



*Short Communication*

## Note on *Adiantum hispidulum* (Pteridaceae), a new record species to Fern Flora of Thailand

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Received 2 November 2012; Accepted 20 June 2013

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### Abstract

*Adiantum hispidulum* Sw., a species of the widespread maidenhair fern, is officially reported for the first time from NE Thailand. We present a description of this newly recorded species and discuss its geographical distribution, phenotypic variation and conservation status.

**Keywords:** Pteridaceae, rosy maidenhair fern, *Adiantum hispidulum*

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### 1. Introduction

The maidenhair ferns, *Adiantum* L., consisting of about 200 species worldwide, belong to the family Pteridaceae in the order Polypodiales (Mabberley, 2008; Smith *et al.*, 2006). The genus has a cosmopolitan distribution, extending from the Pacific Islands to northeast Australia, Asia, S Europe, Madagascar, tropical Africa, and America (Schelpe and Anthony, 1986). This paper is a part of contributions en route for a revision of *Adiantum* L. for the Flora of Thailand Project. In Thailand, 10 species have previously been recorded since 1985 (Tagawa and Iwatsuki, 1985). Currently, Thai *Adiantum* account is being updated to include 17 species (Boonkerd and Pollawatn, 2011).

*Adiantum hispidulum* Sw. was firstly mentioned in a popular Thai Fern-book in 1993 by ML. Charuphan Thongtham, a fern horticulturist who reported the first finding of *A. hispidulum* in their natural habitat at Chulabhorn (Nam Prom) dam, Chaiyaphum province, NE Thailand. However, there was no evidence to prove his discovery, e.g., no photographs or voucher specimens seen. Thus we took it as “unofficial finding”.

Here, we officially report the 18<sup>th</sup> species of Thai maidenhair fern, *Adiantum hispidulum* Sw., found during the botanical trip to Hong Thong Waterfall, Phu Kradung National Park, Loei Province, NE Thailand. It was previously known to occur in tropical Africa, Madagascar, Mauritius, India, China through Malaysia to Australia, as well as New Zealand and Pacific islands (Schelpe and Anthony, 1986; Youxing and Prado, 2012; Shieh, 1994). This is an attractive fern species, with reddish young frond, commonly known as rough maidenhair or rosy maidenhair. It has become a commercial species in many countries including Thailand. It is easily propagated from spores. In the USA, *A. hispidulum*, has escaped from cultivation and become naturalized in some states, such as Connecticut, Georgia, Hawaii (Hoshizaki and Moran, 2001).

The species was first described by Olof Swartz in 1801, from a specimen collected from Australia. The specimen was kept in the Swartz Herbarium at the Swedish Museum of Natural History in Stockholm, Sweden (Schelpe and Anthony, 1986).

### 2. Materials and Methods

This study is based on the determination of a collection made in Loei Province (Hong Thong Waterfall), northeastern Thailand, in 2010. For comparison, we also examined

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herbarium materials at the Royal Botanic Gardens, Kew (K), the National Museum of Natural History in Paris (P), the Swedish Museum of Natural History (S) and the herbarium of the Academy of Natural Sciences, Philadelphia (PH). Herbarium acronyms are according to Holmgren and Holmgren (1998).

### 3. Result

The morphological characters of the Loei specimens are comparable to the descriptions of *Adiantum hispidulum* in Schelpe and Anthony (1986) and Shieh (1994).

They are also particularly similar to those of the type specimen of *A. hispidulum* in the Swartz Herbarium at S and to those of other specimens identified as *A. hispidulum* at K, P, PH and S. Accordingly, *A. hispidulum* is a new record for Thailand. The description below is based on the Thai materials.

#### 3.1 Description

***Adiantum hispidulum* Sw.**, J. Bot. (Schrader). 1800 (2): 82. 1801.; Schelpe & Anthony in Fl. S. Africa (Pteridophyta): 100-101. 1986.; Shieh in Fl. Taiwan 2<sup>nd</sup> ed. 1: 239. 1994.; — *Adiantum hispidulum* Sw. var. *glabratum* Domin, Bibliotheca Botanica 89(4). 1928. — *Adiantum hispidulum* Sw. var. *normale* Domin, Bibliotheca Botanica 89(4). 1928. *Adiantum hispidulum* Sw. f. *strictum* Gilbert, Fern Bull. 13: 109. 1905. — *Adiantum pedatum* G. Forst., Fl. Ins. Austr. 83. 1786. — *Adiantum pubescens* Schkuhr, 24. Kl. Linn. Pfl.-Syst. 1: 108. 1809. Type: Australia, Unknown, Herb. Swartzii Reg. no. S-P 8123 (Holotype, S!). Figures 1-2.

*Plants* ca. 35 cm tall. *Rhizome* short, erect, covered with lanceolate, concolorous brown scales; scales ca. 2.1 x 0.35 mm, entire. *Fronds* erect, tufted. *Stipe* castaneous, polished, ca. 17 cm long, clothed towards the base with brown scales, covered with short stiff multicellular hairs. *Lamina* ovate to deltate, 15.0-17.5 x 5-12 cm, 2- to 3-pinnate. Middle pinnae largest, linear-oblong, ca. 15 cm long; costa densely covered with multicellular hispid hairs, lateral pinnules up to 22 pairs, alternate, with short stalks; middle pinnules nearly equal in size, mostly rhombic, ca. 0.9 x 0.6 cm, becoming gradually smaller toward both ends, thin, firm, dark green, bases cuneate, inner and lower margins straight and entire, upper margins with narrow shallow sinuses, outer margins serrate to incised; veins free, forked, visible on both sides, hairy on both surfaces, hairs multicellular, stiff, patent; lateral pinnae similar to the middle one. *Sori* at 2-3 vein tips, near margin, 4-9 for each leaflets; indusial flaps oblong, bearing brown hairs.

**Specimens Examined.** — THAILAND: Loei, P. Nopsiriwong 14 (BCU); INDIA: Madras, F.M. Jarrett 534 (K); CEYLON: Hakgala, R.B. Faden & A.J. Faden 77/1 (P); PHILIPPINES: Luzon, A.D.E. Elmer 6974 (K); PAPUA NEW GUINEA: Sattelberg, R.J. Johns 086 (K), Mt. Giluwe, J.R. Woodams 149 (K); AUSTRALIA: New South Wales, J.R.

Boosmau s.n. (P); NEW CALEDONIA: M. Franc 364 (P); POLYNESIA: Society Island, W.D. Brackenridge s.n. (PH).

Thailand.— NORTH-EASTERN: LOEI (Hong Thong Waterfall, Phu Kradueng).

**Distribution.** — Tropical Africa, Madagascar, Mauritius, India, China, Taiwan through Malaysia to Australia, New Zealand and the Pacific islands.

**Ecology.** — Terrestrials on dry slopes in semi-shade at around 1,100 m altitude.

**Conservation Status.** — So far, only a small population of about 20 individuals has been found. We considered



Figure 1. *Adiantum hispidulum* Sw. in its natural habitat near Hong Thong Falls, Phu Kradueng, Loei province. Photographed by Pipat Nopsiriwong.

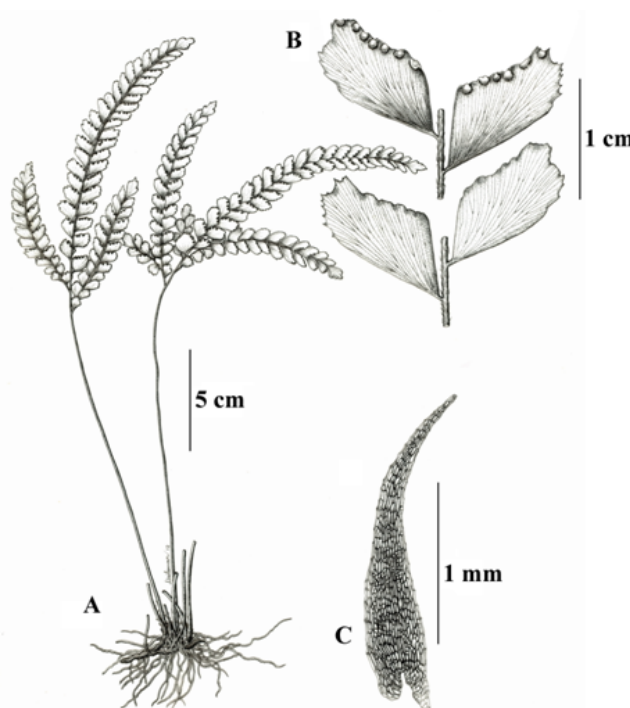


Figure 2. *Adiantum hispidulum* Sw.: A. Whole plant with two fronds; B. Pinnules showing sori and venation; C. Rhizome scale. Drawn by Wilaiwan Nuchthongmuang from P. Nopsiriwong 14 (BCU).

registering *Adiantum hispidulum* as “Data Deficient (DD)” according to IUCN Conservation Status, since only one population has been found. It is hoped that some more populations will be found elsewhere in the protected areas of Thailand.

*Adiantum hispidulum* can be identified using the keys shown in Table 1. This has been extracted from the Flora of Thailand, *Adiantum* account (Tagawa and Iwatsuki, 1985) and has been amended to include the new species of Thai *Adiantum*.

#### 4. Discussion

The occurrence of *Adiantum hispidulum* in NE Thailand corresponds to its wide distribution from Tropical Africa to the Pacific islands (Schelpe and Anthony, 1986). In SE Asia, it was reported from Indonesia, Malaysia, and the Philippines (Youxing and Prado, 2012; Shieh, 1994; Parris and Latiff, 1997). There has been no reports from Lao PDR and Vietnam (Loc, 2006; Newman *et al.*, 2007). The Thai populations were overlooked by botanists for a very long time, despite the fact that many expeditions have been carried out on Phu Kradueng by Thai and overseas botanists. This was probably due to previous limited access to the area called “Pa-Pid” on Phu Kradueng. The repeated discovery of new records and new fern species in Thailand confirms for us that more fieldwork still needs to be carried out in the country (Boonkerd and Pollawatn, 2011; Boonkerd and Pollawatn, 2012; Lindsay, Suksathan and Middleton, 2010).

Terrestrial species with a wide distribution are often characterized by phenotypic plasticity (Briggs and Walters, 1997). To investigate this phenomenon in *Adiantum hispidulum*, dimensions and frond forms of African, New Zealand, Taiwan and Thai plants are compared in Table 2.

It can be seen that African plants has much longer stipe and frond length than Thai and Taiwanese plants. However, the pinnules sizes of all the plants are approximately the same. It is likely that the nature of microenvironment plays a vital role in frond growth rather than leaflet growth. The stipes and the fronds of African plants are longer in length presumably because they are confined to moist and shady habitats that are appropriate in promoting fern growth, while Thai plants occur mostly on rather dry slopes of sandstone valley which are still not suitable to support plant growth (Schelpe and Anthony, 1986). The plants also differ in frond forms: African and Taiwanese plants having pedate fronds, while New Zealand plants showing pinnate, pinnate-pedate and pedate fronds. Thai plants, on the other hand, have rather simple frond ramifications, bearing only pinnately fronds. *A. hispidulum* in New Zealand display much more variations in frond forms than the plants collected from the other countries. Some infraspecific taxa, e.g. *Adiantum hispidulum* Sw. var. *pubescens* Large & Braggins have also been previously found in this country (Large and Braggins, 1993).

Easily propagated from spores, *Adiantum hispidulum* has naturalized in southern United States as well as in Hawaiian Island (Hoshizaki and Moran, 2001; Olsen, 2007; Palmer, 2002). In Thailand, only glaucous maidenhair fern, *Adiantum latifolium* Lam., has been reported to have escaped from cultivation and become weedy species in Khao Nan National Park and many southern provinces (Boonkerd, Chantanaorrapint, and Khwaiphan, 2008). There are currently no reports of *A. hispidulum* being naturalized in Thailand.

#### Acknowledgement

This work was supported by a grant from the National Research University Project of CHE and the Ratchadaphisek-

Table 1. Identification key.

1. Frond bipinnate or more compound	
8. Frond bipinnate	8. <i>A. capillus-verneris</i>
8. Fronds bi-tripinnate	
9. Rachis hairy	
10. Leaflets glabrous, veins not raised	9. <i>A. flabellulatum</i>
10. Leaflets hairy, veins raised on both surfaces	11. <i>A. hispidulum</i>
9. Rachis perfectly glabrous	10. <i>A. stenochlamys</i>

Table 2. Comparison of *Adiantum hispidulum* from Southern Africa, New Zealand, Taiwan and Thailand.

<i>Adiantum hispidulum</i>	Stipe length (mm)	Frond length (mm)	Pinnule size (mm)	Frond form
African plants (Schelpe and Anthony, 1986)	290	430	10 x 6	pedate
New Zealand plants (Large and Braggins, 1993)	-	150	9.5 x 4.6	pinnate, pinnate-pedate, pedate
Taiwan plants (Shieh, 1994)	60-180	120-360	-	pedate
Thai plant (Phu Kradueng)	170	345	9.0 x 6.0	pinnate

somphot Endowment Fund (CC270A). We are also indebted to Chulalongkorn University for funding our visit to the main herbaria in Europe, through the Plants of Thailand Research Unit. The authors are grateful to the directors and curators of BCU, BKF, BM, K, L, P, PH and S for making their collections available for this study. We would like to thank the anonymous reviewers for their helpful comments on the manuscript. Thanks also to Sahanat Petchsri for his help in an illustration, Pipat Nopsiriwong for his specimen collection and Aomtip Petbanna for her help with the specimen measurements.

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