

## NEW AND NOTEWORTHY RECORDS OF MOSSES FROM DOI (MT.) INTHANON, CHIANG MAI, CHOM TONG DISTRICT, NORTHERN THAILAND

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**Abstract.** Mosses new to Thailand (35 species in 29 genera) and new to Doi Inthanon (6 species in 6 genera) are reported based on collections made by the authors. *Austinia tenuinervis* var. *micholitzii* W. R. Buck & H. A. Crum, *Brotherella nictans* (Mitt.) Broth., *Chionostomum hainanensis* B. C. Tan & Y. Jia, *Clastobryopsis muelleri* (Dixon) Tixier, *Trichosteium stigmatosum* Mitt., *Micralsopsis complanata* (Dixon) W. R. Buck, and *Fissidens schwabei* Nog. are fully illustrated.

**Key words:** Doi Inthanon, flora, moss, Thailand

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### INTRODUCTION

Doi (Mt.) Inthanon is located in the Doi Inthanon National Park, Chiang Mai Province, northern Thailand. The park, established in 1972 and located 50 km to the southwest of the city of Chiang Mai, comprises 48,240 ha and ranges from 400 m to 2565 m in altitude. Doi Inthanon has an average annual rainfall of 1908 mm, ranging from 1229 to 2561 mm over a 7-year period (measured in 1993–1999 at the Royal Project Office of Doi Inthanon National Park at 1300 m alt.). This montane forest has a typical tropical monsoonal climate with a 5- to 6-month dry season. Rainfall increases with altitude and clouds frequently cover the mountain above 1500 m alt. even in the dry season (Santisuk 1988) and thus dense mossy forests are developed in Doi Inthanon over 1500 m alt., especially above 2000 m alt.

We have been making bryological collections at Doi Inthanon National Park from 2000 to 2011, primarily at four localities, located at 1300 m alt. (rather dry, hill evergreen forest below the lower

limit of cloud zone), 1700 m alt. (hill evergreen forest above the lower limit of cloud zone, mainly within a 15-ha permanent monitoring plot), 2250–2300 m alt. (open roadside, at the edge and inside mossy montane evergreen forests), and the summit area (2500–2565 m alt., including Ang-ka trail surrounding a small marsh covered by dense mossy forest). In the course of our floristic surveys in these localities, we found a number of mosses new to Thailand or new to Doi Inthanon. The determination of their new record status is based on Akiyama (2006), Nathi *et al.* (2010), Pollawatn *et al.* (2008), Printarakul *et al.* (2012), Tan *et al.* (2006), and Wongkuna *et al.* (2009) as well as the following two checklists, He 2005–2013 and Tan & Iwatsuki (1993). For detailed information of the permanent monitoring plot situated at 1700 m alt., see Akiyama (2010) and Akiyama *et al.* (2011).

We use the following symbols: \* – new to Doi Inthanon (6 species in 6 genera); \*\* – new to Thailand (35 species in 29 genera). Additional symbol

(<sup>1</sup>) means species previously reported without notice in Akiyama *et al.* (2011) from the permanent plot at 1700 m alt. All the specimens are deposited at BKF, CMU or HYO. Species are listed alphabetically by generic name with information on altitude of collection sites with names and numbers of the collectors. Three species previously described on separate papers based on the specimens collected from Doi Inthanon by the authors, i.e., *Clastobryopsis imbricata* H. Akiyama, Ying Chang & B. C. Tan. (Akiyama *et al.* 2010), *Indopotia irieandoana* H. Akiyama (Akiyama & Goffinet 2011), and *Symphiodon leiocarpus* H. Akiyama & Tsubota (Akiyama & Tsubota 2009) are also included in this list.

#### LIST OF MOSS SPECIES

**\*\**Atractylorcarpus comosus*** Dixon

2500 m alt., *Akiyama et al.* 21540.

**\*\**Austinia tenuinervis*** (Mitt.) Müll.Hal.

var. *micholitzii* W. R. Buck & H. A. Crum

Figs 1 & 7c, d

2300 m alt., *Printarakul* 2778 & 2794, *Akiyama et al.* 1456 & 1457, *Akiyama & Printarakul* 2778 & 2794.

NOTE. This species formed thin carpets on tree trunk. It looks like *Micralsopsis complanata* in branching pattern of ascending stems and ovate leaves with short laminal cells, but differs in well developed costa in leaves, perforation in exostome teeth, and absence of endostome. This species has been known from Borneo and Mindanao (Buck & Crum 1978; Tan & Iwatsuki 1991).

**\*\**Barbella stevensii*** (Renauld & Cardot)

M. Fleisch.

2300 m alt., *Akiyama et al.* 1189 & 1230; 2500 m alt. (Ang-ka trail), *Akiyama et al.* 1477 & 1520.

**\*\**Brotherella filiformis*** Dixon

2300 m alt., *Akiyama et al.* 1296.

**\*\**Brotherella nictans*** (Mitt.) Broth.

Fig. 2

2300 m alt., *Akiyama et al.* 1514.

NOTE. This species is characterized by rather small size for the genus and long acuminate leaves with dense serration.

**\*\**Bryocrumia vivicolor*** (Broth. & Dixon)

W. R. Buck

Fig. 8c, d

2300 m alt., *Akiyama et al.* 1289.

NOTE. This species was distinctive in the obtuse leaves arranged in flat foliation along a short prostrating stem. It was found at a single locality in Doi Inthanon where it formed a thin turf on more or less wet boulder at a streamside in a dense montane forest. It has been known from India (Buck 1987).

**\*\**Bucklandiella subsecunda*** (Hook. & Grev. *ex* Harv.) Bednarek-Ochyra & Ochyra

Fig. 8e

2300 m alt., *Akiyama et al.* 1155, *Printarakul* 2788, 2914.

NOTE. This species forms dense, large mats at sunny and open sites on boulders along the summit road.

**\*\*<sup>1</sup>*Calyptrochaeta ramosa*** (M. Fleisch.) B. C. Tan & H. Rob. subsp. *ramosa*

1700 m alt., *Akiyama et al.* 132, 306 & 407; 2500 m alt., *Akiyama et al.* 1531.

**\**Chionostomum hainanensis*** B. C. Tan & Y. Jia

Fig. 3

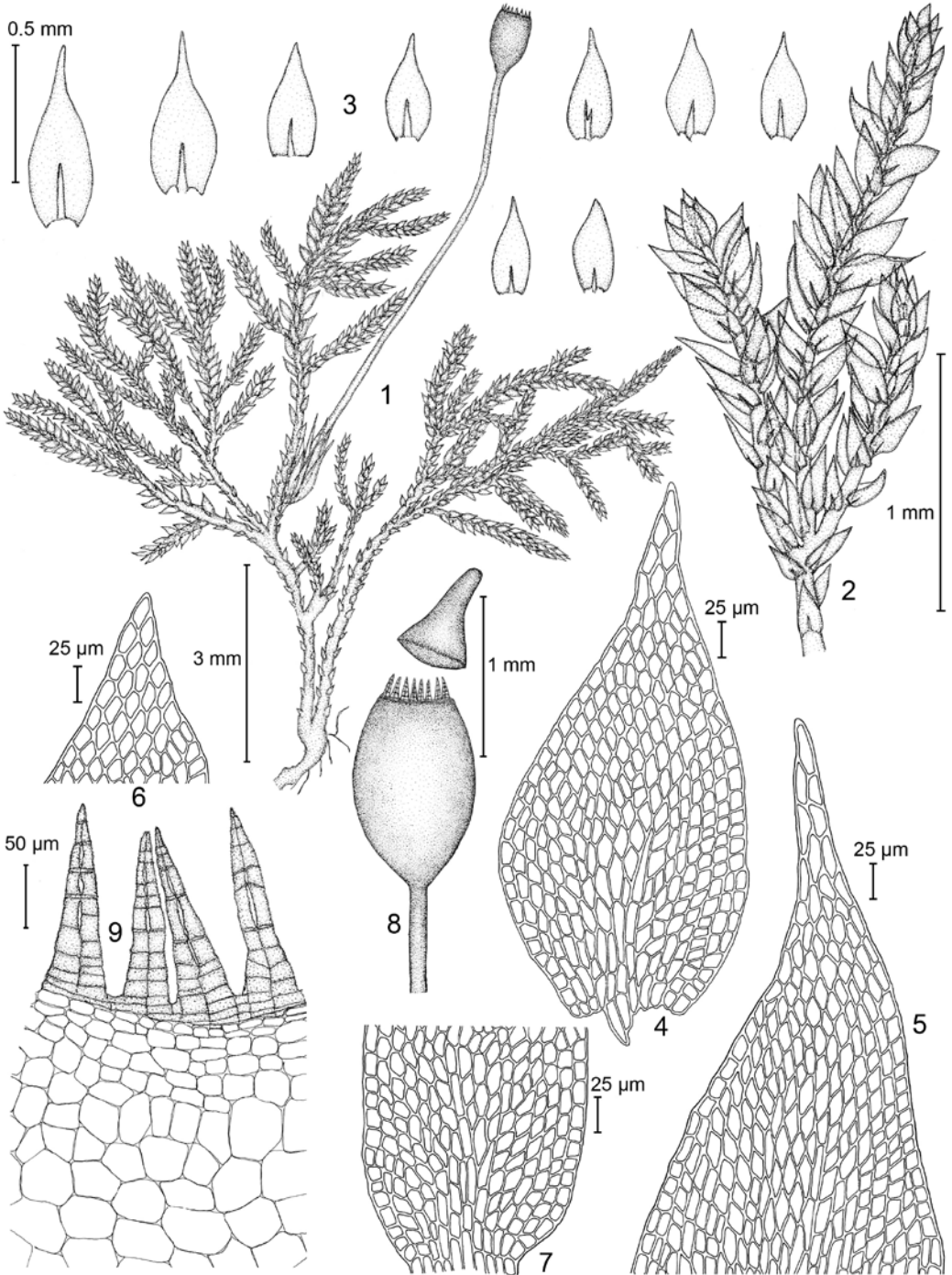
1300 m alt., *Akiyama et al.* 1040.

NOTE. *Chionostomum hainanense* is originally described from China (Hainan Island). It differs from *C. rostratum* (Griff.) Müll.Hal., previously known from Doi Inthanon, in larger plants size and clearly heterophyllioid alars in stem leaves (Tan & Jia 1999).

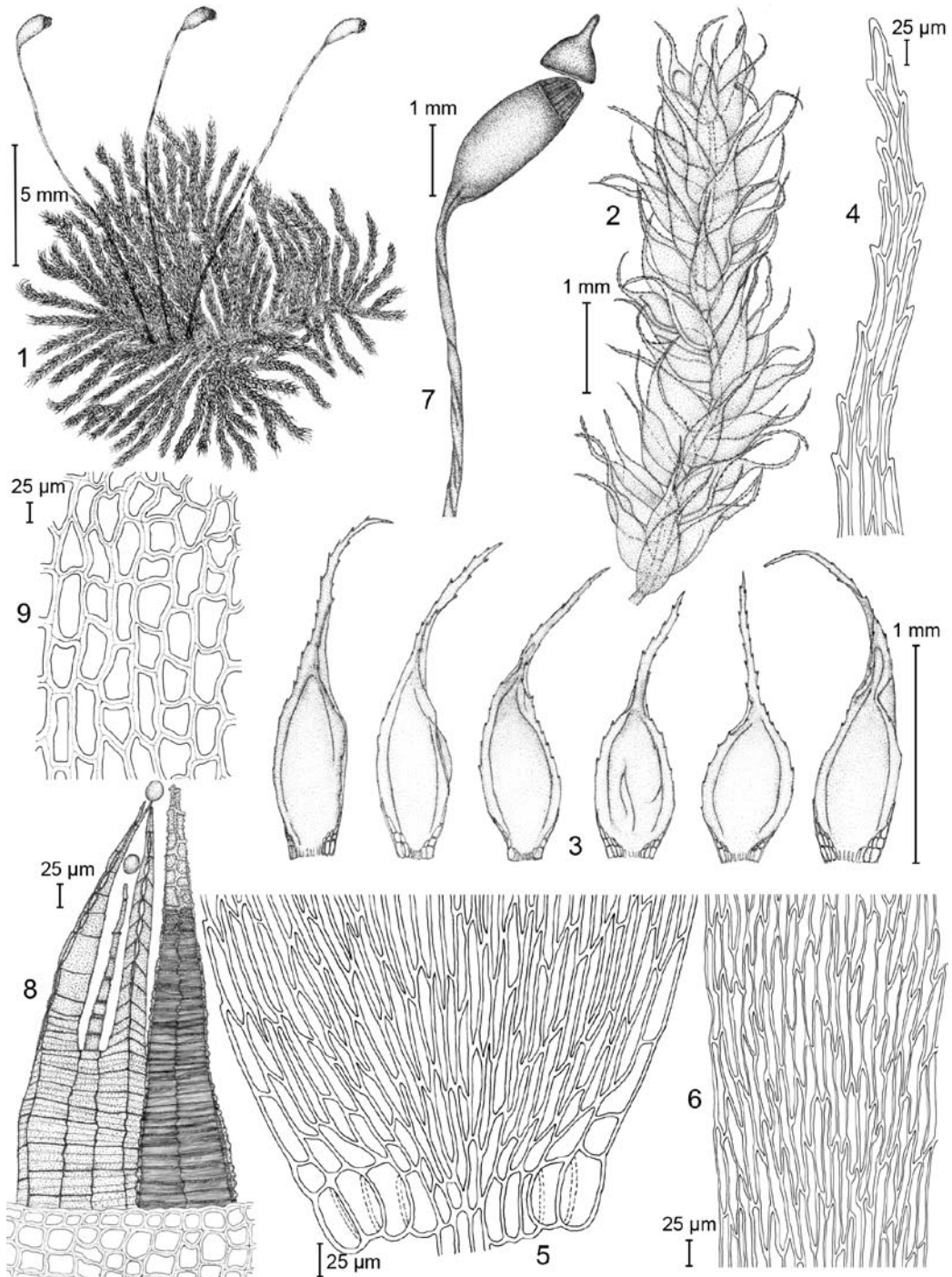
***Clastobryopsis imbricata*** H. Akiyama, Ying Chang & B. C. Tan.

1700 m alt., *Akiyama et al.* 26-b, 31 (TYPE), 185, 273, 280-b, 287, 358-b, *Ando* 433.

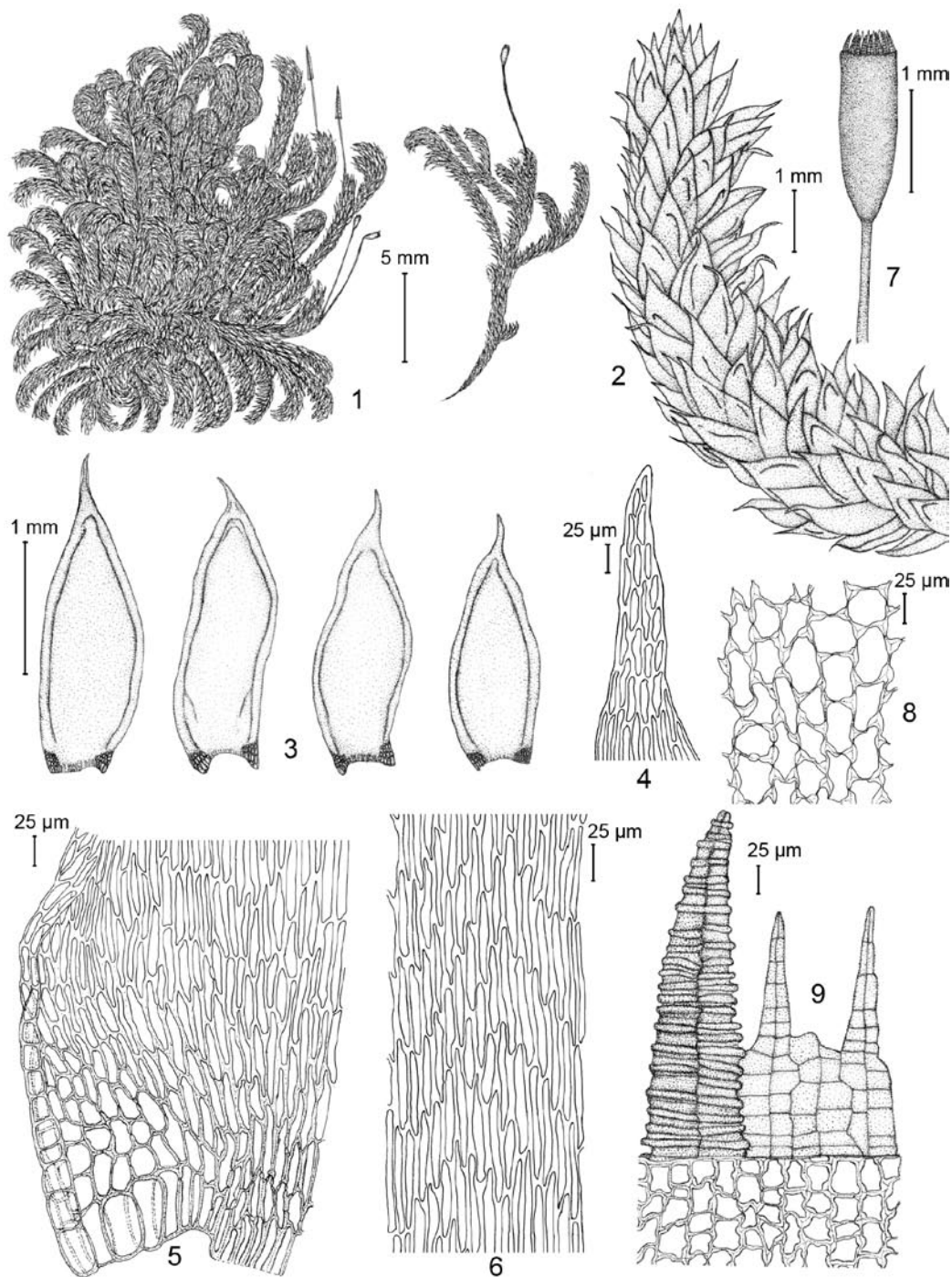
NOTE. For more details, see Akiyama *et al.* (2010).



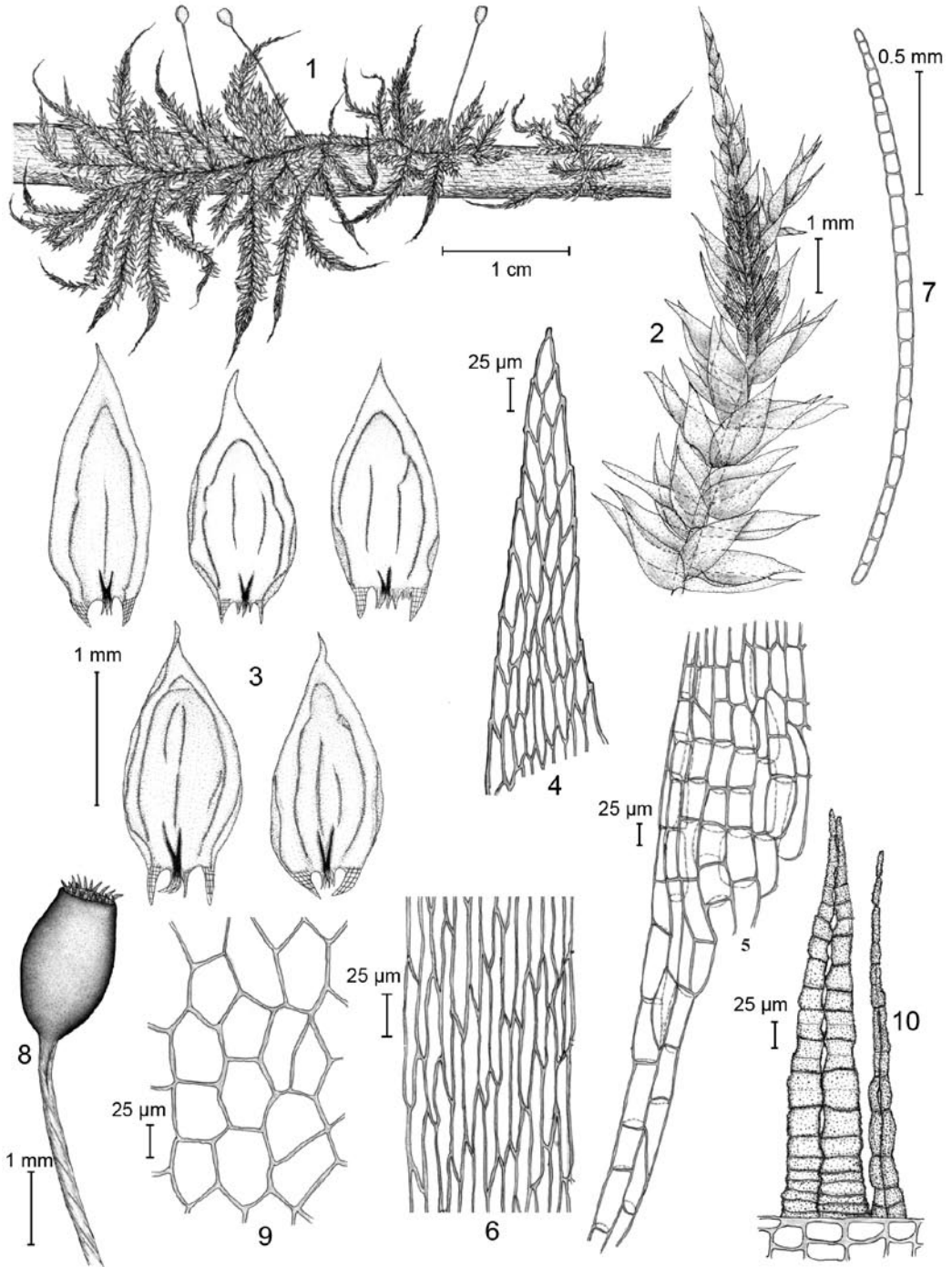
**Fig. 1.** *Austinia tenuinervis* (Mitt.) Müll. Hal. var. *micholitzii* W. R. Buck & H. A. Crum (Fabroniaceae). 1 – habit with sporophyte, 2 – branches, 3 – leaves, 4 – lamina cells, 5–6 – leaf apex cells, 7 – leaf base cells, 8 – capsule and operculum, 9 – peristome teeth. Drawn from *Printarakul 2788* and sporophyte from *Printarakul 2794* (CMU).



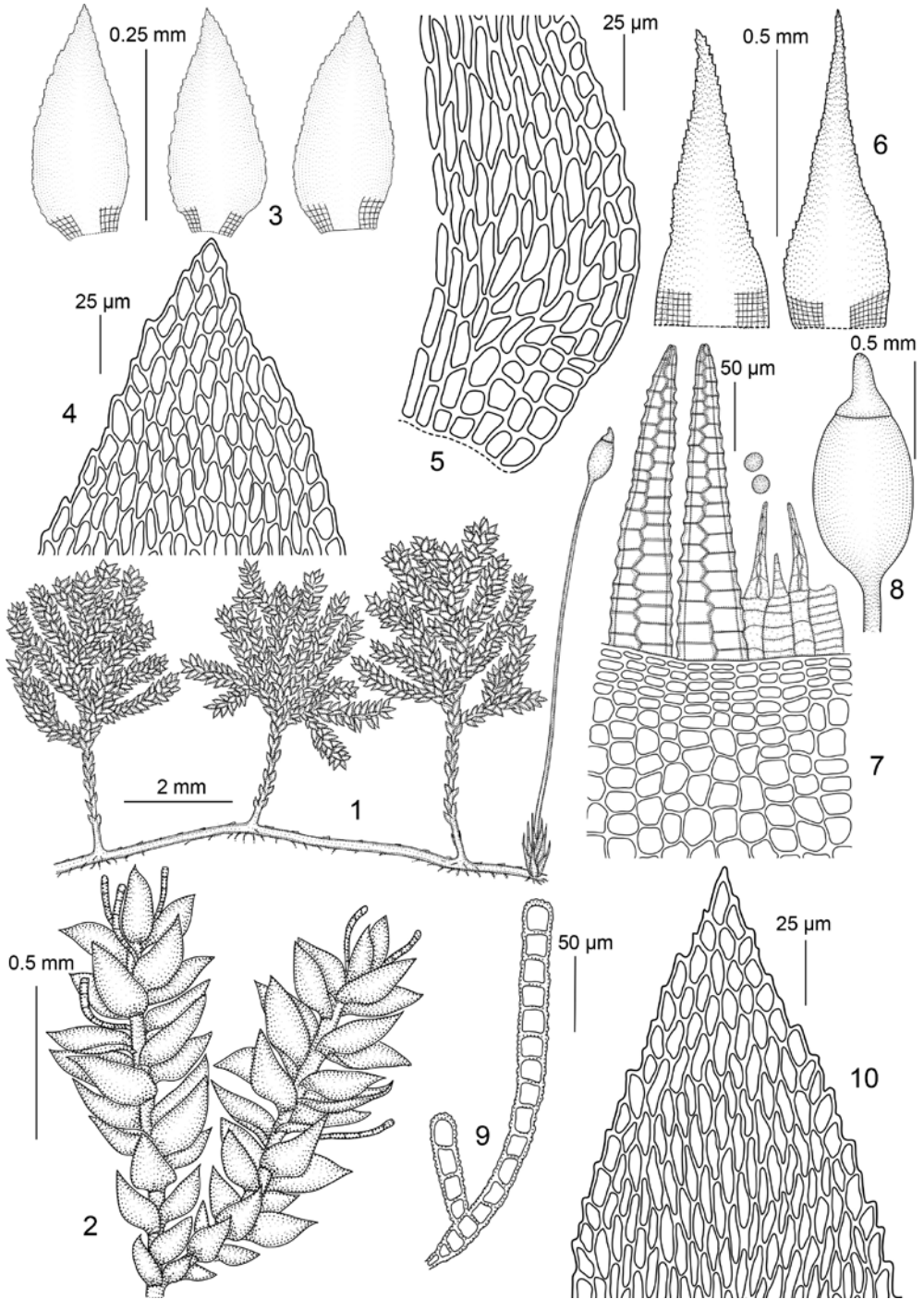
**Fig. 2.** *Brotherella nictans* (Mitt.) Broth. (Sematophyllaceae). 1 – habit with sporophytes, 2 – branch, 3 – leaves, 4 – leaf apex cells, 5 – leaf base cells, 6 – middle lamina cells, 7 – capsule and operculum, 8 – peristome teeth and spores, 9 – exothecial cells of capsule. Drawn from *Printarakul 2808* (CMU).



**Fig. 3.** *Chionostomum hainanensis* B. C. Tan & Y. Jia (Sematophyllaceae). 1 – habit with sporophytes, 2 – branch, 3 – leaves, 4 – leaf apex cells, 5 – leaf base cells, 6 – middle lamina cells, 7 – capsule, 8 – exothecial cells of capsule, 9 – peristome teeth. Drawn from *Printarakul 842* and sporophyte from *Printarakul 2563*. (CMU).

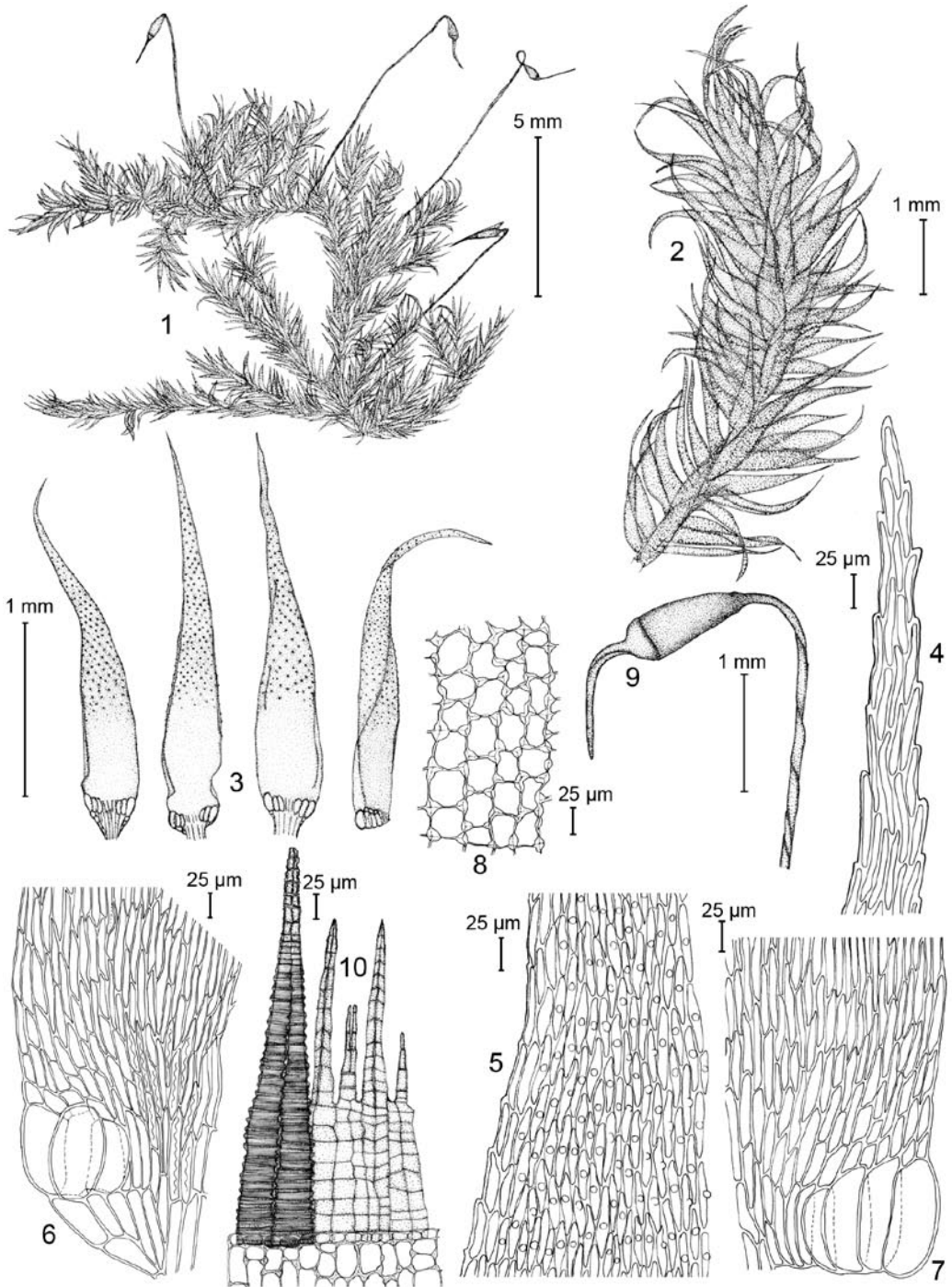


**Fig. 4.** *Clastobryopsis muelleri* (Dixon) Tixier (Pylaisiadelphaceae). 1 – habit with sporophytes, 2 – branch, 3 – leaves, 4 – leaf apex cells, 5 – leaf base cells, 6 – middle lamina cells, 7 – filamentous gemma, 8 – capsule, 9 – exothecial cells of capsule, 10 – peristome teeth. Drawn from *Printarakul 3027* (CMU).



**Fig. 5.** *Micralsopsis complanata* (Dixon) W. R. Buck (Fabroniaceae). 1 – habit with sporophyte, 2 – branches, 3 – leaves, 4 & 10 – leaf apex cells, 5 – leaf base cells, 6 – perichaetial leaves, 7 – peristome teeth, 8 – capsule and operculum, 9 – gemma. Drawn from *Printarakul 3646* (CMU).





**Fig. 6.** *Trichosteleum stigmosum* Mitt. (Sematophyllaceae). 1 – habit with sporophytes, 2 – branch, 3 – leaves, 4 – leaf apex cells, 5 – middle lamina cells, 6 & 7 – leaf base cells, 8 – exothecial cells of capsule, 9 – capsule and operculum, 10 – peristome teeth. Drawn from *Santanachote 01-01* (CMU).



\**Clastobryopsis muelleri* (Dixon) Tixier Fig. 4  
2550 m alt., *Akiyama et al.* 21542.

NOTE. Ovate and concave leaves with long decurrent bases are characteristic from the other species of *Clastobryopsis* found from Doi Inthanon. Printarakul *et al.* (2012) recently reported this species from Doi Pui, Chiang Mai.

\*\**Daltonia apiculata* Mitt.

2280 m alt., *Akiyama et al.* 1353.

\*\**Daltonia aristifolia* Renaud & Cardot

1700 m alt., *Akiyama et al.* 1130 & 1131.

\*\**Daltonia semitoria* Mitt.

2300 m alt., *Akiyama et al.* 1536 & 1555-a, *Printarakul* 3695; 2500 m alt., *Akiyama et al.* 1496.

\*\*<sup>!</sup>*Desmatodon leucostoma* (R. Br.) Berggr.

1700 m alt., *Akiyama et al.* 424.

\*\**Dicranella austro-sinensis* Herzog & Dixon

2300 m alt., *Akiyama et al.* 1159.

\*\*<sup>!</sup>*Diphyscium mucronifolium* Mitt.

1700 m alt., *Akiyama et al.* 1134; 2250 m alt., *Akiyama et al.* 1288.

\*\*<sup>!</sup>*Ditrichum laxissimum* (Mitt.) Kuntze

1700 m alt., *Ando s.n.*

\*\**Eurhynchium angustirete* (Broth.) T. J. Kop.

2300 m alt., *Akiyama et al.* 1297.

\*\**Eurhynchium savatieri* Schimp. ex Broth.

2300 m alt., *Akiyama et al.* 1305 & 1310.

\*\*<sup>!</sup>*Eurhynchium hians* (Hedw.) Sande Lac.

1700 m alt., *Akiyama et al.* 68, 94, 238 & 397.

\*\**Fissidens schwabei* Nog. Fig. 7a, b

1650 m alt., *Akiyama et al.* 1140, *Printarakul* 2639.

NOTE. This species has small plants with sporophytes. It grows on shrub twigs and resembles *Fissidens guandongensis* Z. Iwats. & Z. H. Li. in its outer morphology. The type specimen (*Schwabe* 66, NICH) was collected in Taiwan (<http://hattori-bot-lab.com/species/Fissidens-schwabei.pdf>).

\*\*<sup>!</sup>*Glossadelphus lingulatus* (Cardot) M. Fleisch.

1700 m alt., *Akiyama et al.* 369, 380 & 396.

\*\**Hageniella sikkimensis* Broth. Fig. 7e, f

1300 m alt., *Akiyama et al.* 1401; 2300 m alt., *Akiyama et al.* 1094, 1317 & 1328.

NOTE. This species forms thin, large mats on the root of trees.

\*\*<sup>!</sup>*Hookeriopsis geminidens* Broth.

1700 m alt., *Akiyama et al.* 178.

*Indopotia irieandoana* H. Akiyama

1700 m alt., *Akiyama et al.* 422 (TYPE) & 426.

NOTE. For more details, see Akiyama and Goffinet (2011).

\*\*<sup>!</sup>*Leucoloma amoene-virens* Mitt.

1700 m alt., *Akiyama et al.* 160, 303 & 382.

\*\**Leucoloma taylorii* (Schwägr.) Mitt.

1300 m alt., *Akiyama et al.* 1029 & 1436-a.

\*\**Macrothamnium leptohymenioides* Nog.

2300 m alt., *Akiyama et al.* 1221; 2500 m alt. (Angka trail), *Akiyama et al.* 1486.

\*\*<sup>!</sup>*Micralsopsis complanata* (Dixon) W. R. Buck Figs 5 & 8a, b

1700 m alt., *Akiyama et al.* 26-a, 121, 148, 193, 201, 251, 307, 387, 406, 1128 & 1137; 2300 m alt., *Printarakul* 3646, *Akiyama et al.* 1013, 1016, 1064, 1084, 1090, 1093, 1128, 1137, 1176, 1191, 1207, 1279 & 1329, *Akiyama & Printarakul* 1434 & 1458.

NOTE. The species forms thin and sparse turfs on tree trunk and branches and not uncommon.



**Fig. 7.** a & b – *Fissidens schwabei* Nog. (Doi Inthanon, 1650 m alt.). c & d – *Austinia tenuinervis* var. *micholitzii* (Broth. ex Dixon) W. R. Buck & H. A. Crum (Doi Inthanon, 2300 m alt.). e & f – *Hageniella sikkimensis* Broth. (Doi Inthanon, 1300 m alt.).





**Fig. 8.** a & b, *Micralsopsis complanata* (Dixon) W. R. Buck (Doi Inthanon, 2300 m alt.). c & d – *Bryocrummia vivicolor* (Broth. & Dixon) W. R. Buck (Doi Inthanon, 2300 m alt.). e – *Bucklandiella subsecunda* (Hook. & Grev. ex Harv.) Bednarek-Ochyra & Ochyra (Doi Inthanon, 2300 m alt.). f – *Syrrhopodon semiliber* (Mitt.) Besch. (Doi Inthanon, 1700 m alt.).

Ascending stems showing pinnately branching pattern with sporophytes are distinctive. Buck (1987) reported this interesting moss from India (Assam) and China (Yunnan).

\*\*<sup>1</sup>*Papillaria chrysoclada* (Müll.Hal.) A. Jaeger

1700 m alt., *Akiyama et al.* 114, 158, & 223.

\*\**Pelekium haplohymenium* (Harv. & Hook.f.) A. Touw

1700 m alt., *Akiyama et al.* 1001, 1003 & 1225; 2300 m alt., *Akiyama et al.* 1182.

\*\*<sup>1</sup>*Philonotis mollis* (Dozy & Molk.) Mitt.

1700 m alt., *Akiyama et al.* 412 & 416.

\**Pinnatella amblyphylla* Enroth

1700 m alt., *Akiyama et al.* 1489, *Printarakul* 2677, 2688, & 3672; second report of this species from Thailand (Enroth 1994).

NOTE. The type specimen of this Thailand endemic species is from Doi Chiang Dao (Chiang Mai District). This species formed small patches at the base of tree trunks on the forest floor. We found another 'species' slightly different from the typical *P. amblyphylla* in leaf morphology and occupying a different habitat (on wet boulder at streambed) at a single locality of 1700 m alt.

\*\**Pogonatum nudiusculum* Mitt.

2250 m alt., *Akiyama* 1315 & 1330.

NOTE. See Eddy (1988: 39), who gave Thailand as the distribution area of this species without referring to any voucher specimens.

\**Pohlia flexuosa* Hook.

2300 m alt., *Akiyama et al.* 1170 & 1557.

NOTE. *Printarakul et al.* (2012) recently reported this species from Doi Suthep and Doi Pui, Chiang Mai District.

\*\**Pohlia prolifera* (Kindb.) S. O. Lindberg ex Arnell

2300 m alt., *Akiyama et al.* 1165.

*Symphiodon leiocarpus* H. Akiyama & Tsubota

1700 m alt., *Akiyama et al.* 314 & 332; 2550 m alt., *Akiyama Th-51* (TYPE), *Th-127*, *Th-128* and many others.

NOTE. For details, see Akiyama and Tsubota (2009)

\*<sup>1</sup>*Syrrhopodon semiliber* (Mitt.) Besch. Fig. 8f

1700 m alt., *Akiyama et al.* 18, 195, 285, 288, 300, 312 & 316.

NOTE. Dense and greenish filamentous gemmae produced on the upper half of leaves are very distinctive for *Syrrhopodon semiliber*. It has been known from central and southern parts of Thailand (He 2005–2013).

\*\*<sup>1</sup>*Thuidium pseudoglaucinum* A. Touw

1700 m alt., *Akiyama et al.* 106, 357 & 1146.

\**Trichosteleum stigmosum* Mitt. Fig. 6

1300 m alt., *Akiyama et al.* 1409; 2300 m alt., *Akiyama et al.* 1086 & 1098.

NOTE. This species grows on decayed logs in rather dry, lower montane forests. *Printarakul et al.* (2012) recently reported this species from Doi Pui, Chiang Mai District.

\*\*<sup>1</sup>*Warburgiella leptorhynchoides* (Mitt.) M. Fleisch.

1700 m alt., *Ando s.n.*

\*\**Weisiopsis anomala* (Broth. & Paris) Broth. & Paris

1700 m alt. *Akiyama et al.* 1427.

\*\**Wijkia deflexifolia* (Mitt. ex Renaud & Cardot) H.A.Crum

2500 m alt., *Akiyama* 21537-a.

TAXA EXCLUDED FROM THAILAND FLORA

*Distichophyllum decolyi* Gangulee

This species was earlier reported from Thailand by Akiyama (2006), but the specimen is referable to

the widely distributed and highly variable *D. maibarae* Besch (Ho *et al.* 2010, p. 114).

*Distichophyllum obovatum* (Griff.) Paris

This species was earlier reported from Thailand by Akiyama (2006), but the specimen is referable to *D. wanianum* B. C. Tan & P. J. Lin. (Ho *et al.* 2010, p. 120).

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