
Polystichum loratum (Dryopteridaceae), a New Fern Species from Guizhou, China

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ABSTRACT. A new fern species, *Polystichum loratum* H. He & Li Bing Zhang (Dryopteridaceae), is described and illustrated from limestone cliffs in northern Guizhou Province, China. *Polystichum loratum* is most similar to *P. yaanense* Liang Zhang & Li Bing Zhang in having narrowly ovate to lanceolate abaxial rachis scales. The new species is distinguished by its lorate leaf lamina, the oblong to narrowly ovate microscales (broad-type) on abaxial pinna surfaces, and the exindusiate sori, while *P. yaanense* has lanceolate leaf lamina, subulate microscales (narrow-type) on abaxial pinnae, and indusiate sori. *Polystichum loratum* is considered to be Critically Endangered (CR), based on IUCN Red List criteria.

Key words: China, Guizhou, IUCN Red List, limestone flora, *Polystichum*.

In the summer of 2011, Hai He and Yong-Qing Yang conducted fieldwork in northern Guizhou, China, to search for samples of *Hypodematium glandulosum* Ching ex K. H. Shing (Dryopteridaceae or Hypodemiatiaceae). On the way to the summit of Jindingshan of Zunyi City, a city famous for the 1935 Zunyi Meeting in modern Chinese revolutionary history, a species of *Polystichum* Roth (Dryopteridaceae) growing on limestone cliffs was collected and photographed, and photos, specimens, and DNA samples were sent to Li-Bing Zhang. After comparative morphological investigation, we conclude that the species is unknown to science, and it is described here.

Polystichum loratum H. He & Li Bing Zhang, sp. nov. TYPE: China. Guizhou Province: Zunyi Prefecture, Zunyi City, Jindingshan Town, Xintugou Cun, Jiayanwo, 27°46'11.02"N, 106°46'14.27"E, 1150 m, on shaded & damp limestone cliffs, 2–3 m distant from the ground,

23 June 2011, H. He & Y. Yang 1361 (holotype, CDBI; isotypes, CTC, MO). Figure 1.

Diagnosis. *Polystichum loratum* H. He & Li Bing Zhang is most similar to *P. yaanense* Liang Zhang & Li Bing Zhang in having narrowly ovate to lanceolate abaxial rachis scales, but the new species is distinguished by its lorate leaf lamina (vs. lanceolate in *P. yaanense*), the oblong to narrowly ovate and broad-type microscales (vs. subulate and narrow-type in *P. yaanense*) on abaxial pinna surfaces, and the exindusiate sori.

Plants perennial, caespitose, evergreen; rhizome ascending, 0.5–2.2 cm, 0.4–1.6 cm diam., with remnant bases of old petioles, scaly at the base of the petiole (but scales mostly worn out, incomplete, and much darker in color); adventitious roots dull brown when dry, 0.2–0.3 mm diam., nearly glabrous or occasionally covered with lanate scales, the longer roots once or twice branched with lateral rootlets to 1.8 cm. Leaves 8 to 18(to 25) per rhizome, (5.9–) 11.2–16.8 cm, leaf lamina appressed to substrate or ascending; petioles green, (0.5–)1.5–4.8 cm, 0.3–1.2 mm diam. at middle, densely covered with spreading scales; petiole scales generally 2.5–4.1 × 0.8–1.2 mm, ovate to lanceolate, thin and papery, brown, apex caudate, ending in a ca. 0.8 mm hairlike tip, base rounded and slightly peltate in attachment, scale margins with 0.5–0.8 mm wavy, hairlike outgrowths, mixed with smaller scales (fewer and mostly on adaxial petiole surface) deltoid to lanceolate, ca. 2 × 0.5 mm, margins and apex also with hairlike outgrowths and long hairlike tip; basal petiole scales worn and incomplete, similar to those on rhizome, mostly without marginal outgrowths and hairlike tips, thicker in texture and dark brown in color. Leaf lamina lorate, 1-pinnate, (4.5–)7.5–12.5 × 0.9–1.5 cm, apex acuminate, ± narrowed toward base from the mid-portion and tapering down; rachis 0.3–0.6 mm diam. at middle of lamina, without proliferous bulbils, green and concolorous as pinnae when fresh, yellowish green

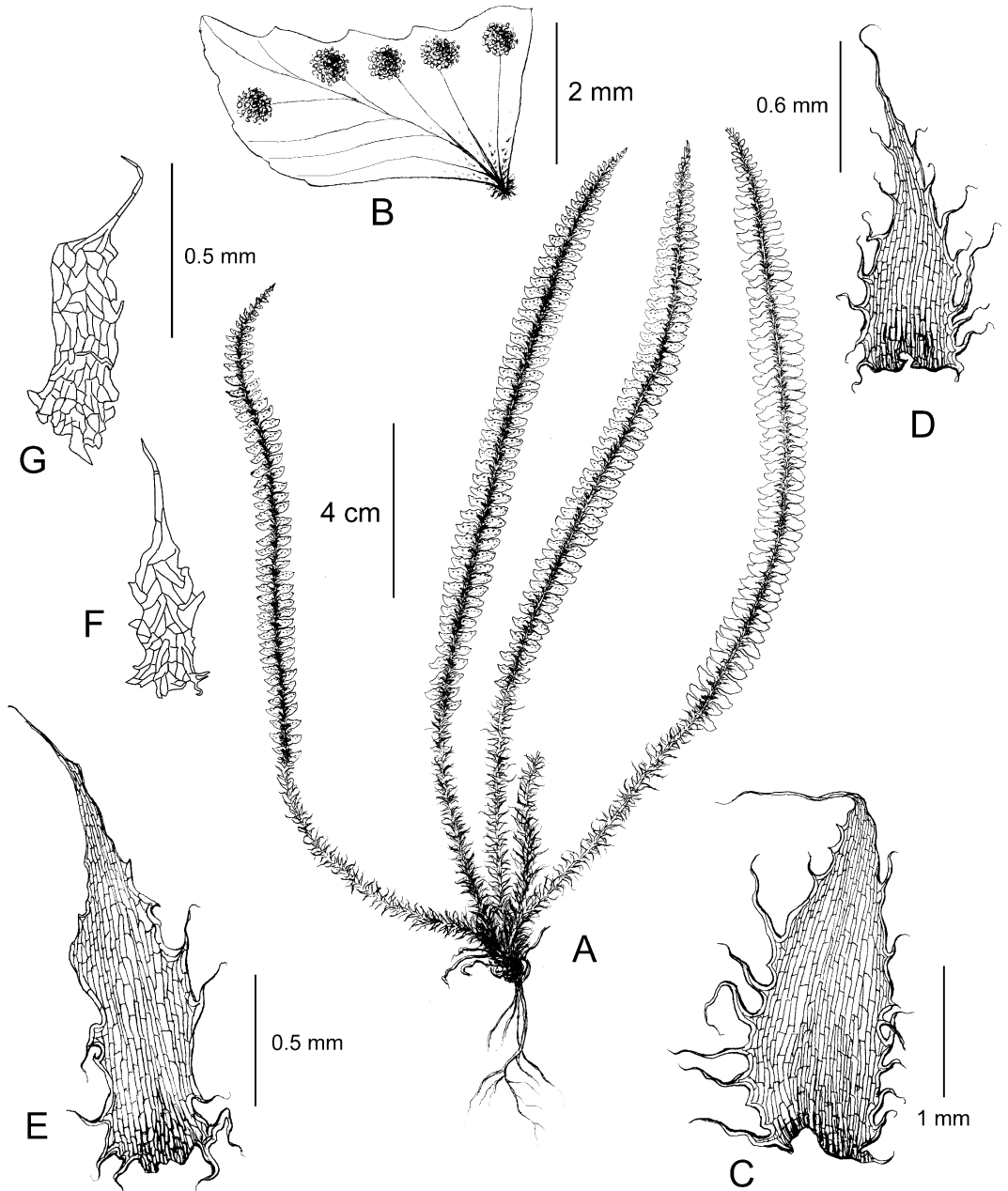


Figure 1. *Polystichum loratum* H. He & Li Bing Zhang. —A. Habit. —B. Pinna. —C, D. Petiole scales. —E. Abaxial rachis scale. —F, G. Microscales (broad-type microscales) of pinnae. A–G drawn from the holotype H. He & Y. Hang 1361 (CDBI).

when dry, densely covered with scales abaxially, sparsely scaly (especially at base of petiolules) adaxially; abaxial rachis scales ovate to lanceolate, similar to those of petiole but smaller, lighter in color and thinner in texture, adaxial rachis scales deltoid and subulate, dark brown, to 2×0.4 mm, hairlike outgrowths only at broadest base, margins nearly entire, apex caudate; pinnae nearly leathery, in (16

to)25 to 55 pairs, alternate, 1–2 mm apart, contiguous or imbricate (sometimes basal 1 to 6 pairs to 3 mm apart even if other pinnae are imbricate), asymmetrically rectangular to oblong (or slightly falcate toward apex), $3.5\text{--}6.5 \times 1.8\text{--}3$ mm, lowest pairs usually $1/2$ to $2/3$ as long as middle pinnae, asymmetrically deltoid or widely so, shortly petiolulate (petiolules to ca. 1 mm, attached to rachis at an acroscopic angle of ca.

60°), basiscopic margins at angles of 75°–150° with rachis, the basiscopic base cuneate, acroscopic side \pm truncate (with a blunt auricle, sometimes auricle deeply incised to near midrib and forming a basal free cuneate-based lobe of ca. 2×1.8 mm with 2 or more small teeth at apex), forming angles of 90°–120° at the point of attachment to the petiolule, margins slightly cartilaginous, basiscopic side of pinnae nearly entire, distally curved toward apex, with 1 or 2 small teeth (distal margins sometimes curved with 2 to 3 undulations), acroscopic side of pinnae with 3 or 4 shallow teeth between the basal auricle tooth and pinna apex (sometimes also with 3 or more shallow or rarely deep undulations), apex rounded or acute (occasionally acuminate) and ending in a blunt tooth, all teeth without aristate tips, adaxial pinna surface glabrous (occasionally with 1 to 3 microscales), abaxial pinna surface sparsely covered with microscales (especially along veins); microscales oblong to narrowly ovate (Fig. 1F, G; broad-type microscales), $0.8\text{--}1.2 \times 0.15\text{--}0.25$ mm, light brown, membranous, apex extended by hairlike appendage, microscale margins irregularly erose, with the broadest part consisting of 6 to 8 lines of cells; venation of pinnae pinnate, visible abaxially and indistinct adaxially, lateral veins free, single or once forked. Sori terminal on lateral veins, 2 to 4(5) on acroscopic side, 0 or 1 on distal basiscopic side, 1.4–2.4 mm diam., mostly medial (between pinna margins and midrib), proximal 1 or 2 sori closer to pinna margins, occasionally all sori close to pinna margins, centers ca. 1.5 mm apart from one another, contiguous when mature; indusia absent; sporangia round, ca. 0.2 mm diam., walls ca. 0.1 mm thick, dark brown when mature; annuli with ca. 15 thickened cells; sporangial stalks ca. 0.3 mm; number of spores per sporangium unknown.

Distribution and ecology. *Polystichum loratum* is currently known only from Xintugou, an area close to Jindingshan Town north of Zunyi City in northern Guizhou. Jindingshan is a scenic mountain near Zunyi, and the area called Xintugou lies within a valley at the western portion of the mountain range; the northern side of Xintugou includes elevated limestone cliffs, where *P. loratum* is found. The areas surrounding Xintugou correspond to a general karst landscape, but without so many limestone outcrops. Given the similarity of the adjacent karst topography to the Xintugou area, we expect that similar habitats, and thus the same plants, could possibly be found during future fieldwork.

Polystichum loratum was observed to grow either on shaded, damp limestone cliffs of a small gorge (Jiayanwo, the type locale) or on unshaded, damp cliffs under shrubs, as well as on the surfaces of carbonate sediment at the bottom of the mouth of a karst cave (Touniudong, Buffalo-Stolen Cave), at 1150–1300 m.

Plants associated with the type of *Polystichum loratum* include the seed plants *Boehmeria clidemioides* Miq. var. *diffusa* (Wedd.) Hand.-Mazz. (Urticaceae), *Briggsia mihieri* (Franch.) Craib (Gesneriaceae), *Elatostema involucratum* Franch. & Sav. (Urticaceae), *Hemiboea subcapitata* C. B. Clarke (Gesneriaceae), *Saxifraga stolonifera* Curtis (Saxifragaceae), *Begonia* L. (Begoniaceae), *Petrocosmea* Oliv. (Gesneriaceae), and *Polygonum* L. (Polygonaceae). Fern associates were *Hypodematum crenatum* (Forssk.) Kuhn (Hypodematiaceae), *Cytomium fortunei* J. Sm., *Polystichum craspedosorum* (Maxim.) Diels, and *P. erosum* Ching & K. H. Shing (Dryopteridaceae).

IUCN Red List category. Only four populations of *Polystichum loratum* have been found at Xintugou, with a total of an estimated 180 individuals (with the smallest population having ca. 30 individuals). The new species clearly should be classified as Critically Endangered (CR), based on current information and according to IUCN Red List criteria (IUCN, 2008). However, a more extensive search is needed to accurately assess the conservation status of the new species.

Etymology. The species epithet is taken from the Latin word “loratum,” meaning “lorate,” referring to the general lorate outline of its lamina.

Taxonomic notes. *Polystichum loratum* has 1-pinnate leaves and is clearly a member of *Polystichum* sect. *Haplopolystichum* Tagawa (1940) s.l. (Zhang & He, 2009). The narrow strap-shaped, lorate outline of the leaf lamina of *P. loratum* is reminiscent of that of *P. subacutidens* Ching ex L. L. Xiang, which is in the same section and is distributed from southern China to northern Vietnam. However, *P. subacutidens* has filiform rachis scales and linear or filiform microscales on pinnae that clearly differ from the new species. In *Polystichum* sect. *Haplopolystichum* s.l., *P. loratum* is one of only two species with ovate to lanceolate rachis scales. The other species in the section with ovate to lanceolate rachis scales is *P. yaanense* (Zhang et al., 2012). In spite of the similar shapes of the rachis scales, these two species can be easily distinguished morphologically from each other. Most important, *P. loratum* has oblong to lanceolate

microscales on pinnae abaxially and exindusiate sori, while *P. yaanense* has subulate microscales on pinnae abaxially and indusiate sori. In addition, *P. loratum* has linear leaf lamina and slightly cartilaginous pinna margins, while *P. yaanense* has lanceolate leaf lamina and noncartilaginous pinna margins. *Polystichum yaanense* occurs in Ya'an Prefecture, Sichuan. The morphological differences between *P. loratum* and *P. yaanense* are elaborated in the following key.

KEY TO SPECIES OF *POLYSTICHUM* SECT. *HAPLOPOLYSTICHUM* S.L. WITH OVATE TO LANCEOLATE RACHIS SCALES IN CHINA

- 1a. Leaf lamina lanceolate; pinnae stiff, nearly transparent when dry with veins being visible adaxially, not cartilaginous on margin; microscales of pinnae subulate; sori indusiate *P. yaanense*
- 1b. Leaf lamina lorate; pinnae soft, not transparent when dry with veins being indistinct adaxially, slightly cartilaginous on margin; microscales of pinnae oblong to narrowly ovate; sori exindusiate *P. loratum*

Paratypes. CHINA. **Guizhou:** Zunyi City, Jindingshan Town, Xintugou, Dongwan, Touniudong (Buffalo-Stolen Cave), 1300 m, 23 June 2011, *H. He & Y. Yang 1343, 1345, 1347, 1354* (CDBI, CTC); Jiayanwo, 1150–1200 m, 23 June 2011, *H. He & Y. Yang 1356, 1360* (CDBI, CTC).

Acknowledgments. This project was supported by the National Natural Science Foundation of China (#31070187) and the Chongqing Municipality Science and Technology Commission (#cste2011jjA00006) to H.H. and by a grant from the Open Laboratory of Ecological Restoration and Biodiversity Conservation of Chengdu Institute of Biology, Chinese Academy of Sciences, to L.-B.Z. We are indebted to Yushan Li for help with fieldwork, Faqiang Lü for the line drawing, and two anonymous reviewers, as well as Sara Fuentes and Victoria Hollowell, for helpful comments. Special thanks go to the curators of CDBI, CTC, and MO for giving us access to the materials in their care.

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