

Research note

Metathelypteris flaccida (Blume) Ching (Thelypteridaceae; Polypodiales), a Newly Recorded Fern in Taiwan

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【 Summary 】

Metathelypteris flaccida (Blume) Ching (Thelypteridaceae) is reported as a new record of Taiwan in this paper. We supply a description of its morphological characters, synonyms, taxonomic notes, line-drawings, photographs, and IUCN Red List Category. A key to species of *Metathelypteris* in Taiwan is also provided herein.

Key words: fern, *Metathelypteris flaccida*, new record, Taiwan, Thelypteridaceae.

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研究簡報

臺灣新紀錄蕨類：薄葉凸軸蕨

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摘 要

本文報導薄葉凸軸蕨(*Metathelypteris flaccida* (Blume) Ching, 金星蕨科)為臺灣的新紀錄蕨類植物。除分別敘述其形態特徵、同物異名及分類註記外,並提供線繪圖與照片,同時也根據國際自然保育聯盟(IUCN)的評估準則,針對本種提出在臺灣的稀有及保育等級建議;最後提供臺產凸軸蕨屬物種檢索表以利鑑別。

關鍵詞:蕨類、薄葉凸軸蕨、新紀錄、臺灣、金星蕨科。

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The fern genus *Metathelypteris* (Thelypteridaceae), typified by *Aspidium gracilescens* Blume (1828), was established by Ching (1963) and is mainly distributed in subtropical Asia; South China is considered its evolutionary center (Wu and Ching 1991). Twelve~20 species are contained within this genus (Wu and Ching 1991, Shing et al. 1999, Lin et al. 2013), and their exclusively common characteristics from other thelypteroid genera are non-grooved costae and veinlet tips never reaching the leaf margins (Ching 1963). In Taiwan, 4 species were recorded, viz., *M. adscendens* (Ching) Ching, *M. gracilescens* (Blume) Ching, *M. laxa* (Franch. & Sav.) Ching, and *M. uraiensis* (Rosenst.) Ching (Kuo 1975, Lu and Yang 2005).

However, in our recent vascular plant surveys in eastern Taiwan, we found a previously unrecorded fern of *Metathelypteris*. After examining the floras of the adjacent areas/countries and related specimens in herbaria of L, PE, TAI, and TAIF, we identified this unknown species as *Metathelypteris flaccida* (Blume) Ching. This paper offers detailed morphological descriptions, diagnostic notes,

illustrated photos, and line-drawings of this species, and key to species of *Metathelypteris* in Taiwan. Meanwhile, the conservation status in Taiwan based on the IUCN Red List criteria (IUCN 2001, 2003) is evaluated as well.

TAXONOMIC TREATMENT

Metathelypteris flaccida (Blume) Ching, Acta Phytotax. Sin. 8(4):306. 1963.
..... 薄葉凸軸蕨(Figs. 1~3)

Basionym: *Aspidium flaccidum* Blume, Enum. Pl. Javae 2:161. 1828.

Type: INDONESIA. Java: Boerangrang, C.L. Blume s.n. (Holotype: L-0052303 photo! Isotype: BM-001044507, not seen).

Homotypic synonyms: *Dryopteris flaccida* (Blume) Kuntze, Revis. Gen. Pl. 2:812. 1891. — *Lastrea flaccida* (Blume) T. Moore, Index Fil. 92. 1858. — *Nephrodium flaccidum* (Blume) Hook., Sp. Fil. 4:133, pl. 263. 1862. — *Thelypteris flaccida* (Blume) Ching, Bull. Fan Mem. Inst. Biol. Bot. 6(5):336. 1936.

Morphology: Rhizomes ascending to erect, covered with brown linear-lanceolate scales. Fronds tufted; stipes 15~30 cm long, slender, covered with similar scales on basal

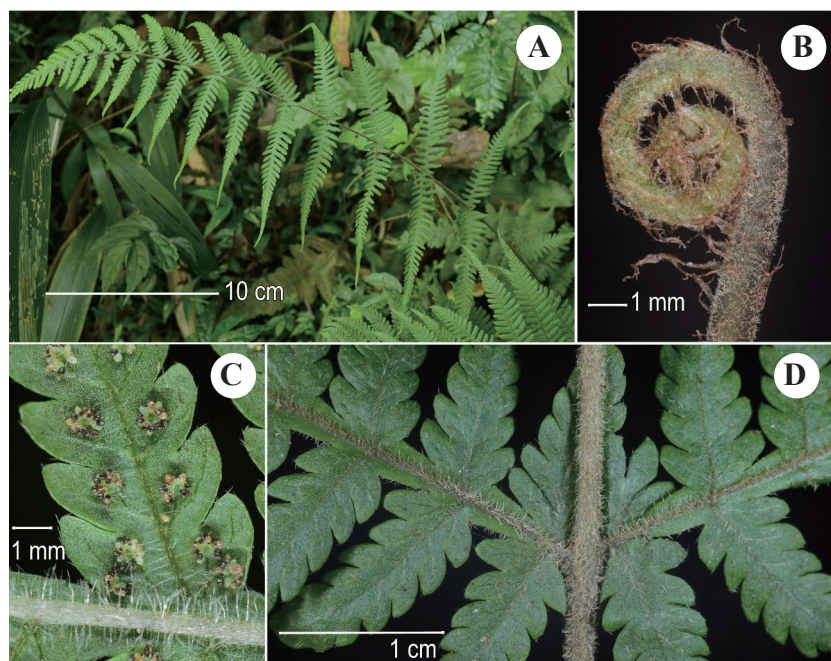


Fig. 1. *Metathelypteris flaccida* (from *P.F. Lu 26713*). **A:** Habit *in situ*; **B:** a scaly crozier; **C:** abaxial view of a portion of a middle fertile pinna; **D:** adaxial view of a proximal portion of a lamina. Photographed by Pi-Fong Lu.

portion and grayish-white hairs throughout, grooved on adaxial surfaces, stramineous except for dark-brown bases. Laminae oblong-lanceolate, acuminate at distal portion, but not or only slightly reduced at basal pinnae, 30~45 cm × 14~18 cm, thinly herbaceous, juvenile sometimes bipinnatisect-bipinnate, but gradually turning into tripinnatilobate-tripinnatifid when mature; pinnae 10~14 pairs, lanceolate, ascending at angles of 70°~85°, subopposite, sessile, apices acuminate and caudate; pinnules lanceolate, dentate to pinnatifid, obtuse-pointed at apices, not distinct and always connected with adjacent ones by narrow wings along costae, hairy on both surfaces of veins and veinlets; rachises, costae, and costules covered with whitish multicellular acicular hairs (0.5~1.2 mm) on abaxial side but with slightly shorter hairs on adaxial side, rachises grooved on adaxial surfaces but costae and costules not so. Venation free and

somewhat ambiguous, lateral veinlets simple or forked, vein-tips not reaching margins. Sori small and rounded, borne on veinlets, indusiate; indusial small, membranous, rounded to somewhat reniform, hairy, pale-greenish when mature but turning grayish-brown and shrunken when dry, often deciduous (in Taiwanese materials).

Distribution: Southwestern China, Bhutan, India, Indonesia, Malaysia, Nepal, the Philippines, Sri Lanka, eastern Taiwan, Thailand, and northern Vietnam.

Habitat: Semi-shaded slopes, near streams, under evergreen broadleaf forests at ca. 800 m in elevation in Taiwan.

Voucher specimen from TAIWAN: Hualien Co.: Sioulin Township, trail between Tatong and Tali, *P.F. Lu 26713* (TAIF).

Conservation status: DD (data deficient). Currently only 1 population with fewer than 30 individuals has been found in Taiwan.

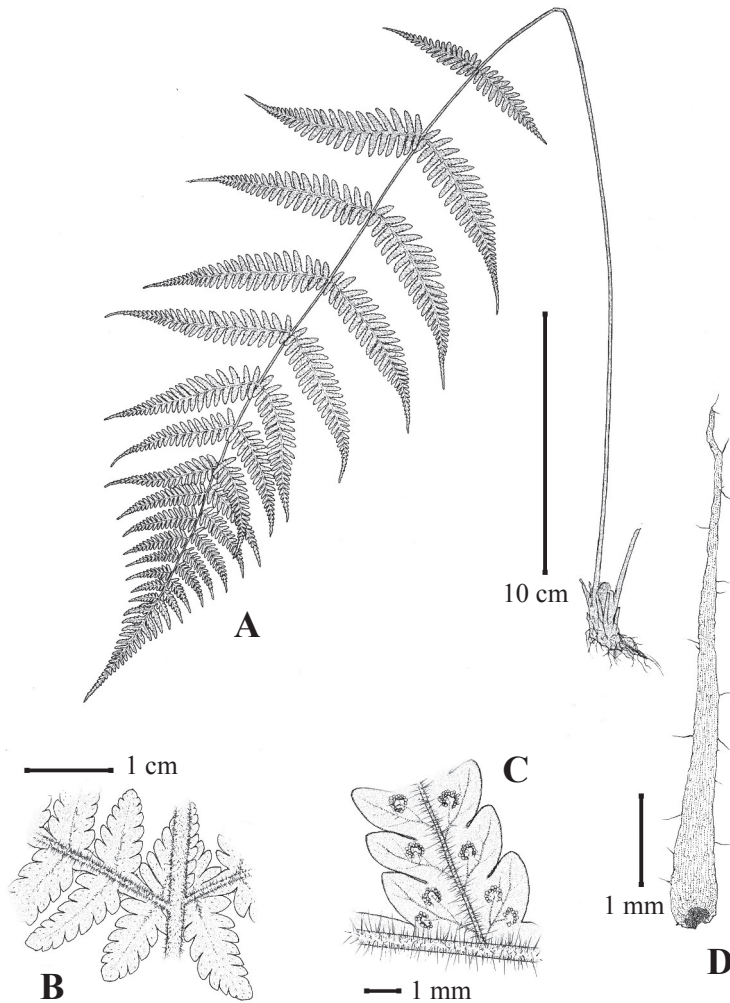


Fig. 2. *Metathelypteris flaccida* (from P.F. Lu 26713). **A:** Habit; **B:** adaxial view of a proximal portion of a lamina; **C:** abaxial view of a portion of a middle fertile pinna; **D:** a scale (on a rhizome). Illustrated by Che-Wei Lin.

Fortunately, the habitat is located within Taroko National Park and thus no immediate threat against its conservation was detected. However, more information is needed to appropriately assess the rareness status of this taxon in Taiwan.

Taxonomic notes:

The Thelypteridaceae is a monophyletic fern family based on morphological and molecular data (Smith and Cranfill 2002, Schuettpelz and Pryer 2007), with 5 genera

generally recognized, viz., *Cyclosorus*, *Macrothelypteris*, *Phegopteris*, *Pseudophegopteris*, and *Thelypteris* (Smith 1990, Smith et al. 2006, 2008, Christenhusz et al. 2011). Among these genera, the first 4 genera are monophyletic, but the last genus *Thelypteris* is definitively paraphyletic to the cyclosoroids (Smith et al. 2006, 2008, Ebihara 2011, He and Zhang 2012) and must be subdivided if *Cyclosorus* is recognized as an independent genus. He and Zhang (2012) suggested accepting well-supported segregates in their analyses



Fig. 3. Type photo of *Metathelypteris flaccida* (C.L. Blume s.n. in L [L-0052303]).

as genera within *Thelypteris*. *Metathelypteris* and its related genera, called the ACMP (*Amauropelta* + *Coryphopteris* + *Metathelypteris* + *Parathelypteris*) clade, could be one of these segregates, but *Metathelypteris* is a well-supported monophyletic unit and could be considered an independent genus. Nevertheless, *Metathelypteris* is a natural

unit regardless of the final generic delimitation made on *Metathelypteris* and its relatives, hence the concept of *Metathelypteris* is adopted herein.

Metathelypteris is a comparatively knotty taxon due to the strikingly morphological similarity at a glance. However, the density and length of hairs are very useful characters

in diagnoses as seen in Taiwan metathelypteroid ferns (Table 1). In the wild, *M. flaccida* is often confused with the fully developed *M. laxa*, if they both happen to have similar frond sizes and lamina dissections. However, the former has obviously longer hairs (0.5~1.2 vs. 0.2~0.4 mm) on both surfaces of the costae, and usually possess narrow wings along the costae of the proximal 1~3 pairs of pinnae. Furthermore, for the purpose of clear identification, a key to Taiwanese metathelypteroid ferns with additional characters is provided below.

Key to species of the genus *Metathelypteris* in Taiwan:

- 1a. Fronds tripinnatifidate-tripinnatifid 2
 1b. Fronds bipinnatifid to bipinnatisect, rarely bipinnate 3
 2a. Costae of proximal pairs of pinnae with narrow wings; both surfaces of rachises, costae, costules, and veinlets covered by distinctly patent long acicular hairs of 0.5~1.2 mm long.
 *Metathelypteris flaccida* (Blume) Ching [薄葉凸軸蕨]

- 2b. Costae of proximal pairs of pinnae without or seldom with narrow wings; both surfaces of rachises, costae, costules, and veinlets covered by somewhat patent short acicular hairs of 0.2~0.4 mm long.
 *Metathelypteris laxa* (Franch. et Sav.) Ching [柔葉凸軸蕨]
 3a. Pinnae abaxially densely covered with short hairs along costae and veinlets; stipes and indusia also densely hairy 4
 3b. Pinnae abaxially glabrous, subglabrous, or loosely covered with short hairs along costae and veinlets; stipes and indusia glabrous or subglabrous 5
 4a. Pinnae usually loosely arranged, proximal ones 2.0~4.0 cm apart from each other; segments usually crenate or serrate on margins, sometimes subentire; lobes of proximal 1 or 2 pairs of pinnae often spaced slightly distantly.
 ... *Metathelypteris laxa* (Franch.)

Table 1. Comparison of the hairiness degree of Taiwanese metathelypteroid ferns

Leaf structure	<i>Metathelypteris adscendens</i>	<i>M. flaccida</i>	<i>M. gracilescens</i>	<i>M. laxa</i>	<i>M. uraiensis</i>
Hair length (mm)	0.1~0.2	0.5~1.2	0.1~0.2	0.2~0.4	0.1~0.2
Stipe	Subglabrous	Hairy	Subglabrous	Hairy	Densely hairy
Ad. surf. ¹⁾ of rachis	Hairy	Densely hairy	Densely hairy	Densely hairy	Densely hairy
Ab. surf. ²⁾ of rachis	Subglabrous	Densely hairy	Glabrous to subglabrous	Densely hairy	Densely hairy
Ad. surf. of costa	Hairy	Densely hairy	Densely hairy	Densely hairy	Densely hairy
Ab. surf. of costa	Subglabrous	Densely hairy	Subglabrous	Densely hairy	Densely hairy
Indusia	Glabrous or with 2~6 hairs	Hairy	Glabrous	Densely hairy	Densely hairy

¹⁾ Ad. surf., adaxial surface; ²⁾ Ab. surf., abaxial surface.

- et Sav.) Ching [柔葉凸軸蕨]*
- 4b. Pinnae usually closely arranged, proximal ones 1.0~2.0 cm apart from each other; segments usually entire or subentire on margins, occasionally shallowly undulate; lobes of proximal pairs of pinnae closely spaced. *Metathelypteris uraiensis* (Rosenst.) Ching [毛柄凸軸蕨]
- 5a. Laminae usually somewhat dark-green, and slightly glossy on adaxial surface; veinlets brown to dark-brown; pinnae usually closely arranged, proximal ones 1.0~2.5 cm apart from each other; basal segments of pinnae seldom shortened; adaxial surfaces of rachises and costae with dense short hairs; populations usually found in mid-elevation mountains of Taiwan at 1500~2400 m. *Metathelypteris gracilescens* (Blume) Ching [光葉凸軸蕨]
- 5b. Laminae usually somewhat light-green to green, and not glossy on adaxial surface; veinlets pale-green to light-brown; pinnae often loosely arranged, and proximal ones 2.0~4.5 cm apart from each other; basal segments of lower 2~4 pairs of pinnae often shortened; adaxial surfaces of rachises and costae slight hairy to hairy; most populations found in low-to mid-elevation mountains of Taiwan at 400~1200 m. *Metathe-*

lypteris adscendens (Ching) Ching [微毛凸軸蕨]

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