

Pseudocrossidium linearifolium (Pottiaceae) comb. et stat. nov.

JUAN A. JIMÉNEZ, MARÍA J. CANO AND J. GUERRA

Departamento de Biología Vegetal, Facultad de Biología, Universidad de Murcia,
Campus de Espinardo, 30100-Murcia, Spain
e-mails: jajimene@um.es; mcano@um.es; jguerra@um.es

STEVEN P. CHURCHILL

Missouri Botanical Garden, 2345 Tower Grove Avenue, P.O. Box 299, St. Louis,
MO 63166-0299, USA
e-mail: steve.churchill@mobot.org

GUILLERMO M. SUÁREZ

Fundación Miguel Lillo, Miguel Lillo 251, San Miguel de Tucumán, Tucumán,
Argentina
e-mail: suarezgm@csnat.unt.edu.ar

ABSTRACT. *Pseudocrossidium linearifolium* (*Barbula subrevoluta* var. *linearifolia* Müll. Hal.) is a new combination and status proposed for a neglected South American taxon. This distinctive moss has been known only from the type locality in the mountains around Córdoba, Argentina. It is newly reported for the moss floras of Ecuador and Bolivia. The species is described, lectotypified, illustrated and its distribution is mapped. Diagnostic characters and distinction from some closely related South American taxa, with which it may be confused, are discussed. *Pseudocrossidium perrevolutum* is reduced to the synonymy of *P. replicatum*.

KEYWORDS. Argentina, Bolivia, Ecuador, *Pseudocrossidium linearifolium*, *P. perrevolutum*, Pottiaceae, taxonomy.



Müller (1879) described *Barbula subrevoluta* Müll. Hal., an illegitimate later homonym of *Barbula subrevoluta* Hampe, as a new species based on a single collection made by P. G. Lorentz in 1871 from Ascochinga in northern Córdoba, central Argentina. In the original diagnosis the new species was compared with *B. revoluta* Brid. (*Pseudocrossidium revolutum* (Brid.) R. H. Zander) from which it differed in the leaf shape and leaf areolation. Two additional varieties of the new species, var. *acutifolia* and var. *linearifolia*, were described on the basis of

two specimens collected in Córdoba province. According to Müller (1879) the former differed from the typical variety by its more acuminate and less mucronate leaves, while the latter was described with linear-lanceolate leaves (ligulate-lanceolate in *Barbula subrevoluta*) and more recurved leaf margins. Later the homonymy was recognized by Müller (1882), who established a new name, *Barbula perrevoluta* Müll. Hal. Until 1993, the species fell into oblivion and it was only listed, without comment, in works such as Paris (1884), Brotherus (1924) and

Kühnemann (1938). Zander (1993) in his world monograph of the family Pottiaceae transferred the three taxa to *Pseudocrossidium* R. S. Williams, although he could not study the type material of *B. perrevoluta* var. *acutifolia*. Characters like the leaves appressed to contorted when dry, margins recurved to widely revolute, the crescent shape of the dorsal stereid band, the dorsal surface cells differentiated and lamina yellow in KOH probably led him to moved them to *Pseudocrossidium*. Zander furthermore pointed out that the type of *B. perrevoluta* var. *linearifolia* seemed to be different at the species level and that studies were needed to clarify its identity.

In the framework of a revision of *Pseudocrossidium* for the project “Study of the Barbuleae and Bryoerythrophyllae tribes in South America” (Jiménez 2007; Jiménez & Cano 2006, 2007, 2008) we had the opportunity to study the type material of *P. perrevolutum* (Müll Hal.) R. H. Zander and *P. perrevolutum* var. *linearifolium* (Müll Hal.) R. H. Zander deposited at NY. Unfortunately, the type specimen of *P. perrevolutum* var. *acutifolium* could not be located in NY or any other herbarium. During recent fieldwork in South America (Argentina, Bolivia and Ecuador) we collected many specimens attributable to var. *linearifolium*. A detailed study of this material proved that Zander’s doubts were justified and reaffirms the species’ distinctive qualities. Thus, we here recognize *P. perrevolutum* var. *linearifolium* at the rank of species, and *P. perrevolutum* is synonymized with *P. replicatum* (Taylor) R. H. Zander.

Pseudocrossidium linearifolium (Müll. Hal.) J.A.

Jiménez & M.J. Cano, *comb. et stat. nov.* **Figs. 1–6**
Barbula subrevoluta var. *linearifolia* Müll. Hal.,
 Linnaea 42: 335. 1879; *Pseudocrossidium*
perrevolutum var. *linearifolium* (Müll. Hal.) R.H.
 Zander, Bull. Buffalo Soc. Nat. Sci. 32: 119.
 1993. TYPE: “Argentina Cordobensis, Barrancas,”
 Nov 1871, *P. G. Lorentz s.n.* (lectotype,
 designated here, NY!).

Description. Plants 0.4–0.8 cm high, growing in dense turfs, yellowish green to dark green. Stems simple or branched, hyalodermis absent, sclerodermis undeveloped, usually with the outer

layer slightly thicker-walled, central strand present; axillary hairs filiform, 4–6 cells long, all hyaline. Leaves appressed to contorted when dry, spreading to reflexed when moist, ligulate to lingulate, sometimes constricted at the middle, strongly channeled near apex, 0.9–1.4(–2) × 0.3–0.4(–0.5) mm; lamina unistratose, yellow with KOH; apex rounded, sometimes broadly obtuse, occasionally ending in a short cell; margins widely recurved to the apex, slightly recurved from midleaf to base, papillose-crenulate from the apex to below midleaf, unistratose, outer marginal cells undifferentiated; costa 48–61 µm wide at base, percurrent or excurrent in a short mucro, 11–56 µm long, ventral cells of the costa in the upper middle quadrate to rectangular, papillose; dorsal cells of the costa in the upper middle rectangular to linear, usually papillose; in cross-section at midleaf elliptic to slightly reniform, with (3–)4 guide cells in 1 layer, 1–2 layers of ventral stereids, 2–3 layers of dorsal stereids, lunulate in shape, hydroids usually undeveloped, dorsal surface cells usually differentiated, ventral surface cells quadrate-rounded to rectangular or oblate, 5–8(–11) × (3–)5–6.5(–8) µm, disposed in 1 layer; upper and middle laminal cells quadrate-hexagonal to rectangular or oblate, (3–)5–8(–9.5) × (3–)5–8(–9.5) µm, thin to slightly thick-walled, not collenchymatous, with 2–4(–6) bifurcate papillae, 1.5 µm high; basal laminal cells usually rectangular, not inflated, (6.5–)11–25.6 × 6.5–8(–9.5) µm, thin-walled, not collenchymatous, smooth. Dioicous. Perigonal leaves ovate, 0.6–0.7 × 0.5–0.7 mm, with plane to slightly recurved margins and acute to obtuse apex. Perichaetial leaves scarcely differentiated, 0.7–1.5 × 0.5–0.7 mm, sometimes inner leaves shorter and wider, with plane margins and emarginate apex. Setae 6.3–9 mm long, orange to reddish brown, slightly twisted to the left in the lower part and to the right in the upper part. Capsules exerted, straight; theca cylindrical to ovoid-cylindrical 1.2–1.5 × 0.4–0.5 mm, yellowish brown to reddish brown; exothelial cells rectangular 22.4–64 × 9.5–19 µm, thin-walled; annulus of 1 row of rounded cells; peristome of 32 filiform and papillose teeth, spirally twisted, sometimes less than one turn, 440–850 µm long, yellowish brown, basal membrane 20–24 µm high; opercula conical, 0.6–

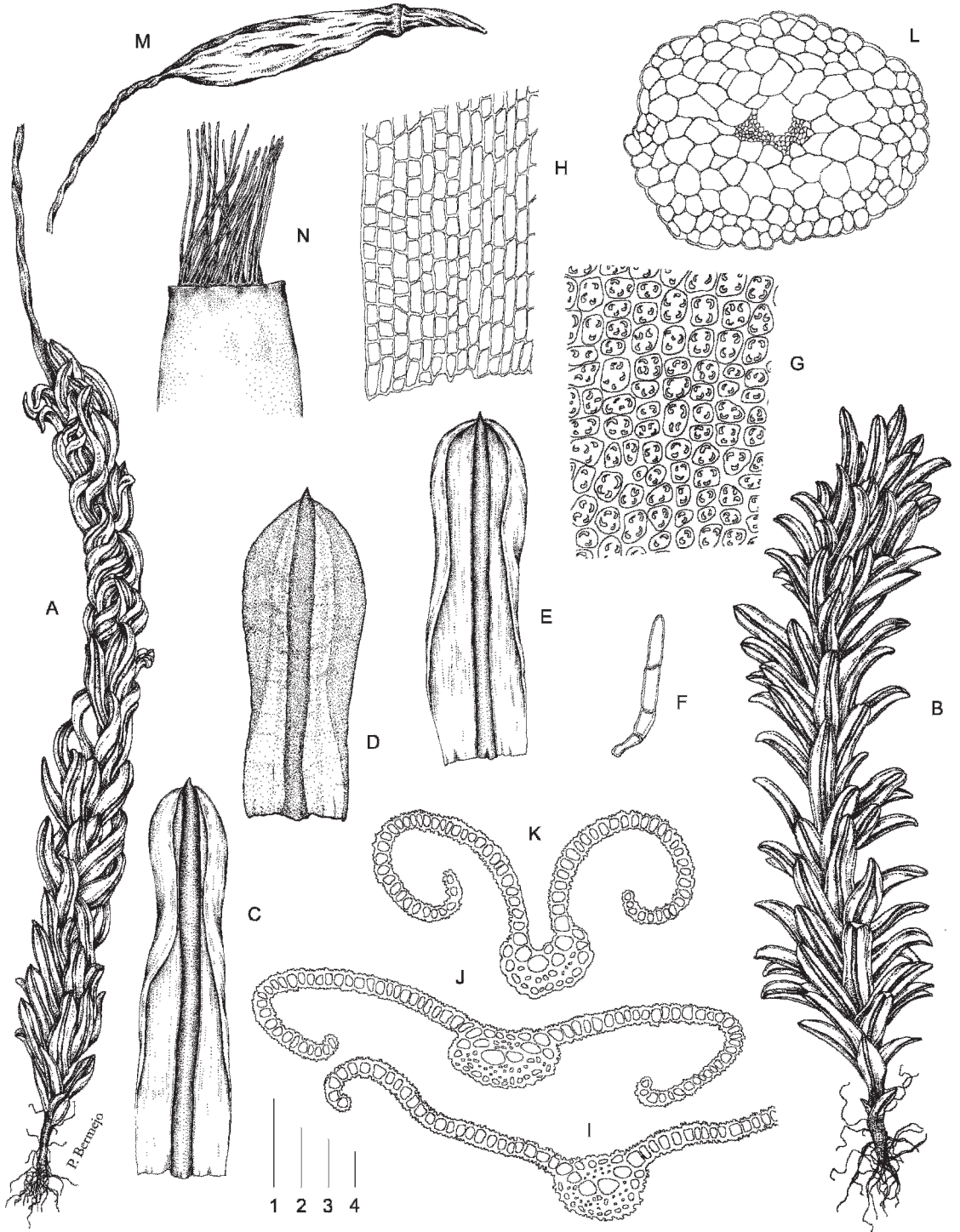
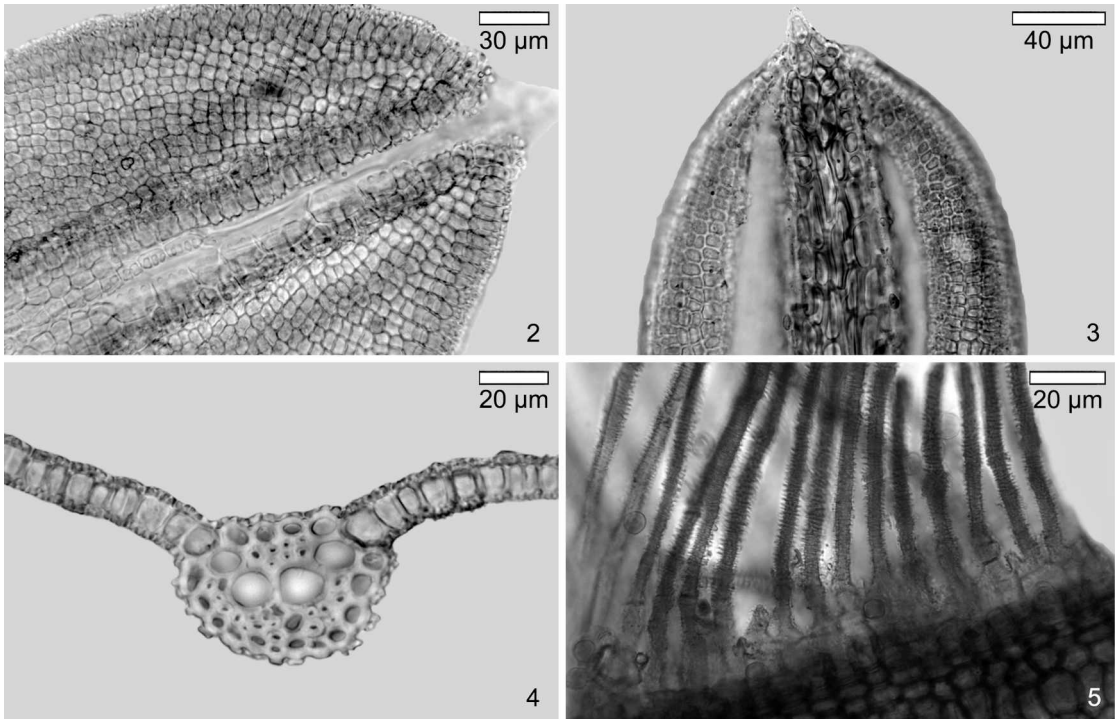


Figure 1. *Pseudocrossidium linearifolium*. A. Habit, dry. B. Habit, wet. C, E. Leaves, dorsal surface. D. Leaf, ventral surface. F. Axillary hair. G. Upper laminal cells. H. Basal laminal cells. I. Transverse section of the costa below midleaf. J. Transverse section of the costa at midleaf. K. Transverse section of the costa above midleaf. L. Transverse section of stem. M. Capsule. N. Peristome. Scale bars: 1 = 0.8 mm (A, B); 2 = 0.25 mm (C–E, M, N); 3 = 25 μ m (F, H–L); 4 = 10 μ m (G). A–C, E–L from Churchill *et al.* 23297 (MO); D, M, N from Suárez 126 (LU).



Figures 2–5. *Pseudocrossidium linearifolium*. 2. Ventral surface of leaf apex. 3. Dorsal surface of leaf apex. 4. Transverse section of the costa at leaf base. 5. Detail of peristome. 2–4 from *Cano & Gallego 3018* (MUB); 5 from *Suárez 126* (LIL).

1 mm long, with spirally twisted cells, yellowish brown to reddish brown. Calyptrae cucullate, ca. 2 mm long, yellowish, smooth. Spores spherical, 8–11 µm in diam., yellowish brown, weakly papillose.

Additional specimens examined. ARGENTINA.

SALTA: La Candelaria, pr. El Ceibal, 17 Feb 2008, *Cano et al. 4233c* (MUB), camino a El Jardín, 11 Apr 2003, *Suárez 126, 128, 130, 146* (LIL); TUCUMÁN: Río Chico, Dique Escaba, 4 Jun 1956, *de la Sota 1077b* (LIL),

Burruyacu, cerca del Río del Nío, 17 Feb 2008, *Cano et al. 4243b* (MUB), Trancas, camino de Ticucho, 7 Aug 2002, *Suárez & Schiavone 117b, 118* (LIL), Trancas, pr. Ticucho, 17 Feb 2008, *Cano et al. 4237a* (MUB). BOLIVIA. CHUQUISACA: Luis Calvo, La Laguna, ca. 4 horas al NW de Cumandaiti, 16 Nov 2006, *Lozano et al. 2196* (HSB, MO, MUB, USZ), Oropeza, Chico, ca. 3 km N de Mojtula, camino entre Aiquile y Chuqui, 15 Jul 2004, *Churchill et al. 23039* (HSB, MO), Oropeza, Comunidad Chuqui Chuqui, ca. 47 km de Sucre, carretera a Aiquile, 17 May 2004, *Churchill et al. 22977* (HSB, MO); COCHABAMBA: pr. Saipina, 3 Aug 2007, *Cano et al. 3560, 3566* (LPB, MUB); SANTA CRUZ: Florida, Cantón Pampa Grande, 7 km NO de Pampa Grande, 26 Aug 2005, *Churchill 23943* (MO, MUB), Vallegrande, ca. 1 km S de Vallegrande, 30 Mar 2001, *Churchill et al. 20360* (MO, MUB), Andrés Ibañez, Municipio de La Guardia, cantón El Carmen km 9, Barrio Muyurina, casa de la familia de Linneo, 24 Mar 2006, *Linneo 380* (LPB, MO, MUB, USZ), Cordillera Camiri, 9 Jun 2006, *Linneo et al. 492* (MO, MUB, USZ); TARIJA: Arce, Municipio de Padcaya, Canton Emborozu, Reserva Natural

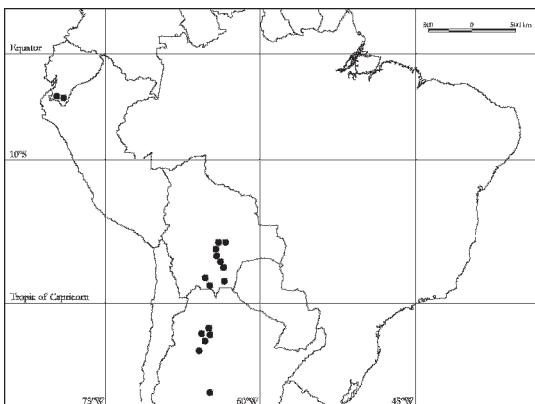


Figure 6. Distribution of *Pseudocrossidium linearifolium*.

Alarachi, al lado del Río Bermejo, 12 Sep 2004, Churchill *et al.* 23297 (MO), canyon 5 mi SW of Tablada, SW of Tarija, 8 Feb 1979, Lewis 79-575, 79-585 (F), Gran Chaco, camino a Tarija cerca del puente Pilcomayo, 9 Feb 2006, Linneo & Nee 192, 195, 196, 197 (MO, MUB, USZ), Gran Chaco, a 25 km ca. sobre la carretera que va a Tarija, 10 Feb 2006, Linneo & Nee 202 (MO, MUB, USZ). ECUADOR. LOJA: pr. Catamayo, 24 Jul 2006, Cano & Gallego 3003a, 3018 (LOJA, MUB), pr. Catacocha, 27 Jul 2006, Cano & Gallego 3059b (LOJA, MUB).

Distribution and ecology. *Pseudocrossidium linearifolium* was until now considered to be an endemic of Argentina, known only from the type locality in Córdoba province, central Argentina. It is here reported from several additional sites in Argentina, Bolivia and Ecuador, extending its range significantly northward (Fig. 6).

Pseudocrossidium linearifolium occurs in Tucumano-Boliviano, Chaco, and Chaco Serrano forests, and dry inter-Andean valleys at 350–2150 m. It grows on sandy, clayey soils and talus next to streams and rivers, more rarely along trails, on artificial walls, rock ledges with accumulated soil and sandstones. Plants of *Pseudocrossidium linearifolium* are frequently associated with *P. replicatum*, *Barbula indica* var. *gregaria*, *Pleurochaete luteola* and *Gertrudiella validinervis*.

Discussion. *Pseudocrossidium linearifolium* is a distinctive species characterized by its ligulate to lingulate leaves, which are strongly channeled near the rounded or obtuse apex, widely recurved margins of undifferentiated cells above mid-leaf, percurrent or excurrent costa in a short mucro, cross-section of the costa with (3–)4 guide cells and two stereid bands, upper and middle laminal cells (3–)5–8(–9.5) μm wide and peristome of 32 spirally twisted teeth.

Pseudocrossidium linearifolium appears to be most closely related to *P. replicatum*, a widely distributed species in South America, with which it shares some similarities such as the position of the leaves when dry, color of lamina with KOH, size and shape of the lamina cells and weakly differentiated perichaetial leaves. However, *P. replicatum* has ovate-lanceolate leaves, more strongly and narrowly revolute leaf margins with differentiated thin-walled, hyaline, outer cells and elongate inner basal laminal

cells. These distinctive characters shown by *P. replicatum* were also found in the type material of *P. perrevolutum* [isotype: Argentina, Córdoba, 1871, *P. G. Lorentz*, NY!] and is reduced to synonymy of *P. replicatum*. In addition, according to Matteri (2003) this specimen represents the second record of *P. replicatum* in Argentina.

There are several *Pseudocrossidium* species in South American that like *P. linearifolium* have leaf margins with undifferentiated outer cells and may be confused with this taxon. *Pseudocrossidium elatum* (R. S. Williams) Delgad. and *P. granulatum* (Thér.) S. P. Churchill, two little known tropical Andean species, are immediately distinguished from *P. linearifolium* by their lamina red in KOH solution, smooth leaf cells and ventral surface cells of costa forming filaments. *Pseudocrossidium crinitum* (Schultz) R. H. Zander, additionally, may have two costal bands of stereids as has *P. linearifolium*, and the leaf lamina likewise yellow with KOH, however, the former differs in having a excurrent costa as a short awn, lanceolate to ovate leaves, and larger upper laminal cells (12–15 μm wide). The last taxon of this group, *P. chilense* R. S. Williams is known from a few localities in Bolivia, Chile and Peru (Churchill *et al.* 2000; He 1998) and is distinguished by its ovate leaves, costa ending below the apex and transverse section of the costa without ventral stereids.

Superficially, *P. linearifolium* resembles *Barbula orizabensis* Müll. Hal., known from North and Central America and Bolivia (Allen 2002; Churchill *et al.* 2000; Zander 1994, 2007), which also has recurved leaf margins to apex or nearly so and cross-section of the costa with two stereid bands, but the latter species can be easily distinguished from it by its narrowly recurved leaf margins and the presence of gemmae in the leaf axils.

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