate segments linear or oblong, 1–4 × 0.8–1.5 mm, with 1 (or 2) veinlets, margin entire, apex rounded or somewhat retuse. Veins dichotomous, obvious. Sori usually on upper parts of frond, terminal on ultimate segments; involucre bivalvate, entire or toothed at apex, obtuse or acute at apex.  $2n = 56$ .

On rocks or tree trunks near streams in forests; 800–1900(–3400) m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang [tropical and subtropical regions worldwide].

*Hymenophyllum punctisorum* Rosenstock (Hedwigia 56: 333. 1915), described from Taiwan, is included here by some authors (e.g., Knapp, Ferns Fern Allies Taiwan, 991. 2011).

**11. *Hymenophyllum productum*** Kunze, Bot. Zeitung (Berlin) 6: 305. 1848.

吊罗蕨 *diao luo lu jue*

*Mecodium productum* (Kunze) Copeland.

Plants 5–15 cm tall. Rhizome ca. 0.5 mm in diam., densely covered with brown hairs. Stipes remote, 2–4 cm apart, 3–5 cm, hairy at very base, glabrous upward, upper parts winged with flat or slightly undulate wings. Rachis like upper parts of stipes, slightly zigzag in upper part, winged throughout, wings 0.4–0.8 mm wide. Lamina tripinnate to quadripinnatifid, green to deep green, oblong to oblong-lanceolate, 5–13 × ca. 5 cm, herbaceous, glabrous throughout, apex acute; pinnae up to 10 pairs, 4–6 × ca. 2 cm, basal ones triangular-rhomboid, apex acute, upper ones gradually becoming smaller; pinnules ca. 5 pairs, with 5–10 segments; ultimate segments narrow, 0.8–1.2 mm

wide, margin entire and flat, apex obtuse to retuse. Sori projecting, lobes constricted below base of involucre; involucre bilabiate, deeply cleft nearly to base, triangular, rounded at base, acuminate at apex; lips toothed; receptacles included, clavate to somewhat columnar.

On moss-covered tree trunks in dense evergreen forests; 900–1100 m. Hainan, Taiwan [Malesia, Thailand].

**12. *Hymenophyllum javanicum*** Sprengel, Syst. Veg. 4(1): 132. 1827.

爪哇蕨 *zhao wa lu jue*

*Mecodium javanicum* (Sprengel) Copeland.

Rhizome long creeping, wiry, slender, ca. 0.5 mm in diam., laxly branched, with rather sparse brownish hairs. Stipes remote, naked but very base hairy, 2–5 cm, winged except near base; wings becoming broader upward, entire, ± crisped at edge. Rachis straight or zigzag in very upper portion, winged like upper portion of stipe. Lamina tripinnate to quadripinnatifid, oblong-subdeltooid, 4–7(–15) cm, 3–4(–7) cm wide at widest basal portion, glabrous, apex ± acute; pinnae 5 or more pairs, basal ones oblong-subdeltooid, up to 3 × 2 cm, base broadly cuneate to rounded, shortly stalked, apex moderately acute to rounded; upper ones gradually becoming smaller upward, oblong in outline; pinna rachis like rachis, ± zigzag throughout; ultimate segments up to 4 mm, narrow, 0.6–1 mm wide, decurrent into every axis forming distinct, wavy or crisped wings ca. 0.8 mm in width, margin entire but undulate or crisped, apex rounded to obtuse; internal cell walls thin, straight. Sori scattered usually on apical parts of pinnae; involucre bivalvate, deeply cleft to base; valves subdeltooid to oblong, 1.2–1.6 mm, up to 1 mm wide, lips finely toothed; receptacles wholly included within involucre, clavate to filiform.  $2n = 72$ .

Epiphytic on moss-covered tree trunks in dense tropical evergreen forests; 1400–2100(–2300) m. E, ?NC, and S Taiwan [India, Indonesia, Malesia, Myanmar, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands (Melanesia, Micronesia, Polynesia)].

**13. *Hymenophyllum riukiense*** Christ, Annuaire Conserv. Jard. Bot. Genève 4: 208. 1900.

琉球蕨 *liu qiu lu jue*

?*Hymenophyllum taiwanense* (Tagawa) C. V. Morton; *Mecodium riukiense* (Christ) Copeland; ?*M. taiwanense* Tagawa.

Plants 6–15 cm tall. Rhizome ca. 0.5 mm in diam., laxly branched. Stipes remote, 2–6 cm, hairy at base, glabrous upward, winged throughout, wings sharply crisped. Lamina tripinnate to quadripinnatifid, oblong-subdeltooid, 4–7 × ca. 4 cm, glabrous, apex acute to moderately acute; pinnae 5–10 pairs, basal ones oblong-subdeltooid, base broadly cuneate to rounded, stalked, apex moderately acute to rounded; upper ones gradually smaller upward, oblong; ultimate segments narrow, ca. 4 × 0.6–1 mm, decurrent into every axis forming distinct, wavy or crisped wings ca. 0.8 mm, margin entire but crisped, apex rounded to obtuse. Sori usually on upper parts of pinnae; involucre subdeltooid to oblong, 1.2–1.6 × ca. 1 mm, lips finely toothed; receptacles usually included.

On moss-covered tree trunks in dense tropical evergreen forests; common at middle or higher elevations. Hainan, ?Taiwan [Japan, Thailand].

**14. *Hymenophyllum fimbriatum*** J. Smith, J. Bot. (Hooker) 3: 418. 1841.

流苏苞蕨 liu su bao lu jue

*Mecodium fimbriatum* (J. Smith) Copeland.

Rhizome long creeping, wiry, irregularly branching, ca. 0.5 mm in diam. or thicker, with dark brownish hairs when young, glabrescent; roots irregularly arising from rhizome, with dense long dark brownish root hairs. Stipe 2–7 cm, winged nearly throughout, with wings up to 1 mm wide on each side, entire but decidedly crisped. Rachis substraight or slightly zigzag in upper part, winged throughout, wings similar to those on stipes or less crisped. Lamina tripinnate-quadripinnatifid, oblong to oblong-ovate, 5–10 cm, 2.5–5 cm wide at widest middle portion, base broadly cuneate to subtruncate, apex acute or moderately so; lateral pinnae ascending, shortly stalked in larger ones, oblong-subdeltoid to oblong, 2–4.5 cm in larger ones, up to 1.8 cm wide, base broadly cuneate, apex moderately acute to rounded; pinna rachis winged and appearing like ultimate segments; larger pinnules pinnate to bipinnatifid, or secondary pinnules 1- or 3-forked; ultimate segments up to 1 mm wide, margin entire, moderately undulate to ± crisped, apex rounded to obtuse. Sori at apices of nearly all ultimate segments of apical portion of frond, ± constricted at base; involucre deeply cleft nearly to base, oblong, 1.2–1.6 × 0.8–1.3 mm; lips fimbriate-toothed at apex but teeth somewhat deciduous; receptacles included within valves, cylindrical.

Epiphytic on tree trunks in primary forests; 800–1400 m. E Taiwan [Indonesia (Borneo, Seram), New Guinea, Philippines, Vietnam].

**15. *Hymenophyllum stenocladum*** (Ching & P. S. Chiu) K. Iwatsuki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 515. 1985.

撕苞蕨 si bao lu jue

*Mecodium stenocladum* Ching & P. S. Chiu, Fl. Reipubl. Popularis Sin. 2: 351. 1959 [*“stenochladum”*].

Plants 5–10 cm tall. Rhizome brown, filiform, subglabrous, with sparse hairy rootlets. Stipes remote, 1–2 cm apart, brown, 2–5 cm × ca. 0.3 mm, glabrous, narrowly winged, wings caducous. Rachis and costae dark brown, slightly zigzag, glabrous, narrowly winged throughout, wings flat. Lamina bipinnate to tripinnatifid, ovate, 3–5 × ca. 1.5 cm, membranous, glabrous, apex obtuse; pinnae 5–8 pairs, basal ones ca. 5 mm apart, upper ones closely spaced, alternate, shortly stalked, spreading, ovate, 8–13 × 4–6 mm, base unequally cuneate, apex obtuse; pinnules 3 or 4 pairs, alternate, shortly stalked, ovate to cuneate, 3–4 × 2–3 mm, base decurrent, apex obtuse; ultimate segments simple or forked, closely spaced, flat, oblong-linear, 1–3 × 0.5–0.8 mm, margin entire, apex obtuse. Veins dichotomous, slightly raised on each surface, brown, glabrous, with a single veinlet. Sori on upper parts of frond, apical on short acroscopic segments; involucre triangular or narrowly ovate, ca. 1.5 mm, with long thin teeth at apex, apex acuminate; lips deeply cleft, lobes constricted below base of involucre.

• On wet rocks near streams in forests; ca. 2200 m. NW Yunnan.

**16. *Hymenophyllum blandum*** Raciborski, Pteridoph. Buitenzorg, 20. 1898.

爪哇厚壁蕨 zhao wa hou bi jue

*Meringium blandum* (Raciborski) Copeland.

Rhizome long creeping, filiform, ca. 0.1 mm in diam., glabrescent. Stipe slender, 1–3 cm, wingless, sparsely hairy. Rachis slender, winged only near apex. Lamina oblong-ovate, 1-pinnate to bipinnatifid, but digitate in appearance, with ca. 10 segments; ultimate segments ca. 0.8 mm wide, margin pale green, denticulate, apex rounded, flat; pinnae simple or forked, or sometimes with 3 lobes of which basal acroscopic one possibly forked again; lobes linear, ca. 2 mm wide, margin toothed. Sori only near apex of lobes, rather short, with hollow conical base and rather short lips, lips broadly rounded, toothed, sometimes reflexed; receptacles projecting, much so in old sori, cylindrical.

On tree trunks in forests, very rare; 700–1400 m. Taiwan [Indonesia, Malaysia, New Guinea, Philippines, Thailand].

**17. *Hymenophyllum denticulatum*** Swartz, J. Bot. (Schrad.) 1800(2): 100. 1801.

厚壁蕨 hou bi jue

*Meringium denticulatum* (Swartz) Copeland.

Plants 3–5 cm tall. Rhizome long creeping, brown, very slender, ca. 0.2 mm in diam., sparsely hairy or subglabrous, with sparse brown hairy rootlets. Stipe brown, 0.5–1.5 cm, slender, sparsely hairy, narrowly winged, edges of wings somewhat toothed. Lamina bipinnate to tripinnatifid, subdeltoid-ovate or oblong, 2–4 × 1.5–2 cm; pinnae 4–6 pairs, closely spaced, alternate, sessile, ovate or oblong, 0.5–1 cm × 3–7 mm, base unequally cuneate, apex obtuse, with 3–7 segments; ultimate segments 1.5–3 × 0.6–0.9 mm, with a single veinlet, decurrent at base to form wings of axes, margin sharply toothed, apex obtuse; wings of rachis and costae (sometimes ultimate segments also) toothed and crisped to varying degrees. Veins dichotomous, dark brown, glabrous; cell walls rather thick, coarsely pitted. Sori apical on short acroscopic segments, usually near rachis in upper part of frond; involucre obconic, tubular with bilabiate mouth, with accessory wings, lips serrate, rounded to moderately acute.

On moss-covered tree trunks or wet rocks in dense dark forests, usually along streams; 400–900 m. Guangdong, Guangxi, Hainan, N, S, and SE Taiwan [N India, Japan (Ryukyu Islands), Malesia, Myanmar, Sri Lanka, Thailand, Vietnam; Pacific islands (Fiji)].

**18. *Hymenophyllum holochilum*** (Bosch) C. Christensen, Index Filic. 362. 1905.

南洋厚壁蕨 nan yang hou bi jue

*Didymoglossum holochilum* Bosch, Pl. Jungh. 1: 561. 1856; *Hymenophyllum subdimidiatum* Rosenstock; *Leptocionium holochilum* (Bosch) Bosch; *Meringium holochilum* (Bosch) Copeland.

Plants 5–10 cm tall. Rhizome long creeping, filiform,

slender, sparsely hairy. Stipe brown, ca. 3 cm, slender, sparsely hairy, very narrowly winged. Rachis hairy on lower surface, usually winged throughout, wings entire. Lamina bipinnate to tripinnatifid, lanceolate to oblong-lanceolate, 4–6 × 1.5–2 cm; pinnae 5–7 pairs, closely spaced, alternate, sessile, broadly ovate, oblique, unequally cuneate at base, with 3–6 segments; ultimate segments simple, rarely forked, closely spaced, linear, with a single veinlet, margin sparsely toothed, apex obtuse. Veins dichotomous, brown, obvious on each surface. Sori large, apical on short acroscopic segments; involucre ovate to elliptic, narrowly winged, cleft to 1/3–1/2, lips entire and slightly revolute; receptacles projecting.

On trees in tropical evergreen forests; 700–1400 m. Taiwan [Malaysia, Thailand; Pacific islands (Melanesia, Micronesia, Polynesia)].

**19. *Hymenophyllum digitatum*** (Swartz) Fosberg, Smithsonian Contr. Bot. 45: 1. 1980.

指状细口团扇蕨 zhi zhuang xi kou tuan shan jue

*Trichomanes digitatum* Swartz, Syn. Fil. 370, 422. 1806; *Microtrichomanes digitatum* (Swartz) Copeland.

Rhizome long creeping, very slender, wiry, with simple, brown, slightly downy hairs; hairs usually sparse at internodes, but crowded at nodes and roots. Stipe 8–30 mm, very slender, not winged, with sparse brown hairs. Lamina dichotomously branched, or sometimes with an indistinct rachis at base, sometimes with unequal branches; branches and ultimate lobes 1.5–2.5 mm wide, longest lobes ca. 2 cm; margins setiferous, setae dark brown, simple, short, stiff. Sori sunken in apices of lobes; hollow part of involucre obconical; mouth slightly 2-lipped, lips slightly rounded; receptacles usually projecting on older sori.  $2n = 72, 144$ ,

On muddy rocks in dense tropical evergreen forests; 1400–1600 m. S and SE Taiwan [Malaysia, Thailand, Vietnam; Africa, Indian Ocean islands (Mascarene Islands), Madagascar, Pacific islands (Melanesia, Micronesia, Polynesia)].

**20. *Hymenophyllum nitidulum*** (Bosch) Ebihara & K. Iwatsuki, Taxon 53: 941. 2004.

细口团扇蕨 xi kou tuan shan jue

*Trichomanes nitidulum* Bosch, Pl. Jungh. 1: 547. 1856; *Gonocormus nitidulus* (Bosch) Prantl; *Microtrichomanes nitidulum* (Bosch) Copeland; *Sphaerocionium nitidulum* (Bosch) K. Iwatsuki.

Plants ca. 3 cm tall. Rhizome creeping, black, filiform, ca. 0.1 mm in diam., with sparse brown downy hairs. Stipes 3–6 mm apart, 2–2.5 cm, slender, nearly wingless. Lamina nearly fan-shaped or obovate, 1–2 × 1.5–2 cm, subglabrous, dichotomously lobed, dissected to base, base shortly cuneate; lobes simple or forked, linear, 0.5–1 cm × 1–2 mm, with a single veinlet, margin entire, apex obtuse to rounded. Sori terminal on lobes; involucre sunken in apices of lobes, obdeltoid.

On tree trunks; 1300–1800 m. Guangxi, Taiwan, Yunnan [Malaysia, Sri Lanka, Vietnam].

**21. *Hymenophyllum pilosissimum*** C. Christensen, Gard. Bull. Straits Settlements 7: 213. 1934.

星毛膜蕨 xing mao mo jue

*Sphaerocionium pilosissimum* (C. Christensen) Copeland.

Rhizome long creeping, slender, wiry, 0.2–0.3 mm in diam., irregularly branching, densely covered with hairs or glabrescent in older portion; hairs slender, brown to pale brown, multicellular and simple or stellate, with a simple stalk cell and 3-forked, biforked, or simple multicellular arms, simple longest ones up to 1.5 mm. Roots irregularly arising from rhizome, with brownish simple hairs. Stipes remote, slender, 0.2–0.3 mm in diam., 2–4 cm but variable, much shorter than laminae, terete in lower portion, narrowly winged in upper portion, covered throughout with stellate hairs. Rachis distinctly winged throughout, winged rachis similar to segments, ± zigzag in upper portion, densely covered by stellate hairs. Fronds pale green in living plant, brown when dried, bipinnate to tripinnate, oblong-lanceolate to lanceolate, (1.5–)4–7(–12) × (1–)1.7–2.5(–3.5) cm, but variable in size and fully soriferous in smaller fronds, usually widest at middle, rounded to moderately acute at apex; pinnae usually more than 10 pairs, upper ones becoming smaller and indistinct, larger ones stalked, bipinnatifid, or with 2- or 3-forked pinnules, oblong-ovate in outline, sometimes up to 4 cm, more than 1 cm wide, winged throughout and similar to segments, densely stellate hairy; ultimate segments linear, sometimes elongate up to 1 cm, (0.7–)1.3–1.7 mm wide, 1-veined with hairy veinlets, margin entire and hairy, apex rounded to moderately acute, or obtuse, or often retuse. Lamina cells larger; internal cell walls thin, straight. Hairs stellate, usually very dense on stipes, on both surfaces of all axes including veinlets, and at margin of segments and wings of rachis and pinna rachis, usually solitary on veins but 2 or 3 hairs articulate at margin, each with 1 stalk cell and (1–)3–5( or 6) unicellular arms, stalk cells tinted pale brown, thick, ca. 0.3 mm, arm cells needlelike, slender, stiff, semitransparent, up to 0.7 mm. Sori solitary at apex of ultimate segments, often at distal end of segment and apparently arranged marginally on upper parts of frond, deeply immersed, ca. 0.8 × 1–1.2 mm; involucre bivalvate in upper 2/3, shallowly cup-shaped in lower immersed portion, semicircular or slightly wider, as wide as ultimate segments; receptacles included, short, clavate.

Epiphytic on moss-covered tree trunks in cloud forests, or on rocks on slopes in wet forests; 400–1800 m. N and S Taiwan [Indonesia (Borneo), New Guinea, Philippines].

**22. *Hymenophyllum pallidum*** (Blume) Ebihara & K. Iwatsuki, Blumea 51: 232. 2006.

毛叶蕨 mao ye jue

*Trichomanes pallidum* Blume, Enum. Pl. Javae 2: 255. 1828; *Craspedoneuron pallidum* (Blume) Bosch; *Crepidomanes pallidum* (Blume) K. Iwatsuki; *Pleuromanes pallidum* (Blume) C. Presl.

Plants 4–12 cm tall. Rhizome light brown, ca. 0.3 mm in diam., with light brown spreading hairs, with sparse rootlets. Stipes 0.5–3 cm apart, dark brown, 1–6 cm, with light brown hairs at base, glabrous upward, wingless. Lamina bipinnatifid to bipinnate, oblong or ovate-lanceolate, 3.5–8 × 1–2 cm, base cuneate, apex obtuse; pinnae 8–10 pairs, closely spaced or

slightly imbricate to neighboring ones, alternate, sessile, oblong-ovate to ovate, 1–1.8 cm × 5–6 mm, oblique, base cuneate, margin parted, apex obtuse; ultimate segments closely spaced, linear, 0.8–1 mm wide, with a single veinlet, entire, obtuse at apex. Veins filiform, brown, dichotomous.  $2n = 72$ .

On wet muddy rocks or tree trunks in dense forests; 800–1400 m.

Hainan, S and SE Taiwan [India, Malesia, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands (Melanesia, Micronesia, Polynesia)].

A less-hairy form collected in E and SE Taiwan was attributed to *Hymenophyllum acutum* (C. Presl) Ebihara & K. Iwatsuki (Blumea 51: 232. 2006; *Trichomanes acutum* C. Presl, Hymenophyllaceae, 42. 1843; *Crepidomanes acutum* (C. Presl) K. Iwatsuki) by Knapp (Ferns Fern Allies Taiwan, 442. 2011). However, further study is needed.

#### Excluded taxa

**Hymenophyllum wrightii** Bosch, Ned. Kruidk. Arch. 4: 391. 1859.

莱氏露蕨 lai shi lu jue

*Mecodium wrightii* (Bosch) Copeland.

Plants 1.5–5 cm tall. Rhizome brown or blackish, ca. 0.1 mm in diam., glabrescent. Stipes remote, 1.5–2 cm apart, glabrous, with wings at apex (sometimes decurrent to middle or nearly to base), wings flat. Lamina 2- or 3-pinnatifid, green, ovate-lanceolate, usually 1.5–3.5 × 1–1.5 cm, membranous, glabrous or with a few multicellular hairs, base cordate or

sometimes nearly truncate, apex obtuse; free lateral pinnae 2 or 3 pairs, alternate, spreading, ovate or obovate, base cuneate to rounded, apex obtuse or rounded; ultimate segments narrowly elliptic to oblong, 8–10 × 3–4 mm, with 1 veinlet at middle of each segment; segments entire, apex rounded, adnate to costae. Veins dichotomous, obvious; rachis and costae with flat wings throughout. Sori on upper parts of fronds, terminal on segments; involucre 1 per segment, bivalvate, cleft to base, entire, rounded at apex.  $2n = 56, 84$ .

On rocks or tree trunks in wet forests. Taiwan [Japan, Korea, Russia (Siberia); North America (W Canada)].

## 6. DIDYMOGLOSSUM Desvaux, Mém. Soc. Linn. Paris 6: 330. 1827.

毛边蕨属 mao bian jue shu

Rhizome filiform, long creeping, with dense hairs, rootless. Lamina small, simple to pinnately decompose, entire or setiferous at margin; false veinlets usually oblique, many, or absent. Sori marginal; involucre campanulate with bilabiate mouth; receptacles projecting.

About 19 species: from tropical and subtropical America across Africa to Sri Lanka; five species in China.

- 1a. Marginal hairs present ..... 1. *D. wallii*  
 1b. Marginal hairs absent.  
 2a. Lamina peltate ..... 5. *D. tahitense*  
 2b. Lamina not peltate.  
 3a. Fronds very small, less than 1 cm ..... 3. *D. motleyi*  
 3b. Fronds larger, 1–2.5 cm or more.  
 4a. Submarginal false veinlets absent ..... 4. *D. sublimbatum*  
 4b. Submarginal false veinlets present ..... 2. *D. bimarginatum*

**1. Didymoglossum wallii** (Thwaites) Copeland, Philipp. J. Sci. 67: 78. 1938.

毛边蕨 mao bian jue

*Trichomanes wallii* Thwaites in Ferguson, Ceylon Ferns, preface. 1880.

Rhizome slender, ca. 0.1 mm in diam., densely hairy; hairs brown. Stipes remotely spaced, or fronds sessile or nearly so. Lamina simple, margin obscurely lobed at most 1/4 way to costae, oblong to linear-oblong, gradually narrowed downward, base subtruncate to cuneate, marginal hairs present, apex rounded to obtuse. Lateral veins simple or forked; false veinlets oblique, parallel to lateral veins, long, ending just within margin, without marginal veins. Sori solitary on apical part of frond; involucre tubular with dilated mouth, completely immersed in frond, 1.5–2 mm.

On rocks in forests; ca. 500 m. Hainan [S Sri Lanka].

*Didymoglossum wallii* was first recorded in China by W. M. Chu and H. G. Zhou (Acta Bot. Yunnan. 16: 125. 1994).

**2. Didymoglossum bimarginatum** (Bosch) Ebihara & K. Iwatsuki, Blumea 51: 236. 2006.

叉脉单叶假脉蕨 cha mai dan ye jia mai jue

*Microgonium bimarginatum* Bosch, Hymenophyll. Javan. 7. 1861; *Trichomanes bimarginatum* (Bosch) Bosch.

Plants 2–3 cm tall. Rhizome densely covered with dark brown multicellular hairs. Stipes 3–4 mm apart, 2–5 mm, densely hairy. Lamina oblong, oblong-ovate, or obovate, ca. 2 cm × 3–5 mm, membranous, glabrous, base cuneate, margin entire or ± crisped, apex rounded to obtuse. Veins pinnate, simple or forked, to margin of lamina; oblique false veinlets many, long, marginal ones continuous with a single row of marginal cells outside strand, joining ends of oblique ones. Sori 1–3 on apical part of frond, terminal on lateral veins; involucre tubular with dilated mouth, with expanded wings, somewhat bilabiate; receptacles projecting.  $2n = 136$ .

On moss-covered rocks or moss-covered tree trunks; 400–600 m. C, ?N, and SE Taiwan [S India, Japan (Ryukyu Islands), Malesia, Sri

Lanka, Thailand; Australia, Pacific islands (Melanesia, Micronesia, Samoa)].

**3. *Didymoglossum motleyi*** (Bosch) Ebihara & K. Iwatsuki, *Blumea* 51: 236. 2006.

细柄单叶假脉蕨 xi bing dan ye jia mai jue

*Microgonium motleyi* Bosch, *Hymenophyll. Javan.* 5. 1861; *M. beccarianum* (Cesati) Copeland; *Trichomanes beccarianum* Cesati; *T. motleyi* (Bosch) Bosch.

Plants small, less than 1 cm tall. Rhizome densely covered with dark brown multicellular hairs. Laminae 1–3 mm apart or closely spaced and slightly imbricate to neighboring ones, sessile or on very short hairy stipes, brown and powdery when dry, ovate, oblong, or linear-oblong, 5–6 mm, membranous, with very fine radiating veins and a short main vein, marginal continuous veinlets absent, base broadly rounded and truncate, margin entire or rarely crisped, apex obtuse. Sori single, terminating segments; involucre usually protruding, tubular, ca. 2 mm.  $2n = 68$ .

Base of tree trunks in dense primary forests, also on moss-covered rocks; 100–400 m. S and SE Taiwan [Japan (Ryukyu Islands), Malaysia, Myanmar, Sri Lanka, Thailand; Australia (Queensland), Pacific islands (Melanesia, Micronesia)].

**4. *Didymoglossum sublimbatum*** (Müller Berol.) Ebihara & K. Iwatsuki, *Blumea* 51: 236. 2006.

单叶假脉蕨 dan ye jia mai jue

*Trichomanes sublimbatum* Müller Berol., *Bot. Zeitung* (Berlin) 12: 737. 1854; *Microgonium sublimbatum* (Müller Berol.) Bosch.

Rhizome ca. 0.2 mm in diam., densely hairy; hairs brown, simple, less than 0.4 mm. Stipes usually 5–7 mm apart, less than 3 mm, very narrowly winged except basal 1–2 mm, densely hairy like rhizome. Lamina simple, oblong to linear-oblong, 1–2.5 cm, less than 1 cm wide, gradually narrowed

downward, base subtruncate to cuneate, margin obscurely lobed at most 1/4 way to costae, apex rounded to obtuse. Lateral veins 3 or 4 pairs, simple or forked; false veinlets oblique, parallel to lateral veins, long, ending just within margin, usually several to 15 lines between adjacent lateral veins, without marginal veins. Sori up to 5 on apical part of frond, terminal on lobes; involucre completely immersed in frond, tubular with dilated mouth, 1.5–2 mm, less than 1 mm in diam., mouth up to 2 mm in diam.

On muddy rocks usually in dark wet forests; ca. 400 m (in Taiwan) up to high elevations. Guangxi, Guizhou, Taiwan, Yunnan [India (Assam), Indonesia (Java), Malaysia, New Guinea, Thailand, Vietnam].

**5. *Didymoglossum tahitense*** (Nadeaud) Ebihara & K. Iwatsuki, *Blumea* 51: 236. 2006.

盾形单叶假脉蕨 dun xing dan ye jia mai jue

*Trichomanes tahitense* Nadeaud, *Énum. Pl. Tahiti*, 18. 1873; *Microgonium omphalodes* Vieillard & E. Fournier; *M. tahitense* (Nadeaud) Tindale; *T. omphalodes* (Vieillard & E. Fournier) C. Christensen.

Plants small, circular in outline. Rhizome densely covered with dark brown multicellular hairs, rootless. Laminae closely spaced, simple, sessile, peltate, directly on rhizome, subcircular in outline, 1–3 cm in diam., slightly crisped at margin or irregularly lobed to 1/3–2/3. Veins 2 or 3 times pinnately divided, or further dichotomously branching, finally lacking tracheids and becoming false veinlets; abaxial surface of fronds with many dark brown hairs along veins and false veins. Sori 1–5, sparsely terminal on true veins running to lamina margin, projecting from margin; involucre tubular with dilated mouth, 2–3 × ca. 2 mm, bilabiate; receptacles projecting, filiform.  $2n = 68$ .

On wet rocks or on tree trunks along streams in densely forested lowlands; 100–700 m. E, N, and S Taiwan [Indonesia (Java), Japan, Malaysia, Vietnam; Australia, Pacific islands (Melanesia, Micronesia, Polynesia)].

## 7. *VANDENBOSCHIA* Copeland, *Philipp. J. Sci.* 67: 51. 1938.

瓶蕨属 ping jue shu

Plants mostly epiphytic. Rhizome stout, long creeping, usually with brown multicellular hairs. Lamina pinnately compound, entire, not thickened at margin. Sori terminal on veinlets; involucre projecting from fronds, tubular to cup-shaped, entire at mouth; receptacles projecting, filiform.

About 35 species: tropics and subtropics of both the Old and New Worlds; seven species (two endemic) in China.

- 1a. Fronds sessile or nearly so.
- 2a. Lamina bipinnate to tripinnatifid, rachis broadly winged ..... 4. *V. fargesii*
- 2b. Lamina 1-pinnate to bipinnatifid, rachis wingless or very narrowly winged ..... 1. *V. auriculata*
- 1b. Stipes at least 1 cm.
- 3a. Rachis wings sharply crisped ..... 5. *V. lofoushanensis*
- 3b. Rachis wings flat or slightly crisped.
- 4a. Mouth of involucre distinctly dilated.
- 5a. Stipes less than 5 cm; basal pinnae: 3 or more pairs strongly shortened ..... 3. *V. cystoseiroides*
- 5b. Stipes more than 10 cm; basal pinnae: 1 or 2 pairs shortened ..... 6. *V. maxima*
- 4b. Mouth of involucre not dilated, or sometimes slightly dilated.
- 6a. Fronds commonly less than 20 cm; rhizome slender, ca. 1 mm in diam. .... 2. *V. kalamocarpa*
- 6b. Fronds more than 20 cm; rhizome thick, usually more than 1.5 mm in diam. .... 7. *V. striata*

**1. *Vandenboschia auriculata*** (Blume) Copeland, Philipp. J. Sci. 67: 55. 1938.

瓶蕨 ping jue

*Trichomanes auriculatum* Blume, Enum. Pl. Javae 2: 225. 1828; *Cephalomanes auriculatum* (Blume) Bosch; *Crepidomanes auriculatum* (Blume) K. Iwatsuki; *Lacostea auriculata* (Blume) Prantl; *Vandenboschia hainanensis* Ching & P. S. Chiu.

Plants 12–30 cm tall. Rhizome smoke-colored, 2–3 mm in diam., stiff, densely covered with dark brown multicellular hairs, hairs caducous. Stipes remote, 3–5 cm apart, smoke-colored, 4–8 × ca. 1 mm, with multicellular hairs at base, wingless or narrowly winged. Rachis smoke-colored, very narrowly winged or nearly wingless, subglabrous. Lamina 1-pinnate, lanceolate, 15–30 × 3–5 cm; pinnae 18–25 pairs, closely spaced, alternate, sessile, ovate-oblong, 2–3 × 1–1.5 cm, apex rounded to obtuse. Lamina and rachis glabrous to densely hairy. Sori apical on short acroscopic segments, 10–14 per pinna; involucre narrowly tubular, 2–2.5 mm, truncate at mouth; receptacles projecting, ca. 4 mm.  $2n = 72$ .

Usually on tree trunks; 500–2700 m. Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, Cambodia, NE India, Japan, Laos, Malesia, Myanmar, Nepal, Thailand; Pacific islands (Micronesia)].

**2. *Vandenboschia kalamocarpa*** (Hayata) Ebihara, Acta Phytotax. Geobot. 60: 32. 2009.

管苞瓶蕨 guan bao ping jue

*Trichomanes kalamocarpum* Hayata, Icon. Pl. Formosan. 5: 260. 1915; *T. parvum* Copeland; *Vandenboschia parva* (Copeland) Copeland.

Plants 5–15 cm tall. Rhizome deep smoke-colored, 1–1.5 mm in diam., with dense dark brown multicellular hairs, with sparse hairy rootlets. Stipes remote, 2–4 cm apart, light brown, 2–8 cm × 0.8–1 mm, glabrous, broadly winged nearly to base. Rachis and costae broadly winged throughout, sometimes slightly crisped, glabrous. Lamina bipinnate to tripinnatifid, broadly lanceolate, 3–10 × 1.5–3 cm, membranous, glabrous; pinnae 10–12 pairs, alternate, sessile, spreading, oblong-ovate, 1–2.5 × 0.5–2 cm, base unequally cuneate, apex obtuse; ultimate segments simple or forked, narrowly linear, 2–3 × 0.6–0.8 mm, with 1 (or 2) veinlets, margin entire, apex rounded. Veins dichotomous, dark green-brown, obviously raised on each surface, glabrous. Sori on upper parts of frond, apical on short acroscopic segments; involucre tubular, ca. 1.5 mm, truncate to slightly dilated at mouth, narrowly winged, lobes slightly constricted below base of involucre; receptacles projecting, brown, filiform, ca. 3 mm, straight.  $2n = 144$ .

On wet rocks near streams in forests, also on steep slopes in ravines; 500–2000 m. Jiangxi, Taiwan [Japan].

Diploids and triploids are known (see Ebihara et al., Acta Phytotax. Geobot. 60: 26–40. 2009).

**3. *Vandenboschia cystoseiroides*** (Christ ex Tardieu & C. Christensen) Ching, Fl. Reipubl. Popularis Sin. 2: 183. 1959.

墨兰瓶蕨 mo lan ping jue

*Trichomanes cystoseiroides* Christ ex Tardieu & C. Christensen, Bull. Mus. Natl. Hist. Nat., sér. 2, 6: 385. 1934; *Crepidomanes cystoseiroides* (Christ ex Tardieu & C. Christensen) K. Iwatsuki; *Vandenboschia assimilis* Ching & P. S. Chiu.

Plants 30–50 cm tall. Rhizome dark brown, 1.5–2.5 mm in diam., stiff, densely covered with dark brown multicellular hairs. Stipes remote, 2–5 cm apart, 4–10 cm × ca. 1 mm, winged nearly to base, hairy at base, glabrous upward. Rachis winged throughout, glabrous. Lamina bipinnate to tripinnatifid, ovate-lanceolate or broadly lanceolate, 15–35 × 4–8 cm, herbaceous to membranous, glabrous; pinnae 15–20 pairs, alternate, sessile, oblong-ovate to oblong-lanceolate, base unequally cuneate, apex obtuse to acuminate; ultimate segments closely spaced, oblong-linear, 1–2 × 0.8–1 mm, with a single veinlet, margin entire, apex rounded. Veins dichotomous, dark green-brown, obviously raised on each surface, glabrous. Sori on short axillary lobes usually near pinnule rachis; involucre funnel-shaped or tubular, narrowly winged, usually dilated at mouth, lobed, lips often revolute; receptacles projecting, brown, ca. 2 mm.

On rocks or tree trunks near streams; 300–500 m. Hainan, SE Yunnan [N Vietnam].

**4. *Vandenboschia fargesii*** (Christ) Ching, Fl. Reipubl. Popularis Sin. 2: 179. 1959.

城口瓶蕨 cheng kou ping jue

*Trichomanes fargesii* Christ, Bull. Soc. Bot. France 52(Mém. 1): 10. 1905; *Crepidomanes fargesii* (Christ) K. Iwatsuki.

Plants medium-sized, epiphytic. Rhizome ca. 0.5 mm in diam., smoke-colored, rootless, with sparse brown multicellular hairs, often with axillary hairy buds. Fronds alternate, closely spaced, spreading, sessile; stipe very short, smoke-colored, sparsely hairy, narrowly winged. Rachis and costae smoke-colored, winged throughout. Lamina bipinnate to tripinnatifid, broadly lanceolate, 6–7 × 2.5–3 cm, membranous and semi-transparent, glabrous; pinnae 15–18 pairs, closely spaced or slightly imbricate to neighboring ones, alternate, sessile, narrowly oblong, base unequally cuneate, apex subrounded; ultimate segments narrowly linear, ca. 0.5 mm wide, margin entire, apex rounded. Veins dichotomous, smoke-colored, obviously raised on each surface, with light brown hairs as rachis and costae. Sori on upper parts of frond, terminal on lower lobes of pinnae; involucre shortly funnel-shaped, ca. 1.5 × 1 mm, narrowly winged, truncate and slightly dilated at mouth; receptacles long projecting, black, ca. 3 mm, bent.

• On tree trunks or on rocks in forests; 1100–1800 m. Chongqing, Guizhou, Yunnan.

**5. *Vandenboschia lofoushanensis*** Ching, Fl. Reipubl. Popularis Sin. 2: 356. 1959.

罗浮山瓶蕨 luo fu shan ping jue

*Crepidomanes lofoushanense* (Ching) K. Iwatsuki.



Plants 15–18 cm tall. Rhizome dark brown, 1.5–2 mm in diam., densely covered with dark brown multicellular hairs, with sparse hairy rootlets. Stipes remote, 0.5–2 cm apart, light green, 5–10 cm × ca. 1 mm, broadly winged nearly to base, wings slightly crisped. Rachis and costae light green-brown, wings slightly crisped, glabrous. Lamina tripinnate, oblong-ovate, 8–10 × 4–5 cm, membranous, glabrous; pinnae 8–10 pairs, alternate or basal ones opposite, oblong-ovate to ovate-triangular, 2–3 × 1.5–2 cm, base subcordate to unequally cuneate, apex obtuse; pinnules 3–5 pairs, alternate, sessile, ovate to oblong, 8–10 × 4–6 mm, base cuneate, margin parted, apex obtuse; ultimate segments closely spaced, simple or forked, narrowly linear, 2–3 × ca. 0.8 mm, margin entire, apex rounded. Veins dichotomous, obviously raised on each surface, glabrous, with 1 (or 2) veinlets. Sori on upper parts of frond, apical on short acroscopic segments; involucre narrowly tubular, ca. 1 mm, narrowly winged, truncate and not dilated at mouth; receptacles long projecting, ca. 3 mm, slightly bent.

- On rocks in forests. Guangdong.

**6. *Vandenboschia maxima*** (Blume) Copeland, Philipp. J. Sci. 67: 54. 1938.

大叶瓶蕨 da ye ping jue

*Trichomanes maximum* Blume, Enum. Pl. Javae 2: 228. 1828; *Crepidomanes maximum* (Blume) K. Iwatsuki; *T. miyakei* Yabe.

Plants usually large, epiphytic. Rhizome black, ca. 3 mm in diam., densely covered with black multicellular hairs when young, hairs caducous, often with axillary hairy buds. Stipes remote, 1–2.5 cm apart, smoke-colored, 15–30 cm × 1.5–2 mm, winged nearly to base, sparsely hairy at base, glabrous upward. Lamina tripinnate to quadripinnatifid, oblong-lanceolate or ovate, 20–35 × 10–15 cm, membranous, glabrous; pinnae 10–15 pairs, alternate, ovate-oblong, 8–12 × 2–3 cm, basal ones shortened. Veins dichotomous, light smoke-colored, obviously raised on each surface, glabrous. Sori apical on acroscopic segments; involucre narrowly tubular to funnel-shaped, 2–2.5 mm, narrowly winged, dilated at mouth; receptacles projecting, 1–2 mm.  $2n = 72$ .

On wet muddy rocks or on wet sandy ground near streams in dense dark forests; 300–400 m. Taiwan [Japan (Ryukyu Islands), Malasia, Thailand, Vietnam; Australia, Pacific islands (Melanesia, Micronesia, Polynesia)].

***Vandenboschia subclathrata*** K. Iwatsuki, Acta Phytotax. Geobot. 17: 70. 1958.

琉球瓶蕨 liu qiu ping jue

*Crepidomanes subclathratum* (K. Iwatsuki) K. Iwatsuki; *Trichomanes subclathratum* (K. Iwatsuki) C. V. Morton.

Plants 6–10 cm tall. Rhizome ca. 0.3 mm in diam., irregularly branching, densely covered with brown to dark brownish hairs, with sparse rootlets. Stipes remote, 1–2 cm apart, 0.5–5 cm, winged nearly to base, wings often sharply crisped. Rachis

**7. *Vandenboschia striata*** (D. Don) Ebihara, **comb. nov.**

南海瓶蕨 nan hai ping jue

Basionym: *Trichomanes striatum* D. Don, Prodr. Fl. Nepal. 11. 1825; *Crepidomanes birmanicum* (Beddome) K. Iwatsuki; *C. radicans* (Swartz) K. Iwatsuki var. *naseanum* (Christ) K. Iwatsuki; *C. striatum* (D. Don) Thapa; *T. birmanicum* Beddome; *T. naseanum* Christ; *T. radicans* Swartz var. *birmanicum* (Beddome) C. Christensen; *T. radicans* var. *naseanum* (Christ) Lellinger; *T. somae* Nakai; *Vandenboschia birmanica* (Beddome) Ching; *V. naseana* (Christ) Ching; *V. radicans* (Swartz) Copeland var. *naseana* (Christ) H. Itô.

Plants 15–40 cm tall. Rhizome deep smoke-colored, 1–1.5 mm in diam., densely covered with dark brown multicellular hairs, with sparse hairy rootlets. Stipes remote, 2–4 cm apart, light brown, 4–10 cm × 0.8–2.5 mm, glabrous, broadly winged nearly to base. Rachis and costae broadly winged throughout, glabrous. Lamina tripinnate to quadripinnatifid, broadly lanceolate, 8–14 × 2.5–5 cm, membranous, glabrous; pinnae 10–12 pairs, alternate, sessile, spreading, oblong-ovate, 1–2.5 × 0.5–2 cm, base unequally cuneate, apex obtuse; pinnules 3–5 pairs, alternate, sessile, cuneate to obovate, 3–7 × 2.5–6 mm, base decurrent, apex obtuse; ultimate segments simple or forked, narrowly linear, 2–3 × 0.6–0.8 mm, with 1 (or 2) veinlets, margin entire, apex rounded. Veins dichotomous, dark green-brown, obviously raised on each surface, glabrous. Sori on upper parts of frond, apical on short acroscopic segments; involucre tubular, ca. 1.5 mm, truncate and not dilated at mouth, narrowly winged, lobes slightly constricted below base of involucre; receptacles projecting, brown, filiform, ca. 3 mm, straight.  $2n = 72$ .

On wet rocks near streams, slopes; (?100–)400–2700 m. Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Bhutan, NE India, Japan, Laos, Myanmar, Nepal, Vietnam].

*Trichomanes striatum* is now confirmed as an earlier name for the plant formerly called *Vandenboschia birmanica* (see Ebihara et al., Acta Phytotax. Geobot. 60: 33. 2009).

The names *Vandenboschia radicans* (Swartz) Copeland (Philipp. J. Sci. 67: 54. 1938; *Trichomanes radicans* Swartz, J. Bot. (Schrader) 1800(2): 97. 1801) and *V. orientalis* (C. Christensen) Ching (Fl. Reipubl. Popularis Sin. 2: 187. 1959; *T. orientale* C. Christensen, Index Filic. 646. 1906) have been misapplied to Chinese plants.

#### Excluded taxa

and costae both winged throughout, wings sharply crisped. Lamina bipinnate to tripinnatifid, ovate to subdeltoid, membranous and transparent; pinnae 4–10 pairs, ovate, 2–4 × ca. 1 cm; ultimate segments narrow, less than 1 mm wide, margin entire, apex rounded to ± acute. Sori terminal on ultimate segments; involucre cup-shaped, tubular, or campanulate, with narrow wings; lips broader, truncate; receptacles long projecting.

On wet moss-covered rocks in open valleys or along streams in dense evergreen forests. ?Hainan [Japan].