



Amblovenatum immersum (Thelypteridaceae): A new record for the flora of Vietnam

Doan Hoang SON^{1,2}, Do Van HAI^{1,3}, Bui Hong QUANG^{1,3}, Cheng Wei CHEN⁴,
La Anh DUONG², Trinh Van HIEU², Ritesh Kumar CHOUDHARY⁵ and Joongku LEE^{6*}

¹Graduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi 10072, Viet Nam

²Institute of Forest Tree Improvement and Biotechnology, Vietnamese Academy of Forest Sciences, Hanoi 10000, Viet Nam

³Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, Hanoi 10072, Viet Nam

⁴Independent Researcher, 37, Lane 656, Chung Cheng Road, Keelung 202, Taiwan

⁵Biodiversity & Palaeobiology Group, Agharkar Research Institute, G.G. Agarkar Road, Pune 411 004, India

⁶Department of Environment and Forest Resources, Chungnam National University, Daejeon 34134, Korea

Corresponding author

Joongku LEE

E-mail: joongku@cnu.ac.kr

OPEN ACCESS

© 2022 the Korean Society of Plant Taxonomists.
This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT: *Amblovenatum immersum* (Blume) Mazumdar (Thelypteridaceae) is newly recorded in Vietnam. It is similar to *A. terminans* (Panigrahi) J. P. Roux in its woody rhizome and cristate spores but differs in terms of its plant size, lobed pinnae, lobed segments, veinlets, sori and indusia. It was previously found to exist in China, India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, and Thailand as well as in east Africa, tropical America, northern Australia and Micronesia. The present study provides a detailed description, photos, and line drawing of the species. Furthermore, a comparison of the diagnostic characters with the closely related species in Vietnam *A. terminans* is provided.

Keywords: Kon Chu Rang Nature Reserve, range extension, Thelypteridaceae

RECEIVED 25 February 2022; **REVISED** 28 March 2022; **ACCEPTED** 22 June 2022

INTRODUCTION

The genus *Amblovenatum* was first recognized by J. P. Roux in 2009 (Roux, 2009). It consists of 12–15 species distributed in India, Australia, Malesia, and the Pacific islands, especially in New Guinea (Holttum, 1971). So far, the genus was known by a single species *A. terminans* in Vietnam. However, comprehensive research including nomenclatural review and critical study of the type specimens was awaited to confirm the actual number of species for the genus.

During our routine survey work in Gia Lai province, north highland of Vietnam, we collected several specimens of *Amblovenatum*. A comparison was made between those with morphologically similar *A. terminans* (Table 1). On the basis of available literature (Holttum, 1977; Loc, 2001; Roux, 2009), and careful investigation of specimens of *Amblovenatum* in the herbaria of Vietnam Academy of Science and Technology (HN) and Taiwan Forestry Research Institute (TAIF), our specimen was identified as *A. immersum* (Blume) Mazumdar, the first record for Vietnam (Fig. 1).

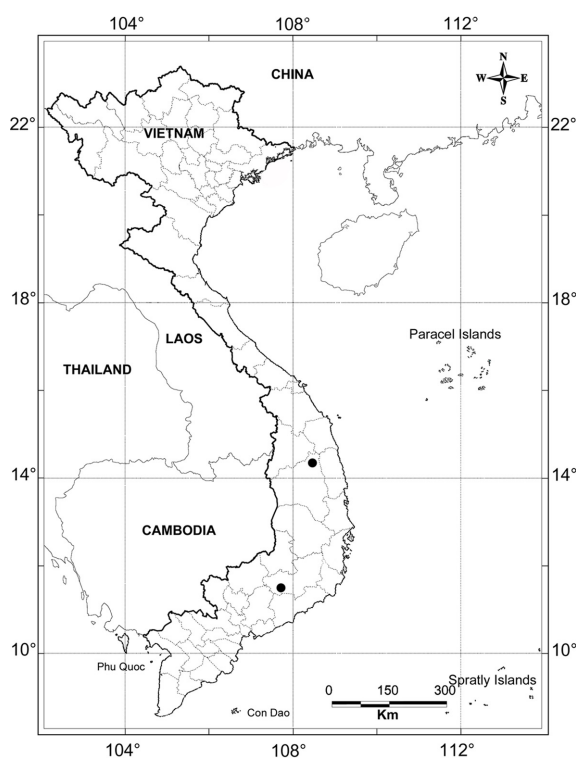
While checking TAIF specimens, we found some specimens of *A. immersum* collected from Lam Dong province (Vietnam), however, they were never been critically examined and documented for its occurrence in Vietnam. Here, we provide a detailed description, habitat, distribution, color photographs, illustration and comparison table for easy identification of *Amblovenatum immersum*.

MATERIALS AND METHODS

The newly recorded species was collected at Kon Chu Rang Nature Reserve in Vietnam. The specimens collected from the natural habitats were thoroughly processed using standard herbarium techniques (Jain and Rao, 1977) and deposited in HN. Specimens housed in TAIF, K, L and P (acronym follows Thiers, 2020) were also scrutinized. Morphological characters were studied by consulting the relevant literature (Holttum, 1971, 1977; Tagawa and Iwatsuki, 1988; Roux, 2009; Mazumdar, 2017).

Table 1. Morphological comparison of *Amblovenatum immersum* with *A. terminans*.

Characters	<i>A. immersum</i>	<i>A. terminans</i>
Plant size (m)	2.6–3	0.4–1
Pinnae	Sessile	Subsessile
Lobes	Lobed to 1 mm from costa or deeper; lobes separated by wide sinuses	Lobed to one third to half of the costa
Segments	60–70 pairs	20–35 pairs
Veinlets per lobe	10–14 pairs	6–8 pairs
Veinlets	Proximal pair arising from base of costules, all reaching margins above sinuses or basal acroscopic veinlet close to sinus	Proximal pair anastomosing, next 1–1.5 pairs running to sinus membrane
Sori	Dorsifixed at middle	Marginal
Indusia	Sulfur-colored glands along margins	No glands along margins

**Fig. 1.** Distribution map of *Amblovenatum immersum* (Blume) Mazumdar in Vietnam.

TAXONOMIC TREATMENT

Amblovenatum immersum (Blume) Mazumdar, Int. J. Adv. Res. Innov. Ideas Educ. 3: 5960, 2017; *Aspidium immersum* Blume, Enum. Pl. Javae 2: 156, 1828; *Thelypteris immersa* (Blume) Ching, Bull. Fan Mem. Inst. Biol. Bot. 6: 306, 1936; *Amphineuron immersum* (Blume) Holttum, in B. K. Nayar & S. Kaur, Companion Handb. Ferns Br. India 203, 1974. (Figs. 2–4).—TYPE: INDONESIA: Java, C. L. Blume s.n. (holotype: L, isotype: K, K000548430, photo!).

Plants 2.6–3 m tall. **Rhizomes** strong, woody, and ascending. **Fronds** approximately 2 m long; stipes nearly 1 m long, ca. 1 cm in diam., bases with thick lanceolate scales, distally with sparse short setae, dark stramineous; laminae oblong-lanceolate, 150–190 × 55–60 cm, bases nearly tapering or sometimes proximal pair of pinnae slightly shortened, pinnate-pinnatifid, acuminate and pinnatifid at apices, papery, when dry grass-green, pinnae abaxially ± with yellow spherical small glands along veins, elsewhere glabrous, adaxially along grooves with dense grayish white fine and long acicular hairs and along veins sparsely shortly hairy; pinnae mostly subopposite, spreading, sessile; middle pinnae linear-lanceolate, 25–35 × 2–3 cm, bases symmetrical, truncate, pinnatifid and reaching both narrow wings of costae, lobed to 1 mm from costa or deeper; lobes separated by wide sinuses, almost at right angles to costa, not falcate, distal lobes more oblique; apices caudate-acuminate; segments 60–70 pairs, flatly spreading, pectinately arranged, linear, 8–14 × 2–3 mm, entire, rounded or acute at apices. **Veins** evident, lateral veins simple, 10–14 pairs per segment, proximal pair arising from base of costules, all reaching margins above sinuses or basal acroscopic veinlet close to sinus. **Sori** orbicular, medium-sized, dorsifixed at middle of lateral veins, 8–10 pairs per segment; indusia orbicular-reniform, somewhat leathery, glabrous, sulfur-colored glands along margins, persistent. **Sporangia** with slender stalks which bear short hairs with glandular tips like the glands on indusia. **Spores** orbicular-reniform, perispore echinate.

Distribution: Vietnam (Gia Lai and Lam Dong Provinces), S. China (W. Hainan), Malasia, N. Queensland, New Hebrides, New Caledonia, Loyalty Islands (Fig. 1).

Ecology, habitat, and conservation status: *Amblovenatum immersum* grows on slopes, secondary forests, roadside, and exposed disturbed areas at an elevation range of about 800 m a.s.l., in association with *Glaphyroidopsis erubescens*

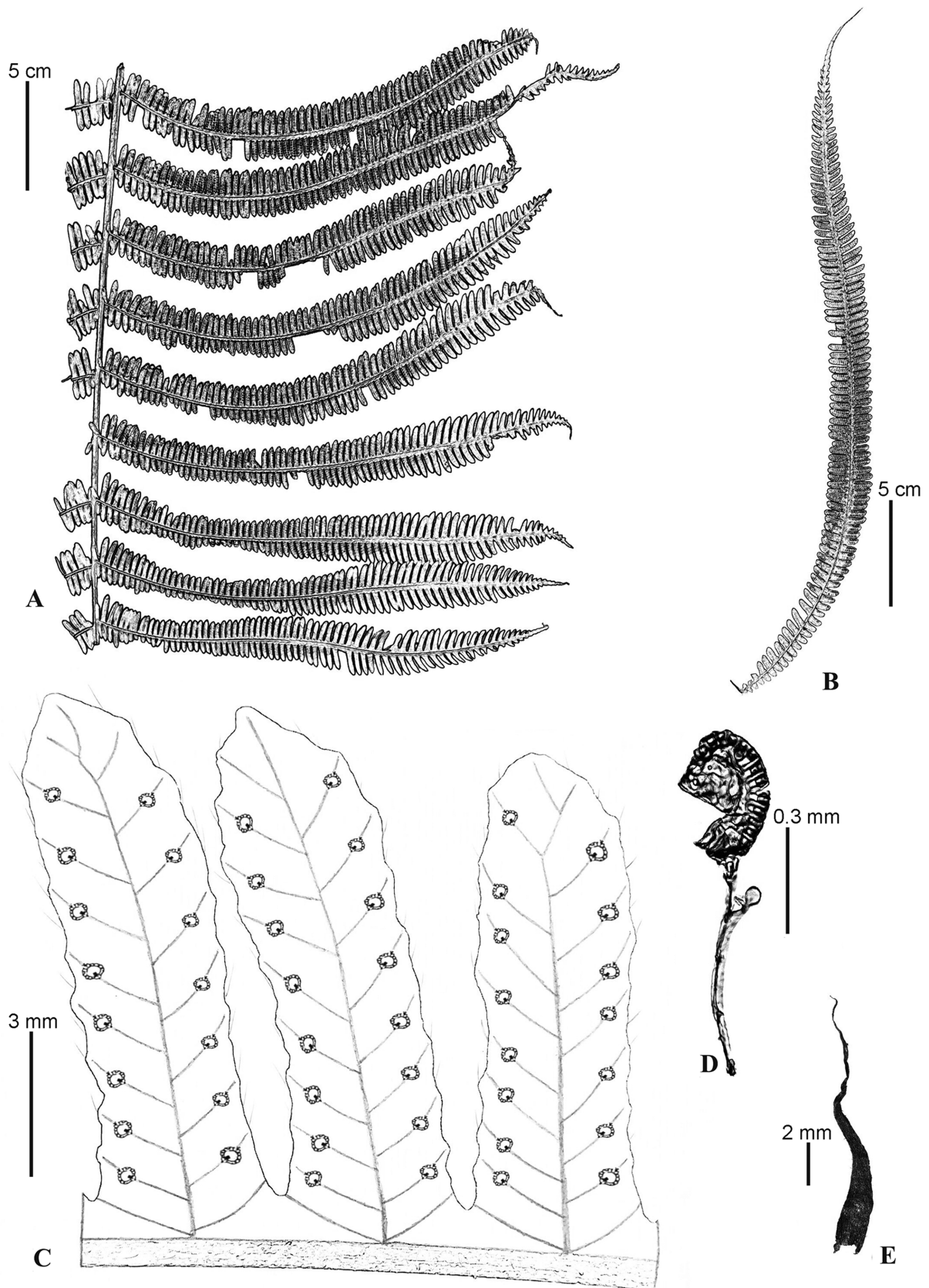


Fig. 2. *Amblovenatum immersum* (Blume) Mazumdar. A. Middle pinnae. B. Pinna. C. Segments. D. Sporangia. E. Scales (Drawings by D. H. Son, based on *Son 75* [HN]).



Fig. 3. *Amblovenatum immersum* (Blume) Mazumdar. A. Habitat. B, C. Habit. D. Rhizomes. E. Middle pinnae.

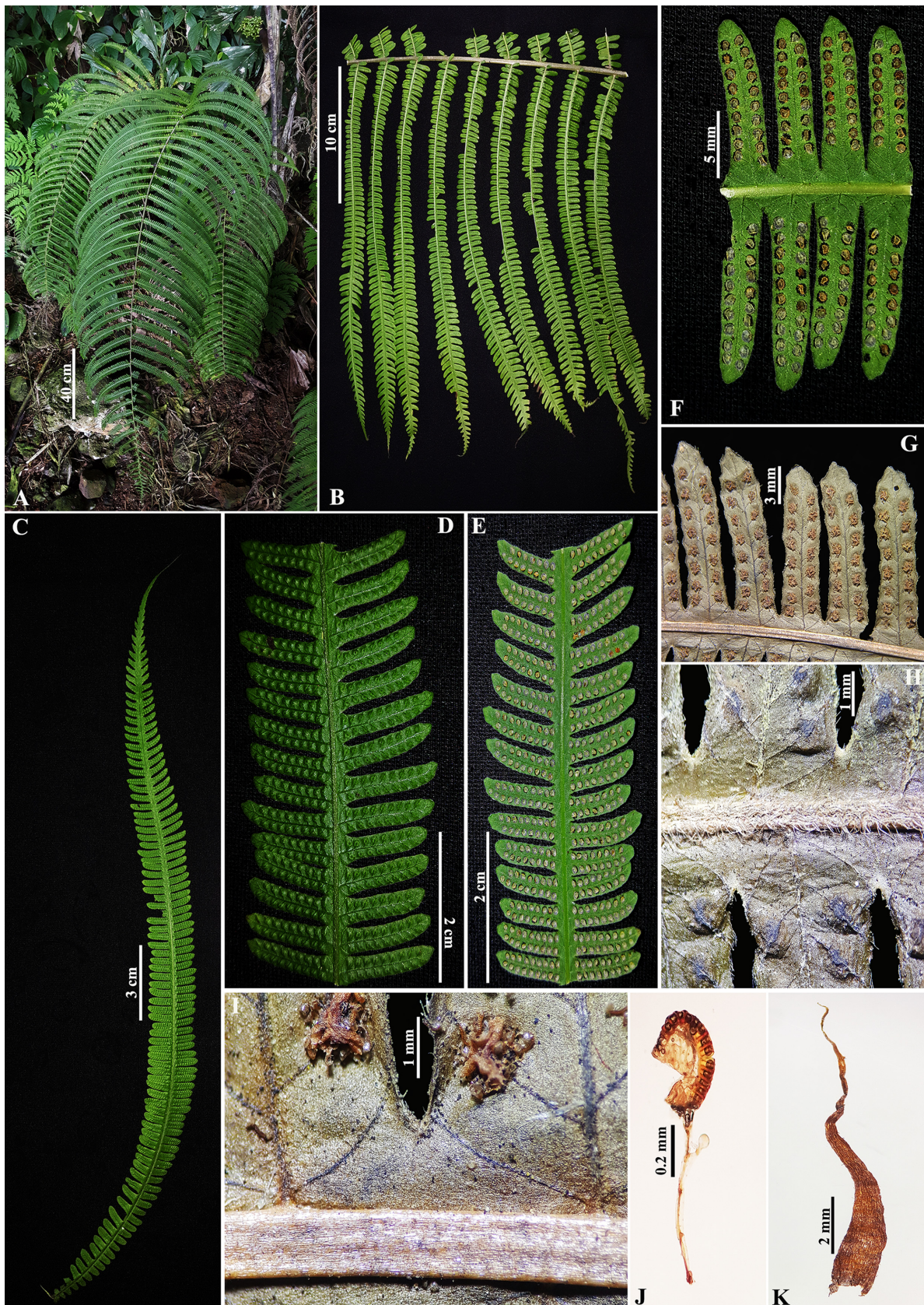


Fig. 4. *Amblovenatum immersum* (Blume) Mazumdar. A. Habit. B. Middle pinnae. C. Pinna. D. Pinnae adaxial view. E. Pinnae abaxial view. F, G. Segments. H. Veins on adaxial side. I. Lobes and sori. J. Sporangia. K. Scale.

(Wall. ex Hook.) Ching, *Pronephrium megacuspis* (Baker) Holttum, *Pneumatopteris truncata* (Poir.) Holttum, *Christella dentata* (Forssk.) Brownsey & Jermy, *Ficus* sp., *Lithocarpus* sp., *Madhuca* sp., *Musa* sp., *Dioscorea* sp., *Lygodium* sp., *Polystichum* sp., and *Chromolaena* sp. We found its distribution in Gia Lai province consisting of at least 10 to 15 mature individuals in >10 populations. Its distribution in Bao Loc Pass in Lam Dong province is documented here based on the specimen record at the Herbarium of Taiwan Forestry Research Institute (TAIF). Further field investigations are needed to confirm its occurrence in other areas of Vietnam. In accordance with the IUCN Red List Categories (2012, ver. 3.1), we propose a temporary listing of this taxon under the Data Deficient (DD) category.

Specimens examined: VIETNAM. Gia Lai Province: Kbang District, Kon Chu Rang Nature Reserve, 14°31'11"N, 108°36'31"E, elev. 870 m, 6 Sep 2018, *Son H. D. Son 75* (HN). Lam Dong Province: Da Huoai District, Bao Loc pass, 28 Jun 2018, elev. 407 m a.s.l., *Cheng-Wei Chen et al. 5182* (TAIF).

ORCID: Doan Hoang SON <https://orcid.org/0000-0002-8776-3291>; Do Van HAI <https://orcid.org/0000-0001-7841-0585>; Bui Hong QUANG <https://orcid.org/0000-0001-6878-7514>; Cheng Wei CHEN <https://orcid.org/0000-0001-9709-6739>; La Anh DUONG <https://orcid.org/0000-0001-6308-8570>; Trinh Van HIEU <https://orcid.org/0000-0002-7058-8917>; Ritesh Kumar CHOUDHARY <https://orcid.org/0000-0001-6250-4624>; Joongku LEE <https://orcid.org/0000-0001-6250-3138>

ACKNOWLEDGMENTS

We are grateful for the support received from the Institute of Forest Tree Improvement and Biotechnology, Vietnamese Academy of Forest Sciences; Vietnam Academy of Science and Technology (grant no. ĐL0000.03/22-23) and Graduate University of Science and Technology (GUST), Vietnam

Academy of Science and Technology (VAST). It is also supported by the framework of international cooperation program managed by the National Research Foundation of Korea (NRF-2019K2A9A1A0609774512), Korea. RKC is grateful to the Director, Agharkar Research Institute for facilities and encouragements.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

LITERATURE CITED

- Holttum, R. E. 1971. Studies in the family Thelypteridaceae. III. A new system of genera in the Old World. *Blumea* 19: 17–52.
- Holttum, R. E. 1977. Studies in the family Thelypteridaceae. XII. The genus *Amphineuron* Holttum. *Blumea* 23: 205–218.
- Jain, S. K. and R. R. Rao. 1977. *A Handbook of Field and Herbarium Methods*. Today and Tomorrow Printers and Publishers, New Delhi, 150 pp.
- Loc, P. K. 2001. Thelypteridaceae. *In* Checklist of Plant Species of Vietnam, Vol. 1. Ban, N. T. and N. T. Nguyen (eds.), Agriculture Publishing House, Hanoi. Pp. 1111–1124.
- Mazumdar, J. 2017. Nomenclatural changes in Indian ferns. *International Journal of Advance Research and Innovative Ideas in Education* 3: 5960–5961.
- Roux, J. P. 2009. Synopsis of the Lycopodiophyta and Pteridophyta of Africa, Madagascar and neighbouring islands. *Strelitzia* 23: 1–296.
- Tagawa, M. and K. Iwatsuki. 1988. Pteridophytes. *In* Flora of Thailand, Vol. 3, Parts 3. Smitinand, T. and K. Larsen (eds.), Chutima Press, Bangkok. Pp. 297–480.
- Thiers, B. M. 2020. The World's Herbaria 2020: A summary report based on data from Index Herbariorum. Retrieved Feb. 25, 2022, available from http://sweetgum.nybg.org/science/wp-content/uploads/2021/01/The_World_Herbaria_2020_7_Jan_2021.pdf.