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Asplenium cardiophyllum, a species of fern newly discovered in Thailand

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ABSTRACT: *Asplenium cardiophyllum* (Hance) Baker, a species of fern endemic to East Asia, is reported for the first time from Thailand. We present a description of this newly recorded species and discuss its geographical distribution and conservation status.

KEYWORDS: Aspleniaceae, *Hymenasplenium*, pteridophyte

INTRODUCTION

The spleenwort ferns, including the genus *Asplenium* L. and their putative segregates, consist of about 700 species[1], and belong to the family Aspleniaceae in the order Polypodiales[2]. In Thailand, 37 species have previously been recorded[3,4]. Here, we report an additional species for mainland Asia as well as Thailand, *Asplenium cardiophyllum* (Hance) Baker, which was found during a botanical trip to limestone mountains in Loei Province, northeastern Thailand. *Asplenium cardiophyllum* naturally occurs in limestone rock crevices or on calcareous soils[5,6]. Its distribution (Fig. 1) was previously noted as disjunctive from Hainan Island, south China to Kitadaito Island, the Ryukyu Islands, and the Bonin (Ogasawara) Islands, southeast of the main islands of Japan[7]. So far, the only mainland Asia's population was reported from Quảng Bình, a province in the North Central Coast of Vietnam at altitude ranging from 340–1000 m[8].

Asplenium cardiophyllum was first described by Hance in 1883 as *Micropodium cardiophyllum* Hance from a specimen collected in Hainan, south China by B. C. Henry in 1882[9]. Makino, on the other hand, described a specimen collected by S. Ikeno from the Bonin Islands in 1899 as *Scolopendrium ikenoi* Makino[10], which was later transferred to *Phyllitis ikenoi* (Makino) C. Chr.[11] and then to *Boniniella ikenoi* (Makino) Hayata[12]. Christensen[13], then, reduced *Boniniella ikenoi* (Makino) Hayata to *B. cardiophyllum* (Hance) Ching. This name is still being used in the Flora of China[5], while *Asplenium cardiophyllum* (Hance) Baker is the accepted name elsewhere, especially in the Flora of Japan[1,6]. Previously, some authors treated *Asplenium cardiophyllum* as a member of *Asplenium* sect. *Hymenasplenium* (Hayata) K. Iwats. together with *A. excisum* C. Presl, *A. apogamum* N. Murak. & S. I. Hatanaka, due to their common features in raphides, phyllopodia-bearing, and rhizome with dorsiventral dictyosteles[7].

MATERIALS AND METHODS

This study is based on specimens collected from Nong Hin District, Loei Province, northeastern Thailand. For comparison, we also examined herbarium material deposited in BK, BKF, C, and MAK (Herbarium abbreviations are according to Ref. 14).

RESULTS

The morphological characters of the Thai specimens (*T. Boonkerd et al 2011–304*) matched well with the pictures of *A. cardiophyllum* (Hance) Baker in Iwatsuki[6]. They also corresponded to the herbarium specimens of *A. cardiophyllum* (*F. A. McClure 8487*), collected from Hainan, China and kept at C and to a type specimen of *Scolopendrium ikenoi* Makino, deposited in Makino herbarium, Tokyo Metropolitan University, Tokyo. *A. cardiophyllum* can thus be identified as a new record for Thailand. However, there is a slight difference among populations. Thai and the Chinese specimens look almost the same, while the Japanese and Vietnamese plants tend to have longer lamina.

DESCRIPTION

Asplenium cardiophyllum (Hance) Baker, Ann. Bot. (Oxford) 5(19): 311–312.1891. – *Micropodium cardiophyllum* Hance J. Bot. 21: 268.1883. – *Scolopen-*

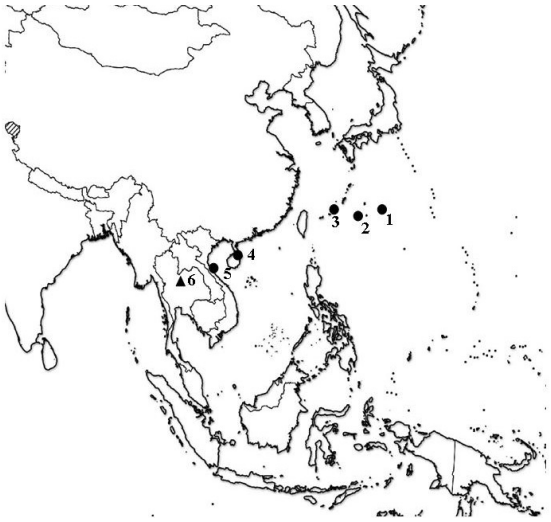

Fig. 1 Distribution of *Asplenium cardiophyllum* (1–6). Circles (•) show the previous distribution. The triangle (▲) shows the present finding. 1 Hahajima Island, Japan; 2 Kitadaito Island, Japan; 3 The Ryukyu Islands, Japan; 4 Hainan Island, China; 5 Quảng Bình, Vietnam; 6 Loei province, Thailand.

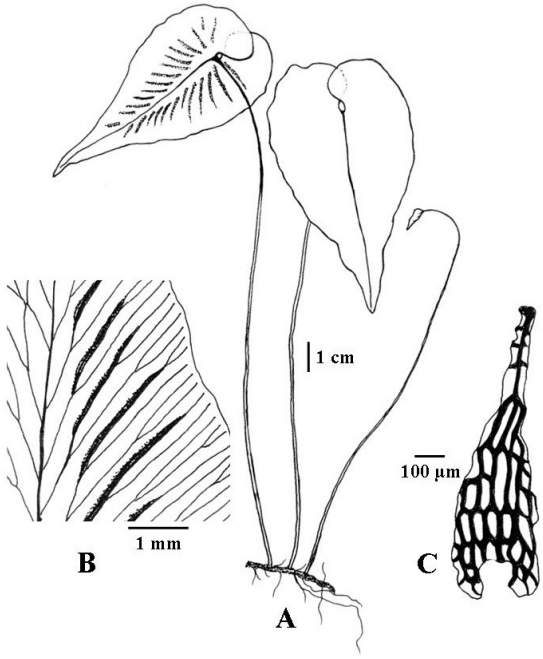

Fig. 2 *Asplenium cardiophyllum* (Hance) Baker: **A.** Whole plant with simple leaves, **B.** Lamina showing sori and venation, **C.** Rhizome scale. Drawn by Rossarin Pollawatn from *T. Boonkerd et al 2011-304* (BCU).

drium ikenoi Makino, Bot. Mag. (Tokyo) 13. 130. 1899. – *Phyllitis cardiophylla* Ching, Icon. Filic. Sin. 1: t. 27.1930. – *Boniniella ikenoi* (Makino) Hayata, J. Jap. Bot. 12(8): 541.1936.

Type: Hahajima Isl., Ogasawara (Bonin) Islands, *S. Ikeno s.n.* (holotype, MAK!).

Rhizome short, creeping, 0.7–1.8 mm in diameter, covered with scales and hairs; scales ovate-lanceolate, 0.5–1.4 mm by 0.2–0.5 mm, dark brown, clathrate, entire; hairs simple, multiseptate. *Stipe* 10–20 cm long, 0.2–0.6 mm in diameter, deep castaneous and polished, sparsely covered with hairs. *Lamina* simple, monomorphic, ovate-lanceolate, 3.2–10 cm × 3.0–5.8 cm; apex acuminate, base deeply cordate, the two basal lobes usually overlapped, thinly covered with long narrow scales; margin entire or irregularly lobed; herbaceous to chartaceous; light green in living specimens, green-brown when dried; midrib indistinct on both surface, lateral veins 1–2 times forked, visible, forming a few areoles, without free veinlets, end of veinlets free, not reaching the margin. *Sori* linear, 0.2–2.2 cm long, on acroscopic side of lateral veins, 8–27 for each lamina; indusial membranaceous, almost entire, persistent.

Specimens Examined.– *T. Boonkerd et al 2011-304* (BCU); *F. A. McClure 8487* (C); *S. Ikeno s.n.* (holotype of *Scolopendrium ikenoi* Makino, MAK!).

Thailand.– NORTHEASTERN: Loei (Nong Hin).

Distribution.– South China, Southeast Japan.

Ecology.– In limestone rock crevices or on calcareous soil in semi shade areas at 420 m alt.

Conservation Status.– So far, only a small population of about 40 individuals has been found. We are considering registering *Asplenium cardiophyllum* as locally threatened species, since its present habitat is not in protected area and is easily accessible, especially by plant hunters. It is hoped that some more population will be found elsewhere in the protected areas of Thailand and the neighbouring countries.

Asplenium cardiophyllum can be identified using the keys shown in Table 1. This has been extracted from the Flora of Thailand, Aspleniaceae account[3] and has been amended to include the new species of Thai *Asplenium*.

DISCUSSION

This paper is the second report of the existence of *Asplenium cardiophyllum* in mainland Asia. To date, there has been no report of this fern species from Cambodia, Lao PDR, or Malaysia[15–17]. Its occurrence in Thailand is interesting, although not unexpected, since the most up to date checklist of Vietnam plants includes also this fern species[8]. It is also important

Table 1 Identification key.

1. Frond simple		
2. Frond circular or cordate; stipe up to 10 cm or more long, castaneous, polished		
3. Rhizome short, erect. Laminae nearly circular	1.	*A. delavayi*
3. Rhizome short, creeping. Laminae cordate	2.	*A. cardiophyllum*
2. Frond elongate; stipe shorter or with decurrent base of lamina		
4. Veins all free		
5. Midrib winged on lower surface; apex of frond proliferous	3.	*A. batuense*
5. Midrib not winged; apex of frond not proliferous		
6. Margin of frond subentire, not toothed		
7. Lamina 1.7–4 cm broad; veins with angles of less than 30° to midrib	4.	*A. ensiforme*
7. Lamina up to 8 cm broad; veins with angles of more than 45° to midrib	10.	*A. squamulatum*
6. Margin of frond minutely toothed at least in the upper part		
8. Frond 35–60 cm long, 2–2.5 cm broad	11.	*A. scortechini*
8. Frond up to 30 cm long, 3.5 cm broad	12.	*A. salignum*
4. Veins anastomosing at margin, joining the apices of veinlets		

to note that *Gastrodia verrucosa* Blume, recently described as a new record for Thailand, was collected from Soi Dao mountains in Chantaburi Province, southeast Thailand[18]. Seidenfaden and Wood mentioned that this orchid species also occurred in Japan, on the Bonin Islands, Ryukyu Islands, Sumatra, and Java (see Ref. 18). It is remarkable that *Asplenium cardiophyllum* and *Gastrodia verrucosa* share their geographical distribution in the Ryukyu and Bonin Islands and Thailand. This newly discovered fern species of Thailand shows once again that we still need to do a lot more fieldworks in Thailand, where many new populations and even new species are still awaiting to be discovered.

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