植 物 分 类 学 报 43(2): 97–115(2005)
Acta Phytotaxonomica Sinica

A taxonomic revision of the fern genus *Bolbitis* (Bolbitidaceae) from China

[1,2]DONG Shi-Yong [2]ZHANG Xian-Chun*

[1] (*South China Botanical Garden, the Chinese Academy of Sciences*, Guangzhou 510650, China)

[2] (*Laboratory of Systematic and Evolutionary Botany, Institute of Botany, the Chinese Academy of Sciences*, Beijing 100093, China)

Abstract A taxonomic revision of the Chinese species of *Bolbitis* based on studies of herbarium specimens and SEM observation of spores is presented in this paper. Twenty species and three hybrids are recognized in China. Among these, *B. costata* (C. Presl) Ching and *B. hookeriana* K. Iwats. are new records to China, *B. fengiana* (Ching) S. Y. Dong and *B. medogensis* (Ching & S. K. Wu) S. Y. Dong are new combinations. Eight new synonyms are proposed: *B. latipinna* Ching, *B. media* Ching & Chu H. Wang, *B. yunnanensis* Ching, *Egenolfia crassifolia* Ching, *E. crenata* Ching & P. S. Chiu, *E. fengiana* Ching, *E. medogensis* Ching & S. K. Wu and *E.* ×*yunnanensis* Ching & P. S. Chiu. Based on the perispore features, the spores of Chinese *Bolbitis* can be clearly divided into three types: type A with reticulate perispore, type B with cristate-undulate perispore and type C with smooth, undulate perispore. The perispore feature, as well as venation pattern and the pattern of apical part of a lamina, are the most important and useful characters for the delimitation of species in *Bolbitis.*

Key words *Bolbitis*, Bolbitidaceae, taxonomic revision, spore morphology, China.

The genus *Bolbitis* and the genus *Egenolfia* were established by Schott in 1834 (cf. Christensen, 1906). Iwatsuki (1959) merged *Egenolfia* into *Bolbitis* considering that the two genera cannot be satisfactorily defined. Hennipman (1977) accepted Iwatsuki's generic delimitation. He recorded seven species, one hybrid and a dubious species with distribution in China in his comprehensive worldwide monograph. Ching (1931) monographed the genus *Egenolfia* and recognized nine species and one variety. Two of the nine species are present in China. Ching and Wang (1983) described nine new species of *Bolbitis* and five new species of *Egenolfia* from Hainan, Xizang and Yunnan; Kuo (1990) reported a new hybrid, *B.* ×*nanjenensis* from Taiwan, and a species, *B. scalpturata* (Fée) Ching, as a new record to Taiwan; Chu and Zhou (1994) reported *B. deltigera* (Bedd.) C. Chr. as a new record to China. In the treatment of the Flora Reipublicae Popularis Sinicae 6 (1), 13 species of *Bolbitis* and 10 species of *Egenolfia* were included (Wang, 1999), but *B.* ×*nanjenensis*, *B. scalpturata* and *B. deltigera* were not mentioned.

Early in 1931, both Christensen and Ching recognized the close affinity of *Egenolfia* to *Bolbitis* (previously as *Campium* C. Presl). Christensen (1931) suggested placing the species of both in a single genus and dividing them into two sections: *Egenolfia* with free veins and *Bolbitis* with anastomosing veins. Ching's work in 1931 came to the same conclusion that the two genera might well be united, but he still maintained *Egenolfia* and *Bolbitis* as two genera for practical purposes, in view of that *Egenolfia* is exclusively a tropical Asiatic genus and it distinguishes itself from *Bolbitis* by free venation, dentate or erose scales and caespitose

Received: 8 December 2003 Accepted: 15 September 2004
Supported by the grant for surveying the biodiversity in South China from the Kadoorie Farm and Botanic Garden, Hong Kong Special Administrative Region, China, and the Special Project for Taxonomic and Floristic Researches from the Chinese Academy of Sciences.
* Author for correspondence. E-mail: <zhangxc@ibcas.ac.cn>.

leaves. When Iwatsuki (1959) observed a hybrid (*Bolbitis*×*laxireticulata*) with the inconstant venation and elucidated that none of the characters used by Ching can discriminate *Egenolfia* from *Bolbitis*, he merged *Egenolfia* into *Bolbitis*. In 1977, Hennipman's elaborate work on the genus *Bolbitis* shows that evidence from the habitat, morphology, karyology, gametophytes and juvenile leaves does not support *Egenolfia* as a distinct genus separated from *Bolbitis*.

In the present paper, the generic delimitation of *Bolbitis* follows Iwatsuki (1959) and Hennipman (1977). Our studies are based on both herbarium and field observations, as well as SEM observation of the spores. Twenty-two species and three hybrids of *Bolbitis* are recognized from China. Among these, *B. costata* (C. Presl) Ching and *B. hookeriana* K. Iwats. are new records to China.

The spores of 28 samples belonging to 17 species were examined under SEM. Three distinct types of spores in the Chinese *Bolbitis* can be distinguished, and the spore morphology proved very useful in species delimitation. Hennipman (1997) recognized four types of spores. Our observations agree with the description and division of spores given by Hennipman, but type D spores were not found in Chinese *Bolbitis.*

1 Material and methods

Herbarium materials for the morphological study were from PE, PYU, IBSC, KUN and SYS. Some taxa were studied in the field during two botanical expeditions to Hainan and one to Yunnan in 2002 and 2003. For the SEM-photography spores were stuck on aluminum stubs with double-sided tape and sputter-coated with gold. Spores were observed and photographed under a Hitachi S-800 scanning electron microscope. All materials for spore SEM study were from PE and the voucher specimens were listed in Table 1.

Table 1 Source of materials for SEM observation of spores

Species	Locality and voucher	Figure	Spore type
Bolbitis appendiculata (Willd.) K. Iwats.	Mt. Damaoshan (大帽山), Hong Kong (香港); K. Y. Chan 1279 (PE)	1: A	A
B. appendiculata	Mt. Limushan (黎母山), Hainan (海南); S. Y. Dong (董仕勇) 836 (PE)`		A
B. appendiculata	Wanning (万宁), Hainan (海南); S. Y. Dong et al. (董仕勇等) 559 (PE)		Abortive
Egenolfia crenata Ching & P. S. Chiu (=*B. appendiculata*)	Jinping (金平), Yunnan (云南); Sino-USSR Yunnan Exped. (中苏联合云南考察队) 892 (PE)		A
B. medogensis (Ching & S. K. Wu) S. Y. Dong	Mêdog (墨脱), Xizang (西藏); Plateau Ecology Exped. (高原生态组) 11252 (PE)	1: B, C	A
B. angustipinna×*sinensis* Hennipman	Jinghong (景洪), Yunnan (云南); Sino-USSR Yunnan Exped. (中苏联合云南考察队) 5775 (PE)		Abortive
B. annamensis Tardieu & C. Chr. (=*B. heteroclita* (C. Presl) Ching)	Annam, Vietnam; Cadiere 149 (PE)		B
E. bipinnatifida J. Sm. (=*B. sinensis* (Baker) K. Iwats.)	Jinghong (景洪), Yunnan (云南); C. W. Wang (王启无) 7902 (PE)		Abortive
B. fengiana (Ching) S. Y. Dong	Malipo (麻栗坡), Yunnan (云南); K. M. Feng (冯国楣) 13971 (PE)	1: H	B
B. hekouensis Ching	Hekou (河口), Yunnan (云南); S. K. Wu (武素功) 4056 (PE)	1: L	B
B. heteroclita (C. Presl) Ching	Mt. Limushan (黎母山), Hainan (海南); S. Y. Dong (董仕勇) 867 (PE)	2: C	B
B. heteroclita	Without precise locality, Sichuan (四川); Z. Y. Zhu (祝正银) 768 (PE)		B
B. rhizophylla (Kaulf.) Hennipman	Luzon, Philippines; Anonymous s.n. (PE)	1: D, E	B

Table 1 (continued)

Species	Locality and Voucher	Figure	Spore type
B. scandens W. M. Chu	Lüchun (绿春), Yunnan (云南); W. M. Chu et al. (朱维明等) 6733 (PE)	1: J, K	B
B. sinensis	Without precise locality, Yunnan (云南); Sino-USSR Yunnan Exped. (中苏联合云南考察队) 7300 (PE)	1: F	B
B. subcordata (Copel.) Ching	Mt. Wuzhishan (五指山), Hainan (海南); Hainan Exped. (海南队) 1816 (PE)	2: A, B	B
B. subcordata	Wanning (万宁), Hainan (海南); S. Y. Dong et al. (董仕勇等) 558 (PE)		B
B. subcordata	Wanning (万宁), Hainan (海南); S. Y. Dong et al. (董仕勇等) 557 (PE)		B
B. subcordata	Jinxiu (金秀), Guangxi (广西); Y. J. Wang (王燕杰) 5190 (PE)		Abortive
B. subcordata	Rongshui (融水), Guangxi (广西); S. H. Chun (陈少卿) 15679 (PE)		B
B. tibetica Ching & S. K. Wu	Mêdog (墨脱), Xizang (西藏); Qinghai-Xizang Exped. (青藏队) 74-4551 (PE)	1: I	B
B. tonkinensis (C. Chr.) K. Iwats.	Tonkin, Vietnam; Hanoi 3396 (PE)	1: G	B
B. angustipinna (Hayata) H. Ito	Jinghong (景洪), Yunnan (云南); Sino-USSR Yunnan Exped. (中苏联合云南考察队) 5699 (PE)	2: I, J	C
B. angustipinna	Mt. Qixianling (七仙岭), Hainan (海南); S. Y. Dong (董仕勇) 920 (PE)		C
B. costata (C. Presl) Ching	Yingjiang (盈江), Yunnan (云南); Yunnan Univ. West Yunnan Pl. Exped. (云南大学滇西植物调查组) 10664 (PE)	2: K, L	C
B. deltigera (Bedd.) C. Chr.	Yingjiang (盈江), Yunnan (云南); Yunnan Univ. West Yunnan Pl. Exped. (云南大学滇西植物调查组) 10901 (PE)	2: F	C
B. hainanensis Ching & Chu H. Wang	Simao (思茅), Yunnan (云南); R. C. Ching (秦仁昌) 595 (PE)	2: G, H	C
B. scalpturata (Fée) Ching	Mt. Qixianling (七仙岭), Hainan (海南); S. Y. Dong (董仕勇) 919 (PE)	2: D, E	C

2 Spore morphology

2.1 Observation

Spores monolete, ellipsoid to spheroidal, 20-55 μm in diameter; perispores usually with wide wings or gross ridges. According to the four spore types recognized by Hennipman (1977), three types were observed in Chinese *Bolbitis*.

Type A—Perispore reticulate, with reticulate, thin and wide wings. This type was observed in two species: *B. appendiculata* (Fig. 1: A) and *B. medogensis* (Fig. 1: B, C). In addition, *B. hookeriana* K. Iwats. was reported having this type of spores (Hennipman, 1977).

Type B— Perispore cristate-undulate, with thin wings. This type is very common in *Bolbitis* and was observed in the following eight species: *B. rhizophylla* (Fig. 1: D, E), *B. sinensis* (Fig. 1: F), *B. tonkinensis* (Fig. 1: G), *B. fengiana* (Fig. 1: H), *B. heteroclita* (Fig. 2: C), *B. scandens* (Fig. 1: J, K), *B. hekouensis* (Fig. 1: L), and *B. tibetica* (Fig. 1: I). Compared with type A and type C, type B exhibits a wider range of variation.

Type C— Perispore undulate, without wings but with gross ridges. This type was observed in five species: *B. angustipinna* (Fig 2: I, J), *B. costata* (Fig 2: K, L), *B. deltigera* (Fig 2: F), *B. hainanensis* (Fig 2: G, H), and *B. scalpturata* (Fig 2: D, E). Among these species, the spores of *B. costata* are distinct by having perispore without gross ridges.

2.2 Discussion

The spore morphology in *Bolbitis* is distinct and significant in the species delimitation. There are no marked differences in spore size in Chinese *Bolbitis*, but the diverse and stable perispore features provide useful evidence in the subdivision of this genus and the delimitation

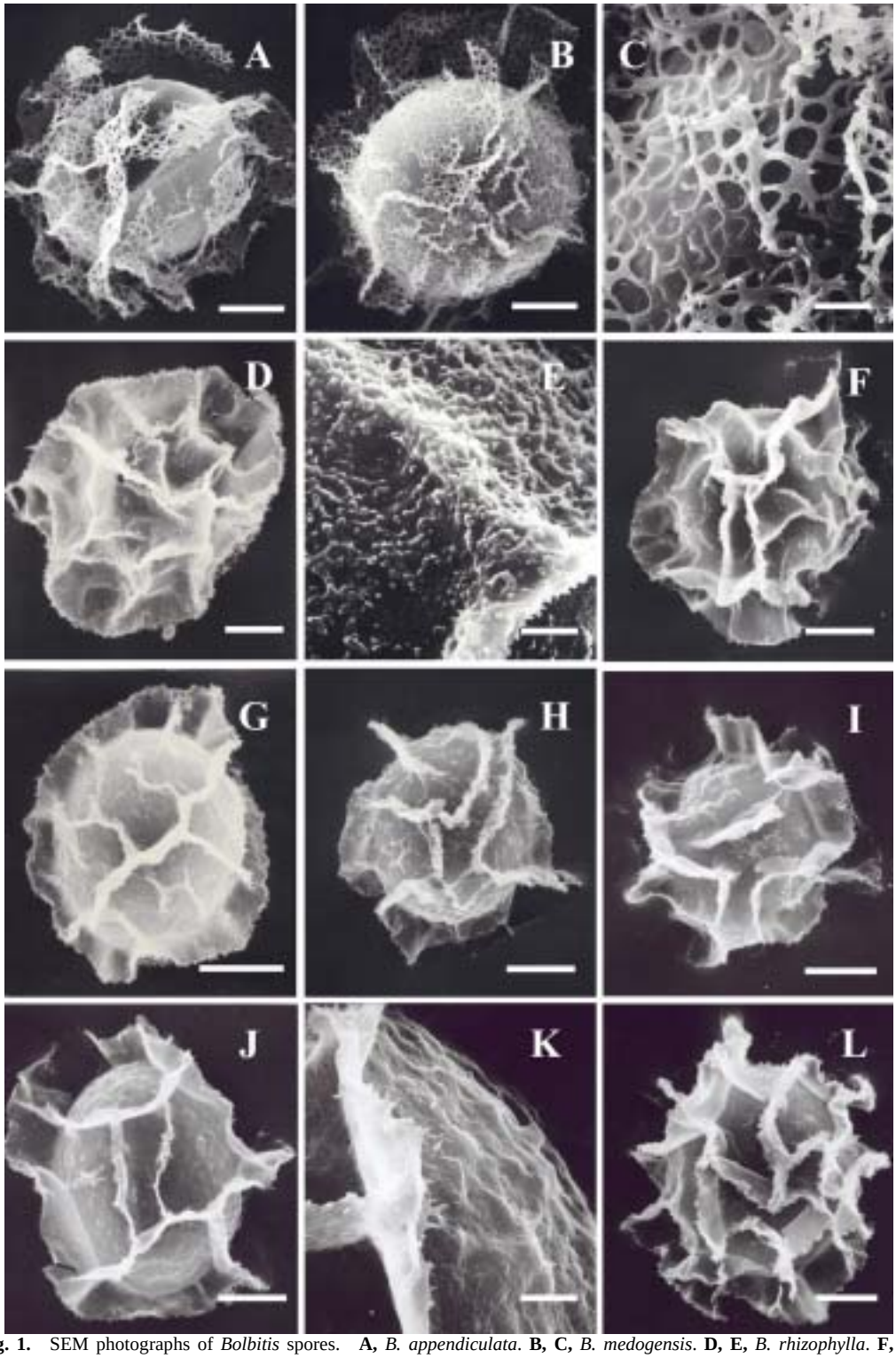

Fig. 1. SEM photographs of *Bolbitis* spores. **A,** *B. appendiculata*. **B, C,** *B. medogensis*. **D, E,** *B. rhizophylla*. **F,** *B. sinensis*. **G,** *B. tonkinensis*. **H,** *B. fengiana*. **I,** *B. tibetica*. **J, K,** *B. scandens*. **L,** *B. hekouensis*.
Scale bar: 10 μm in A, B, D, F-J, L and 2 μm in C, E, K.

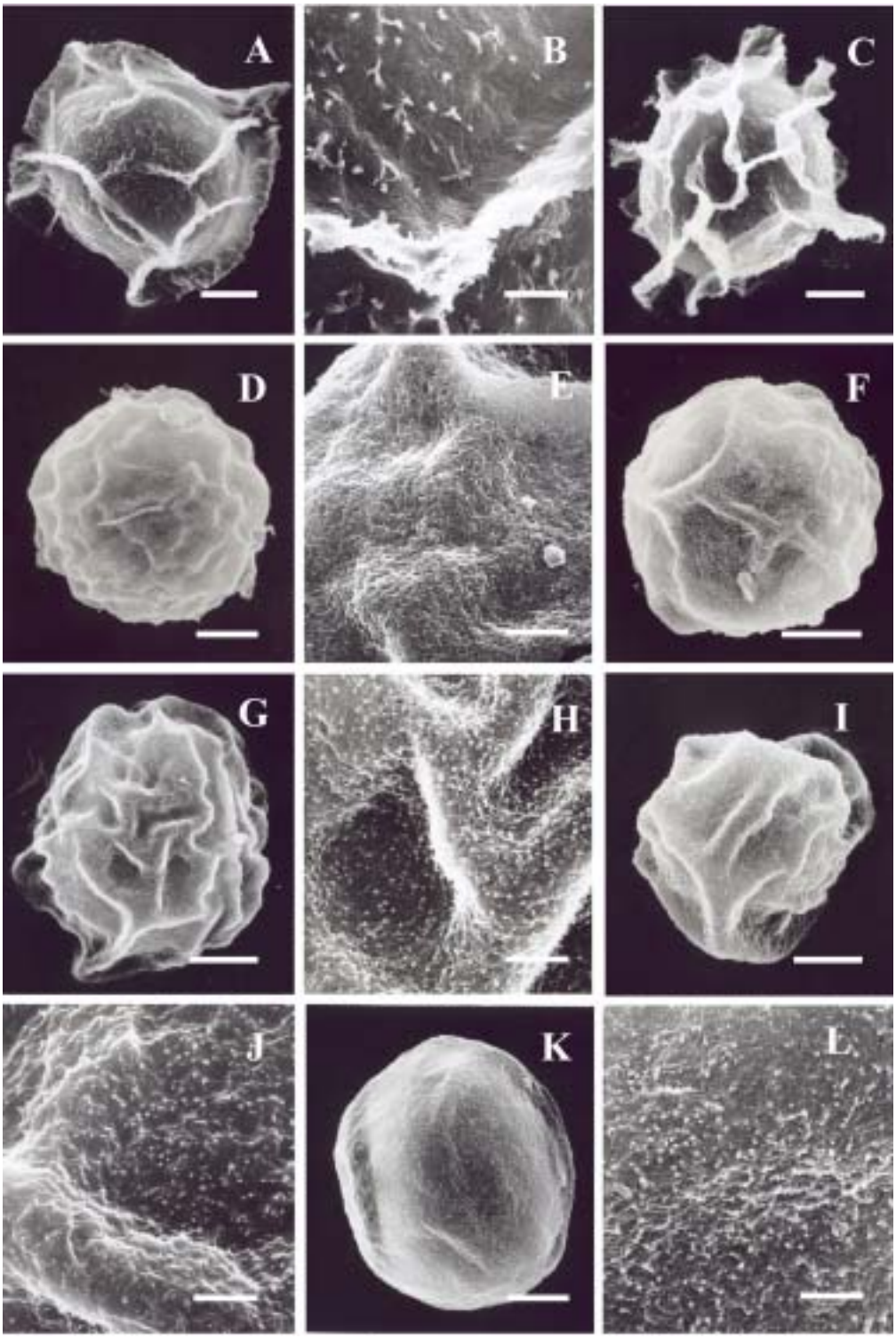

Fig. 2. SEM photographs of *Bolbitis* spores. **A, B,** *B. subcordata*. **C,** *B. heteroclita*. **D, E,** *B. scalpturata*. **F,** *B. deltigera*. **G, H,** *B. hainanensis*. **I, J,** *B. angustipinna*. **K, L,** *B. costata*.
Scale bar: 10 μm in A, C, D, F, G, I, K and 2 μm in B, E, H, J, L.

of species. Our preliminary spore examination shows that it is not reasonable to divide the genus *Bolbitis* into *Egenolfia* and *Bolbitis* s.s. Because over half species of *Egenolfia* (Fig. 1, D, E, G, H) and *Bolbitis* s.s. each (Fig. 1: F, I-L; Fig. 2: A-C) in China have spores with perispore cristate-undulate (type B), although spores with reticulate perispore (type A) only occur in *Egenolfia* (Fig. 1: A-C) and those with undulate perispore (type C) only occur in *Bolbitis* s.s. (Fig. 2: D-L). Based on the differences of the three type spores, it appears possible to divide Chinese *Bolbitis* into three sections. In the taxonomic treatment of some dubious species, the perispore feature is very useful. *Egenolfia crenata* is morphologically similar to *B. appendiculata* (Willd.) K. Iwats., but different by being larger in size. The spores of these two species show no difference, all with reticulate perispore. Similarly, the perispore feature supplies further evidence to treat *B. annamensis* Tardieu & C. Chr. as a synonym of *B. heteroclita* (C. Presl) Ching.

It is difficult to draw a conclusion on the evolutionary trend of the three spore types recognized herein. Though one of these spore types (type A) is easily distinguished from the other two (type B and type C) by the perispore feature, the spore morphology has not been found to be correlated with other gross-morphological characters in this genus. There are only partial connections among spore types, venation pattern and the pattern of apical part of a lamina, which are the most valuable diagnostic characters in *Bolbitis*. The type C spores only occur in the species with anastomosing veins and with imparipinnate laminae; the type A spores only occur in the species with free veins but with a pinnately divided apical part of laminae; and the type B spores are not correlated with either the venation pattern or the morphology of lamina apex. Therefore, the evolutionary trends of the spore types and thus the evolutionary relationships of the species in *Bolbitis* cannot be revealed.

3 Systematic treatment

Bolbitis Schott, Gen. Fil. pl. 14. 1834; Ching in C. Chr., Ind. Fil. Suppl. 3: 47. 1934; Copel., Gen. Fil. 115. 1947; K. Iwats. in Acta Phytotax. Geobot. 18: 44. 1959; Hennipman, Monogr. Gen. *Bolbitis* 123. 1977; et in Steenis & Holttum, Fl. Mal. Ser. II, 1 (4): 314. 1978; K. U. Kramer in Kubitzki, Fam. Gen. Vas. Pl. 1: 167. 1990; C. M. Kuo in Bot. Bull. Acad. Sin. 31: 305. 1990; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 104. 1999. Type: *Bolbitis serratifolia* (Kaulf.) Schott.

Egenolfia Schott, Gen. Fil. pl. 16. 1834; Ching in Bull. Fan Mem. Inst. Biol. Bot. Ser. 2: 297. 1931; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 115. 1999. Type: *Egenolfia hamiltoniana* Schott (=*Bolbitis appendiculata* (Willd.) K. Iwats.).

A genus of about 80 species pantropical in distribution, 20 species and three hybrids recognized from China.

Key to species of China

1. Veins all free.
   2. perispore reticulate; lateral pinnae subentire or crenate, base asymmetrical (except *B. hookeriana*), apex obtuse or acute.
      3. Stipe and rachis subglabrous; base of pinnae asymmetrical; fertile pinnae ovate or oblong.
         4. Rhizome creeping; sterile pinnae usually obtuse or rounded at apex; fertile pinnae 2-20 mm long and 2-4 mm wide ……..…….…… 1. **B. appendiculata**
         4. Rhizome short-creeping or suberect; sterile pinnae acute at apex; fertile pinnae ca. 80 mm long and 8-10 mm wide. ……..…..……..… 2. **B. medogensis**
      3. Stipe and rachis densely scaly; base of pinnae symmetrical; fertile pinnae moniliform……... ……..…… 3. **B. hookeriana**
   2. perispore cristate-undulate; lateral pinnae pinnatifid, base symmetrical, apex acuminate (lateral pinnae of

B. rhizophylla usually margin serrate and apex rounded).
5. Bulbil terminal on the lamina; lateral pinnae subentire to serrate ……4. **B. rhizophylla**
5. Bulbil subterminal on the lamina; lateral pinnae pinnatifid.
6. Apex of lobes rounded, lobes 0-1 mm apart without spines on margin ……..…..5. **B. sinensis**
6. Apex of lobes obtusely acute, lobes 2-3 mm apart with fine spines on margin.
7. Stipe and rachis densely scaly, scales dark-brown, appressed; lobes of pinnae falcate, 6-15 mm long …….. 6. **B. tonkinensis**
7. Stipe and rachis subglabrous, scales brown, patent; lobes of pinnae triangular, 2-5 mm long……. ……...…… 7. **B. fengiana**

1. Veins more or less anastomosing.
8. Venation pattern more or less irregular, veins along costae usually anastomosing and others free or rarely uniting, included free veinlets never present; rachis narrowly winged (in *B. angustipinna*×*sinensis*, rachis wingless).
9. Pinnae pinnatifid, base symmetrical; rachis wingless ……..… 8. **B. angustipinna**×**sinensis**
9. Pinnae subentire or crenate, base more or less asymmetrical; rachis narrowly winged.
10. Pinnae subentire; more veins anastomosing …… 9. **B.** ×**nanjenensis**
10. Pinnae crenate; except those along costae, other veins all free ……10. **B.** ×**laxireticulata**
8. Venation pattern regular, veins variously anastomosing, with or without included free veinlets; rachis wingless.
11. 5-8 veinlets arising from either side of lateral veins uniting in sterile pinnae, veinlets near margin more or less uniting; lamina imparipinnate; leaves often dark-brownish when dry.
12. Fronds in 2 series on rhizome; scales on base of stipe narrowly lanceolate, without obvious brown margin.
13. Leaves herbaceous; rhizome 3-5 mm thick, terrestrial or climbing on bases of tree-trunks….. ……...… 11. **B. heteroclita**
13. Leaves chartaceous; rhizome 8-10 mm thick, high-climbing …….12. **B. scandens**
12. Fronds in 4 series on dorsal surface of rhizome; scales on base of stipe ovate-lanceolate, with obvious brown margin ……13. **B. confertifolia**
11. 1-4 veinlets arising from either side of lateral veins uniting in sterile pinnae, veinlets near margin all free (excluding those in *B. costata*); lamina with a pinnate apical part or not; leaves greenish or rarely purplish when dry.
14. Lamina with a pinnate apical part; lateral pinnae (4)7-15 pairs; base of sterile pinnae rounded, truncate or subcordate; perispore cristate-undulate.
15. Stipe and rachis hardly scaly; venation pattern with included free veinlets or not.
16. Included free veinlets present; base of sterile pinnae rounded……...…14. **B. subcordata**
16. Included free veinlets absent; base of sterile pinnae subcordate……..15. **B. christensenii**
15. Stipe and rachis densely scaly throughout; venation pattern without included free veinlets.
17. Bulbil subterminal; sterile pinnae rounded at base ……16. **B. hekouensis**
17. Bulbil terminal; sterile pinnae truncate at base ……17. **B. tibetica**
14. Lamina imparipinnate; lateral pinnae 2-7 pairs (except *B. angustipinna* with 8-24 pairs); base of sterile pinnae cuneate to rounded; perispore smoothly undulate.
18. Fertile pinnae lanceolate, 3-8 times longer than wide.
19. Sterile pinnae 2-3 pairs, 4.5-6 cm wide; fertile pinnae acrostichoid....18. **B. hainanensis**
19. Sterile pinnae 5-7 pairs, 2-4 (5) cm wide; either side of costae or lateral veins with a narrow region not bearing sporangia in fertile pinnae.
20. 2-3 veinlets arising from lateral veins, most areoles without included free veinlets and few areoles usually with one, free veinlets without thickened ends; costae usually purplish or stramineous when dry ……..…19. **B. scalpturata**
20. 4-5 veinlets arising from lateral veins, most areoles with 1-3 included free veinlets, free veinlets with thickened ends; costae stramineous when dry…….20. **B. deltigera**
18. Fertile pinnae linear, 14-50 times longer than wide.
21. Venation pattern without included free veinlets; lateral pinnae (8-)15-24 pairs…… ……...……...…….. 21. **B. angustipinna**
21. Venation pattern with included free veinlets; lateral pinnae 2-6 pairs.

22. Leaves purplish when dry; 5-8 veinlets arising from either side of lateral veins uniting in sterile pinnae; fertile pinnae 7-8 cm long ……..…….…22. **B. costata**
22. Leaves greenish when dry; 4 veinlets arising from either side of lateral veins uniting in sterile pinnae; fertile pinnae ca. 20 cm long …… ..……23. **B. virens**

1. Bolbitis appendiculata (Willd.) K. Iwats. in Acta Phytotax. Geobot. 18: 48. 1959; Pic. Serm., Ind. Fil. Suppl. 4: 140. 1965; Hennipman, Monogr. Gen. *Bolbitis* 185, figs. 49-51. 1977, p.p.; et in Steenis & Holttum, Fl. Mal. Ser. II, 1 (4): 322, fig. 29. 1978; Tagawa & K. Iwats., Fl. Thail. 3 (3): 316. 1988.——*Acrostichum appendiculatum* Willd., Sp. Pl. 5: 114. 1810. ——*Egenolfia appendiculata* (Willd.) J. Sm., Ferns Br. For. 111. 1866; Ching in Bull. Fan Mem. Inst. Biol. Bot. 2: 308. 1931; Tardieu & C. Chr. in Lecomte, Fl. Gén. Indo-Chiné 7: 426. 1941; J. L. Tsai & W. C. Shieh in T. C. Huang et al., Fl. Taiwan., ed. 2, 1: 356, pl. 142. 1994; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 117, pl. 22: 1-6. 1999. Type: India. Without precise locality, Klein 912 (holotype, B).

Egenolfia crenata Ching & P. S. Chiu in Acta Phytotax. Sin. 21: 212. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 118. 1999, syn. nov. Type: China. Yunnan (云南): Jinping (金平), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 892 (holotype, PE!; isotype, KUN!).

刺蕨 Fig. 1: A

Representative specimens examined:

China. Guangdong (广东): Huaiji (怀集), W. T. Tsang (曾怀德) 23204 (IBSC, SYS), Y. G. Liu (刘英光) 02798 (PE, IBSC); Maoming (茂名), L. Deng (邓良) 1787 (PE, IBSC, KUN), L. Deng (邓良) 2337 (IBSC, KUN); Shenzhen (深圳), Shenzhen Exped. (深圳队) 743, 783 (PE); Wengyuan (翁源), S. K. Lau (刘心祈) 2389 (PE, SYS); Xinyi (信宜), C. Wang (黄志) 31155 (PE, IBSC, KUN), C. Wang (黄志) 31973 (PE, SYS), C. Wang (黄志) 37833 (IBSC); Yangchun (阳春), H. G. Ye et al. (叶华谷等) 121 (IBSC); Yu'nan (郁南), N. Liu et al. (刘念等) 2728, 2735 (IBSC). **Guangxi** (广西): Fangcheng (防城), W. T. Tsang (曾怀德) 26823 (IBSC, SYS); Luocheng (罗城), W. M. Chu et al. (朱维明等) 18378 (PYU); Nanning (南宁), R. C. Ching (秦仁昌) 8238 (PE, SYS); Pingnan (平南), C. Wang (黄志) 4071 (PE); Rongshui (融水), S. H. Chun (陈少卿) 14129 (PE, IBSC, KUN); Rongxian (荣县), S. H. Chun (陈少卿) 9819 (IBSC); Yaoshan (瑶山), K. K. Whong 140 (PE), S. S. Sin (辛树帜) 3863 (PE, SYS). **Hainan** (海南): Baisha (白沙), W. M. Chu et al. (朱维明等) 18133 (PYU); Baoting (保亭), S. K. Lau (刘心祈) 28113 (PE, IBSC, KUN); Changjiang (昌江), S. Y. Dong et al. (董仕勇等) 56, 110 (PE); Danzhou (儋州), W. T. Tsang (曾怀德) 756 (SYS); Lingshui (陵水), W. M. Chu (朱维明) 5913 (PYU), Hainan Exped. (海南队) 1873 (PYU), Diaoluoshan Exped. (吊罗山队) 2309, 3309 (PE, IBSC); Mt. Jianfengling (尖峰岭), S. Y. Dong et al. (董仕勇等) 262 (PE), Z. X. Li et al. (李泽贤等) 1240 (IBSC), Hainan Exped. (海南队) 1449 (PYU); Mt. Limushan (黎母山), S. Y. Dong (董仕勇) 836 (PE), S. H. Chun (陈少卿) 10667 (PE, IBSC); Mt. Wuzhishan (五指山), E. Hainan Exped. (海南东队) 552 (PE, IBSC), C. Wang (黄志) 35443 (PE), 35625 (IBSC), N. K. Chun (陈念劬) 44026 (PE, IBSC, KUN), F. A. McClure 1978, 1984 (SYS), F. W. Xing et al. (邢福武等) 5406 (IBSC); Qiongzhong (琼中), L. Deng (邓良) 3424 (IBSC); Sanya (三亚), C. Wang (黄志) 34603 (PE, IBSC), 34299B (IBSC), H. Y. Liang (梁向日) 62714, 63186 (PE, IBSC); Wanning (万宁), L. Deng (邓良) 2929 (IBSC), S. Y. Dong et al. (董仕勇等) 559 (PE); Without precise locality, 917 Group (917组) 042 (SYS), P. Zeng (曾沛) 12514 (SYS). **Hong Kong** (香港): Mt. Damaoshan (大帽山), K. Y. Chan 1279 (PE). **Taiwan** (台湾): Xinzhu (新竹), D. E. Boufford

et al. 25213 (PE, KUN); Miaoli (苗栗), S. J. Mou (牟善杰) 17722 (PYU). **Yunnan** (云南): Cangyuan (沧源), W. M. Chu et al. (朱维明等) 15417, 17417 (PYU); Hekou (河口), W. M. Chu (朱维明) 5761 (PYU), Dept. Biol. Yunnan Univ. Exer. Exped. (云南大学生物系实习队) 1699, 1700 (PYU), K. H. Cai (蔡克华) 215 (PE), Z. X. Zhou (周政贤) 42 (PE); Jinping (金平), W. M. Chu (朱维明) 4051 (PYU), W. M. Chu et al. (朱维明等) 6525 (PYU), S. K. Wu (武素功) 3997 (PE, PYU); Lüchun (绿春), W. M. Chu et al. (朱维明等) 6643 (PYU); Mengla (勐腊), W. M. Chu et al. (朱维明等) 18664 (PYU); Pingbian (屏边), W. M. Chu (朱维明) 51 (PYU); Yingjiang (盈江), Yunnan Univ. West Yunnan Pl. Exped. (云南大学滇西植物调查组) 9918, 10767, 10871 (PYU).

Habitat: On moist rocks in rain forests, alt. 100-1200 m.

Distribution: A widespread species in tropical Asia, southward to Java and northward to southern China, eastward to Philippines and westward to Sri Lanka.

Note: *Egenolfia crenata* was described as new for sterile leaves larger, fertile pinnae more shortened and the apex of sterile pinnae sharply acute by comparison with *B. appendiculata* (Ching & Wang, 1983). Our examination has shown that the type collection of *E. crenata* is in the normal variation range of *B. appendiculata* in the size of sterile leaves, and that there is no difference between these two species in the morphology of fertile pinnae and in the spore morphology.

2. Bolbitis medogensis (Ching & S. K. Wu) S. Y. Dong, com. nov. ——*Egenolfia medogensis* Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. 1: 278. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 116. 1999, syn. nov. Type: China. Xizang (西藏): Mêdog (墨脱), Qinghai-Xizang Exped. (青藏队) 74-4335 (holotype, PE!; isotype, KUN!).

墨脱刺蕨 Fig. 1: B, C

Representative specimen examined:

China. Xizang (西藏): Mêdog (墨脱), Plateau Ecology Exped. (高原生态组) 11252 (PE).

Habitat: On slope in evergreen broad-leaved forests, alt. 900 m.

Distribution: Only known from the type locality.

Note: This species is close to *B. appendiculata* and may be an ecological form of the latter. Considering the much larger size in leaves and the restricted distribution, it is maintained as a separate species.

3. Bolbitis hookeriana K. Iwats. in Acta Phytotax. Geobot. 18: 49. 1959. —— *Polybotrya vivipara* Buch.-Ham. ex Hook., Exot. Fl. 2: t. 107. 1825, non *Bolbitis vivipara* C. Chr., Ind. Fil. Suppl. 3: 51. 1934. —— *Egenolfia vivipara* (Hook.) C. Chr., Ind. Fil. Suppl. 3: 102. 1934; Tardieu & C. Chr. in Lecomte, Fl. Gén. Indo-Chiné 7: 423. 1941. —— *Bolbitis appendiculata* ssp. *vivipara* var. *vivipara* (Hook.) Hennipman in Blumea 18: 147. 1970 et Monogr. Gen. *Bolbitis* 196, fig. 50: a-h, fig. 51. 1977. Type: India. Assam: Goalpara, Wallich 29 p.p. (holotype, K).

Representative specimen examined:

China. Yunnan (云南): Yingjiang (盈江), Q. Z. Huang (黄全忠) 783 (PE), new record.

Habitat: Creeping on rocks in forests, alt. 500 m.

Distribution: China (W Yunnan), Bangladesh, India, Myanmar, Indo-China Peninsula.

Note: This species is a member with type A spore but distinct in Chinese *Bolbitis* by the moniliform fertile pinnae.

虎克实蕨

4. Bolbitis rhizophylla (Kaulf.) Hennipman in Blumea 18: 148. 1970 et Monogr. Gen. *Bolbitis* 199, fig. 52: d-r, fig. 53. 1977; et in Steenis & Holttum, Fl. Mal. Ser. II, 1 (4): 32, fig.

27g. 1978. ——*Gymnogramma rhizophylla* Kaulf., Enum. Fil. 78. 1824. ——*Egenolfia rhizophylla* (Kaulf.) Fée, Gen. Fil. 48. 1852; J. L. Tsai & W. C. Shieh in T. C. Huang et al., Fl. Taiwan., ed. 2, 1: 356. 1994; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 118. 1999. Type: Philippines. Manila: Chamisso s.n. (holotype, LE?; isotype, B).

根叶刺蕨 Fig. 1: D, E

Representative specimen examined:

China. Taiwan (台湾): Tainan (台南), T. Murakami et al. 236 (KUN).

Habitat: On rocks in forests, alt. 400-500 m.

Distribution: China (Taiwan), Philippines.

Note: This species is the only one with terminal bulbil on fronds among the species which have a free venation pattern.

5. Bolbitis sinensis (Baker) K. Iwats. in Acta Phytotax. Geobot. 18: 49. 1959; Hennipman, Monogr. Gen. *Bolbitis* 202, figs. 53, 54. 1977; et in Steenis & Holttum, Fl. Mal. Ser. II, 1 (4): 325, fig. 27h. 1978; Tagawa & K. Iwats., Fl. Thail. 3 (3): 318. 1988 ——*Acrostichum sinense* Baker in Kew Bull. 1906: 14. 1906. ——*Egenolfia sinensis* (Baker) Maxon in Proc. Biol. Soc. Wash. 36: 173. 1923; Tardieu & C. Chr. in Lecomte, Fl. Gén. Indo-Chiné 7: 424, fig. 48: 1, 2. 1941; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 120, pl. 22: 9-11. 1999. Type: China. Yunnan (云南): Simao (思茅), Henry 12494 (holotype, K).

Egenolfia bipinnatifida J. Sm., Hist. Fil. 132. 1875; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 122. 1999. —— *Bolbitis bipinnatifida* (J. Sm.) K. Iwats. in Acta Phytotax. Geobot. 18: 49. 1959 (sphalm. *bipinnata*), non *B. bipinnatifida* (Mett.) Ching in C. Chr., Ind. Suppl. III. 1934. Type: Myanmar. Tenasserim: Dawna Range near Moulmein, parish 60 (holotype, K).

Egenolfia crassifolia Ching in Acta Phytotax. Sin. 21: 216. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 120. 1999, syn. nov. Type: China. Yunnan (云南): Lushui (泸水), Nanshuibeidiao Exped. (南水北调队) 8117 (holotype, PE!; isotypes, PYU!, KUN!).

中华刺蕨 Fig. 1: F

Representative specimens examined:

China. Guangxi (广西): Tianlin (田林), C. C. Chang (张肇骞) 10974 (IBSC). **Yunnan** (云南): Cangyuan (沧源), W. M. Chu et al. (朱维明等) 15304, 15371 (PYU); Gengma (耿马), W. M. Chu et al. (朱维明等) 15260 (PYU); Jingdong (景东), B. Y. Qiu (邱炳云) 52677 (KUN); Jinghong (景洪), W. M. Chu (朱维明) 3932 (PYU), W. M. Chu et al. (朱维明等) 479, 500 (PYU), Y. M. Feng (冯永明) 11 (PYU), J. M. Zeng & Q. Yang (曾觉明,杨泉) 140, 782 (PYU), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 56097 (KUN), G. D. Tao et al. (陶国达等) 43514, 43521 (PYU), Anonymous 56837 (KUN), C. W. Wang (王启无) 78219, 79027 (PE), 78750 (PE, KUN); Lüchun (绿春), S. K. Wu et al. (武素功) 821 (KUN); Menghai (勐海), W. M. Chu et al. (朱维明等) 15764, 24592 (PYU), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 5605, 7121, 7300 (KUN); Mengla (勐腊), W. M. Chu (朱维明) 2062 (PYU), X. W. Li (李锡文) 59-13479 (KUN), Sino-Japanese Exped. (中日队) 114 (KUN), H. T. Tsai (蔡希陶) 59-10985 (KUN); Simao (思茅), R. C. Ching (秦仁昌) 415, 524, 527 (PE), Sino-Japanese Exped. (中日队) 229 (KUN), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 56056 (KUN); Without precise locality, Sino-USSR Yunnan Exped. (中苏联合云南考察队) 7120, 7300 (PE); Xinping (新平), W. M. Chu (朱维明) 357 (PE, PYU); Yangbi (漾濞), W. M. Chu et al. (朱维明等) 9473 (PYU); Yingjiang (盈江), Q. Z. Huang (黄全忠) s.n. (PE), Yunnan Univ. West Yunnan Pl. Exped. (云南大学滇西植物调查组) 10695, 10708, 10740, 10761, 10869, 10899 (PYU); Yongde (永德), W. M. Chu et al. (朱维明等)

15078 (PYU); Yun Xian (云县), W. M. Chu et al. (朱维明等) 14828 (PYU).

Habitat: In soil or on rocks in forests, alt. 650-1900 m.

Distribution: China, Bangladesh, Myanmar, Thailand, Cambodia, Vietnam, Java, Lesser Sunda Islands.

Note: *Egenolfia crassifolia* was described based on a sheet of sterile specimen (Nanshuibeidiao Exped. 8117, PE) and cannot be distinguished from *B. sinensis*. An isotype (PYU) of *E. crassifolia* was identified as *E. sinensis* by Professor W. M. Chu of Yunnan University in 1999.

6. Bolbitis tonkinensis (C. Chr.) K. Iwats. in Acta Phytotax. Geobot. 18: 49. 1959; Hennipman, Monogr. Gen. *Bolbitis* 310. 1977; Tagawa & K. Iwats., Fl. Thail. 3 (3): 319. 1988. ——*Egenolfia tonkinensis* C. Chr. in Bull. Fan Mem. Inst. Biol. Bot. 2: 306. 1931; Tardieu & C. Chr. in Lecomte, Fl. Gén. Indo-Chiné 7: 424. 1941; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 119. 1999. Type: Vietnam. Tonkin: Lang-Son, Herb. Ecole Sup. Agric. & Sylvic. Hanoi 3396 (holotype, BM; isotype, PE!).

镰裂刺蕨 Fig. 1: G

Representative specimens examined:

China. Yunnan (云南): Jinghong (景洪), W. M. Chu et al. (朱维明等) 24575, 24640 (PYU); Mengla (勐腊), W. M. Chu (朱维明) 5988 (PYU), B. G. Li (李保贵) 00690, 00756 (PYU); Simao (思茅), Z. H. Hu (胡志浩) s.n. (PYU).

Habitat: On moist rocks in forests, alt. 500-1260 m.

Distribution: China, Vietnam (Tonkin).

Note: This species resembles both *B. fengiana* and *B. sinensis*, and is distinguished from the latter two by its densely scaly stipe and rachis.

7. Bolbitis fengiana (Ching) S. Y. Dong, com. nov. ——*Egenolfia fengiana* Ching in Acta Phytotax. Sin. 21: 215. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 119, pl. 22: 7, 8. 1999, syn. nov. Type: China. Yunnan (云南): Malipo (麻栗坡), K. M. Feng (冯国楣) 13758 (holotype, PE!).

疏裂刺蕨 Fig. 1: H

Representative specimens examined:

China. Yunnan (云南): Jinping (金平), W. M. Chu et al. (朱维明等) 6513 (PYU); Lüchun (绿春), W. M. Chu et al. (朱维明等) 6645 (PYU); Malipo (麻栗坡), K. M. Feng (冯国楣) 13971 (PE, KUN), 22987 (KUN); Pingbian (屏边), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 3551 (PE), W. M. Chu et al. (朱维明等) 29221 (PYU), Y. Jiao (焦瑜) 96-49 (PYU).

Habitat: In valley under forests, alt. 550-1700 m.

Distribution: Endemic to China (Yunnan).

8. Bolbitis angustipinna×sinensis Hennipman, Monogr. Gen. *Bolbitis* 284, fig. 83: a-c. 1977. Type: China. Yunnan (云南): Xishuangbanna (西双版纳), between Jinghong (景洪) and Mengxing (勐醒), Rock 2636 (holotype ?; isotypes, BM, C, US).

Egenolfia×yunnanensis Ching & P. S. Chiu in Acta Phytotax. Sin. 21: 216. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 123. 1999, syn. nov. Type: China. Yunnan (云南): Jinghong (景洪), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 5775 (holotype, PE!; isotype, KUN!).

Campium sinense auct. non (Baker) C. Chr.: C. Chr., Contr. U.S. Nat. Herb. 26: 292, 1931, p.p.

云南实蕨

Representative specimens examined:

China. Yunnan (云南): Jinghong (景洪), W. M. Chu et al. (朱维明等) 480 (PYU); Menghai (勐海), W. M. Chu et al. (朱维明等) 6856 (PYU).

Habitat: On ground or at base of tree-trunks in valleys under rain forests, alt. 850-1050 m.

Distribution: Endemic to China (southern Yunnan).

Note: The venation pattern in this species is irregular. One to three veinlets arising from lateral veins can be observed anastomosing.

9. Bolbitis×nanjenensis C. M. Kuo in Bot. Bull. Acad. Sin. 31: 308, fig. 1. 1990; R. J. Johns, Ind. Fil. Suppl. 6: 63. 1996. Type: China. Taiwan (台湾): Pingdong (屏东), Kuo & Yu 14856 (holotype, TAI).

南仁实蕨

Habitat: In a ravine in semi-original dwarf forests.

Distribution: Only known from the type locality.

Note: This hybrid is very close to *B.* ×*laxireticulata*, but their putative parents for the two hybrids are different. The putative parents of *B.* ×*nanjenensis* are *B. appendiculata* and *B. heteroclita* (Kuo, 1990), and those of *B.* ×*laxireticulata* are *B. appendiculata* and *B. subcordata* (see the following note).

10. Bolbitis×laxireticulata K. Iwats. in Acta Phytotax. Geobot. 18: 50, figs. 7, 8. 1959; Hennipman, Monogr. Gen. *Bolbitis* 307, fig. 86: i-q. 1977; C. M. Kuo in Bot. Bull. Acad. Sin. 31: 308. 1990. ——*Egenolfia laxireticulata* (K. Iwats.) C. M. Kuo in H. L. Li et al., Fl. Taiwan. 1: 352. 1975; J. L. Tsai & W. C. Shieh in T. C. Huang et al., Fl. Taiwan., ed. 2, 1: 356. 1994. Type: Japan. Ryukyu: Isl. Amami-Ooshima, Tagawa & Iwatsuki 2918 (holotype, KYO).

网脉实蕨

Representative specimens examined:

China. Hainan (海南): Mt. Limushan (黎母山), S. Y. Dong (董仕勇) 858 (PE). **Hong Kong** (香港): Without precise locality, Anonymous s.n. (IBSC, herb. no. 623194).

Habitat: On rocks along stream in secondary rain forests, alt. 650 m.

Distribution: China (Hainan, Hong Kong and Taiwan), Japan (Ryukyu Isl.).

Note: This hybrid was originally reported from Ryukyu and was suggested hybridity between *B. appendiculata* and *B.* ×*laxireticulata* (Iwatsuki, 1959). The present fern was recently collected from Mt. Limushan of the Hainan Island. It grows on rocks by a stream in secondary rain forests. The outline of this fern is very similar to that of *B. appendiculata*. which grows side by side with *B.* ×*laxireticulata*, but much larger than the latter. The plant size, the number and shape of lateral pinnae, the venation pattern, and the number of scales on stipe and rachis are intermediate between *B. appendiculata* and *B. subcordata*, two species which are very common on Mt. Limushan and throughout the Hainan Island. In addition, *B. appendiculata* and *B. subcordata* also grow in Hong Kong, Taiwan and Ryukyu where *B.* ×*laxireticulata* occurs. So the present fern may have originated from *B. appendiculata* and *B. subcordata* by hybridization.

11. Bolbitis heteroclita (C. Presl) Ching in C. Chr., Ind. Fil. Suppl. 3: 48. 1934; Tardieu & C. Chr. in Lecomte, Fl. Gén. Indo-Chiné 7: 434. 1941; K. Iwats. in Acta Phytotax. Geobot. 18: 57, fig. 12. 1959; Hennipman, Monogr. Gen. *Bolbitis* 221, fig. 60. 1977; et in Steenis & Holttum, Fl. Mal. Ser. II, 1 (4): 325, figs. 25d, 31a-g. 1978; Tagawa & K. Iwats., Fl. Thail. 3 (3): 320. 1988; J. L. Tsai & W. C. Shieh in T. C. Huang et al., Fl. Taiwan., ed. 2, 1: 353, pl. 141. 1994; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 108, pl. 19: 1-4. 1999. ——*Acrostichum heteroclitum* C. Presl, Rel. Haenk. 1: 15, pl. 2, fig. 2. 1825. Type: Philippines. Luzon:

Sorsogon, Haenke s.n. (holotype, PRC).

Bolbitis annamensis Tardieu & C. Chr. in Not. Syst. 7: 100. 1938; et in Lecomte, Fl. Gén. Indo-Chiné 7: 436, fig. 50: 3, 4. 1941; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 106, pl. 19: 5. 1999. Type: Vietnam. Annam: Thanh Tan, Cadiere 149 (holotype, BM; isotype, PE!).

长叶实蕨 Fig. 2: C

Representative specimens examined:

China. Chongqing (重庆): Beibei (北碚), X. Zhou (周锌) 1202 (PE); Nanchuan (南川), Z. Y. Liu et al. (刘正宇等) 4580 (PYU); Without precise locality, B. Y. Zhang et al. (张百誉等) 0085 (PE), C. Z. Liu et al. (刘承泽等) 100121(PE). **Guangdong** (广东): Dongxing (东兴), K. K. Tsoong (钟观光) s.n. (PE); Fengkai (封开), S. Wang (黄成) 164033 (PE). **Guangxi** (广西): Fusui (扶绥), S. H. Chun (陈少卿) 12090 (PE, IBSC, KUN); Longsheng (龙胜), P. S. Qiu (裘佩熹) 4580 (PE); Nanning (南宁), H. Li et al. (黎桦等) 504 (PYU); Napo (那坡), S. P. Ko (高锡朋) 56007 (PE); Rongshui (融水), S. H. Chun (陈少卿) 15626 (PE, IBSC, KUN); Wuming (武鸣), Anonymous 138 (PE); Without precise locality, Guangxi Exped. (广西队) 3477 (PE). **Guizhou** (贵州): Anlong (安龙), P. S. Wang (王培善) 76279 (PYU); Chishui (赤水), Z. Y. Cao et al. (曹子余等) 240, 285 (PE), P. S. Wang (王培善) 77787 (PYU); Dushan (独山), X. Y. Hou (侯学煜) 1904 (PE); Leishan (雷山), P. S. Wang (王培善) 76970 (PE, PYU); Liping (黎平), F. Wang et al. (王峰等) 91609 (PYU). **Hainan** (海南): Baisha (白沙), W. M. Chu et al. (朱维明等) 18107 (PYU); Danzhou (儋州), W. T. Tsang (曾怀德) 382 (PE, SYS); Ledong (乐东), S. Y. Dong et al. (董仕勇等) 303 (PE); Mt. Limushan (黎母山), S. Y. Dong (董仕勇) 837, 867 (PE). **Sichuan** (四川): Mt. Emeishan (峨眉山), W. M. Chu (朱维明) 7205, 7843 (PYU), K. H. Shing et al. (邢公侠等) 1382, 1720, 1739 (PE); Qianwei (犍为), K. H. Shing et al. (邢公侠等) 0524-B (PE); Without precise locality, Z. Y. Zhu (祝正银) 768 (PE). **Yunnan** (云南): Cangyuan (沧源), W. M. Chu et al. (朱维明等) 15302, 15303, 15432 (PYU); Gengma (耿马), Y. H. Li (李延辉) 002276 (KUN); Guangnan (广南), W. M. Chu et al. (朱维明等) 8347 (PYU); Hekou (河口), Dept. Biol. Yunnan Univ. Exer. Exped. (云南大学生物系实习队) 704 (PE, PYU), 795, 1723, 1734 (PYU), K. H. Cai (蔡克华) 993 (PE); Jinghong (景洪), W. M. Chu (朱维明) 2086, 2102 (PYU), W. M. Chu et al. (朱维明等) 450, 24608 (PYU), H. Q. Guo (郭汉卿) 56 (PE), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 5701, 9612 (PE, KUN), 9759 (KUN), C. W. Wang (王启无) 77910, 78094 (PE, IBSC, KUN), Yunnan First Group Exped. (云南一组) 92 (PE), G. F. Zhang (张光飞) 24669 (PYU), Anonymous 803 (PYU), 55859, 56779 (KUN); Jinping (金平), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 305, 886, 1714 (PE); Lancang (澜沧), W. M. Chu et al. (朱维明等) 15547 (PYU); Luoping (罗平), W. M. Chu et al. (朱维明等) 13254 (PYU); Lüchun (绿春), W. M. Chu et al. (朱维明等) 6732 (PYU); Maguan (马关), W. M. Chu et al. (朱维明等) 23486, 29267 (PYU); Menghai (勐海), W. M. Chu et al. (朱维明等) 6838 (PYU), C. W. Wang (王启无) 74857 (PE), 77117 (PE, KUN), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 5481, 5656 (PE, KUN); Mengla (勐腊), W. M. Chu (朱维明) 2051, 2083 (PYU), J. W. Li et al. (李建伟等) 17854 (PYU), Sino-Japanese Exped. (中日队) 248, 339 (KUN), C. W. Wang (王启无) 80051 (PE, KUN); Mengzi (蒙自), T. N. Liou (刘慎锷) 018720 (PE); Pingbian (屏边), H. T. Tsai (蔡希陶) 60522 (PE, KUN); Shuangjiang (双江), W. M. Chu et al. (朱维明等) 15529 (PYU); Suijiang (绥江), W. M. Chu (朱维明) 4855 (PYU); Xichou (西畴), W. M. Chu et al. (朱维明等) 21820 (PYU); Ximeng (西盟), W. M. Chu et al. (朱维明等) 15649 (PYU); Yingjiang (盈江),

Q. Z. Huang (黄全忠) 780, 784, 789 (PE), Yunnan Univ. West Yunnan Pl. Exped. (云南大学滇西植物调查组) 10665, 10750 (PYU).

Habitat: Usually on rocks or at base of trees near streams in forests, alt. 100-1250 m.

Distribution: Widespread in Asian tropics.

Note: This species has (0)1-3(5) pair(s) of lateral pinnae. The plant with simple leaf (without lateral pinnae) was formerly referred to *B. annamensis* and reported only in central Vietnam and Guangxi (Wang, 1999). Recently, a population of *B. heteroclita* without lateral pinnae was also observed in Mt. Limushan of Hainan.

12. Bolbitis scandens W. M. Chu in Acta Phytotax. Sin. 21: 213. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 113. 1999. Type: China. Yunnan (云南): Lüchun (绿春), W. M. Chu et al. (朱维明等) 6733 (holotype, PYU!; isotypes, PE!, PYU!).

附着实蕨 Fig. 1: J, K

Representative specimen examined:

China. Yunnan (**云南**): Mengla (勐腊), W. M. Chu (朱维明) 2050 (PYU).

Habitat: Climbing on tree-trunks in valley under forests, alt. 700-800 m.

Distribution: Only known from southern Yunnan, China.

Note: This species is very similar to *B. heteroclita*. It is distinct by having rhizome climbing on tree-trunks over two meters in height. In addition, it can be distinguished from the latter by having lateral pinnae usually three-paired, terminal pinnae never obviously prolonged and leaf texture thickly papyraceous. We suspect that it may be an ecological form of *B. heteroclita*. More collections and further observation in the field are needed for a better understanding of this species.

13. Bolbitis confertifolia Ching in Acta Phytotax. Sin. 21: 211. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 108. 1999. Type: China. Yunnan (云南): Jinghong (景洪), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 1851 (holotype, PE!).

密叶实蕨

Habitat: In rain forests.

Distribution: Only known from the type locality.

Note: This species is poorly known to date because of only a type available for study. Its rhizome which was originally described erect, is actually long-creeping. Many long roots are present on the ventral surface of rhizome and four series of stipes on the dorsal surface of rhizome. The stipes of fronds are jointed to the rhizome nearly at a 30º angle. This species is close to *B. heteroclita* but differs by having ovate-lanceolate scales at the base of stipe. The scales in *B. heteroclita* and other species of *Bolbitis* are usually narrowly lanceolate.

14. Bolbitis subcordata (Copel.) Ching in C. Chr., Ind. Fil. Suppl. 3: 50. 1934; Tardieu & C. Chr. in Lecomte, Fl. Gén. Indo-Chiné 7: 433. 1941; K. Iwats. in Acta Phytotax. Geobot. 18: 54, fig. 11. 1959; Hennipman, Monogr. Gen. *Bolbitis* 280, figs. 81: a-c, 82. 1977; J. L. Tsai & W. C. Shieh in T. C. Huang et al., Fl. Taiwan., ed. 2, 1: 355. 1994; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 110, pl. 20: 1-12. 1999. ——*Campium subcordatum* Copel. in Philip. Journ. Sci. 37: 369, fig. 23, pl. 16. 1928. Type: China. Hainan (海南): Mt. Wuzhishan (五指山), C. C. C. McClure 9436 (holotype, P?; isotypes, BISH, BM, C, MO, P).

B. media Ching & Chu H. Wang in Acta Phytotax. Sin. 21: 212. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 112. 1999, syn. nov. Type: China. Hainan (海南): Wanning (万宁), Y. Chong (钟义) 3952 (holotype, PE!).

华南实蕨 Fig. 2: A, B

Representative specimens examined:

China. Fujian (福建): Fuzhou (福州), W. M. Chu et al. (朱维明等) 17889 (PYU); Nanjing (南靖), Fujian Exped. (福建队) 526, 545, 606 (PE), N. S. Zhou (周楠生) 441 (PE); Yongchun (永春), Nandadui (南大队) 22485 (PE); Wuping (武平), Meihuashan Exped. (梅花山队) 161 (IBSC); Without precise locality, S. G. Tang 13096, 16254, 16286, 16455, 16473 (SYS). **Guangdong** (广东): Dapu (大埔), L. Deng (邓良) 5435 (IBSC); Mt. Dinghushan (鼎湖山), P. Zeng (曾沛) 10319 (SYS); Ruyuan (乳源), C. H. Tsoong (钟济新) 10768 (IBSC); Shenzhen (深圳), Shenzhen Exped. (深圳队) 189, 639 (PE); Shixing (始兴), H. G. Ye et al. (叶华谷等) 1049 (IBSC); L. Deng (邓良) 6860 (PE, IBSC, KUN); Xinfeng (新丰), H. G. Ye (叶华谷) 1041 (IBSC); Y. W. Taam 221 (SYS); Yangchun (阳春), H. G. Ye et al. (叶华谷等) 400 (IBSC); Yu'nan (郁南), H. G. Ye et al. (叶华谷等) 2730 (IBSC); Yingde (英德), C. Wang (黄志) 31559 (SYS), S. Wang (黄成) 163430 (PE, IBSC), 163811 (PE, IBSC, KUN); B. S. Wang (王伯荪) 12407 (SYS), H. T. Chang (张宏达) 7034 (SYS), P. Zeng (曾沛) 12124 (SYS), Q. G. Wu (吴七根) 0029 (SYS), Y. K. Wang 31559 (PE). **Guangxi** (广西): Cangwu (苍梧), S. H. Chun (陈少卿) 10173 (IBSC, KUN); Guiping (桂平), H. Li et al. (黎桦等) 1019, 1021 (PYU); Jinxiu (金秀), Dayaoshan Exped. (大瑶山考察队) 13567 (IBSC), Y. J. Wang (王燕杰) 5190 (PE); Rongshui (融水), S. H. Chun (陈少卿) 15679 (PE, IBSC, KUN); Without precise locality, A. N. Steward et al. 1084 (PE). **Hainan** (海南): Changjiang (昌江), S. Y. Dong et al. (董仕勇等) 168 (PE); Ledong (乐东), S. Y. Dong et al. (董仕勇等) 218, 260 (PE); Lingshui (陵水), H. Feng (冯钦) 20146 (PE, SYS), S. Y. Dong (董仕勇) 364, 378 (PE), Hainan Exped. (海南队) 1920 (PE), Z. X. Li et al. (李泽贤等) 1512 (IBSC); Mt. Wuzhishan (五指山), F. A. McClure 2789, 2880 (SYS), Hainan Exped. (海南队) 1816 (PE); Qionghai (琼海), E. Hainan Exped. (海南东队) 365 (PE, KUN), CAS Trop. For. Exped. (中科院热带林调查队) 00365 (IBSC); Sanya (三亚), H. Y. Liang (梁向日) 62315 (PE); Wanning (万宁), S. Y. Dong et al. (董仕勇等) 557, 558 (PE), Z. X. Li et al. (李泽贤等) 4891 (IBSC); F. W. Xing et al. (邢福武等) 5404 (IBSC); P. Zeng (曾沛) 12864 (SYS); Y. Chong (钟义) 3952 (IBSC); Without precise locality, P. Zeng (曾沛) 12522 (SYS), C. Wang (黄志) 34232 (PE). **Hong Kong** (香港): Mt. Damaoshan (大帽山), S. Y. Hu (胡秀英) 9745 (PE), W. T. Tsang (曾怀德) 21228 (PE, SYS). **Jiangxi** (江西): Quannan (全南), J. F. Cheng (程景福) 64430 (PYU), 64435 (PE, PYU). **Taiwan** (台湾): Without precise locality, Tanaka s.n. (PE). **Yunnan** (云南): Menghai (勐海), W. M. Chu et al. (朱维明等) 6856 (PE); Guangnan (广南), Z. R. Wang (王中仁) 403 (PE). **Zhejiang** (浙江): Yueqing (乐清), J. X. Wang (王景祥) 1543 (PE), P. S. Qiu et al. (裘佩熹等) 6377 (PE).

Habitat: In rain forests, alt. 200-370 m.

Distribution: China (SE, S and SW China), Vietnam (Tonkin), Japan (southern Kyushu to Ryukyu).

Note: The types of both *B. media* and *B. subcordata* were collected from the Hainan Island. There are a lot of collections of *B. subcordata* but only a type specimen of *B. media* has been seen in the major Chinese herbaria. Observation in the field has shown that *B. subcordata* is common in Hainan yet *B. media* is a doubtful species. Ching and Wang (1983) noted that *B. media* is similar to *B. subcordata* but differs by having plant smaller, stipe slender, lateral pinnae smaller, subentire, coriaceous, and lateral veins beneath not distinct. Examination of the type of *B. media* has shown that the leaves are not coriaceous but herbaceous and the specimen is an immature plant of *B. subcordata* with slender and

indistinct veins.

15. Bolbitis christensenii (Ching) Ching in C. Chr., Ind. Fil. Suppl. 3: 47. 1934; Tardieu & C. Chr. in Lecomte, Fl. Gén. Indo-Chiné 7: 437. 1941; Hennipman, Monogr. Gen. *Bolbitis* 303, fig. 86: e, f. 1977; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 109. 1999. ——*Campium christensenii* Ching in Bull. Fan Mem. Inst. Biol. Bot. 2: 214, pl. 31. 1931. Type: China. Guizhou (贵州): Puding (普定), H. J. Esquirol 2672 (holotype, K?).

贵州实蕨

Habitat: In forests near streams.

Distribution: China (Guizhou), Vietnam (Tonkin).

Note: The present fern is poorly known because of lacking enough collections. It is close to *B. subcordata* but differs in the venation pattern. The included free veinlets are present in *B. subcordata* but not in *B. christensenii*.

16. Bolbitis hekouensis Ching in Acta Phytotax. Sin. 21: 212. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 109. 1999. Type: China. Yunnan (云南): Hekou (河口), S. K. Wu (武素功) 4056 (holotype, PE!; isotype, KUN!).

河口实蕨 Fig. 1: L

Representative specimens examined:

China. Yunnan (云南): Hekou (河口), K. H. Cai (蔡克华) 748 (PE), Dept. Biol. Yunnan Univ. Exer. Exped. (云南大学生物系实习队) 2367 (PYU), W. M. Chu (朱维明) 5864 (PYU), W. M. Chu et al. (朱维明等) 19348, 21931 (PYU); Maguan (马关), W. M. Chu (朱维明) 8413 (PYU).

Habitat: Usually in rocky crevices of limestone area in forests, alt. 400-1100 m.

Distribution: Only known from southern Yunnan, China.

Note: This species is slightly close to *B. rivularis* (Brackenr.) Ching from the Pacific Islands, but differs in the venation pattern and geographical distribution. There are 1-2 pair(s) of veinlets arising from each side of lateral veins in *B. hekouensis* but the similar veinlets are 3-4 pairs in *B. vivularis*. In distribution, *B. hekouensis* occurs only in southern Yunnan, China, while *B. vivularis* has a wide distribution, occurring in New Guinea, Vanuatu, and Fiji.

17. Bolbitis tibetica Ching & S. K. Wu in C. Y. Wu, Fl. Xizang. 1: 276. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 106. 1999. Type: China. Xizang (西藏): Mêdog (墨脱), Qinghai-Xizang Exped. (青藏队) 74-4551 (holotype, PE!; isotype, KUN!).

西藏实蕨 Fig. 1: I

Habitat: In broad-leaved forests, alt. 800 m.

Distribution: Only known from the type locality.

Note: This species is distinct in the genus *Bolbitis* by having venation anastomosing, bulbil terminal, stipe and rachis densely scaly.

18. Bolbitis hainanensis Ching & Chu H. Wang in Acta Phytotax. Sin. 21: 214. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 115. 1999. Type: China. Hainan (海南): Without precise locality, C. Wang (黄志) 35870 (holotype, PE!).

B. yunnanensis Ching in Acta Phytotax. Sin. 21: 214. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 113. 1999, syn. nov. Type: China. Yunnan (云南): Simao (思茅), R. C. Ching (秦仁昌) s.n. (holotype, PE!).

厚叶实蕨 Fig. 2: G, H

Representative specimens examined:

China. Yunnan (云南): Jinghong (景洪), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 8156 (PE); Simao (思茅), R. C. Ching (秦仁昌) 594, 595, 618 (PE).

Habitat: In dense forests.

Distribution: Endemic to China (Hainan and Yunnan).

Note: *B. yunnanensis* Ching is very similar to *B. hainanensis* in morphology. Both are distinct among Chinese *Bolbitis* by having thick papyraceous laminae and wrinkled undulate margin of leaves. In addition, the two species share many characters, such as scales on rachis and costae narrowly lanceolate, terminal pinnae conforming to the lateral ones, a lamina provided with 2-3 pairs of lateral pinnae, and venation pattern without included free veinlets. As the two species cannot be clearly distinguished from each other, we reduce *B. yunnanensis* herein as a synonym of *B. hainanensis*.

19. Bolbitis scalpturata (Fée) Ching in C. Chr., Ind. Fil. Suppl. 3: 50. 1934; K. Iwats. in Acta Phytotax. Geobot. 18: 59. 1959; Hennipman, Monogr. Gen. *Bolbitis* 163, fig. 43: a-d. 1977; et in Steenis & Holttum, Fl. Mal. Ser. II, 1 (4): 321. 1978; C. M. Kuo in Bot. Bull. Acad. Sin. 31: 308, fig. 1. 1990. —— *Heteroneuron scalpturatum* Fée, Hist. Acrost. 95, t. 56. 1845. Type: Philippines. Manila: Without precise locality, Gaudichaud s.n. (holotype, P).

红柄实蕨 Fig. 2: D, E

Representative specimens examined:

China. Hainan (海南): Mt. Diaoluoshan (吊罗山), S. Y. Dong et al. (董仕勇等) 549 (PE); Mt. Qixianling (七仙岭), S. Y. Dong (董仕勇) 919 (PE).

Habitat: On rocks in forests, alt. 0-1200 m.

Distribution: China, Myanmar, Thailand, Vietnam, Malaysia, Indonesia, Philippines.

Note: The present species is close to *B. deltigera*. Both species are characterized by having pinnae lanceolate and chartaceous, lateral pinnae 5-7-paired, terminal pinnae conforming to the lateral ones and subarticulate to the rachis, fertile pinnae generally not acrostichoid, and type C spore. But these two species is quite different in the venation pattern. In *B. deltigera*, there are 4-5 veins arising from each side of lateral veins anastomosing, areoles mostly with 1-3, usually 2 included free veinlets which thicken at the end. Whereas in *B. scalpturata*, there are only 2-3 veins arising from each side of lateral veins anastomosing, only a small part of areoles with 1, rarely 2 included free veinlets which do not thicken at the end. In addition, the costae of pinnae in *B. scalpturata*, albeit not in every plant, turn purplish when dry, yet the costae of pinnae in *B. deltigera* always remain stramineous.

20. Bolbitis deltigera (Bedd.) C. Chr., Ind. Fil. Suppl. 3: 48. 1934; Tagawa & K. Iwats., Fl. Thail. 3 (3): 316. 1988. ——*Poecilopteris costata* var. *deltigera* Bedd., Ferns Br. Ind. 114, pl. 114. 1865. ——*Bolbitis virens* var. *deltigera* (Bedd.) Hennipman in Blumea 18: 149. 1970; et Monogr. Gen. *Bolbitis* 184, figs. 47, 48: k-m. 1977. Type: Nepal. Between Katmandu and Bhimpedy, Wallich 59 (holotype, K).

间断实蕨 Fig. 2: F

Representative specimens examined:

China. Hainan (海南): Mt. Qixianling (七仙岭), W. M. Chu et al. (朱维明等) 18174 (PYU). **Yunnan** (云南): Cangyuan (沧源), W. M. Chu et al. (朱维明等) 15438 (PYU); Yingjiang (盈江), Yunnan Univ. West Yunnan Pl. Exped. (云南大学滇西植物调查组) 10901 (PE, PYU), 9921, 10606 (PYU).

Habitat: On slope or in valley under rain forests, alt. 340-700 m.

Distribution: China, Bangladesh, Nepal, Bhutan, Sikkim, India, Myanmar, Thailand.

21. Bolbitis angustipinna (Hayata) H. Ito in J. Jap. Bot. 14: 443. 1938; Pic. Serm., Ind. Fil. Suppl. 4: 42. 1965; Hennipman, Monogr. Gen. *Bolbitis* 152, fig. 40: a-f. 1977; et in Steenis & Holttum, Fl. Mal. Ser. II, 1 (4): 321, figs. 26c, 27a. 1978; Tagawa & K. Iwats., Fl. Thail. 3

(3): 311. 1988; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 110, pl. 21: 4-6. 1999. ——*Leptochilus angustipinnus* Hayata, Ic. Pl. Form. 5: 297, fig. 119. 1915. Type: China. Taiwan (台湾): near Peikanghsi (北港溪), Owatari s.n. (holotype, TAI).

Acrostichum contaminans Wall., List no. 22. 1828, *nom. nud.*——*Acrostichum crispatulum* var. *contaminans* Clarke, Trans. Linn. Soc. II, Bot. 1: 580, pl. 84, fig. 2A, C. 1880. ——*Bolbitis contaminans* Ching in C. Chr., Ind. Fil. Suppl. 3: 47. 1934; K. Iwats. in Acta Phytotax. Geobot. 18: 53, fig. 9. 1959; J. L. Tsai & W. C. Shieh in T. C. Huang et al., Fl. Taiwan., ed. 2, 1: 352. 1994. Type: Nepal. Between Helounda and Bhimpedy, Wallich 22 (holotype, K).

多羽实蕨 Fig. 2: I, J

Representative specimens examined:

China. Hainan (海南): Mt. Qixianling (七仙岭), S. Y. Dong (董仕勇) 920 (PE), new record. **Taiwan** (台湾): Pingdong (屏东), Faurie 206, 281 (PE). **Yunnan** (云南): Jinghong (景洪), W. M. Chu et al. (朱维明等) 525 (PYU), B. Y. Qiu (邱炳云) 57880 (KUN), J. F. Rock 2427 (PE), Sino-USSR Yunnan Exped. (中苏联合云南考察队) 5699 (PE, KUN), 9541 (KUN), Yunnan First Group Exped. (云南一组) 95 (PE); Lüchun (绿春), S. K. Wu et al. (武素功等) 888 (KUN).

Habitat: On rocks or at base of tree-trunks in dense forests, alt. 850 m.

Distribution: China, Nepal, Bhutan, Sikkim, India, Sri Lanka, Myanmar, Thailand.

Note: The terminal part of lamina is often a pinna which conforms to the lateral pinnae. But sometimes a lamina with a narrowly triangular apical part instead of a pinna is also present in some fronds.

22. Bolbitis costata (C. Presl) Ching in C. Chr., Ind. Fil. Suppl. 3: 47. 1934; Hennipman, Monogr. Gen. *Bolbitis* 155, fig. 41. 1977; Tagawa & K. Iwats., Fl. Thail. 3 (3): 311. 1988. ——*Campium costatum* C. Presl, Tent. Pterid. 238. pl. X. 23. 1836. Type: Bangladesh. Sylhet, Wallich 26 (holotype ?; isotypes, B, K, P, W).

紫轴实蕨 Fig. 2: K, L

Representative specimens examined:

China. Yunnan: Yingjiang (盈江), Yunnan Univ. W Yunnan Pl. Exped. (云南大学滇西植物调查组) 10664 (PE, PYU), new record.

Habitat: In valley in forests, alt. 360 m.

Distribution: China, Bangladesh, Nepal, Sikkim, India, Myanmar, Thailand.

Note: The present fern was first found in China by Professor W. M. Chu of Yunnan University from western Yunnan. A common character of this species and *B. scalpturata* is that the fronds usually turn purplish when dry. However, the present fern is very different from the latter by having sterile pinnae 4-9 cm wide, 5-8 veinlets arising from each side of lateral veins, and fertile pinnae linear (14-16 times as long as wide). On the contrary, in *B. scalpturata*, the sterile pinnae are 1.5- 4 cm wide, 2-3 veinlets arise from each side of lateral veins, and the fertile pinnae are lanceolate (3-8 times longer than wide).

23. Bolbitis virens (Hook. & Grev.) Schott, Gen. Fil. pl. 13. 1834; Hennipman in Blumea 18: 149. 1970, p.p., et Monogr. Gen. *Bolbitis* 180, p.p., fig. 48: a-g. 1977. ——*Acrostichum virens* Hook. & Grev., Ic. Fil., t. 221. 1831. Type: Myanmar. Tovag, Wallich 1033 (holotype, K).

Bolbitis latipinna Ching in Acta Phytotax. Sin. 21: 213. 1983; Chu H. Wang in Fl. Reip. Pop. Sin. 6 (1): 112, pl. 21: 7-9. 1999, syn. nov. Type: China. Yunnan (云南): Jinghong (景洪), C. W. Wang (王启无) 78807 (holotype, PE!; isotype, KUN!).

宽羽实蕨

Representative specimen examined:

China. Yunnan (云南): Jinghong (景洪), C. W. Wang (王启无) 78807A (IBSC).

Habitat: On rocks in forests, alt. 850 m.

Distribution: China (Yunnan), Bangladesh, Myanmar, Thailand.

Note: The type of *B. latipinna* Ching agrees well with the type of *B. virens*. Hennipman (1977) had studied it and cited it under *B. virens*.

Acknowledgements We express our gratitude to the Wild Animals and Plants Conservation Center of Hainan for the assistance in the field work. We also thank Mr. Y. H. XIAO (Institute of Botany, the Chinese Academy of Sciences) for his help in the SEM observation of spores. We are grateful to Prof. W. M. CHU and Dr. Z. R. HE (Yunnan University) for assistance in checking some specimens in PYU. Finally, many thanks go to the curators and staff of PE, PYU, IBSC, SYS, and KUN for the facilities, and to the curator and staff of K for providing some type photographs.

References

Christensen C. 1906. Index Filicum. Hafniae: H. Hagerup. 161, 301.

Christensen C. 1931. Asiatic Pteridophyta collected by Joseph F. Rock 1920-1924. Contributions from the United States National Herbarium 26: 265-337.

Ching R-C (秦仁昌). 1931. On the genus *Egenolfia* Schott. Bulletin of the Fan Memorial Institute of Biology 11: 297-317.

Ching R-C (秦仁昌), Wang C-H (王铸豪). 1983. Materiae ad floram filicum sinensium. Acta Phytotaxonomica Sinica (植物分类学报) 21: 211-218.

Chu W-M (朱维明), Zhou H-G (周厚高). 1994. Some pteridophytes new to Hainan and China. Acta Botanica Yunnanica (云南植物研究) 16: 123-130.

Hennipman E. 1977. A monograph of the fern genus *Bolbitis* (Lomariopsidaceae). Leiden: Leiden University Press.

Iwatsuki K. 1959. Taxonomic studies of Pteridophyta IV. Acta Phytotaxonomica et Geobotanica 18: 44-59.

Kuo C-M. 1990. Materials for the Lomariopsidaceae of Taiwan. Botanical Bulletin of Academia Sinica 31: 305-304.

Wang C-H (王铸豪). 1999. Bolbitidaceae. In: Flora Reipublicae Popularis Sinicae (中国植物志). Beijing: Science Press. 6 (1): 104-124.

中国实蕨属的分类修订

[1,2]董仕勇 [2]张宪春

[1] (中国科学院华南植物园 广州 510650)

[2] (中国科学院植物研究所系统与进化植物学重点实验室 北京 100093)

摘要 对实蕨属*Bolbitis*的17种植物的孢子进行了扫描电镜观察。根据孢子周壁特征,中国产实蕨属的孢子明显可分为3种类型：A型孢子具网状周壁,B型孢子具鸡冠状-波状周壁,C型孢子具平滑的波状周壁。孢子周壁特征、叶脉式样和叶片顶部的形态是实蕨属中最有价值的分类学性状。根据标本检查,结合野外调查和孢子形态观察,对中国产实蕨属的分类进行了修订,确定中国有实蕨属植物20种和3杂交种,其中包括2个新组合*B. fengiana* (Ching) S. Y. Dong和*B. medogensis* (Ching & S. K. Wu) S. Y. Dong,以及2个中国新分布*B. costata* Ching ex C. Chr.和*B. hookeriana* K. Iwats.。将*B. latipinna* Ching、*B. media* Ching & Chu H. Wang、*B. yunnanensis* Ching、*Egenolfia crassifolia* Ching、*E. crenata* Ching & P. S. Chiu、*E. fengiana* Ching、*E. medogensis* Ching & S. K. Wu和*E.* ×*yunnanensis* Ching & P. S. Chiu等8个名称处理为新异名。文中给出了分种检索表、每个种的生境和分布资料、大多数种的特征集要和孢子扫描电镜照片。

关键词 实蕨属; 实蕨科; 分类修订; 孢子形态; 中国