

Pleocnemia conjugata (Dryopteridaceae), a new record for Thailand

RATSAMEE SIMMA¹, SUMON MASUTHON² & STUART LINDSAY³

ABSTRACT. *Pleocnemia conjugata* (Blume) C.Presl, a new record for Thailand, is described and illustrated.

KEY WORDS: Dryopteridaceae, fern, new record, *Pleocnemia conjugata*, Tectariaceae, Thailand.

INTRODUCTION

Until recently, the fern genus *Pleocnemia* C.Presl was thought to be represented in Thailand by only three species, *P. hemiteliiformis* (Racib.) Holttum, *P. irregularis* (C.Presl) Holttum and *P. submembranacea* (Hayata) Tagawa & K.Iwats. These were treated under Dryopteridaceae in the Flora of Thailand (Tagawa & Iwatsuki, 1988) and under Tectariaceae by Lindsay *et al.* (2009). However, the recent phylogenetic work of Liu *et al.* (2014) supports their retention in Dryopteridaceae.

In May 2005 and June 2007 several specimens of an interesting but unfamiliar *Pleocnemia* species were collected in Khao Pu Khao Ya National Park, Phatthalung province. Subsequent herbarium and library research revealed this species to be *Pleocnemia conjugata* (Blume) C.Presl. As this is a new record for Thailand, the key to *Pleocnemia* given in the Flora of Thailand needs to be amended and a thorough description needs to be provided.

AMENDED KEY TO THE SPECIES OF *PLEOCNEMIA* IN THAILAND

1. Frond bipinnatifid or bipinnate, sori without indusia
 2. Frond bipinnatifid; veins copiously anastomosing to form areoles other than costal and costular ones ***P. irregularis***
 2. Frond bipinnate; veins anastomosing to form costal and costular areoles only, or rarely with one more row of areoles
 3. Base of pinnules not widened; no glands on sporangia ***P. hemiteliiformis***
 3. Base of pinnules conspicuously widened; glands present on sporangia ***P. submembranacea***
1. Frond tripinnate (at base), sori with indusia ***P. conjugata***

DESCRIPTION

Pleocnemia conjugata (Blume) C.Presl, Epimel. Bot.: 259. 1851 [‘1849’]; Holttum, Reinwardtia 1: 177, figs. 1, 5, 7 & 9. 1951; Holttum, Rev. Fl. Malaya 2: 534, figs. 314 & 315. 1955 [‘1954’]; Molesworth Allen, Gard. Bull. Sing. 17: 268. 1959; Holttum, Kew Bulletin 29: 350. 1974; Piggott, Ferns Malaysia in Colour: 330. 1988; Holttum, Fl.

Males., Ser. II, Pterid. vol. 2, part 1: 16, figs 4a & 4b. 1991.— *Aspidium conjugatum* Blume, Enum. Pl. Javae 2: 169. 1828. Type: Indonesia, Moluccas, s.d., *Blume s.n.* (K! 000420778, L?). See notes below and Holttum (1955) for further discussion of the type. See Holttum (1991) for additional synonyms. Figs. 1 & 2.

Terrestrial. *Rhizome* short, stout, erect or decumbent, the apex appearing woolly due to a dense

¹ Field and Renewable Energy Crops Research Institute, Department of Agriculture, Chatuchak, Bangkok 10900, Thailand. E-mail: ratsameesimma@gmail.com

² Department of Botany, Faculty of Science, Kasetsart University, Chatuchak, Bangkok 10900, Thailand.

³ Gardens by the Bay, 18 Marina Gardens Drive, Singapore 018953. E-mail: stuart.lindsay@gardensbythebay.com.sg

covering of very long, soft, linear scales. *Scales* basally attached (although rather loosely so), up to 25 mm long and 0.8 mm wide (at the base, less than 0.1 mm wide above the base), concolorous brown or reddish-brown, margins coarsely toothed. *Stipe* to ca 115 cm long, densely scaly at base (with scales similar to those on the rhizome), glabrous or apparently so above the base (with a good microscope, sparse, small, appressed, scales can sometimes be seen). Stipe slightly flattened above, not grooved in fresh material (but often grooved when dry), reddish-brown at base and below for its entire length, green above. *Lamina* tripinnate, deltoid-ovate in outline, up to ca 120 cm long and ca 125 cm wide, green and slightly shiny above, much paler and not shiny below, subcoriaceous. *Rachis* similar to stipe, reddish-brown below, at least in lower part, green above, not grooved when fresh. *Pinnae* up to ca 17 pairs of free pinnae consisting (from the base upwards) of one pair of tripinnate pinnae, up to 4 pairs of widely-spaced bipinnate pinnae, and up to 15 pairs of pinnatifid or more shallowly-lobed pinnae. The basal pinnae or supra-basal pinnae usually the longest or the lowermost 2 or 3 pairs of pinnae more-or-less the same length. Basal pinnae up to ca 70 cm long and 45 cm wide, long-stalked (to 6.5 cm), reflexed, asymmetrically triangular due to several enlarged basiscopic pinnules, the first (basal) basiscopic pinnule pinnate, to 35 cm long and 8.5 cm wide, the second (and sometimes third) basiscopic pinnules always absent. *Suprabasal* and other large bipinnate pinnae up to ca 70 cm long and 25 cm wide, shortly stalked or sessile, not reflexed, oblong or lanceolate, base truncate, apex acuminate, with 14–17(–20) pairs of free pinnules before the pinnatifid apex. *Pinnules* (excluding those of the basal pinnae), sessile, angled at about 60 degrees to the costae, the largest ca 6–10(–13) cm long \times 1.3–1.8 (–2.3) cm wide, somewhat oblong, base truncate, apex acuminate, the margins lobed to a little more than half way to costule. *Lobes* 4–6 mm wide, falcate, apex rounded or blunt, margins toothed distally. Each pair of lobes separated by a narrow sinus, a short blunt tooth-like structure at the base of each sinus (projecting from the dorsal surface of the lamina before being pressed). *Veins* distinct on both surfaces, veinlets anastomosing to form long costular areoles (between the midveins of the lobes) and a few irregularly shaped areoles between the costules and the sinuses; a few additional

irregularly shaped areoles on each side of the midveins of the lobes but usually only in the basal part of the lobes, the more distal veins being free, forked once or twice. *Indumentum*: the midveins of the lobes and some veinlets bearing oblong, unicellular, translucent-yellow, glandular hairs below, without such hairs above. *Veinlets* sometimes also bearing very sparse, fine, transparent, patent, uniseriate glandular hairs below, without such hairs above. Costae and costules bearing numerous transparent, patent, uniseriate hairs below. *Costae* densely covered with similar but shorter hairs above. *Costules* glabrous above. *Rachis* glabrous or sparsely hairy below (with or without sparse, small, appressed scales similar to those on the stipe), sparsely or densely hairy above. *Sori* round, dorsal on veinlets, mostly medial (midway between the midvein and margin of each fertile lobe), some supramedial (slightly closer to the margin than to the midvein of each fertile lobe), indusiate, indusia round-reniform, glabrous, persistent, usually folded in half at maturity. *Sporangia* long-stalked, glabrous. *Soral* paraphyses absent. *Spores* monolete, bilateral, bean-shaped with winged perispore.

Thailand.— PENINSULAR: Phatthalung [Si Banphot District, Khao Pu Khao Ya National Park, Rieng Thong Waterfall, 180 m, 12 May 2005, *Simma et al.* 190 (BKF, 2 specimens); same locality, 20 June 2007, *Simma & Kaeowkhao* 288 (BK, BKF, SING); same locality, 20 June 2007, *Simma & Kaeowkhao* 294 (BKF)].

Distribution.— Southern Myanmar, Malaysia (Peninsular, Sabah, Sarawak), Singapore, Indonesia (Kalimantan, Java, Sumatra, Sulawesi, Lesser Sunda Islands, Moluccas), Philippines, Papua New Guinea (Holttum, 1974). Records from Hong Kong (e.g. Holttum, 1991) were misidentifications for other *Pleocnemia* species.

Ecology.— *Pleocnemia conjugata* is a large terrestrial fern. In Thailand, it grows on the banks of a stream in evergreen forest at an altitude of 180 m. In Peninsular Malaysia, it grows in semi-shade in lowland dipterocarp forest and hill dipterocarp forest up to 560 m altitude (Jaman & Latiff, 1999). Throughout its range it appears to have a preference for lightly shaded or rather open forest and, according to Holttum (1955), “it certainly does not occur in normal fully shaded primitive forest”. Holttum (1991) also concluded that *P. conjugata* grows in places

with a short regular dry season but its discovery in Pulau Tioman and Singapore (since 1991) indicates that it is capable of growing in aseasonal forests.

Proposed IUCN conservation assessment.—Least Concern (LC). This species is widespread with a large AOO and EOO and with no known uses leading to discernable threats.

Notes.—(1) The indumentum of *Pleocnemia conjugata* is somewhat variable across its range. All plants are characterized by the presence of at least some unicellular translucent-yellow glandular hairs below (at least when fresh; often discoloured, damaged or destroyed by alcohol and/or drying) and transparent uniseriate hairs on many axes above and/or below. However, the density and distribution of these hairs is somewhat variable (e.g. Singaporean plants have yellow glandular hairs on the costae and costules as well as on the midveins of the lobes and veinlets; and the costae, costules and rachises have no uniseriate hairs below). The description of the indumentum given above is based on Thai material.

(2) There is some uncertainty as to whether or not the type of *Aspidium conjugatum* Blume still exists. Holttum (1991) implied that the holotype was at L, with an isotype at K, but Peter Hovenkamp has been unable to trace any original material in Leiden and the so-called isotype at K (which, from its annotations, is obviously the specimen to which Holttum refers) appears not to bear Blume's handwriting and is labelled as being from Java rather than from the Moluccas as stated in the protologue. Another problem with the Kew 'type' is that although it has only 6 sori these are submarginal not medial or supramedial. Holttum (1955) discussed this issue, and the contradiction between Blume's and Presl's descriptions and his own observations. He clearly believed that *P. conjugata* could have non-medial sori although he omitted to mention this possibility in his later Flora Malesiana description (Holttum, 1991).

(3) Holttum's descriptions of *P. conjugata* are a little confusing because he refers to costae as "pinna-rachises" or simply "rachises" and to "costal areoles" instead of "costular areoles", etc. In our description we use the words rachis and costae in their more conventional senses; that is, that the rachis is the main axis of the lamina, the axes arising from

it are costae, the axes arising from costae are costules and the axes arising from the costules are (in this species which has lobes not pinnulets) the midveins of the pinnule lobes.

(4) Although the basal pinna illustrated in Figure 1 was drawn from *Simma et al.* 190, both of the duplicates at **BKF** now, unfortunately, lack their basal pinnae. The most complete specimens are *Simma & Kaeowkhao* 294 (**BKF**) and *Simma & Kaeowkhao* 288 (**BKF**, **SING**).

ACKNOWLEDGEMENTS

We thank Mr Somchai Saeongkaeo and Mrs Phloenchit Pawangsawat, Khao Pu Khao Ya National Park for their advice, support and facilities during this study, and Miss Rawadee Kaewkaw [spelt 'Kaeowkhao' on the specimen labels] for her assistance in the field. We also thank the directors and curators of BCU, BK, BKF, PSU and SING for providing access to their specimens. R. Simma conducted this research while in receipt of a scholarship from the Graduate School, Kasetsart University. We also thank Dr Peter Hovenkamp for his help with trying to trace the type of the species, and Dr David J. Middleton for his comments on the manuscript.

REFERENCES

- Holttum, R.E. (1955) [‘1954’]. A Revised Flora of Malaya: An illustrated systematic account of the Malayan flora, including commonly cultivated plants. Vol. II, Ferns of Malaya. Government Printing Office, Singapore.
- Holttum, R.E. (1974). The fern-genus *Pleocnemia*. Kew Bulletin 29: 341–357.
- Holttum, R.E. (1991). Pteridophyta: Ferns and Fern Allies, *Tectaria* Group. In: Flora Malesiana Foundation (ed.), Flora Malesiana, Series II, 2(1): 1–132. Rijksherbarium/Hortus Botanicus, Leiden.
- Jaman, R. & Latiff, A. (1999). The pteridophyte flora of Pulau Tioman, Peninsular Malaysia. The Raffles Bulletin of Zoology, Supplement No. 6: 77–100.
- Lindsay, S., Middleton, D.J., Boonkerd, T. & Suddee, S. (2009). Towards a stable nomenclature for Thai ferns. Thai Forest Bulletin (Botany) 37: 64–106.

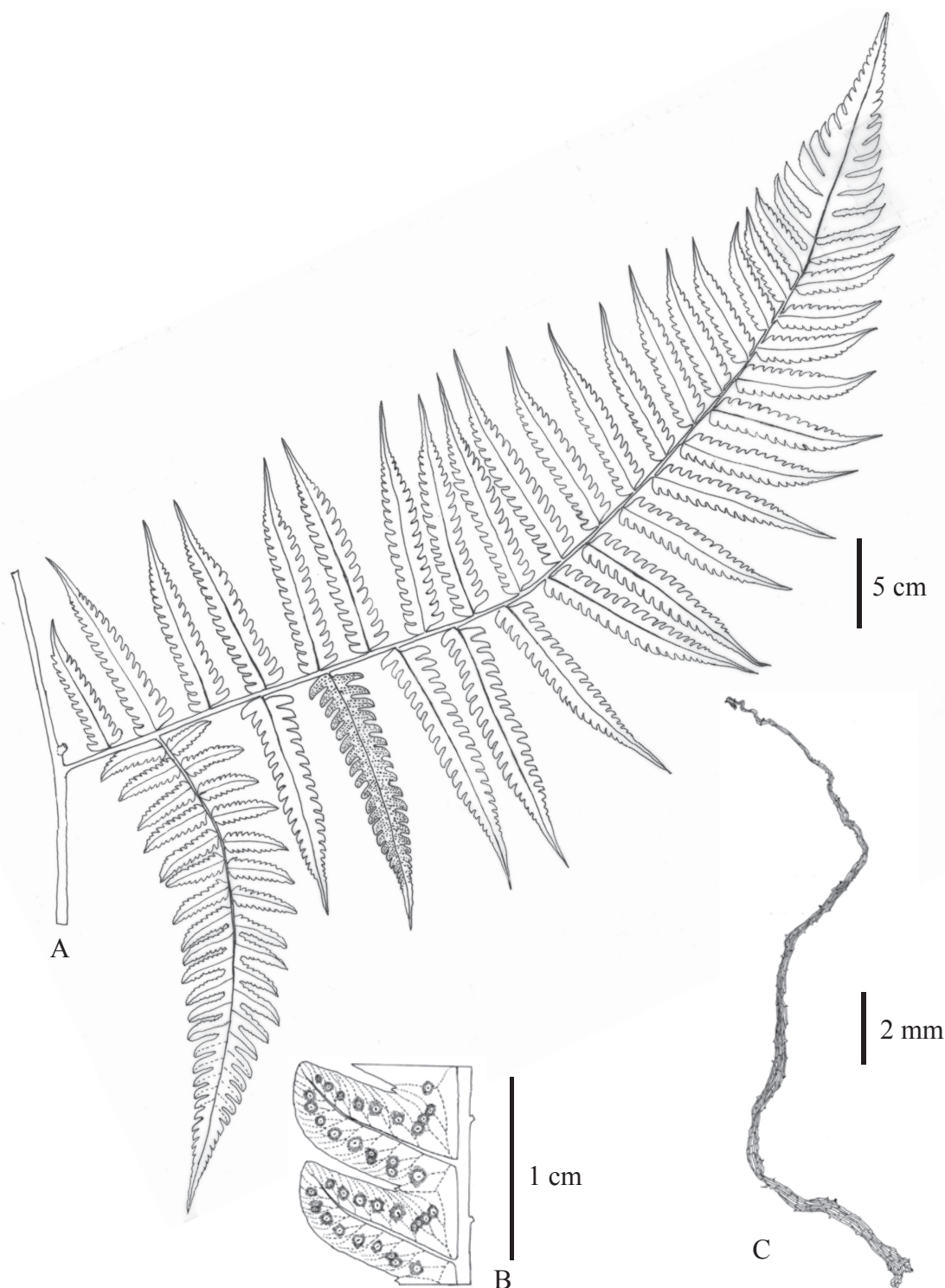


Figure 1. *Pleocnemia conjugata* (Blume) C.Presl; (A) basal pinna attached to stipe and rachis; (B) pinnule lobes with sori (same as Fig. 2B); (C) stipe scale. Drawn from R. Simma *et al.* 190 (BKF) by R. Simma.

Liu, H.-M., He, L.-J. & Schneider, H. (2014). Towards the natural classification of Tectarioid ferns: Confirming the phylogenetic relationships of *Pleocnemia* and *Pteridrys* (eupolypods I). *Journal of Systematics and Evolution* 52: 161–174.

Tagawa, M. & Iwatsuki, K. (1988). Pteridophytes. In: T. Smitinand & K. Larsen (eds), *Flora of Thailand* 3(3). Royal Forest Department, Bangkok.

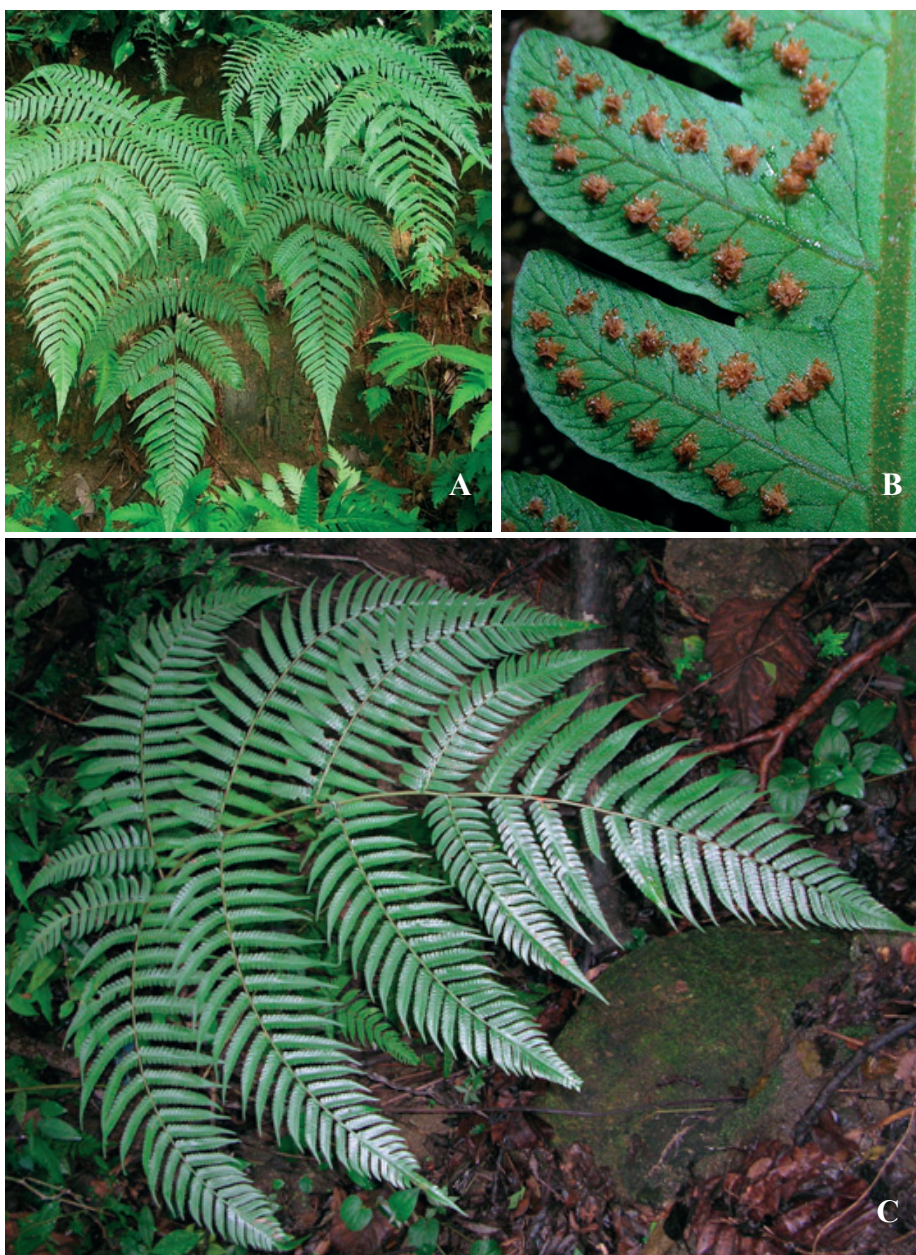


Figure 2. *Pleocnemia conjugata* (Blume) C.Presl; (A) plant in nature; (B) pinnule lobes with sori (same as Fig. 1B); (C) whole frond showing the tripinnate basal pinnae. All photos by R. Simma.