

FRUITING MATERIAL OF *PHILONOTIS ESQUELENSIS* (BARTRAMIACEAE, BRYOPHYTA) DISCOVERED IN CHILE

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Summary: *Philonotis esquelensis*, a species described from Argentina, is recorded for the first time for Chile. In this work the sporophyte is described and illustrated, amending the original description. SEM of spores, capsule, and peristome are here made. A distribution map of the species in southern South America is presented.

Key words: Capsule, peristome, setae, spores, sporophyte.

Resumen: Material fructificado de *Philonotis esquelensis* (Bartramiaceae, Bryophyta) descubierto en Chile. *Philonotis esquelensis*, una especie descrita para la Argentina, es registrada por primera vez para Chile. En el presente trabajo se describe e ilustra el esporofito, completando así su diagnóstico original. MEB de esporas, cápsula y peristoma son aquí realizados. Se presenta un mapa de la distribución de la especie en el sur de América del Sur.

Palabras clave: Cápsula, esporas, esporofito, peristoma, seta.

INTRODUCTION

Philonotis Brid. is a genus marked by its small size; leaves variously erect to appressed but never sheathing, non plicate at base; capsules ovoid to subglobose, rugose to strongly furrowed when dry; peristome absent, rudimentary or fully developed, and sub-reniform spores (Allen, 1999). It inhabits rocks or soil, usually associated with wet sites such as stream banks or seeps, from near sea level to 4700 m (Gradstein *et al.*, 2001).

As part of the project “Biosystematics and phylogeny of the genus *Philonotis* (Bartramiaceae, Bryophyta) in southern South America” some specimens collected in Chile were identified as *Philonotis esquelensis* Matteri, a species not previously recorded from this country (see Table 1). The species was described based on male

plants from Esquel (Chubut Province, Argentina) collected by O. Kühnemann in 1940 (Matteri, 1968). The original description included only gametophytic characters; however, the material found in Chile contains fertile plants which grow forming an almost pure dense turf.

A detailed description and illustration of *P. esquelensis* and its sporophytes, including SEM of spores, capsule, and peristome are here presented. This work represents an amended description of the species, and also includes a map of its distribution in southern South America.

MATERIALS AND METHODS

We studied types and specimens from BA, CONC, and LIL, in addition to our own collections deposited in CTES and LIL (Thiers, 2013).

The specimens were studied morphologically with conventional techniques for bryophytes and mounted in water-glycerine-phenol or Hoyer’s solution (Anderson, 1954).

Microscopic characters were analyzed by using light microscopy (LM) Leica Model CME, and scanning electron microscopy (SEM) JEOL 5800

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Table 1. List of species from *Philonotis* recorded in Chile, updated names, and additional references.

Species registered in Chile	Author of the record	Current Name	Additional references of the current name
<i>Bartramidula cygnea</i> (Mont.) Paris	Herzog (1922)	<i>Philonotis cygnea</i> (Mont) D.G. Griffin & W.R. Buck	Seki (1974); Müller (2009)
<i>Philonotis elongata</i> (Dism.) H.A. Crum & Steere	Ireland <i>et al.</i> (2006)	<i>Philonotis elongata</i> (Dism.) H.A. Crum & Steere	Müller (2009)
<i>Philonotis glabrata</i> Broth.	Brotherus (1924)	<i>Philonotis glabrata</i> Broth.	Bartram (1957); Robinson (1975)
<i>Philonotis glaucescens</i> (Hornsch.) Broth.	He (1998)	<i>Philonotis glaucescens</i> (Hornsch.) Broth.	Müller (2009)
<i>Philonotis laxissima</i> Mitt.	Brotherus (1924)	<i>Philonotis hastata</i> (Duby) Wijk & Margad.	Espinosa (1941); Ireland & Bellolio (2002); Müller (2009)
<i>Bartramia krausei</i> Müll.Hal.	Müller (1874)	<i>Philonotis krausei</i> (Müll Hal) Broth.	Thériot (1935); He (1998); Müller (2009)
<i>Philonotis litorea</i> Cardot & Broth.	Skottsberg (1914)	<i>Philonotis litorea</i> Cardot & Broth.	Matteri (1989); Müller (2009)
<i>Philonotis luteola</i> E. B. Bartram (later homonym of <i>P. luteola</i> Cardot)	Bartram (1946)	<i>Philonotis polymorpha</i> (Müll. Hal.) Kindb.	Matteri (1973); Müller (2009)
<i>Philonotis nigroflava</i> Müll. Hal.	Dusén (1903)	<i>Philonotis nigroflava</i> Müll. Hal.	Müller (2009); Ireland <i>et al.</i> (2006)
<i>Philonotis scabrifolia</i> (Hook. f. & Wilson) Braithw.	Cardot (1908)	<i>Philonotis scabrifolia</i> (Hook. f. & Wilson) Braithw.	Matteri (1968); Müller (2009)
<i>Philonotis vagans</i> (Hook. f. & Wilson) Mitt.	Dusén (1903)	<i>Philonotis vagans</i> (Hook. f. & Wilson) Mitt.	Cardot (1908); Müller (2009)
<i>Philonotis vagans</i> var. <i>evanidinervis</i> Broth.	Brotherus (1924)	<i>Philonotis vagans</i> var. <i>evanidinervis</i> Broth.	Müller (2009)

LV operating at 20 KV. Characters illustrated by SEM were obtained from samples fixed in FAA, critical-point dried, and then mounted on double-sided tape and coated with gold-palladium.

RESULTS

Philonotis esquelensis Matteri. *Revista Museo Argent. Ci. Nat. Bernardino Rivadavia Instituto Nac. Investigación Ci. Nat., Bot.* 3: 211. 1968. **TYPE:** ARGENTINA. *Chubut: Esquel*, 28/XI/1940, O. Kühnemann 5165 (*Holotype:* BA!; *Isotype:* LIL!). Figs. 1-5.

Plants small to medium size, green to yellowish-green, growing in dense turfs. **Stem** red, tomentose below, branched in subfloral whorls, 0.7-2.1 cm long, transverse section rounded, hyalodermis present, sclerodermis in 2 rows; central strand present. **Rhizoids** smooth to densely rugose. **Axillary hairs** 2-cells, basal cell short and brown, apical cell hyaline, globose to subglobose, 15-39 µm

long. **Leaves** erect when dry, erect-spreading when wet, sometimes secund, ovate-lanceolate; 0.4-1.2 × 0.2-0.4 mm, apex acuminate; margin serrulate in the upper half by projecting cells papillae, dentate in the lower half, recurved in upper 2/3 of lamina; **costa** robust and well-defined, 33.2-81.34 µm wide, excurrent to long-excurrent; in cross-section at mid-leaf elliptic, 6-7 guide cells in one layer, ventral stereids in 1-2 layers, 2-3 in dorsal surface, semicircular in shape, epidermis dorsal and ventral present, hydroids well-developed; upper laminal cell rectangular to sub-linear, 26.5-41.5 × 4.9-6.6 µm, papillae at upper cells ends, basal cells sub-quadrate to rectangular, 24.9-31.5 × 8.3-13.2 µm, papillae at lower cell ends. **Dioicous. Perichaetia** gemmiform, subtended by a whorl of branches; **perichaetial leaves** ovate-lanceolate, 1.5-1.7 × 0.3-0.4 mm. **Setae** erect, reddish-brown, 1.5-1.6 cm long, transverse section rounded. **Capsules** erect to inclined, globose to subglobose when mature, 1.6-2.3 × 0.6-2.2 mm, furrowed when dry, striated when wet; exothecial cells quadrate to rectangular, irregularly arranged, thick-walled, 29.8-61.4 ×

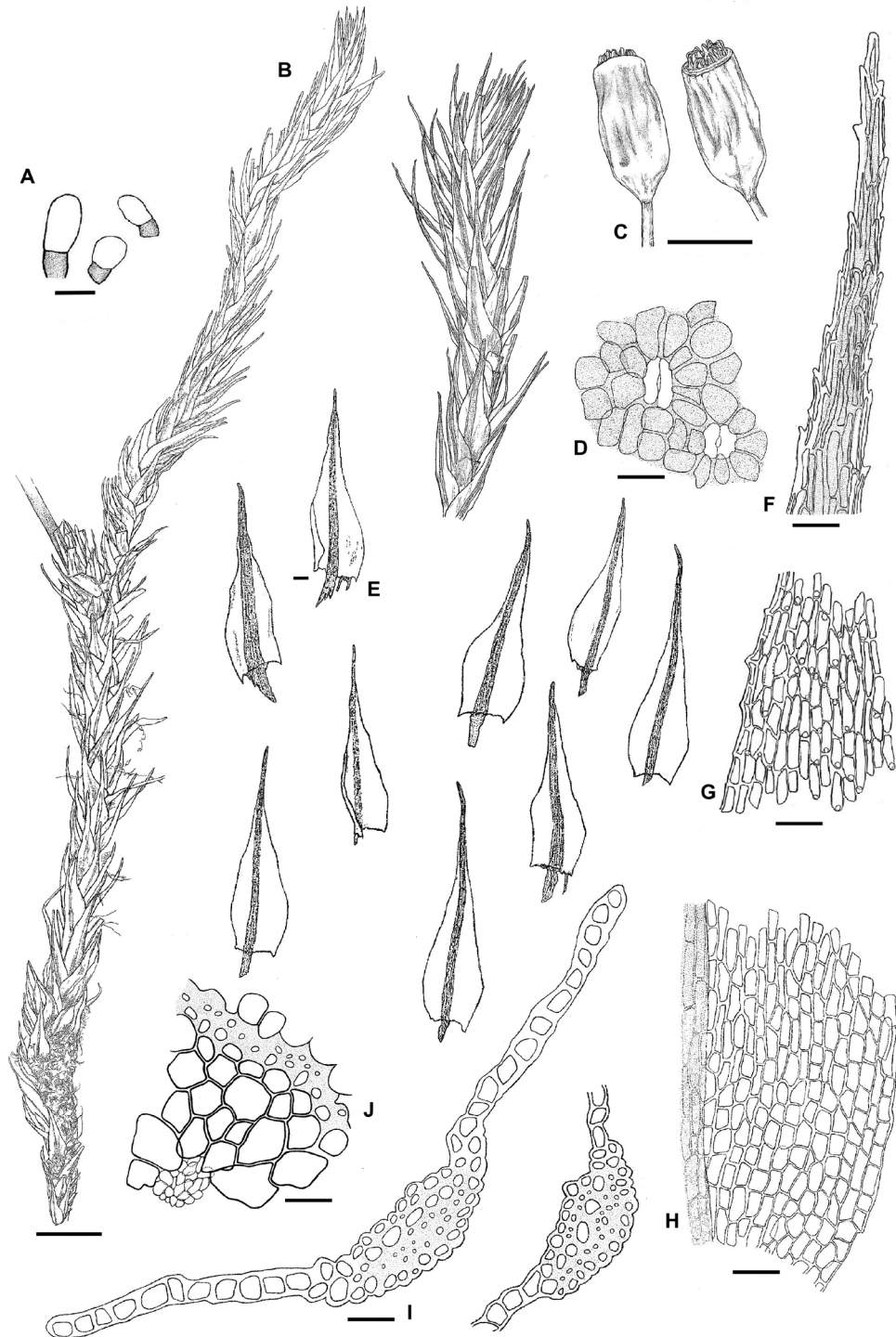


Fig. 1. *Philonotis esquelensis*. **A:** Axillary hairs. **B:** Habit. **C:** Capsule. **D:** Cryptopore stomata. **E:** Leaves. **F:** Detail of apical laminal cells. **G:** Median laminal cells. **H:** Basal laminal cells. **I:** Transverse section of the costa below mid-leaf. **J:** Transverse section of the stem. Scales: B: 0,2 cm. C: 1 mm. A: 5 μ m. D-J: 50 μ m (Larraín 26624, CONC).

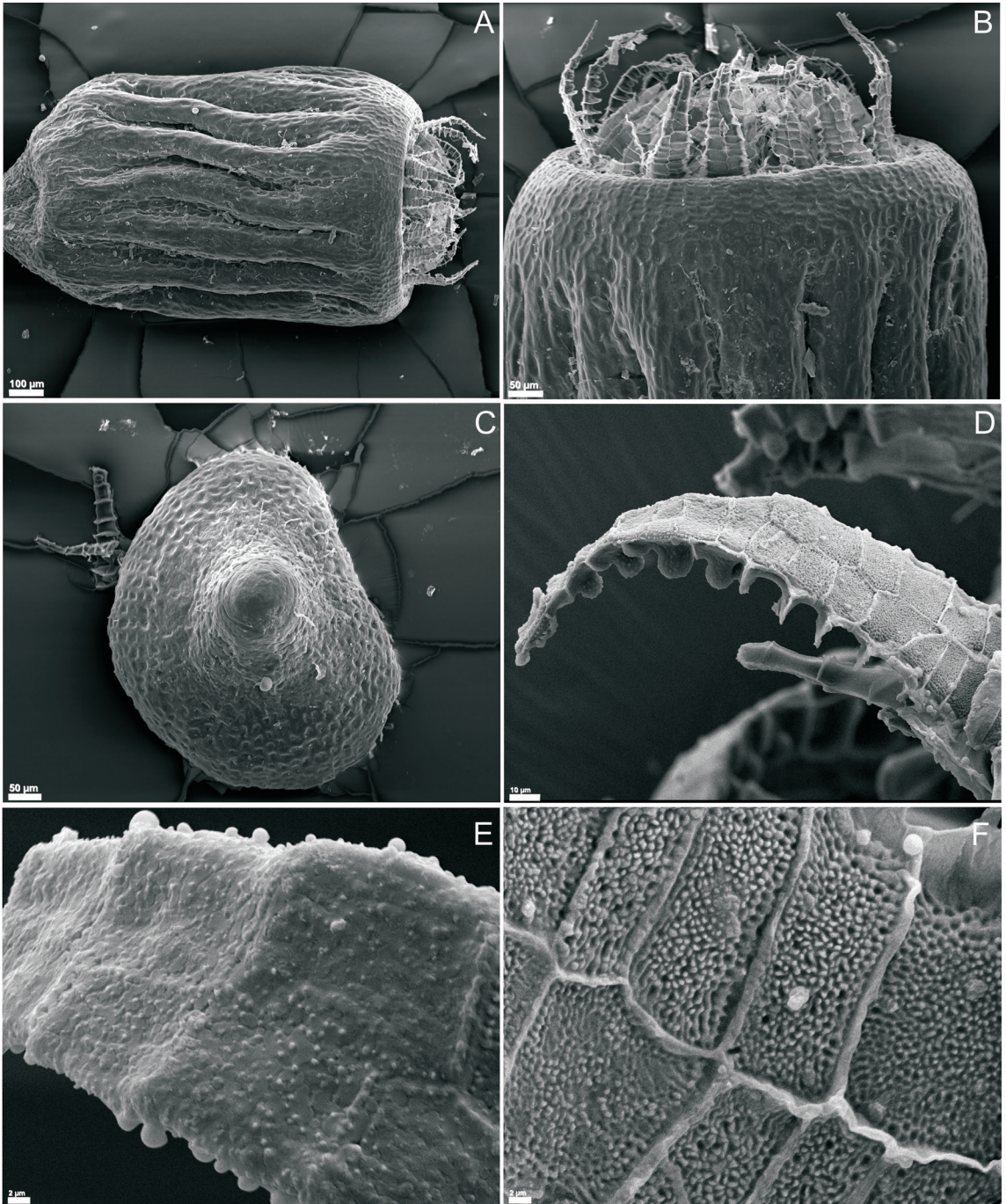


Fig. 2. *Philonotis esquelensis*. SEM. **A:** Capsule. **B:** Peristome. **C:** Operculum. **D:** Exostome teeth. **E:** Exostome apex. **F:** Exostome base. Scales: A-B: 50 µm. C-E: 10 µm (Matter 327, BA).

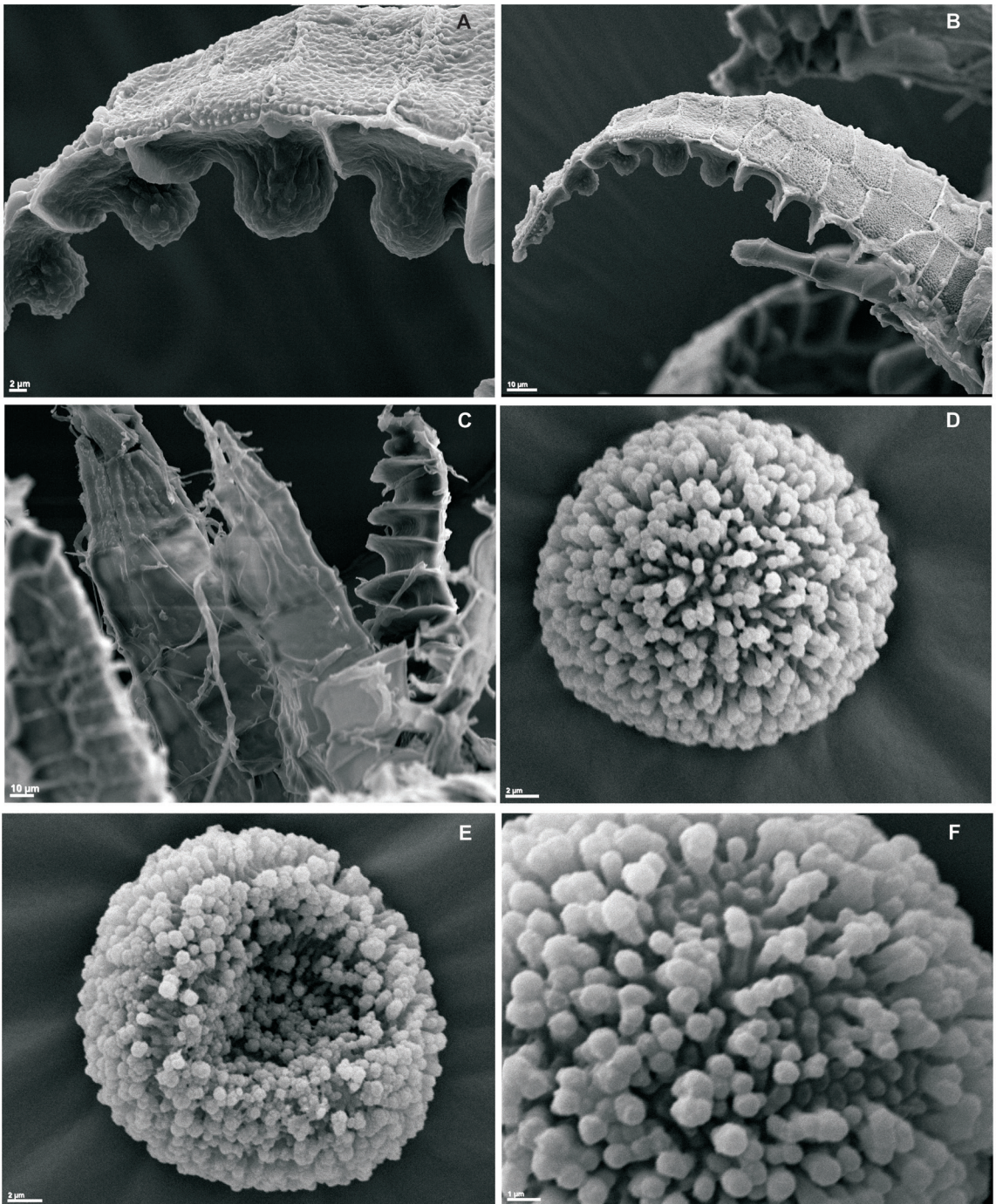


Fig. 3. *Philonotis esquelensis*. SEM. **A:** Inner surface of the exostome. **B:** Detail of the exostome and cilia. **C:** Endostome. **D:** Distal view of the spore. **E:** Proximal view. **F:** Spore ornamentation (Matteri 327, BA).

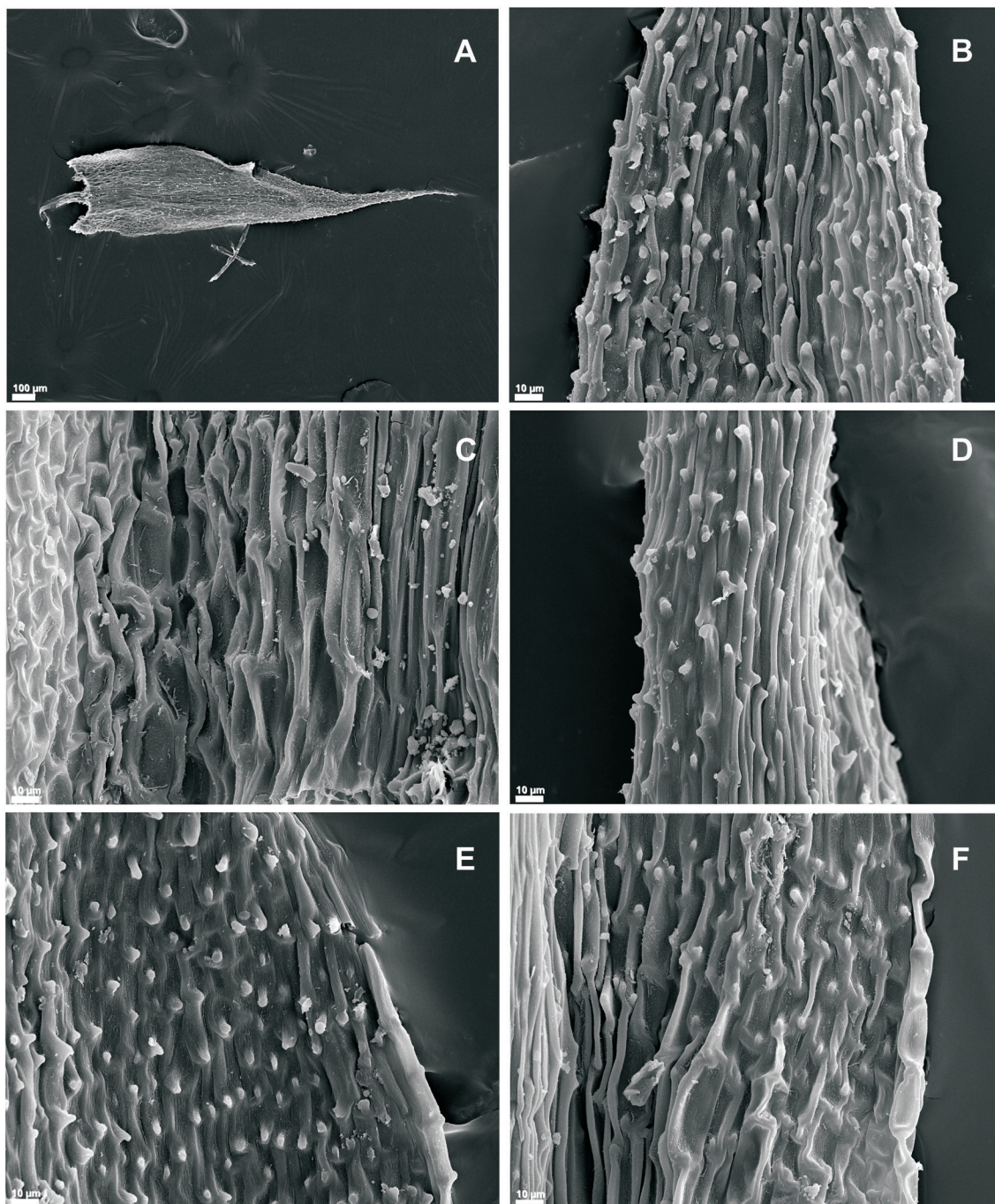


Fig. 4. *Philonotis esquelensis*. **A:** Leaf. **B:** Apical laminal cells in adaxial surface. **C:** Basal laminal cells. **D:** Apical laminal cells in abaxial surface. **E:** Median laminal cell. **F:** Basal laminal cell (Larraín 32067, LIL).

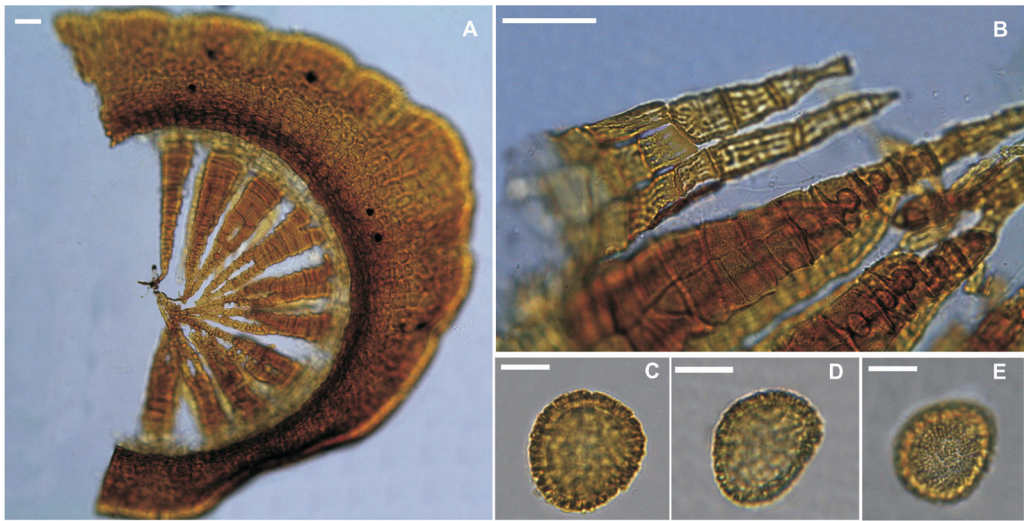


Fig. 5. *Philonotis esquelensis*. **A:** Peristome. **B:** Exostome and endostome in detail. **C:** Spore in optical view. **D:** Equatorial view. **E:** Spore ornamentation. Scales: A-B: 50 μ m. C-D-E: 10 μ m (Matteri 379, BA).

18.2-30.1 μ m; stomata present, cryptopores; annulus absent. **Operculum** conic-mammillate. **Peristome** double, reddish-brown; exostome teeth lanceolate, fenestrate and bordered, $0.30-0.33 \times 0.05-0.07$ mm, outer surface coarsely papillose above, finely and densely papillose below, trabeculae thin above, inner surface sparsely granulose, trabeculae thick below; endostome segments $3/4$ the length of the exostome, yellowish, coarsely papillose throughout, segments split along the median line and each half diverging toward the cilia, cilia 1-2, short, stout below. **Calyptra** not seen. **Spores** sub-reniform, yellowish-brown, 20-24 μ m diameter; densely pilate, pila 1.17-1.67 μ m long.

Philonotis esquelensis differs markedly from its Andean-Patagonian and Chilean congeners by the small to medium size, ovate-lanceolate leaves without differentiated margin; margin serrulate and slightly recurved at the apex; papillae at the upper cell ends in the apex, at the lower cell ends in the base; and an excurrent costa.

By its aspect it may be confused with *P. nigroflava* Müll. Hal., but the latter has leaves with a narrower base, costa short-excurrent, and narrower to linear laminal cells in the apex.

Geographic Distribution: Argentina, Chile (Fig. 6).

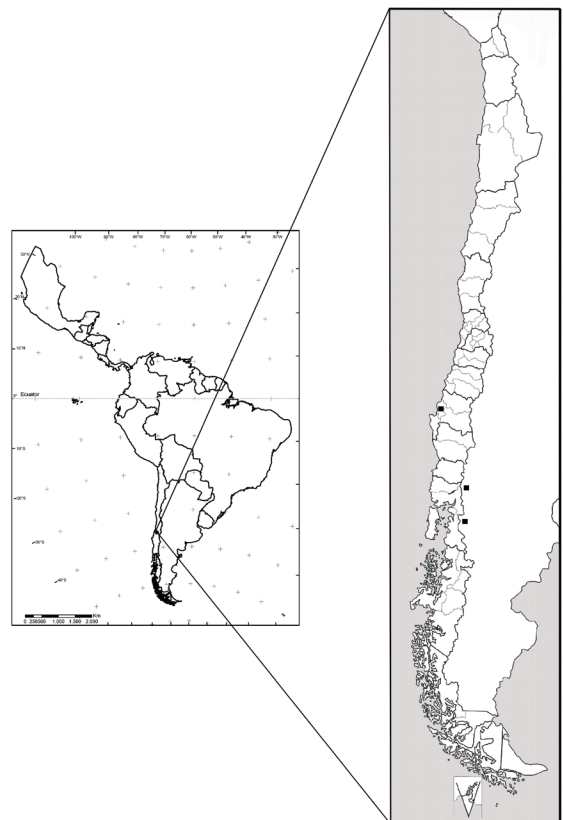


Fig. 6. Distribution map of *P. esquelensis* in southern South America.

Specimens examined: ARGENTINA. Neuquén: Dpto. Huiliches, Parque Nacional Lanín, bosque coihue/ciprés/rodal a orillas del Lago, 39°43'22"S, 71°31'22"S, 1000 m, X/2009, J. Larraín 32067, con G. Suárez (CONC, CTES, LIL). *Chubut:* Por carretera a Esquel unos 140 km al norte en cascada con mesas para comer a un costado de la carretera, "Paraje al costado del camino", 42°09'41"S, 71°24'04"W, 400 m, 23/X/2009, J. Larraín 32094, con G. Suárez (CONC, CTES, LIL). *Río Negro:* Cerro Catedral, sobre paredón junto a la cascada, 29/I/1969, C. Matteri 379 (BA). CHILE. *Región Metropolitana (RM), Prov. de Melipilla:* Reserva Nacional Roblería del Cobre de Loncha, detrás de casa CONAF sector Los Maquis, 34°09'01"S, 70°56'58"W, 990 m, en talud seco junto al sendero saliendo hacia el NE, 24/IX/2007, J. Larraín 30030, con R. Vargas (CONC). *Región del Biobío (VIII), Prov. Concepción:* Los Barros, Laguna del Laja, justo antes de llegar al refugio militar, 37°27'57"S, 71°19'20"W, 1450 m, en pared de roca húmeda, 22/XII/2006, J. Larraín 26264 (CONC); Los Barros, sobre paredón rocoso, 22/I/1969, C. Matteri 327 (BA); Los Barros, en "chorrillo" sobre paredón húmedo, 22/I/1969, C. Matteri 325 (BA); *Región de la Araucanía (IX), Prov. Malleco:* Reserva Nacional Lago Galletué, Pte. Los Milicos, afloramiento rocoso junto al río, matorral de *Nothofagus antarctica* y araucarias dispersas, 38°40'01"S, 71°23'08"W, 21/X/2009, J. Larraín 32001 con G. Suárez (CONC). *Región de Aisén (XI), Prov. Capitán Prat:* Cochrane, Reserva Nacional Tamango, a lo largo del sendero, primeros 200 m, 47°14'28"S, 72°31'12"W, 200 m, en el suelo, 17/I/2007, J. Larraín 26624, con R. Vargas (CONC).

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