

Research note

New Additions to the Fern Flora of Taiwan (5)

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【 Summary 】

Two fern taxa, viz., *Equisetum arvense* L. (Equisetaceae) and *Pteris edanyoi* Copel. (Pteridaceae), were newly recorded in Taiwan. Their morphological descriptions and illustrations are presented.

Key words: fern, new record, Taiwan, plant taxonomy.

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研究簡報

臺灣蕨類植物誌增註(5)

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摘 要

本文報導臺灣新發現的兩種新紀錄蕨類：問荊(*Equisetum arvense* L., 木賊科)及耶氏鳳尾蕨(*Pteris edanyoi* Copel., 鳳尾蕨科)，並提供形態描述及圖片供參。

關鍵詞：蕨類、新紀錄、臺灣、植物分類學。

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Two unrecognized ferns were collected in the wild during our recent investigation of ferns in Taiwan. After consulting the floras of adjacent regions of Taiwan and examining the specimens of related species, these two ferns are confirmed as new taxa to Taiwan: *Equisetum arvense* L., and *Pteris edanyoi* Copel., respectively. Herein, morphological descriptions, illustrations, taxonomic and ecological notes of both newly recorded ferns are presented. Their conservation status based on IUCN categories (IUCN 2001, 2003) are evaluated as well.

1. *Equisetum arvense* L., Sp. Pl. 2: 1061. 1753. 問荊(Fig. 1)

Type: USA. Virginia, *J. Clayton 341* (Lectotype: BM [BM-000062951]; designated by Jonsell & Jarvis, Nordic Journ. Bot. 14(2): 148. 1994; photo!).

Homotypic synonym: *Allostelites arvensis* (L.) Börner, Fl. Deut. Volk 59. 1912.

Morphology: Summer-green herb, plants medium-sized, about 20~40 cm tall. Rhizomes subterranean, long-creeping, blackish brown. Aerial stem annual, dimorphic, erect. Sterile stems green, 20~40 cm tall and usually longer than fertile ones, 2.5~4 mm in diam., bearing many branches in whorls at

nodes; main stems with many arc-shaped ridges superficially; sheaths about 5 mm long including teeth, dark green to dark brownish, long, narrow; sheath teeth 5~6, lanceolate-deltoid, acuminate at apex, about 2 mm long, blackish brown, margin membranous, light brown, persistent; internodes 2~3 cm. Lateral branches tender, slender, flattened, with usually 4 narrow ridges; sheath teeth usually 4, yellowish to light green, lanceolate, margin membranous, persistent. Fertile stems germinating in spring earlier than sterile branches, but soon dying to dead after spore dispersal, pale pinkish to yellowish brown, 10~30 cm tall, 3~5 mm in diam., more or less fleshy, without whorled branches, ridges inconspicuous; internodes 2~6 cm; sheaths castaneous or pale yellow, 6~8 mm long; sheath teeth 8~12, castaneous, narrowly deltoid, 3~6 mm long. Strobilus terete, apex blunt, 2~4 cm long, ca. 1 cm in diam.; stalk 3~6 cm long.

Distribution: AMERICA (Canada, Greenland, and USA), and ASIA (Bhutan, China, India, Japan, Mongolia, Nepal, North Korea, South Korea, Russia, and Taiwan).

Habitat: Stream beds and open fields or meadows beside streams at ca. 2200 m in elevation (in Taiwan).

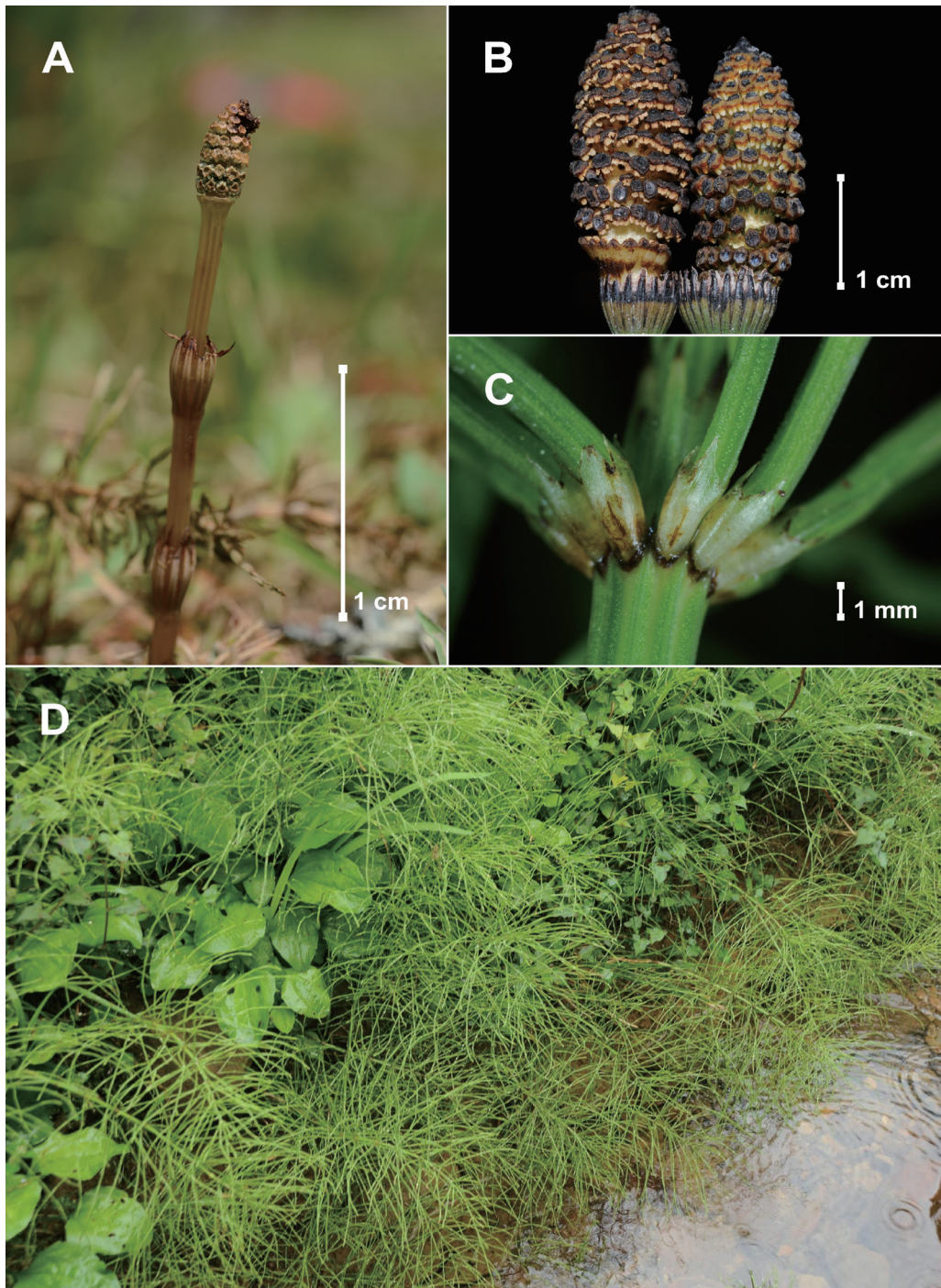


Fig. 1. *Equisetum arvense* L. A: A fertile aerial stem with a strobilus. B: Strobili. C: A node, with 6-8 branches in a whorl, of a sterile aerial stem; every base of lateral branch surrounded by a toothed sheath. D: Habits in situ. Scale bars: A, B = 1 cm, C = 1 mm. Photographs by Pi-Fong Lu.

Conservation status: DD (data deficient). In Taiwan, only a single small population covering ca. 30×50 m² area is known from Alishan area currently. Although the single population is now sustained frequent human activities and disturbances, nevertheless, such interruptions may just help to maintain the survival of this species by keeping them free from shading as well as competition. *Equisetum arvense* may not be a native fern to Taiwan. The reason why the conservation status for this fern is evaluated as DD tentatively is that it is hard to prove to be recently invasive by nature forces into, or just an escaped horticultural plant newly naturalized in Taiwan.

Voucher specimens: TAIWAN. Chiayi Co.: Alishan, 1 Jul. 2013, *PF Lu 25832* (TAIF); *ibid.*, 27 Mar. 2016, *PF Lu 29375* (TAIF); *ibid.*, 30 Mar. 2016, *YH Chang 20160330-001* (TAIF).

Note: The broad-sensed *Equisetum arvense* is distributed mainly in the north-temperate zone of the world and contains a dozen of infraspecific taxa reflecting widely morphological variances. After examining the related specimens of China (PE), Japan (TNS) and USA (MO), there are scarce differences found in Taiwanese materials from them; therefore, the concept of the broad-sensed *E. arvense* is adopted herein. *Equisetum arvense* can be easily distinguished from the native species, *E. ramosissimum*, by obviously dimorphic features between fertile and sterile aerial stems, regular whorled-branching pattern of main stems, apically blunt strobili, and persistent, blackish brown or reddish brown, leathery sheath teeth (vs. monomorphic features of fertile and sterile aerial stems, often unbranched main stems, apically mucronate strobili, and usually deciduous, light brown or gray, membranous sheath teeth, of *E. ramosissimum*).

2. *Pteris edanyoi* Copel., Philipp. J. Sci. 81: 8, t. 1(2). 1952. 耶氏鳳尾蕨 (Figs. 2-1 & 2-2)

Type: THE PHILIPPINES. Luzon, Rizal Prov., Mt. Lumutan, *M. Ramos & G. Edano 2-107*, Jul. 1917 (Holotype: US [US-00134515], photo!; Isotype: MICH [MICH-1191418], photo!).

Morphology: Plants 1.8~2.5 m tall. Rhizomes ascending to erect, short, stout, apices with brown scales. Fronds clustered, glabrescent. Stipes dark brown, 110~140 cm, glabrous but loosely covered with the similar scales at basal portions. Lamina pedate, tripartite with 1 2-pinnatipartite central division and 2 3-pinnatipartite lateral divisions (lateral branches or lateral pinnae), 90~130×95~140 cm, thinly papery; central division oblong-ovate in outline, 80~100×28~35 cm, stalked (20~25 cm), rachises convex abaxially and shallowly grooved adaxially, pinnae 8~10 pairs, 1-pinnatipartite, short-stalked (0.8~1.5 cm), segments 16~20 pairs, 4~6 cm long for the basal and middle ones and gradually shortened toward the apices, linear-lanceolate, mostly straight or slightly oblique (not apparently curved or falcate), obtuse or mucronate, serrate at sterile margins, glabrous, alternate or subopposite, basal parts adnate to the neighboring ones; lateral branches about the same size with or even slightly larger than the central division, 80~110 cm long, the most basal basisopic pinnules always developed and usually 2-pinnatipartite, costae and costules convex abaxially and shallowly grooved adaxially. Veinlets slender, conspicuous only abaxially, venation loosely and partially reticulate, in addition to a series of narrow areoles along costa and costules, veinlets further anastomosing to form a few of polygonal areoles. Sori linear, extending continuously along leaf margins, often sterile at apices of lobes; false indusia (i.e. pseudoindusia) brown or light brown, linear, membranous,

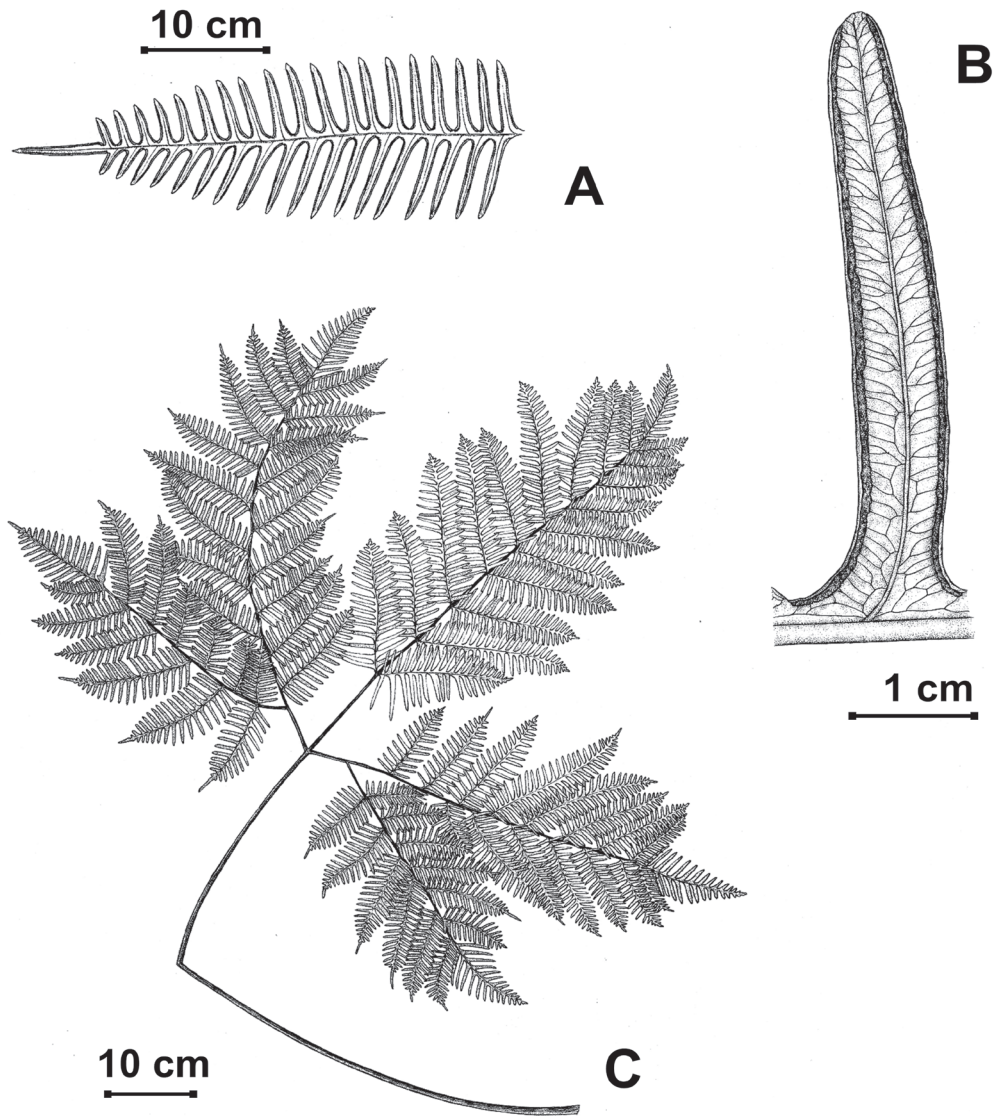


Fig. 2-1. *Pteris edanyoi* Copel. **A:** Apical part of a fertile pinna. **B:** Abaxile surface (undersurface) of a fertile pinnule. **C:** The whole figure of a frond. Scale bars: A, C = 10 cm, B = 1 cm. Illustrated by Che-Wei Lin.

entire, persistent.

Distribution: the Philippines and Taiwan.

Habitat: Growing on hemi-shady floors or slopes beside the broad-leaved forests at low-altitude mountain areas in Southeast Taiwan.

Conservation status: **CR**. To date only one population with about 15~20 individuals (most are juvenile sporelings) is found in SE

Taiwan. Fortunately, the location of the single known population is within the conservation area so that the immediate human disturbance is prevented effectively.

Voucher specimens: TAIWAN. Taitung Co.: Mar. 1913, *T. Soma s.n.* (TAIF); Man-jhou Township, the ravine of Luliao Stream, 4 Apr. 2015, *YH Chang 20150404-006* (TAIF).

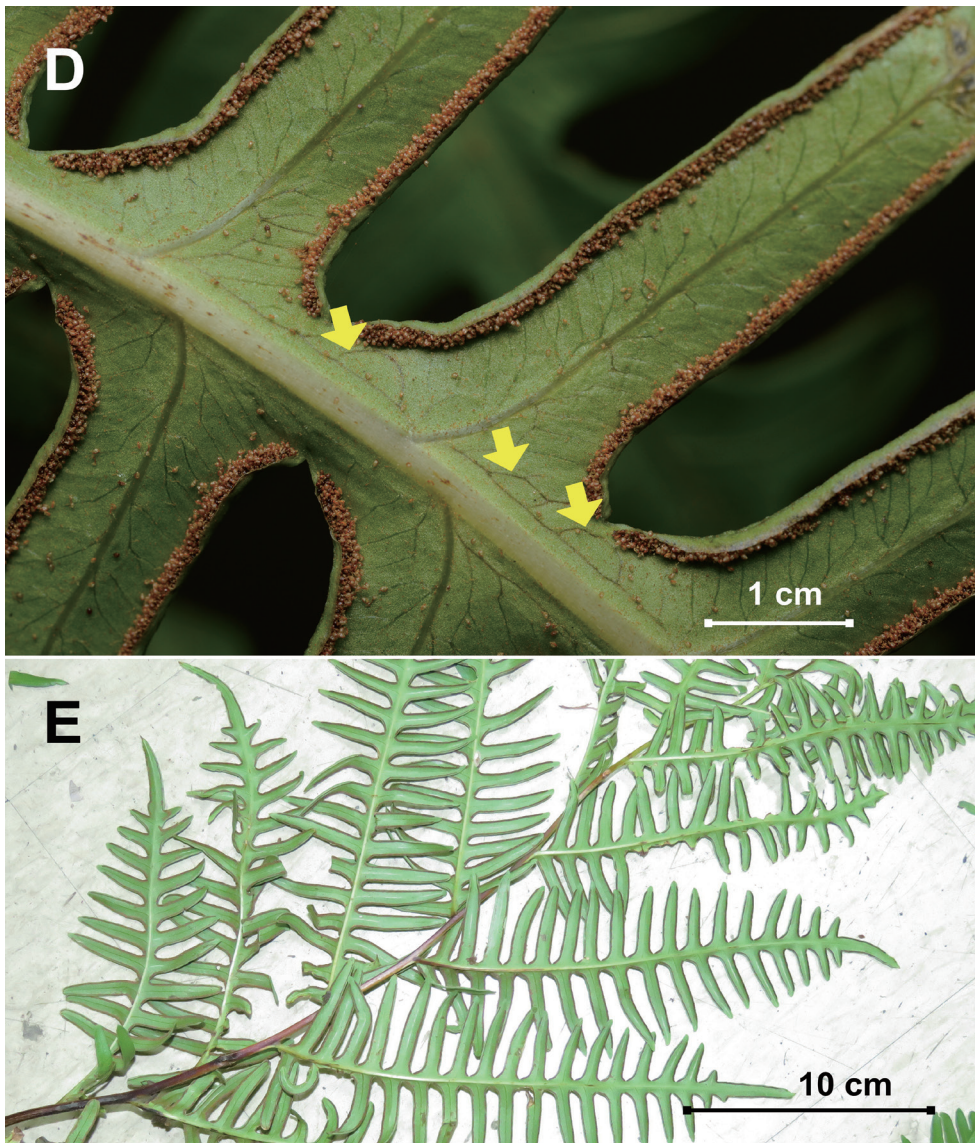


Fig. 2-2. *Pteris edanyoi* Copel. **D:** Close up shot of the abaxial surface of a fertile pinna. **E:** Abaxial surface of a part of lateral pinna. Scale bars: **D** = 1 cm, **E** = 10 cm. Photographs by Tian-Chuan Hsu.

Note: The first specimen of *Pteris edanyoi* from Taiwan was collected by T. Soma in 1913, though the misidentification as *P. attenuata* Sw. was given for this fern at that time. After over 100 years, this fern is rediscovered at low-altitude mountain areas of SE Taiwan. *Pteris edanyoi* looks like *P. terminalis*

Wall. ex J. Agardh (namely *P. excelsa* sensu Taiwan) at a glance mainly due to its much longer and slightly wider segments. However, the former is also distinctly differentiable from the latter by its tripartite (to pedate) architecture of fronds (vs. pinnate architecture of fronds for *P. terminalis*).

Key to species with tripartite frond architecture of the genus *Pteris* in Taiwan:

- 1a. Lamina tripartite to pedate 2
 1b. Lamina pinnate.....
 the rest *Pteris* species of Taiwan.
 2a. Veins all free.....
 *P. longipes* (蓬萊鳳尾蕨)
 2b. Venation anastomosing at least with a series of areoles along costa 3
 3a. Areoles restricted to along main costa, absent from segments; veins above areoles all free
 *P. wallichiana* (瓦氏鳳尾蕨)
 3b. Areoles along costa as well as along costules of segments 4
 4a. Venation copiously anastomosing; segments up to 3 cm long.

 *Pteris tripartita* (三腳鳳尾蕨)
 4b. Venation partially anastomosing (that is, except areoles along costules of segments and costa, areoles forming occasionally and usually solitary without adjacent ones); segments at least 4 cm long
 ...*Pteris edanyoi* (耶氏鳳尾蕨)

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LITERATURE CITED

- Copeland, EB. 1952.** New Philippine ferns (IX). Philipp J Sci 81:1-47.
IUCN. 2001. IUCN Red List Categories and Criteria: Version 3.1. Gland, Switzerland: IUCN Species Survival Commission.
IUCN. 2003. Guidelines for application of IUCN Red List Criteria at Regional Levels: Version 3.0. Gland, Switzerland: IUCN Species Survival Commission.
Jonsell B, Jarvis CE. 1994. Lectotypifications of Linnaean names for Flora Nordica, Vol. 1 (Lycopodiaceae-Papaveraceae). Nordic J Bot 14: 145–164.
Linnaeus C. 1753. Species Plantarum, Tomus 2. Laurentius Salvius, Holmiae (viz., Stockholm), Sweden. p 1061.

