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Three new species of the fern genus *Pteridrys* (Tectariaceae) from Vietnam

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Abstract

The fern genus *Pteridrys* is characterized by having free veins and a tooth on each sinus between two pinna or pinnule lobes. This genus is currently known from nine to ten species. Here we add three new species of *Pteridrys* from northern Vietnam found in an expedition in 2013.

Key words: *Pteridrys*, Tectariaceae, Vietnam

Introduction

The tropical Asian fern genus *Pteridrys* C.Christensen & Ching (1934: 129) is characterized by having free veins and a small tooth in each sinus between adjacent pinna or pinnule lobes (Wang 1999). *Pteridrys* has been recognized as a genus since its publication, but its systematic placement has been controversial. Before the advent of molecular phylogenetics, it had been placed in or associated with various families. Recent molecular works have placed it in Tectariaceae or associated it with *Tectaria* Cavanilles (1799: 115) and allied genera (Hasebe *et al.* 1995, Liu *et al.* 2007, 2014, Ding *et al.* 2014, Moran *et al.* 2014, Wang *et al.* 2014, Zhang *et al.* 2016, 2017).

The taxonomy of *Pteridrys* has rarely been explored since its introduction by Christensen & Ching (1934), who recognized seven species. Up to now, only ten names at specific rank exist (Christensen & Ching 1934, Copeland 1947, Ching & Wang 1981, Holttum 1991, Dong & Christenhusz 2013). However, our morphological and molecular studies (Zhou *et al*., unpubl. data) show that the genus is far more diverse than we ever thought. Here we describe three new species from northern Vietnam based on our own collections made in 2013. Unlike *P. australis*, the common species in southern China and northern Vietnam (Wang 1999, Dong & Christenhusz 2013), none of these three new species has catenate hairs (ctenitoid hairs sensu Holttum 1991, Duan *et al*. 2017).

Notably, all these three species of *Pteridrys* are distributed in tropical forest. With accelerated rate of deforestation (e.g., Bawa & Seidler 2015) and global warming the conservation of the tropical forest (Asner 2015, Graham 2015, Laurance 2015, Pimm & Joppa 2015) and restoration in our human-dominated and ever more rapidly changing world (Aronson *et al.* 2017, Brancalion & van Melis 2017, Chazdon 2017, Falk 2017, Holl 2017, Meine 2017, Reid & Aronson 2017, Reid *et al.* 2017, Woodworth 2017) play an important role in saving the biodiversity including species of *Pteridrys* in tropical forest.

Taxonomy

Pteridrys costularis Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou, *sp. nov.* Figs. 1A–D & 2.

Type:—VIETNAM. Bac Kan: Na Phac District, elev. 1100–1300 m, 6 December 2013, *Li Bing Zhang, Liang Zhang & Ngan Thi Lu 6731* (holotype VNMN!, isotypes CDBI!, MO!).

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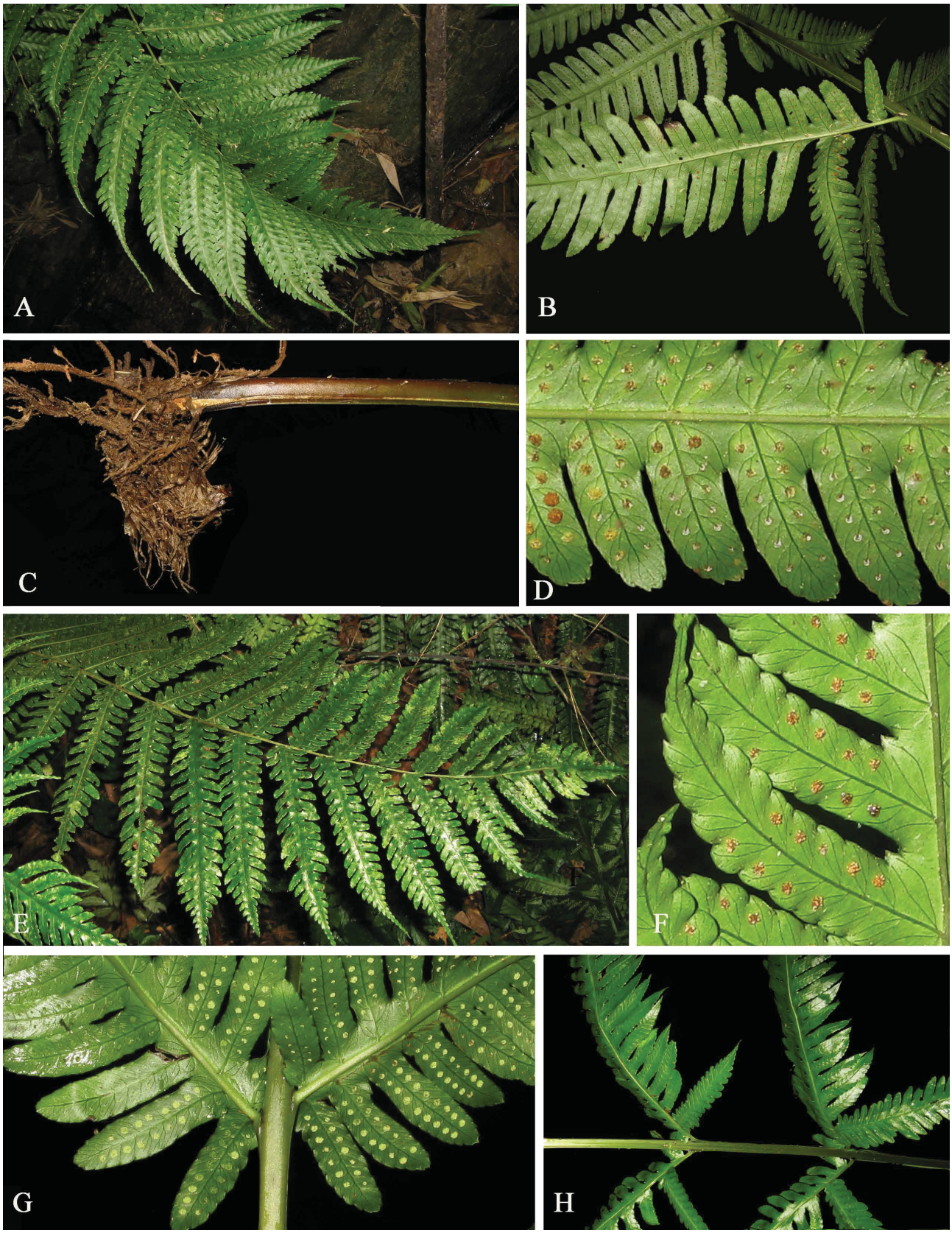

FIGURE 1. Field images of *Pteridrys costulalis* Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou, *Pteridrys hanoiensis* Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou, and *P. vietnamensis* Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou. A–D. *Pteridrys costulalis*:—A. Portion of lamina.—B. Basal pairs of pinnae, showing basal basiscopic pinnules of basal pinnae strongly elongate.—C. Rhizome and basal stipe.—D. Portion of pinna showing venation and sori. E & F. *Pteridrys hanoiensis*:—E. Portion of lamina.—F. Portion of pinna showing venation and sori. G & H. *Pteridrys vietnamensis*:—G. Portion of rachis with portions of pinnae.—H. Portions of basal pinnae showing basal basiscopic pinnules of basal pinnae strongly elongate.

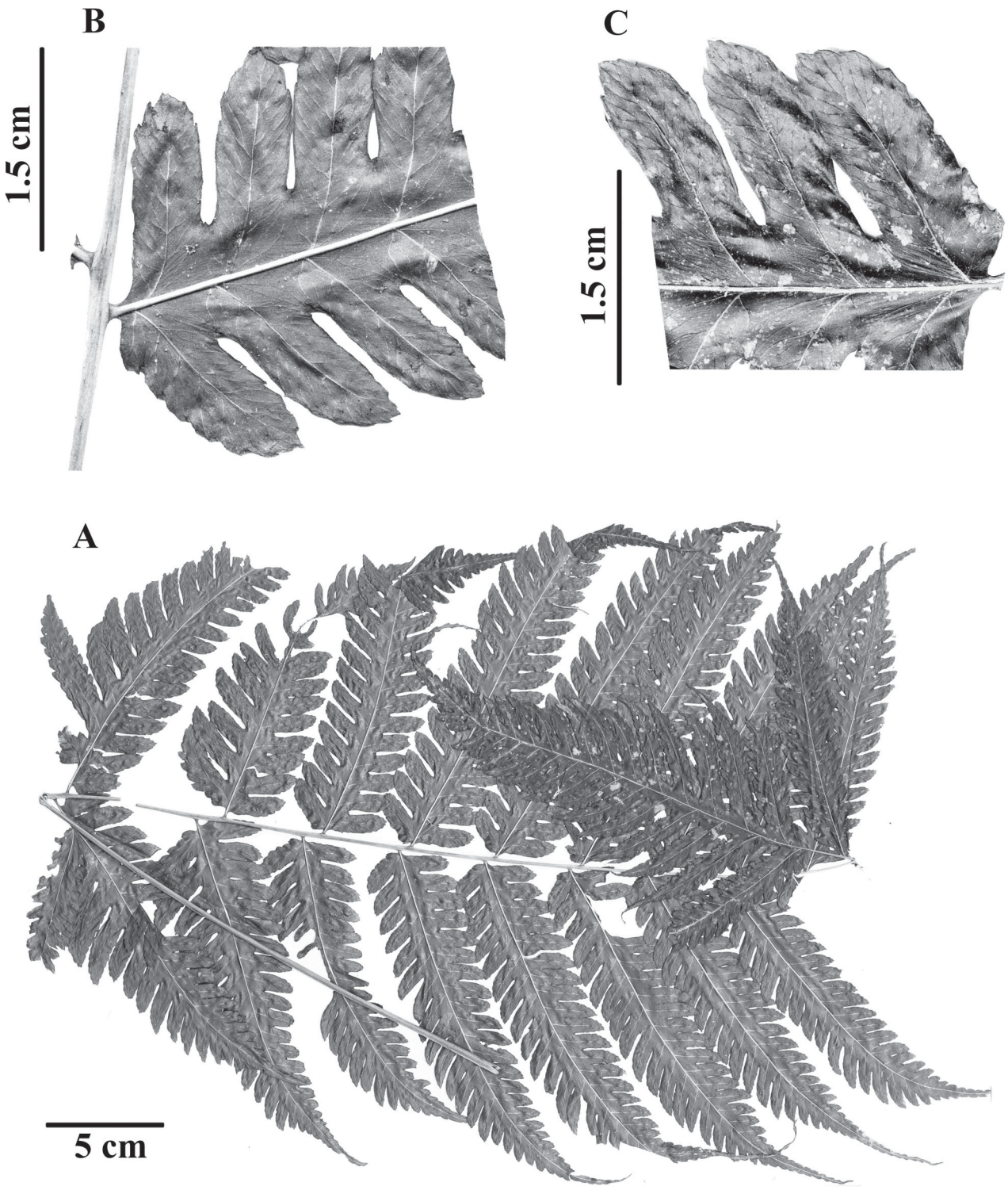

FIGURE 2. *Pteridrys costulalis* Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou.—A. Habit.—B. Portion of rachis with portion of pinna.—C. Portion of pinna.

Diagnosis:—This species is similar to *Pteridrys microthecia* (Fée 1865: 37) C.Christensen & Ching (1934: 139) in having basal basiscopic lobes of basal pinnae elongate and strongly toothed, and lobes oblong and serrulate only on distal margins, but differs in basal basiscopic veinlet of each lobe (arising from the base of costule *vs*. obviously arising from costae), and the lowest secondary veinlets of primary veinlets (arising from primary veinlets and distant from costule *vs*. arising from costule).

Plants ca. 0.7 m tall. Rhizome ascending. Stipe stramineous, more than 25 cm long, rhizome apex and stipe base covered with lanceolate scales. Lamina papery, brown when dry, ca. 45 × 23 cm, oblong to oblong-lanceolate, bipinnatifid; rachis stramineous, glabrous; lateral pinnae ca. 20 pairs; basal pinnae lanceolate, ca. 15 × 7 cm, petiolules ca. 0.4 cm, lobed (sinuses more than 2/3 the length of the adjacent lobes); basal basiscopic lobes of basal pinnae lanceolate, elongate, ca. 3.5 × 1.0 cm, margins strongly dentate to slightly pinnatilobate, teeth or lobes ca. 12 pairs; basal acroscopic lobes similar to next one, slightly overlapping rachis on abaxial side; pinna lobes 16–18 pairs, 1.7–2.4 × 0.7–0.9 cm, oblong, acute at apex, serrulate on the distal margins, sinuses between lobes 0.1–0.2 cm, with a sharp tooth in each sinus; costae glabrous; veins free, distinct on both surfaces; veinlets 5–8 pairs on each lobe, 1–2(–3)-furcate; soriferous veinlets stopping at sori; basal basiscopic veinlet of each lobe arising from base of costule; lowest secondary veinlets of primary veinlets arising from primary veinlets and distant from costule. Sori terminal on veinlets, 3–5 pairs on each lobe; indusia brown, 0.5–0.6 mm in diam., rounded-reniform, without hairs, fugacious.

Etymology:—From the Latin *costularis*, of or pertaining to a costule, referring to the basal basiscopic veinlet of each lobe arising from the base of a costule in this species (instead of a costa).

Distribution:—This species is currently known to be endemic to northern Vietnam.

Notes:—This species is also similar to *Pteridrys lofouensis* (Christ 1910: 143) C.Christensen & Ching (1934: 134) in having basal basiscopic lobes of basal pinnae elongate and lobes oblong, but the new species has a smaller habit (ca. 0.7 m tall), and basal basiscopic lobes of basal pinnae slightly elongate (ca. 3.5 cm) and strongly toothed on margins, while *P. lofouensis* has a larger habit (0.8–1.3 m long), and basal basiscopic lobes strongly elongate (7–10 cm long) and pinnatifid.

Pteridrys hanoiensis Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou, *sp. nov*. Fig. 3

Type:—VIETNAM. Hanoi: Ba Vi National Park, elev. ca. 900 m, 25 November 2013, *Li Bing Zhang, Liang Zhang & Ngan Thi Lu 6517* (holotype VNMN!, isotypes CDBI!, MO!).

Diagnosis:—This species is similar to *Pteridrys lofouensis* (Christ) C.Chr. & Ching in having basal basiscopic lobes of basal pinnae elongate, lobes oblong and rounded at apex, and the lowest secondary veinlets of primary veinlets arising from primary veinlets, but differs in basal acroscopic lobes (usually overlapping the rachis *vs*. not overlapping the rachis), lobes (1.5–2.5 cm long vs. 1.3–1.7 cm long), and sori (7–8(–10) pairs on each lobe and subterminal on veinlets *vs*. sori 4–6(–7) pairs on each lobe and often terminal on veinlets).

Plants more than 1.3 m tall. Rhizome not seen. Stipe stramineous, 60–70 cm long, scales not seen. Lamina thinly papery, dark brown when dry, 70–100 × 35–45 cm; oblong to oblong-lanceolate, bipinnatifid; rachis brown when dry, glabrous; lateral pinnae ca. 25 pairs; basal pinnae lanceolate, 20–25 × 10–12 cm, petiolules ca. 0.5 cm, deeply lobed (sinuses nearly reaching the costae); basal basiscopic lobes of basal pinnae lanceolate, strongly elongate, 9–10 × 2.5–3 cm, pinnatifid, lobes ca. 15 pairs, margins subentire to serrate at apex; basal acroscopic lobes similar to next one, overlapping rachis on abaxial side; pinna lobes 21–25 pairs, 1.3–2 × 0.6–0.7 cm, oblong, obtuse at apex, serrate to entire on margins, involute when dry, sinuses between lobes 0.1–0.2 cm, with a sharp tooth in each sinus; costae glabrous; veins free, slightly distinct on both surfaces, veinlets 7–10 pairs on each lobe, 2(–3)-furcate; soriferous veinlets stopping at sori or going through sori but not reaching lobe margins; basal basiscopic veinlets of each lobe arising from base of costule or from costa and slightly remote from base of costule; lowest secondary veinlets of primary veinlets arising from costule. Sori terminal or subterminal on veinlets, 7–8(–9) pairs on each lobe; indusia brown, 0.5–0.7 mm in diam., rounded-reniform, without hairs, persistent.

Etymology:—From *hanoi*, the city name in Vietnam, and Latin ending -ensis, of origin, referring to the type locality in Hanoi.

Distribution:—This species is currently known to be endemic to northern Vietnam.

Notes:—Phylogenetically, this species is sister to a clade containing *Pteridrys costulalis* Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou, *P. lofouensis* (Christ) C.Chr. & Ching, *P. vietnamensis* Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou (see below), and an undescribed species.

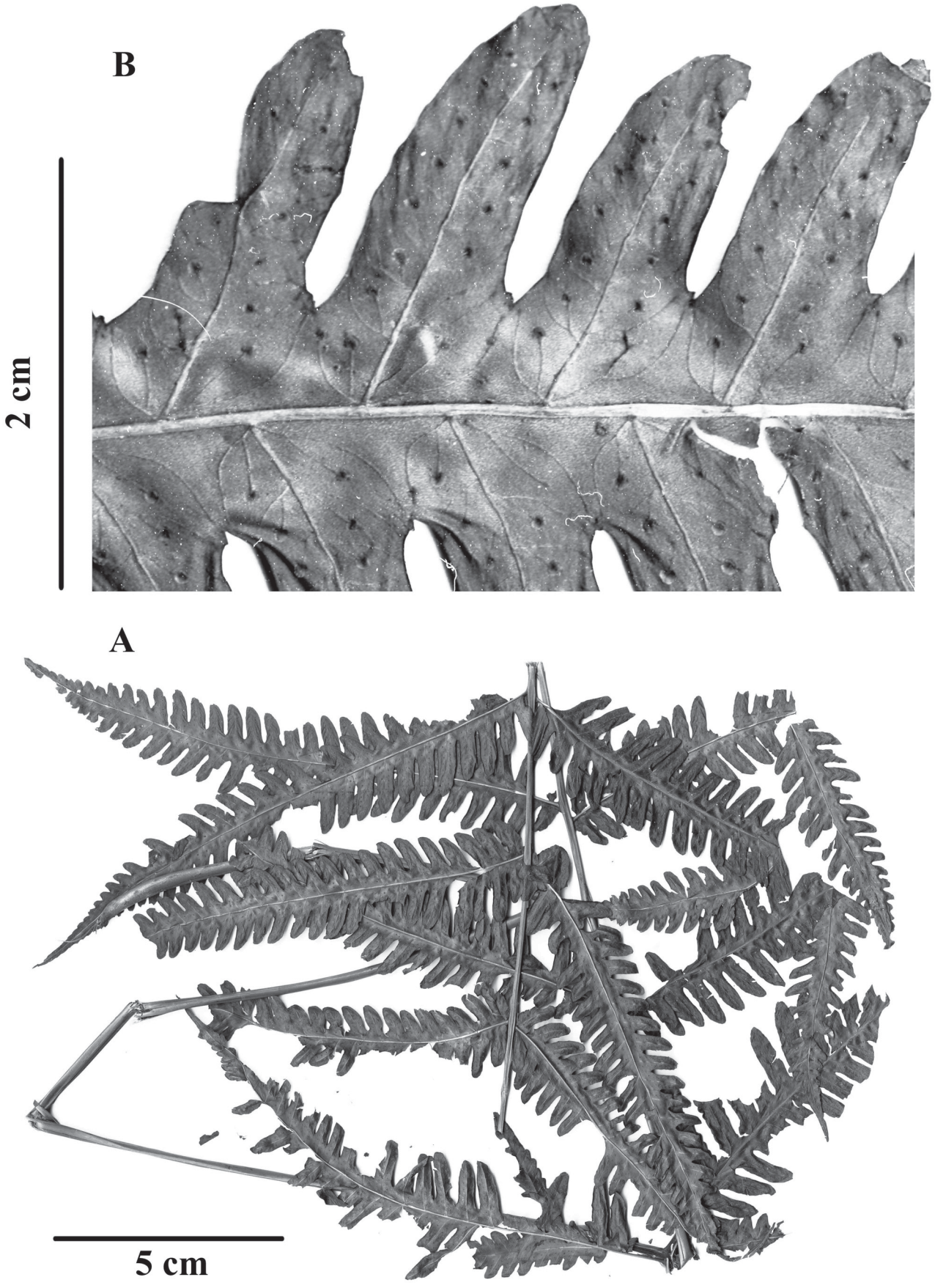

FIGURE 3. *Pteridrys hanoiensis* Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou.—A. Lower portion of frond.—B. Portion of pinna.

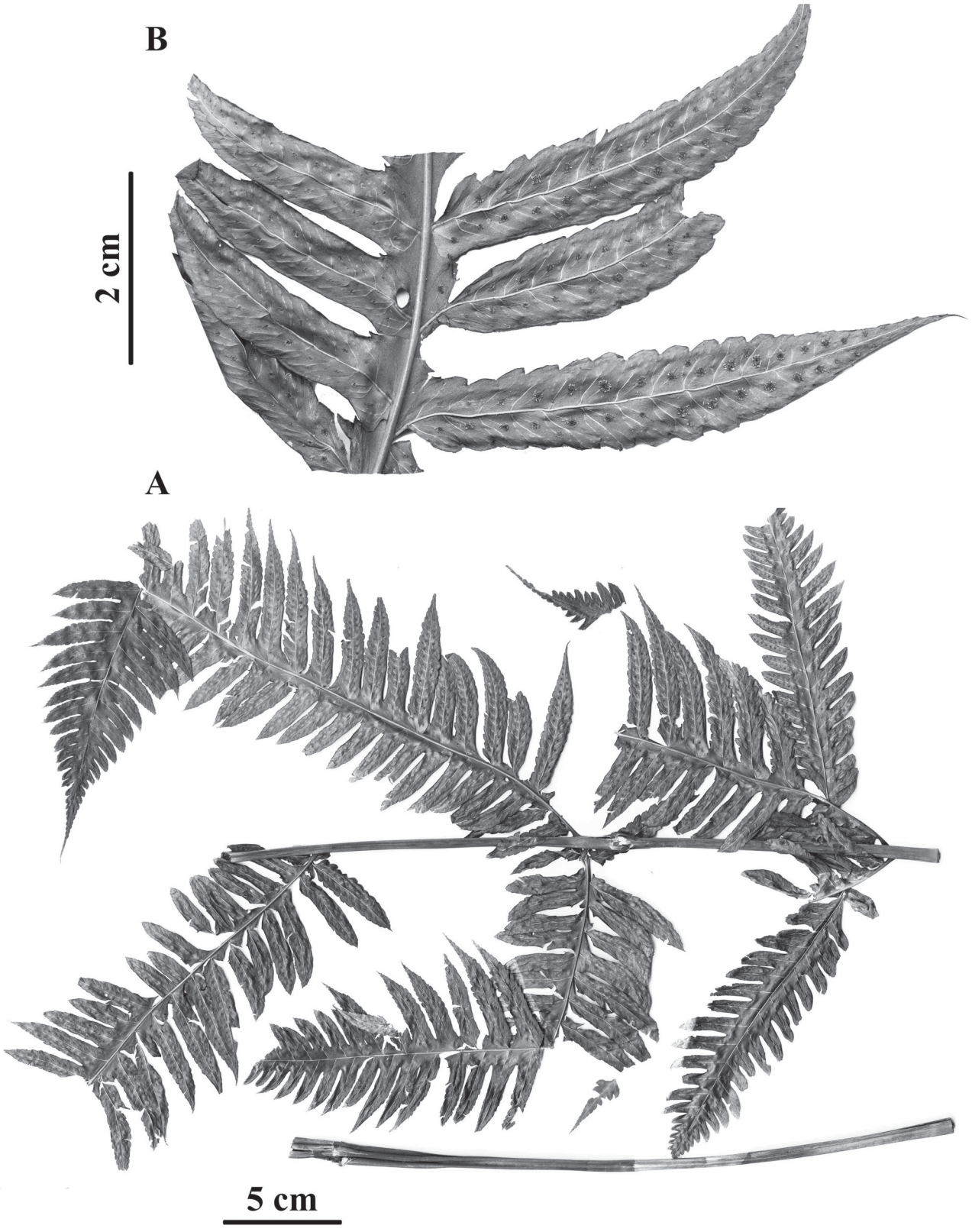

FIGURE 4. *Pteridrys vietnamensis* Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou.—A. Lower portion of frond.—B. Portion of pinna.

Pteridrys vietnamensis Li Bing Zhang, Liang Zhang, N.T.Lu & X.M.Zhou, *sp. nov*. Figs. 1E–H & 4.

Type:—VIETNAM. Phu Tho: Tan Son District, Xuan Son National Park, elev. ca. 950 m, 27 November 2013, *Li Bing Zhang, Liang Zhang & Ngan Thi Lu 6554* (holotype VNMN!, isotypes CDBI!, MO!).

Diagnosis:—This species is similar to *Pteridrys lofouensis* (Christ) C.Chr. & Ching in having the basal basiscopic pinnules of the basal pinnae strongly elongate and crenate-dentate margins on the lobes, but differs in lamina color (dark green when dry *vs*. dark brown when dry), lobe shape (lanceolate *vs*. oblong), the origin of the basal basiscopic veinlet in a lobe (usually arising from the base of costule *vs*. arising from costae) and number of sori (7–11(–18) pairs on each lobe *vs*. sori 4–6(–7) pairs on each lobe).

Plants ca. 1.5 m tall. Rhizome not seen. Stipe stramineous, more than 60 cm long, scales not seen. Lamina thinly papery, dark green when dry, ca. 80–100 × 35–50 cm, oblong to oblong-lanceolate, bipinnatifid; rachis brown, glabrous; lateral pinnae ca. 25 pairs; basal pinnae lanceolate, ca. 35 × 15 cm, petiolules ca. 0.35 cm, deeply lobed (sinuses nearly reaching the costae); basal basiscopic lobes of basal pinnae broadly lanceolate, strongly elongate, ca. 15 × 4 cm, pinnatifid, lobes ca. 23 pairs, oblong to lanceolate, margins slightly serrate at distal part, apex obtuse or acute; basal acroscopic lobes similar to next one, overlapping rachis; pinna lobes 30–35 pairs, 2.5–5 × 0.5–1.0 cm, lanceolate, acuminate, serrate on margins, sinuses between lobes 0.1–0.2 cm, with a sharp tooth in each sinus; costae glabrous; veins free, distinct on both surfaces, veinlets 9–13(–17) pairs on each lobe, 2–3(–4)-furcate; soriferous veinlets stopping at sori or going slightly through sori but not reaching lobe margins; basal basiscopic veinlets of each lobe arising from base of costule; the lowest secondary veinlets of primary veinlets often arising from costule. Sori terminal, subterminal or dorsal on veinlets, 7–11(–18) pairs on each lobe; indusia brown, rounded-reniform ca. 0.5 mm in diam., without hairs, persistent.

Etymology:—From the country name *Vietnam* and the Latin ending *-ensis*, of origin, referring to the type locality in Vietnam.

Distribution:—This species is currently known to be endemic to northern Vietnam.

Notes:—This is a very distinct species with lanceolate lobes acuminate at apex, which is reminiscent of *Pteridrys cnemidaria* (Christ 1910: 140) C.Christensen & Ching (1934: 136), but the former has sessile or subsessile pinnae, while the latter has obvious pinna petiolules up to 4 cm long.

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