



NOTA

New records for the fern flora (Polypodiopsida) in Yungas from Tucumán, Argentina

Nuevas citas para la flora de helechos (Polypodiopsida) en las Yungas de Tucumán, Argentina

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ABSTRACT

Didymoglossum krausii (Hymenophyllaceae), *Amauropelta jujuyensis* and *Amauropelta nubicola* (Thelypteridaceae) are recorded for the first time in Tucumán, Argentina, in Yungas biogeographic province. This is the southernmost record of the three taxa. An updated description is provided, along with pictures, and characteristic of the habitats of the species in Tucumán.

Palabras clave — *Amauropelta*; *Didymoglossum*; ferns; Hymenophyllaceae; Thelypteridaceae; Tucumán.

RESUMEN

Se cita a *Didymoglossum krausii* (Hymenophyllaceae), *Amauropelta jujuyensis* y *Amauropelta nubicola* (Thelypteridaceae) por primera vez para Tucumán, Argentina, en la provincia biogeográfica de las Yungas. Este constituye el registro más austral de los tres taxones. Se proporciona una descripción actualizada, junto con fotografías, y características de los hábitats de las especies en Tucumán.

Keywords — *Amauropelta*; *Didymoglossum*; helechos; Hymenophyllaceae; Thelypteridaceae; Tucumán.

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INTRODUCTION

The Subtropical Andean Yungas, known locally as Southern Austral Yungas, is one of the global biodiversity hotspots extending from the department of Santa Cruz in Bolivia to the province of Catamarca in north-western Argentina (Arana *et al.*, 2021). This biogeographic province which is characterized by being a cloudy forest, product of the orography of the Andes, is considered as a conservation priority at global and regional scales due to their high levels of species richness and endemism (Brown, 2009), as well as their crucial role in the connectivity among different South America biogeographical areas (Arana *et al.*, 2021). However, in Argentina the Yungas has already lost more than 31% of its original extent as a consequence of an intense anthropogenic disturbance associated with oil exploitation, extensive ranching, and agricultural and urban expansion (Malizia *et al.*, 2012).

Ferns, which comprise c.12000 species, are the most conspicuous spore-bearing land plants (PPG I, 2016). They have evolved remarkable adaptations to extreme environments, from tropical to cold temperate regions, from lowland to alpine zones and from xeric to aquatic conditions (Ponce & Arana, 2016). Ferns are considered important ecological indicators because they are susceptible to environmental changes (Sharpe *et al.*, 2010). Ferns of montane forests are possibly one of the botanical groups that are most susceptible to fragmentation and edge effect processes (Silva *et al.*, 2018). So, knowing the diversity composition of fern flora, especially in the high threatened cloud forest as Yungas, is fundamental for detecting forest changes and loss of environmental quality.

Based on the observation of live plants during fieldworks occurring in Tucumán during the years 2022 and 2023, we registered three species of ferns (Polypodiopsida) belonging to families Hymenophyllaceae and Thelypteridaceae, as new records for the Tucumán flora. Thus, arises as the aim of this work to extend the distribution of *Didymoglossum krausii* (Hooker & Greville) C. Presl (Hymenophyllaceae), *Amauropelta jujuyensis* (de la Sota) Salino & T.E. Almeida and *Amauropelta nubicola* (de la Sota) Salino & T.E. Almeida (Thelypteridaceae) to Tucumán province. The recordings presented herein, not only contribute to the description of the composition of Tucumán fern flora, but also extend the southern limit of known distribution of these species in Yungas biogeographic province, being this, its southernmost recording on the continent.

METHODS

Field campaigns in the localities of Cochuna and Quebrada de los Sosa, at the banks of river basins flowing through the Yungas at Nevados del Aconquija (province of Tucumán) led to the discovery of populations of *Didymoglossum krausii* (Hymenophyllaceae), *Amauropelta jujuyensis* and *Amauropelta nubicola* (Thelypteridaceae) not registered previously in the area. *Didymoglossum krausii* were collected at the banks of Cochuna river (27°20'22"S & 65°53'44"W), Chicligasta Department and at "Quebrada de los Sosa" (27°05'09"S & 65°36'46"W), Monteros Department; whereas those of *Amauropelta jujuyensis* and *A. nubicola* and were collected only at "Quebrada de los

Sosa". Additionally, specimens belonging to the taxa housed in the following herbaria were analysed: LIL, LP, RCVC and SI (acronyms follow Thiers, 2023). The voucher specimens were deposited in LIL and RCVC. Specialized literature was used to confirm identity of the species and determine its geographic distribution, particularly in Argentina (Arana *et al.*, 2015; Larsen & Ponce, 2016; Ponce, 1987, 1998, 2016). Additional data were obtained from Flora del Cono Sur (<http://www2.darwin.edu.ar/Proyectos/FloraArgentina/>) database.

RESULTS AND DISCUSSION

Didymoglossum krausii (Hooker & Greville) C. Presl,
Abh. Böhm. Ges. Wiss. 5: 115. 1843. *Trichomanes krausii* Hook. & Grev., Icon.
Filic.: tab. 149. 1831. Type: Dominica. Without locality, 1827,
G. Kraus s.n. (holotype E 00205305!) (Fig. 1)

Epiphytic, *rhizomes* long creeping, densely covered with blackish hairs. *Fronde*s remote, sessile or shortly petiolate, 2-8 cm long; *petioles* 0.5-1.4 cm long, with the base covered by the same hairs as the rhizome, sometimes hairy along their entire length; *laminae* elliptic in outline, ovate or obovate, 1-2-pinnatifid, 2-3 × 1-1.6 cm; *rachises* well differentiated, often with dark hairs on the abaxial side, at least near the base; simple and bifid hairs on the leaf margin, stellate on the leaf sinuses or on the teeth; *segments* narrow; sparse false veins close or subparallel to the margin. *Sori* terminal on the segments of the apical part of the lamina, one to several per lamina, partially or deeply immersed in it, winged; *indusia* conical, bilabiate, with lips wider than the tube, with dark margins; *receptacle* exert (Fig. 1C).

Selected specimens revised.— ARGENTINA. Prov. Tucumán, Dpto. Chicligasta, Río Cochuna, 10-VIII-2022, *Arana s.n.* (RCVC). Dpto. Monteros, Río Los Sosa, 28-III-2023, *Romagnoli s.n.* (LIL).

Distribution and habitat.— Neotropical species found from USA (Florida), Central America (Mexico, Costa Rica), to Brazil, and Argentina. In the last country is located in the provinces of Misiones and Salta (Larsen & Ponce, 2016) inhabiting the natural environments of Yungas, and Paraná forests, and now is registered for Tucumán province. The specimens studied here were collected at 850 m a.s.l. (Cochuna river) and at 1065 m a.s.l. (Los Sosa river) inhabiting shady stream banks. These populations consisted of many individuals grouped and scattered in shadow humid places growing as epiphyte on trunks of *Allophylus edulis* (A. St.-Hil., A. Juss. & Cambess.) Hieron. ex Niederl. (Sapindaceae) (Fig. 1A, B). The species is accompanied by scattered specimens of the epiphyte fern *Asplenium erosum* L. var. *erosum* (Aspleniaceae), and the terrestrial ferns *Cystopteris diaphana* (Bory) Blasdell (Cystopteridaceae), *Diplazium lilloi* (Hicken) R.M. Tryon & A.F. Tryon (Athyriaceae), *Pteris deflexa* Link (Pteridaceae), *Equisetum bogotense* Kunth (Equisetaceae) and *Pleopeltis tweediana* (Hook.) A.R. Sm. (Polypodiaceae).

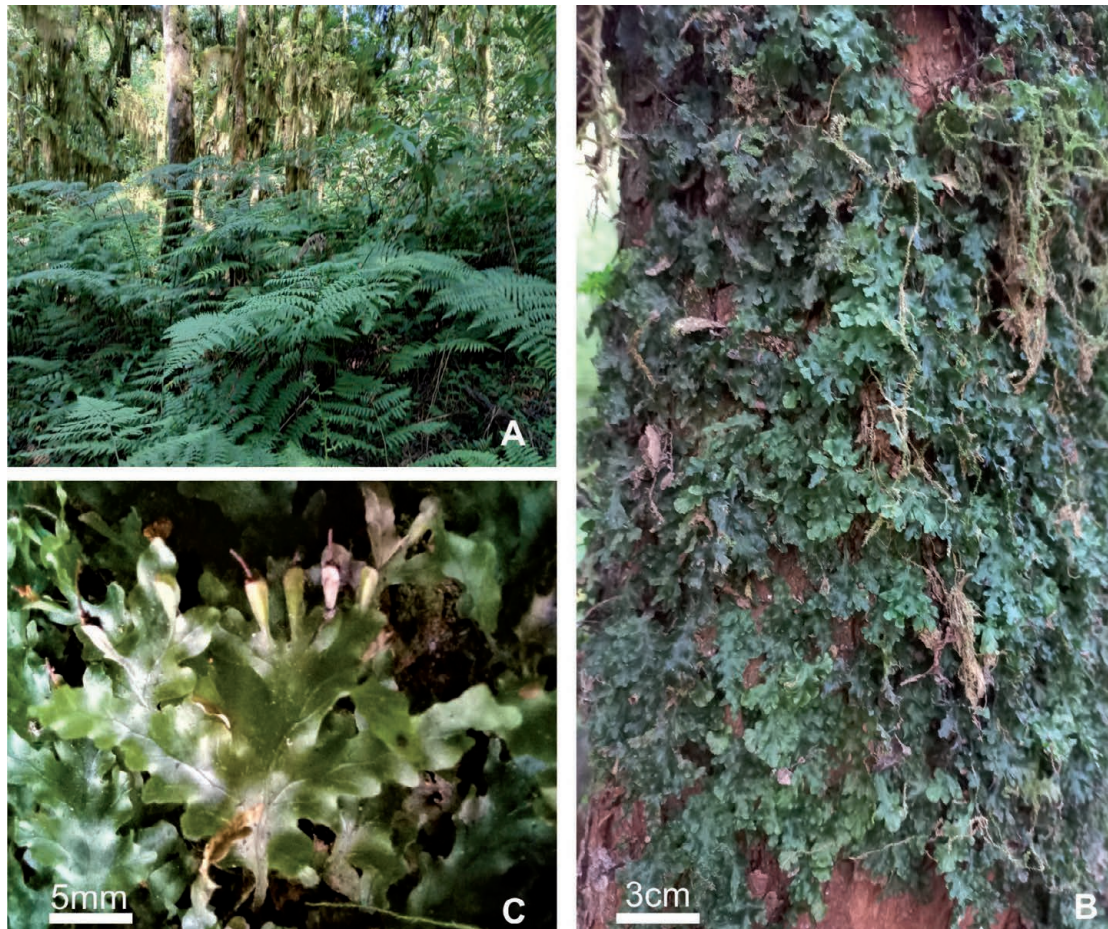


Fig. 1. *Didymoglossum krausii*. A) The riparian environment of the Cochuna River. B) Epiphytic habitat of the species. C) Aspect of the sporophyte.

Fig. 1. *Didymoglossum krausii*. A) Ambiente ripario del río Cochuna. B) Hábitat epífita de la especie. C) Aspecto del esporofito.

This species is easily recognized from the other species of *Didymoglossum* inhabiting the province of Tucumán (Arana *et al.*, 2015; Larsen & Ponce, 2016) for the laminae pinnatifid to 2-pinnatifid (vs. laminae lobed to pinnatisect, sometimes flabelliform in *D. hymenoides* and *D. reptans*); and sori, which are partially or deeply immersed in laminar tissue, alate (vs. sori not immersed in laminar tissue, and not winged, or rarely with a very narrow wing at the base in the other two species).

Amauropelta jujuyensis (de la Sota) Salino & T.E. Almeida,
PhytoKeys 57: 25. 2015. *Thelypteris jujuyensis* de la Sota Darwiniana 18: 222.
1973. Type; Argentina. Jujuy. Ledesma: camino de Mesada de Las Colmenas
a Abra de Cañas, 1000-1700 m s.m., 17 Mar 1966, *de la Sota* 4412
(holotype, LP!) (Fig. 2)

Terrestrial; *rhizomes* erect or suberect, with scales brownish, ovate-lanceolate, glabrous. *Fronde* polystic, 0.60-1 (1.5) m long; *petioles* stramineous, 1/10-1/6 of the total length of the frond, 2-6 mm in diameter, glabrous, with faint, appressed scales at



Fig. 2. A) Los Sosa river riparian environment. B) Aspect of the sporophyte of *Amauropelta jujuyensis*. C) Abaxial surface of a pinna of *Amauropelta jujuyensis* with sori protected by reniform indusia. D) Aspect of the sporophyte of *Amauropelta nubicola*. E) Abaxial surface of a pinna of *Amauropelta nubicola* with exindusiated sori.

Fig. 2. A) Ambiente ripario del río Los Sosa. B) Aspecto del esporofito de *Amauropelta jujuyensis*. C) Superficie abaxial de una pinna de *Amauropelta jujuyensis* con soros protegidos por indusios reniformes. D) Aspecto del esporofito de *Amauropelta nubicola*. E) Superficie abaxial de una pinna de *Amauropelta nubicola* con los soros exindusitados.

the base; *laminae* elliptic in outline, 16-25(-30) cm wide, almost abrupt or gradually tapering at base, papyraceous; *rachis* stramineous, with simple, arching, antrorse hairs on upper side, glabrous on underside; *pinnae* triangular or linear-triangular, straight or curved, ascending, with acute or attenuate apices, 7-15 × 0.8-1.8 cm, the basal 3-4 pairs reduced, the smaller ones 0.8-1.5 cm long, costa with hairs similar to those of the rachis on the upper side and with piliform scales on the underside, with inconspicuous aerophores (Fig. 2B); *segments* linear-triangular, 3-4 mm wide, straight or oblique, with acute or obtuse apices, margin entire-undulate or subcrenulate, with 6-8 (-10) pairs of veins, with sparse simple hairs on the laminae, veins and margins on the adaxial side, often the acroscopic basal segments of the first pinnae larger and margin serrate. *Sori* round, medial or closer to the margin; indusia reniform, ciliate, rarely glabrous (Fig. 2C).

Selected specimens revised.— ARGENTINA. Prov. Tucumán, Dpto. Monteros, Río Los Sosa, 28-III-2023, *Arana s.n.* (RCVC), *Romagnoli s.n.* (LIL).

Distribution and habitat.— This species constitutes an endemism of Argentinean Yungas, growing in cloud forests along the banks of streams and waterfalls or very humid ravines. In Tucumán was found at the banks of a subsidiary stream of Los Sosa river, in Quebrada de los Sosa (1065 m a.s.l.) (Fig. 2A), growing with the native ferns *Cystopteris diaphana* (Cystopteridaceae), *Cranfillia caudata* (Baker) V. A. O. Dittrich & Gasper (Blechnaceae), *Mucura globulifera* (Poir.) L. A. Triana & Sundue (Dennstaedtiaceae), and the lycophyte *Selaginella novae-hollandiae* (Sw.) Spring (Selaginellaceae). This record constitutes the southernmost known limit of the species.

Amauropelta nubicola (de la Sota) Salino & T.E. Almeida,

PhytoKeys 57: 28. 2015. *Thelypteris nubicola* de la Sota, Darwiniana 18 (1-2): 225,

1973. Type: Argentina, Jujuy. Dr. Manuel Belgrano: El Cucho, Cerro Labrado,

Potrero de las Mulas, 11 Mar 1966, *E. R. de la Sota 4377*

(holotype, LP!; isotype, US 00066600!) (Fig. 2)

Terrestrial; *rhizomes* shortly creeping, 1.5-2 cm in diameter, scaly; rhizome scales brown, ovate, glabrous. *Fronde*s polystic, 0.80-1.5 m long; *petioles* stramineous with darkened base, 1/5- 1/4 of the total length of the frond, with sparse simple hairs; *laminae* elliptic in outline, 18-25 cm long, abruptly reduced at the base, papyraceous; *rachis* stramineous, with simple arching, antrorse hairs present in the dorsal ridge, abaxially glabrous; *pinnae* linear-lanceolate, 9-13 × 1.5-2 cm, acute, the basal 4-6(-7) pairs reduced, the smaller pinnae auriculiform, 0.5-1 cm long, costa adaxially with hairs similar to rachis, with inconspicuous aerophores (Fig. 2D); *segments* linear-triangular, straight or oblique, obtuse, 3.5-4.5 mm wide, with entire or crenulate margin and acroscopically lobed basal segments overlapping the rachis; on the lower pinnae these segments are larger than the following, with 6-10 pairs of veins, often furcate on the basal segments, with a few setiform hairs on the adaxial costa, laminae glabrous. *Sori* exindusiate, round, medial (Fig. 2E).

Selected specimens revised.— ARGENTINA. Prov. Tucumán, Dpto. Tañi del Valle, Río Los Sosa, 28-III-2023, *Arana s.n.* (RCVC), *Romagnoli s.n.* (LIL).

Distribution and habitat.— This species is endemics from Southern Yungas, in Bolivia and Argentina, where it found in very humid places above 1700 m a.s.l. In Tucumán, *A. nubicola* was found growing in the same places that *A. jujuyensis*.

The use of morphological characters, often subtle, to distinguish genera and to identify species have contributed to the reputation of the Thelypteridaceae and particularly *Amauropelta* as taxonomically complex (Fawcett *et al.*, 2021). The species delimitation in *Amauropelta* is complicated, probably due to recent diversification and hybridization events in this taxon (Almeida *et al.*, 2016). The genus *Amauropelta* comprises more than 200 species chiefly Neotropical in distribution, with 21 species growing in Argentina (Ponce, 2016). Among them, *A. jujuyensis* and *A. nubicola* are readily distinguishable for the presence/absence of indusia. Both species could be confused with *A. decurtata*, one of the common species in Yungas, but the indusia pilose with acicular hairs and sessile orange glandular hairs makes *A. decurtata* very distinguishable from *A. jujuyensis* and *A. nubicola*.

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