

A review of the species diversity of *Selaginella* in Fujian Province of China

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Abstract Examination of some 80 historical herbarium specimens preserved in a number of institutions in Fujian Province and our recent collections made from Mt. Wuyi Shan area shows that there are 18 species and one variety of *Selaginella* in the province, of which, *Selaginella albociliata*, *S. braunii* and *S. ciliaris* are three new records for the provincial flora. A new key to the species of this genus in the province is given. Pertinent taxonomic notes and phytogeographical discussion of the species diversity of Fujian *Selaginella* are also provided.

Key words *Selaginella*, taxonomy, Fujian, China.

Selaginella Beauv. is a speciose and difficult genus to catalogue taxonomically because it includes a large number of species that are polymorphic morphologically. To date, there are more than 750 recognized species around the world divided into five subgenera (Jermy, 1990).

Species of *Selaginella* are used in traditional medicine in many countries to treat a variety of diseases, such as cancer, cardiovascular problems, diabetes, gastritis, hepatitis, skin diseases, and urinary tract infections (Silva et al., 1995). In fact, *Selaginella tamariscina*, *S. tamariscina* var. *pulvinata*, *S. doederleinii*, *S. moellendorffii*, *S. uncinata* and *S. involvens*, among others, have been reported as cures for a variety of diseases in China (Chang et al., 2000; Lin et al., 1991; Wang & Wang, 2001).

Alston (1934) was the first to make a review of this genus in China and listed 41 species, four of which were from the Fujian Province, namely *S. delicatula*, *S. heterostachys*, *S. moellendorffii*, and *S. tamariscina*. The number of species in Fujian has since been increased to 15 in the second edition of Flora of Fujian (Lin et al., 1991). Nevertheless, because of the rather similar plant habit and akin leaf morphology seen among closely related species whose identification depends much on the minute leaf and spore characters, many of the species are confused and overlooked in floristic treatment, or not collected in the field. Consequently, the species diversity of *Selaginella* in many places is often under-estimated.

In October of 2002 we conducted a new survey of the species of *Selaginella* in Mt. Wuyi Shan and adjacent areas. The voucher specimens are deposited at the herbaria of National University of Singapore (SINU) and Xiamen University (AU). Our study also includes the re-examination of more than 80 historical specimens collected from various parts of the province that are preserved at the herbaria of Xiamen University (AU) and Fujian Normal University (FNU). As a result, three new species records, and one species, possibly new to science, have been documented. Only specimens of new records for the province are cited below.

Since the keys to the species of *Selaginella* published in many provincial floras in China that we have consulted have employed, either unreliable quantitative characters to distinguish the species, or inaccurately observed characters for a species, we have prepared below a new key to the species of *Selaginella* in Fujian Province. As many of the Fujian species of

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Selaginella have a broad distribution, this key should help also to identify specimens collected from the neighboring provinces of Guangdong, Jiangxi, Zhejiang, Hainan, and Taiwan.

1 Key to the species of *Selaginella* in Fujian Province

(Species names placed inside the parenthesis were not seen in our study but reported from the province)

1. Strobilus tetragonous; sporophylls uniform.
 2. Main stems stout, forming a trunk.
 3. Dorsal leaves coarsely toothed, sometimes ciliate, aristate.....1. **S. tamariscina** var. **tamariscina**
 3. Dorsal leaves nearly entire, weakly serrate, acuminate..... 2. **S. tamariscina** var. **pulvinata**
 2. Main stems not forming a stout trunk.
 4. Main stems erect or suberect, rooting at base.
 5. Stem and branches glabrous or smooth.
 6. Main stems erect, rooting at base; leaves near the base of stem monomorphic, equilateral, adpressed or directed upward.
 7. Dorsal leaves acuminate, without conspicuous white margins.....3. **S. involvens**
 7. Dorsal leaves aristate, with white margins.....4. **S. moellendorffii**
 6. Main stems suberect, prostrate or scandent, roots extending upward to lower 1/3 of the main stem; leaves dimorphous nearly to base of stem, unequal in size and shape, the lateral leaves spreading outward.
 8. Leaves serrulate to serrate, without a conspicuous white margin, dorsal leaves slightly oblique at base.....5. **S. doederleinii**
 8. Leaves entire, with white margins, dorsal leaves strongly oblique or unequal at base.....6. **S. delicatula**
 5. Stem and branches pubescent or hairy.
 9. Lateral and axillary leaves ciliate..... (7. **S. biformis**)
 9. Lateral and axillary leaves entire.
 10. Lateral and axillary leaves auriculate at base, at least on one side; sporophylls ovate-lanceolate.....8. **S. trichoclada**
 10. Lateral and axillary leaves exauriculate at base; sporophylls broadly ovate.....9. **S. braunii**
 4. Main stems creeping, rooting at intervals throughout the stem and branches.
 11. Stem and branches pubescent..... (7. **S. biformis**)
 11. Stem and branches glabrous.
 12. Strobili laxly organized, often branched; sporophylls somewhat similar to vegetative leaves.....10. **S. nipponica**
 12. Strobili densely organized, not branched; sporophylls quite different from the vegetative leaves.
 13. Dorsal and lateral leaves serrulate, denticulate or ciliate.
 14. All leaves with whitish, translucent margins; dorsal leaves aristate; lateral leaves overlapping, with clearly developed pseudonerves; axillary leaves smaller in size than lateral leaves.....11. **S. davidii**
 14. All leaves without a whitish, translucent margin; dorsal leaves acuminate; lateral leaves distantly spaced, without apparent pseudonerves; axillary leaves about the same size as lateral leaves.....(12. **S. remotifolia**)
 13. Dorsal and lateral leaves entire.
 15. Plants greenish; dorsal leaves auriculate on one side at base.....13. **S. limbata**
 15. Plants bluish; dorsal leaves not auriculate at base.....14. **S. uncinata**
1. Strobilus flattened; sporophylls dimorphic.
 16. Plants large, main stem erect, 3-4-pinnate; dorsal leaves cordate at base.....15. **S. labordei**
 16. Plants small, main stem creeping, at most bipinnate; dorsal leaves not cordate at base.
 17. Leaves denticulate at base; lateral leaves broadly ovate, curved.....16. **S. heterostachys**
 17. Leaves ciliate at base; lateral leaves ovate-lanceolate, not curved.
 18. Dorsal and lateral leaves ciliate all around, cilia 1/2 longer than wide with broad whitish margin.....17. **S. albociliata**
 18. Dorsal and lateral leaves ciliate at base, with narrow whitish margins.
 19. Dorsal leaves equal at base ,main stem 2-pinnate.....18. **S. ciliaris**
 19. Dorsal leaves unequal at base ,main stem 3-4-pinnate.....(19. **S. xipholepis**)

2 Taxonomic notes

1. *Selaginella albociliata* P. S. Wang in J. Arnold Arboretum 71: 269. 1990.

白毛卷柏

This is a slender, creeping species that grows abundantly on cemented stone walls along the sides of open pathway in Mt. Wuyi Shan where the Da-Hong-Pao tea plants are cultivated. The lateral and axillary leaves are broadly ovate to ovate-lanceolate. Dorsal leaves are smaller, ovate and cuspidate. All the leaves have a broad whitish or translucent margin and long cilia throughout. Strobili are long and flattened with ciliated leaf margins, very much like the ones illustrated in Figures 2 and 3 of Plate 151 of this species in Wang and Wang (2001).

Selaginella albociliata is quite similar to *S. chaetoloma* Alston in having conspicuously ciliated leaf margins, but differs from the latter in having whitish, translucent leaf margins with longer cilia (Alston, 1932; Wang, 1990). Both taxa have a preference for calcareous substrates. This Chinese endemic species is restricted to Guizhou (type locality) and Guangxi (Wang & Wang, 2001), and is new to Fujian Province.

Specimens examined: **Fujian (福建)**: Mt. Wuyi Shan (武夷山), Tan 02-505, 02-506 (AU!, SINU!).

2. *Selaginella braunii* Baker, Gard. Chron. 783, 1120. 1867.

布朗卷柏

This is a new species record for Fujian Province. Formerly known from Hubei, Sichuan, Zhejiang (Alston, 1934) and recently reported from Anhui, Guizhou, Yunnan, Jiangxi, Hunan and Hainan (Zhang, 1993; Wu, 1995; Wang & Wang, 2001), the species is identified by the presence of tiny hairs on all branches. It differs from the other hairy species in the province, *S. trichoclada*, in having exauriculate axillary and lateral leaves. The dorsal leaves of *S. braunii* are narrowly lanceolate, quite unlike those of *S. trichoclada* which are ovate.

Plants of *S. braunii* can be confused with *S. delicatula*. The plant size, branching pattern and leaf morphology of these two taxa are rather similar, but the hairy branches of *S. braunii* are enough to distinguish it from the other taxon.

Selaginella braunii is also superficially similar to *S. labordei*, but the latter is a smaller plant with dimorphous or flattened strobili. *Selaginella braunii* has tetragonous strobili and the plants often reach a height of 30 cm.

Specimen examined: **Fujian (福建)**: Without precise locality, Anonymous 678 (AU!).

3. *Selaginella ciliaris* (Retz.) Spring in Bull. Acad. Brux. 10: 231. 1843.

缘毛卷柏

The plant is small and may have been overlooked by local collectors in the past. The species is variable in its growth form ranging from having a main stem with many short, lateral branches to the absence of a main stem but with many branches. The diagnostic feature lies in the presence of cilia around the margins of dorsal and axillary leaves; hence, the appropriate species epithet. The cilia, however, are only present on the upper margin of the lateral leaves. The strobili are of flattened type, rarely producing megasporangium. The brightly orange microsporangia are abundantly produced.

This somewhat weedy species growing in semi-open grassy habitat in SE Asia, surprisingly, is reported here for the first time from Fuzhou in Fujian Province. The species has been reported earlier from Guangdong, Hainan and Taiwan (Alston, 1934; Tsai & Shieh, 1994; Yang & Zhang, 2003).

Specimen examined: **Fujian (福建)**: Fuzhou (福州), Z. Y. Zhou (周贞英) 760 (AU!).

4. *Selaginella davidii* Franch., Pl. David. I: 344. 1889.

蔓出卷柏(大卫卷柏)

This is a widespread, but locally not common, species in China. The plants are large, creeping, growing to 20 cm long. It is best identified by the densely arranged, and often overlapping, lateral leaves that develop distinct pseudonerves on both sides of the midrib. In our study we have seen only one specimen from Fujian Province (Lin Lai-Guan 1028a, AU). Good illustration of this species is shown in volume 1 of Flora of Jiangxi (Cheng, 1993).

The species appears to be similar to *S. repanda* (Desv.) Spring (高雄卷柏) in its leaf morphology and laminar texture as well. Studies are needed to clarify the taxonomic relationship of these two species.

5. *Selaginella delicatula* (Desv.) Alston in J. Bot. 70: 282. 1932.

薄叶卷柏

This is a large species of *Selaginella* found inside forests and on shaded stream banks. The plants are suberect to somewhat scandent. The vegetative leaves are entire and have whitish margins, although Alston (1934) reported the lateral leaves to be "minutely serrulate at apex". The dorsal leaves are ovate to narrowly ovate, very asymmetrical, and strongly curved in outline. The tetragonous strobili are frequently produced.

Selaginella picta A. Braun ex Baker, known from the neighboring Jiangxi and Guangdong provinces (Cheng, 1993), is reportedly similar in its overall morphology to *S. delicatula* but differs from the latter primarily in having a black colored stem apices when dry and a less branched plant habit. We have not seen any specimen from Fujian that fits into the character combination of *Selaginella picta*.

6. *Selaginella doederleinii* Hieron. in Hedwigia 43: 41. 1904.

深绿卷柏

This is a common and distinctive species in Fujian Province and many other parts of China that has a creeping to suberect stem with many short, lateral branching systems that are irregularly 2- to 3- pinnate. The leaves are dark green and the strobili are tetragonous. The plants are large, measuring to 40 cm long. All leaf margins are serrulate or serrate. A good illustration of this species can be found in the second edition of Flora of Taiwan (Tsai & Shieh, 1994) and also in Flora of Jiangxi (Cheng, 1993).

7. *Selaginella heterostachys* Baker in J. Bot. 23: 177. 1885.

异穗卷柏

This is one of the small, creeping species of *Selaginella* in the province that produces flattened strobili. The species can be recognized by its distantly spaced, ovate to ovate-lanceolate lateral leaves that are somewhat curved in outline. The dorsal and axillary leaves are without a whitish, translucent margin. It is a common species around Mt. Wuyi Shan area and in other parts of the province (Lin et al., 1991). It is also a widespread species in southern China.

Selaginella boninensis Baker known from Taiwan and Japan differs from the present species in being larger in plant size (Nakaike, 1982; Tagawa, 1983). But using only the large plant size with a measurement of stem to 6-9 mm wide, including the lateral leaves (Tsai & Shieh, 1994), to determine *S. boninensis* can be misleading. Among the Fujian collections studied, we have seen several specimens of typical *S. heterostachys* measuring to such a large dimension. Like *S. heterostachys*, *S. boninensis* exhibits a certain degree of leaf morphological variation. Typical *S. boninensis* differs from *S. heterostachys* in having lanceolate and oblong-lanceolate dorsal and axillary leaves. Also, the lateral leaves of *S. boninensis* are contiguous in arrangement and not curved.

8. *Selaginella involvens* (Sw.) Spring in Bull. Acad. Brux. 10: 136. 1843.

兖州卷柏

This is a species found in xeric and opened places in many provinces in China. Its overall morphology is like that of *S. moellendorffii*, with the basal part of the stem covered characteristically with adpressed leaves. One distinction between these two taxa lies in the stem leaves near the base. In the case of *S. involvens*, the basal stem leaves are monomorphic, tightly and closely adpressed around the round stem, while the equally monomorphic, basal stem leaves of *S. moellendorffii* are less adpressed and more distantly spaced around the angular stem. A more reliable diagnostic character can be found in the dorsal leaves of *S. involvens*, which are acuminate and without a white margin, quite unlike the dorsal leaves of *S. moellendorffii*.

In Fujian Province, *S. involvens* is not so common and widespread as *S. moellendorffii*. But like *S. moellendorffii*, the elongate branches will curl inward during dry seasons to conserve water. This xeric feature of *S. involvens* and *S. moellendorffii* has not been mentioned in the provincial floras.

9. *Selaginella labordei* Hieron. ex Christ in Bull. Acad. Int. Geogr. Bot. 11: 272. 1902.

细叶卷柏

This is a medium sized, erect plant with many spreading, irregular branches. The dorsal leaves have a characteristic cordate base. Strobili are of the flattened type with only moderately dimorphous sporophylls.

It is a widespread species in China south of Yellow River, but appears to be rare in Fujian Province. The Flora of Fujian (Lin et al., 1991) listed only one locality, Dehua, for this species.

10. *Selaginella limbata* Alston in J. Bot. 70: 62. 1932.

耳基卷柏

Selaginella limbata is superficially similar to *S. uncinata*; both are creeping members of the genus growing in similar habitats, which are forest floor near the edge of forest and in semi-shaded grassy sites. The auriculate dorsal leaves and the absence of bluish sheen on the leaves should separate this species from *S. uncinata*.

This species has been reported also from Guangdong, Hong Kong and Jiangxi (Alston, 1932; Lin et al., 1991).

11. *Selaginella moellendorffii* Hieron. in Engler & Prantl, Natürl Pflanzenfam. I, 4: 680. 1901 (1902).

江南卷柏

In Fujian Province, this common species of *Selaginella* seems to confine to a vertical distribution below 1500 m on Mt. Wuyi Shan. Its preferred habitats are forest floor, stream bank and shaded sites along the roads. The species has also morphological plasticity; some specimens have the dorsal leaves nearly entire, with only a few short hairs near the base of lateral leaves. However, the apparently ciliolate dorsal leaves with aristate apex and whitish margins are consistent enough to be diagnostic. Outside of Fujian, the species is also widespread in many provinces south of the Yellow River.

12. *Selaginella nipponica* Franch. & Sav., Enum. Pl. Jap. 2: 199. 1879.

伏地卷柏(日本卷柏)

Among the Fujian *Selaginella*, this and *S. tamariscina* are the two most easily recognized species. Plants of *S. nipponica* are slender and creeping, with many long strobili that are themselves branched. The sporophylls are indistinctly dimorphous and merge imperceptibly with the vegetative leaves below, blurring the demarcation of the strobilus. The species is

widespread and common in temperate part of China, reaching as far north as Qinghai Province (Wang & Wang, 2001).

13. *Selaginella tamariscina* (Beuav.) Spring in Bull. Acad. Brux. 9:136. 1843.

卷柏

This is a widespread East Asiatic species. It is known to have medicinal property and is called the “resurrection plant”. In China, many of the medicinal plant materials of *S. tamariscina* come from Fujian Province (Chang et al., 2000).

The species forms scattered small communities on dry, nutrient poor, rocky and shaded cliff in Jiangle, Liancheng, Yonggan, Taining counties. It is common in Mt. Wuyi Shan Scenic Area, representing one of the pioneering plant species in the so-called Danxia geologic formation.

The dendroid plants are profusely branched distally, often 4- to 5- pinnate. This feature is seldom mentioned in the floras where the plant is described as bi- to tripinnate. In the Flora of Jiangxi (Cheng, 1993) and the Flora of Fujian (Lin et al., 1991), the illustrations of the species do not show the high degree of branching system. On the other hand, the illustration of this species in the second edition of the Flora of Taiwan (Tsai & Shieh, 1994) seems to be based on a juvenile specimen with no trunk formation. For detailed descriptions of the dorsal, lateral and axillary leaves, and sporophylls too, see the above mentioned floras.

14. *Selaginella tamariscina* var. *pulvinata* (Hook. & Grev.) Alston in Bull. Fan Mem. Inst. Biol. 5: 271. 1934.

垫状卷柏

This taxon has been accepted as a species in many provincial floras in China. Based on our study, we concur with Alston (1934) in treating it as a variety of *S. tamariscina*.

The main character separating these two taxa outlined in a number of provincial floras, which focuses on the “trunk” feature, or the rarely seen “cushion” formation, are not useful. Alston (1934) might have started the use of this distinction when he reported in passing that the trunk of *S. tamariscina* was formed by the matted roots, while the roots of var. *pulvinata* remained spreading out. However, we cannot see a correlation between the root or trunk character and the other leaf characters. Instead, we observe during this study a more dependable and consistent character which sees var. *pulvinata* to have dorsal leaves with nearly entire, thickened margins and forming two straight rows on the branches, while that of var. *tamariscina* to have dorsal leaves with denticulate to serrate and translucent margins, and directing outward.

The distribution of var. *pulvinata* ranges from Jiangxi, Henan, Hebei, Hubei, Hunan, Guangxi, Sichuan, Xizang to Yunnan (Alston, 1934; Wang & Wang, 2001), and may represent a variety adapted to the colder and drier inland conditions. In Fujian Province, var. *pulvinata* appears to concentrate in Daiyun Mountain Range.

15. *Selaginella trichoclada* Alston in J. Bot. 70: 63. 1932.

毛枝卷柏

This widespread species in eastern China is not common in Fujian. According to the Flora of Fujian (Lin et al., 1991), it is found in Nanjing and Changting.

Selaginella trichoclada is rather similar to *S. delicatula* in its suberect to scandent habit and branching pattern. But the two can be easily separated by the presence of hairs on the branches and the auriculate axillary leaves seen in the former but not in *S. delicatula*.

There is a specimen preserved at FNU collected by A. N. Steward (no. 7221) in 1924 from Mt. Huang Shan which was mistakenly identified as *S. plana* Hieron. The existence of natural populations of *S. plana* in China was questioned by Alston (1934) who stated that the

species was probably cultivated in China. According to Tan and Jermy (1981), *S. plana* is introduced to Asia from West Indies.

16. *Selaginella uncinata* (Desv.) Spring in Bull. Acad. Brux. 10: 141. 1843.

翠云草

This is a highly ornamental species grown in many gardens in SE Asia. The plants are creeping, with numerous rhizophores or axillary roots, and produce tetragonous strobili. The leaves often reflect a bluish sheen when the plants grow in shaded sites. It is a common species in Fujian Province.

3 Species not seen

1. *Selaginella biformis* A. Braun ex Kuhn, Fil. Afr. 189. 1868. (syn. *S. flagellifera* Bull, 1886).

二型卷柏

This species is easy to identify by its hairy stem and branches. Among the species of *Selaginella* that have hairy branches, *S. biformis* is the only one that has both creeping and erect plant habits. In the Flora of Fujian (Lin et al., 1991), this species was reported from Xiamen City as a cultivated plant growing on wet, shaded rocks. Unfortunately, we cannot find any plants of this species in Xiamen City today.

2. *Selaginella remotifolia* Spring in Miq., Pl. Jungh. 3: 276. 1854.

疏叶卷柏

This is a medium-sized species with a long creeping stem and irregular lateral branches. The dorsal leaves are lanceolate, acuminate, with oblique asymmetrical leaf base. Lateral leaves are ovate to ovate-lanceolate, while axillary leaves are ovate to lanceolate. All the leaves are without a whitish or translucent margin. The strobili are tetragonous. In this regard, the illustration of this species in the second edition of Flora of Taiwan (Tsai & Shieh, 1994, pl. 12, p. 55), which shows a flattened strobilus, is not accurate.

The species is reported in the Flora of Fujian (Lin et al., 1991) to be widespread, but we did not see any authentic specimen of this species in our study. Wang and Wang (2001) reported this to be common in mountains with acidic soil below 2000 m in elevation.

3. *Selaginella xipholepis* Baker in J. Bot. 23: 155. 1885.

剑叶卷柏

This is a medium-sized species with a creeping stem. The dorsal leaves are lanceolate, acuminate, with oblique asymmetrical leaf base. Lateral leaves are ovate, with oblique asymmetrical leaf base. Axillary leaves are ovate to lanceolate. The diagnostic feature lies in the presence of cilia around the margins of dorsal and axillary leaves. The cilia, however, are only present on the underside margin of the leaves. The strobili are of flattened type.

The species is reported in Mt. Longqi Shan in Fujian and Hong Kong (Zhang, 1994), but we did not see the specimen of this species in our study. Wang and Wang (2001) reported this to be common on mountains of Guizhou, Yunnan, Sichuan, southern Shaanxi, Hunan, Guangxi and Guangdong below 2200 m in elevation.

4 Phytogeography of *Selaginella* in Fujian

Our study reviewed the 17 species and one variety of *Selaginella* reported from Fujian Province. Of these, *S. albociliata*, *S. braunii* and *S. ciliaris* are three new species records for

the province. Phytogeographically speaking, five species are widespread in East Asia, four are widely distributed in SE Asia, two are shared with Taiwan of China, Japan and northern Philippines, and six are localized Chinese endemics.

In addition, we collected a species of small *Selaginella* growing in mixture with *S. heterostachys* in Mt. Wuyi Shan area that seems to represent a hitherto undescribed species. The plants (Tan 02-507, SINU) are slender, the main stem creeping, measuring to 5 cm long, rooting at intervals, and with few lateral branches. The dorsal and axillary leaves are rather symmetrically lanceolate, acuminate and only sparsely denticulate. Lateral leaves are ovate-lanceolate, acute, and ciliolate on the upper margin. Because of the thick lamina, all the vegetative leaves are dark green with inconspicuous midrib. Until the strobili are collected, the species status of this specimen cannot be ascertained.

Comparing the species diversity of *Selaginella* of Fujian and the neighboring provinces (Ching et al., 1964; Dahlen, 1988; Lin et al., 1991; Cheng, 1993; Tsai & Shieh, 1994; Wu, 1995; Dong et al., 2003), it becomes apparent that the province under study is rich in species. Thus far, the published records show that Guangdong (including Hong Kong) has 14 species, Hainan has 13 species, Jiangxi, 16 species, Zhejiang, 14 species, and Taiwan, 14 species.

Since the diversity of this genus is higher in the tropics than in the temperate and boreal regions, Guangdong, Hainan and Taiwan, which have less known number of species of *Selaginella* compared to Fujian Province, are very likely under-collected. This is especially true with several small species which can be overlooked in the field by the unfamiliar collectors. For example, two of the three new records of Fujian *Selaginella*, *S. albociliata* and *S. ciliaris*, belong to the small plant sized taxa. Since *S. albociliata* is known from Guizhou and Guangxi, its presence in Jiangxi and Guangdong can be expected. The other newly mentioned taxon, *S. ciliaris*, is a widespread species in Asian tropics, but has not been reported from Hainan until 2003 (Dong et al., 2003; Yang & Zhang, 2003). Similarly, *S. remotifolia*, which has a wide distribution ranging from Malesia, Indochina to southern China, has no report from Guangdong and Hainan provinces.

On the other hand, when comparing the diversity of *Selaginella* of Fujian Province with that of the neighboring countries in the tropics, Fujian has only a moderate representation of the species diversity. Peninsular Malaysia has 28 species (Wong, 1983; Miyamoto & Ohba, 1992), Thailand, 29 species (Tagawa & Iwatsuki, 1979), and the Philippines, 50 species (Alston, 1935; Tan, 1975; Tan & Jermy, 1981). Except for a few widespread species, such as *S. biformis*, *S. ciliaris*, *S. delicatula*, *S. remotifolia*, *S. moellendorffii* and *S. involvens*, the species composition of *Selaginella* between the subtropical Asiatic and tropical Asiatic regions are quite different.

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福建卷柏属植物的物种多样性述评

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摘要 卷柏属 *Selaginella* Beauv. 是一个在分类上较困难的类群, 种类多, 形态变化大。全世界有卷柏属植物 750 种以上, 可以分为 5 个亚属。2002 年 10 月我们对武夷山脉及周边地区的卷柏种类进行了调查, 采集的

标本存放于新加坡国立大学标本馆(SINU)和厦门大学标本馆(AU)。此外,我们还认真观察了来自福建师范大学标本馆(FNU)和AU的卷柏标本。结果表明,在福建,卷柏有18种1变种。其中,缘毛卷柏*S. ciliaris*、白毛卷柏*S. albociliata*和布朗卷柏*S. braunii*是福建分布的3个新记录。

关键词 卷柏属; 分类学; 福建; 中国

福建省卷柏属种类检索表

(括号中的种类在这次研究中未见到)

1. 孢子叶穗方形,孢子叶同型。
 2. 主茎粗大,形成主干。
 3. 背叶具有粗锯齿,有时具纤毛,先端芒尖.....1. 卷柏*S. tamariscina* var. *tamariscina*
 3. 背叶近全缘,锯齿不明显,先端渐尖.....2. 垫状卷柏*S. tamariscina* var. *pulvinata*
 2. 主茎不形成粗大的主干。
 4. 主茎直立或斜升,根从茎基部或下部伸出。
 5. 茎和枝光滑无毛。
 6. 主茎直立,根从基部长出;茎基部的叶同型,大小相等,抱茎或向上。
 7. 背叶渐尖,叶缘无明显的白边.....3. 兖州卷柏*S. involvens*
 7. 背叶芒尖,叶缘具白边.....4. 江南卷柏*S. moellendorffii*
 6. 主茎斜升或攀缘,根一直长到主茎的1/3处;茎基部的叶近两型,大小与形状不等,侧叶向外伸出。
 8. 叶缘具缘毛,无明显白边,背叶基部稍偏斜.....5. 深绿卷柏*S. doederleinii*
 8. 叶全缘,具白边,背叶基部明显偏斜.....6. 薄叶卷柏*S. delicatula*
 5. 茎和枝具毛。
 9. 腹叶和腋叶具短缘毛.....(7. 二型卷柏*S. biformis*)
 9. 腹叶和腋叶全缘。
 10. 腹叶和腋叶的基部至少一边耳状;孢子叶卵形至披针.....8. 毛枝卷柏*S. trichoclada*
 10. 腹叶和腋叶的基部不为耳状;孢子叶宽卵形.....9. 布朗卷柏*S. braunii*
 4. 主茎匍匐,根从茎或枝的节间伸出。
 11. 茎与枝有毛.....(7. 二型卷柏*S. biformis*)
 11. 茎与枝光滑。
 12. 孢子叶穗排列松散,分枝;孢子叶与营养叶有点相似.....10. 伏地卷柏*S. nipponica*
 12. 孢子叶穗排列紧密,不分枝;孢子叶完全不同于营养叶。
 13. 背叶与腹叶边缘具细锯齿,细牙齿或有短缘毛。
 14. 所有叶片具有白色透明或半透明的边缘;背叶芒尖;腹叶覆瓦状排列,具有明显的假脉;腋叶长度不及腹叶.....11. 蔓出卷柏*S. davidii*
 14. 叶片没有白色透明或半透明的边缘;背叶渐尖;腹叶松散排列,无明显假脉;腋叶与腹叶仅等长.....(12. 疏叶卷柏*S. remotifolia*)
 13. 背叶与腹叶边缘全缘。
 15. 叶面绿色;背叶一侧的基部耳状.....13. 耳基卷柏*S. limbata*
 15. 叶面带蓝色;背叶基部不为耳状.....14. 翠云草*S. uncinata*
 1. 孢子叶穗扁平,孢子叶两型。
 16. 植株较大,主茎直立,3-4回羽状;背叶基部心形.....15. 细叶卷柏*S. labordei*
 16. 植株较小,主茎匍匐,2-4回羽状;背叶基部非心形。
 17. 叶片基部叶缘具细牙齿;腹叶宽卵形,弯曲.....16. 异穗卷柏*S. heterostachys*
 17. 叶片基部叶缘具缘毛;腹叶卵形至披针形,不弯曲。
 18. 背叶和腹叶叶缘具长缘毛,缘毛长超过叶片宽度的1/2,具有宽白边.....17. 白毛卷柏*S. albociliata*
 18. 背叶和腹叶基部叶缘具缘毛,具狭窄的白边。
 19. 背叶基部对称,主茎2回羽状.....18. 缘毛卷柏*S. ciliaris*
 19. 背叶基部不对称,主茎3-4回羽状.....(19. 剑叶卷柏*S. xipholepis*)