Confirmation of three species of pteridophytes in Taiwan

Ho-Ming Chang(1) and Jenn-Che Wang(1,2)

(Manuscript received 24 October, 2001; accepted 28 November, 2001)

ABSTRACT: The distribution of *Huperzia serrata* (Thunb. ex Murray) Trevisan var. *serrata*, *Dryopteris lacera* (Thunb.) O. Ktze., and *Ophioglossum thomale* Komarov in Taiwan are confirmed. Nomenclatural treatments, including two new combinations: *Huperzia serrata* var. *longipetiolata* (Spring) H.-M. Chang and *Huperzia serraia* var. *myriophyllifolia* (Hayata) H.-M. Chang, along with descriptions, taxonomic notes, and color photos are provided.


INTRODUCTION

Since the publication of Flora of Taiwan (Li et al., 1975, first edition), the ferns and fern allies of Taiwan have been thoroughly revised for three times, viz. Kuo (1985, 1997) and the second edition of Flora of Taiwan (Huang et al., 1994). However, despite being previously reported, some species of ferns and fern allies in Taiwan were still questioned by local pteridologists. They were usually treated doubtfully because no specimen was available in Taiwan herbaria and/or no one re-collected them in the fields. During the past several years, the first author successively found some formerly uncertain species and confirmed their distribution in Taiwan. In this paper, we sustain their distribution in Taiwan and give nomenclatural treatments, descriptions, taxonomic notes, and color photos as follows.

TAXONOMIC TREATMENT


Terrestrial, bulbiferous plants. Stem actinostele, usually ascending at lower part, erect at upper part, 5-25 cm long, sparsely dichotomous branching. Microphylls chartaceous, variable (from linear to ovate-oblong) in shape, usually dentate at margin; trophophylls 7-20 mm long, 1-5 mm broad, sporophylls 3-10 mm long, 0.5-2 mm broad. Spororangia kidney-shaped, solitary at adaxial base of sporophyll, growing segmentally along upper part of persistent main stem, yellowish when mature. No distinct annual strobili.

---

1. Department of Biology, National Taiwan Normal University, Wenshan, Taipei 116, Taiwan. ROC.
2. Corresponding author. Tel.: +886-2-29326234 ext. 229; Fax.: +886-2-29312904; E-mail: biofv017@scc.ntnu.edu.tw
Distribution: Asia, Austro-Malaysian region, Hawaii, Mexico, and West Indies.

Most fern taxonomists in Taiwan adopted the broad concept that all members of Lycopsidaeae belonged to a single genus Lycopodium except Kuo (1997). Recent studies advocate that the genus Lycopodium (sensu lato) should be divided into four (Øllgaard, 1987, 1990; Nakaike, 1996; Kuo, 1997) or more genera (Wu & Ching, 1991; Zhang & Kung, 2000). This study follows the system of Øllgaard (1987).

Huperzia serrata is very variable and many infraspecific taxa have been proposed. In Taiwan, it was usually thought that there were only two varieties (or forma), var. longipetiolata and var. myriophyllifolia (DeVol, 1965, 1975; Kuo, 1997), except Shieh (1972). The former is a common taxon growing in the understory of mountain forests from low (400m) to middle (2500m) altitudes. The latter is a rather rare taxon, found only in one locality of mid-altitude. It is characterized by having narrower linear microphylls with the margin strongly crinkly and toothed. Previous taxonomists, such as Kuo (1985) and Tsai and Shieh (1994), thought that both of them belonged to the Huperzia serrata complex. However, the first author found that H. serrata var. serrata and H. serrata var. longipetiolata grew in separate populations at the same locality, Yuanyanghu Lake. We confirm that H. serrata var. serrata does occur in Taiwan. Huperzia serrata var. serrata can be easily distinguished from H. serrata var. longipetiolata, mainly by its narrowly oblongate microphylls. In addition, H. serrata var. longipetiolata has obvious petiole and its microphylls are broader (3-5 mm) than H. serrata var. serrata (1-2 mm). Sometimes, H. serrata var. serrata may have entire or few-toothed leaf margins.

From the record of the specimens in herbaria, we can confirm that H. serrata var. serrata is distributed in at least four localities of northern Taiwan (Fig. 1). Usually, it occupies habitats similar with H. serrata var. longipetiolata.

Key to varieties in Taiwan

1. Trophophyll oblong, 3-5mm broad, distinctly petiolate ........................................ 1b. H. serrata var. longipetiolata
   1. Trophophyll linear to oblongate, 1-2mm broad, sessile or narrowing to a broader base
      2. Trophophyll narrowly oblongate to oblongate, 1-2mm broad, margin more or less flat
         ................................................................. 1a. H. serrata var. serrata
      2. Trophophyll narrowly acicular or linear, 1-1.5mm broad, margin strongly crinkly
         ................................................................. 1c. H. serrata var. myriophyllifolia

1a. Huperzia serrata (Thunb. ex Murray) Trevisan var. serrata 千層塔 Figs. 2, A & B

Platanther serratus (Thunb. ex Murray) Beauv., Prod. Aeth.ég. 100-111. 1805.

Microphylls chartaceous, yellowish green, narrowly oblongate to oblongate, acute at apex, sessile or gradually narrowing to a broader base, margin more or less flat; trophophylls 7-15 mm long, 1-2(3) mm broad, sporophylls 3-8 mm long, 0.5-1 mm broad.
Fig. 1: Distribution of *Huerzia serrata* var. *serrata* (solid circle), *Ophioglossum themale* (star) and *Dryopteris lacera* (empty circle) in Taiwan.

Chromosome numbers: *n* = 68 or 136, 2*n* = 204, diploid, triploid or tetraploid (Takamiya & Kurita, 1983; Takamiya, 1984)

Distribution: Japan, Korea, China, India, and Malaysia. In Taiwan, growing at forest edge in mid-altitude mountains.


*Urostachys serratus* var. *javanicus* forma *longipetiolatus* (Spring) Herter ex Nessel, Bärlappgewächse, 59. 1939.


*Urostachys serratus* var. *javanicus* (Sw.) Herter ex Nessel, Bärlappgewächse, 58. 1939.

*Urostachys javanicus* (Sw.) Herter, Ind. Lycop. 66. 1949.

Microphylls chartaceous, green to dark green, oblong to ovate-oblong, acute or acuminate at apex, notably petiolate; trophophylls 8–25 mm long, 3–5 mm broad, sporophylls 3–8 mm long, 1–2 mm broad.
Fig. 2. A & B: *Huperzia serrata* var. *serrata*. C & D: *Dryopteris lacera*. E & F: *Ophioglossum themale*. 
Chromosome numbers: \( n = 136 \), tetraploid (Tsai & Shieh, 1987).
Distribution: Sakhalin, Japan, China, the Philippines, and India. In Taiwan, growing in mountain forests at low to middle elevations.


1c. Huperzia serrata var. myriophyllifolia (Hayata) H.-M. Chang, *comb. nov.*

阿里山千層塔


*Urostachys serratus var. myriophyllifolius* (Hayata) Herter ex Nessel, Bärlappgewächse 59. 1939.

*Urostachys myriophyllifolius* (Hayata) Herter, Ind. Lycope. 71. 1949.


Microphylls chartaceous, acicular or linear, attenuate at apex, sessile, margin sharp toothed and crispate; sporophylls similar to trophophylls, 13-20 mm long, 1-1.5 mm broad. Chromosome numbers: no data.
Distribution: Endemic, growing in the forest of Mt. Alishan in central Taiwan.

Specimens examined: CHIAYI: Arians, Kawakami et Mori s.n. 1911 (Topotype: TAIF!); Alishan, Minyueh, Kanekhira et Sasaki s.n. 1918 (TAIF).


Evergreen fern, with partially dimorphic fertile frond. Rhizome stout, erect. Stipes tufted, 15-20 cm long, pale brown, densely scaly. Scales dimorphic, spreading, reddish brown, membranous, the larger scales ovate to broad lanceolate, 8-15 mm long and 3-8 mm broad on stipe, 2-8 mm long and 1-2 mm broad on rachis, ciliate on margins; the smaller scales linear to linear-lanceolate, 2-3 mm long and 0.5-1.5 mm broad on stipe, 0.5-2 mm long and less than 1 mm broad on rachis, ciliate to split ciliate on margins. Laminae lanceolate to ovate,
bipinnate to tripinnatifid, 30-60 cm long, 20-30 cm broad, subcoriaceous, lower pinnae shorter; pinnae dimorphic, about 10-15 pairs, with short petiole; sterile pinnae 5-6 pairs, oblong-lanceolate, 10-15 cm long, 3-5 cm broad; fertile pinnae 8-10 pairs, strongly contracted and shortened, confined to upper 1/4 to 1/3 of the frond, less than 10 cm long, 1-3 cm broad, crimped and dry when sporangia mature. Sori round, indusia entire.

Chromosome numbers: n=41 or 82, diploid or tetraploid (Weng, 1989; Iwatsuki, 1995).

Distribution: China and Japan. In Taiwan, only three distant populations are found, very rare.


In Taiwan, Dryopteris lacera was first recorded by Jeng (1978). His report was adopted by DeVol (1979), DeVol and Kuo (1979), and Kuo (1985) when they revised all Taiwanese pteridophytes. Nevertheless, this species was omitted in later studies, such as Tsai & Shieh (1994) and Kuo (1997). The first author collected this species in Hsinchu County in the summer of 2000, and found it again at Mt. Nanhuatashan this year (Fig. 1). The most important character of D. lacera is its dimorphic pinnae. Other species of Dryopteris in Taiwan has wholly monomorphic pinnae, that is, all pinnae are potentially capable of forming sori. It has sharply contracted and distinguishable soriferous pinnae occupying only the apical part of the frond. When the sporangia mature, its pinnules of fertile pinnae are wholly crimped, not partially crimped as those of D. squamiseta (Hook.) Ktze.

Geographically, the distribution of D. lacera in Taiwan is almost on the southern limit of its range. We infer the three disjunctive populations in Taiwan could be relics of an once large, widespread and continuous population, or alternatively, populations founded by long distance spore dispersal.


狭葉瓶爾小草 Figs. 2, E & F

Ophioglossum vulgatum L. var. thermale (Komarov) C. Chr. in Hultén, Fl. Kamt. 1: 45-46. 1927.

Terrestrial, summer-green plants. Rhizome short, bearing 2-5 fronds simultaneously, gemma borne on slender creeping roots. Phyllomophore 1-3 cm long; trophophyll linear-lanceolate to linear, inward depressed, subsessile, 2-7 cm long, 0.5-1.5 cm broad, acute or obtuse at apex, attenuate at base; venation fine, areolae long, seldom with included free veinlets; sporophyll stipe 3-5 cm long, fertile spikes 2-3 cm long.

Chromosome numbers: n=240 or 480, tetraploid or octoploid (Kurita, 1981; Kato, 1995).

Distribution: Siberia, Japan, China, and Micronesia. In Taiwan, growing in low-altitude fields of eastern part.

Specimens examined: ILAN: Tatung, Campus of Yingshih Primary School, Chang 3211 (TAIF). HUALIEN: Sanchan, Estuary of Sanchanhsi, Leong 756 (HAST); Hualien City, Campus of Hualien Normal College, Chang s.n. 2001 (TAIF); Shoufong, Campus of National Tunghua University, Chang s.n. 2000 (TAIF).
In general, the Taiwanese species of *Ophioglossum* are difficult to distinguish, but *O. themale* is easily detected by its narrow and inward depressed trophophylls. Besides, a short rhizome bearing 2-5 fronds simultaneously is another special character of this species. Although Tagawa (1958), Nishida (1959), Ohwi (1965), Shieh (1973), Yang (1973), Nakaike (1992), and Kato (1995) have recorded its distribution in Taiwan, they didn’t mention where it grew, who collected it, and what its features were. For a long time, the local taxonomists couldn’t be certain whether it grew in Taiwan or not. Last April, the first author found a large population of it in a schoolyard, beside a mountain, of Ilan County (Fig. 1). Then we examined specimens of the genus *Ophioglossum* in Taiwan’s major herbaria and found that the species had been collected three times from another locality in eastern Taiwan. This distribution pattern of being confined in eastern Taiwan is just like other vascular plants, such as *Gentiana tenuissima* (Chen and Wang, 1999) having closed species in Japan of the same series. It seems interesting to seek why they just grow in eastern Taiwan, and why they are both phytogeographically close to those in Japan.

ACKNOWLEDGEMENTS

We would like to express our gratitude to the reviewers for their critical comments on the manuscript. Grateful thanks from the authors are due to Dr. W.-L. Chiou of Taiwan Forestry Research Institute for his comments and for kindly providing literature. We are indebted to Messrs C.-T. Lu, S.-W. Chung, C.-W. Chen and P.-S. Li for their assistance in field collection. We also thank the herbaria HAST, TAI, TAIF and TNU for access to examine specimens.

LITERATURE CITED

Jeng, Y.-C. 1978. A revision of Taiwan *Dryopteris*. M.S. thesis of National Taiwan University, Taipei. (In Chinese)


台灣產三種蕨類植物之確認

張和明(1)、王震哲(1,2)

（收稿日期：2001年10月24日；接受日期：2001年11月28日）

摘 要

本文確認千層塔（Huperzia serrata var. serrata）、二型鱗毛蕨（Dryopteris lacera）及狹葉瓶爾小草（Ophioglossum themale）三種蕨類植物分布於台灣，並提供形態描述、分類註解、彩色照片與包括千層塔（Huperzia serrata）種下分類群的命名處理。

關鍵詞：二型鱗毛蕨，千層塔，長柄千層塔，阿里山千層塔，石松，狹葉瓶爾小草，蕨類，台灣。

1. 國立台灣師範大學生物學系，台北市116汀州路4段88號，台灣。
2. 通信作者。