



New or otherwise interesting records of Pottiaceae (Bryophyta) for Peru

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Abstract

Barbulastrum linearifolium, *Husnotiella asperifolia*, *Leptodontium stellaticuspis*, *Mironia ehrenbergiana*, *Syntrichia ramosissima*, *S. robusta* and *Trichostomopsis challaensis* are reported for the first time from Peru, and *Bryoerythrophyllum recurvirostrum* is new for the Neotropics. In addition, the distribution of *Leptodontium proliferum* and *Tortula arequipensis* in this country is updated.

Key words: bryophytes, distribution, mosses, Neotropics, South America

Introduction

The tropical Andes are one of the great centers of biodiversity in the world, containing around 16% of the moss species that exist in the world (Churchill 2009). The Pottiaceae are the most diverse in this region with around 221 species and 44 genera, that occurs mainly in puna formation or inter-Andean valleys (Cano *et al.* 2020).

The first list of the Peruvian mosses was published by Soukup (1951) and later updated by Hegewald & Hegewald (1975). Menzel (1992) provided a preliminary checklist with 889 species and an overview of the status of moss exploration. Churchill *et al.* (2000) reported 113 species and 33 genera of Pottiaceae in their inventory of the mosses of the tropical Andean countries. Since then, numerous studies (e.g., Alonso *et al.* 2017; Cano *et al.* 2008a, 2010, 2015, 2019, 2024; Cano & Gallego 2008a; Cano & Jiménez 2016; Ellis *et al.* 2019; Gallego *et al.* 2011; Jiménez *et al.* 2012, 2015, 2018; Jiménez & Cano 2008a, b, 2019; Zander 2021, 2024) have contributed additional records and descriptions of new taxa, thereby increasing our knowledge of the diversity of Peruvian Pottiaceae.

Over the last two decades, the second, third and fourth authors have been engaged in studies of South American Pottiaceae (Cano 2003, Cano *et al.* 2011, Gallego *et al.* 2011, Cano & Jiménez 2012, Gallego & Cano 2021), as a part of their studies they carried out expeditions to northern, central and southern Peru (Gallego *et al.* 2006, Jiménez *et al.* 2015, Cano *et al.* 2019). Despite these efforts, some regions such as Apurímac, Ayacucho and Huancavelica are practically unexplored. For this reason, the first author is currently conducting field work in the central Andes of Peru, with the aim to increase the knowledge of the bryoflora, clarifying the range extensions of many species and other gaps in information about their habitat, morphological variability and associations with other mosses.

Material and methods

The specimens presented in this paper were collected by the first author during field trips to the Huancavelica region (Peru), at elevations mainly about 4800–5100 m, between June 2024 and January 2025. Additional material was incorporated from collections made by the second author in the Puno region in 2005, and by the second and third authors from other localities: Ancash and Lima region in 2013, and Cajamarca in 2009. Specimens were deposited at USM and MUB. They were studied with the typical anatomical and morphological methods applied for Pottiaceae (Zander 1993). Microscopic examinations were carried out, and measurements taken with a Leica EZ4 light stereoscope, a Leica-DM500 light microscope, while microphotographs were obtained with a Leica ICC50 camera mounted on the microscope. Specimens were examined in 2% potassium hydroxide.

Results

This study reports the occurrence of eight Pottiaceae species in Peru for the first time. Additionally, the known distribution of two previously recorded species has been updated. Information on taxonomy, distribution, habitat and illustration is provided for each taxon.

New records

Barbulastrum linearifolium (Müll.Hal.) M.J.Cano & J.A.Jiménez (2022: 927). Fig. 1

Taxonomic Note:—*Barbulastrum* M.J.Cano & J.A.Jiménez was proposed as a new genus within the Pottiaceae to accommodate *Pseudocrossidium linearifolium* (Müll.Hal.) J.A.Jiménez & M.J.Cano, based on molecular and morphologic evidence (Cano *et al.* 2022). This species is characterized by ligulate to lingulate leaves, sometimes constricted and with widely recurved margins, a costa with superficial ventral cells differentiated and two bands of stereids, and perichaetial leaves scarcely differentiated from the vegetative ones (Jiménez *et al.* 2009). *Barbulastrum linearifolium* is related to *Pseudocrossidium replicatum* (Taylor) R.H.Zander, but the latter differs by its strongly revolute margins and rectangular and yellowish basal paracostal cells. A detailed description and illustrations of this species are provided in Jiménez *et al.* (2009) as *Pseudocrossidium linearifolium*.

Distribution and habitat:—This species has been reported from the Tucumano-Boliviano, Chaco, and Chaco Serrano forests, as well as from dry inter-Andean valleys of Argentina, Bolivia, and Ecuador at elevations between 158–2150 m, typically on sandy or clayey soils (Jiménez *et al.* 2009, Jiménez *et al.* 2020). The Peruvian specimens were collected in dry forest formations on sandy soils between 1000–3000 m (Fig. 2E). It was associated with other xeromorphic species, such as *Aloina limbata* M.J.Cano, J.A.Jiménez & M.T.Gallego, *Husnotiella lainzii* (J.A.Jiménez & M.J.Cano) J.A.Jiménez & M.J.Cano or *Pseudocrossidium replicatum*.

Specimens examined:—PERU. Cajamarca: pr. Balsas, 1000 m, 06°51'01''S, 78°01'42''W, 18 June 2009, *M. J. Cano & J. A. Jiménez* 5169 (MUB 32900); pr. Chilete, 1080 m, 07°10'32''S, 78°49'40''W, 20 June 2009, *M. J. Cano & J. A. Jiménez* 5226 (MUB 32899, USM 247238); La Libertad: pr. Agallpampa, 3000 m, 07°57'57''S, 78°33'10''W, 30 June 2009, *M. J. Cano & J. A. Jiménez* 5385a (MUB 32901).

Bryoerythrophyllum recurvirostrum (Hedw.) P.C.Chen (1940: 5). Fig. 3

Taxonomic Note:—Previous reports of *Bryoerythrophyllum recurvirostrum* in the Neotropics correspond to *B. recurvirostrum* var. *aeneum* (Müll.Hal.) R.H.Zander (Menzel 1992), which is currently recognized at the species level as *B. aeneum* (Müll.Hal.) B.H.Allen. According to Zander (1978) and Allen (2002), *Bryoerythrophyllum recurvirostrum* is mainly recognized by its lanceolate leaves, apex widely acute, often dentate, and margins recurved from near the base to the apex. In agreement with Zander (1978) and Allen (2002), *Bryoerythrophyllum aeneum* is similar to *B. recurvirostrum* in most gametophyte characters, but it differs in its dioicous sexuality and the presence of rhizoidal tubers. In addition, Allen (2002) gave as differential characters between both taxa the presence of pluripapillose basal leaf cells in *B. aeneum* and walls of basal cells thicker than those of *B. recurvirostrum*. The Peruvian material studied has not the widely acute and dentate apex, but the rest of characters correspond to *B. recurvirostrum*. Descriptions and illustrations of these species are given by Zander (1978) and Allen (2002).

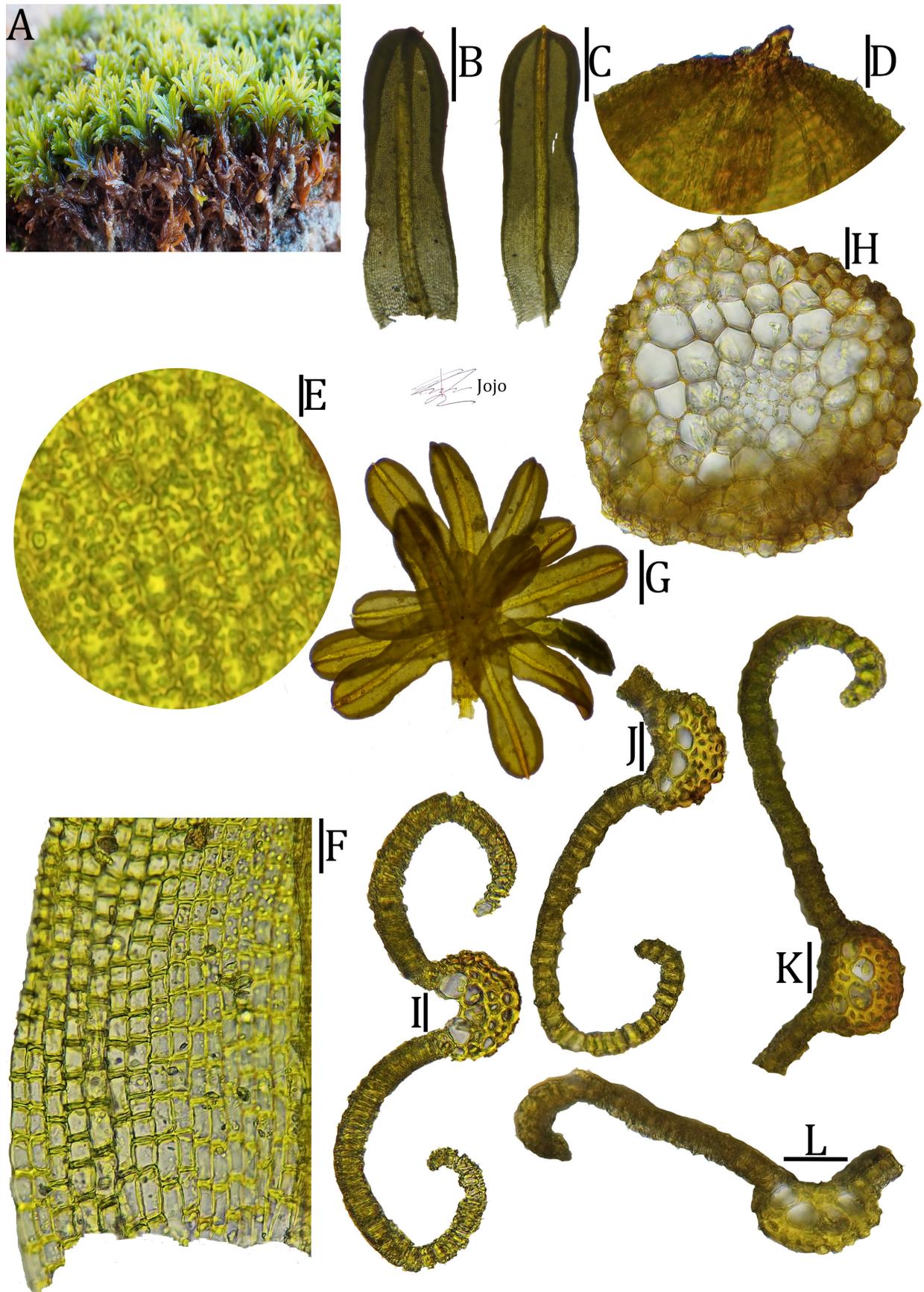


FIGURE 1. *Barbulastrum linearifolium*. A. Habit of plants in the field. B–C. Leaves. D. Apex of a leaf. E. Middle laminal cells. F. Basal cells. G. Habit, when wet. H. Transverse section of a stem. I–L. Transverse section of a leaf from the apex to the base. Scale bars: B–C = 0.25 mm. D = 27.5 μ m. E = 5 μ m. F = 20 μ m. G = 0.3 mm. H = 25 μ m. I = 20 μ m. J = 25 μ m. K–L = 27.5 μ m. All from *Cano & Jiménez 5226*. Photos: A by C. Aedo; B–L by J. Ramos D.

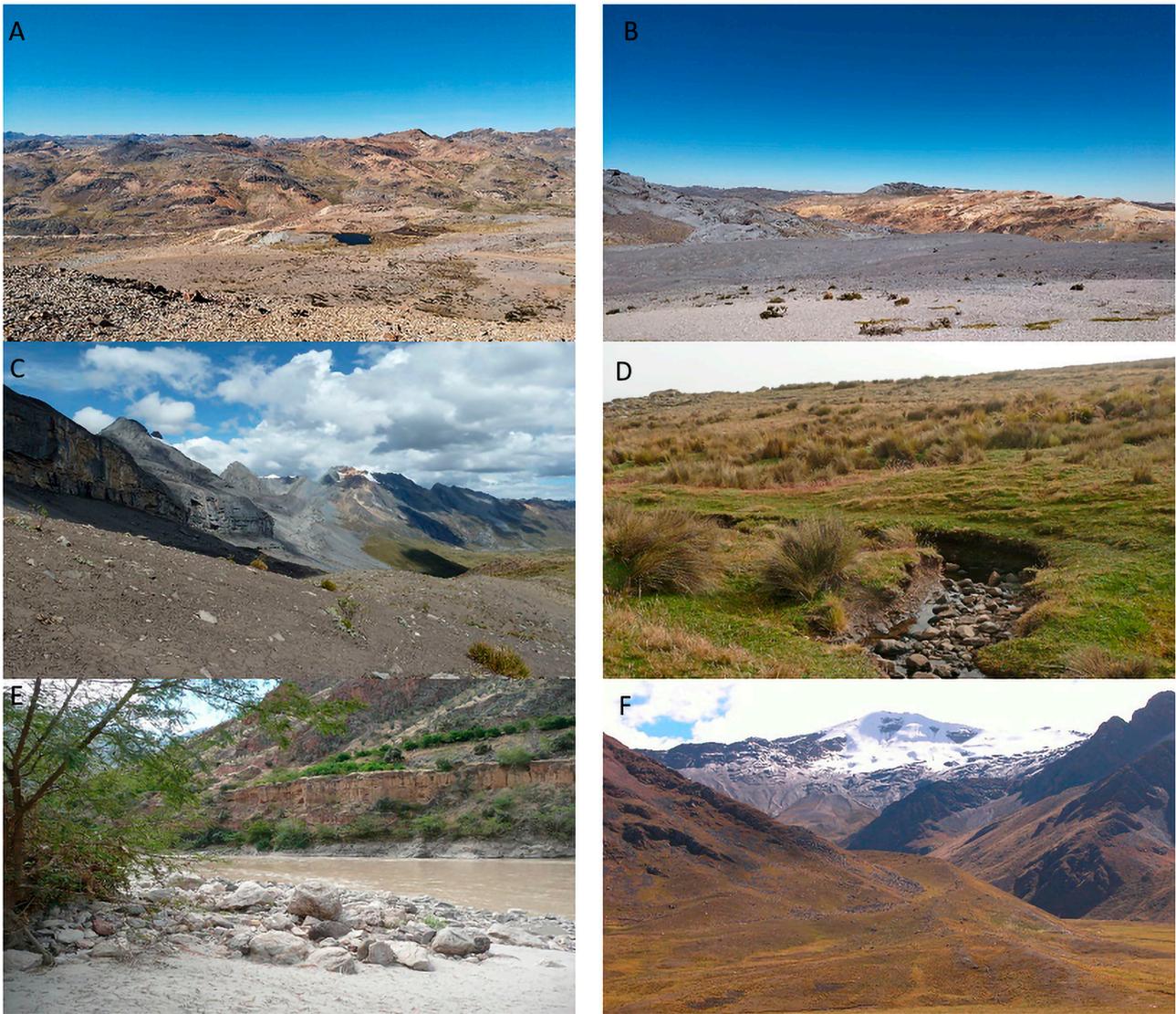


FIGURE 2. Localities visited along the Peruvian Andes. A. Abra Chonta, Huancavelica. B. Abra hacia Chinchá, Huancavelica. C. Abra Yanashalla, Ancash. D. Coris, Ancash. E. Balsas, Cajamarca. F. Abra la Raya, Puno. Photos: A–B. J. Ramos D; C–D J.A. Jiménez; E–F M.J. Cano.

Distribution and habitat:—*Bryoerythrophyllum recurvirostrum* is widely distributed across the Northern Hemisphere (Zander 1978, Allen 2002, Sollman 2015). In the Southern Hemisphere, however, it has been recorded only from a few regions, including southern Africa, subantarctic islands, Antarctica, Australia, and New Zealand. Apparently, it is rare in South America, where it is only known from Argentina (Matteri 2003). Huancavelica specimens were collected in dry and exposed slopes in periglacial area with sparse vegetation composed mainly of scattered patches or individuals of *Senecio nutans* Sch.Bip., *S. gamolepis* Cabrera, *Xenophyllum dactylophyllum* (Sch.Bip.) V.A.Funk and *Cinnagrostis* sp. between 4800–5100 m (Fig. 2A). It is growing with *Syntrichia ruralis* (Hedw.) F.Weber & D.Mohr, *Trichostomopsis australasiae* (Hook & Grev.) H.Rob and species mentioned in this paper. The specimens collected in Ancash (Fig. 2C–D), Lima and Pasco provinces grow in dry puna on rocks and taluses between 4490–4800 m. Here it is frequently associated with other species such as *Erythrophyllopsis andina* (Sull.) R.H.Zander and *Didymodon laevigatus* (Mitt.) R.H.Zander. This is the first record of this species in the Neotropics.

Specimens examined:—PERU. Ancash: Abra de Yanashalla, 4800 m, 09°51'35"S, 77°04'25"W, 25 May 2013, M. J. Cano, J. A. Jiménez & M. Alonso 7278 (MUB 48722); Abra Ucchuchacua, 4700 m, 10°36'24"S, 76°40'29"W, 31 May 2013, M. J. Cano, J. A. Jiménez & M. Alonso 7528, 7531 (MUB 49020, 49023); Cordillera Negra, pr. Coris, 4480 m, 09°37'11"S, 77°37'57"W, 17 May 2013, M. J. Cano, J. A. Jiménez & M. Alonso 6919b (MUB 48345); Huancavelica: Santa Ana District, Abra Chonta, 5061 m, 13°04'35.323"S, 75°03'38.574"W, 17 January 2025, J. Ramos D. 291 (MUB 65251, USM 356862); Santa Ana District, Abra Chonta, 5066 m, 13°04'34.344"S, 75°03'47.108"W,

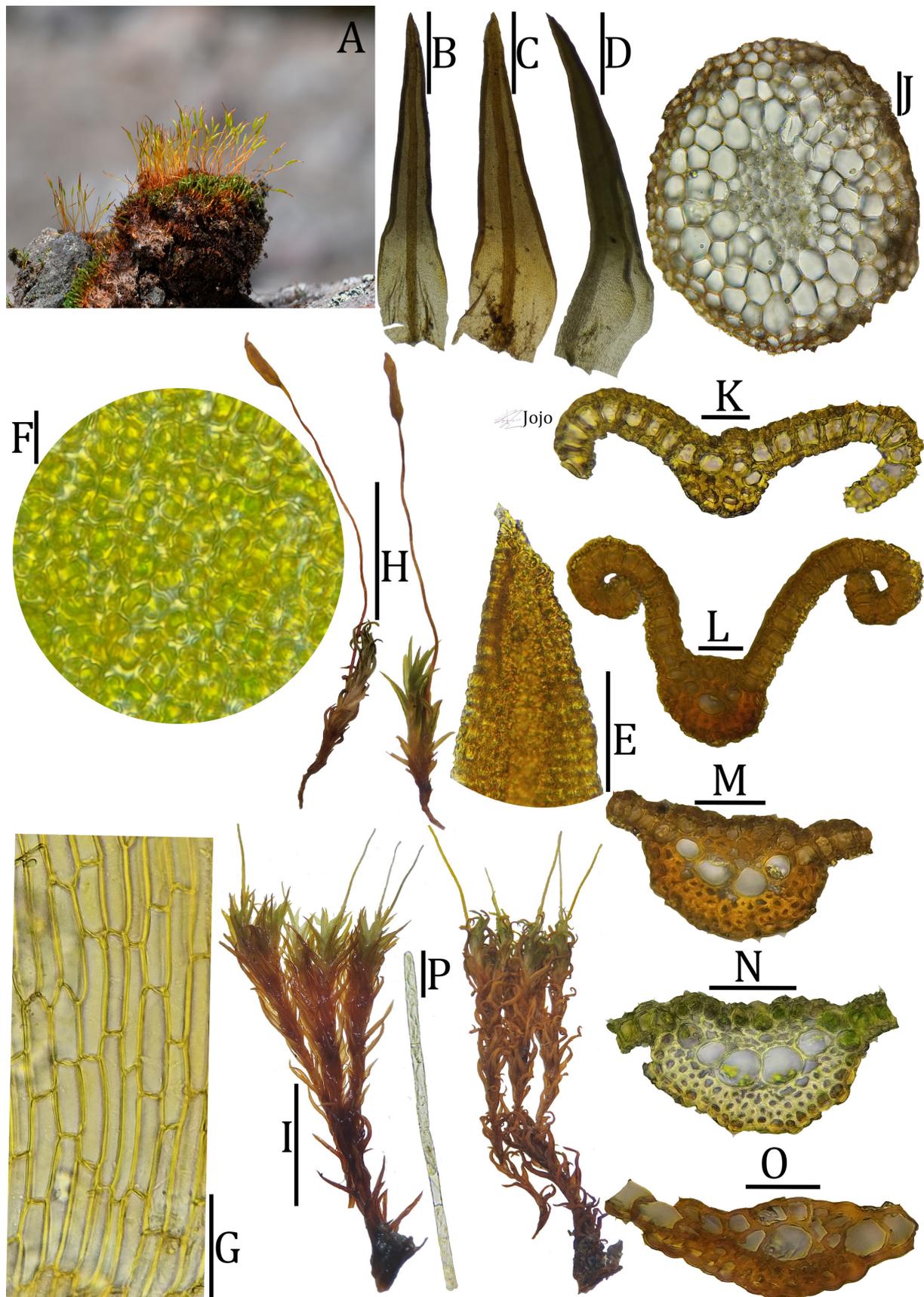


FIGURE 3. *Bryoerythrophyllum recurvirostrum*. A. Habit of plants in the field. B–D. Leaves. E. Apex of a leaf. F. Middle laminal cells. G. Basal cells. H. Habit, when dry. I. Habit, when wet. J. Transverse section of a stem. K–O. Transverse section of a leaf from the apex to the base. P. Axillary hair. Scale bars: B–D = 0.6 mm. E = 57.5 μ m. F = 7.5 μ m. G = 47.5 μ m. H–I = 4 mm. J = 40 μ m. K = 20 μ m. L = 25 μ m. M = 32.5 μ m. N–O = 35 μ m. P = 50 μ m. A, H, N (from *J. Ramos D. 291*); B–G, I–M, O, P (from *J. Ramos D. 292*). Photos: A by J. Roque; B–P by J. Ramos D.

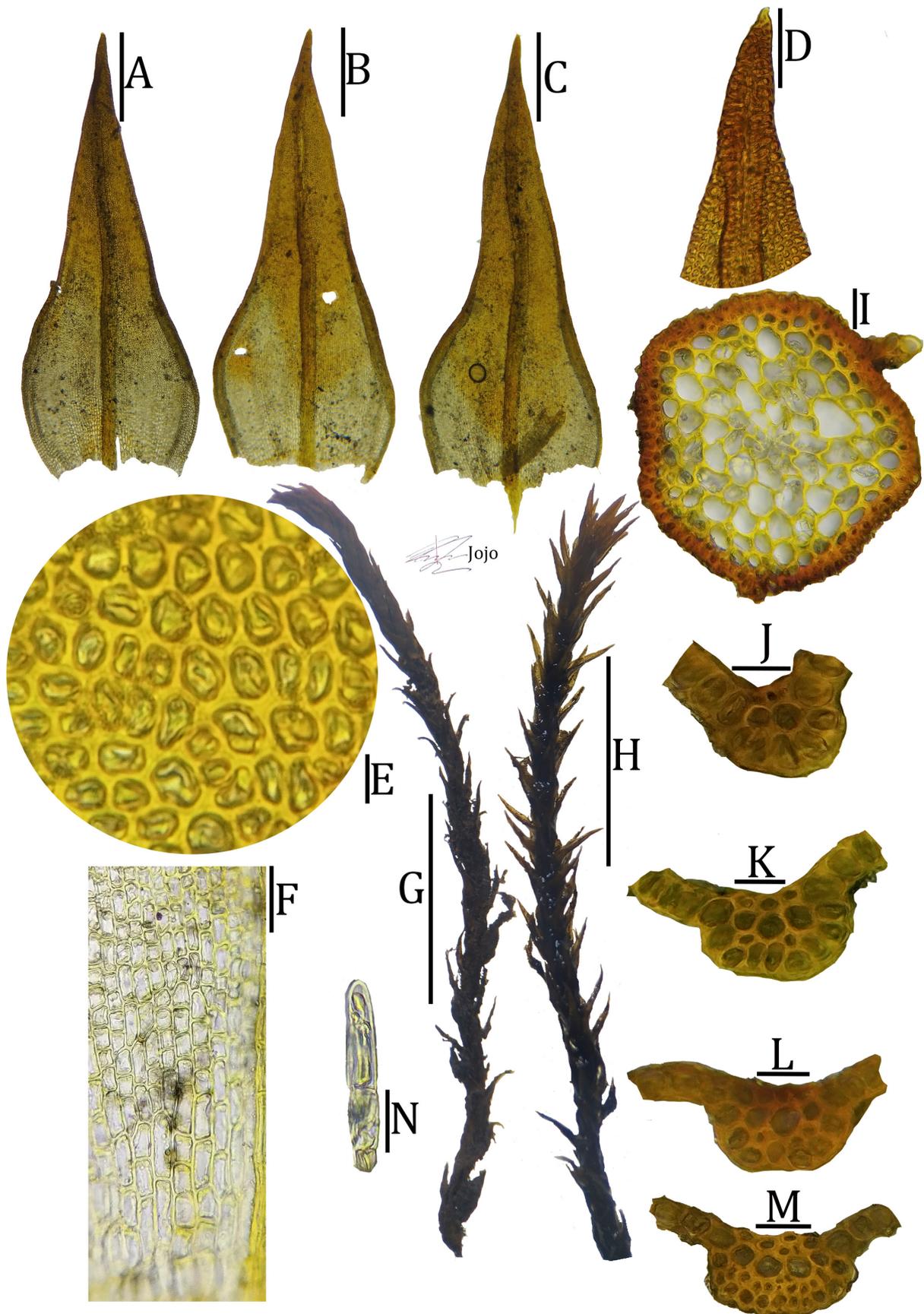


FIGURE 4. *Husnotiella asperifolia*. A–C. Leaves. D. Apex of a leaf. E. Middle laminal cells. F. Basal cells. G. Habit, when dry. H. Habit, when wet. I. Transverse section of a stem. J–M. Transverse section of a leaf from the apex to the base. N. Axillary hair. Scale bars: B–C = 0.30 mm. D = 67.5 μ m. E = 7.5 μ m. F = 32.5 μ m. G–H = 3 mm. I = 30 μ m. J–K = 15 μ m. L–M = 20 μ m. N = 20 μ m. All from *Cano & Jiménez 7279*. Photos: by J. Ramos D.

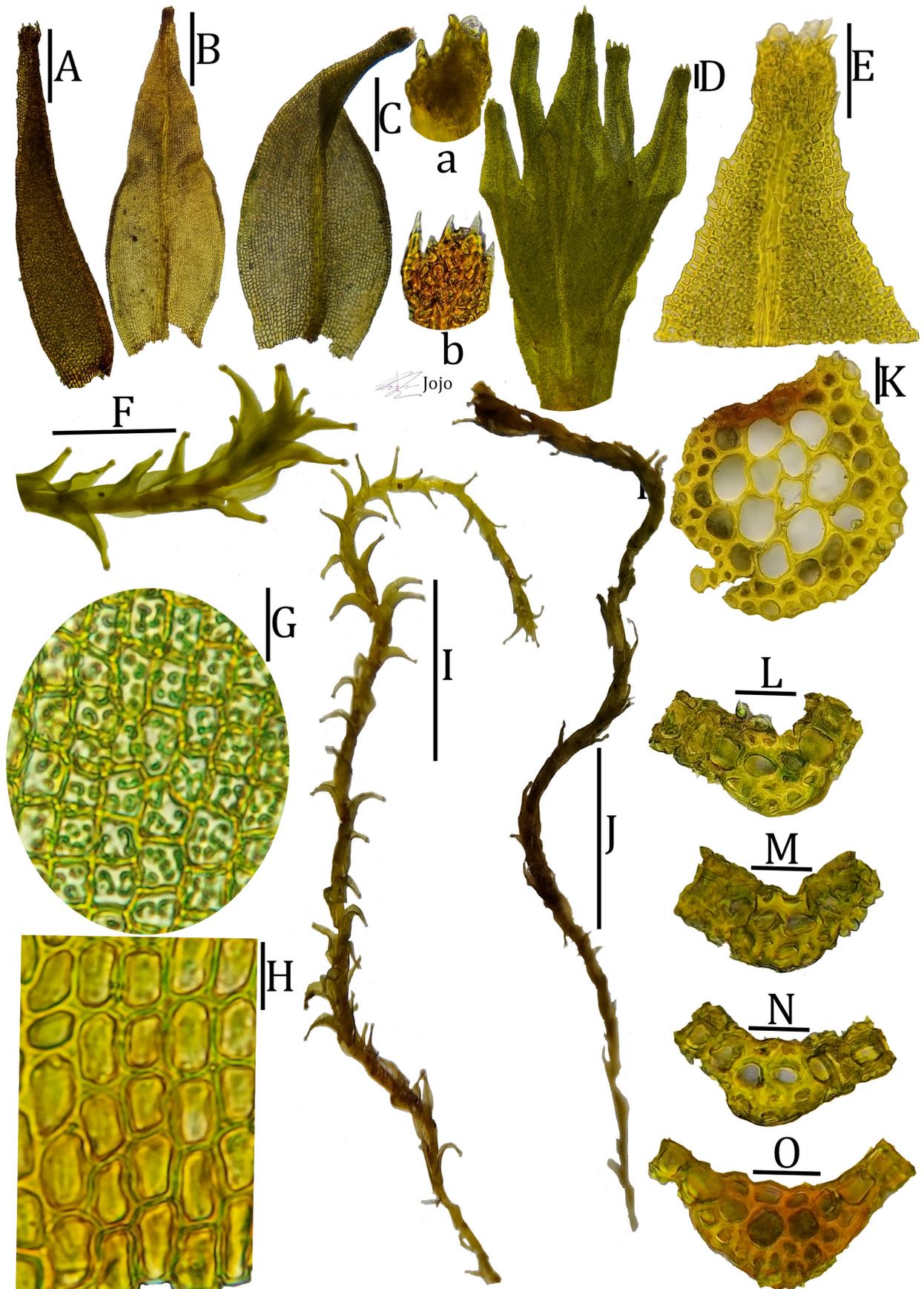


FIGURE 5. *Leptodontium stellaticuspis*. A–C. Leaves. D. Apical shoot (a. front view of gemma cup; b. lateral view of gemma cup). E. Leaf apex. F. Portion of the branch. G. Middle laminal cells. H. Basal cells. I. Habit, when wet. J. Habit, when dry. K. Transverse section of a stem. L–O. Transverse section of a leaf from the apex to the base. Scale bars: A–C = 0.2 mm. D–E = 50 μ m. F = 1 mm. G = 10 μ m. H = 12.5 μ m. I–J = 2 mm. K = 25 μ m. L–O = 17.5 μ m. All from *J. Ramos D. 42*. Photos: by J. Ramos D.

17 January 2025, *J. Ramos D.* 292 (MUB 65249, USM 356863); Lima: entre el Abra Uchchucacua y Oyón, 4490 m, 10°36'16"S, 76°41'36"W, 31 May 2013, *M. J. Cano, J. A. Jiménez & M. Alonso* 7576d (MUB 49072).

Husnotiella asperifolia (Mitt.) J.A.Jiménez & M.J.Cano (2022: 298). Fig. 4

Taxonomic Note:—This species was recently transferred from *Didymodon* Hedw. to *Husnotiella* Cardot based on molecular evidence (Jiménez *et al.* 2022). It is characterized by its keeled, recurved and squarrose leaves when moist, natural reddish color of the plants and leaf lamina with KOH, the lack a cauline central strand, and long-rectangular basal cells forming a differentiated area (Jiménez *et al.* 2005, Jiménez 2006). Complete descriptions, illustrations and keys to the determination of this species are provided by Jiménez *et al.* (2005) and Jiménez (2006) as *Didymodon asperifolius* (Mitt.) H.A.Crum, Steere & L.E.Anderson.

Distribution and habitat:—*Husnotiella asperifolia* is essentially a panholarctic, highly disjunct species with an Arctic-alpine distribution (Jiménez 2006). Outside the Holarctic, the species has so far only been reported from two localities in tropical Africa (Ellis *et al.* 2020) and two others in Bolivia (Cano *et al.* 2008b), where it always occurs above 4000 m. The Peruvian specimen was collected in high and dry puna formation on calcareous rocks (Fig. 2C). It was associated with other species such as *Didymodon laevigatus*, *Trichostomopsis australasiae*, and *Syntrichia andicola* (Mont.) Ochyra. This new record of *H. asperifolia* extends its known range in South America.

Specimens examined:—PERU. Ancash: Abra de Yanashalla, 4800 m, 09°51'35"S, 77°04'25"W, 25 May 2013, *M. J. Cano, J. A. Jiménez & M. Alonso* 7279 (MUB 48723, USM 358795).

Leptodontium stellaticuspis E.B.Bartram (1955: 55). Fig. 5

Taxonomic Note:—*Leptodontium stellaticuspis* is easily distinguished by its apical toothed cup formed terminally on a leaf. According to Zander (1972), this species is the only moss known to exhibit this feature. Other differences from related species, such as *L. flexifolium* (Dicks.) Hampe ex Lindb. and *L. proliferum* Herzog, include their filiform habit and generally simple stems. In addition, propagules of *L. proliferum* are borne on the excurrent part of the costa, whereas those of the *L. flexifolium* occur on short branching stalks at the base of the stem. Recently Zander (2017) proposed *Microleptodontium stellaticuspis* (E.B.Bartram) R.H.Zander as an alternative name for this species, which has been used only in a few publications so far (Aponte-Rojas *et al.* 2022, Ellis *et al.* 2023). Description and illustration of this species are given by Zander (1972).

Distribution and habitat:—*Leptodontium stellaticuspis* is known from Ecuador (Zander 1972, 2017), Venezuela (Griffin 1975) and Colombia (Churchill 1989); its range now extends to central Peruvian Andes. Until 2017, its distribution was considered restricted to the Andes in South America. However, it is no longer regarded as an Andean endemic species, as it has also been recorded from the Kerguelen Islands (Ellis *et al.* 2018). In the Huancavelica region it was found on soil and rocks between 4700–4900 m, in dry puna formations associated with *Syntrichia ruralis*, *Bryum argenteum* Hedw., *Zygodon pichinchensis* (Taylor) Mitt and *Campylopus* sp. In the Lima region this species was found in bofedal formation on grass-based soils, where it grows mixed with *Syntrichia andicola*.

Specimens examined:—PERU. Huancavelica: Pilpichaca District, Abra Apacheta, 4821 m, 13°21'18.959"S, 74°44'10.575"W, 01 July 2024, *J. Ramos D.* 42 (MUB 65254, USM 356613); Ascensión District, Apu Citac, 4734 m, 12°49'46.205"S, 75°13'42.012"W, 17 July 2024, *J. Ramos D.* 153 (USM 356724); Lima: Cordillera Raura, base del pico Torre de Cristal, 4314 m, 10°29'19"S, 76°45'21"W, 30 May 2013, *M. J. Cano et al.* 7481b (MUB 48967, USM 358798).

Mironia ehrenbergiana (Müll.Hal.) R.H.Zander (1993: 112). Fig. 6

Taxonomic Note:—This species is mainly distinguished from other species of *Mironia* by its dentate upper leaf margins and intact leaf apices. The neotropical *Bryoerythrophyllum jamesonii* (Taylor) H.A.Crum could be confused with *M. ehrenbergiana* because both species share an overall appearance, size, and dentate leaf apices. However, *M. ehrenbergiana* can be differentiated by having bistratose upper leaf margins while in *B. jamesonii* the leaf margins are unistratose. A complete description and illustration of this species can be found in Allen (2002).

Distribution and habitat:—*Mironia ehrenbergiana* is a montane Neotropical species known from Mexico, Guatemala, Costa Rica, Bolivia, Colombia, Ecuador and Venezuela (Allen 2002, Churchill *et al.* 2000). In Ancash region, it was collected on soil in bofedal formation (high altitude peatland) (Fig. 2D) along with other species such as *Erythrophyllopsis andina* (Sull.) R.H.Zander, *Molendoa peruviana* (Sull.) M.J.Cano & J.A.Jiménez, and *Leptodontium*

tricolor (R.S.Williams) R.H.Zander. In Huancavelica region this species was collected in puna grassland on soil between 4700–4900 m, associated with *E. andina* and *Syntrichia ruralis*.

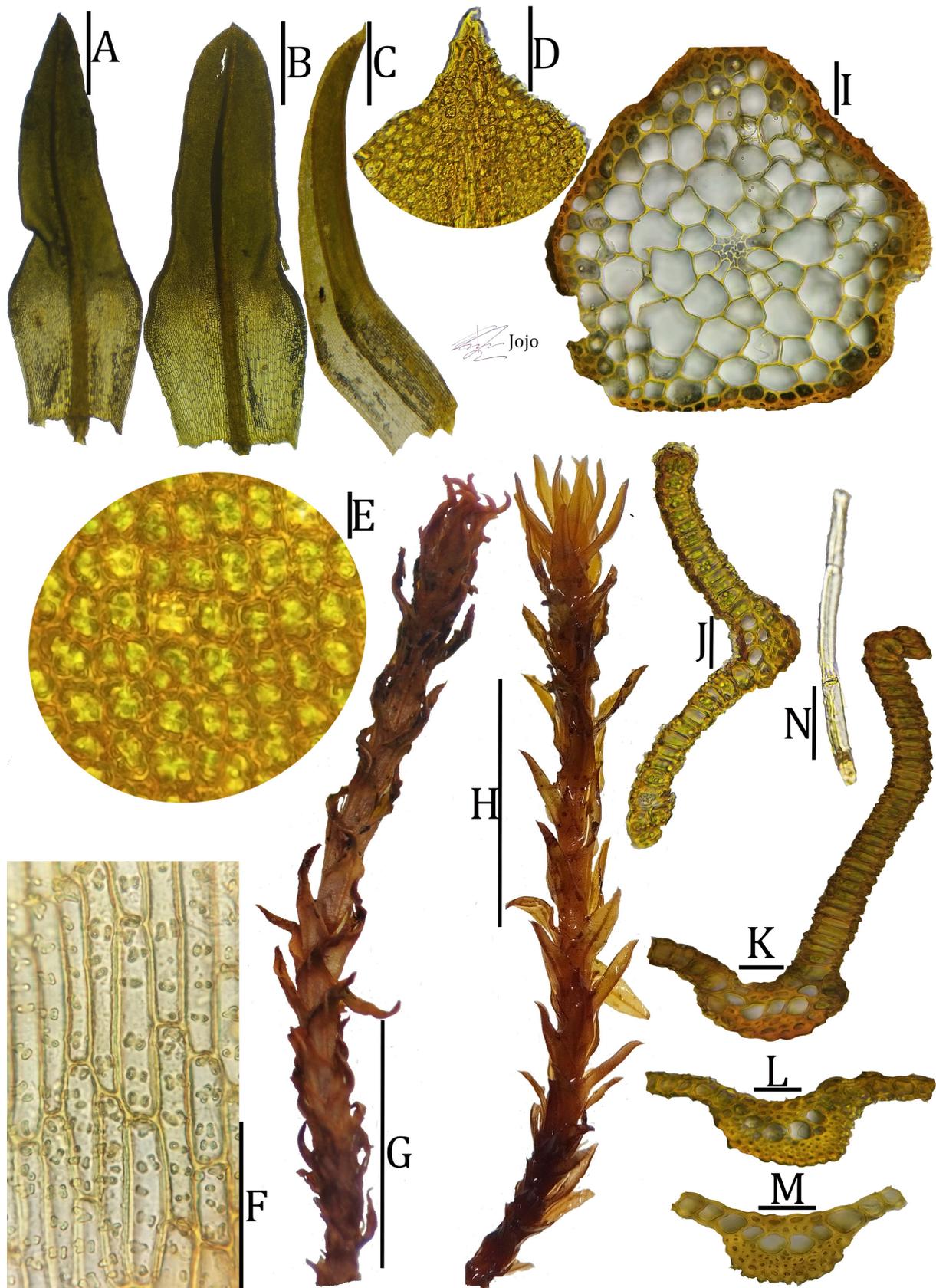


FIGURE 6. *Mironia ehrenbergiana*. A–C. Leaves. D. Leaf apex. E. Middle laminal cells. F. Basal cells. G. Habit, when dry. H. Habit, when wet. I. Transverse section of a stem. J–M. Transverse section of a leaf from the apex to the base. N. Axillary hair. Scale bars: A–C = 0.44 mm. D = 75 μ m. E = 10 μ m. F = 62.5 μ m. G–H = 4 mm. I = 37.5 μ m. J = 35 μ m. K = 25 μ m. L = 32.5 μ m. M = 37.5 μ m. N = 35 μ m. All from *J. Ramos D. 158a*. Photos: by J. Ramos D.

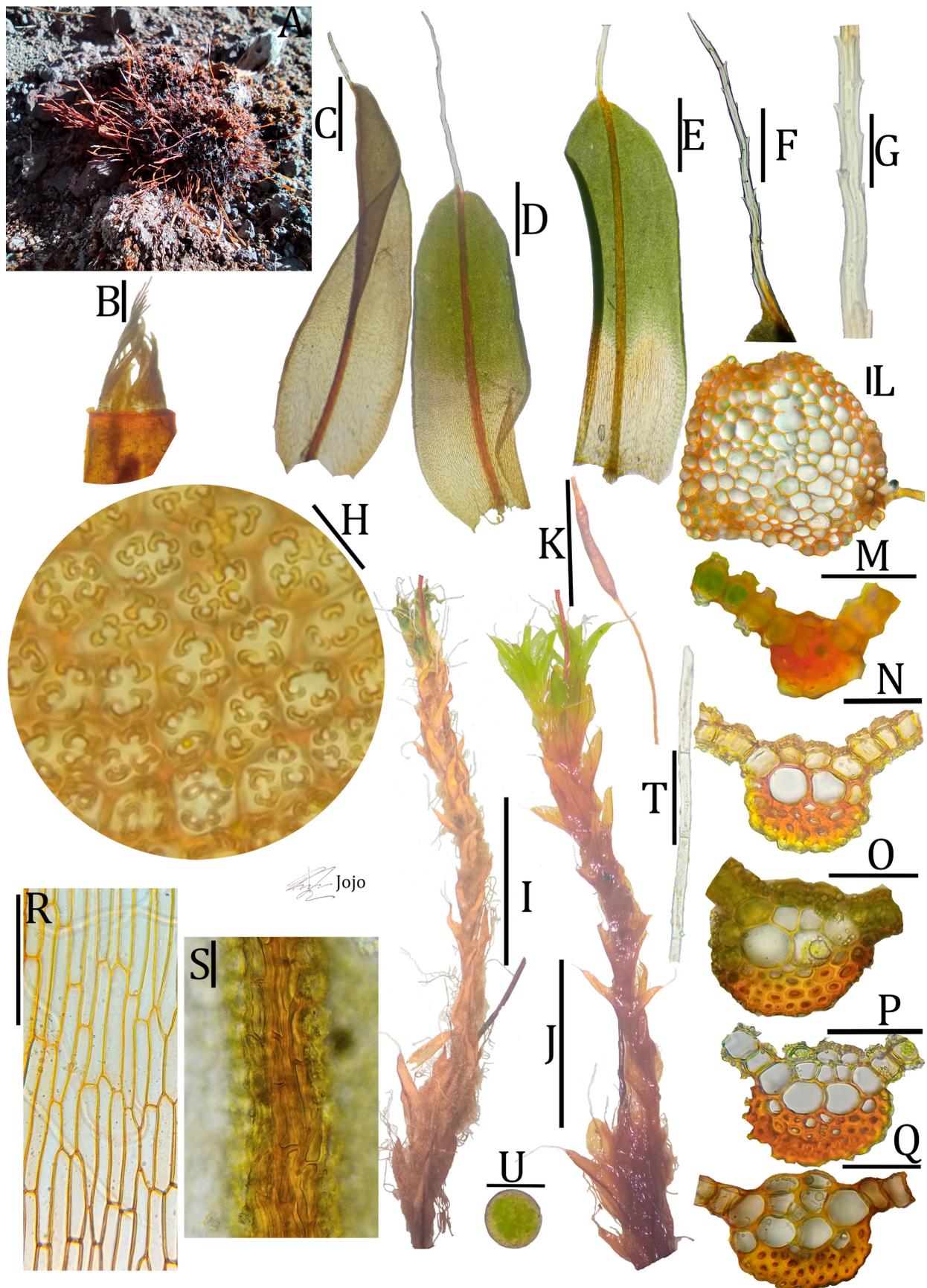


FIGURE 7. *Syntrichia ramosissima*. A. Habit of plant in the field. B. Peristome. C–E. Leaves. F. Leaf apex. G. Portion of hyaline hair point. H. Middle laminal cells. I. Habit, when dry. J. Habit, when wet. K. Sporophyte. L. Transverse section of a stem. M–Q. Transverse section of a leaf from the apex to the base. R. Basal cells. S. Dorsal surface of the costa. T. Axillary hair. U. Spore. Scale bars: B = 280 μm . C–E = 0.6 mm. F = 0.3 mm. G = 0.15 mm. H = 17.5 μm . I–J = 5 mm. K = 3.4 mm. L = 17.5 μm . M–N = 25 μm . O–Q = 50 μm . R = 95 μm . S = 25 μm . T = 30 μm . U = 15 μm . A, O, Q (from *Jorge Ramos D. 8*); B–N, P, R–U (from *J. Ramos D. 61*). Photos: by J. Ramos D.

Specimens examined:—PERU. Ancash: Cordillera Negra, pr. Coris, 4480 m, 09°37'11"S, 77°37'57"W, 17 May 2013, *M. J. Cano, J. A. Jiménez & M. Alonso 6926* (MUB 48352, USM 358793); Huancavelica: Ascensión District, Apu Citac, 4843 m, 12°49'16.638"S, 75°13'51.175"W, 17 July 2024, *J. Ramos D. 158a* (USM 358659).

Syntrichia ramosissima (Thér.) R.H.Zander (1993: 269). Fig. 7

Taxonomic Note:—According to Gallego & Cano (2009), *S. ramosissima* is distinguished by its repeatedly branched gametophyte, a dorsal costa surface that is smooth or weakly papillose in the upper third, and a short basal membrane of the peristome. It closely resembles *Syntrichia obtusissima* (Müll.Hal.) R.H.Zander, as both share similar middle laminal cell size, an excurrent costa forming a spinose hair-point, basal leaf margins recurved up to the upper third and leaves not constricted at the middle. However, *S. ramosissima* differs by having a much shorter basal membrane of the peristome (5–8 cell rows) compared to *S. obtusissima* (15–18 cell rows), which forms a conspicuous tube (Gallego & Cano 2009).

Distribution and habitat:—Apparently *Syntrichia ramosissima* is a very rare species, because it is only known from a few localities in Bolivia (Thériot 1929, Churchill *et al.* 2009). Its low representation in herbaria is possibly associated with its occurrences at high altitudes. In Huancavelica region these specimens occur on soil and rocks between 4800–5100 m, in areas with sparse vegetation composed mainly of scattered patches or individuals of *Senecio nutans*, *S. gamolepis*, *Xenophyllum dactylophyllum* and *Cinnagrostis* sp. (Fig. 2A–B). This species was also collected in high Andean relic forest on bark of *Polylepis flavipila* (Bitter) M.Kessler & Schmidt-Leb. at 4625 m. It is growing with *Bryum argenteum*, *Encalypta asperifolia* Mitt., *Erythrophyllopsis andina*, *Hennediella longirostris* (Hampe ex Müll.Hal.) R.H.Zander, *Leptodontium proliferum*, *Syntrichia ruralis* and *Trichostomopsis australasiae*.

Specimens examined:—PERU. Huancavelica: Huachocolpa District, Abra Huayraccasa, 4950 m, 13°04'34.176"S, 75°0'37.027"W, 28 June 2024, *J. Ramos D. 8* (MUB 65258, USM 356577); Santa Ana District, Abra Chonta, 5030 m, 13°05'5.544"S, 75°02'43.521"W, 29 June 2024, *J. Ramos D. 13* (USM 356582); Castrovirreyña District, Abra hacia Chíncha, 4892 m, 13°0'15.293"S, 75°20'45.624"W, 02 July 2024, *J. Ramos D. 61* (USM 356632); Huancavelica District, Apu Huamanrazu, 5009 m, 12°54'44.057"S, 75°02'59.935"W, 16 July 2024, *J. Ramos D. 135* (USM 356706); Pilpichaca District, CC. PP. Carhuancho, 4625 m, 13°18'8.556"S, 74°55'31.401"W, 22 October 2024, *J. Ramos D. 214* (USM 356785).

Syntrichia robusta (Thér.) R.H.Zander (1993: 269). Fig. 8

Taxonomic Note:—According to Lightowers (1985b), *Syntrichia robusta* is characterized by lanceolate leaves, costa percurrent, with dorsal surface smooth or weakly papillose and leaf margins dentate in the upper third. Gallego *et al.* (2009, 2011) provided additional diagnostic features, including a horn-shaped basal hyaline area, leaves usually bordered, with a cross-section of the costa that has 2–4 rows of guide cells, 1–3 rows of dorsal stereids and undeveloped hydroids. The Peruvian material examined lacks bordered leaves. Gallego *et al.* (2009) indicated that *Syntrichia robusta* is closely related to *Syntrichia serrulata* (Hook. & Grev.) M.J.Cano, as both species share several morphological characters, particularly in leaf shape and structure. However, *S. robusta* differs by having larger plants and laminal cells than *S. serrulata*. Descriptions and illustrations of this species are provided by Lightowers (1985a) and Zander (1993).

Distribution and habitat:—According to Gallego *et al.* (2011) *Syntrichia robusta* is known from subantarctic islands, New Zealand and South America (Bolivia, Chile, Argentina and Ecuador). The new record occurs growing on soil at 4800–5010 m on slopes with sparse vegetation mainly composed of scattered Poaceae, and associated with other mosses such as *Leptodontium flexifolium*, *Syntrichia ruralis* and *S. ramosissima*. This finding closes the distribution gap between Bolivia and Ecuador.

Specimen examined:—PERU. Huancavelica: Huancavelica District, Apu Huamanrazu, 5009 m, 12°54'44.057"S, 75°02'59.935"W, 16 July 2024, *J. Ramos D. 136a* (USM 358660).

Trichostomopsis challaensis (Broth.) R.H.Zander (2013: 93).

Taxonomic Note:—*Trichostomopsis challaensis* can be recognized by its lanceolate leaves that are crisped when dry, bistratose leaf lamina, cross-section of the costa with two stereids bands, and porose basal cells. It closely resembles *Trichostomopsis paramicola* (H.Rob.) R.H.Zander, as both share hyaline sheathing leaf bases and the bistratose leaf margins. However, *Trichostomopsis challaensis* differs by having a completely bistratose lamina above midleaf. This

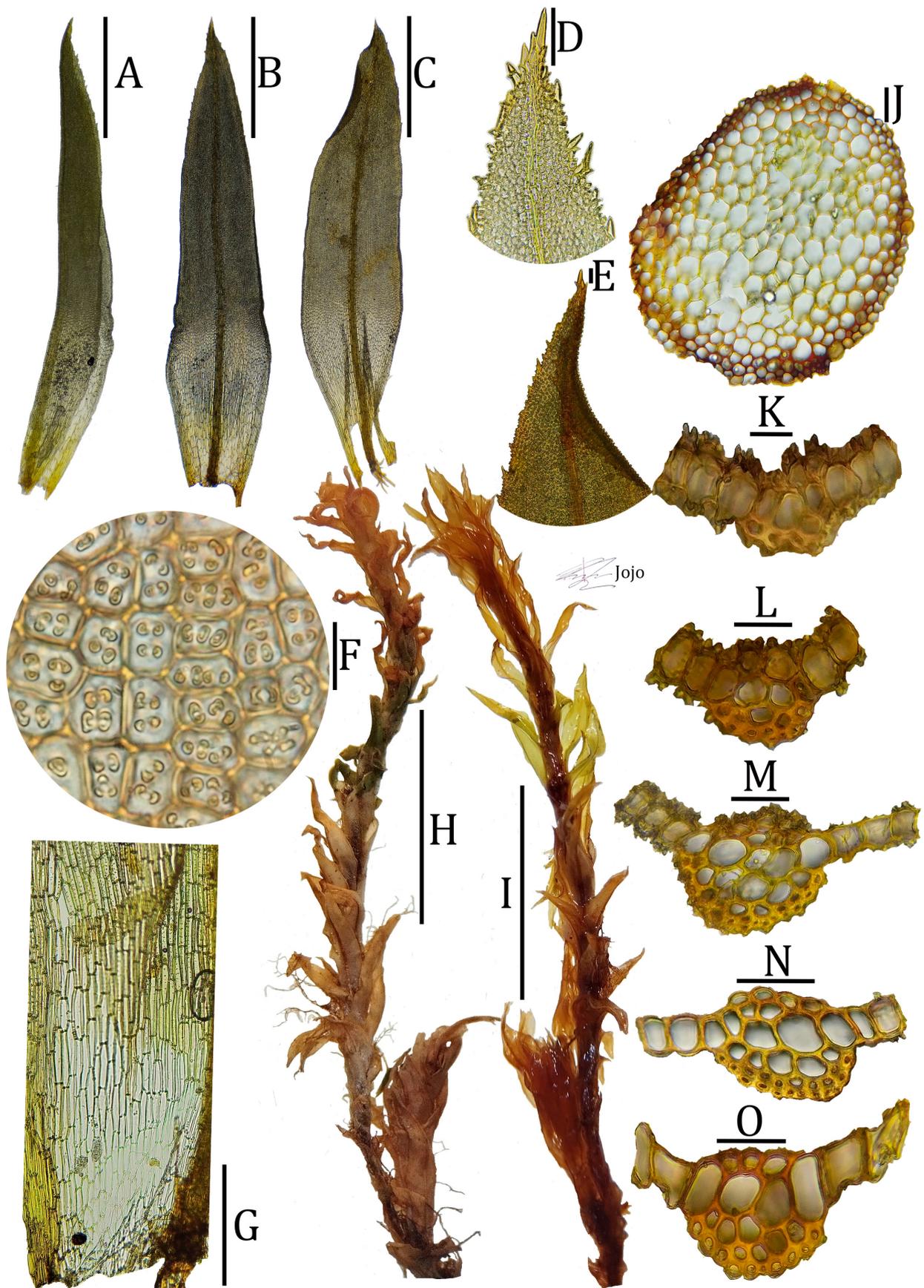


FIGURE 8. *Syntrichia robusta*. A–C. Leaves. D–E. Leaf apex. F. Middle laminal cells. G. Basal cells. H. Habit, when dry. I. Habit, when wet. J. Transverse section of a stem. K–O. Transverse section of a leaf from the apex to the base. Scale bars: A–C = 1 mm. D = 80 μm . E = 20 μm . F = 17.5 μm . G = 200 μm . H–I = 5 mm. J = 37.5 μm . K–L = 20 μm . M = 32.5 μm . N = 42.5 μm . O = 35 μm . All from *J. Ramos D. 136a*. Photos: by *J. Ramos D.*

taxon has been previously reported from Cusco, but published images do not match with the species cited here (Saire *et al.* 2022).

Distribution and habitat:—Until recently, *Trichostomopsis challaensis* was considered endemic to Bolivia, where it was known from the type locality in the province of La Paz and two other places in the province of Potosí (Churchill *et al.* 2009). Later, Jiménez *et al.* (2022) included a specimen of this species from Mendoza province, Argentina, in their phylogenetic study of the genus *Didymodon* and related genera. Here, *T. challaensis*, is reported from two additional sites in the Ancash region, Peru, extending its range significantly northward. The Ancash specimens were collected on soil between 4150–4800 m, in dry puna, where it grows along with *Bryoerythrophyllum inaequalifolium* (Taylor) R.H.Zander, *Anoetangium aestivum* (Hedw.) Spruce, and *Gertrudiella glaucescens* (Hampe) J.A.Jiménez & M.J.Cano.

Specimen examined:—PERU. Ancash: Cordillera Negra, pr. Abra Tres Cruces, 4150 m, 08°51'22"S, 77°57'42"W, 21 May 2013, *M. J. Cano, J. A. Jiménez & M. Alonso 7134b* (MUB 48570); Abra de Yanashalla, 4800 m, 09°51'35"S, 77°04'25"W, 25 May 2013, *M. J. Cano, J. A. Jiménez & M. Alonso 7266* (MUB 48709).

Range extensions

Leptodontium proliferum Herzog (1916: 33)

Taxonomic Note:—*Leptodontium proliferum* is characterized by its dimorphic leaves: upper leaves bearing obovoid to claviform propagules on the excurrent portion of the costa, while lower leaves have a percurrent to subpercurrent costa (Zander 1972). The specimen from Huancavelica differs from these diagnostic characters, as all leaves exhibit an excurrent costa. In the *Moss flora of Mexico*, Zander (1994) described this taxon based on a specimen collected from 20 km E of Amaecameca (Cárdenas 3943 BUF, MEXU) previously identified as *Streptopogon rzedowskii* Cárdenas. Zander noted that *L. proliferum* may have either all leaves or just the upper leaves with excurrent costa consistent with the Huancavelica specimen. *Leptodontium proliferum* resembles *L. gemmascens* (Mitt.) Braithw. as both species have propagules that are borne on the excurrent portion of the costa. However, *L. gemmascens* can be distinguished by their monomorphic leaves and non-claviform propagules (Zander 1972).

During taxonomic revision of genus *Tortula* Hedw. in South America Cano & Gallego (2008b) determined that earlier name *Tortula umbrosa* Dúsen was placed into the same concept of *Leptodontium proliferum*. Thus, they proposed to conserve name *L. proliferum* against *T. umbrosa* in order to maintain nomenclatural stability due to widely used the name *L. proliferum* in bryological literature. This proposal was accepted eight years later (Klazenga 2016). Despite the fact that the committee voted in favor of the proposal, Zander (2017) proposed a new combination for *L. proliferum* as *Microleptodontium umbrosum* (Dúsen) R.H.Zander as a part his recently studies in the genus, which was later, corrected as *M. proliferum* (Herzog) R.H.Zander & Brinda (Zander & Brinda 2021). Descriptions and illustrations of this species are given by Zander (1972, 2017) and Zander (1994).

Distribution and habitat:—*Leptodontium proliferum* is known from Europe (Porley & Edwards 2010), Africa (Hodgetts *et al.* 1999), Mexico (Zander 1994) and South America (Bolivia, Colombia, Chile, and Peru) (Zander 1972, Müller 2009, Churchill *et al.* 2000). In Peru, this taxon was first reported by Hegewald & Hegewald (1985) based on three collections from the Junín region and two collections from Cajamarca. Since then, this taxon has not been reported from any other regions of the country. Furthermore, Zander (2017) in his recent proposal to transfer the genus *Leptodontium* (Müll.Hal.) Hampe ex Lindb. to a new family, Streptotrichaceae, and to divide it into 7 different genera (*Austroleptodontium* R.H.Zander, *Crassileptodontium* R.H.Zander, *Leptodontium*, *Microleptodontium* R.H.Zander, *Rubroleptodontium* R.H.Zander, *Stephanoleptodontium* R.H.Zander and *Williamsiella* E.Britt.) cited this taxon as *Microleptodontium umbrosum*. However, its presence in this country has not been confirmed. The wide distribution of *L. proliferum* in Peru is here confirmed based on several specimens from Ancash, Cajamarca, Huancavelica and Puno (Fig. 9). In the Huancavelica region it was found growing on soil in a similar area and associated with the same species mentioned in this paper. In Ancash, it was found growing on soil within a *Polylepis* woodland at 3875 m; and taluses with remnants of scrubland at 4000 m; in Cajamarca, on soil at the base of *Festuca sp.* in Jalca at 3630 m; and in Puno, on taluses or on soil in bofedales (high-altitude wetlands) of the Andean puna between 4335–4690 m.

Specimens examined:—PERU. Ancash: Cordillera Negra, pr. Mina Santo Toribio, 4000 m, 09°29'23"S, 77°35'4"W, 18 May 2013, *M. J. Cano, J. A. Jiménez & M. Alonso 6969* (MUB 48398, USM 358794); pr. Huallanca, 3875 m, 09°52'9"S, 76°59'4"W, 25 May 2013, *M. J. Cano, J. A. Jiménez & M. Alonso 7304* (MUB 48748, USM 358797); Cajamarca: Jalca de Kumulca, 3630 m, 07°02'28"S, 78°15'30"W, 16 June 2009, *M. J. Cano, J. Guerra & J. A. Jiménez 5100* (MUB 32843, USM 358792); Huancavelica: Castrovirreyna District, Abra hacia Chíncha, 4895

m, 13°0'15.098"S, 75°20'45.922"W, 02 July 2024, *J. Ramos D. 65* (MUB 65255, USM 356636); Pilpichaca District, Abra Apacheta, 4810 m, 13°21'19.641"S, 74°44'9.045"W, 01 July 2024, *J. Ramos D. 35a* (USM 356606); Puno: pr. Palca, 4690 m, 15°15'53"S, 70°41'13"W, 4 April 2005, *M. J. Cano 2251* (MUB 20730); Abra de la Raya, 4335 m, 14°28'58"S, 70°59'16"W, 6 April 2005, *M. J. Cano 2857* (MUB 20808).

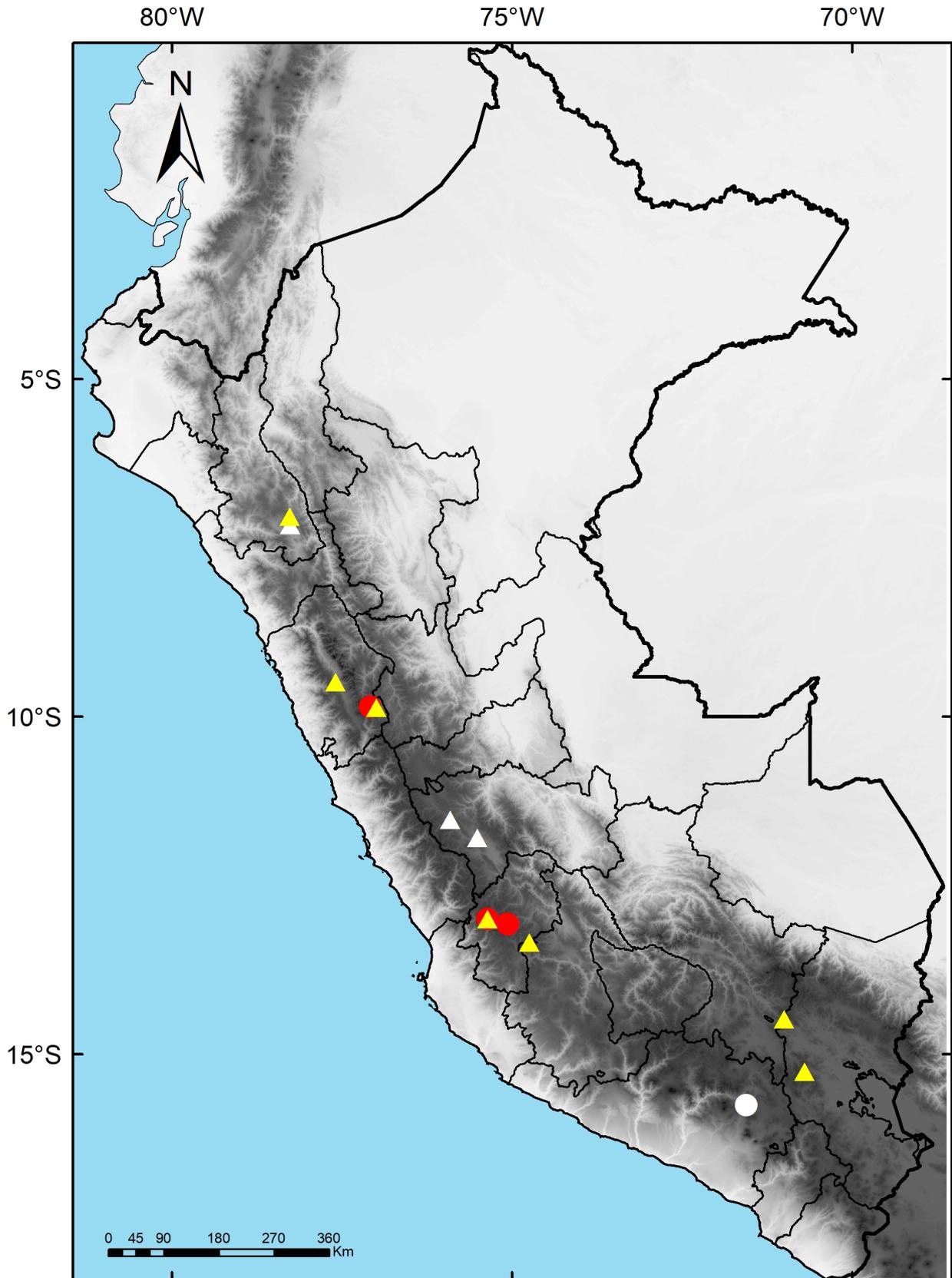


FIGURE 9. Distribution of *Leptodontium proliferum* Herzog (triangles) and *Tortula arequipensis* M.J. Cano & M.T. Gallego (circles) in Peru. Literature records (white), new records (colored).

Tortula arequipensis M.J.Cano & M.T.Gallego (2008a: 179).

Taxonomic Note:—This taxon was described by Cano & Gallego (2008a) based on two specimens collected from snowy Huarancante mountain in Arequipa, Peru. According to these authors, this species is characterized by long leaves with a yellowish hair point, upper and middle laminal cells 15–22.5 µm wide, smooth, and a peristome with a short basal membrane. *Tortula arequipensis* may be confused with *T. mucronifolia* Schwägr., a species widely distributed outside South America, because both share several gametophytic characters, as well as similar capsules, spores and peristome sizes. However, the latter species can be distinguished by a shorter hair point (less than 1000 µm) compared to *T. arequipensis* (longer than 1000 µm) and by a higher basal membrane of the peristome (greater than 380 µm in *T. mucronifolia*; less than 100 µm in *T. arequipensis*) (Cano & Gallego 2008a). A description and illustration of this species are given by Cano & Gallego (2008a).

Distribution and habitat:—Until now, *T. arequipensis* was known only from the type locality in the southern Peruvian Andes (Cano & Gallego 2008a). The present study expands the species distribution to the central Peruvian Andes (Ancash and Huancavelica) (Fig. 9). In Huancavelica region *T. arequipensis* has been found in the Chonta Mountain range above 4600 m. The vegetation of these mountains is sparse or absent, mainly composed of *Senecio nutans*, *S. gamolepis*, *Xenophyllum dactylophyllum* and *Cinnagrostis* sp. in scattered spots. *Tortula arequipensis* has been found on soil accompanied by *Bryum argenteum*, *Bartramia polytrichoides* Müll.Hal., *Brachythecium* sp., *Syntrichia ruralis*, *Trichostomopsis australasiae*, *Erythrophyllopsis andina* and *Bryoerythrophyllum recurvirostrum*. In Ancash region, this species was found growing in limestone rock crevices at 4800 m associated with *Trichostomopsis australasiae*.

Specimens examined:—PERU. Ancash: Abra Yanashalla, 4800 m, 09°51'35"S, 77°04'25"W, 25 May 2013, M. J. Cano, J. A. Jiménez & M. Alonso 7285 (MUB 48729, USM 358796); Huancavelica: Huachocolpa District, Abra Huayraccasa, 5006 m, 13°04'35.083"S, 75°01'38.694"W, 5006 m, 28 June 2024, J. Ramos D. 9 (MUB 65259, USM 356578); Castrovirreyna District, Abra hacia Chinchá, 4889 m, 13°0'14.316"S, 75°20'46.021"W, 02 July 2024, J. Ramos D. 68 (MUB 65257, USM 356639); Santa Ana District, Abra chonta, 5045 m, 13°04'35.162"S, 75°03'30.438"W, 17 January 2025, J. Ramos D. 289 (MUB 65252, USM 356860).

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