



## *Polystichum asiae-minoris* (Dryopteridaceae), a new fern from Kastamonu, Turkey

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### Abstract

A new fern of *Polystichum* (Dryopteridaceae), *P. asiae-minoris*, is described and illustrated from Horma Canyon in the borders of Küre Mountains National Park in Kastamonu Province located in the north of Turkey. *Polystichum asiae-minoris* is distinguishable from the morphologically similar *P. obliquum* by having pinnae abaxially densely covered with broad-type microscales. It is not certain to which lineage the new species closely allied. The new species has extremely narrow distribution and is classified as Critically Endangered (CR) following IUCN Red List Criteria.

**Keywords:** IUCN Red List, *Polystichum obliquum*

### Introduction

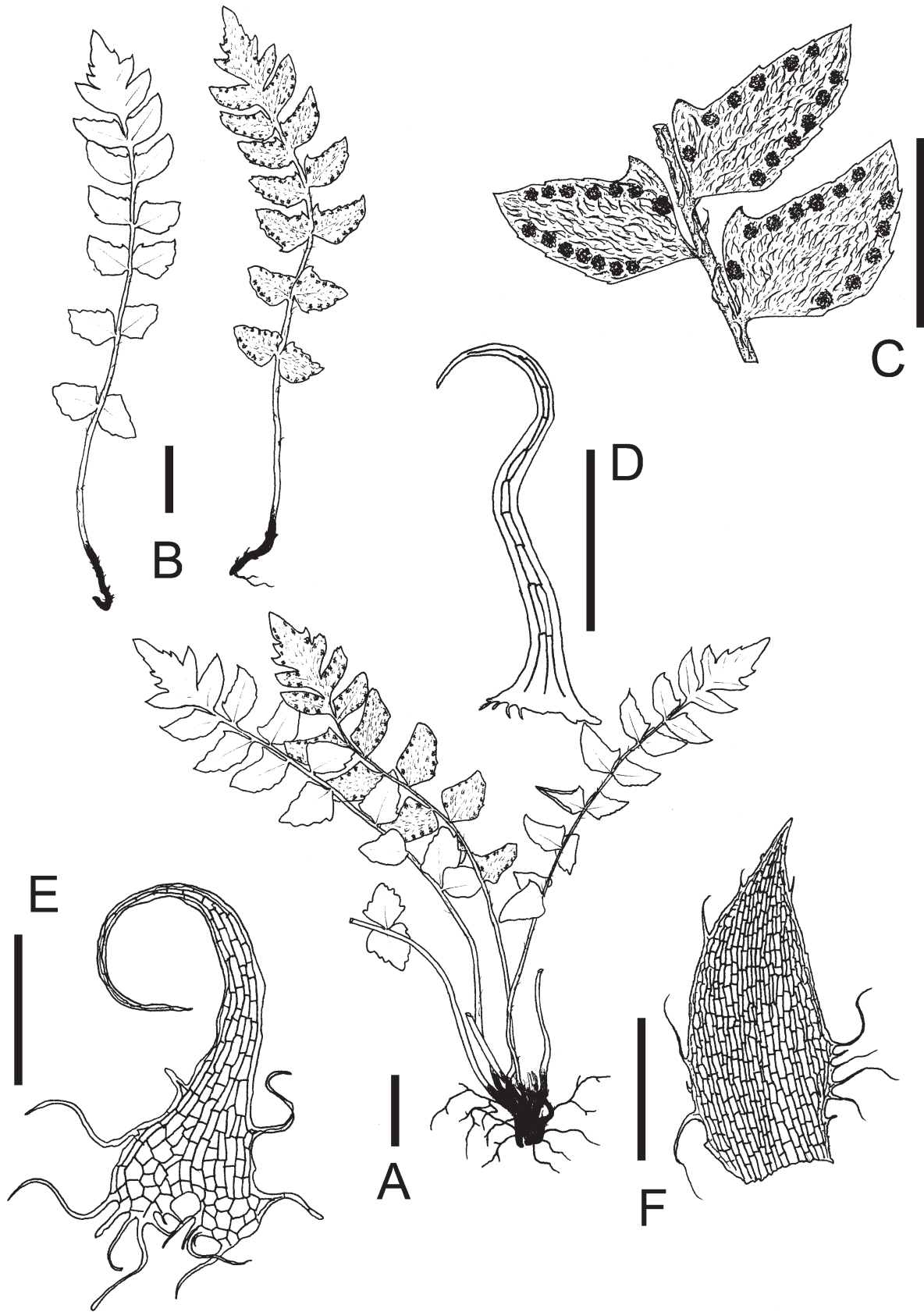
In July 2018, during a joint field trip for the investigation of a new wooden walk way in Horma Canyon, a species of fern with once-pinnate laminae was first photographed and collected. Anomalous in the context of Turkey's pteridophyte flora (Henderson 1965, Davis 1988), the fern was determined as a species of *Polystichum* Roth (1800: 31; Dryopteridaceae). Among the eight native species of *Polystichum* in Europe, three are once-pinnate like the plants from Horma Canyon. Among these three, only one, *P. lonchitis* (Linnaeus 1753: 1088) Roth (1800: 71), is known from Turkey. Though *P. lonchitis* prefers circum-neutral to basic substrates like the Horma Canyon plants, the two are strikingly different. Unlike the Horma Canyon plants, *P. lonchitis* is strongly spinulose, has basal pinnae much more reduced relative to the medial pinnae, and has indusiate sori distributed over much of the abaxial pinna surface.

After the Horma Canyon plant was compared with those species of *Polystichum* distributed in Turkey (Henderson 1965, Davis 1988), it was realized that this species is new to Turkey. Detailed photographs and a specimen were then sent to the senior author LBZ. As a result of detailed studies, it was identified as a new member of the genus. We hereby describe it as *P. asiae-minoris*.

### Taxonomy

*Polystichum asiae-minoris* Tunçkol & Li Bing Zhang, *sp. nov.* (Figs. 1, 2).

**Type:**—TURKEY. Kastamonu: Küre Mountains National Parks, Horma Canyon, Limestone Bedrock, 41°38'04"N, 33°08'35"E, elev. 800 m, 20 July 2018, *B. Tunçkol T4500* (holotype CDBI!, isotypes ISTO-38328!).



**FIGURE 1.** *Polystichum asiae-minoris* Tunçkol & Li Bing Zhang.—A. Plant habit.—B. Leaf.—C. Pinnae.—D. Rachis scale.—E. Scale from middle of petiole.—F. Scale from base of petiole. A–F drawn by ZLL based on the holotype (Scale A, B, C=1 cm; D=0.5 mm; E & F=1 mm).



**FIGURE 2.** *Polystichum asiae-minoris* Tunçkol & Li Bing Zhang.—A. The canyon where the new species was discovered.—B–D. Habit in the field.—E. Lower portion of plant.—F. Upper portion of adaxial leaf surface.—G. Lower portion of adaxial leaf surface.—H, J, K. Portions of abaxial leaf surfaces.

**Diagnosis:**—*Polystichum asiae-minoris* is somewhat similar to *P. obliquum* (D. Don 1825: 3) T. Moore (1858: 87, 98) in having oblique-oblong pinnae and sharing same plant size, but the former has laminae oblanceolate (vs. lanceolate in the latter), pinnae with broad-type microscales (vs. narrow-type microscales in the latter), sori closer to pinna margins (vs. medial in the latter), basal petioles blackish (vs. brown or stramineous in the latter).

Plants perennial, evergreen, (18–)12–18(–20) cm tall. Rhizomes ascending, ca. 2 cm long, ca. 1.5 cm diam., with remnant bases of old petioles; roots dull brown when dried, up to 10 cm long, ca. 0.5 mm diam. Leaves in tufts; petioles 4–7 cm long, ca. 1.2 mm diam., basal portions covered with scales; proximal petiole scales ovate to ovate-lanceolate, 1.4–3.6 × 0.9–1.8 mm, papery, dull brown, margins fimbriate, apex acuminate; distal petiole scales ovate-lanceolate, 2.2–3 × 0.5–1 mm, membranous, margins weakly fimbriate and fimbriae narrow- to broad-based, apex long-acuminate or caudate. Laminae oblanceolate, 1–pinnate, (4–)7–12 cm, apex acuminate; rachises ca. 0.9 mm diam., brown, adaxially sulcate; rachis scales of two types, the first ovate or ovate-lanceolate, light brown, up to 1.5 mm long including tip, 0.5 mm wide at base, margins with irregular outgrowths, fimbriate, apex long-caudate; the second bristle-like, ca 1 mm long, margins entire and fimbriate at base. Pinnae in 5–8 pairs, alternate, auriculate, separate from each other, 2–13 mm apart, oblique-oblong, papery, base cuneiform, largest pairs 1.2–1.6 × 0.4–0.6 cm, above center of lamina, basal pinnae progressively narrower, basal pair reflexed; proximal margins not overlapping rachis, basiscopic margins cartilaginous and shallowly toothed, acroscopic margins nearly entire and forming a (60–)90–110° angle with rachis, apex acute; basal pinnae with undulate or entire margins and obtuse apex; pinna petioles 0.5–1 mm long; adaxially glabrous; abaxially with dense microscales; microscales broad-type, ovate or ovate-lanceolate, or lanceolate, whitish brown, 0.5–1(–1.5) mm long, 0.15–1.5 mm wide at base, margins subentire; costa sunken abaxially and protruding adaxially, veins obscure and invisible both sides, lateral veins free, forked. All pinnae fertile; sori terminal on lateral veins of fertile pinnae, 0.8–1.2 mm diam., submarginal (centers of sori 1–1.5 mm from pinna margins, 0.7–3.5 mm from midrib), 2–6 on acroscopic side and 6–8 on distal basiscopic side, centers 1–1.5 mm apart from one another; indusia absent.

**Geographical distribution:**—*Polystichum asiae-minoris* is known only from Horma Canyon in Küre Mountains National Park, in north-central Turkey.

**Habitat:**—The new species was observed to be epilithic on limestone bedrock, in humid and shady conditions.

**IUCN Red List category:**—The new species is only known from its type locality. There were only ca. 110 individuals observed in the field. This area is one of the 100 Forest Hotspots of Europe that should be protected and it is also one of the nine hotspots of Turkey. Yet, with the new wooden walkway in the Canyon opened up for tourism, the status of the new species should be Critically Endangered (CR) category based on current information and following IUCN (IUCN Standards and Petitions Subcommittee 2017).

**Etymology:**—From the Latin, *asiae-minoris*, Asia Minor, referring to its geographical origin.

**Vernacular name:**—Kanyon Eðreltisi.

## Discussion

Morphologically, *Polystichum asiae-minoris* is somewhat similar to *P. obliquum* from the Himalayan region by the shape of pinnae, but the new species is unique within the entire *P.* subg. *Haplopolystichum* in having a combination of broad-type microscales and oblique-oblong pinnae.

In a world context, the Horma Canyon plants are morphologically and ecologically similar to two *Polystichum* lineages, the East Asian *P.* subg. *Haplopolystichum* (Tagawa) Li Bing Zhang (in Zhang & Barrington 2013a: 675) and the Antillean once-pinnate lineage (Mickel 1997). Both comprise small, epilithic, once-pinnate species and include exindusiate taxa. These two species groups are unrelated phylogenetically (McHenry & Barrington, 2014, Le Péchon *et al.* 2016). *Polystichum asiae-minoris* can even be related to the Asian genus *Cyrtomium* C. Presl (1836: 86) or the American genus *Phanerophlebia* C. Presl (1836: 84). Notably, both *Cyrtomium* and *Phanerophlebia* have members of once-pinnate, epilithic, exindusiate species (Yatskievych 1996, Zhang & Barrington 2013b). We can not exclude an independent adaptation of *P. asiae-minoris* to calcareous bedrock. Right now it is unclear to which taxon *P. asiae-minoris* is phylogenetically sister and how divergent *P. asiae-minoris* and its sister are at molecular level. No matter which lineage *P. asiae-minoris* is related to, the discovery of this new species in Turkey is biogeographically significant.

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