New Additions to the Fern Flora of Taiwan(4)

臺灣蕨類植物增註(4)

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Abstract

Two newly recorded fern species, *Hymenophyllum palmatifidum* (Müll. Berol.) Ebihara & K. Iwats. (Hymenophyllaceae) and *Oreogrammitis caespitosa* (Blume) Parris (Polypodiaceae), were found in the foggy forest region of southeastern Taiwan. Their morphological descriptions and illustrations are presented.

摘 要

本文報導台灣東南部霧林區域發現的兩種台灣新紀錄蕨類：毛緣細口團扇蕨 (*Hymenophyllum palmatifidum* (Müll. Berol.) Ebihara & K. Iwats.，膜蕨科) 與穴孢濱禾蕨 (*Oreogrammitis caespitosa* (Blume) Parris，水龍骨科)，並提供形態描述及圖片。

Key words: Hymenophyllaceae, *Hymenophyllum palmatifidum*, *Oreogrammitis caespitosa*, Polypodiaceae, Taiwan.

關鍵詞：膜蕨科、毛緣細口團扇蕨、穴孢濱禾蕨、水龍骨科、臺灣。

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Introduction

During our recent field investigation in Taiwan, we discovered two new fern species, *Hymenophyllum palmatifidum* (Müll. Berol.) Ebihara & K. Iwats. (Hymenophyllaceae) and *Oreogrammitis caespitosa* (Blume) Parris (Polypodiaceae). Both species were discovered in the foggy and mossy forests in the southern part of the Central Mountain Ridge, a well-known main habitat of several rare and endangered ferns in Taiwan that hosts the most grammitid ferns and a series of filmy ferns (Moore 1999, 2000a, 2000b, 2001, Moore *et al*. 2003). Most of the species found in this region, including the two newly recorded ones, are inhabitants of tropical Asian montane forests with their northernmost distribution in Taiwan. Our recent discoveries (Hsu *et al*. 2014, Hsu *et al*. 2015) add to the understanding of fern diversity in the southern Central Mountain Ridge and southern Taiwan's floristic connection with the tropical southeastern Asia. Herein, morphological descriptions, illustrations, taxonomic and ecological notes of *H. palmatifidum* and *O. caespitosa* are presented. Their threatened status based on IUCN categories (IUCN 2001, 2003) are evaluated as well.

Taxonomic Treatments

(1) ***Hymenophyllum palmatifidum*** (Müll. Berol.) Ebihara & K. Iwats., Taxon 53(4): 941. 2004. 毛緣細口團扇蕨 Fig. 1.

Basionym: *Trichomanes palmatifidum* Müll. Berol., Bot. Zeitung (Berlin) 42: 732. 1854.

Type: INDONESIA. Java: *Zöllinger 1722* (holotype: B photo!; isotypes: K, L, P photo!).

Synonyms: *Trichomanes digitatum* Sw. var. *palmatifidum* (Müll. Berol.) Hook. & Baker, Syn. fil. 76. 1867. — *Gonocormus palmatifidus* (Müll. Berol.) Prantl, Unters. Morph. Gefässkrypt. 1: 51. 1875. — *Microtrichomanes palmatifidum* (Müll. Berol.) Copel., Philipp. J. Sci. 67: 36. 1938. — *Sphaerocionium palmatifidum* (Müll. Berol.) K. Iwats., J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 211. 1982.

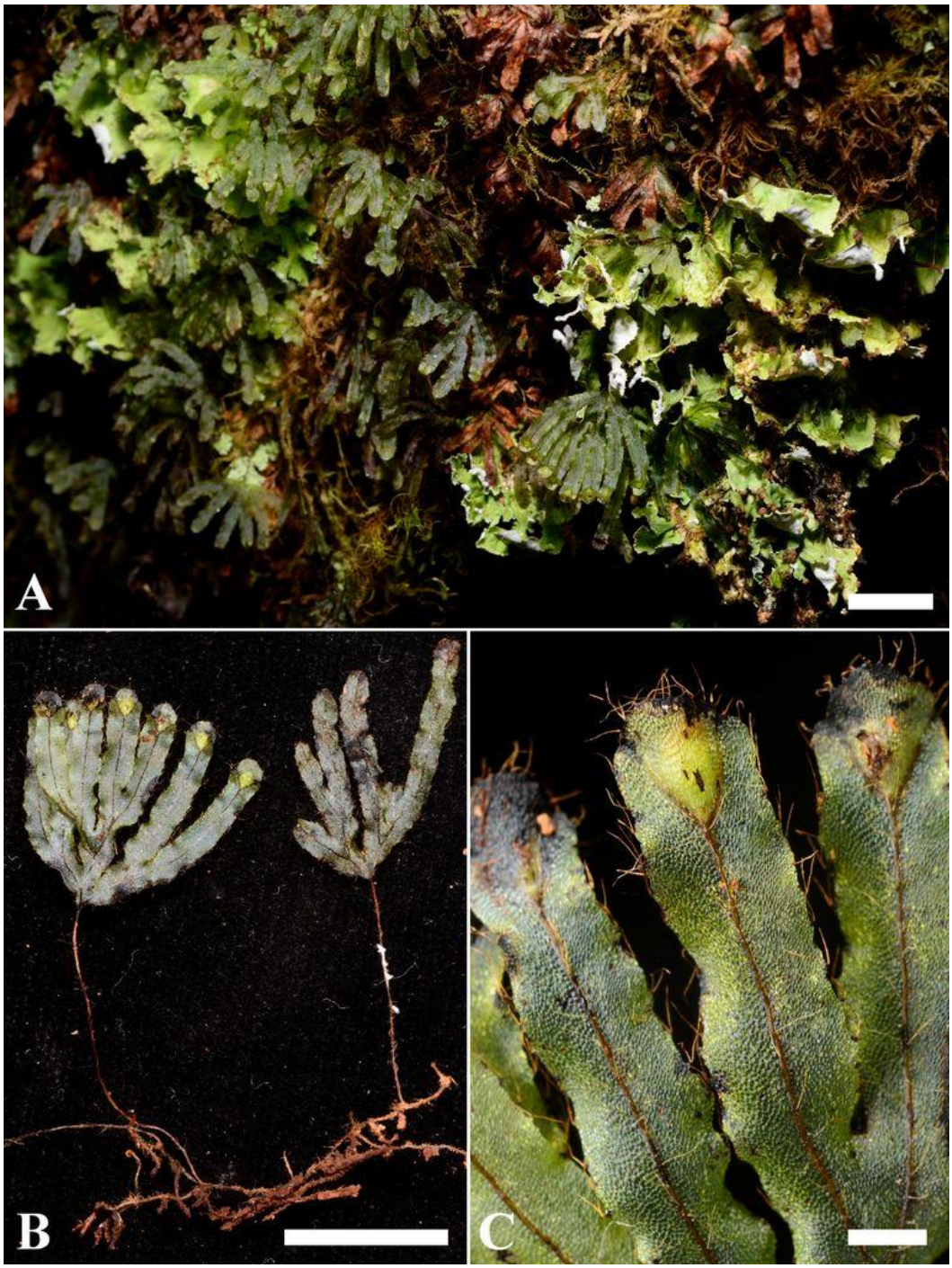

Fig. 1. *Hymenophyllum palmatifidum* (Müll. Berol.) Ebihara & K. Iwats. (from *T.C. Hsu 7150*). A: Habits *in situ*. B: Habit. C: Fertile lobe of lamina, showing the forked marginal setae and obconical involucres. Scale bars: A–B = 1 cm; C = 1 mm. Photographs by T.C. Hsu.

Morphology: Rhizome long creeping, filiform, wiry, with simple, brown, downy hairs. Stipe 12~25 mm, very slender, wingless, with sparse brown hairs. Lamina ca. 10~20 mm × 1~1.5 mm, flabellate or obovate, dichotomously branched, often without an distinct rachis; lobes up to 10 mm long, 1.5~2 mm wide; margins setiferous, setae golden brown, stiff, usually basally forked, rarely simple, ca. 0.5 mm long; midribs glabrous or very sparse setiferus adaxially, sparse to scattered setiferus abaxially, setae usually simple, occasionally forked. Sori sunken in apices of lobes; hollow part of involucres obconical; mouth slightly 2-lipped, lips semiorbicular.

Distribution: Indonesia, Malaysia, New Guinea and Taiwan.

Habitat: Epiphytic on the shaded side of a trunk near tree base in a foggy and mossy broadleaved forest at ca. 2100 m elev.

Conservation status: CR [D1]. In Taiwan, only a single small population covering ca. 20 × 40 cm^2 area of a tree trunk was found. The population is threatened by frequently occurring landslides that could directly destroy its habitat or cause extreme habitat fragmentation.

Voucher specimen: TAIWAN. Taitung County: Jinfong Township, from Mt. Peitawu to Mt. Payusen, 2 Jun 2014, *TC Hsu 7150* (TAIF).

N**ote:** *Hymenophyllum palmatifidum* belongs to a group of species formerly placed in the genus *Microtrichomanes* and characterized by cup-shaped involucres and dichotomous fronds with neither false veinlets nor specialized cells (Copeland 1938, Iwatsuki 1975, Ebihara *et al.* 2004). However, most species, including *Microtrichomanes palmatifidum*, were found deeply nested within *Hymenophyllum* according to molecular data and hence transferred to *Hymenophyllum* (Ebihara *et al.* 2004). The discovery of *H. palmatifidum* in Taiwan greatly extends its northern boundary of distribution and also strongly suggests that the species also occurs in the Philippines which now represents a gap among its known distribution range.

Morphologically, *H. palmatifidum* resembles *H. digitatum* and *H. nitidulum*, also former members of *Microtrichomanes*, in sharing slender, wiry stipes and flabellately or dichotomously branched fronds. A key to the closely allied species of *H. palmatifidum* as well as the main frame for all known members of genus *Hymenophyllum* in Taiwan is presented here (cf. Ebihara *et al.* 2004, 2006, Liu *et al.* 2013, Tsai and Shieh 1994):

1a. Blades glaucous or covered with whitish multicellular hairs.
…… Subgenus ***Pleuromanes*** [毛葉蕨亞屬]
…… *H. acutum* (C. Presl) Ebihara et K. Iwats. [疏毛毛葉蕨]
…… *H. pallidum* (Blume) Ebihara et K. Iwats. [毛葉蕨]
1b. Blades neither glaucous nor covered with whitish multicellular hairs. ……. 2
2a. Stellate hairs present on blades.

…… Subgenus ***Sphaerocionium***

…… *H. pilosissimum* C. Chr. [星毛膜蕨]

2b. Stellate hairs absent on blades. …….....……... 3

3a. Involucre lips usually enlarged and somewhat bivalvate, but not deeply cleft; involucres obconic or rarely campanulate, blades digitately or dichotomously branched.

…….....…… 4. Subgenus ***Sphaerocionium***

3b. Involucre lips bivalvate, usually deeply cleft towards bases or nearly so; involucres rounded, ovate, elliptic, or rarely tubular; blades pinnately dissected. …….....……7

4a. Marginal setae absent.

…… *H. nitidulum* (Bosch) Ebihara et K. Iwats. [細口團扇蕨] (old fronds)

4b. Marginal setae present. …….....….... 5

5a. Marginal setae unicellular, < 0.2 mm.

…… *H. digitatum* (Sw.) Fosberg [指裂細口團扇蕨]

5b. Marginal setae multicellular, > 0.3 mm. …….....…. 6

6a. Marginal setae scarce, simple.

…… *H. nitidulum* (young and mature fronds)

6b. Marginal setae frequent, usually basally forked.

…… *H. palmatifidum* (Müll. Berol.) Ebihara & K. Iwats. [毛緣細口團扇蕨]

7a. Margins of blades entire.

…… Subgenus ***Mecodium*** [蕗蕨亞屬]

…… *H. badium* Hook. et Grev. [蕗蕨]

…… *H. fimbriatum* J. Sm. ex Hook. [叢葉蕗蕨]

…… *H. javanicum* Spreng. [爪哇蕗蕨]

…… *H. oligosorum* Makino [長毛蕗蕨]

…… *H. paniculiflorum* C. Presl [圓錐苞蕗蕨]

…… *H. polyanthos* (Sw.) Sw. [細葉蕗蕨]

…… *H. productum* Kunze [南洋蕗蕨]

…… *H. taiwanense* (Tagawa) C.V. Morton [臺灣蕗蕨]

7b. Margins of blades toothed. …….....……........ 8

8a. Involucres mainly rounded or ovate; receptacles included in involucres.

…… *Hymenophyllum* group [膜蕨群] of Subgenus ***Hymenophyllum*** [膜蕨亞屬]

…… *H. barbatum* (Bosch) Baker [華東膜蕨]

…… *H. devolii* M.J. Lai [棣氏膜蕨]

…… *H. simonsianum* Hook. [寬片膜蕨]

8b. Involucres ovate, elliptic or tubular; receptacles far extruded out of involucres.

…… *Meringium* group [厚壁蕨群] of Subgenus ***Hymenophyllum***
…… *H. blandum* Racib. [爪哇厚壁蕨]
…… *H. denticulatum* Sw. [厚壁蕨]
…… *H. holochilum* (Bosch) C. Chr. [南洋厚壁蕨]

(2) ***Oreogrammitis caespitosa*** (Blume) Parris, Gard. Bull. Singapore 58(2): 257. 2007. 穴孢濱禾蕨 Fig. 2.

Basionym: *Grammitis caespitosa* Blume, Enum. Pl. Javae 2: 115. 1828.

Type: INDONESIA. Java: Mt. Gede, 7 Jan 1913, *Matthew s.n.* [neotype: K photo!, designated by Parris (1983)].

Morphology: Rhizome dorsiventral, stipes in two rows, not articulated to rhizome, densely scaly. Scales 2~3 mm × 0.2~0.3 mm, yellowish brown, glabrous, not clathrate. Stipes 10~30 mm × ca. 0.5 mm; setae on stipe dense, pale yellowish, simple or forked, 0.1~0.2 mm long. Laminae 2~9 cm × 0.3~0.6 cm, linear-lancelate to linear-oblanceolate, acute to acuminate at apex, cuneate to long-attenuate at base, entire; setae dark reddish, simple, 0.1~0.4 mm long sparse on margin and very sparse on abaxial midrib; midrib immersed adaxially, slightly prominent abaxially, almost concolorous or slightly darker than lamina; lateral veins obscure (occasionally visible in old fronds), 1-forked, ending with small hydathodes on adaxial surface, acroscopic branch sometimes extending beyond sori. Sori circular to elliptic, in apical 1/3~2/3 of lamina but not immediately below the apex, 1 row each side of midrib, 2~16 in each row, approximately midway between margin and midrib, deeply sunken in steep-sided pits with sometimes slightly elevated rims, slightly elevated adaxially; sporangia glabrous or with 1~2 setae at apices.

Distribution: Indonesia, Malaysia (Sabah), the Philippines and Taiwan.

Habitat: In a foggy and mossy predominantly broadleaved forest (with scarce *Chamaecyparis formosensis* Matsum.) at ca. 1800 m elev., typically found epiphytic on moss-covered small- to medium-sized branches along semi-open stream valley.

Conservation status: EN [D1]. Only a single locality has been found in Taiwan with an estimated 50~250 mature individuals. No obvious threat is currently detected, but the habitat condition should be continuously monitored since such kind of cloudy forest is often thought to be especially vulnerable to climate change (Markham 1998, Foster 2001).

Voucher specimens: TAIWAN. Taitung County: Beinan Township, Ketepola Stream, 5 Feb 2013, *Y.H. Chang 20130205-044* (TAIF); same loc., 16 Feb 2015, *T.C. Hsu 7463* (TAIF).

Note: The materials found in Taiwan agree well with the description from New Guinea (Parris 1983) and the specimen collected from Java (*C.W. Chen 2009*, TAIF) except for higher ratio of glabrous sporangia. This distinction is temporarily regarded as regional variation.

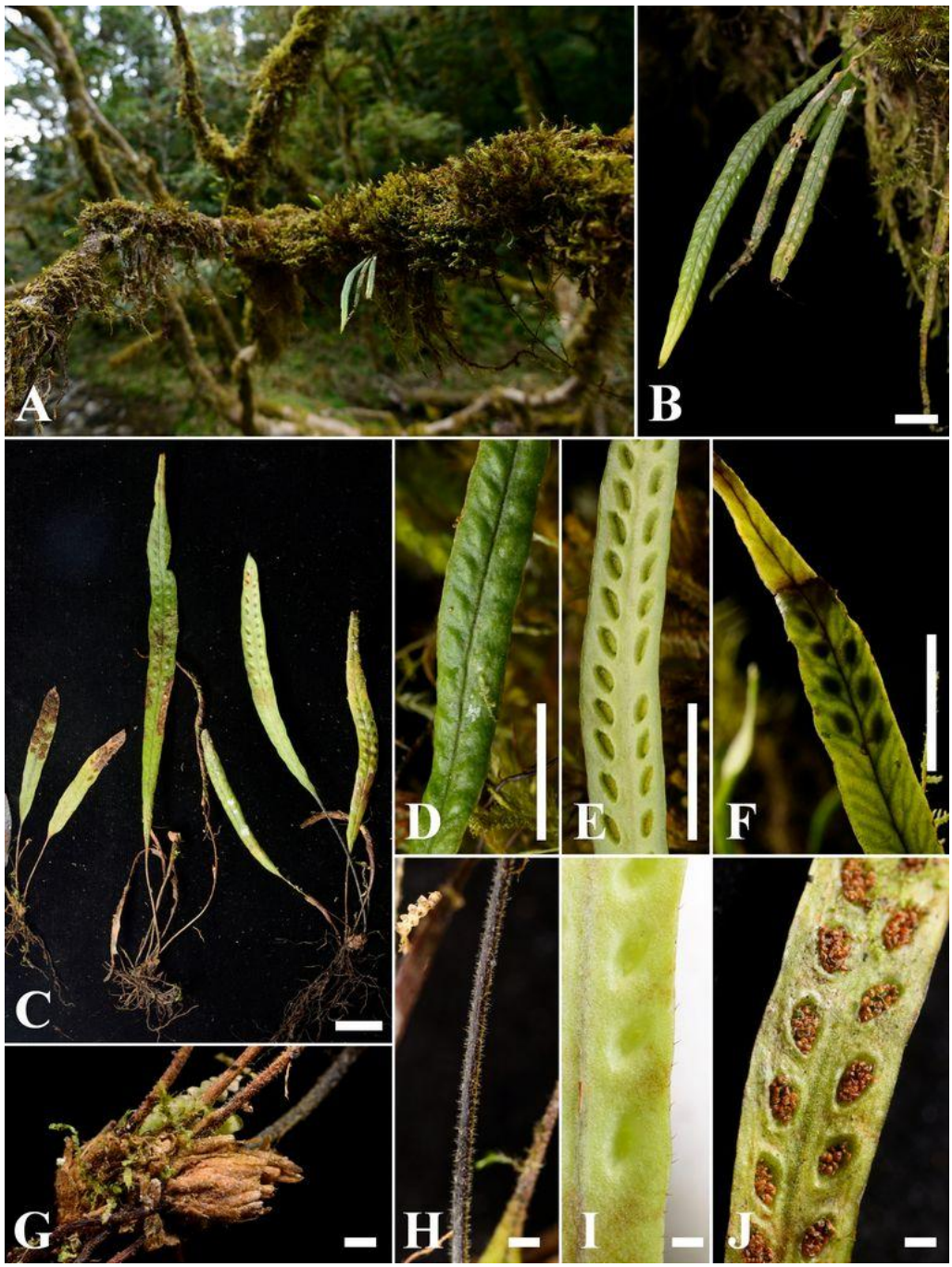

Fig. 2. *Oreogrammitis caespitosa* (Blume) Parris (from *T.C. Hsu 7463*). A-B: Habitat and habit *in situ*. C: Habits. D–F: Lamina; D, adaxial view; E, abaxial view, with immature sori; F, adaxial view in transmitted light, showing venation. G: Rhizome and scales. H: Stipe. I: Marginal setae. J. Mature sori. Scale bars: B–F = 1 cm; G–J = 1 mm. Photographs by T.C. Hsu.

Based on frond dissection, the grammitids having simple, linear or lanceolate fronds with circular to somewhat elliptic sori. They were often treated under a broad-sensed genus *Grammitis* Sw. in the past (ex. DeVol 1975, Shieh *et al.* 1994, Zhang 2000), and comprised at least 150 species (Copel and 1947). After several taxonomic works on the grammitid ferns in the latest 20 years (ex. Hirai *et al.* 2011, Kessler *et al.* 2011, Labiak *et al.* 2010a, 2010b, Parris 1997, 1998, 2007 and 2013, Perrie and Parris 2012, Ranker *et al.* 2004, Sundue 2010a, 2010b, 2013, Sundue *et al.* 2010, 2012), a whole new scheme for all grammitids with more than 20 genera (Parris 2010) is formed step by step, and *Grammitis s.str.* becomes a small genus of ca. 23 species with blackish sclerotic lamina margins (Parris 2007).

Materials of *Grammitis s.l.* collected in Taiwan belong to two genera, i.e. *Oreogrammitis* Copel. and *Radiogrammitis* Parris, according to the new scheme just mentioned above. A key to distinguish the grammitid species with simple fronds in Taiwan is presented here (cf. Moore and Parris 2013, Parris 2010, Shieh *et al.* 1994):

1a. Sori linear, somewhat parallel to midvein and sunken in grooves in lamina.
…… Genus ***Scleroglossum*** [革舌蕨屬]
…… *S. sulcatum* (Kuhn) Alderw. [革舌蕨] (= *S. pusillum*; auct. Taiwan.)
1b. Sori circular to broadly elliptic, superficial or slightly sunken in broad shallow pits in lamina. …..…2
2a. Rhizomes dorsiventral, stipes in two rows.
…… 3. Genus ***Oreogrammitis*** (the simple-frond part) [濱禾蕨屬]
2b. Rhizomes radial, stipes in whorls.
…… 8. Genus ***Radiogrammitis*** (the simple-frond part) [輻禾蕨屬]
3a. Both surfaces of lamina glabrous; sori sunken in pits in lamina. …….....…….. 4
3b. The degrees of hairiness on laminae varying from nearly glabrous to densely hairy just depending on species; sori superficial. …….....….. 5
4a. Stipe 1~3 cm, sori deeply sunken in pits with steep sides and sometimes slightly elevated rims.
…… *O. caespitosa* (Blume) Parris [穴孢濱禾蕨]
4b. Stipe < 0.5 cm; sori sunken without steep sides or distinct rims.
…… *O. nuda* (Tagawa) Parris [長孢濱禾蕨]
5a. Lateral veins visible clearly on upper surface of lamina.
…… *O. reinwardtii* (Blume) Parris [毛濱禾蕨]
5b. Lateral veins hidden and not prominent on either surface of lamina. …….....…… 6
6a. Mature lamina glabrous or nearly glabrous with very sparse hairs.
…… *O. adspersa* (Blume) Parris [無毛濱禾蕨]
6b. Mature lamina with hairs wholly or at least on midrib. …….....…….… 7
7a. Lamina usually less than 6 cm; stipes very short, ca. 5 mm long; frond hairs less than 1 mm long

(0.1-0.2 mm); sporangia glabrous.

…… *O. dorsipila* (Christ) Parris [短柄濱禾蕨] (= *Grammitis fenicis*; auct. Taiwan.)

7b. Lamina usually more than 8 cm; stipes 8-40 (-50) mm long; frond hairs longer and up to 1.2 mm long; sporangia setose.

…… *O. congener* (Blume) Parris [南亞濱禾蕨]

8a. Marginal hairs of lamina solitary.

…… *R. setigera* (Blume) Parris [剛毛輻禾蕨] (= *G. intromissa*)

8b. Marginal hairs of lamina solitary and/or in tuft. ……..……. 9

9a. Rhizomes without scales; marginal hairs pale to medium reddish brown, tufted, in 2 lengths.

…… *R. alepidota* (M. G. Price) Parris [無鱗輻禾蕨]

9b. Rhizomes with scales; marginal hairs dark reddish brown, solitary and/or tufted, all in the same length or nearly so. ……..…….. 10

10a. Vein endings with hydathodes on adaxial side of lamina; veins 1-forked, branches usually equal in length.

…… *R. moorei* Parris et Knapp [牟氏輻禾蕨]

10b. Vein endings without hydathodes on adaxial side of lamina; veins 1-forked, acroscopic branch much shorter than basiscopic one.

…… *R. taiwanensis* Parris et Knapp [臺灣輻禾蕨] (= *G. jagoriana*; auct. Taiwan.)

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