

The genus *Tortula* (Pottiaceae, Bryophyta) in South America

MARÍA J. CANO* and M. TERESA GALLEGU

Departamento de Biología Vegetal (Botánica), Facultad de Biología, Universidad de Murcia, E-30100, Spain

Received 20 September 2006; accepted for publication 23 August 2007

The moss genus *Tortula* is revised for South America. A key, descriptions, illustrations, distribution data, and light and scanning electron micrographs of the 11 species recognized are provided. A new species, *Tortula arequipensis*, is described from Peru. Twenty-six names are lectotypified. Thirty eight species are excluded from the genus *Tortula*. Six new combinations are proposed: *Syntrichia breviseta*, *Syntrichia buchtienii*, *Syntrichia napoana*, *Syntrichia polylepidis*, *Syntrichia pseudolatifolia*, and *Tortula diaguita*. Thirty-six names are newly synonymized. Previous records of *Tortula vahliana* from Chile correspond to *Tortula platyphylla*. *Microbryum davallianum*, *Tortula cernua*, *Tortula hoppeana*, and *T. vahliana* are newly reported for South America. In addition, new records for different countries of the study area are reported. © 2008 The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2008, 156, 173–220.

ADDITIONAL KEYWORDS: bryophytes – taxonomy – typifications.

INTRODUCTION

The genus *Tortula* Hedw. represents one of the most complex and diverse genera in terms of morphological variation in the family Pottiaceae. It includes approximately 144 species in the world (Crosby *et al.*, 1999), distributed mainly in temperate areas of the Northern Hemisphere.

Its taxonomic circumscription has been controversial over the last two centuries, and there has been no consensus on which species, or even other genera, should be included. Zander (1989, 1993), in his classification of the genera of Pottiaceae, recognized genera such as *Chenia* R.H. Zander, *Dolotortula* R.H. Zander, *Hennediella* Paris, *Hilpertia* R.H. Zander, *Sagenotortula* R.H. Zander, *Stonea* R.H. Zander, and *Syntrichia* Brid., as segregated from *Tortula*, and included taxa that traditionally were placed in other genera, such as some species of *Pottia* Ehrh. ex Fűrnr., *Phascum* Hedw. (for example, *Phascum cuspidatum* Hedw.), and the genus *Desmatodon* Brid. The genus, as emended, is characterized by a stem

with a central strand and an absence of sclerodermis and hyalodermis, a usually yellow colour of the KOH leaf reaction, costa in cross-section with dorsal and ventral surface cells developed, with hydroids, band of the ventral stereids usually undifferentiated, and dorsal band of the stereids well differentiated, and usually semicircular in shape. In addition, Zander (1993) noted that some genera, such as *Pterygoneurum* Jur. and *Crossidium* Jur., were morphologically very close to *Tortula*, and even some species of *Crossidium* could be more appropriately included in *Tortula*. Studies using *rps4* and internal transcribed spacer (ITS) sequences have also shown the complexity of the phylogeny and infrageneric classification of *Tortula* and its relationship with certain genera, such as *Crossidium*, *Pterygoneurum*, and *Stegonia* Venturi (Werner *et al.*, 2002; Cano, Werner & Guerra, 2005). Therefore, the circumscription of the genus *Tortula* requires further study, as a first step towards a taxonomic revision of the genus.

With the exception of the treatment of Brotherus (1924a), the genus *Tortula* has never been monographed or critically revised; only regional treatments exist, which are included in diverse floras, including

*Corresponding author. E-mail: mcano@um.es

those of Steere (1939) for the flora of North America and north Mexico, Lawton (1971) for the Pacific North-west of North America, Nyholm (1989) for Scandinavia and Finland, Mishler (1994) for Mexico, Smith (2004) for Great Britain and Ireland, and Cano (2006) for Spain. According to Allen (2002) and Delgadillo, Bello & Cárdenas (1995), this genus is not represented in Central America and the West Indies.

The only treatment including the South American species of *Tortula* was performed by Mitten (1869). He recognized 99 species in the genus *Tortula*; however, in his concept of this genus, species currently in the genera *Aloina* Kindb., *Aloinella* Cardot, *Barbula* Hedw., *Bryoerythrophyllum* P.C. Chen, *Didymodon* Hedw., *Dolotortula*, *Hennediella*, *Hyophiladelphus* (Müll. Hal.) R.H. Zander, *Pseudocrossidium* R.S. Williams, *Pterygoneurum*, *Sagenotortula*, *Syntrichia*, *Trichostomum* Bruch, and *Tortella* (Lindb.) Limpr. were included. The only species presently in *Tortula* which were included in Mitten's work are as follows: *T. acaulon* (With.) R.H. Zander (as *Phascum cuspidatum* Hedw.), *T. atrovirens* (Turner ex Sm.) Lindb., *T. muralis* Hedw., *T. muricola* (Müll. Hal.) Mitt., and *T. platyphylla* Mitt. Other species reported in Mitten's work, such as *T. contorta* (Hampe) Mont., *T. crenata* Mitt., and *T. peruviana* Mitt., have not been studied further, and therefore their status remains unclear.

This paper presents a taxonomic revision of the genus *Tortula* in South America. The aim is to assess the morphological variation and to delimit the species in the genus *Tortula* in this area. The present revision provides a first contribution to a future study of the family Pottiaceae in South America.

MATERIAL AND METHODS

This revision is based on more than 250 specimens from the following herbaria: AAS, B, BA, BM, BR, CANM, FH, FI, FLAS, GZU, H, HBG, JE, L, LD, M, MO, MUB, NY, O, PC, RB, S, SGO, U, UPS, and US. Curators from CAS, EGR, F, GOET, HB, LIL, MAPR, PMA, and UPTL, and W. J. P. Frahm and Ph. Sollman, kindly answered our request, but they did not find any of the requested specimens in their herbaria. This study also includes new material collected by the first author during fieldwork in Chile and Peru, deposited at MUB and with duplicates in CONC and USM.

The studied area includes the following countries: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, French Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela. However, no species of *Tortula* have been found in Colombia, Ecuador, French Guyana, Guyana, and Suriname.

The names of *Tortula* and the currently included genera, such as *Pottia* and *Phascum*, were checked

in *Index Muscorum* (Wijk, Margadant & Florschütz, 1967, 1969) and in the main South American checklist (Buck, 1985; Greene, 1986; Yano, 1989, 1995, 1996; Delgadillo *et al.*, 1995; He, 1998; Churchill, Griffin III & Muñoz, 2000; Matteri, 2003a, 2004) in order to locate taxa of these genera described in South America. More than 50 names were detected in *Tortula* in this area, although most are of doubtful status and known only from the type locality. In addition, the status of six species described or combined with *Pottia* and one name in *Phascum*, which have not been studied after their description, were detected.

Microscopic examinations and measurements were taken with an Olympus-BH2 light microscope, and microphotographs were obtained with a Spot insight 3.5 camera mounted on this microscope. Specimens were examined in 2% KOH solution. To avoid developmental deviations, descriptions and illustrations were made from leaves taken from the middle of the stem. Cross-sections of vegetative leaves were made in the middle. The leaf width was measured in the middle. As some species show an intramarginal border, the marginal external cells are those placed one or two rows from the margins, and the marginal internal cells are those placed three or more rows from the margins, as shown in Figure 1.

Leaf surface, peristome, and spores were also studied using a Jeol JSM-6100 scanning electron

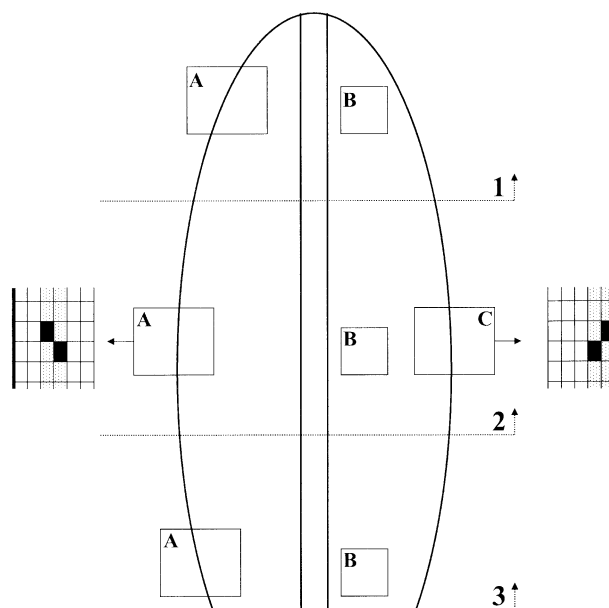


Figure 1. Scheme of the characters used to describe the laminal cells. 1A, Upper external marginal cells. 1B, Upper laminal cells. 2A, Middle internal marginal cells. 2B, Middle laminal cells. 2C, Middle external marginal cells. 3A, Basal external marginal cells. 3B, Basal laminal cells.

microscope at an accelerating voltage of 15–20 kV. The material was fixed in 3% glutaraldehyde with 0.1 M cacodylate buffer at 4 °C, washed in cacodylate and saccharose buffer, dehydrated in an increasing acetone gradient (30%, 50%, 70%, 90%, and 100%), critical point dried, and sputtered with a gold layer (thickness, 200–300 Å).

In the taxonomic treatment, the synonyms included are those reported in the studied area. All type citations refer to the information on the labels of the type material. In the section of excluded names, those that are accepted are shown in bold type, and the first name given is the combination in *Phascum*, *Pottia*, or *Tortula*. New combinations are proposed when differential characters shown by the taxa suggest that they are independent species. For doubtful cases, we have only indicated the genus to which the species should be transferred.

TAXONOMIC TREATMENT

TORTULA HEDW., *SP. MUSC. FROND.*: 104. 1801

Type: Tortula subulata Hedw. [lectotype designated by Steere (1939)].

Description: Plants of small size, growing in loose, dense turfs or gregarious, yellowish green to brown. Stems usually branched; in cross-section, circular, hyalodermis undifferentiated, sclerodermis absent or with the outer cells smaller and with thicker walled, central strand differentiated, sometimes weakly; axillary hairs of hyaline cells. Rhizoids, brownish, smooth; rhizoidal and protonemal gemmae sometimes developed. Leaves incurved to spirally twisted when dry, erect-patent to spreading when moist, usually ovate to lingulate or spatulate, occasionally orbicular, obovate, linear, oblong, or elliptical, flat to concave; base usually not differentiated; lamina unistratose; apex rounded to acute, sometimes tapering to the apex, apiculate or not, occasionally cucullate; margins revolute to recurved, occasionally plane, papillose-crenulate or entire, rarely denticulate near apex, uni- to bistratose, bordered or not, sometimes intramarginally, by short-rectangular to linear or oblate cells, usually less papillose or with smooth and thicker walls than the rest of the laminal cells; costa usually excurrent in a mucro, apiculus or hair-point hyaline, yellowish or brownish, smooth, rarely percurrent or ending below the apex; ventral surface cells of the costa mostly rectangular to quadrate or rounded, papillose or smooth, bulging or not; dorsal surface cells of the costa rectangular to linear, smooth or papillose; in cross-section, semicircular, circular, or elliptical with guide cells in one or two layers, band of ventral stereids usually undifferentiated, band of

dorsal stereids differentiated, semicircular or circular, more rarely oval in shape, sometimes with substereids, hydroids scarcely or well developed, ventral surface cells differentiated, usually quadrate to rectangular, rounded, disposed in one or two layers; dorsal surface cells differentiated; upper and middle laminal cells usually quadrate, short-rectangular or hexagonal, sometimes rhomboidal, rounded or oblate, usually thin-walled, not or slightly collenchymatous, smooth or more commonly papillose, with simple or bifurcate papillae; upper and middle marginal cells oblate, quadrate to rectangular or linear, rarely rounded or rhomboidal, usually thick-walled, smooth or papillose; basal laminal cells rectangular, sometimes oblate, usually inflated, hyaline, thin-walled, not or slightly collenchymatous, usually smooth; basal marginal cells quadrate to long-rectangular, thin- to slightly thick-walled, smooth. Dioecious or monoecious. Perichaetia terminal; leaves usually undifferentiated, rarely sheathing at base. Seta erect or curved, rarely slightly flexuose, usually spirally twisted to right above and to left below, sometimes straight or spirally twisted to left throughout, smooth, yellowish to reddish brown. Capsule erect, rarely horizontal to cernuous, cleistocarpous or stegocarpous, immersed or exserted; theca ovoid to cylindrical, more rarely globose, elliptical or turbinate, orange to reddish brown; exothecial cells quadrate to rectangular, thin- to thick-walled; stomata at theca base, superficial; annulus of one to three vesiculose or rounded, sometimes quadrate rows of cells, usually persistent, sometimes undifferentiated; peristome undifferentiated or of 16 or 32 filamentous or plane, sometimes anastomosed, papillose, spirally twisted or straight teeth, yellowish to orange or brownish, basal membrane usually differentiated, papillose, yellowish to orange or brown. Operculum long conical to rostrate, sometimes undifferentiated, occasionally systylious, with spirally twisted cells or in straight rows, orange to reddish brown. Calyptra cucullate, sometimes slightly mitrate, smooth, naked, yellow to brownish. Spores spherical to elliptical, granulate, sometimes clavate, baculate, verrucose or vermiculate, yellowish to brown. Leaf colour reaction with KOH yellow, rarely orange or with red spots.

1. *TORTULA ACAULON* (WITH.) R.H. ZANDER, *BULL. BUFFALO SOC. NAT. SCI.* 32: 378. 1993 (FIGS 2–10) *Phascum acaulon* With., *Syst. Arr. Brit. Pl.* ed. 4, 3: 768. 1801. *Ind. loc.*: [Great Britain] 'Heaths and ditch banks, garden walks, especially in a sandy soil. . .'. *Type:* not located.
Phascum cuspidatum Hedw., *Sp. Musc. Frond.* 22. 1801. *Ind. loc.*: 'In hortorum areis ubique gregatim'. *Type:* G.

KEY TO SPECIES OF *TORTULA* IN SOUTH AMERICA

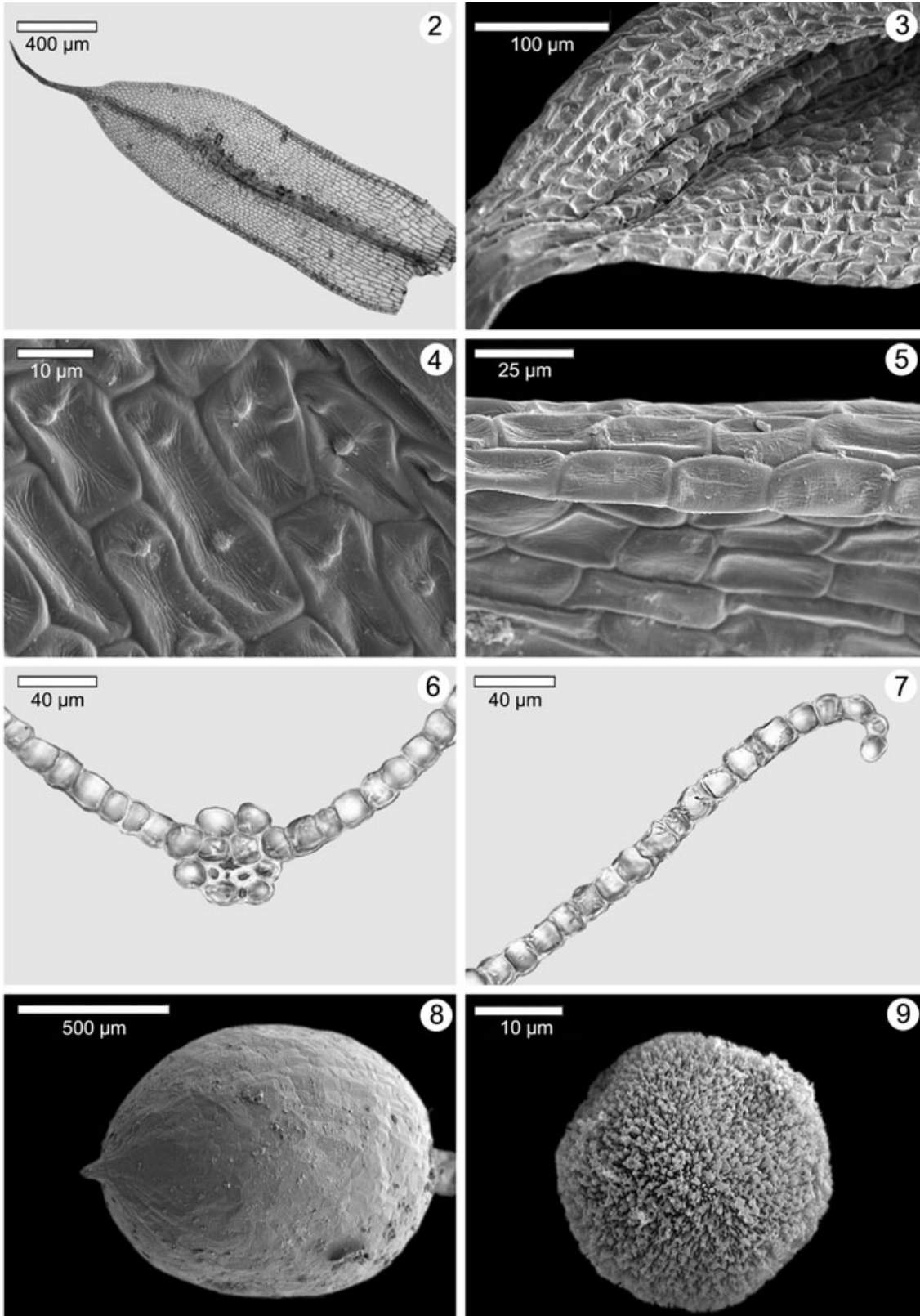
1. Middle external marginal cells of the leaf linear to long-rectangular (length/width ratio, 7.5–40); capsule horizontal or cernuous.....4. *T. cernua*
1. Middle marginal external cells of the leaf quadrate, subquadrate, short-rectangular, or oblate [length/width ratio, (0.3)0.6–1.9(2.8)]; capsule erect.....2
2. Upper and middle laminal cells smooth or with one to three simple papillae, 1 µm high.....3
2. Upper and middle laminal cells with (2)4–6(10) simple or bifurcate papillae, 2.5–5 µm high.....5
3. Capsules cleistocarpous, immersed; leaves usually triangular-lanceolate to oblong or lingulate.....1. *T. acaulon*
3. Capsules stegocarpous, exerted; leaves obovate, linear or elliptical to lanceolate.....4
4. Leaves elliptical to lanceolate, or linear; costa excurrent in a hair-point [(700)1230–1740 µm]; theca cylindrical; peristome of 32 papillose teeth.....2. *T. arequipensis*
4. Leaves usually obovate; costa percurrent or excurrent in a mucro (75–450 µm); theca turbinate; peristome teeth undifferentiated.....10. *T. truncata*
5. Ventral surface cells of the costa rounded to rectangular, (15)22.5–25(32.5) µm in length, bulging, disposed in one to two layers (in cross-section).....6
5. Ventral surface cells of the costa quadrate, rectangular, sometimes subquadrate, rarely oblate or rounded, (7.5)10–17.5 µm in length, not bulging, disposed in one layer (in cross-section).....7
6. Leaf lingulate to oblong-lingulate or obovate, rarely elliptical; leaf margins strongly recurved to revolute from near the base to near the apex.....3. *T. atrovirens*
6. Leaf widely ovate to elliptical or orbicular; leaf margins plane.....5. *T. diaguita*
7. Costa usually ending two to six cells below the leaf apex; basal laminal cells usually slightly thick-walled and papillose; perichaetial leaves slightly sheathing at base.....7. *T. jaffuelii*
7. Costa usually excurrent in a mucro, apiculus, hair-point, or percurrent, rarely ending two to three cells below the leaf apex; basal laminal cells thin-walled and smooth; perichaetial leaves not sheathing at base.....8
8. Middle laminal cells 12.5–20 µm wide.....9
8. Middle laminal cells (5)7.5–12.5(15) µm wide.....10
9. Leaves unbordered; peristome teeth 200–230 µm long, straight; spores 17.5–20 µm in diameter...6. *T. hoppeana*
9. Leaves bordered; peristome teeth *c.* 510 µm long, spirally twisted; spores 7.5–10 µm in diameter.....11. *T. vahliana*
10. Leaves without intramarginal borders or scarcely differentiated [length/width ratio of middle internal marginal cells (0.7)0.9–1.3(1.6)]; peristome teeth more than one turn spirally twisted; basal membrane of peristome (32.5)41.3–81.3(95) µm long.....8. *T. muralis*
10. Leaves with strongly differentiated intramarginal borders [length/width ratio of middle internal marginal cells (0.8)1.8–3.6(4)]; peristome teeth straight or less than one turn spirally twisted; basal membrane of peristome (87.5)100–132.5(150) µm long.....9. *T. platyphylla*

Phascum calodictyon Müll. Hal., *Flora* 71: 4. 1888, *syn. nov. Ind. loc.*: ‘Montevideo, in terra, Octobri 1877: Prof. Arechavaleta, Hb. Lund’. Type: ‘Uruguay, Montevideo’, x.1877, *Arechavaleta s.n.* (holotype: LD!).

Description: Plants 0.3–0.7 cm high, growing in dense or loose turfs, green to yellowish green or yellowish brown. Stems 0.2–0.3 cm, usually branched. Rhizoidal and protonemantic gemmae undeveloped. Leaves incurved to slightly spirally twisted when dry, erect-patent to patent when moist, triangular-lanceolate to oblong or lingulate, concave to keeled, (0.9)1.3–2.5(3.7) × 0.4–0.8 mm; apex acute, occasion-

ally obtuse, tapering to the apex, not cucullate; margins recurved to revolute from near base to the apex, entire, occasionally slightly denticulate by projection of papillae, unistratose, unbordered; costa 50–70 µm wide, excurrent in a hair-point 520–850 µm, yellowish, smooth; ventral surface cells of the costa rectangular, not bulging, smooth or slightly papillose in the upper part; dorsal surface cells of the costa rectangular, smooth; in cross-section, semi-circular, with two guide cells in one layer, band of dorsal stereids semicircular, with one to three stereid rows, band of ventral stereids undifferentiated, occasionally one layer of substereids, hydroids

Figures 2–9. Scanning electron micrographs (Figs 3 – 5, 8, 9) and light micrographs (Figs 2, 6, 7) of *Tortula acaulon* (from *Kuhnemann 175*, PC). Fig. 2. Leaf. Fig. 3. Ventral surface of the leaf apex. Fig. 4. Middle laminal cells. Fig. 5. Middle marginal cells of the leaf. Fig. 6. Cross-section of the costa at midleaf. Fig. 7. Cross-section of the middle marginal cells of the leaf. Fig. 8. Capsule. Fig. 9. Spore.



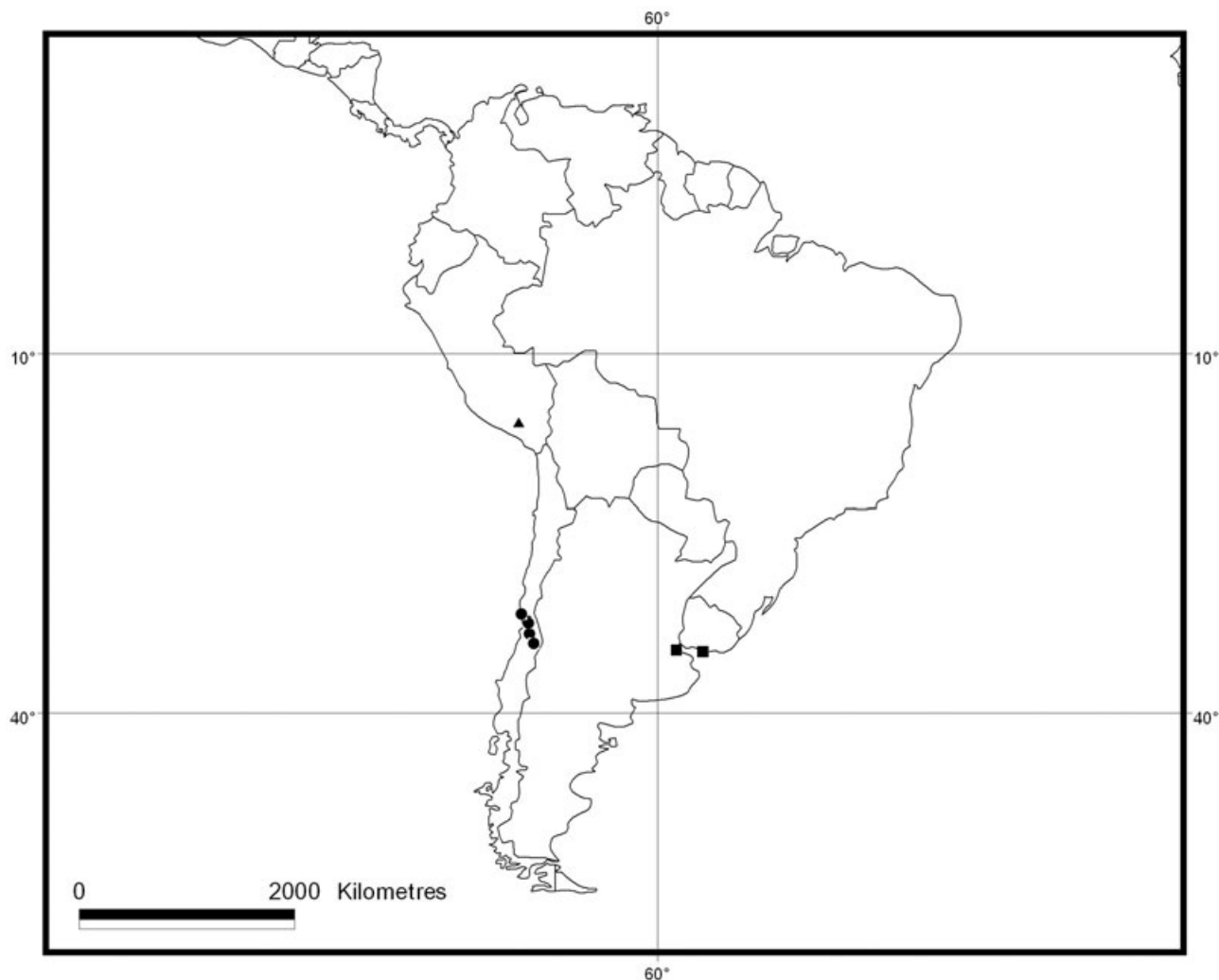


Figure 10. Distribution of *Tortula acaulon* (■), *T. arequipensis* (▲), and *T. jaffuelii* (●) in South America.

developed, ventral surface cells rounded to oblate, $12.5\text{--}15 \times 12.5(22.5)\ \mu\text{m}$, disposed in one layer, dorsal surface cells differentiated; upper laminal cells quadrate-hexagonal to rectangular or quadrate, sometimes rhomboidal, $15\text{--}27.5 \times 7.5\text{--}20\ \mu\text{m}$, thin-walled, not collenchymatous, smooth or with one to two simple papillae, $1\ \mu\text{m}$ high, upper external marginal cells rectangular, $15\text{--}20 \times 7.5\text{--}15\ \mu\text{m}$ (length/width ratio, 1.2–2.7); middle laminal cells quadrate to rectangular, $10\text{--}45 \times 10\text{--}12.5\ \mu\text{m}$, thin- to slightly thick-walled, not collenchymatous, with zero to three simple papillae, $1\ \mu\text{m}$ high, middle external marginal cells rectangular to subquadrate, $12.5\text{--}27.5 \times 10\text{--}17.5\ \mu\text{m}$ (length/width ratio, 0.8–2.8), thin- to slightly thick-walled, smooth, middle internal marginal cells rectangular to quadrate, $15\text{--}22.5 \times 10\text{--}15\ \mu\text{m}$ (length/width ratio, 1–2.3), thin- to slightly thick-walled, smooth; basal laminal cells rectangular, usually inflated, $50\text{--}92.5 \times 22.5\text{--}30\ \mu\text{m}$, thin-walled, not col-

lenchymatous, smooth, basal external marginal cells rectangular, $45\text{--}57.5 \times 10\text{--}15\ \mu\text{m}$ (length/width ratio, 3.6–5.3), thin-walled, smooth. Autoecious. Perichaetial leaves undifferentiated, not sheathing at base, $2.4\text{--}3.3 \times 0.5\text{--}0.8\ \text{mm}$. Seta erect, $0.2\text{--}0.4 \times 0.1\text{--}0.14\ \text{mm}$, straight, yellowish brown. Capsule erect, cleistocarpous, immersed; theca globose, apiculate, $0.8\text{--}1.3 \times 0.6\text{--}1.1\ \text{mm}$, yellowish brown; exothecial cells rectangular, $22.5\text{--}67.5 \times 12.5\text{--}37.5\ \mu\text{m}$, thin-walled; annulus undifferentiated; peristome undifferentiated; basal membrane undeveloped. Operculum undifferentiated. Calyptra cucullate, $0.4\text{--}0.6\ \text{mm}$ long, yellowish brown. Spores spherical, $25\text{--}35\ \mu\text{m}$ in diameter, clavate to baculate, brownish. Leaf colour reaction with KOH yellow.

Illustrations: Guerra (2006: 179 as *Phascum cuspidatum*); Mishler (1994: 379 as *Phascum cuspidatum*);

Zander (1993: 220 as *Tortula atherodes* R.H. Zander, *nom. inval.*).

Habitat: On soil; 0–30 m.

Distribution: Argentina and Uruguay. Also known from Europe (Hill *et al.*, 2006), temperate Asia (Li, Crosby & He, 2001), North Africa (Ros, Cano & Guerra, 1999), North America (Anderson, Crum & Buck, 1990), Central America (Mexico) (Mishler, 1994), Australia (Streimann & Klazenga, 2002), and New Zealand (Fife, 1995).

Additional specimens studied: ARGENTINA. BUENOS AIRES: Buenos Aires, 11.vi.1936, *Kühnemann 175* (PC). URUGUAY. MONTEVIDEO: Montevideo, vi.1874, *Arechavaleta s.n.* (NY); *ibid.*, *Gibert 1335* (NY).

Notes: *Tortula acaulon* is easily recognized by its triangular-lanceolate to oblong leaves, smooth or slightly papillose distal laminal cells, acute apex, and cleistocarpous and immersed capsule.

It was reported by Mitten (1869) from the Neotropics [*Andes Quitenses, Spruce*]; however, no material was found at Mitten herbarium in NY which confirms this record.

Phascum calodictyon was described by Müller (1888) in his paper on 'Musci cleistocarpici novi', where he commented that it was a species close to *Phascum cuspidatum* (*Tortula acaulon*). After examining the original material, which according to the protologue was deposited in LD, we could not find any morphological differences between this taxon and *Tortula acaulon*. Therefore, *Phascum calodictyon* is proposed as a new synonym of the latter species.

2. *TORTULA AREQUIPENSIS*, SP. NOV. (FIGS 10–19)

Diagnosis: Autoica. Phyllidia elliptica vel angustiora (lanceolata vel etiam linearia) sed apice acuta vel acuminata, margine distincta carentia sed marginaliter plerumque recurvata; nervo in longum pilum hyalinum, flavidulum, excurrenti; laminae cellulis magnis, laevibus. Theca cylindrica, peristomatis dentibus, in basali brevi membrana insidentibus, parce spiraliter contortis.

Type: PERU. AREQUIPA: pr. Chivay, cara sur nevado Huarancante, 15°45'30"S, 71°32'43"W, 1.iv.2005, 4600 m, *Cano 2163a* (holotype: MUB 20373; isotype: USM).

Description: Plants 1.5–1.7 cm high, growing in dense turfs, green to yellowish green. Stems 1.3–1.5 cm, branched. Rhizoidal and protonematic gemmae undeveloped. Leaves incurved to slightly twisted when dry,

patent when moist, elliptical to lanceolate, or linear, concave to keeled, 2.6–4.7 × 0.9–1.6 mm; apex acute, sometimes acuminate, tapering to the apex, not cucullate; margins recurved from near the base to the apex or upper third, sometimes recurved at one margin and plane at the other, entire, sometimes denticulate near the apex by projection of papillae, unistratose, unbordered; costa 87.5–107.5 µm wide, excurrent in a hair-point (700)1230–1740 µm, yellowish, smooth; ventral surface cells of the costa rectangular, not bulging, smooth; dorsal surface cells of the costa elongate, smooth; in cross-section, semicircular, with two guide cells in one layer, band of ventral stereids undifferentiated, band of dorsal stereids semicircular, with three to four stereid rows, hydroids developed, ventral surface cells rounded to oblate, 12.5–15 × 12.5–15 µm, disposed in one layer, dorsal surface cells differentiated; upper laminal cells hexagonal-quadrate to rounded, 15–30 × 15–20 µm, thin- to slightly thick-walled, not collenchymatous, smooth, upper external marginal cells quadrate to rectangular, 12.5–27.5 × 12.5–17.5 µm (length/width ratio, 1–1.8); middle laminal cells rectangular to hexagonal, 32.5–50 × 15–22.5 µm, thin- or slightly thick-walled, not or slightly collenchymatous, smooth, middle external marginal cells oblate, quadrate or rectangular, 12.5–15 × 12.5–20 µm (length/width ratio, 0.8–1), slightly thick-walled, smooth, middle internal marginal cells rectangular to oblate, 12.5–27.5 × 12.5–20 µm (length/width ratio, 0.6–1.3), slightly thick-walled, smooth; basal laminal cells rectangular, inflated, 22.5–87.5 × 20–27.5 µm, thin-walled, not collenchymatous, smooth, basal external marginal cells rectangular, 27–75 × 12.5–17.5 µm (length/width ratio, 1.8–5), thin-walled, smooth. Autoecious. Perichaetial leaves undifferentiated, not sheathing at base, 2.7–3.9 × 0.6–0.9 mm. Seta erect, sometimes curved, 8–1 × 0.16–0.23 mm, twisted to the right above and slightly to the left below, yellowish to reddish brown. Capsule erect, stegocarpous, exerted; theca cylindrical, 2.1–2.5 × 0.8–0.9 mm, orange to reddish brown; exothecial cells rectangular, 50–137.5 × 20–30 µm, slightly thick-walled; annulus of vesiculate cells; peristome of 32 filamentous and papillose teeth, sometimes anastomosed at base, less than one turn spirally twisted, 450–660 µm long, yellowish; basal membrane 80–100 µm long. Operculum conical, 0.8–1 mm long, not systylious, with spirally twisted cells. Calyptra cucullate, 4.5–4.9 mm long, yellowish brown. Spores spherical, 15–20 µm in diameter, granulate, light brown. Leaf colour reaction with KOH yellow.

Habitat: Soil under volcanic rock in a rocky open formation with spots of *Azorella* Lam., *Nototriche* Turcz., and *Geranium sessiliflorum* Cav.; 4600–4900 m.

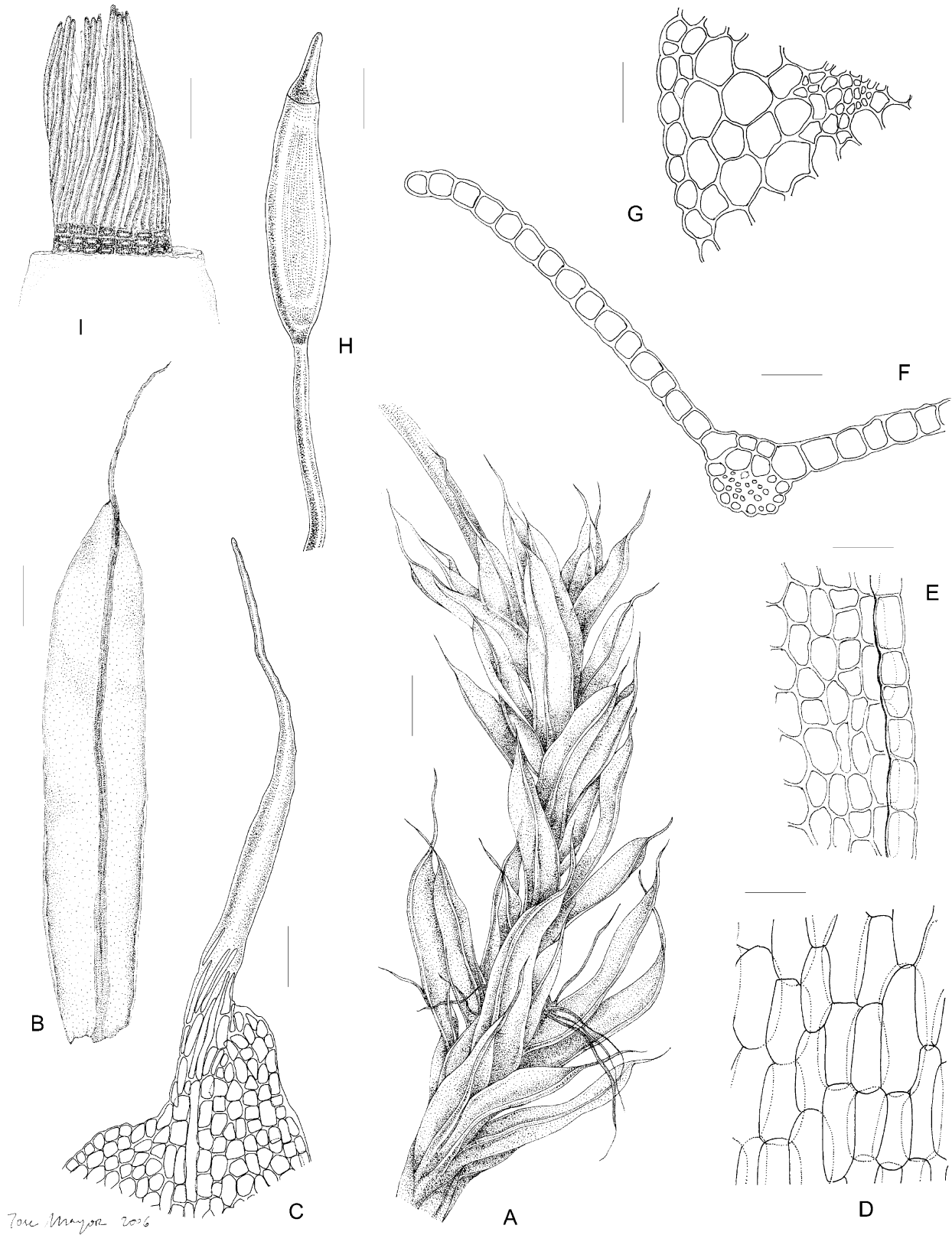


Figure 11. Drawings of *Tortula arequipensis* (from *Cano 2163b*, MUB). A, habit; B, leaf; C, leaf apex; D, basal laminal cells; E, middle marginal cells; F, cross-section of the leaf at middle; G, cross-section of the stem; H, capsule; I, peristome. Scale bars: A, 1 mm; B, 0.5 mm; C, 90 μ m; D, E, 35 μ m; F, G, 55 μ m; H, 0.7 mm; I, 160 μ m.

Distribution: Peru.

Additional specimen studied: PERU. AREQUIPA: Nevado Huarancante, 15°44'44"S, 71°34'34"W, 3.iv.2005, *Cano 2213* (MUB 20753, USM).

Notes: *Tortula arequipensis* is characterized by long leaves, with a yellowish hair-point, upper and middle laminal cells 15–22.5 µm wide, smooth, and peristome with a short basal membrane. It is close to *Tortula mucronifolia* Schwägr., a species known from Europe, temperate Asia, North Africa, North America, Mexico, and New Zealand. Both species share the shape and size of the leaf, usually smooth laminal cells, size of the capsule, spores, and peristome, but *T. arequipensis* has a longer yellowish hair-point [(700)1230–1740 µm] than *T. mucronifolia* (130–500 µm) and a shorter basal membrane of the peristome (80–100 µm) than *T. mucronifolia* (380–900 µm). The high basal membrane of the peristome, which forms a tube above the mouth of the urn, is a distinctive character of *T. mucronifolia*. We have studied some Arctic specimens of *T. mucronifolia* with a shorter basal membrane of the peristome. However, in these cases, whole plants are smaller than the typical form (reduced leaves, seta, and peristomes), being dwarfed forms of *T. mucronifolia*. This peculiarity was also observed by Steere (1940). In well-developed plants, no material of *T. mucronifolia* with a shorter basal membrane has been found (Cano *et al.*, 2005), and the two Peruvian specimens of *T. arequipensis* show the same diagnostic characters.

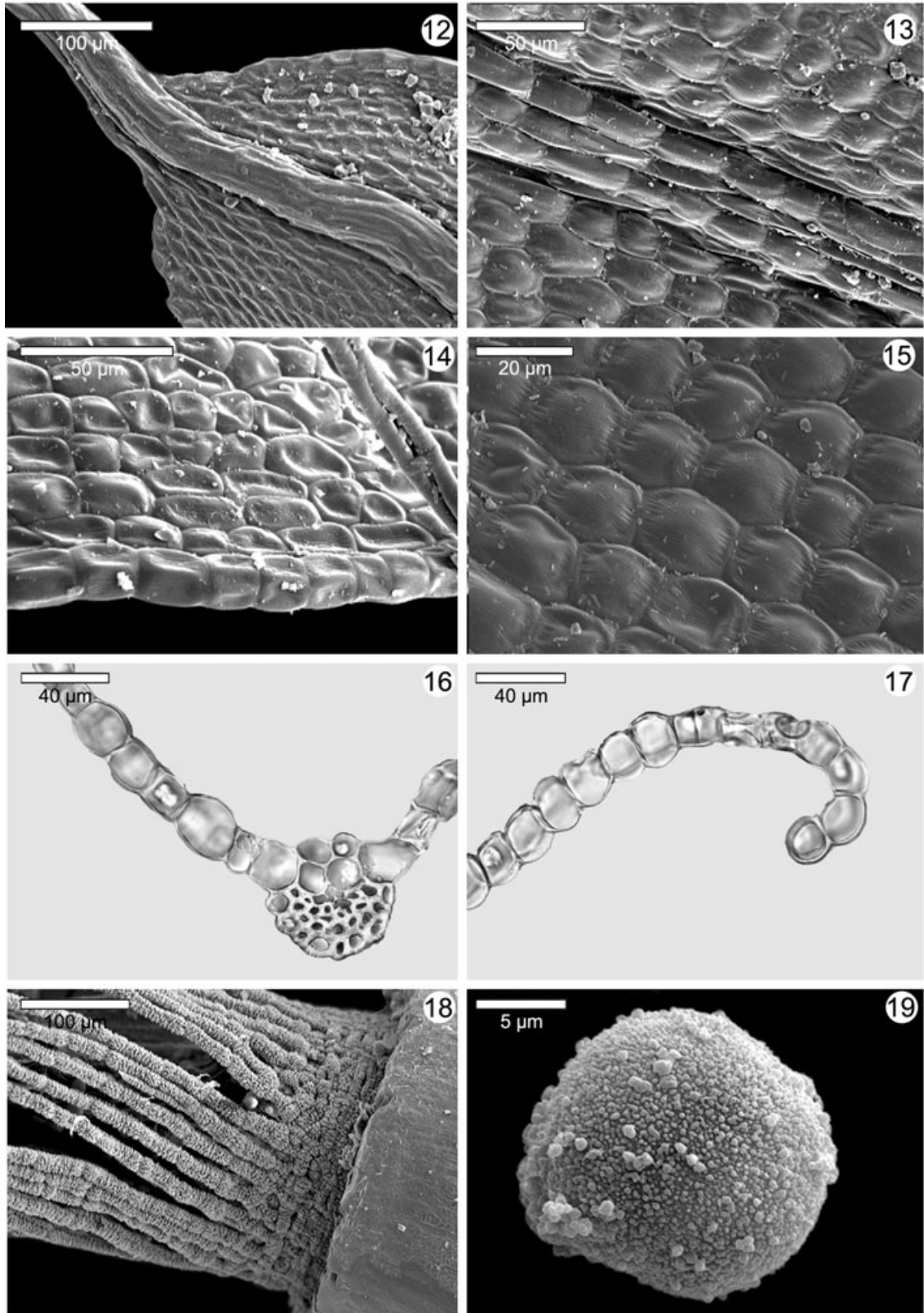
3. *TORTULA ATROVIRENS* (TURNER EX SM.) LINDB., ÖFVERS. FÖRH. KONGL. SVENSKA VETENSK.-AKAD. 21: 236. 1864 (FIGS 20–28)

Grimmia atrovirens Turner ex Sm., *Engl. Bot.* 28: 2015. 1809. *Ind. loc.*: 'sent by the Rev. H. Davies from North Wales, and grew on the ground in broad patches'. *Type*: [Great Britain] 'Anglesea' 1800, *Davies s.n.* [lectotype designated by Cano & Gallego (2003): BM!].

Tortula minima Herzog, *Biblioth. Bot.* 87: 46, fig. 13e–i. 1916, *syn. nov.* *Ind. loc.*: 'Auf Erde zwischen Choro u. Cocapata, c. 3500 m, No. 4170'. *Type*: [Bolivia] 'Zwischen Choro und Cocapata' 3500 m, viii.1911, *Herzog 4170* (holotype: JE!; isotype: PC!).

Tortula atrovirens var. *brevifolia* Thér., *Revista Chilena Hist. Nat.* 25: 296. 1921, *syn. nov.* *Ind. loc.*: 'Playa Ancha (Valparaíso), sur la terre, c. fr. (Amb. Buriel; 1915, h. Costes, n. 78 et 81)'. *Type*: [Chile] 'Playa Ancha (Valparaíso)', 1915, *Buriel 78/81* (holotype: PC!).

Description: Plants 0.2–0.5 cm high, growing in loose or dense turfs, green-olive to brownish. Stems (0.05)0.1–0.3 cm high, simple or branched. Rhizoidal and protonematic gemmae undeveloped. Leaves regularly spirally twisted when dry, erect-patent to patent when moist, lingulate to oblong-lingulate, obovate, sometimes elliptical, strongly concave, (0.9)1.2–1.9(2.4) × 0.4–0.6 mm; apex obtuse to acute, occasionally apiculate, up to 37.5 µm long, cucullate or not; margins strongly recurved to revolute from near the base to the apex, entire or papillose-crenulate from the apex to middle or in the upper third, unistratose, usually bordered by zero to six differentiated cell rows, forming a marginal border; costa (50)62.5–86.8(109) µm wide, usually percurrent or excurrent in a mucro, brownish, 20–370 µm, smooth; ventral surface cells of the costa rounded, bulging, papillose; dorsal surface cells of the costa elongate, smooth, rarely slightly papillose; in cross-section, circular to semicircular, with two to five guide cells in one layer, band of ventral stereids undifferentiated, band of dorsal stereids usually oval, with 2–5(8) stereid rows, hydroids developed, ventral surface cells rounded to rectangular, 20–32.5 × 12.5–17.5 µm, disposed in one to two layers, dorsal surface cells usually differentiated, smooth; upper laminal cells quadrate to rectangular, occasionally oblate or hexagonal, 10–12.5(15) × (7.5)10–12.5(15) µm, thin- to slightly thick-walled, not collenchymatous, with two to six bifurcate papillae, more rarely simple (1.5)2.5 µm high, upper external marginal cells oblate to rounded-quadrate, sometimes rectangular or quadrate, 7.5–10 × (7.5)10–12.5(15) µm (length/width ratio, 0.6–1.3); middle laminal cells quadrate to rectangular, 10–15 × (7.5)10–12.5 µm, thin-walled, not collenchymatous, with two to six simple or bifurcate papillae, 2.5 µm high, middle external marginal cells oblate to quadrate, (5)7.5–12.5 × (7.5)10–15 µm [length/width ratio, (0.3)0.6–1], usually slightly thick-walled, smooth, middle internal marginal cells oblate to rounded, rarely rectangular or quadrate, (7.5)10–12.5 × (7.5)10–15 µm [length/width ratio, (0.5)0.7–1.3], thin- to slightly thick-walled, smooth; basal laminal cells rectangular, sometimes oblate, inflated or not, 15–55 × (12.5)15–25(27.5) µm, thin-walled, not collenchymatous, smooth, basal external marginal cells quadrate to rectangular, (15)20–30 × 12.5–20 µm [length/width ratio, 1–1.9(2.4)], thin- to slightly thick-walled transversally, smooth. Autoecious. Perichaetial leaves undifferentiated, rarely weakly differentiated, with the leaf margins less recurved than vegetative leaves and a longer mucro, not sheathing at base, 1.2–1.5 × 0.4–0.7 mm. Seta erect, (1.8)3–5(6.3) × 0.08–0.1 mm, orange to yellowish brown, twisted to the right above and slightly to the left below. Capsule erect, stegocarpous, exerted; theca ovoid-cylindrical



to ovoid or elliptical, $0.1\text{--}1.8 \times 0.5\text{--}0.6$ mm, orange to brownish; exothelial cells rectangular, $27.5\text{--}87.5 \times 17.5\text{--}25$ μm , usually thick-walled; annulus of vesiculose cells; peristome of 16 filamentous to plane and papillose teeth, irregularly divided below, sometimes anastomosed, straight to slightly spirally twisted, $62.5\text{--}140$ μm long, yellowish to orange; basal membrane $30\text{--}87.5$ μm long. Operculum conical, 0.39 mm long, not systylious, with straight to slightly spirally twisted cells. Calyptra cucullate, c. 1.75 mm long, yellowish brown. Spores spherical, $17.5\text{--}20$ μm in diameter, granulate to vermiculate, light brown. Leaf colour reaction with KOH yellow with red spots.

Illustrations: Cano (2006: 164); Magill (1981: 211 as *Desmatodon convolutus* (Brid.) Grout); Mishler (1994: 358); Zander (1993: 221).

Habitat: Bare soils and crevices of rocks with accumulated soil; 0–3500 m.

Distribution: Argentina, Bolivia, Chile, and Uruguay. Also known from Europe (Hill *et al.*, 2006), temperate Asia (Kürschner, 2000; Li *et al.*, 2001), North America (Steere, 1939), Mexico (Mishler, 1994), Africa (Magill, 1981; O'Shea, 2003), Australia (Streimann & Klazenga, 2002), and New Zealand (Fife, 1995).

Representative specimens studied: ARGENTINA. CÓRDOBA: Unquillo-versus río Ceballos, 2.v.1931, *Hosseus 400* (FH, M, PC). CHUBUT: xi.1895, *Dusén s.n.* (S). Mendoza: Portezuelo de Rahué, ii.1888, *Kuntze 6042a* (S B103854). SALTA: south of Cafayate, 3.xii.1960, *Steere 60-114b* (NY). CHILE. REGIÓN II (ANTOFAGASTA): Paposo, Quebrada Guanillos, Aguada Perales, sector de los tranques, 12.xi.1972, *Mahú 11421* (MO). REGIÓN IV (COQUIMBO): pr. Choros, 12.xi.2001, *Cano 144* (MUB 20844). REGIÓN V (VALPARAÍSO): Valparaíso 1940, *Schwabe s.n.* (JE). REGIÓN METROPOLITANA DE SANTIAGO: Baños de Colina, 8.ix.2001, *Cano 27* (MUB 20842). REGIÓN VI (MAULE): pr. Constitución, 14.xii.2001, *Cano 409* (MUB 18228). URUGUAY. MONTEVIDEO: Santiago Vázquez 1927, *Herter 843* (NY).

Notes: *Tortula atrovirens* is characterized by linguulate to oblong-lingulate leaves, mucronate apex, recurved to revolute margins from near the base to the apex, and strongly developed ventral surface cells of the costa. Some material studied has costa with

two to three dorsal stereid layers and with ventral surface cells of the costa disposed in one to two layers, which is similar to specimens from Morocco and the Canary Islands identified as *Crossidium davidai* Catches. Other samples (*Cano 409*) show a long mucro which, in the perichaetial leaves, is even a short hair-point. Until new collections are carried out in the studied area, these specimens are included in the variation shown by *T. atrovirens*.

In the studied area, this species was reported from central Argentina, Uruguay, and central Chile. After this study, the range of this species was extended to the Neotropics (Bolivia, and tropical areas of Argentina and Chile).

Tortula minima was described by Herzog (1916) from a collection from Bolivia. After study of the type material, we conclude that there are no significant morphological differences between this taxon and *T. atrovirens*, and so it is regarded as synonymous with the latter species.

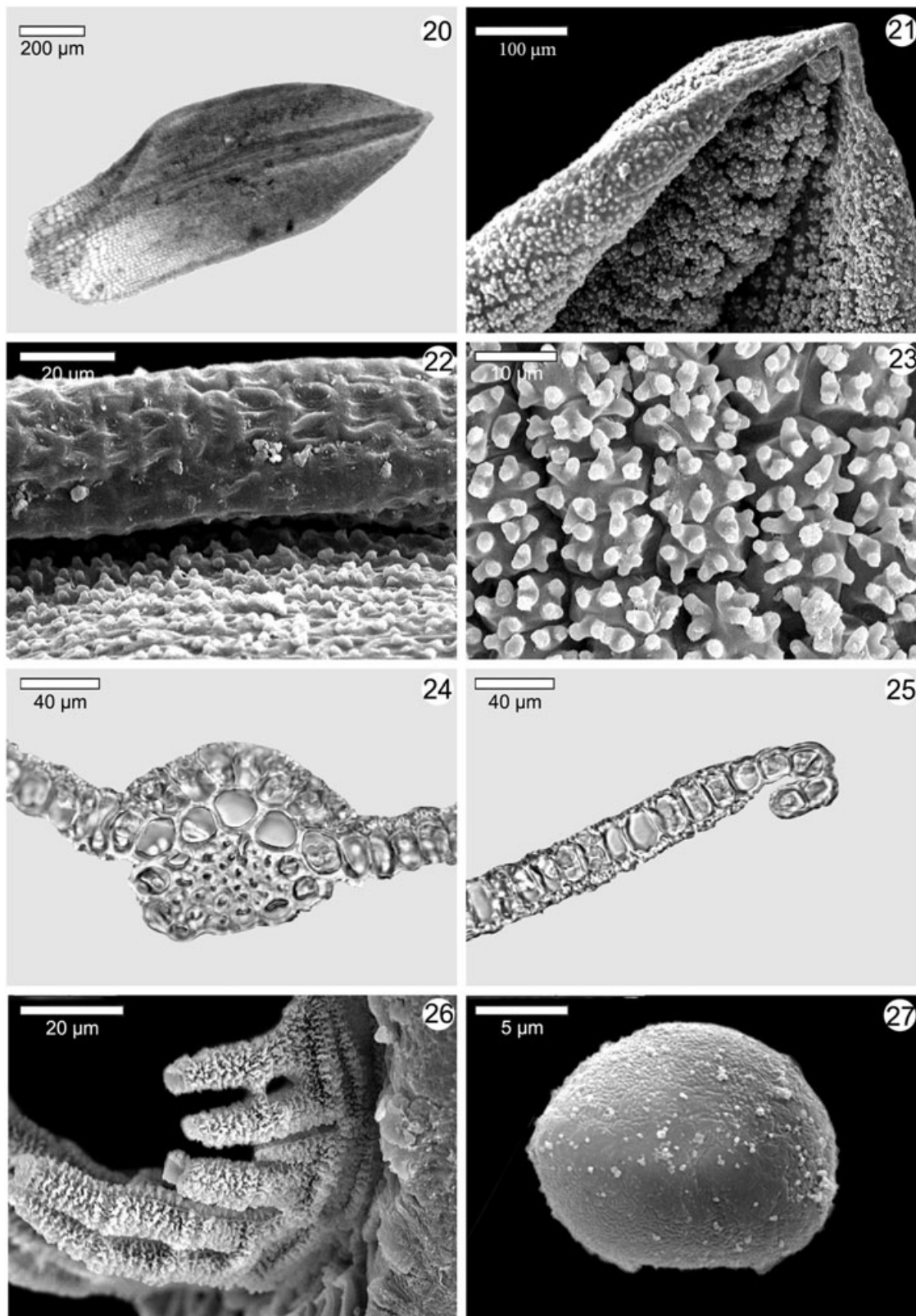
The type study of *T. atrovirens* var. *brevifolia* has shown that its differential characters are within the usual range of variation of *T. atrovirens*, and it is considered to be synonymous with the latter species.

Zander (1993) considered *Didymodon schimperi* (Mont.) Broth. (*Trichostomum schimperi* Mont., Ann. Sci. Nat., Bot., sér. 3, 4: 109. 1845) as synonymous with *T. atrovirens*. After studying the original material of *Trichostomum schimperi* ['Chile, Racangua' 1828, *Bertero s.n.* (PC!)], it does not correspond to any species of *Tortula*. *Trichostomum schimperi* has linguulate leaves, recurved margins, rounded apex, upper and middle laminal cells papillose, ventral surface of the costa with elongated cells on the upper half of the leaf, absence of hydroids, yellowish orange leaf colour reaction with KOH, and peristome of 16 cleft, irregular and short teeth. In addition, it shows teratological axillary hairs, rare structures described in some species of *Didymodon tophaceus* (Brid.) Lisa from Arkansas in the USA (Allen, 1992), which have not been detected in the European, Asiatic, and North African specimens of *Didymodon tophaceus* (Jiménez *et al.*, 2005). Therefore, we have concluded that *Trichostomum schimperi* is a badly preserved specimen of *Didymodon tophaceus*.

4. *TORTULA CERNUA* (HUEBENER) LINDB., *MUSCI SCAND.*: 20. 1879 (FIGS 29–37)

Desmatodon cernuus Huebener, *Muscol. Germ.*: 117. 1833. *Ind. loc.*: 'Diese ausgezeichnete Art wurde vom

← **Figures 12–19.** Scanning electron micrographs (Figs 12 – 15, 18, 19) and light micrographs (Figs 16, 17) of *Tortula arequipensis* (from *Cano 2163b*, MUB). Fig. 12. Dorsal surface of the leaf apex. Fig. 13. Ventral surface cells of the leaf costa at middle. Fig. 14. Middle marginal cells of the leaf. Fig. 15. Middle laminal cells. Fig. 16. Cross-section of the costa at midleaf. Fig. 17. Cross-section of the middle marginal cells of the leaf. Fig. 18. Peristome. Fig. 19. Spore.



Figures 20–27. Scanning electron micrographs (Figs 21 – 23, 26, 27) and light micrographs (Figs 20, 24, 25) of *Tortula atrovirens* (from Cano 27, MUB). Fig. 20. Leaf. Fig. 21. Ventral surface of the leaf apex. Fig. 22. Middle marginal cells. Fig. 23. Middle laminal cells. Fig. 24. Cross-section of the costa at midleaf. Fig. 25. Cross-section of the middle marginal cells of the leaf. Fig. 26. Peristome. Fig. 27. Spore.

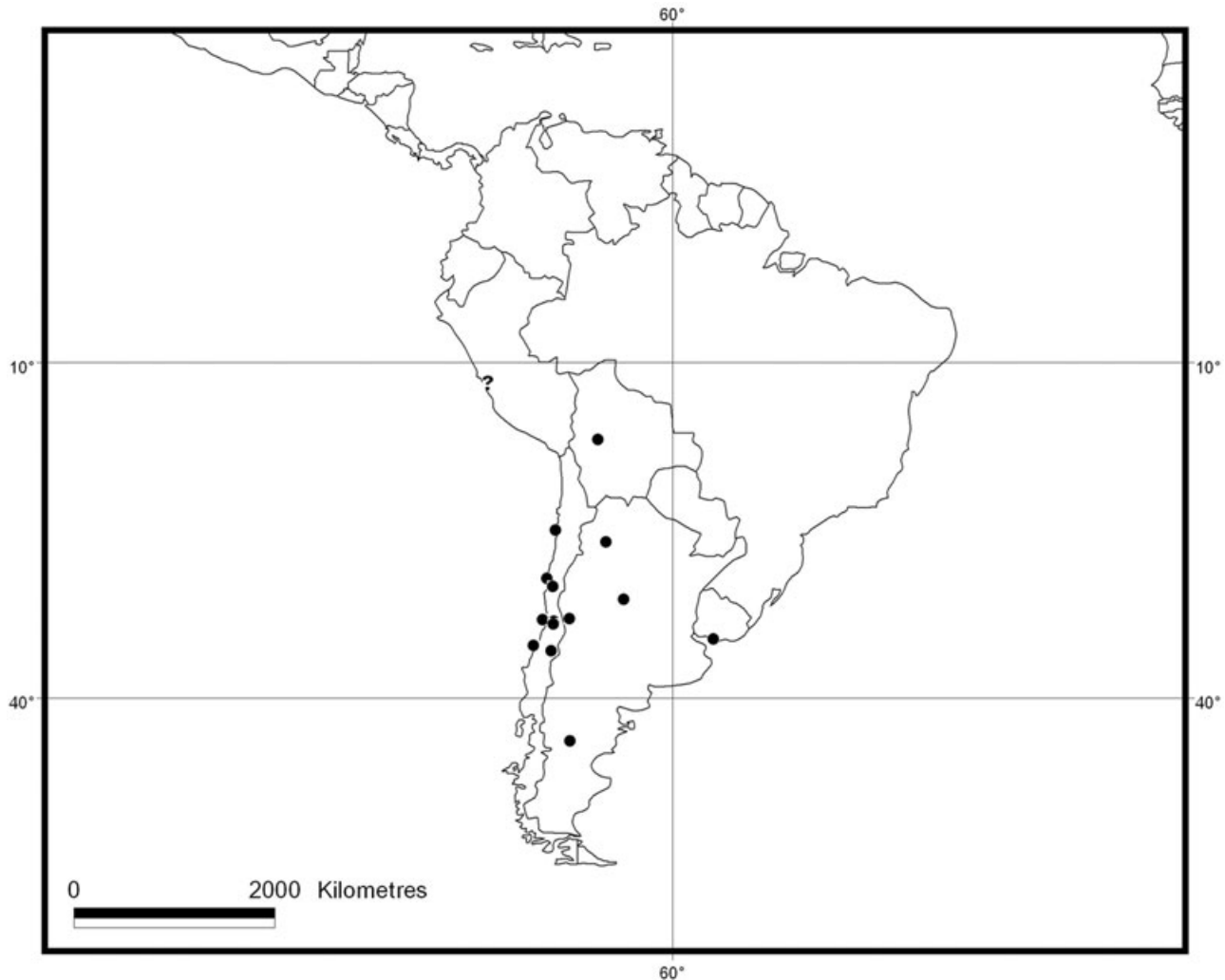
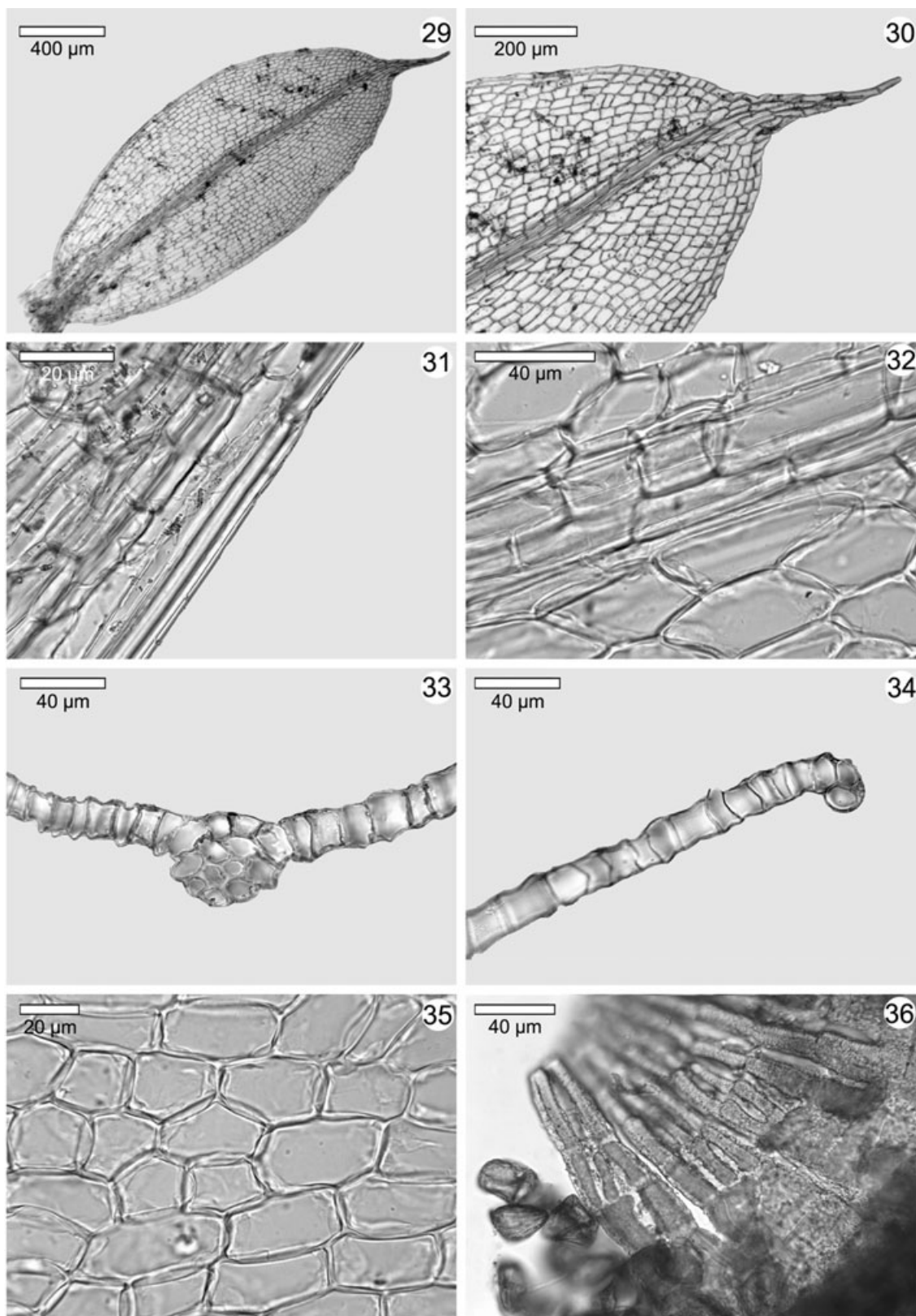


Figure 28. Distribution of *Tortula atrovirens* (●) and *T. vahliana* (?) in South America. Inexact locality of *T. vahliana* in Peru is marked with a question mark.

Prof. Treviranus, welcher sie mir gütigst ertheilt, im südlichen Tyrol auf dem Schleeherngebirge im Sommer 1826 entdeckt'. Type: '[Pap Schernitz] in Tyrol', *Treviranus s.n.* (lectotype designated here: BM-Schimper!).

Desmatodon argentinicus Broth., *Ark. Bot.* 15(6): 5. 1918. *Tortula argentinica* (Broth.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 222. 1993, *syn. nov. Ind. loc.*: 'Argentina: prov. Jujuy, Laguna colorada (in puna) loco graminoso subhumido, c. 3900 m s. m. (n. 55)'. Type: 'Argentina: prov. Jujuy, Laguna colorada', 3900 m, 20.x.1901, *Fries* 55 (holotype: H-BR 1131 11!; isotypes: PC!, S B103432!).

Description: Plants 0.6–0.7 cm high, growing in loose turfs, yellowish. Stems 0.3–0.4 cm, simple. Rhizoidal and protonemtic gemmae undeveloped. Leaves erect, flexuose when dry, patent to spreading when moist, oblong to obovate or spatulate, flat, 1.6–2.4 × 0.5–0.9 mm; apex obtuse to acute, not cucullate; margins plane above, recurved in the basal third or from the base to the middle or upper third, entire, in some leaves slightly dentate near the apex, unistratose to bistratose in the marginal row, bordered by 2(3) differentiated cell rows, forming a marginal border; costa 50–67.5 µm wide, percurrent to excurrent in an apiculus, yellowish, 260 µm, smooth; ventral surface



Figures 29–36. Light micrographs of *Tortula cernua* (from Fries 55, PC). Fig. 29. Leaf. Fig. 30. Ventral surface of the leaf apex. Fig. 31. Middle marginal cells of the leaf. Fig. 32. Ventral surface cells of the leaf costa at middle. Fig. 33. Cross-section of the costa at midleaf. Fig. 34. Cross-section of the middle marginal cells of the leaf. Fig. 35. Middle laminal cells. Fig. 36. Peristome and spores.

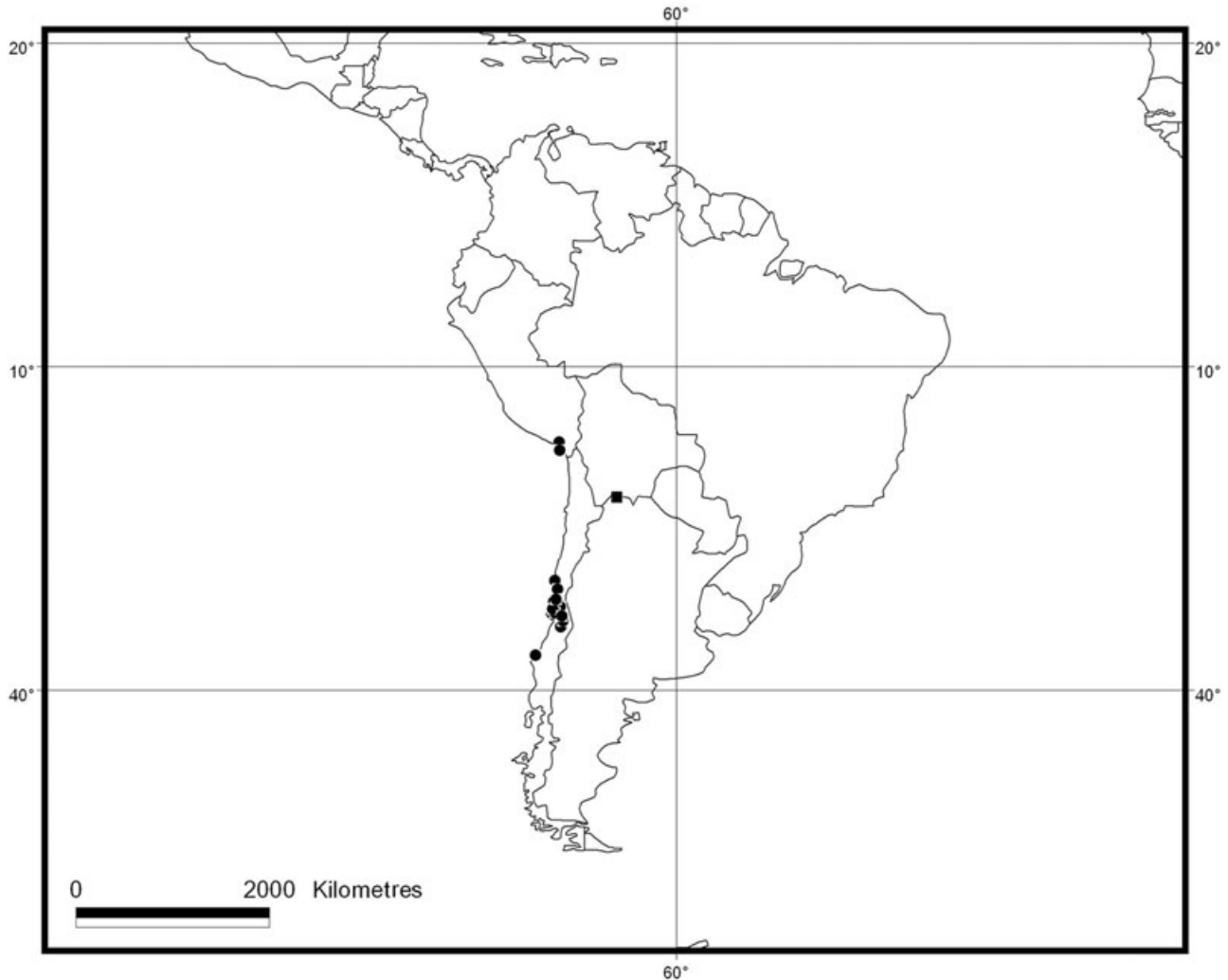


Figure 37. Distribution of *Tortula cernua* (■) and *T. platyphylla* (●) in South America.

cells of the costa rectangular, not bulging, smooth; dorsal surface cells of the costa linear, smooth; in cross-section, semicircular, with two guide cells in one layer, band of ventral stereids undifferentiated, band of dorsal stereids semicircular, with one to two substereids, hydroids scarcely developed, ventral surface cells quadrate, $12.5\text{--}15 \times 17.5\text{--}20 \mu\text{m}$, disposed in one layer, dorsal surface cells scarcely differentiated; upper laminal cells hexagonal, quadrate or rectangular, $20\text{--}55 \times 20\text{--}27.5 \mu\text{m}$, thin-walled, not collenchymatous, smooth, upper external marginal cells rectangular to rhomboidal, $15\text{--}32.5 \times 7.5\text{--}15 \mu\text{m}$ (length/width ratio, 1–4.3); middle laminal cells rect-

angular to hexagonal, sometimes slightly inflated, $37.5\text{--}55 \times 20\text{--}27.5 \mu\text{m}$, thin-walled, not or scarcely collenchymatous, smooth, middle external marginal cells linear to long-rectangular, $67\text{--}100 \times 2.5\text{--}10 \mu\text{m}$ (length/width ratio, 7.5–40), slightly thick-walled, smooth, middle internal marginal cells linear to rectangular, $45\text{--}50 \times 10\text{--}15 \mu\text{m}$ (length/width ratio, 3–5), slightly thick-walled, smooth; basal laminal cells rectangular, inflated, $40\text{--}87.5 \times 30\text{--}55 \mu\text{m}$, thin-walled, not collenchymatous, smooth, basal external marginal cells long-rectangular to rectangular, $87.5\text{--}117.5 \times 12.5\text{--}15 \mu\text{m}$ (length/width ratio, 5.8–9.4), thin-walled, smooth. Monoecious (autoecious). Perichaetial leaves

Figures 38–45. Scanning electron micrographs (Figs 38–41, 45) and light micrographs (Figs 42–44) of *Tortula diaguita* (from Cano 187a, MUB). Fig. 38. Leaf. Fig. 39. Dorsal surface of the leaf apex. Fig. 40. Middle marginal cells of the leaf. Fig. 41. Ventral surface cells of the costa and laminal cells at middle. Fig. 42. Cross-section of the costa at midleaf. Fig. 43. Cross-section of the middle marginal cells of the leaf. Fig. 44. Peristome. Fig. 45. Spore.

usually undifferentiated, not sheathing at base, 2.6×0.6 mm. Seta slightly flexuose, $9.7\text{--}14.5 \times 0.15\text{--}0.18$ mm, slightly twisted to the right above and to the left below, brownish. Capsule horizontal or cernuous, stegocarpous, exerted; theca ovoid-cylindrical, $1.1\text{--}1.6 \times 0.7\text{--}0.8$ mm, brownish; exothecial cells quadrate to rectangular, $32.5\text{--}62.5 \times 20\text{--}32.5$ μm , slightly thick-walled; annulus of rounded cells; peristome of 16 plane and slightly papillose teeth, sometimes divided into two to three linear prongs, often anastomosed below, straight, $180\text{--}200$ μm long, yellowish brown, basal membrane $30\text{--}50$ μm long. Operculum conical, $0.5\text{--}0.6$ mm long, not systylous, with cells in straight rows. Calyptra not seen. Spores spherical, $30\text{--}32.5$ μm in diameter, verrucose, brownish. Leaf colour reaction with KOH yellow.

Illustrations: Crum & Anderson (1981: 379 as *Desmatodon cernuus*); Zander (1993: 221).

Habitat: Soil in puna formation; 3900 m.

Distribution: Argentina. Also known from Europe (Hill *et al.*, 2006), North America (Crum & Anderson, 1981), and temperate Asia (Li *et al.*, 2001).

Notes: According to Stafleu & Cowan (1979), the original herbarium of Hübener in LZ was destroyed, but there is material of this author housed at BM, FB, HEID, and STR. We have located one syntype of *Desmatodon cernuus* at Schimper herbarium in BM, which is chosen as the lectotype.

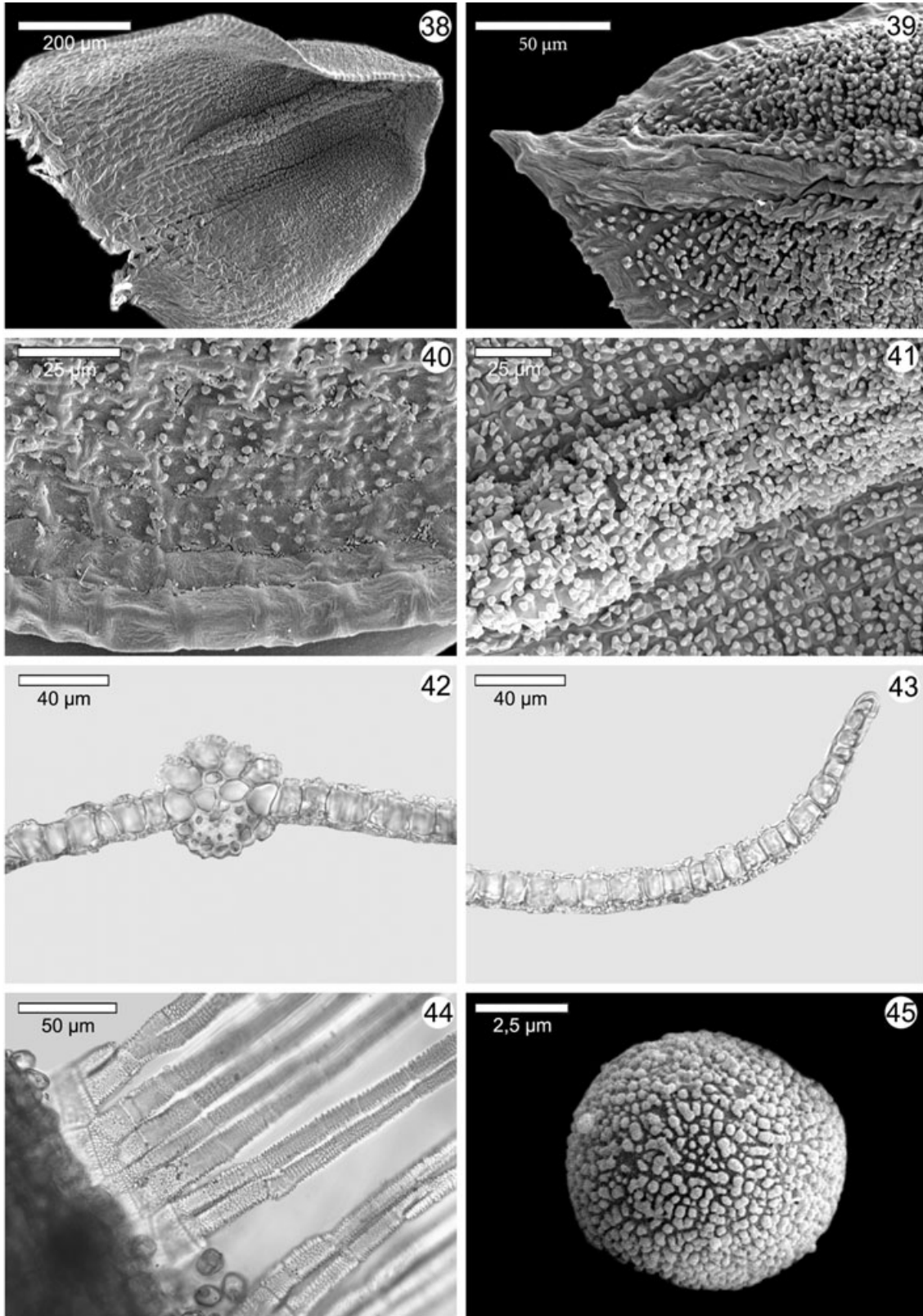
Desmatodon argentanicus was described by Brothrus (1918) from a specimen collected by R. E. Fries in the Andean north of Argentina. The type material shows leaves with smooth cells, upper and middle external marginal cells of the leaf linear and disposed in one to two layers, which form a border, and a cernuous or horizontal capsule, with short and straight peristome teeth. We have not found significantly different characters between *D. argentanicus* and the type material of *T. cernua*. The only differential character is the smooth laminal cells in *D. argentanicus*. In the protologue, Brothrus (1918) also mentioned: 'species *D. cernuo* (Hüb.) Bryol. eur. affinis, sed foliis laxe reticulatis cellulis laevissimis jam dignoscenda'. However, the presence or absence of papillae in the laminal cells seems to be a variable character in this species (Crum & Anderson, 1981), and *D. argentanicus* is similar to other North Ameri-

can collections studied of *T. cernua*. Therefore, *D. argentanicus* is here proposed as a new synonym of *T. cernua*. Moreover, *T. cernua* is newly reported for South America.

5. **TORTULA DIAGUITA** (R.H.ZANDER & MAHÚ)
M.J.CANO & M.T.GALLEGO, **COMB. NOV.**
(FIGS 38–46)

Hennediella diaguita R.H. Zander & Mahú, *Bryologist* 102: 349, figs 1–11. 1999. *Ind. loc.*: 'Chile. Prov. De Limari. Parque Nacional Fray Jorge, La Escondida, matorral de Trichocereus, Eriocyse and Caesalpinia, on soil, 270 m, Mahú 21946, 10 September 1986'. *Type:* 'Chile. Coquimbo (Región IV): Limari, Parque Nacional Fray Jorge, La Escondida', 270 m, 10.ix.1986, *Mahú 21946* (holotype: MO!).

Description: Plants 0.2–0.3 cm high, growing in loose turfs or gregarious, yellowish green. Stems 0.05–0.1 cm, simple or branched. Rhizoidal and protonematic gemmae undeveloped. Leaves patent-incurved when dry, patent to spreading when moist, widely ovate to elliptical or orbicular, concave, $(0.7)0.9\text{--}1.3 \times 0.7\text{--}1.1$ mm; apex rounded to obtuse, sometimes cucullate; margins plane, entire, unistratose, bordered by two to five differentiated cell rows, forming a marginal border; costa $30\text{--}40$ μm wide, percurrent; ventral surface cells of the costa rounded, bulging, papillose; dorsal surface cells of the costa rectangular to linear, smooth; in cross-section, semicircular, with two guide cells in one layer, band of ventral stereids undifferentiated, band of dorsal stereids usually oval, with two to three stereid rows, hydroids developed, ventral surface cells rounded, $(15)22.5\text{--}25 \times (12.5)17.5\text{--}20$ μm , disposed in one to two layers, dorsal surface cells usually differentiated; upper laminal cells quadrate-hexagonal to rectangular, $15\text{--}17.5 \times 10\text{--}15$ μm , thin-walled, not collenchymatous, with four to seven bifurcate papillae, 2.5 μm high, upper external marginal cells quadrate to rectangular, $10\text{--}17.5 \times 7.5\text{--}10$ μm (length/width ratio, 1–1.8); middle laminal cells quadrate to rectangular, $12.5\text{--}25 \times 10\text{--}15$ μm , thin-walled, not collenchymatous, with four to six bifurcate papillae, 2.5 μm high, middle external marginal cells quadrate to rectangular, $10\text{--}17.5 \times 7.5\text{--}10$ μm (length/width ratio, 1–2.3), thick-walled, sometimes only slightly, smooth,



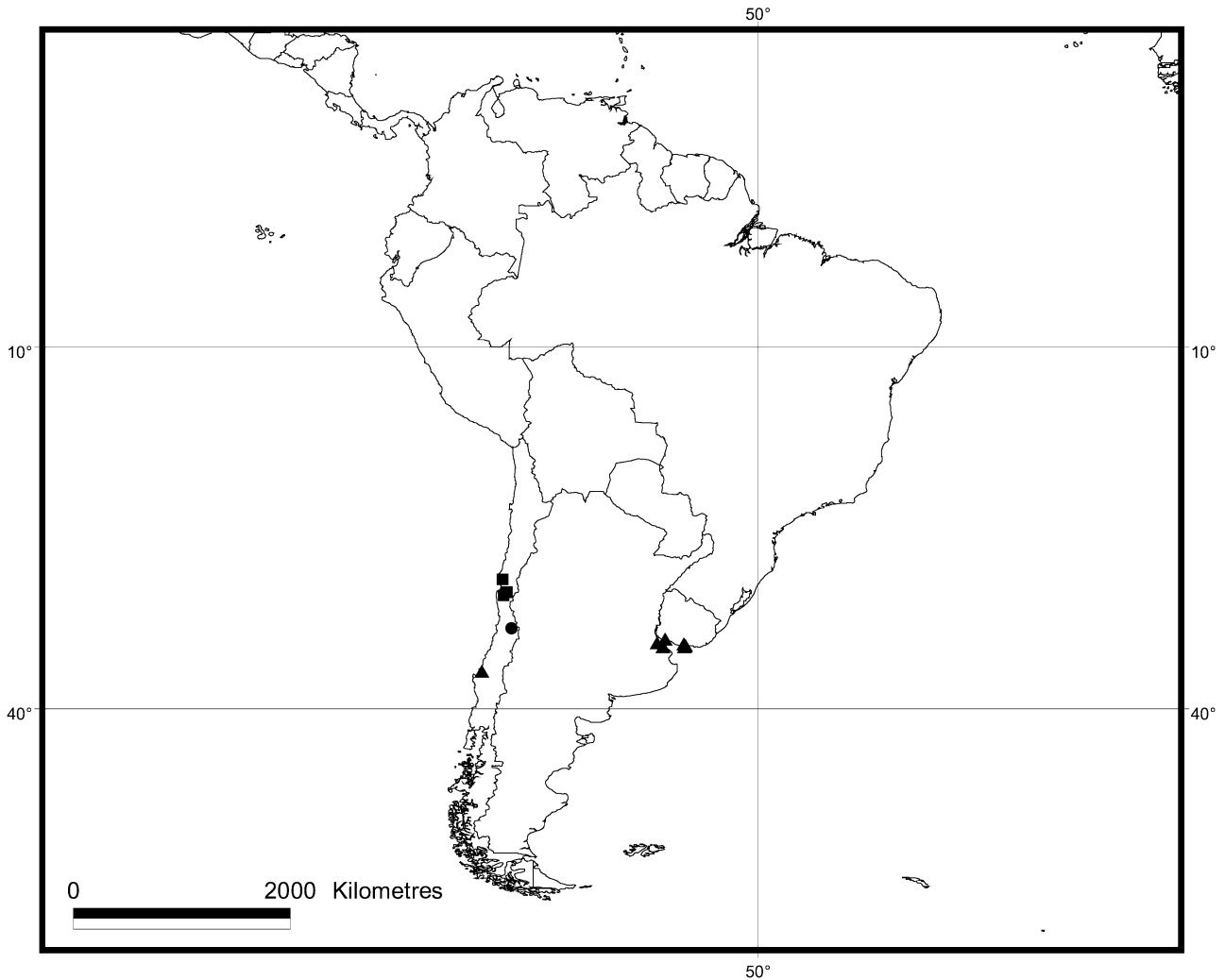


Figure 46. Distribution of *Tortula diaguata* (■), *T. hoppeana* (●), and *T. truncata* (▲) in South America.

middle internal marginal cells quadrate to rectangular, $10\text{--}20 \times 7.5\text{--}15 \mu\text{m}$ (length/width ratio, 1–2.7), slightly thick-walled, with four to six simple or bifurcate papillae; basal laminal cells rectangular, inflated or not, $37.5\text{--}80 \times 17.5\text{--}22.5 \mu\text{m}$, usually thin-walled, not collenchymatous, smooth, basal external marginal cells quadrate to rectangular, $15\text{--}45 \times 15\text{--}17.5 \mu\text{m}$ (length/width ratio, 1–2.6), thin-walled, sometimes transversally slightly thick-walled, smooth. Synoecious or paroecious. Perichaetial leaves undifferentiated, sometimes with a few teeth at the apex, not sheathing at base, $1.1\text{--}1.4 \times 0.7\text{--}0.9 \text{ mm}$. Seta erect, $3.5\text{--}4.3 \times 0.09\text{--}0.1 \text{ mm}$, twisted to the right above and sometimes slightly to the left below, yellowish to reddish brown. Capsule erect, stegocarpous, exserted; theca ovoid-cylindrical, $1\text{--}1.2 \times 0.4\text{--}0.5 \text{ mm}$, reddish brown; exothecial cells rectangular, $75\text{--}37.5 \times 12.5\text{--}20 \mu\text{m}$, thin-walled; annulus of vesiculose cells; peristome of 16 filamentous and papillose

teeth, split below, slightly spirally twisted less than one turn, *c.* $632.5 \mu\text{m}$ long, yellowish, basal membrane *c.* $25 \mu\text{m}$ long. Operculum conical, *c.* 0.4 mm long, not systylious, with spirally twisted cells. Calyptra cucullate, $1.5\text{--}1.8 \text{ mm}$ long, brownish yellow. Spores spherical, $13\text{--}15 \mu\text{m}$ in diameter, granulate, yellowish. Leaf colour reaction with KOH yellow.

Illustrations: Zander & Mahú (1999: 350 as *Hennediella diaguata*).

Habitat: Bare soils in Cactaceae formations with bushes of *Puya* Molina, *Adesmia* DC., *Senecio brunonianus* Hook. & Arn., *Caesalpinia* L., *Bridgesia incisifolia* Bert. ex Cambess., or *Haplopappus hirtellus* DC.; 210–750 m.

Distribution: Chile.

Additional specimens studied: CHILE. REGIÓN IV (COQUIMBO): pr. Choros, 12.xi.2001, *Cano 142b* (MUB 16411); Hurtado, 15.xi.2001, *Cano 187a* (MUB 20837).

Notes: Zander & Mahú (1999) placed this species in the genus *Hennediella* because of the red colour of the KOH leaf reaction (which it was only possible to observe after boiling the leaves on a slide in KOH), the weak denticulation in some of the leaves, especially the perichaetial, the nearly flat superficial cell walls of the distal lamina, the leaf border of thicker walled, smooth cells, and the nearly round dorsal stereid band. In addition, these authors stated that, although some *Tortula* species have differentiated margins and reddish coloration with KOH, the latter restricted to the basal cells, species with cucullate leaves are found only in *Hennediella*. According to Zander & Mahú (1999), other diagnostic characters of this species are the strongly concave orbicular to oblong-elliptical leaves, cucullate apex in most of the leaves, peristome of filamentous teeth, and slightly twisted and bulging ventral costa surface.

Two new collections of this species from Coquimbo have been obtained in this study [*Cano 142b, 187a*]. In these collections, the marginal cells of the leaves are differentiated, but are usually quadrate or short-rectangular and similar to those of other *Tortula* species studied. Other characters of *H. diaguita* which do not match with *Hennediella* are the deep yellow leaf colour with KOH, the rounded and bulging ventral costa surface, which varies from one to two layers, and the dorsal band of stereids oval in some cross-sections. These characters are closer to the genus *Crossidium*. We tentatively placed this species in the genus *Tortula*, considering this genus in a wide sense which could include species presently in *Crossidium*.

6. *TORTULA HOPPEANA* (SCHULTZ) OCHYRA,
BRYOLOGIST 107: 499. 2004 (FIGS 46–54)

Trichostomum hoppeanum Schultz, *Syll. Pl. Nov.* 2: 140. 1828. *Ind. loc.:* 'Habitat in rupibus editissimis Carinthiae (Hopp. et Hornsch.) et in alpinis Salisburg. (Funcck)'. *Type:* [Austria] 'Auf der Pasterze bei Glockn.' [lectotype designated by Ochyra (2004): GZU-Hoppe!].

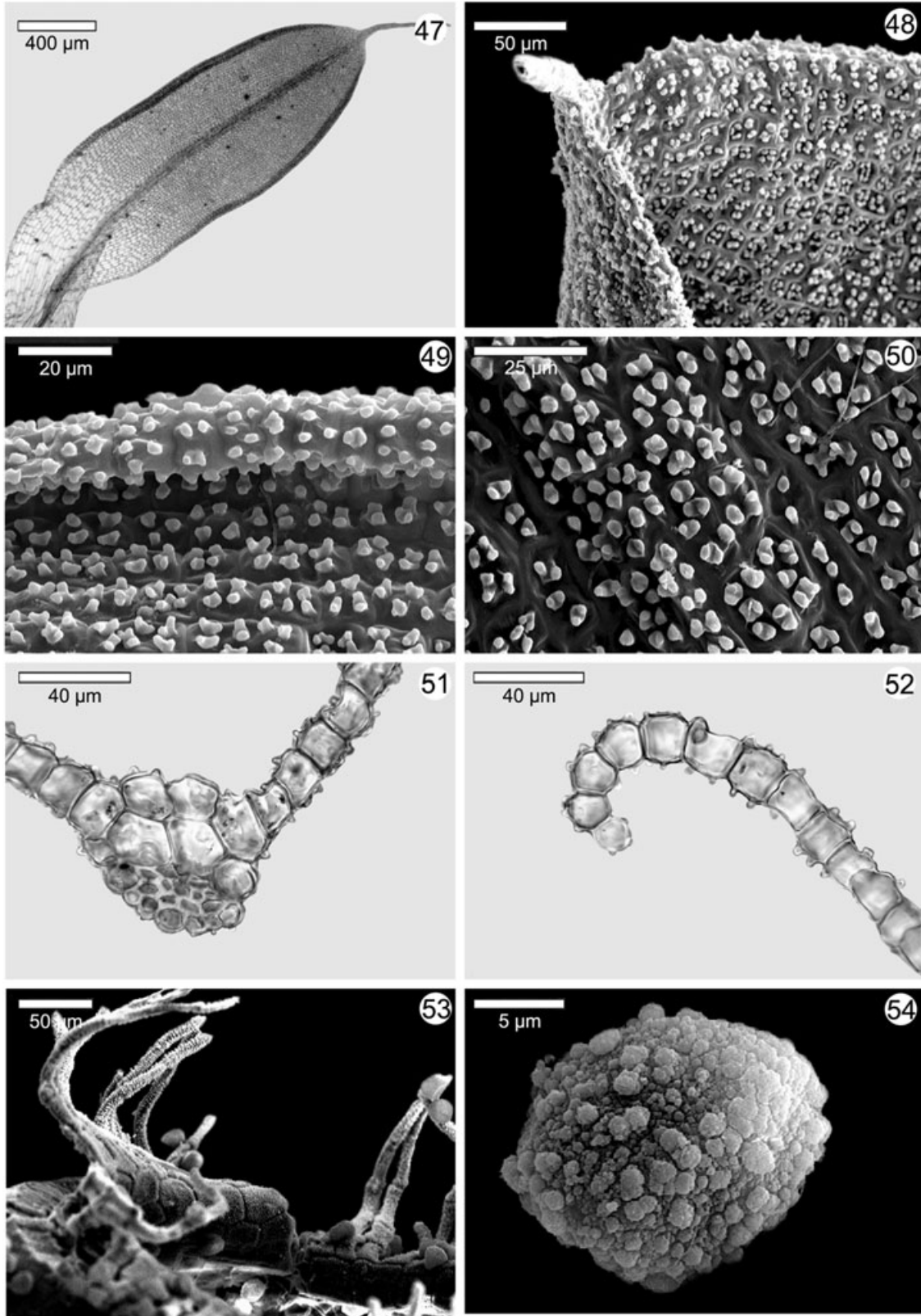
Description: Plants 0.5–0.6 cm high, growing in dense turfs, green. Stems 0.3–0.4 cm, usually simple. Rhizoidal and protonemantic gemmae undeveloped. Leaves incurved to spirally twisted in the upper part when dry, patent to spreading when moist, ovate to linguulate, slightly concave, 2.5–2.7 × 0.7–1.8 mm; apex obtuse to acute, not cucullate; margins recurved from

near the base to usually near the apex, papillose-crenulate, unistratose, unbordered; costa 50–80 µm wide, excurrent in a hair-point, yellowish, 350–607 µm, smooth; ventral surface cells of the costa rectangular, not bulging, papillose; dorsal surface cells of the costa rectangular, papillose; in cross-section, semicircular, with two guide cells in one layer, band of ventral stereids undifferentiated, band of dorsal stereids semicircular, with three stereid rows, hydroids developed, ventral surface cells rounded, 15–17.5 × 15–20 µm, disposed in one layer, dorsal surface cells differentiated; upper laminal cells oblate, quadrate to rectangular, 15–20 × 12.5–20 µm, thin-walled, not collenchymatous, with three to four bifurcate papillae, 2.5 µm high, upper external marginal cells oblate, quadrate to rectangular, 12.5–17.5 × 10–15 µm (length/width ratio, 0.8–1.8); middle laminal cells rectangular, 22.5–30 × 12.5–20 µm, thin-walled, not collenchymatous, with four to eight simple papillae, 2.5 µm high, middle external marginal cells oblate, quadrate or rectangular, 10–22.5 × 12.5 µm (length/width ratio, 0.8–1.8), thin-walled, smooth, middle internal marginal cells rectangular, 17.5–20 × 12.5–15 µm (length/width ratio, 1.33–1.4), thin-walled, with four to six simple papillae; basal laminal cells rectangular, inflated, 57.5–100 × 32.5–40 µm, thin-walled, not collenchymatous, smooth, basal external marginal cells rectangular, 52.5–80 × 12.5–15 µm (length/width ratio, 3.5–6.4), thin-walled, smooth. Autoecious. Perichaetial leaves undifferentiated, not sheathing at base, 1.9–2 × 0.5–0.6 mm. Seta erect, 11–13.5 × 0.12–0.15 mm, twisted to the right above and slightly to the left below, yellowish. Capsule erect, stegocarpous, exerted; theca cylindrical, 1.8–1.9 × 0.7–0.8 mm, yellowish brown; exothecial cells rectangular, 50–55 × 12.5–22.5 µm, thin- to slightly thick-walled; annulus of rounded cells; peristome of 16 plane and slightly papillose teeth, irregularly divided below, straight, 200–230 µm long, yellowish, basal membrane 10–25 µm long, papillose. Operculum rostrate, 0.6–0.8 mm long, temporarily systylious, with straight to slightly twisted cells above. Calyptra not seen. Spores spherical, 17.5–20 µm in diameter, verrucose, light brown. Leaf colour reaction with KOH yellow.

Illustrations: Cano (2006: 171); Crum & Anderson (1981: 377 as *Desmatodon latifolius* (Hedw.) Brid).

Distribution: Chile. Also known from Europe (Hill *et al.*, 2006), North America (Anderson *et al.*, 1990), North Africa (Ros *et al.*, 1999), temperate Asia (Saito, 1975; Li *et al.*, 2001), tropical Asia (Gangulee, 1969), and Antarctica (Ochyra, 2004).

Habitat: Soil near waterfall; 3500 m.



Figures 47–54. Scanning electron micrographs (Figs 48–50, 53, 54) and light micrographs (Figs 47, 51, 52) of *Tortula hoppeana* (from *Costés 1101*, PC). Fig. 47. Leaf. Fig. 48. Ventral surface of the leaf apex. Fig. 49. Middle marginal cells. Fig. 50. Ventral surface cells of the costa and laminal cells at middle. Fig. 51. Cross-section of the costa at midleaf. Fig. 52. Cross-section of the middle marginal cells of the leaf. Fig. 53. Peristome. Fig. 54. Spore.

Specimen studied: CHILE. REGIÓN METROPOLITANA DE SANTIAGO: Mine Disputado de Las Condes, i.1930, *Costés 1101* (PC).

Notes: The Chilean specimen has some deviant characters with respect to other specimens of *T. hoppeana* studied from southern Europe. Thus, the margins are recurved from the base to near the apex in some leaves, when they are usually recurved from the base to the upper third of the leaf, and the operculum temporarily remains attached to the columella, when most of the specimens of *T. hoppeana* have no or only a slightly systylious operculum, although this character has also been observed in specimens from North America and Europe (cf. Crum & Anderson, 1981; Nyholm, 1989). The rest of the characters, such as ovate to lingulate leaves, papillose laminal cells, 12.5–20 µm in width, unbordered leaf, and peristome of short and straight teeth, are similar to those typical of *T. hoppeana*.

This species is newly reported from South America.

7. *TORTULA JAFFUELI* THÉR., *REVISTA CHILENA HIST. NAT.* 27: 9, PL. 2 FIG. 1. 1923
(FIGS 10, 55–62)

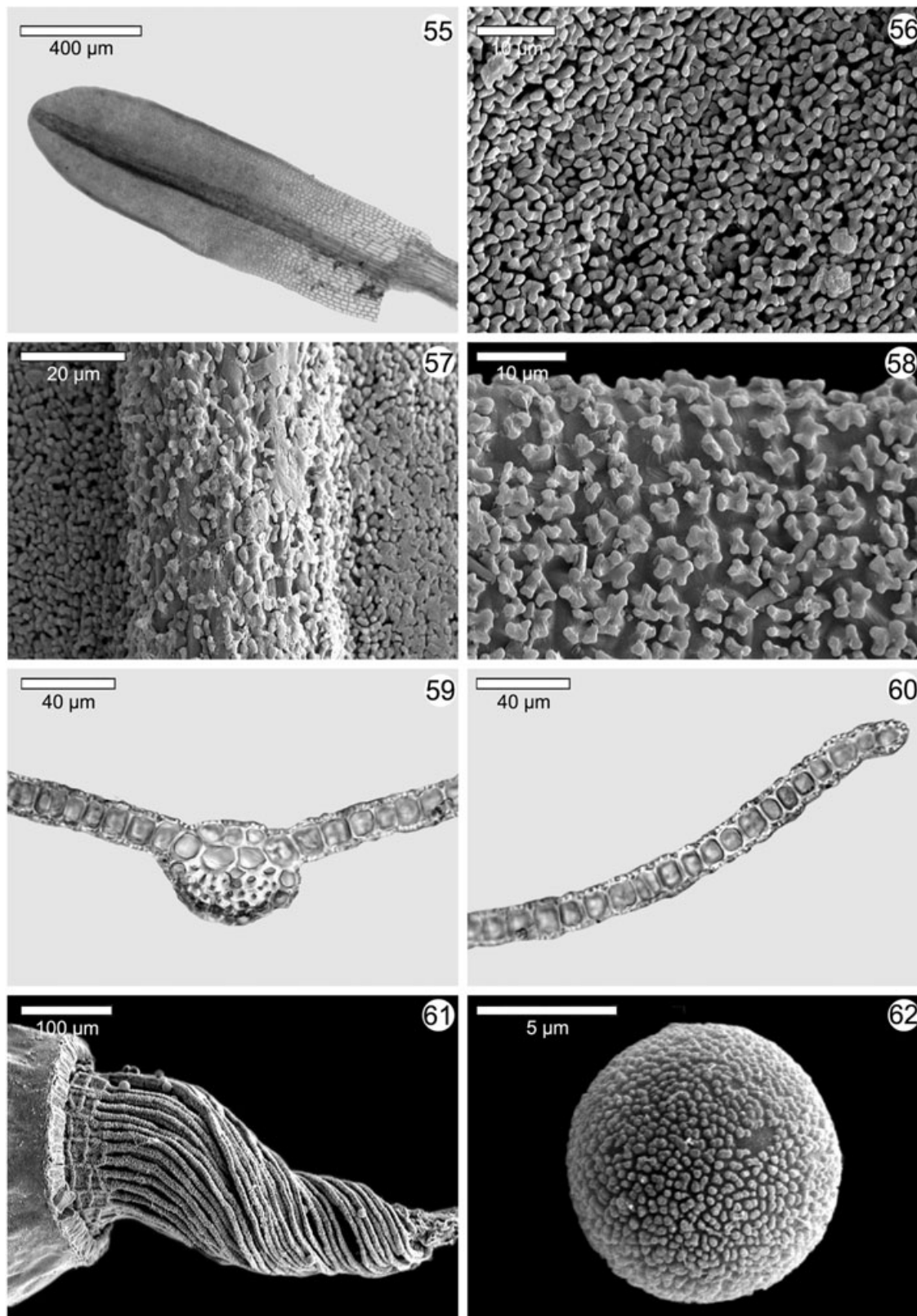
Syntrichia jaffuelii (Thér.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 269. 1993. *Ind. loc.:* ‘Los Perales de Marga-Marga, sur la terre, leg. P. Jaffueli, oct. 1919’. *Type:* ‘Chili, Los Perales de Marga Marga’, ix.1919, *Jaffuel 23* (holotype: PC!; isotypes: B!, FH!, PC!, W!).

Description: Plants 0.3–0.6 cm high, growing in dense turfs, light to dark green. Stems 0.2–0.5 cm high, branched, with subfloral innovations. Rhizoidal gemmae developed, 25–40 µm in diameter, multicellular, uni- or multistratose, ovoid to spherical, brownish; protonemata gemmae undifferentiated. Leaves erect to patent when dry, patent to spreading when moist, lingulate, plane, slightly channelled at the costa above, 1.2–2.4(3.5) × 0.4–0.5 mm; apex rounded, not cucullate; margins recurved irregularly from the upper third to below middle, sometimes from below apex to upper third or only in one margin, papillose-crenulate, unistratose, unbordered; costa 30–75 µm wide, ending two to six cells below the apex; ventral surface cells of the costa rectangular, not bulging, papillose; dorsal surface cells of the costa elongate, papillose; in cross-section, semicircular, with two to six guide cells in one to two layers, band of ventral

stereids undifferentiated, band of dorsal stereids semicircular to slightly lunulate, with two to four stereid rows, hydroids developed, ventral surface cells quadrate to rectangular, 7.5–10 × 5–15 µm, disposed in one layer, dorsal surface cells differentiated; upper laminal cells quadrate-rounded to rectangular, (5)7.5–10 × (5)7.5–10 µm, slightly thick-walled, usually not collenchymatous, with four to five bifurcate papillae, 2.5 µm high, upper external marginal cells oblate to rounded, 5(10) × 7.5–10 µm (length/width ratio, 0.5–1); middle laminal cells quadrate to rectangular or oblate, 5–7.5 × 5–15 µm, slightly thin-walled, not collenchymatous, with four to seven bifurcate papillae, 2.5 µm high, middle external marginal cells oblate to rectangular, (5)10–12.5 × (5)7.5 µm [length/width ratio, 0.7–1.9(2.5)], slightly thick-walled, with four to five simple or bifurcate papillae, middle internal marginal cells quadrate to rectangular or quadrate-rounded, 7.5–12.5 × 7.5 µm (length/width ratio, 1–1.7), slightly thick-walled, with four to seven simple or bifurcate papillae; basal laminal cells rectangular, occasionally inflated, 17.5–57.5 × 15–22.5 µm, thin- to slightly thick-walled, usually not collenchymatous, usually with two to ten simple papillae, in the upper part, mainly, on the dorsal side, rarely smooth, basal external marginal cells rectangular, 25–30 × (7.5)10–12.5 µm [length/width ratio, 2.2–2.5(4)], thin-walled, smooth. Dioecious. Perichaetial leaves slightly differentiated, longer and with slightly sheathing base, 1.6–2.8 × 0.4–0.8 mm. Seta erect, 15–23 × 0.08–0.1 mm, straight or slightly twisted to the left, yellowish. Capsule elliptical, stegocarpous, exerted; theca, 1.2 × 0.5–0.7 mm, yellowish brown; exothecial cells rectangular, 22.5–95 × 22.5–30 µm, thin- to slightly thick-walled; annulus of vesiculate cells; peristome of 32 filamentous and papillose teeth, straight to usually one turn spirally twisted, 410–560 µm long, yellowish, basal membrane 70–75 µm long. Operculum conical, 0.5–0.9 mm long, not systylious, with spirally twisted cells. Calyptra not seen. Spores spherical, 10–12.5 µm in diameter, granulate, yellowish to light brown. Leaf colour reaction with KOH yellow.

Illustration: Thériot (1923).

Habitat: Soil bank in bushes with *Mutisia* L.f., *Puya*, *Lithraea caustica* Hook. & Arn., and *Haplopappus hirtellus* Phil.; 660–1500 m.



Figures 55–62. Scanning electron micrographs (Figs 56–58, 61, 62) and light micrographs (Figs 55, 59, 60) of *Tortula jaffuelii* (Figs 55–60 from *Cano 320*, MUB; Figs 61, 62 from *Cano 137b*, MUB). Fig. 55. Leaf. Fig. 56. Ventral surface cells of the costa and laminal cells at middle. Fig. 57. Dorsal surface cells of the leaf costa at middle. Fig. 58. Middle marginal cells of the leaf. Fig. 59. Cross-section of the costa at midleaf. Fig. 60. Cross-section of the middle marginal cells of the leaf. Fig. 61. Peristome. Fig. 62. Spore.

Distribution: Chile.

Representative specimens studied: CHILE: REGIÓN IV (COQUIMBO): Cuesta de Caviolén, 11.xi.2001, *Cano 137b* (MUB 29935). REGIÓN METROPOLITANA DE SANTIAGO: Cerro Bravo, prés de Santiago, 16.vi.1917, *Bertho 4c* (PC). REGIÓN VII (O'HIGGINS): Rancagua, mina La Juanita, 8.xii.2001, *Cano 320* (MUB 29934).

Notes: *Tortula jaffuelii* was described on the basis of a specimen from Valparaíso (Chile). In this study, we have detected new collections from Coquimbo, O'Higgins, and Santiago. In all cases, they show lingulate leaves, yellow with KOH, and a cross-section similar to that found in *Tortula*: dorsal and ventral surface cells differentiated, band of ventral stereids semicircular, and hydroids developed, although, in some cross-sections, the ventral band of stereids is slightly lunulate. However, the perichaetial leaves are long and slightly sheathing at base, the basal cells are not strongly differentiated from the distal cells, which can be papillose (mainly at the dorsal side of the leaf), and usually slightly thick-walled, the marginal laminal cells are undifferentiated, and some cross-sections of the stem seem to show weakly developed sclerodermis. This combination of characters is not found in *Tortula*. Possibly because of these deviant characters, Zander (1993) transferred this species to the genus *Syntrichia*, although the anatomy of the costa and the leaf reaction with KOH are typical of the genus *Tortula*. Therefore, we provisionally placed this species in *Tortula* and await a new evaluation of the genus.

The Chilean *T. jaffuelii* is similar to material of *Tortula bogosica* (Müll. Hal.) R.H. Zander studied by us from the Canary Islands and South Africa, a species which Zander (1993) related to *Barbula*. Both species have the habit of *Barbula*, with lingulate leaves, dorsal surface of the costa usually papillose, upper and middle laminal cells small and strongly papillose, and the presence of numerous rhizoidal gemmae. However, both species can be distinguished by the costa (which is usually excurrent in a mucro in *T. bogosica* and ceasing two to six cells below the apex in *T. jaffuelii*), dorsal surface cells of the costa in cross-section (usually undifferentiated in *T. bogosica* and well differentiated in *T. jaffuelii*), and laminal cells (usually thin-walled in *T. bogosica* and slightly

thick-walled in *T. jaffuelii*). In addition, *T. jaffuelii* has more strongly differentiated perichaetial leaves than the specimens of *T. bogosica*.

The protologue of this species indicates that the date of collection was October 1919; however, the label of the holotype (handwritten 'type' by Thériot) and isotypes studied shows a different date of collection: September 1919. Therefore, it was probably a mistake in the publication of Thériot (1923).

8. *TORTULA MURALIS* HEDW., *SP. MUSC. FROND.*: 123. 1801 (FIGS 63–71)

Ind. loc.: 'In muris, tegulis, parietibus ad saxa vulgarissima'. *Type:* [lectotype designated by Guerra, Ros & Carrión (1992): G!].

Tortula muralis var. *aestiva* Brid. ex Hedw., *Sp. Musc. Frond.*: 123. 1801. *Tortula aestiva* (Brid. ex Hedw.) P. Beauv., *Prodr. Aethéogam.*: 91. 1805. *Ind. loc.:* not indicated. *Type:* not located.

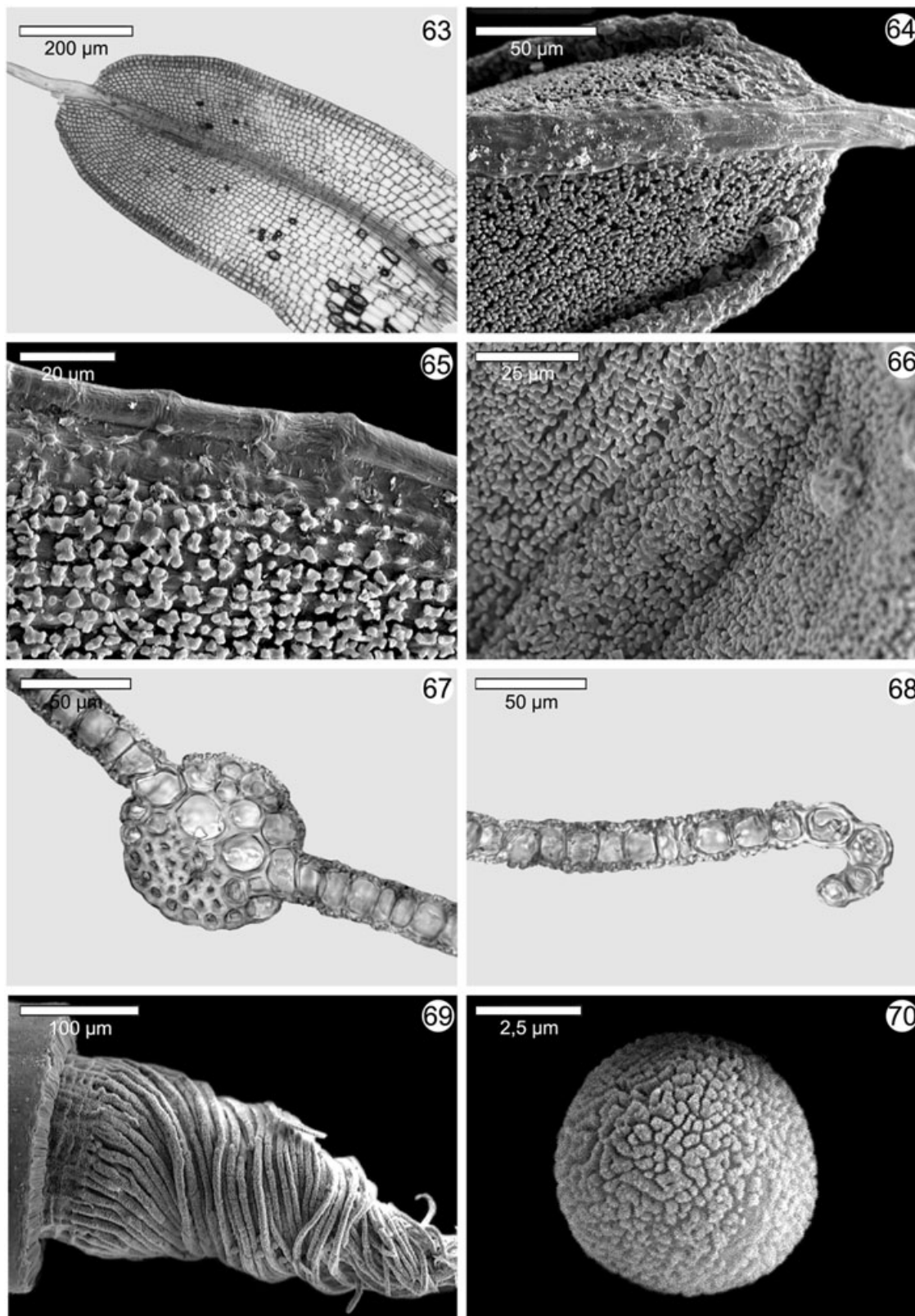
Barbula muralis var. *rupestris* Schultz, *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 11: 221. 1823. *Ind. loc.:* 'Habitat in muris tegulis, locis sabulosis umbrosis omnis Europae; . . . Var. β . in rupestribus apricis'. *Type:* not located.

Barbula muricola Müll. Hal., *Bot. Zeitung (Berlin)* 15: 381. 1857. *Tortula muricola* (Müll. Hal.) Mitt., *J. Linn. Soc., Bot.* 12: 166. 1869. *Ind. loc.:* 'Brazilia, ins. Sancta Catharina, locis umbrosis ad muros prope Desterro, *Pabst*'. *Type:* 'Brazilia, in muris umbrosis insulae San. Catharinae', *Pabst s.n.* (lectotype designated here: S B103653!).

Barbula annulus Müll. Hal., *Linnaea* 43: 430. 1882. *Tortula annulus* (Müll. Hal.) Broth. ex Paris, *Index Bryol.*, ed. 2, 5: 35. 1906. *Ind. loc.:* 'Argentina Buenos-Airensis, in arenosis apud Flores & Martio 1880: Prof. O. Schnyder'. *Type:* not located; synonymized by Wijk, Margadant & Florschütz (1959).

Tortula muralis var. *longipila* Dusén, *Ark. Bot.* 6(10): 3. Taf. 1 figs 1–4. 1906, *syn. nov.* *Ind. loc.:* 'Patagonia septentrionalis prope Carmen de Patagones opp. in arenosis. . . die vorliegende Varietät ist am Unterlaufe des Rio Negro und wohl auch in den benachbarten Gebieten allgemein'. *Type:* 'Argentina, ad ostium fl. Río Negro', 12.viii.1897, *Dusén 818* (lectotype designated here: NY!; isolectotypes: E!, O!, PC!).

Description: Plants 0.2–0.8 cm high, growing in dense turfs, yellowish green. Stems 0.05–0.5 cm, simple or



Figures 63–70. Scanning electron micrographs (Figs 64–66, 69, 70) and light micrographs (Figs 63, 67, 68) of *Tortula muralis* (from Deguchi 2867, SGO). Fig. 63. Leaf. Fig. 64. Dorsal surface of the leaf apex. Fig. 65. Middle marginal cells of the leaf. Fig. 66. Ventral surface cells of the costa and laminal cells at middle. Fig. 67. Cross-section of the costa at midleaf. Fig. 68. Cross-section of the middle marginal cells of the leaf. Fig. 69. Peristome. Fig. 70. Spore.

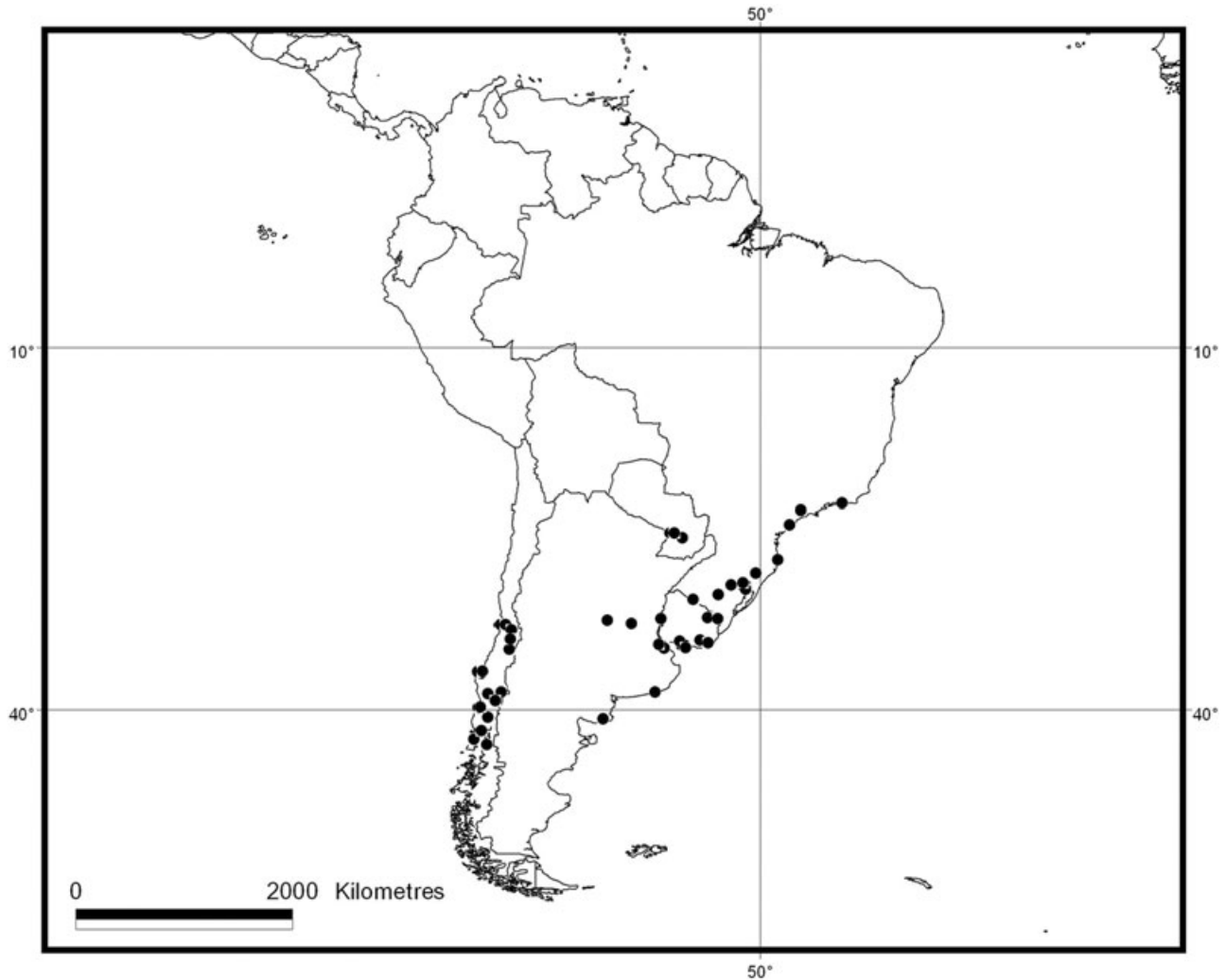


Figure 71. Distribution of *Tortula muralis* (●) in South America.

branched. Rhizoidal and protonematic gemmae undeveloped. Leaves usually spirally twisted, rarely incurved when dry, patent to spreading when moist, usually lingulate, slightly concave, (1.1)1.6–2.4(3) × 0.4–0.6 mm; apex rounded to obtuse, not cucullate; margins recurved from near the base to the apex, papillose-crenulate from the apex to below middle or near base, unistratose, sometimes bistratose in the marginal row, usually bordered by four to seven differentiated cell rows, forming a marginal border; costa (40)62.5–87.5 μm wide, excurrent in a hair-point, more rarely in an apiculus, hyaline, sometimes yellowish or brownish, (80)102.3–663.5 μm, smooth;

ventral surface cells of the costa quadrate to rectangular, not bulging, papillose; dorsal surface cells of the costa elongate, smooth to slightly papillose in the upper part; in cross-section, circular to semicircular, with 2–6(8) guide cells in one to two layers, band of ventral stereids undifferentiated or occasionally in one to two layers, band of dorsal stereids semicircular, with (2)3–5 stereid rows, hydroids developed, ventral surface cells rectangular to quadrate, 10–12.5 × 10–12.5 μm, disposed in one layer, dorsal surface cells differentiated; upper laminal cells quadrate-hexagonal to rectangular, (7.5)12.5–15(17.5) × (7.5)10–12.5 μm, thin-walled, not

collenchymatous, with four to six bifurcate papillae, 2.5–5 µm high, upper external marginal cells quadrate to rectangular, sometimes oblate, (7.5)10–15 × 7.5–10(15) µm [length/width ratio, (0.3)0.9–1.6(1.7)]; middle laminal cells quadrate-hexagonal to rectangular, (10)12.5–17.5(20) × 10–12.5(15) µm, thin-walled, not collenchymatous, with four to ten bifurcate papillae, 2.5–5 µm high, middle external marginal cells rectangular, sometimes quadrate or oblate, (10)12.5–15 × 10–12.5 µm [length/width ratio, (0.8)1–1.3(1.5)], thick-walled, sometimes slightly thick-walled, smooth or with two to four simple papillae, middle internal marginal cells rectangular to quadrate-rounded, rarely oblate, (10)12.5–18.8(20) × (10)12.5–15(17.5) µm [length/width ratio, (0.7)0.9–1.3(1.6)], usually slightly thick-walled, smooth or with four to six bifurcate papillae; basal laminal cells rectangular, inflated, 30–53.8(80) × (17.5)20–22.5(25) µm, thin-walled, not or slightly collenchymatous, smooth, basal external marginal cells rectangular, (20)22.2–48.2(57.5) × (10)12.5–22.5(25) µm [length/width ratio, 1–2.7(4.6)], usually thin-walled, smooth. Autoecious or dioecious. Perichaetial leaves undifferentiated, 1.5–2.4 × 0.4–0.5 mm. Seta erect, 9.6–16 × 0.1–0.16 mm, twisted to the right above and slightly to the left below, reddish brown to yellowish brown. Capsule erect, stegocarpous, exerted; theca cylindrical, 1.5–3 × 0.5–0.7 mm, reddish brown; exothecial cells rectangular, (40)47.5–66.3(75) × 12.5–20 µm, usually thin-walled; annulus of vesiculose cells; peristome of 32 filamentous and papillose teeth, more than one turn spirally twisted, 558–900 µm long, orange; basal membrane (32.5)41.3–81.3(95) µm long, papillose. Operculum conical, 0.9–1.2 mm long, not systylious, with spirally twisted cells. Calyptra cucullate, 3–3.21 mm long, brownish yellow. Spores spherical, 10–12.5 µm in diameter, granulate to vermiculate, yellowish. Leaf colour reaction with KOH yellow.

Illustrations: Cano (2006: 166); Crum & Anderson (1981: 398).

Habitat: On bricks or cement walls, more rarely in dry limestone or soil; 0–1500 m.

Distribution: Argentina, Brazil, Chile, Paraguay, Uruguay. Also known from Europe (Hill *et al.*, 2006), temperate Asia (Saito, 1975; Kürschner, 2000; Li *et al.*, 2001), tropical Asia (Tan & Iwatsuki, 1991), Africa (O'Shea, 2003), North America (Crum & Anderson, 1981), Australia (Streimann & Klazenga, 2002), and New Zealand (Fife, 1995).

Representative specimens studied: ARGENTINA. BUENOS AIRES: vicinity of Buenos Aires, 29.viii.1915, *Rose 20961* (NY, US). CÓRDOBA: Bell Ville, Los Algar-

robos, i.1910, *Haakon s.n.* (O). ENTRE RÍOS: Concepción del Uruguay, 22.vi.1880, *Niedelen 246* (B). SANTA FÉ: Rosario, río Paraná, 28.ix.1910, *Haakon s.n.* (O). BRAZIL. RIO DE JANEIRO: Rio de Janeiro, *Glaziou 6396* (NY). RIO GRANDE DO SUL: Porto Alegre, rua dos voluntarios da Patria, 10.x.1897, *Reincket & Germak 15* (FH, PC, S B103673). SÃO PAULO: Iquape, 1.ix.1901, *Schiffner 240* (FH, H, O, S B103668). CHILE. REGIÓN V (VALPARAÍSO): Cerro La Campana, 17.ix.1972, *Mahú 10404* (MO). REGIÓN METROPOLITANA DE SANTIAGO: Santiago, Universidad Católica, Campus Oriente, 14.vii.1979, *Mahú 23225* (MO). REGIÓN VI (MAULE): Prov. Curicó, aduana Los Queñes, frente al retén de carabineros, 18.v.1973, *Mahú 9345* (MO). REGIÓN VII (O'HIGGINS): Rancagua, 9.xii.2001, *Cano 327* (MUB 15902). REGIÓN VIII (BIOBÍO): Concepción, 9.ix.1896, *Dusén 179* (E, FH, JE, M, NY, O, PC, S). REGIÓN IX (ARAUCANÍA): Pucón, 29.xii.2001, *Cano 496* (MUB 17943, CONC). REGIÓN X (LOS LAGOS): prov. Osorno, around Termas Puyehue, east end of Lago Puyehue, Parque Nacional Puyehue, 23.xi.1987, *Deguchi 2867* (SGO); Chiloé, murs de la cathedrale, 1918, *P. Cypr. Deltor s.n.* (PC). PARAGUAY. CENTRAL: San Lorenzo, 24.v.1984, *Bordas 62* (NY). CORDILLERA: north-east of Caacupé, Cerro de Cristo Rey, 6.i.1984, *Kuc s.n.* (NY). GUAIRÁ: Villarrica, 14.xii.1982, *Bordas 39* (MO, NY). URUGUAY. CANELONES: Las Piedras, xi.1911, *Felippone 635* (PC). CERRO LARGO: Bañado de Medina, Alborada de Arrarte, *Rosengurtt B8224* (NY, US). LAVALLEJA: Villa Serrana, xi.1959, *García Zorrón 1906* (US). MONTEVIDEO: Malvín, 24.vii.1926, *Herter 70533* (FH, MO, RB). RIVERA: Rivera, Escuela Agraria, i.1960, *García Zorrón 2109* (US). ROCHA: Rocha, parque fortaleza de Santa Teresa, ii.1960, *García Zorrón 2333* (US). SAN JOSÉ: Playa Pascual, 22.xii.1946, *Castellanos 8575* (FH).

Notes: In the Neotropics, *T. muralis* was reported by Ayala (1970) from three specimens collected in 'Lomas' of Trujillo (Peru) and deposited at HUT. We have not been able to study these samples, but we found duplicates of them at US herbarium. After studying the material, it does not correspond to any species of *Tortula*, and the specimens proved to be *Syntrichia limensis* (R.S. Williams) R.H. Zander. Therefore, the report of *T. muralis* should be excluded from the Neotropics.

We have not been able to locate the type material of *T. annulus*, but the original description suggests its resemblance to *T. muralis*, with which it was synonymized by Wijk *et al.* (1959).

By contrast, we have found several syntypes of *T. muralis* var. *longipila* distributed in different herbaria (E, NY, O, PC) as *Tortula longipila* Dusén from Rio Negro. The specimen of NY is here formally

designated as the lectotype of this name. According to the protologue, this taxon can be distinguished from var. *muralis* by a long hair-point and a capsule with the annulus disposed in only one row. In addition, the original material shows the upper and middle laminal cells with papillae of 5 µm high, when *T. muralis* usually has papillae of 2.5 µm high. However, all of these characters can be included in the variability of *T. muralis*, and therefore this taxon is treated here as a synonym of *T. muralis*.

9. *TORTULA PLATYPHYLLA* MITT., *J. LINN. SOC.*,
BOT. 12: 167. 1869 (FIGS 37, 72–79)

Desmatodon amblyophyllus Mont., *Ann. Sci. Nat., Bot.*, sér. 3, 4: 108. 1845. *Trichostomum amblyophyllum* (Mont.) Müll. Hal., *Syn. Musc. Frond.* 1: 592. 1849. *Tortula amblyophylla* (Mont.) Thér., *nom. illeg. Bull. Soc. Bot. Genève* 12: 5. 1919 [non *Tortula amblyophylla* (Hook.) Mitt., *J. Linn. Soc., Bot.* 12: 155. 1869]. *Ind. loc.*: 'Chili, ad terram prope Valparaiso et S. Jago, Gay'. Type: [Chile] 'S. Jago', v.18[two last numbers illegible], *Gay s.n.* (lectotype designated here: PC!).

Barbula berteroana Müll. Hal., *Bot. Zeitung (Berlin)* 20: 349. 1862. *Tortula berteroana* (Müll. Hal.) Broth. ex Paris, *Index Bryol.*, ed. 2, 5: 37. 1906, *nom. illeg.* (non *Tortula berteroana* Mitt. *nom. illeg. J. Linn. Soc., Bot.* 12: 154. 1869), *syn. nov. Ind. loc.*: 'Chile, prope Quillotam: Bertero Sept 1829'. Type: 'Chiles, Quillota' 1829, *Bertero s.n.* (lectotype designated here: PC!).

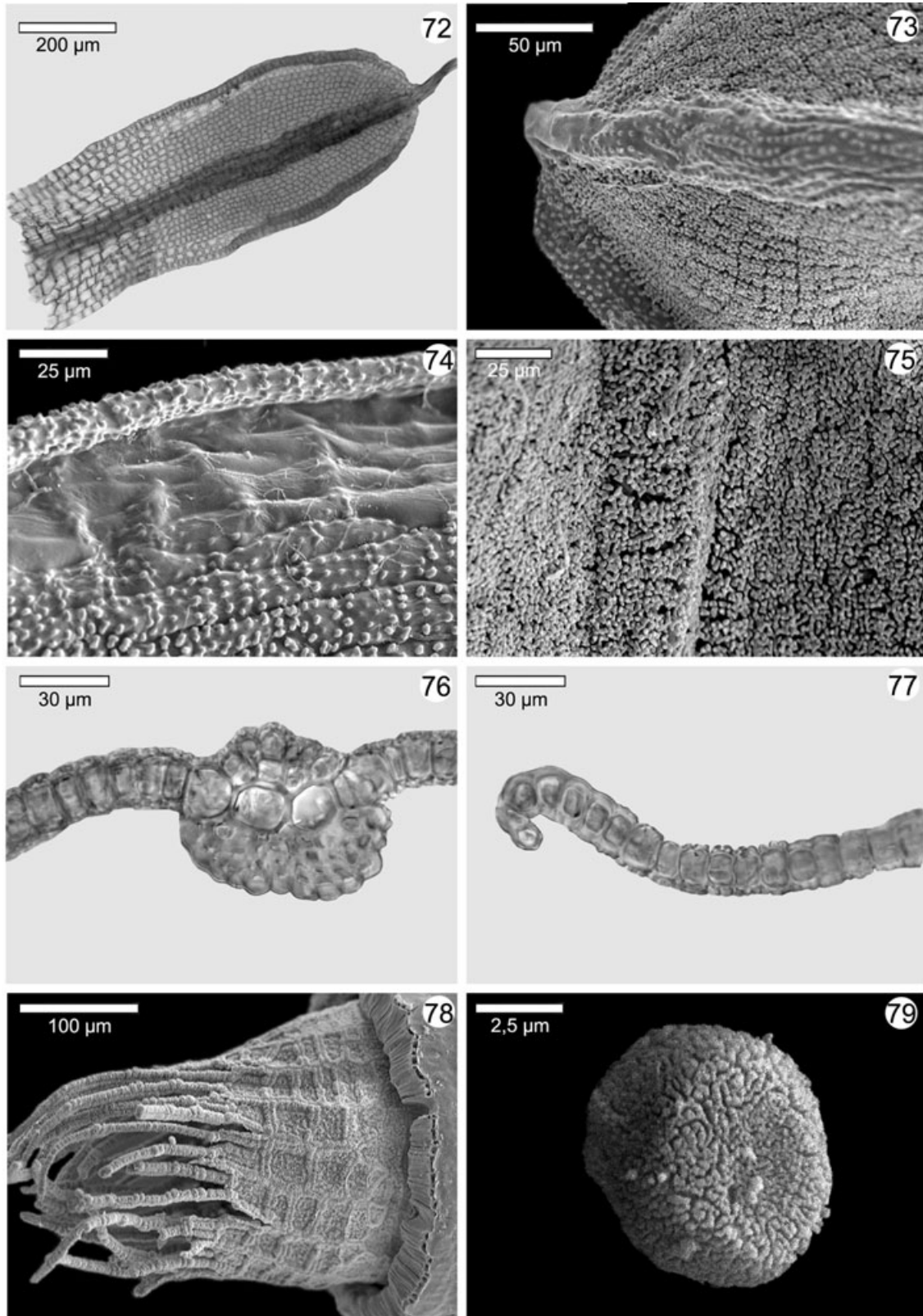
Barbula graminicolor ssp. *subgraminicolor* Thér., *Revista Chilena Hist. Nat.* 21: 7. 1917. *Ind. loc.*: 'Los Perales de Marga-Marga; sur le mortier des murs'. Type: 'Chili, Los Perales de Marga-Marga, près Valparaiso', vii.1915, *Costés s.n.* (holotype: PC!).

Tortula flavipes Broth., *Acta Horti Gothob.* 1: 192. 1924, *nom. illeg.*, *syn. nov.* [non *Tortula flavipes* (Bruch & Schimp.) Wilson, *Bryol. Brit.* 128. 1855]. *Ind. loc.*: 'Chile: Prov. Coquimbo, Estancia Frai Jorge; ad terram (117)'. Type: [Chile] 'Coquimbo' viii.1917, *Skottsberg s.n.* (holotype: H-BR 4168 006!; isotype: PC!).

Tortula purpureo-velutina Herzog, *Rev. Bryol. Lichénol.* 23: 73. 1954, *syn. nov. Ind. loc.*: 'Mittelchile: Viña Concon, Strandweg, leg. G. H. Schwage, n°176'. Type: 'Mittelchile, bei Viña-Concon', 11.ii.1941, *Schwabe 176* (holotype: JE!).

Description: Plants 0.3–0.7 cm high, growing in dense to loose turfs, yellowish green. Stems 0.05–0.5 cm high, simple or branched. Rhizoidal gemmae undeveloped; protonematic gemmae occasionally differentiated. Leaves incurved to slightly twisted in the upper part when dry, patent to spreading when moist, lingulate to lingulate-ovate, sometimes constricted at middle, slightly concave distally, 1.3–2.6 × 0.3–

0.6 mm; apex rounded, sometimes obtuse, apiculate or not, not cucullate; margins recurved from below middle to near apex, papillose-crenulate from the apex to below middle, unistratose, sometimes the marginal row bistratose, bordered by four to seven differentiated cell rows, forming an intramarginal border; costa (32.5)50–67.5(92.5) µm wide, percurrent, sometimes excurrent in an apiculus or hair-point, brownish, 60–237.5 µm, smooth; ventral surface cells of the costa rectangular to quadrate, not bulging, papillose; dorsal surface cells of the costa linear to long-rectangular, papillose, sometimes smooth; in cross-section, circular to semicircular, with 2–4(7) guide cells in one to two layers, band of ventral stereids undifferentiated, band of dorsal stereids semicircular, with two to four stereid rows, sometimes substereids, hydroids developed, ventral surface cells quadrate to rectangular, (7.5)10–12.5 × (5)10–12.5(15) µm, disposed in one layer, dorsal surface cells usually differentiated; upper laminal cells quadrate-hexagonal to rectangular, 7.5–10(12.5) × (5)7.5–10(12.5) µm, thin-walled, not collenchymatous, with 3–6(10) bifurcate papillae, 2.5 µm high, upper external marginal cells quadrate to rectangular or oblate, (5)7.5–12.5(15) × 5–10(12.5) µm [length/width ratio, (0.5)1–2(2.5)]; middle laminal cells rectangular to quadrate-hexagonal, 10–15(17.5) × (5)7.5–10(12.5) µm, thin-walled, not collenchymatous, with five to ten bifurcate papillae, 2.5 µm high, middle external marginal cells quadrate to rectangular or oblate, (5)7.5–10(20) × (5)7.5–10(12.5) µm [length/width ratio, (0.4)0.8–1.5(2.8)], thin- to slightly thick-walled, with two to eight simple papillae, middle internal marginal cells rectangular, rarely oblate, linear or quadrate, (10)17.5–30 × 7.5–10(15) µm [length/width ratio, (0.8)1.8–3.6(4)], usually slightly thick-walled, smooth or with one to six simple papillae; basal laminal cells rectangular, usually inflated, 50–65(100) × (15)20–27.5(30) µm, thin-walled, usually not collenchymatous, smooth, basal external marginal cells usually rectangular, (20)25–50(57.5) × (7.5)12.5–20(30) µm [length/width ratio, (1)1.5–2.9(4)], thin-walled, rarely transversally thick-walled, smooth. Dioecious. Perichaetial leaves undifferentiated, not sheathing at base, 2–2.2 × 0.6–0.8 mm. Seta erect, (6)10–12(15) × 0.11–0.12 mm, twisted to the right above and slightly to the left below, yellowish brown to orange. Capsule erect, stegocarpous, exerted; theca usually ovoid-cylindrical, (1.2)1.5–1.9(2) × 0.6–0.8 mm, yellowish brown to reddish brown; exothecial cells rectangular, (25)45–62.5(107.5) × (15)20–27.5(30) µm, usually thick-walled; annulus of vesiculose cells; peristome of 32 filamentous and papillose teeth, straight to less than one turn twisted, (220)315–675(950) µm long, yellowish to orange, basal membrane (87.5)100–132.5(150) µm long. Operculum conical, 0.8–1.4 mm long, not systylious, with spirally



Figures 72–79. Scanning electron micrographs (Figs 73–75, 78, 79) and light micrographs (Figs 72, 76, 77) of *Tortula platyphylla* (Fig. 72 from *Mahú 10617b*, H; Figs 73–75, 78, 79 from *Cano 22*, MUB; Figs 76, 77 from *Bertho s.n.*, FH). Fig. 72. Leaf. Fig. 73. Dorsal surface of the leaf apex. Fig. 74. Middle marginal cells of the leaf. Fig. 75. Ventral surface cells of the costa and laminal cells at middle. Fig. 76. Cross-section of the costa at midleaf. Fig. 77. Cross-section of the middle marginal cells of the leaf. Fig. 78. Peristome. Fig. 79. Spore.

twisted cells. Calyptra not seen. Spores spherical, 10–12.5 µm in diameter, granulate to vermiculate, yellowish to light brown. Leaf colour reaction with KOH yellow to orange.

Illustration: Zander (1993: 228).

Habitat: Walls and dry banks in hillside with *Puya* and *Acacia caven* (Molina) Molina; 0–2430 m.

Distribution: Chile and Peru.

Representative specimens studied: CHILE. REGIÓN IV (COQUIMBO): La Paloma, 15.x.1914, *Rose & Rose 19522* (US); Las Vacas, 6.x.1914, *Rose & Rose 19230a* (NY, US); vicinity of Illapel, 8.x.1914, *Rose & Rose 19462d* (NY, US); vicinity of La Serena, 10.x.1914, *Rose & Rose 19289* (NY, US). REGIÓN V (VALPARAÍSO): Papudo, 11.xi.2001, *Cano 111* (MUB 20840); Los Perales 1919, *Jaffuel s.n.* (PC, S B103857, UPS); Reñaca, xi.1923, *Bertho 93* (PC); Viña del Mar, 13.ix.1914, *Rose & Rose 19105* (US, NY). REGIÓN METROPOLITANA DE SANTIAGO: Baños de Colina, 8.xi.2001, *Cano 22* (MUB 20841); Peñalolén, viii.1919, *Bertho & Jaffuel, 13b* (PC); Santiago, Santa Julia, 8.ix.1970, *Mahú 5074* (US); Santiago, Cerro de San Cristobal, 13.xi.1975, *Mahú 10617b* (H 3147197, MO). REGIÓN VII (O'HIGGINS): Rancagua, Cachapoal 1828, Bertero 127 (PC). REGIÓN VIII (BIOBÍO): Concepción, 15.xi.1905, *Thaxter s.n.* (FH). PERU. AREQUIPA: Arequipa, 28.viii.1994, *Rose 19531* (NY). MOQUEGUA: pr. Torata, 14.iv.2005, *Cano 2408a* (MUB 20437). TACNA: pr. Palchia, 15.iv.2005, *Cano 2427a* (MUB 20470).

Notes: *Tortula platyphylla* is characterized by upper and middle laminal cells (5)7.5–10(12.5) µm wide, lingulate to lingulate-ovate, sometimes constricted at middle, with rounded and in some cases apiculate apex and with a well-developed intramarginal border of quadrate to rectangular cells, less papillose and thicker walled, disposed in four to seven rows. In addition, the costa in the upper part is usually curved, which is well observed in the dorsal surface of the leaf. It is similar to *Henediella bellii* (E.B. Bartram) R.H. Zander, a species known only from Ecuador (Bartram, 1955), because both species have leaves with a differentiated intramarginal border, which can be bi- or unistratose; however,

T. platyphylla can be distinguished by its recurved margins (plane in *H. bellii*) and costa usually percurrent or excurrent in a yellowish apiculus or short hair-point (usually ending below the apex in *H. bellii*). It is also close to *T. muralis* and *T. brevipes* (Lesq.) Broth., species known from the USA and Mexico. However, *T. platyphylla* can be distinguished from the former species by the peristome teeth straight or slightly twisted and a basal membrane of the peristome of (87.5)100–132.5(150) µm long [in *T. muralis*, the peristome teeth are more than one turn spirally twisted and the basal membrane is (32.5)41.6–81.3(95) µm long], and a more differentiated intramarginal border. *Tortula platyphylla* differs from *T. brevipes* by well-developed intramarginal border (undifferentiated in *T. brevipes*) and a peristome of straight or slightly twisted teeth (peristome teeth about one full turn twisted in *T. brevipes*). One sample of *T. platyphylla* studied [*Rose 19522* (US)] had peristome teeth of 850 µm long and more than one turn spirally twisted; however, the basal membrane of the peristome was 120 µm long and the intramarginal border was well developed.

The Peruvian specimens lack a sporophyte; however, the gametophytic characters are the same as those of the Chilean specimens. In addition, this material has protonematic gemmae, which have not been observed in the Chilean material. Until more specimens can be collected in Neotropical areas, this material is identified as *T. platyphylla*.

In the original description of *Desmatodon amblyophyllus*, two localities were mentioned (Montagne, 1845). We have only found one syntype deposited in the PC herbarium, which is selected as the lectotype.

According to Wijk *et al.* (1959), *Barbula berteroana* is a synonym of *T. muralis*. We have located a syntype of this name in PC, which is chosen as the lectotype. After studying the type material, we can conclude that there are no morphological differences between this taxon and *T. platyphylla*, and so it should be regarded as a synonym of the latter. The same is true of *Barbula graminicolor* ssp. *subgraminicolor*, whose original material corresponds with that of *T. platyphylla*. This synonym has already been observed by Thériot (1923).

After studying the type material of *Tortula flavipes*, we conclude that this name is a synonym of *T. platyphylla*.

Sollman (1990) considered *Tortula purpureo-velutina* as a synonym of *Pseudocrossidium crinitum*. After studying the original material of this name deposited in JE, it does not correspond with any species of *Pseudocrossidium*. We conclude that it is a small and sterile sample of *T. platyphylla*.

10. *TORTULA TRUNCATA* (HEDW.) MITT., *NAT. HIST. AZORES*: 297. 1870 (FIGS 46, 80–87)

Gymnostomum truncatum Hedw., *Sp. Musc. Frond.*: 30. 1801. *Ind. loc.*: ‘Omnibus fere regionibus locisque communis; laetissime in graminosis vigens’. *Type*: ‘*Gymnostomum truncatum*’ [lectotype designated by Geissler in Margadant & Geissler (1995): G-Hedwig]. *Bryum truncatum* With., *Syst. Arr. Brit. Pl.* 4, 3: 801. 1801. *Pottia truncatula* (With.) Büse, *Musci Neerl. Spec. Exisic.* 67. 1858, *nom. illeg.* (art. 52.1). *Ind. loc.*: [Great Britain] ‘Ditch banks, meadows, pastures and heaths. . . Hasselquist observing this plant growing in great abundance upon the walls of Jerusalem. . .’. *Type*: not located.

Pottia physcomitrioides Müll. Hal., *Hedwigia* 36: 101. 1897. *Ind. loc.*: ‘Argentina, La Plata: Dr. Spegazzini 1886 legit et misit’. *Type*: ‘Argentina, La Plata’, *Spegazzini s.n.* (lectotype designated here: PC!; isolectotype: S B105783!).

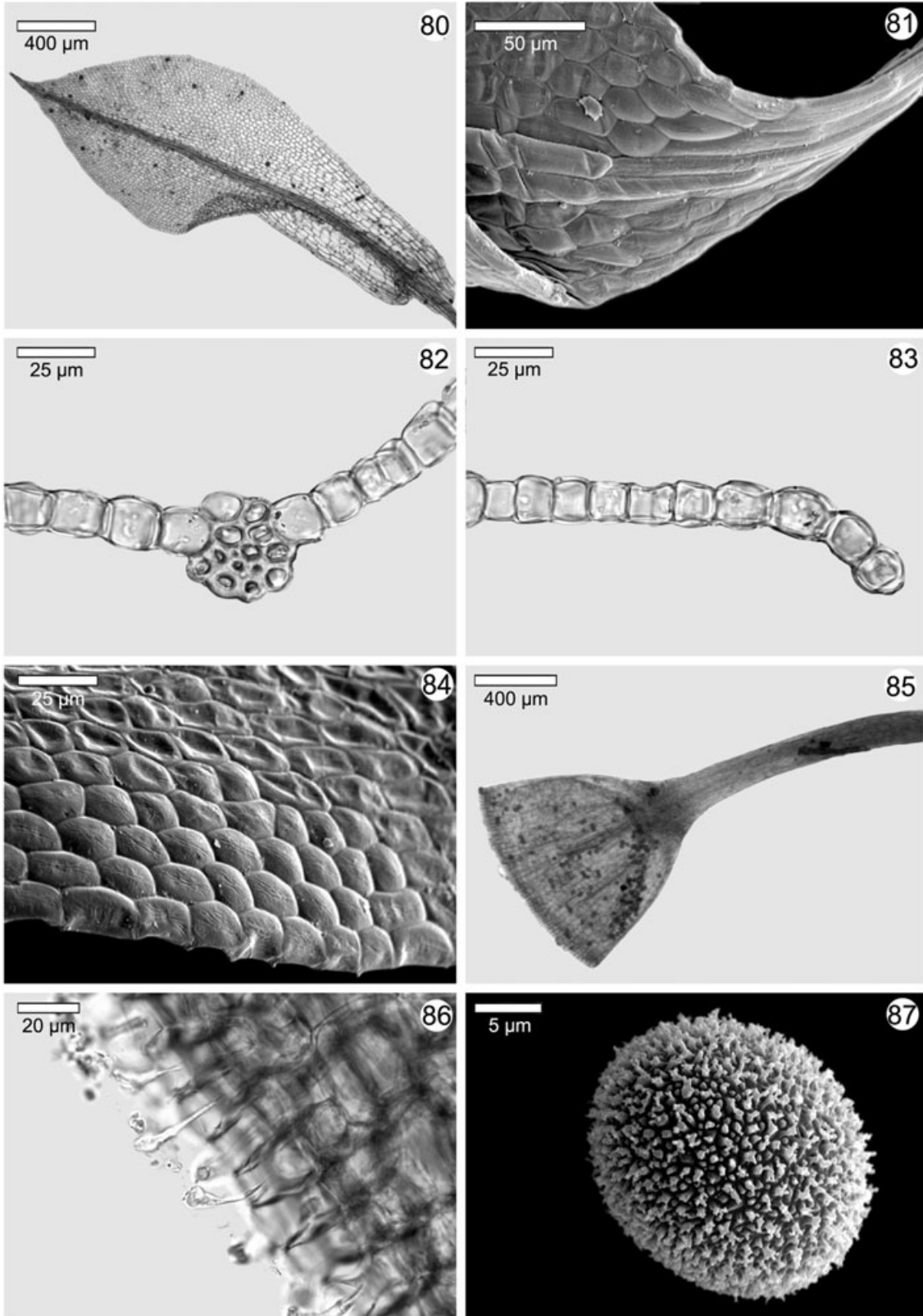
Description: Plants (0.3)0.4–0.7(0.8) cm high, growing in loose turfs to gregarious, yellowish green to light green. Stems 0.1–0.5(0.7) cm high, simple or branched. Rhizoidal and protonemal gemmae undeveloped. Leaves incurved, erect or erect-patent to slightly twisted when dry, erect-patent to spreading when moist, elliptical to obovate, more rarely oblong-elliptical, flat to slightly concave, (1.3)2–2.4 × (0.5)0.8–1.1 mm; apex usually obtuse, sometimes apiculate, not cucullate; margins recurved from the base to middle, or only at base, sometimes plane or recurved only in one margin, entire, rarely slightly denticulate near the apex by projection of papillae, unistratose, usually unbordered, sometimes the marginal row of cells thicker walled; costa (57.5)75–95(100) µm wide, percurrent or excurrent in a mucro, yellowish to brown, 75–450 µm, smooth; ventral surface cells of the costa rectangular, not bulging, smooth; dorsal surface cells of the costa elongate, smooth; in cross-section, semicircular, with two guide cells in one layer, band of ventral stereids undifferentiated, band of dorsal stereids semicir-

cular, with one to four stereid rows, sometimes substereids, hydroids developed, ventral surface cells rounded, (10)12.5–15(17.5) × (10)12.5–17.5 µm, disposed in one layer, dorsal surface cells differentiated; upper laminal cells hexagonal to quadrate-hexagonal or rectangular, (12.5)17.5–25(27.5) × (10)15–20(22.5) µm, thin- to slightly thick-walled, not collenchymatous, with zero to one simple papillae, 1 µm high, upper external marginal cells rectangular, more rarely quadrate or oblate, (10)12.5–20(30) × (7.5)10–12.5(17.5) µm [length/width ratio, (0.57)1.25–1.75(4)]; middle laminal cells rectangular or quadrate-hexagonal, (15)20–27.5(37.5) × (12.5)15–20(30) µm, thin- to slightly thick-walled, not collenchymatous, smooth, middle external marginal cells rectangular, rarely quadrate, (15)20–22.5(27.5) × (10)12.5–15 µm [length/width ratio, (1)1.6–1.8(2.75)], thin-walled, sometimes slightly thick-walled, smooth, middle internal marginal cells rectangular, sometimes quadrate or subquadrate, 15–22.5(35) × (7.5)12.5–17.5 µm [length/width ratio, (0.86)1–2], thin- to slightly thick-walled, smooth; basal laminal cells rectangular, inflated, (42.5)50–102.5 × (20)25–32.5(37.5) µm, usually thin-walled, not or slightly collenchymatous, smooth, basal external marginal cells rectangular, (32.5)35–57.5(75) × (10)12.5–17.5(20) µm [length/width ratio, (1.8)2.6–4.8(6)], usually thin-walled, smooth. Autoecious. Perichaetial leaves undifferentiated, not sheathing at base, 1.7–2 × 0.6–0.9 mm. Seta erect, 1.9–2.9 × 0.10–0.18 mm, straight to slightly twisted to the left, yellowish to orange. Capsule erect, stegocarpous, exerted; theca turbinate, 0.7–1 × (0.6)0.9–1.1 mm, orange to reddish brown; exothecial cells rectangular to quadrate, (32.5)37.5–47.5(62.5) × 25–37.5 µm, thin-walled; annulus of quadrate cells, filaments in the cells of the annulus sometimes differentiated; peristome undifferentiated, basal membrane undifferentiated. Operculum rostrate, 0.5–0.9 mm long, not systylious, with straight, sometimes slightly twisted above cells. Calyptra cucullate to slightly mitrate, 1.14–1.44 mm long, brownish yellow. Spores spherical, (20)22.5–25(27.5) µm in diameter, baculate, brownish. Leaf colour reaction with KOH yellow.

Illustrations: Crum & Anderson (1981: 369 as *Pottia truncata* (Hedw.) Bruch & Schimp.); Zander (1993: 229).

Habitat: On soil; 10–50 m.

Figures 80–87. Scanning electron micrographs (Figs 81, 84, 87) and light micrographs (Figs 80, 82, 83, 85, 86) of *Tortula truncata* (from *Felippone 1684*, PC). Fig. 80. Leaf. Fig. 81. Ventral surface of the leaf apex. Fig. 82. Cross-section of the costa at midleaf. Fig. 83. Cross-section of the middle marginal cells of the leaf. Fig. 84. Middle marginal cells of the leaf. Fig. 85. Capsule. Fig. 86. Annulus with filaments differentiated. Fig. 87. Spore.



Distribution: Argentina, Chile, and Uruguay. Also known from Europe (Hill *et al.*, 2006), temperate Asia (Saito, 1975; Li *et al.*, 2001), North Africa (Ros *et al.*, 1999), North America (Anderson *et al.*, 1990), Australia (Streimann & Klazenga, 2002), and New Zealand (Fife, 1995).

Representative specimens studied: ARGENTINA. BUENOS AIRES: 1897, *Heribaud s.n.* (PC). CHILE. REGIÓN VIII (BIOBÍO): Mitrinhue, 14.ix.2001, *Ireland & Bellolio 30377* (MO). URUGUAY. CANELONES: La Paz 1916, *Felippone 1316* (JE). COLONIA: Estanzuela, 28.vii.1928, *Herter 3581* (NY). MONTEVIDEO: Montevideo, *Felippone 1684* (PC); Carrasco, viii.1924, *Herter 1443* (NY); Unión, *Felippone 252* (NY); Mabin, *Felippone 793* (H-BR 3390 005); Mirador Rosado, *Felippone 215* (H-BR 3390 012).

Notes: *Tortula truncata* is easily characterized by usually obovate leaves, with smooth cells, and capsules exerted, turbinate, and gymnostomous.

Müller (2002) reported *Pottia intermedia* (Turner) Fürnr. (*Tortula modica* R.H.Zander) from one locality in Chile, indicating that the new record seemed to be based on an introduction. The Chilean specimen [REGIÓN VII (O'HIGGINS): Talca, area of the university, 6.vi.1999, *Müller C16* (DR)] exhibited the typical characters provided for this species: more cylindrical theca and elongate seta than *T. truncata*. New collections will be necessary to know the status of this taxon in South America.

We have located two syntypes of *Pottia physcomitrioides* at S and PC herbaria. We chose the specimen from PC as the lectotype, because it is better preserved.

11. *TORTULA VAHLIANA* (SCHULTZ) MONT., *FL.*

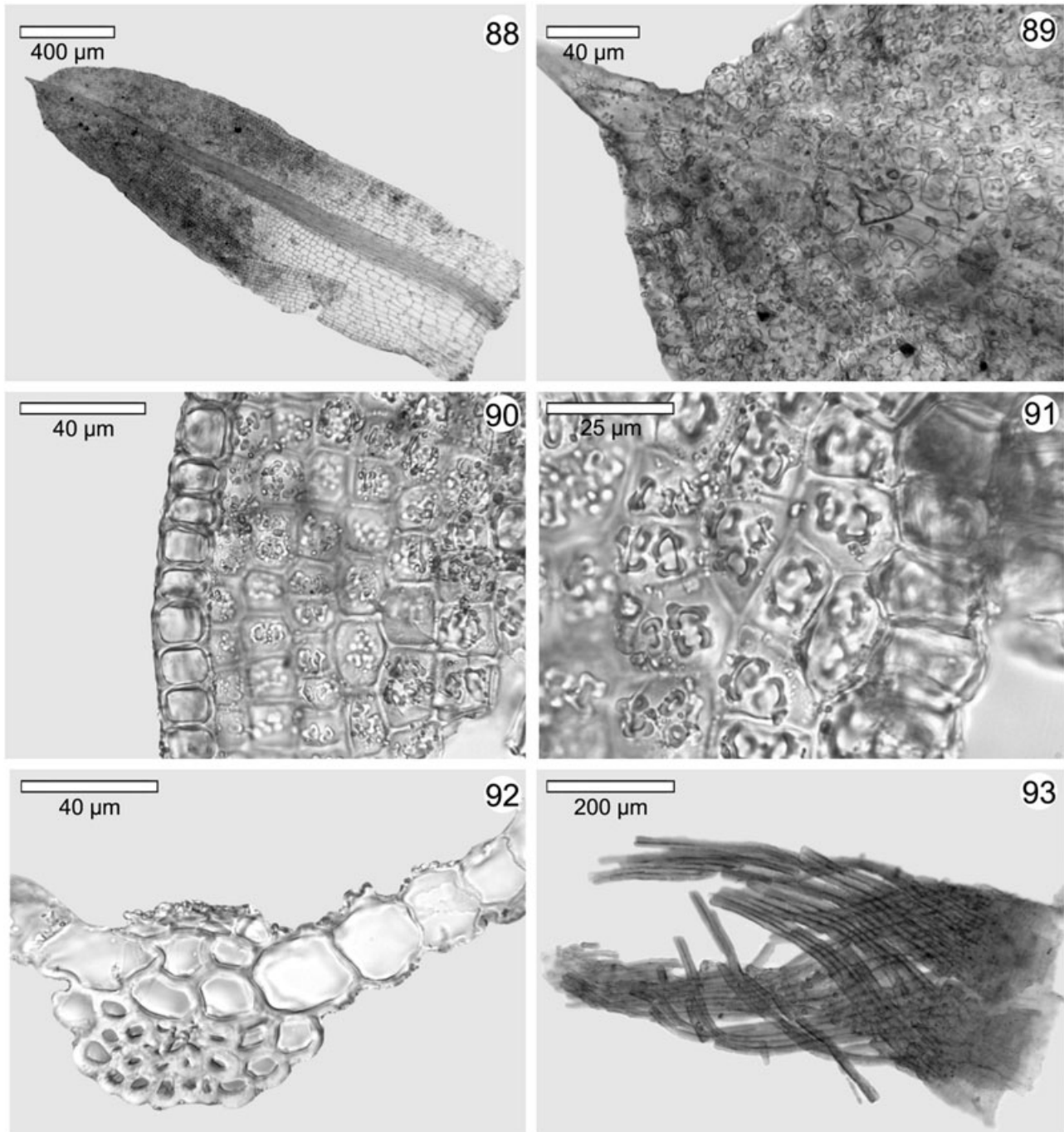
CHIL. 7: 153. 1850 (FIGS 28, 88–93)

Barbula vahliana Schultz, *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 11(1): 222. 1823. *Ind. loc.:* 'Alpibus Pyrenaeis ad terram ochraceam, ubi Bridelii primus legit'. *Type:* not located. *Tortula peruviana* Mitt., *J. Linn. Soc., Bot.* 12: 169. 1869. *Barbula peruviana* (Mitt.) A. Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1871–72: 441. 1873, *syn. nov. Ind. loc.:* 'Peruvia, Herb. Hooker'. *Type:* 'Peru', *Hooker s.n.* (lectotype designated here: NY-Mitten!).

Description: Plants 0.2–0.4 cm high, growing in turfs, yellowish green. Stems 0.1–0.2 cm, usually simple. Rhizoidal and protonemetic gemmae undeveloped. Leaves erect to erect-patent when dry, patent, spreading when moist below, oblong to lingulate, slightly

concave, 1.5–1.9 × 0.5–0.6 mm; apex rounded, sometimes obtuse, not cucullate; margins plane, sometimes slightly recurved below, papillose-crenulate from the apex to the middle, unistratose, usually bordered by one to three differentiated cell rows, forming a marginal border; costa 80–92.5 µm wide, usually excurrent in an apiculus, rarely ending two to three cells below the apex, yellowish to hyaline, 50–75 µm, smooth; ventral surface cells of the costa rectangular to hexagonal, not bulging, papillose from near the apex to the lower third; dorsal surface cells of the costa linear, slightly papillose near the apex, smooth in the rest; in cross-section, circular to semicircular, with four guide cells in two layers, band of ventral stereids undifferentiated, band of dorsal stereids semicircular, with two to four stereid rows, hydroids developed, ventral surface cells quadrate, 7.5–15 × 7.5–12.5 µm, disposed in one layer, dorsal surface cells differentiated, similar to substereids; upper laminal cells quadrate-hexagonal, 12.5–20 × 12.5–17.5 µm, thin-walled, not collenchymatous, with two to four bifurcate papillae, 5 µm high, upper external marginal cells quadrate or oblate, sometimes short-rectangular, 7.5–17.5 × 10–15 µm (length/width ratio, 0.5–1.8); middle laminal cells quadrate-hexagonal, 17.5–25 × 12.5–20 µm, thin-walled, not or very slightly collenchymatous, with four to six bifurcate papillae, 5 µm high, middle external marginal cells quadrate to short-rectangular or oblate, 10–20 × 12.5–15 µm (length/width ratio, 0.7–1.6), slightly thick-walled, with two to four inconspicuous and simple papillae, middle internal marginal cells quadrate-hexagonal to rectangular or quadrate, 12.5–20 × 12.5–17.5 µm (length/width ratio, 0.8–1.6), slightly thick-walled, with two to four simple and inconspicuous papillae; basal laminal cells rectangular, inflated, 37.5–75 × 15–37.5 µm, thin-walled, slightly collenchymatous, smooth, basal external marginal cells rectangular, 17.5–37.5 × 12.5–17.5 µm (length/width ratio, 1–3), thin-walled, smooth. Dioecious (probably rhizoautoecious). Perichaetial leaves undifferentiated, not sheathing at base, 2–2.2 × 0.5 mm. Seta erect, 8–10 × 0.10–0.12 mm, slightly twisted to the right above and to the left below, reddish brown. Capsule erect, stegocarpous, exerted; theca cylindrical, 1.4–2 × 0.4–0.5 mm, reddish brown; exothecial cells rectangular, 27.5–55 × 12.5–15 µm, thin-walled; annulus of vesiculate cells; peristome of 32 filamentous and papillose teeth, one turn spirally twisted, c. 510 µm long, orange; basal membrane c. 100 µm long, papillose. Operculum conical, c. 0.77 mm long, not systylious, with spirally twisted cells. Calyptra cucullate, yellowish brown. Spores spherical, 7.5–10 µm in diameter, granulate, brownish. Leaf colour reaction with KOH yellow.

Illustration: Cano (2006: 171).



Figures 88–93. Light micrographs of *Tortula vahliana* (from Hooker *s.n.*, NY). Fig. 88. Leaf. Fig. 89. Ventral surface of the leaf apex. Fig. 90. Middle marginal cells of the leaf. Fig. 91. Middle laminal cells. Fig. 92. Cross-section of the costa at midleaf. Fig. 93. Peristome.

Habitat: Unknown.

Distribution: Peru. Also known from Europe (Hill *et al.*, 2006), North Africa (Ros *et al.*, 1999), and temperate Asia (Düll, 1984).

Notes: According to Mitten (1869), the original material of *T. peruviana* was deposited in 'herb. Hooker'. In BM, where the original herbarium of Hooker is housed, there is no syntype of this name. We have found a syntype in the Mitten herbarium at NY, which we here

select as the lectotype of this name. After studying the type material of this species, we cannot find any diagnostic character to segregate this taxon from the European specimens studied of *T. vahliana*. Thus, *T. peruviana* has oblong to lingulate leaves, with plane or only slightly recurved margins at the middle, usually rounded apex, marginal cells forming a differentiated border of usually quadrate, less papillose, and thicker walled cells than the rest of the lamina, and peristome with 32 spirally twisted teeth with a short basal membrane and small spores. Therefore, with the current data, *T. peruviana* is considered to be conspecific with *T. vahliana*.

Tortula vahliana has not previously been cited in the Neotropics. The only report of this species in America is by Montagne (1850) from Chile, although this species does not appear in the last Chilean checklist (He, 1998). After studying the specimen, which supports the record of Montagne (1850) (Quillota, *Bertero s.n.*, PC), it was identified as *T. platyphylla*. This material is coincidentally the type material of *Barbula berteroa*. Consistently, the newly synonymized *T. peruviana* is the first report of *T. vahliana* in America.

EXCLUDED TAXA

1. *POTTIA ALTIPIES* BROTH., *ARK. BOT.* 15(6): 4. 1918, *SYN. NOV.* = *HENNEDIELLA HEIMII* (HEDW.) R.H. ZANDER

Ind. loc.: 'Argentina: prov. Salta, Chorillos (in puna) in ripa rivuli humida, c. 4300 m s. m. (n. 60)'. *Type*: 'Argentina, prov. Salta, Chorillos', 4300 m, 30.x.1901, *Fries 60* (lectotype designated here: S B90603!; isolecotype: PC!).

We have found two syntypes of this name housed at PC and S. We chose the syntype at S as the lectotype of *P. altipes*. The original material shows capsules systylious, with turbinate thecas, polygonal exothecial cells, hexagonal and with inconspicuous papillae in the upper and middle laminal cells, border scarcely differentiated, and orange KOH leaf reaction. *Pottia altipes* certainly represents *H. heimii*, and its morphological characters fall within the range of variation of this latter species. Therefore, we conclude that *P. altipes* is a new synonym of *H. heimii*.

2. *POTTIA CHUBUTENSIS* CARDOT & BROTH., *KONGL. SVENSKA VETENSK. ACAD. HANDL.* 63(10): 21. 1923, *SYN. NOV.* = *HENNEDIELLA HEIMII* (HEDW.) R.H. ZANDER

Ind. loc.: 'Patagonia andina: Territ. Chubut, Valle 16. de Octubre, Estancia Underwood (318)'. *Type*: [Argentina] 'Patagonie, territoire Chubut, vallée du 16 octobre, Estancia Underwood', 5.xi.1908, *Skottsberg 318* (lectotype designated here: PC!).

A syntype of this name was deposited in Cardot's herbarium at PC. It is selected here as the lectotype.

After studying the type material of *P. chubutensis*, we did not find any differences to separate this material from *H. heimii*. Thus, the plants have turbinate capsules, with the operculum attached to the columella, marginal cells of the leaf scarcely differentiated, and orange KOH leaf reaction. Therefore, *P. chubutensis* is proposed as a new synonym of *H. heimii*.

3. *POTTIA CUCULLATA* (HAMPE) A. JAEGER, *BER. THÄTIGK. ST. GALLISCHEN NATURWISS. GES.* 1871–72: 345 1873, *SYN. NOV.* = *OREOWEISIA EROSA* (HAMPE EX MÜLL. HAL.) KINDB.

Anacalypta cucullata Hampe, *Ann. Sci. Nat., Bot.*, sér. 5, 5: 335. 1866. *Weissia cucullata* (Hampe) Mitt., *nom. illeg.*, *J. Linn. Soc., Bot.* 12: 140. 1869 [non *Weissia cucullata* Müll. Hal., *Bot. Zeitung (Berlin)* 16: 163. 1858]. *Ind. loc.*: 'Bogota, Guadalupe, 3200 met., leg. Lindig.'. *Type*: [Colombia] 'Bogota, Guadalupe', 3200 m, *Lindig s.n.* (holotype: BM-Hampe!; isotype: BM-Bescherele!).

The original material deposited at BM consists of small plants with oblong-ligulate leaves, obtuse apex, crenulate margins, rounded to subquadrate, mamillate laminal cells, stem with central strand, and peristome of rudimentary teeth. We conclude that this species does not belong to the genus *Tortula* or any other genera of Pottiaceae. It shows the same morphological characters as *Oreoweisia erosa*. Therefore, *P. cucullata* is synonymized here with this latter species.

4. *POTTIA HUMILLIMA* (ÅNGSTRÖM) PARIS, *INDEX BRYOL.* 1023. 1898, *SYN. NOV.* = *MICROBRYUM DAVALLIANUM* (SM.) R.H. ZANDER

Anacalypta humillima Ångström, *Öfvers. Förh. Kongl. Svenska Vetensk.-Akad.* 33(4): 10. 1876. *Ind. loc.*: [Brazil] 'Widgren retulit'. *Type*: 'Brazilia, Caldas' *Widgren s.n.* (lectotype designated here: S B10082!).

In the herbarium of J. Ångström at S, there is deposited a sheet which contains plants numbered from one to six. Most of them are glued and others are on a slide. This material was collected by Widgren in Brazil and, in numbers five and six, 'Caldas, Brazilia' is indicated. All of this material is chosen as the lectotype. The material seems to belong to *Microbryum* Schimp. Thus, the small plants show apiculate leaves, with recurved margins, upper and middle laminal cells papillose, reddish KOH leaf reaction, a single band of dorsal stereids, and urne stegocarpous. We were only able to study the spores from one

specimen which was inside a small envelope. These spores are papillose. Therefore, we conclude that *P. humillima* is a new synonym of *M. davallianum*.

Microbryum davallianum is known from Europe, North Africa, temperate Asia, North America, and Australia (Düll, 1984). Therefore, it is a new record for South America. In the studied material for this revision, we have identified other specimens of *M. davallianum* from Chile [Región Metropolitana de Santiago, Santiago, Facultad de Ciencias, 16.vi.1983, *Mahú 20447* (MO)]. Therefore, the range of this species in South America is extended to Brazil and Chile.

5. *POTTIA LIGULARIFOLIA* MÜLL. HAL., *HEDWIGIA* 34: 123. 1895, **SYN. NOV. = ZANDERIA OCTOBLEPHARIS** (A. JAEGER) GOFFINET

Ind. loc.: 'Minas Geraës: in regione fluminis Paranahyba, in terra, Martio 1893 – Ule n. 1502'. *Type*: [Brazil] 'In Paranahybagebiet, Minas Geraes', iii.1893, *Ule 1502* (lectotype designated here: HBG!).

We have located the original material of this species at the HBG herbarium, which matches exactly with the description provided by Brotherus (1895). In addition, 'ex Herb. Ule' is indicated on the label. This material is chosen as the lectotype.

The plants have a stem without central strand, spatulate leaves, with obtuse-rounded apex, upper laminal cells rounded to subquadrate, smooth, thick-walled, costa ending below the apex, in cross-section without ventral surface cells, and capsules with peristome of 16 teeth in eight pairs. All of these characters are distinctive of *Z. octoblepharis* (cf. Goffinet, 1997). Therefore, *P. ligularifolia* is synonymized with this latter species.

6. *POTTIA ULEANA* PARIS, *INDEX BRYOL.* 1030. 1898, **SYN. NOV. = ZANDERIA OCTOBLEPHARIS** (A. JAEGER) GOFFINET

≡ *Pottia asperula* Müll. Hal. ex Broth., *Hedwigia* 34: 123. 1895, *nom. illeg.* (non *Pottia asperula* Mitt., *J. Bot.* 9: 4. 1871). *Ind. loc.*: 'Am. merid. Brazil. or. (Goyaz)'. *Type*: [Brazil]: 'Bras. Goyaz', i.1893, *Ule 1554* (lectotype designated here: S B105785!).

We located a syntype in the G. Roth herbarium at S. It is chosen as the lectotype of this name. The specimen has the same characteristics as those shown by *P. ligularifolia*, except that the leaves are more lingulate than those of the latter species. It was not possible to observe the peristome, because the capsules lack an operculum and it has fallen down. Therefore, *P. uleana* is here synonymized with *Z. octoblepharis*.

7. *TORTULA AMPHIDIIFOLIA* (MÜLL. HAL.) BROTH., *NAT. PFLANZENFAM.* 1(3): 430. 1902, **SYN. NOV. = CHENIA LORENTZII** (MÜLL. HAL.) R.H. ZANDER

Barbula amphidiifolia Müll. Hal., *Linnaea* 42: 332. 1879. *Ind. loc.*: 'Argentina Cordobensis, Ascochinga, cum *Barbula sedifolia* et *Trichostomo acaulo* Aprili 1871, terrestris'. *Type*: 'Argentina, Cordobensis, Ascochinga', iv.1871, *Lorentz s.n.* (lectotype designated here: S B103816!; isolectotype: NY!).

We located two syntypes of this name in NY and S herbaria. We select as lectotype of this name the syntype of S. The samples are poorly preserved, but it was possible to observe the following characters: reddish lamina with KOH, distal laminal cells smooth, without border differentiated, some leaves slightly dentate near apex, and cross-section of the costa with substereids. The syntype of NY has specimens only with setae and the syntype of S has broken capsules. However, Müller (1879), in the original description, wrote that the capsule had a peristome with a short basal membrane and rudimentary teeth. We conclude that *T. amphidiifolia* is a new synonym of *C. lorentzii*.

8. *TORTULA ATRATA* THÉR., *REVISTA CHILENA HIST. NAT.* 25: 297, PL. 25 FIG. 1. 1921, **SYN. NOV. = SYNTRICHIA BREVISETA** (MONT.) **COMB. NOV.** (SEE *TORTULA BREVISETA* MONT.)

Ind. loc.: 'Los Perales de Marga-Marga (en société avec *Orthotrichum rupestre*), c. fr. juin (Costes, n°102 pp)'. *Type*: 'Chili, Los Perales de Marga Marga' 1915, *Costés 102 p.p.* (holotype: PC!).

The type specimen lacks sporophytes and shows lingulate leaves, constricted at the middle, irregularly bistratose in the upper third and at middle, with a hyaline, short and smooth or spinulose hair-point, plane or weakly recurved at base or up to the middle margins, bordered by three to five rows of thicker walled and smooth cells, upper and middle laminal cells 10–12.5 × 7.5–10(12.5) µm, cross-section of the costa with two to three dorsal stereid rows, with hydroids and substereids, and dorsal side of the costa with simple or bifurcate papillae, 2.5–5(10) µm high. All of these characters place this species as a new synonym of *S. breviseta*.

9. *TORTULA BERTHOANA* THÉR., *REVISTA CHILENA HIST. NAT.* 30: 343, LÁM. 25 FIG. 3. 1926. **SYNTRICHIA** SP.

Ind. loc.: 'Los Perales de Marga-Marga (M. Bertho 1924)'. *Type*: 'Chili, Los Perales, pr. Valparaiso', ii.1924, *Bertho 136* (holotype: PC!; isotypes: S B103842!, W!).

The plants are small, fragile, with lingulate to lingulate-spathulate leaves, margins recurved up to the middle, upper and middle laminal cells 10–12.5 µm wide, cross-section of the costa with three to four dorsal stereid rows and without hydroids, papillose costa ending some cells below the apex and gradually narrowed to the apex, with short basal membrane of the peristome, and spores 7.5–10(12.5) µm in diameter. The anatomy of the costa and the KOH reaction place this species in the genus *Syntrichia*. It could be a different expression of *S. fragilis*; however, it has constricted leaves at the middle, with narrower upper and middle laminal cells, cross-section of the costa without hydroids, a different leaf apex, and smaller spores. Until a complete study of *Syntrichia* is carried out in South America, *T. berthoana* is transferred to the genus *Syntrichia*.

10. *TORTULA BREVISETA* MONT., *ANN. SCI. NAT., BOT., SÉR.* 3, 4: 107. 1845 = *SYNTRICHIA BREVISETA* (MONT.) M.J.CANO & M.T.GALLEGO, *COMB. NOV.*

Ind. loc.: 'in terra circa S. lago reipublice chilensis Aprili 1829 legit cl. C. Gay. Herb. Mus. Par.' *Type*: 'Chile, S. Lago', *Gay s.n.* (holotype: PC!; isotype: PC!).

After studying the original material of *T. breviseta*, it proved to belong to the genus *Syntrichia*, because it shows a costa with crescent-shaped dorsal stereid rows and absence of dorsal surface cells of the costa, and red KOH leaf reaction. As published by Montagne (1845), the plants have a short seta (5 mm high) and peristome with long spirally twisted teeth (900 µm high) and short basal membrane (two cell rows of 37.5 µm high). Therefore, we transferred this name to the genus *Syntrichia* as *S. breviseta*.

11. *TORTULA BRUNNEA* (MÜLL. HAL.) BROTH., *NAT. PFLANZENFAM.* 1(3): 433. 1902, *SYN. NOV.* = *SYNTRICHIA FRAGILIS* (TAYLOR) OCHYRA

Barbula brunnea Müll. Hal., *Nuovo Giorn. Bot. Ital.* 4: 113. 1897. *Ind. loc.*: [Bolivia] not indicated. *Type*: 'Bolivia, provincia Cochabamba, prope Choquecamata', vi.1889, *Germain s.n.* (lectotype designated here: FI!).

After searching in most of the herbaria in which material of C. Müller could have been deposited, we were only able to locate a syntype of this taxon in the herbarium of E. Levier at FI, which we chose as the lectotype of this name. The material showed fragile leaves, as is mentioned in the original description, with mucronate apex, leaf margins slightly recurved, smooth dorsal surface of the costa, without hydroids, upper and middle lamina cells 10 µm wide, and membrane of the peristome short (100 µm high, six

to eight cell rows). According to Gallego (2005), the typical morphotype of *S. fragilis* shows a papillose dorsal surface of the costa, hydroids, upper and middle lamina cells wider, and leaf margins recurved up to the upper third, but all of these characters are present in the variability shown by this species. Therefore, *B. brunnea* is here synonymized with *S. fragilis*.

12. *TORTULA BUCHTIENII* HERZOG, *BEIH. BOT. CENTRALBL.* 27: 354. 1910 = *SYNTRICHIA BUCHTIENII* (HERZOG) *COMB. NOV.*

Ind. loc.: 'Bolivia, Cacaltaya, 4800 m, leg. O. Buchtien, März., 08'. *Type*: 'Bolivia, Chacaltaya, 4800 m', ii.1908 m, *Buchtien 25* (holotype: JE!; isotypes: PC-Cardot!, PC-Thériot!).

The type material lacks sporophytes and is recognized by lingulate leaves, weakly constricted and recurved up to the upper third, smooth, brown hair-point, hyaline at the apex (130–200 µm long), unistratose lamina, upper and middle laminal cells (7.5)10–12.5 µm wide, cross-section of the costa with five to six dorsal stereid rows, one to two guide cell rows and hydroids, which sometimes are scarcely differentiated, and papillose dorsal surface of the costa, with simple papillae, 2.5 µm long. This species is similar to *S. bartramii* (Steere) R.H. Zander, but the latter species shows a longer and spinulose hair-point (although some specimens have an apiculate apex), plane leaf margins, dorsal surface of the costa more papillose, and lamina irregularly bistratose. It also resembles *S. montana* var. *calva* (Durieu & Sagot) J.J. Amann, but the mucronate apex, smaller laminal cells, 5–7.5(10) µm wide, clearly constricted leaves, and leaf margins recurved up to the middle, rarely up to the upper third, are significant differences from this taxon. Therefore, we transfer *T. buchtienii* to the genus *Syntrichia* as *S. buchtienii*.

13. *TORTULA BULLATA* HERZOG, *HEDWIGIA* 64: 10. 1923, *NOM. ILLEG.* [NON *TORTULA BULLATA* (SOMMERF.) LINDB., *MUSCI SCAND.* 21. 1879], *SYN. NOV.* = *SYNTRICHIA RURALIS* (HEDW.) F. WEBER & D. MOHR

Ind. loc.: 'Chile, auf sandiger Erde eines Waldschlages bei Punta Arenas (Süd-Chile), c. 50 m über dem Meer, Dezember 1911, leg. Th. Herzog'. *Type*: 'Chile, Bei Punta Arenas', xii.1911, *Herzog 5249* (holotype: JE!; isotypes: JE!, PC!).

Tortula bullata is clearly related to the *S. ruralis* complex, which is only represented in South America by *S. ruralis* var. *ruralis* and *S. ruralis* var. *spiralis* (Herzog) R.H. Zander. The leaves are ovate, with slightly cucullate apex, long and spinose hyaline hair-

point, recurved leaf margins up to the upper third or to the apex, costa without hydroids, upper and middle laminal cells 10–12.5 µm wide, and peristome with long teeth and a high basal membrane. The lamina, mainly in young leaves, tapers to the apex. The leaves are patent or spreading when moist and not recurved, as might be expected in *S. ruralis*, but this character does not separate this species from *S. ruralis* var. *ruralis*. Therefore, we conclude that *T. bullata* nom. illeg. is a new synonym of *S. ruralis*.

14. *TORTULA CHARACODONTA* (MÜLL. HAL.) BROTH.,
NAT. PFLANZENFAM. 1(3): 430. 1902, SYN.
NOV. = *SYNTRICHIA PERCARNOSA* (MÜLL. HAL.)
R.H. ZANDER

Barbula characodonta Müll. Hal., *Linnaea* 43: 431. 1882. *Ind. loc.*: 'Argentinia subtropica Tucumanensis, Sierra de Aconquija in montibus excelsis inter Siambòn et Tafi terram habitans, Aprili 1872'. *Type*: 'Argentinia subtropica Tucumanensis, Sierra de Aconquija in montibus excelsis inter Siambòn et Tafi terram habitans', iv.1872, *Lorentz s.n.* (lectotype designated here: PC!).

We have only been able to locate one syntype in PC of the unique specimen reported in the original description (Müller, 1882), which we have chosen as the lectotype. The material consists of only three poorly preserved plants, with two sporophytes and without a peristome, but the cross-section of the leaves clearly places this species in the genus *Syntrichia*. The plane leaf margins, weakly bordered, slightly cucullate apex, small upper and middle laminal cells (5)7.5–10 µm wide, and scarcely differentiated basal hyaline area of the leaves of this plant characterize *S. percarcosa*, with which *T. characodonta* is synonymized.

15. *TORTULA CHUBUTENSIS* DUSÉN, *BOT. NOT.*
1905: 300. 1905, SYN. NOV. = *SYNTRICHIA RURALIS*
(HEDW.) F. WEBER & D. MOHR

Ind. loc.: 'Patagonia orientalis prope ostium flum. Chubut in arena mobili'. *Type*: [Argentina] 'Patagonia orientalis, Territorio Chubut, prope Rawson colonien', ix.1865, *Dusén* 68 (lectotype designated here: S B103778!; isolectotypes: PC!, UPS!).

We have located three syntypes of this name in the Cardot herbarium at PC, UPS, and the Dusén herbarium at S. We chose the specimen deposited at S as the lectotype because it is better preserved and is the only specimen from the Dusén herbarium. The species is recognized by ovate-lingulate and unistratose leaves, without constriction at the middle, with recurved margins up to the upper third or near to the apex, not bordered, with long, spinose

and hyaline hair-point, cross-section of the costa without hydroids, and upper and middle laminal cells of 12.5 µm wide. Brotherus (1931) compared this species with *T. ruralis* (Hedw.) P. Gaertn., B. Mey. & Scherb, and separated the two species by the leaf shape only. The type material is sterile; therefore, it is synonymized with *S. ruralis* on the basis of gametophytic characters.

16. *TORTULA CONTORTA* (HAMPE) MONT., *FL. CHIL.*
7: 147. 1850, SYN. NOV. = *SYNTRICHIA*
FLAGELLARIS (SCHIMP.) R.H. ZANDER

Barbula contorta Hampe, *Syn. Musc. Frond.* 1: 629. 1849. *Ind. loc.*: 'Chile: Bertero'. *Type*: 'Chile', *Bertero s.n.* (holotype: BM-Hampe!).

The type is a poorly preserved specimen, as it consists of three leaves and one sporophyte with few perichaetial leaves. Features of note are the flagelliform branches, lingulate to lanceolate leaves, recurved margins up to the upper third, not bordered, with a smooth hair-point (200–500 µm long) or apiculus (50–100 µm long), leaves individually twisted when dry, papillose dorsal surface of the costa, cross-section of the costa with hydroids, 1–3(4) dorsal stereid rows, sometimes with substereids and one to three guide cell rows, upper and middle laminal cells (10)12.5–15(17.5) µm wide, peristome with long teeth, and basal membrane of 200–350 µm high. *Tortula contorta* is placed in *Syntrichia* on the basis of the gametophytic characters, and is synonymized with *S. flagellaris*.

17. *TORTULA FERRUGINEA* E.B. BARTRAM,
REV. BRYOL. LICHÉNOL. 33: 325. 1964–65 [1965],
SYN. NOV. = *SYNTRICHIA BOGOTENSIS* (HAMPE)
R.H. ZANDER

Ind. loc.: 'Tucuman: Tafi, Cumbres Calchafines, 4200 m, M. Lillo no. 00300'. *Type*: [Argentina] 'Tafi, Cumbres Calchafines, 4200 m', 1.ii.1907, *M. Lillo s.n.* (ex LIL no. 300) (holotype: FH-Bartram!).

Bartram (1965) published this species on the basis of a specimen without sporophytes, with lightly contorted, erect, acuminate, nearly plane margined leaves, with yellowish hair points. In the protologue, he indicated some affinity between the new species and *T. chrysophylla* (Müll. Hal.) Paris, which, according to Matteri (2003b), is a synonym of *S. princeps* (De Not.) Mitt. The type material has the gametophytic characters which define *S. bogotensis*: orange to reddish or reddish brown hair-points, leaf apex occasionally sharply toothed, cross-section of the costa with 1–3(4) stereid rows, without hydroids, plane leaf margins, and upper and middle laminal cells 12–26 µm wide. The leaf margins are slightly

recurved near the middle in some leaves, although this has also been observed in Neotropical specimens of this species (Gallego, Cano & Sérgio, 2005). According to Matteri (2003a), *S. bogotensis* has not been reported in Argentina; therefore, it is a new record for this country.

18. *TORTULA FRAGILLIMA* HERZOG, *HEDWIGIA* 57: 246. 1916, *SYN. NOV.* = *SYNTRICHIA FRAGILIS* (TAYLOR) OCHYRA

Ind. loc.: 'An Baumrinde im Bergwald von Santiago de Chiquitos (Ostbolivia), c. 700 m, Mai 07, leg. Th. Herzog.' *Type*: [Bolivia] 'bei Santiago de Chiquitos', 700 m, v.1907, *Herzog s.n.* (holotype: JE!).

We have studied the holotype deposited at the Herzog herbarium in JE. It is characterized by fragile, mucronate, and unistratose leaves, with recurved margins up to the middle, or only at the base, upper and middle laminal cells 7.5–10 µm wide, and strongly papillose dorsal surface of the costa. The cross-section of the costa shows hydroids and two to three dorsal stereid rows. All of these characters are typical of *S. fragilis*, with which it is synonymized. The specimen bears a revision label by Ph. Sollman with the name '*Syntrichia fragilis*' handwritten, from 1991, but, to our knowledge, this synonym has not been published until now.

19. *TORTULA LAEVINERVIS* BROTH. EX DUSÉN, *ARK. BOT.* 6(10): 4, TAF. 1 FIGS 9–12. 1906, *SYN. NOV.* = *SYNTRICHIA FRAGILIS* (TAYLOR) OCHYRA

Ind. loc.: 'Chile centralis Valparaíso, Viña del mar in rupibus'. *Type*: 'Chile australis ad Valparaiso opp. in rupibus et saxis', 21.vi.1896, *Dusén 121* (lectotype designated here: M!; isolectotypes: E!, NY!, O!, PC!).

Dusén (1906a), in the original description, compared this species with *T. epilosa* Broth. ex Dusén, but he distinguished *T. laevinervis* by its narrow leaf and the costa excurrent in an arista. We located several syntypes of this name in E, NY, M, O, and PC herbaria. We selected the specimen deposited at M as the lectotype, because it is the best preserved. After studying the original material, this proved to belong to the genus *Syntrichia*. In addition, the drawing from the original description supports this. Distinguishing features include the fragile (although some have quite firm), mucronate, and unistratose leaves, with recurved margins up to the middle, upper and middle laminal cells 7.5–10 µm wide, and papillose dorsal surface of the costa. The cross-section of the costa shows hydroids and three to four dorsal stereid rows. All of these characters indicate that this species is a synonym of *S. fragilis*.

20. *TORTULA LIGULATA* HERZOG, *BIBLIOTH. BOT.* 87: 48, FIG. 13B–D. 1916, *SYN. NOV.* = *SYNTRICHIA FRAGILIS* (TAYLOR) OCHYRA

Ind. loc.: 'Auf trockener Erde im Aracatal, c. 3000 m, no. 3193'. *Type*: [Bolivia] 'Aracatal', 3000 m, ix.1911, *Herzog 3193* (holotype: JE!; isotypes: B! L!, M!, O!, PC!).

Herzog (1916) published this species on the basis of one collection. The original material lacks sporophytes and shows fragile, lingulate, weakly constricted at middle or not constricted, unistratose leaves, mucronate, with recurved margins up to the middle, middle and upper laminal cells 7.5–10 µm wide, cross-section of the costa with hydroids, and an anatomy characteristic of the genus *Syntrichia* (dorsal stereid band crescentic in shape and dorsal epidermis layer undifferentiated). All of these gametophytic characters are present in the variability shown by *S. fragilis*, and it is synonymized with this species.

21. *TORTULA LITOREA* CARDOT & BROTH., *KONGL. SVENSKA VETENSKAPSAKAD. HANDL.* 63(10): 23, TAB. 2, FIG. 2A–E. 1923. *SYNTRICHIA* SP.

Ind. loc.: 'W. Falkland: Port Philomel, Halfway Cove (346). E. Falkland: Darwin Harbour (347)'. *Type*: [Argentina] 'Falkland, île occidentale, Halfway Cove', 21.xi.1907, *Skottsberg 346* (lectotype designated here: PC!; isolectotype: UPS!).

We have found four syntypes in PC and UPS of the collections reported in the protologue. We have selected the number *Skottsberg 346* from PC as the lectotype, because it is better preserved. The species is recognized by lanceolate, not constricted, mucronate and not bordered leaves, sometimes fragile, with recurved margins up to the upper third. The original material has no sporophytes, but the structure of the leaf, including the costa, suggests that this species belongs to the genus *Syntrichia*. The leaf shape and the papillae of the dorsal surface of the costa are different from those typical of *S. fragilis*, but the rest of the gametophytic characters are typical of the latter species. Cardot & Brotherus (1923) noted that *T. litorea* was related to *T. saxicola* Cardot on the basis of the mucronate apex, but the former has different basal cells of the leaf and a longer apiculus. This species could be a synonym of *S. fragilis*, but, in the absence of sporophytes, it is difficult to explore the matter further, and we transfer this name to the genus *Syntrichia*.

22. *TORTULA NAPOANA* DE NOT., *MEM. REALE ACCAD. SCI. TORINO SER.* 2, 18: 450. 10. 1859 = *SYNTRICHIA NAPOANA* (DE NOT.) *COMB. NOV.*

Ind. loc.: 'clarissimo Osculati ad flumen Napo in Columbiae meridionalis regionibus' *Type*: 'Columbia ad fl. Napo', *Osculati s.n.* (holotype: RO!).

This species is only known from the type collection. We have studied the holotype deposited at RO, which has leaves that are mucronate, fragile, lingulate, and bistratose in patches, with middle and upper laminal cells 12.5 µm wide, with bordered and plane or recurved up to the middle margins, sometimes bistratose, and with rounded or obtuse apex. The dorsal surface of the costa is weakly papillose, with simple papillae. The cross-section of the costa has no hydroids or they are scarcely differentiated, and has four dorsal stereid rows. The costa ends some cells under the apex. All of these gametophytic characters show that it is a *Syntrichia* species. It is similar to *S. fragilis* on the basis of the leaf shape and costa anatomy, but has an irregularly bistratose lamina and bordered leaf margins, sometime bistratose. De Notaris (1859), in the original description, compared it with *B. glacialis* Kunze ex Müll. Hal. [*S. glacialis* (Kunze ex Müll. Hal.) R.H. Zander], but the latter has lingulate to lanceolate leaves, with recurved margins up to the upper third, and a dorsal surface of the costa strongly papillose, with papillae from the base up to the apex leaves. Therefore, *T. napoana* is transferred here to the genus *Syntricha* as *S. napoana* (De Not.) *comb. nov.*

23. *TORTULA OBSCURETIS* THÉR., *REVISTA CHILENA HIST. NAT.* 22: 84, PL. 5 FIG. 3. 1918
***PSEUDOCROSSIDIUM* SP.**

Ind. loc.: 'Victoria, sur la terre (n.°28A)'. Type: 'Chili, Victoria' 1915, *Campo 28A* (holotype: PC!; isotype: B!).

The original material shows stems with sclerodermis, revolute leaf margins from apex to near base, costa with crescent-shaped band of dorsal stereids, and yellow leaf KOH reaction. All of these characters clearly place this species in the genus *Pseudocrossidium* R.S. Williams. It is similar to *Pseudocrossidium excavatum* (Mitt.) R.S. Williams; however, the marginal laminal cells are not hyaline and thin-walled as in the latter species. In addition, this species has triangular to triangular-ovate leaves, upper and middle laminal cells with usually bi- or trifurcate papillae, apex mucronate, and marginal cells smaller and less papillose than the rest of the laminal cells. All of these characters could appear in *Ps. leucocalyx* (Mont.) Thér., however until we know the variability of this latter species in South America, it is difficult to explore the matter further. We transfer this name to the genus *Pseudocrossidium*.

24. *TORTULA PERARMATA* BROTH., *ACTA HORTI GOTHOB.* 1: 192. 1924, **SYN. NOV.** =
PSEUDOCROSSIDIUM LEUCOCALYX (MONT.) THÉR.

Ind. loc.: 'Chile: Prov. Coquimbo, Estancia Frai Jorge in fruticetis siccis ad terram arenosam, 215 m s. m.

(120)'. Type: [Chile] 'Prov. Coquimbo, Est. Frai Jorge', 215 m, 15.viii.1917, *Skottsberg & Skottsberg 120* (lectotype designated here: H-BR 4186 013!; isolectotypes: PC!, S B90629!, S B90631!, SGO!, UPS!).

Brotherus (1924b) described *T. perarmata* from one specimen collected by Carl and Inga Skottsberg in the 'Svenska Pacific Expedition 1916–17'. We found syntypes in H-BR, S, SGO, and UPS, which represent duplicates from a homogeneous collection. In addition, one specimen sent by Brotherus with the same locality and date was found at PC. We chose the syntype kept at H-BR as the lectotype of this name.

The original material lacks sporophytes and is mainly characterized by lingulate leaves, obtuse-rounded apex, leaf margins recurved from the apex to near the base, with smaller and smooth marginal cells, upper and middle laminal cells with a single, high, bi-trifurcate papilla, costa rough dorsally by prorate papillae, and yellow leaf reaction with KOH. All of these morphological characters appear in *Pseudocrossidium leucocalyx* although the costa ending in distinctive conical and smooth cells (cf. Zander, 1993) is only observed in some leaves. Therefore, we conclude that *T. perarmata* is conspecific with *Ps. leucocalyx*.

25. *TORTULA PERPUSILLA* (MÜLL. HAL.) BROTH.,
NAT. PFLANZENFAM. 1(3): 430. 1902,
SYN. NOV. = ***PSEUDOCROSSIDIUM REPLICATUM***
(TAYLOR) R.H. ZANDER

Barbula perpusilla Müll. Hal. *Linnaea* 42: 348. 1879.
Ind. loc.: 'Argentina Cordobensis, Cordoba, in der Aue im Flußbende des Rio primero, Aug 1870'. Type: 'Argentina, Córdoba, im Rio primero', viii.1870, *Lorentz s.n.* (lectotype designated here: PC-Thériot!).

We have only located one syntype of this name from the Müller herbarium, which was deposited in the Thériot herbarium at PC. It is chosen as the lectotype. After studying the sample, it proved to be a species of the genus *Pseudocrossidium*, because it shows the margins strongly recurved, with marginal laminal cells differentiated, hyaline, and thin-walled, and sclerodermis developed. The leaves are linear-lingulate, with the basal cells near the costa rectangular and yellowish, and the cross-section of the costa shows a single band of stereids and usually four guide cells in one row. We have not found any differences to separate this material from *Pseudocrossidium replicatum*. Therefore, we consider both species conspecific.

26. *TORTULA PLANICOSTA* HERZOG, *MEMORANDA SOC. FAUNA FL. FENN.* 27: 108. 1952
***PSEUDOCROSSIDIUM* SP.**

Ind. Loc.: 'Argentina Patagonica: Südufer des Lago Pellegrini, Cuenca de Vidal, östlich des Rio Neuquen,

Bahnhof Contraalmirante Cordero, leg. W. Schiller, 25.i.22'. *Type*: 'Argent. Patagonien, S. Uffër des Lago Pellegrini (Cuenca de Vidal), östlich des Rio Neuquen bei Bhf. Contraalmirante Cordero', 25.i.1922, *Schiller s.n.* (holotype: JE!).

This species is characterized by its lanceolate leaves, yellow with KOH, with revolute margins, acute apex, costa excurrent into a reddish, short hair-point, margins unbordered, cross-section of the costa elliptic to reniform with four guide cells in one layer, one band of dorsal stereids, and ventral and dorsal surface cells differentiated. The anatomy of the costa and the short hair-point are similar to those shown by species of *Pseudocrossidium*, such as *Ps. crinitum*. However, *T. planicosta* shows shorter basal laminal cells, a more reddish hair-point, a more acute apex, and more lanceolate leaves than the latter species. This species could be a synonym of *Ps. crinitum*, but, until we know the variability of this latter species in South America, it is difficult to explore the matter further. We transfer this name to the genus *Pseudocrossidium*.

27. *TORTULA POLYCARPA* DUSÉN, *ARK. BOT.* 6(8): 17, TAF. 7 FIGS 1–6. 1906,
SYN. NOV. = *HENNEDIELLA ARENAE*
 (BESCH.) R.H. ZANDER

Ind. loc.: 'Patagonia australis ad Punta Arenas emporium. Patagonia occidentalis in valle fluminis Aysen in rupibus'. *Type*: [Chile] 'Fretum magellanicum ad Punta Arenas emporium', 16.xii.1895, *Dusén s.n.* (lectotype here designated: S B90646!; isolectotypes: FI!, PC!, UPS!).

Dusén (1906b) cited two syntypes in the description of *T. polycarpa*. We chose the material from Punta Arenas kept at S as lectotype, because it is better preserved. The original material comprises plants with linguulate leaves, narrowly recurved margins, bordered by differentiated cells, papillose dorsal surface of the costa from the base to near the apex, cylindrical capsules with high basal membrane of the peristome, and anatomy of the costa similar to that found in *Tortula*. However, the KOH leaf reaction is red, and the margins are dentate near the apex. All of these characters are diagnostic of *H. arenae*. Therefore, *T. polycarpa* is here considered as a new synonym of the latter species.

28. *TORTULA POLYLEPIDIS* HERZOG, *BIBLIOTH. BOT.* 87: 49, FIG. 14. 1916 = *SYNTRICHIA POLYLEPIDIS*
 (HERZOG) *COMB. NOV.*

Ind. loc.: 'An einem Polylepistamm im Llavetal, c. 3800 m, no. 4874'. *Type*: 'Bolivia, im Llavetal', c. 3800 m, v.1911, *Herzog 4874* (holotype: JE!; isotypes: B!, L!, M!, O!, PC!).

This species is distinguished by its linguulate to spathulate leaves, recurved up to the upper third, with a smooth and short hair-point, apex obtuse to acute, margins bordered by three to five rows of thicker walled and less papillose cells, upper and middle laminal cells 7.5–10(12.5) µm wide, cross-section of the costa without hydroids, dorsal surface of the costa weakly papillose, and a short basal membrane of the peristome. *Tortula polylepidis* is close to *S. glacialis*, known from southern South America and the Sub-Antarctic Islands, because both taxa have similar leaf shape, bordered and recurved margins, short hair-point, and size of laminal cells. However, *S. glacialis* has a coarsely papillose dorsal surface of the costa from the base to near the apex (smooth or weakly papillose at the middle in *T. polylepidis*), basal laminal cells papillose (smooth in *T. polylepidis*), cross-section of the costa with two to four guide cell rows (one to two rows in *T. polylepidis*), higher basal membrane of the peristome than *T. polylepidis*, and is a dioecious species (*T. polylepidis* is synoecious). In addition, the costa lacks dorsal surface cells, the dorsal band of stereids is crescent shaped, and the laminal cells are red with KOH, characters typical of *Syntrichia*. Therefore, *T. polylepidis* is here transferred to the genus *Syntrichia* as *S. polylepidis*.

29. *TORTULA PSEUDOLATIFOLIA* CARDOT, *BULL. HERB. BOISSIER SÉR.* 2, 5: 1003. 1905
 = *SYNTRICHIA PSEUDOLATIFOLIA* (CARDOT)
COMB. NOV.

Ind. loc.: 'Terre-de-Feu: Lapataia'. *Type*: [Argentina] 'Terre-de-Feu: Lapataia', 9.x.1902, *Skottsberg s.n.* (Svenska Sydpolarexpeditionen 1901–03 nr. 64) (holotype: PC-Cardot!; isotype: PC-Theriot!).

The name gives reference to a plant appearance similar to that of *S. latifolia* (Bruch ex Hartm.) Huebener. According to its gametophytic characters, it is congeneric with this species. The type material has no sporophytes, and is characterized by linguulate to spathulate leaves, brittle, usually weakly constricted at the middle, with obtuse to acuminate apex and recurved up to the middle, bordered and sometimes sinuate margins, weakly papillose or smooth costa, excurrent in a mucro or apiculus, with middle and upper laminal cells 12.5–15 µm wide, cross-section of the costa with two to three dorsal stereid rows and without hydroids. The leaf margins, when sinuate, are usually irregularly pluristratose. The specified combination of characters is distinctive of *T. pseudolatifolia*, and so this species is transferred to the genus *Syntrichia* as *S. pseudolatifolia*.

30. *TORTULA PULVINATULA* DUSÉN, BOT. NOT. 1905: 300. 1905, **SYN. NOV. = SYNTRICHIA BREVISETA** (MONT.) M.J.CANO & M.T.GALLEG0, **COMB. NOV.** (SEE *TORTULA BREVISETA* MONT.)

Ind. loc.: 'Patagonia septentrionalis in arboribus'. *Type*: 'Patagonia septentrionalis, ad lac. Nahuelhuapi', vii.1892, *Dusén s.n.* (lectotype here designated: PC!; isolectotype: S B100673!)

We have studied two syntypes deposited at S and PC herbaria. The specimen from S is mixed with *Syntrichia costesii* (Thér.) R.H. Zander, whereas that from PC contains only *T. pulvinatula*. For this reason, we selected the latter as the lectotype. The leaf shape, plane and bordered margins, anatomy of the cross-section of the costa, and papillae of this specimen support our belief that this species is conspecific with *S. breviseta*.

31. *TORTULA SANTIAGENSIS* BROTH., *ACTA HORTI GOTHOB.* 1: 191. 1924, **SYN. NOV. = PSEUDOCROSSIDIUM EXCAVATUM** (MITT.) R.S. WILLIAMS

Ind. loc.: 'Chile: Santiago, Cerro San Cristóbal; ad rupes calcareas (116)'. *Type*: 'Chile, Santiago, Cerro San Cristóbal', 600 m, *Skottsberg & Skottsberg 116* (lectotype designated here: H-BR 4186 005!; isolectotypes: S B90648!, UPS!).

Brotherus (1924b) described *T. santiagensis* from a specimen collected by Carl and Inga Skottsberg in the 'Svenska Pacific Expedition 1916–17'. We found syntypes of this name at H-BR, S, and UPS, which represent duplicates from a homogeneous collection. We chose the syntype kept at H-BR as the lectotype of this name.

The original material consists of small plants with ovate leaves, yellow leaf reaction with KOH, strongly revolute margins, and differentiated by hyaline, thin-walled cell margins, rounded to obtuse apex, costa percurrent, with four guide cells and perichaetial leaves differentiated. We conclude that there are no morphological differences between this taxon and *Pseudocrossidium excavatum*, and so it is here regarded as a synonym of the latter.

32. *TORTULA SAVATIERI* (BESCH.) BROTH., *NAT. PFLANZENFAM.* 1(3): 433. 1902, **SYN. NOV. = SYNTRICHIA FRAGILIS** (TAYLOR) OCHYRA

Barbula savatieri Besch., *Bull. Soc. Bot. France* 32: 59. 1885. *Ind. loc.*: 'Pérou, Matucana (Dr Savatier, n°1210)'. *Type*: [Peru] 'Matucana', 19-[illegible]-1878, *Savatier s.n.* (holotype: BM-Bescherelle!; isotype: PC!).

Bescherelle (1916) published this species on the basis of one collection. He compared it with the European *Barbula alpina* Bruch & Schimp., now

known as *Syntrichia sinensis* (Müll. Hal.) Ochyra, as both had the same habitat, leaf shape, and structure of the peristome. However, the author distinguished *B. savatieri* by the more elongate leaves, with revolute, sinuate and papillose margins, and costa reddish and papillose at the dorsal surface, which is excurrent in a short mucro. The type material shows the characteristics exposed by Bescherelle (1916); however, the characters provided as differential can be included in the variation shown by *S. fragilis*.

33. *TORTULA SINUATA* E.B. BARTRAM, *REV. BRYOL. LICHÉNOL.* 33: 325. 1964–65 [1965], **SYN. NOV. = SYNTRICHIA LACERIFOLIA** (R. S. WILLIAMS) R.H. ZANDER

Ind. loc.: 'Tucuman: Department Tafi: Tafi del Valle 2000 m, I., M. Lamb no. 12668 type; Tafi del Valle, Quebradita, 2300 m, M. Lillo, no. 302'. *Type*: [Argentina] 'Tucuman, Tafi del Valle' 2000 m, *Lamb 5477* (ex LIL no. 12668) (holotype: FH-Bartram!).

Bartram (1965) characterized this species by its typical deeply sinuate or even irregularly lobed upper leaf margins. After studying the type material, it proved to be *S. lacerifolia*, a species known only from Bolivia and Peru. Therefore, this species is a new record for Argentina.

34. *TORTULA SORDIDA* HERZOG, *BIBLIOTH. BOT.* 88: 9, FIG. 4. 1920, **SYN. NOV. = SYNTRICHIA ANDICOLA** (MONT.) OCHYRA

Ind. loc.: 'An Löbshängen bei La Paz, c. 3600 m, n°2555'. *Type*: 'Bolivia, La Paz', 3600 m, ix.1911, *Herzog 2555* (holotype: JE!).

In the protologue, Herzog (1920) compared *T. sordida* with *T. andicola* Mont. (*S. andicola*), because both species show a similar dentate leaf apex. However, *T. sordida* has smaller, keeled, and linguulate leaves, with basal leaf cells narrower than *T. andicola*. After study of the type material, we conclude that these characters fall within the range of variation of *S. andicola*. In addition, the original material shows the distinctive combination of characters of this latter species: ovate to ovate-lanceolate leaves, with recurved margins, and a costa that ends below the apex but continuing again in the hair-point. Therefore, *T. sordida* is included in the list of synonyms of *S. andicola*.

35. *TORTULA SQUARRIPILA* THÉR., *REVISTA CHILENA HIST. NAT.* 21: 10. PL. 2 FIG. 2. 1917. **SYNTRICHIA SP.**

Ind. loc.: 'Los Perales de Marga-Marga'. *Type*: 'Chili, Los Perales, pr. Valparaiso' 1915, *Costés* (illegible number) (holotype: PC!; isotype: W!).

The type material is mixed with *Pseudocrossidium crinitum* (Schultz) R.H. Zander and *S. princeps*. In the original description, Thériot (1917) stated that *T. squarripila* belonged to the *T. ruralis* group, closely related to *T. obtusissima* (Müll. Hal.) Mitt. and *T. chubutensis*. The plants are spirally twisted when dry and patent when moist, with ovate to lingulate, not constricted leaves, emarginate to rounded apex, with a long, spinose and hyaline hair-point, the margins of the leaf are recurved up to the apex and not bordered, the upper and middle laminal cells are papillose, (7.5)10–12.5(15) µm wide, the cross-section of the costa has three to four dorsal stereid rows and hydroids, and the lamina is irregularly bistratose in patches in the upper and middle parts of the leaf. We found no difference between *S. ruralis* and *T. squarripila*, except for the irregularly bistratose lamina and the presence of hydroids in the cross-section of the costa of the latter. These characters are typical of *S. caninervis* (Mitt.) Broth., but the shape of the leaf, lamina cells, and sporophyte are different. With regard to the sporophyte characters, *T. squarripila* has a shorter basal membrane of the peristome than *S. ruralis*. For the moment, *T. squarripila* is here transferred to the genus *Syntrichia*, awaiting a careful study of these species and their variations throughout South America.

36. *TORTULA STENOPHYLLA* CARDOT & BROTH.,
KONGL. SVENSKA VETENSKAPSAKAD. HANDL. 63(10):
22. TABLE 2, FIG. 3A–E. 1923, NOM. ILLEG. (NON
TORTULA STENOPHYLLA MITT., J. PROC. LINN. SOC.,
BOT., SUPPL. 1: 28. 1859), SYN. NOV.
= *SYNTRICHIA ANDERSSONII* (ÅNGSTRÖM)
R.H. ZANDER

Ind. loc.: 'Patagonia andina: Valle Frias, Cerro Cáceres, in declivi meridionali, 900 m s. m. (964). Fuegia: Ushuaia, Rio Olivia, as rupes irrigatas pr. cataractam (335). Specimina ibidem a cl. Skottsberg anno 1902 lecta (n. 66) et a cl. Cardot olim sub *T. serrulata* Hook. et Grev. memorata (Fl. bryol. terr. magell. p. 99) teste ejusdem in sched. ad *T. stenophyllam* pertinent'. *Type*: [Argentina] 'Patagonia, Valle Frias', 19.xi.1908, *Skottsberg 964* (lectotype designated here: PC!, isolectotype: UPS!).

We have found the three syntypes mentioned in the protologue at PC and a sheet labelled with the number 'Skottsberg 964', which is inside of a sheet labelled as 'Skottsberg 335' at UPS. We chose the specimen *Skottsberg 964* deposited at PC as the lectotype, because it is better preserved. Cardot & Broth. (1923) stated that *T. stenophylla* was a species close to *T. serrulata* Hook. & Grev., but with a different shape of the leaves and papillae of the costa. After study of the original material, it proved to be *S. and-*

erssonii on the basis of its lingulate, bordered, not constricted, unistratose mucronate, with recurved margins up to the middle, and acute, sometimes dentate apex leaves.

37. *TORTULA XEROPHILA* HERZOG, BIBLIOTH. BOT.
87: 50, FIG. 15. 1916 *PSEUDOCROSSIDIUM* SP.

Syntrichia xerophila (Herzog) S.P. Churchill, *Trop. Bryol.* 26: 129. 2005. *Ind. loc.*: 'In der Dornbuchsteppe des Palo mit Gertrudia validinervis H., c. 1600 m; no. 4344/a; im Trockenwald bei Perico (N.-Argentinien), c. 400 m, no. 2622'. *Type*: 'Perico (N. Argentinien)' 300 m, x.1910, *Herzog 2622* (lectotype designated here: JE!; isolectotypes: B!, O!, PC!).

In JE, where the original herbarium of Th. Herzog is kept, the two syntypes mentioned in the protologue (no. 4344/a and no. 2622) are deposited. Both have the characters provided in the original description, but the number 4344/a lacks sporophytes. Therefore, we chose the number 2622 as the lectotype of this name. Both specimens have leaves with recurved margins, rounded to obtuse apex, costa excurrent into a long hair-point, and in cross-section with four guide cells in one layer, one band of dorsal stereids, and ventral and dorsal surface cells differentiated. In addition, the leaves are yellow with KOH and the perichaetial leaves are undifferentiated. Churchill & Fuentes (2005) transferred this species to the genus *Syntrichia* as *S. xerophila*. However, the characters above are diagnostic of the genus *Pseudocrossidium*; in particular, the long hair-point is characteristic of *Pseudocrossidium crinitum*. Until we know the variability of this latter species in South America, it is difficult to explore the matter further. We transfer this name to the genus *Pseudocrossidium*.

38. *TORTULA UMBROSA* DUSÉN, ARK. BOT. 6(10): 9,
TAF. 3 FIGS 4–12. 1906, SYN.

NOV. = *LEPTODONTIUM PROLIFERUM* HERZOG

Ind. loc.: 'Chile australis ad Peulle coloniam in ripa orientali lac. Todos los Santos sitam in terra arenoso-argillosa silvosa'. *Type*: [icon] in Dusén (1906a: Taf. 3, figs 4–12) (lectotype designated here); epitype designated here: [Chile, Región IX (Aisén)] 'Ins. Guaitecas' 1897, *Dusén 667* (S B90941!).

Tortula umbrosa was described by Dusén (1906a) on the basis of one specimen collected by the author in Región X (Los Lagos), Peulle, near to Lake Todos los Santos. After its description, no new information was published for this name, and it has only been compiled in different checklists of the area (Greene, 1986; He, 1998). According to Stafleu & Cowan (1976), the original herbarium of P. Dusén is at S, and many duplicates of his collections have been distributed in

numerous herbaria. For this study, we were not able to locate any syntypes of this name in S or in other herbaria studied. In S, there are housed two specimens of Dusén labelled '*Tortula umbrosa*', one of them (S B90941) belonging to the original herbarium of P. Dusén. However, the locality of both specimens is different ('ins. Guaitecas') to that described in the protologue.

Therefore, the only elements that are eligible for the typification of *T. umbrosa* are the illustrations published in the original description of Dusén (1906a: taf. 3 figs 4–12), which are here formally designated as the lectotype of this name. In these figures, most of the differential characters are drawn, such as the propaguliferous costa and the dimorphic leaves. However, the cross-section of the costa only shows one band of stereids, because it was probably drawn in the basal part. Because of the absence of these taxonomic characters in the lectotype, we designated as epitype the specimen labelled as '*Tortula umbrosa*' from the Dusén herbarium at S in order to serve as a source for these missing characters.

From the protologue and epitype, *T. umbrosa* is characterized by stems without a central strand and hyalodermis, KOH leaf reaction yellow, leaf margins dentate, and cross-section of the costa with two bands of stereids and an absence of ventral surface cells. All of these characters are present in the genus *Leptodontium* (Müll. Hal.) Hampe ex Lindb. In addition, it has dimorphic leaves, the lower lingulate and the upper with excurrent costa, which bear claviform propagula. Therefore, *T. umbrosa* is here synonymized with *Leptodontium proliferum*, a species reported from Bolivia, Colombia, Peru (Churchill *et al.*, 2000), Mexico (Zander, 1994), and Lesotho (Hodgetts, Matcham & Duckett, 1999).

TAXA FOR WHICH TYPE SPECIMENS HAVE NOT BEEN LOCATED

1. *TORTULA ACULEONERVIS* (MÜLL. HAL.) BROTH., NAT. PFLANZENFAM. 1(3): 434. 1902

Barbula aculeonervis Müll. Hal., *Linnaea* 42: 349. 1879. *Ind. loc.*: 'Argentina Cordobensis, Ascochinga et Las Peñas cum *Barbula minutirosula*, *Fabronia argentinica* et *Lorentzi* alque *Dime rotontio Mendozensis*'.

None of the consulted herbaria house type specimens of this species, and the original description is not explanatory with regard to the taxonomic status. According to Müller (1879), it probably belongs to the genus *Syntrichia*, because he placed this species in *Barbula* (*Syntrichia*) in the original description. In addition, he noted that it was similar to *B. minutirosula*, another species whose type has not been located.

2. *TORTULA APPRESSA* MITT., *J. LINN. SOC., BOT.* 12: 152. 1869

Ind. loc.: 'Chili, Lobb'.

No original material has been found for this name, although it was included by Mitten (1869) in *Tortula* sect. *Pachynoma* Mitt., where species of *Pseudocrossidium*, *Didymodon*, and *Bryoerythrophylum* were placed. According to the original description, it shows a similar habit to *B. gracilis* Schumach [= *Didymodon acutus* (Brid.) K. Saito]. In addition, the leaf costa is shortly excurrent, channelled, with revolute margins, the basal cells quadrate, the perichaetial leaves ovate, with acute apex, and the peristome teeth are contorted. Therefore, *T. appressa* could belong to some *Didymodon* or *Pseudocrossidium* species, in which case it should be excluded from the genus *Tortula*.

3. *TORTULA CRENATA* MITT., *J. LINN. SOC., BOT.* 12: 169. 1869

Barbula crenata (Mitt.) A. Jaeger, *Ber. Thätigh. St. Gallischen Naturwiss. Ges.* 1871–72: 441. 1873. *Ind. loc.*: 'Andes Quitenses, Jameson'.

According to Mitten (1869), this species was similar in size to *T. agraria* (Hedw.) P. Beauv. [*Hypophiladelphus agrarius* (Hedw.) R.H. Zander], but the structure of the leaf was more similar to *T. denticulata* (Wilson) Mitt. [*Hennediella denticulata* (Wilson) R.H. Zander]. We have not been able to locate any syntype of this name in the requested herbaria. However, the original description indicates that *T. crenata* has oblong-spathulate leaves in the lower part of the stem, with a short hair-point, and those from the upper part apiculate, with recurved and crenulated margins and with the costa ending below the apex. The peristome teeth are long and contorted. According to these characters, this taxon could belong to the genus *Chenia*.

4. *TORTULA MINUTIROSULA* (MÜLL. HAL.) BROTH., NAT. PFLANZENFAM. 1(3): 434. 1902

Barbula minutirosula Müll. Hal., *Linnaea* 42: 349. 1879. *Ind. loc.*: 'Patria Argentina Cordobensis, Ascochinga et Las Peñas'.

As noted before, we have not been able to locate any syntype in the studied herbaria of this name, and the original description does not provide any information about its taxonomic status. According to Müller (1879), it probably belongs to the genus *Syntrichia*, because he placed this species in *Barbula* (*Syntrichia*) in the original description. In addition, he indicated that it was similar to *B. aculeonervis*.

5. *TORTULA PODOCARPI* (MÜLL. HAL.) BROTH.,
NAT. PFLANZENFAM. 1(3): 434. 1902

Barbula podocarpi Müll. Hal., *Linnaea* 42: 352. 1879.
Ind. loc.: 'Argentina subtropica, Cuesta de Pinos, ad
truncos *Podocarpi angustifolii*, inter *Fabroniam*
podocarpi'.

None of the consulted herbaria house type specimens of this species. The original description lacks diagnostic characters that inform us about its taxonomic status. According to Müller (1879), it probably belongs to the genus *Syntrichia*, because he placed this species in *Barbula* (*Syntrichia*) in the original description. In addition, the plant is epiphytic, which is more usual in species of this latter genus.

INVALID NAMES

Barbula subgraminicolor Thér., *Revista Chilena Hist. Nat.* 21: Lám.1 fig. 1. 1917, *nom. inval.* [art. 32.1.(c), Greuter *et al.* (2000)].

Barbula muralis var. *australis* Hampe, *Bot. Zeitung* (Berlin) 20: 349. 1862, *nom. inval.* [art. 34.1.(c), Greuter *et al.* (2000)].

Tortula armata Broth., *Biblioth. Bot.* 87: 48. 1916, *nom. inval.* [art. 32.1.(c), Greuter *et al.* (2000)].

Herzog (1916) cited *T. armata* on the basis of four Bolivian collections. We have located one of these specimens at PC (Bolivia, Cochabamba, 3400 m, Waldgrenze über Tablas, v.1911, Herzog 2929), which proved to be *Bryoerythrophyllum jamesonii* (Taylor) H.A. Crum.

Tortula felipponei Thér., *Rev. Bryol.*, n.s. 2: 210. 1. 1930, *nom. inval.*

This name was reported by *Index Muscorum* (Wijk *et al.*, 1969), but does not appear in this reference, as Greene (1986) also observed. Probably, it is a mistake for *Trematodon felipponei* Thér., *Rev. Bryol.*, n.s. 2: 210, fig. 1. 1929 [1930], which was published in Felippone (1930).

Tortula longipila Dusén, *Index Bryol.*, ed. 2, 5: 47. 1906, *nom. inval.* [art. 32.1.(c), Greuter *et al.* (2000)].

Tortula occultilimbata Cardot, *Recueil Publ. Soc. Havraise Études Diverses* 1921: 5. 1921, *nom. inval.* [art. 34.1.(c), Greuter *et al.* (2000)].

Tortula subenervis Dusén, *Index Bryol.*, ed. 2, 5: 59. 1906, *nom. inval.* [art. 32.1.(c), Greuter *et al.* (2000)].

Tortula subviridula Broth. in Weberb., *Pfl.-Welt Peruan. Anden*: 397. 1945, *nom. inval.*, [art. 32.1.(c), Greuter *et al.* (2000)].

ACKNOWLEDGEMENTS

This research was carried out with financial support from the Spanish Ministry of Education and Science [projects PR2001-0293, CGL2006-00599, CGL2004-00788/BOS (cofinanced by FEDER), and 'Ramón y Cajal' Programme (cofinanced by the European Social Fund)] Fundación Séneca (02979/PI/OS) and from the European Union (through the COLPARSYST programme). We thank the staff of the Botany Department, University of Concepción and A. Cano (University of San Marcos, Lima, Peru) for their assistance during our field trips in Chile and Peru, respectively, and the curators of the herbaria cited in the text for the loan specimens or assistance during our visits to their herbaria. Thanks are also given to M. Laínz for the Latin diagnosis, and, in particular, to J. Guerra for improving the drawings and his uncompromising support and to J. A. Jiménez for providing bibliography, reading the text, and helping with the identification of some species.

NOTE ADDED IN PROOF

The interesting report of *Tortula porteri* (James) Broth. from Venezuela by Zander & Eckel (2007) was received too late for consideration above. The specimen that supports this record [BOLIVAR: Canaima, near la laguna, 2.ix.1976, Sharp 599b (MO)] exhibits the typical characters of this species: lingulate to oblong-ovate leaves, plane margins, usually percurrent costa and a well-developed marginal border of quadrate to rectangular, less papillose and thicker walled cells disposed in 3-5 rows. *Tortula porteri* was known of in North America, so this new record extends the distributional range significantly southward into northern South America.

REFERENCES

- Allen B. 1992. Teratological axillary 'hairs' in *Didymodon tophaceus*. *The Bryologist* **95**: 97–99.
- Allen B. 2002. Moss flora of Central America. Part 2. Encalyptaceae-Orthotrichaceae. *Monographs in Systematic Botany from the Missouri Botanical Garden* **90**: 1–699.
- Anderson LE, Crum HA, Buck WR. 1990. List of mosses of North America north of Mexico. *The Bryologist* **93**: 448–499.
- Ayala F. 1970. Lista de briofitas de las lomas de Trujillo. *Boletín de la Sociedad Botánica de la Libertad* **2**: 45–51.

- Bartram EB. 1955.** Mosses of the Ecuadorian Andes collected by P. R. Bell. *Bulletin of the British Museum (Natural History), Botany* **2**: 51–64.
- Bartram EB. 1965.** New and noteworthy mosses from northern Argentina. *Revue Bryologique et Lichénologique* **33**: 323–327.
- Bescherelle E. 1916.** Mousses nouvelles de l'Amérique australe. *Bulletin de la Société Botanique de France* **32**: 54–69.
- Brotherus VF. 1895.** Beiträge zur Kenntniss der brasilianischen Moosflora. *Hedwigia* **34**: 117–131.
- Brotherus VF. 1918.** Contributions à la flore bryologique de l'Argentine. *Arkiv för Botanik utgivet av K. Svenska Vetenskapsakademien* **15**: 1–15.
- Brotherus VF. 1924a.** Musci (Laubmoose). In: Engler A, Prantl K, eds. *Die Natürlichen Pflanzenfamilien*, ed. 2, 10. Berlin: Duncker & Humblot.
- Brotherus VF. 1924b.** Musci nonulli Chilense a C. Skottsberg anno 1917 lectae. *Acta Horti Gothoburgensis* **1**: 189–195.
- Brotherus VF. 1931.** Neue exotische Laubmoose. *Mitteilungen aus dem Institut für allgemeine Botanik in Hamburg* **8**: 399–406.
- Buck WR. 1985.** A preliminary list of mosses of Paraguay. *Candollea* **40**: 201–209.
- Cano MJ. 2006.** *Tortula*. In: Guerra J, Cano MJ, Ros RM, eds. *Flora Briofítica Ibérica*, Vol. 3. Murcia: Universidad de Murcia/Sociedad Española de Briología, 146–176.
- Cano MJ, Gallego MT. 2003.** Lectotypification of twenty names of taxa referable to *Tortula* Hedw. (Pottiaceae, Bryophyta). *Taxon* **52**: 611–618.
- Cano MJ, Werner O, Guerra J. 2005.** A morphometric and molecular study in *Tortula subulata* complex (Pottiaceae, Bryophyta). *Botanical Journal of the Linnean Society* **149**: 333–350.
- Cardot J, Brotherus VF. 1923.** Botanische Ergebnisse der schwedischen Expedition nach Patagonien und dem Feuerlande 1907–1909. X. Les mousses. *Kongliga Svenska Vetenskapsakademiens Handlingar* **63**: 1–74.
- Churchill SP, Fuentes CA. 2005.** Additions, combinations, and synonyms for the Bolivian Moss Flora. *Tropical Bryology* **26**: 119–131.
- Churchill SP, Griffin D III, Muñoz J. 2000.** A checklist of the mosses of the Tropical Andean countries. *Ruizia* **17**: 1–203.
- Crosby MR, Magill RE, Allen B, He S. 1999.** *A checklist of mosses*. St. Louis, MO: Missouri Botanical Garden.
- Crum HA, Anderson LE. 1981.** *Mosses of eastern North America*. New York: Columbia University Press.
- Delgadillo MC, Bello B, Cárdenas A. 1995.** LATMOSS. *Monographs in Systematic Botany from the Missouri Botanical Garden* **56**: 1–191.
- De Notaris G. 1859.** Musci Napoani sive muscorum ad Flumen Napo in Columbia. *Memoire della Reale Accademia delle Scienze di Torino* **2** **18**: 437–455.
- Düll R. 1984.** Distribution of the European and Macaronesian Mosses (Bryophytina). Part. I. *Bryologische Beitrage* **4**: 1–113.
- Dusén P. 1906a.** Beiträge zur Bryologie der Magellanslander von Westpatagonien und Sudchile. V. *Arkiv för Botanik utgivet av K. Svenska Vetenskapsakademien* **6**: 1–32.
- Dusén P. 1906b.** Beiträge zur Bryologie der Magellanslander von Westpatagonien und Sudchile. IV. *Arkiv för Botanik utgivet av K. Svenska Vetenskapsakademien* **6**: 1–40.
- Felippone F. 1930.** Contribution à la flore bryologique de l'Uruguay. *Revue Bryologique, nouvelle série* **2**: 210–225.
- Fife AJ. 1995.** Checklist of the mosses of New Zealand. *The Bryologist* **98**: 313–337.
- Gallego MT. 2005.** A taxonomic study of the genus *Syntrichia* Brid. (Pottiaceae, Musci) in the Mediterranean Region and Macaronesia. *Journal of the Hattori Botanical Laboratory* **98**: 47–122.
- Gallego MT, Cano MJ, Sérgio C. 2005.** *Syntrichia bogotensis* (Briopsida, Pottiaceae) new for Macaronesia. *The Bryologist* **108**: 219–233.
- Gangulee HC. 1969.** *Mosses of eastern India and adjacent regions*, fasc. I. Calcutta: Privately published.
- Goffinet B. 1997.** The Rhachitheciceae: revised circumscription and ordinal affinities. *The Bryologist* **100**: 425–439.
- Greene DM. 1986.** *A conspectus of the mosses of Antarctica, South Georgia, the Falkland Islands and southern South America*. Cambridge: British Antarctic Survey.
- Greuter W, McNeill J, Barrie FR, Burdet HM, Demoulin V, Filgueiras TS, Nicolson DH, Silva PC, Skog JE, Trehane P, Turland NJ, Hawksworth DL. 2000.** International code of botanical nomenclature (Saint Louis Code). *Regnum Vegetabile* **138**: 1–474.
- Guerra J. 2006.** Phascum. In: Guerra J, Cano MJ, Ros RM, eds. *Flora Briofítica Ibérica*, Vol. 3. Murcia: Universidad de Murcia/Sociedad Española de Briología, 176–180.
- Guerra J, Ros RM, Carrión JS. 1992.** The taxonomic status of *Tortula muralis* var. *baetica* (Musci, Pottiaceae): a comparative study. *Journal of Bryology* **17**: 275–283.
- He S. 1998.** A checklist of the mosses of Chile. *Journal of the Hattori Botanical Laboratory* **85**: 103–189.
- Herzog Th. 1916.** Die Bryophyten meiner zweiten Reise durch Bolivia. *Bibliotheca Botanica* **87**: 1–347.
- Herzog Th. 1920.** Die Bryophyten meiner zweiten Reise durch Bolivia. *Bibliotheca Botanica* **88**: 1–33.
- Hill MO, Bell N, Bruggeman-Nannenga MA, Brugués M, Cano MJ, Enroth J, Flatberg KI, Frahm JP, Gallego MT, Garilleti R, Guerra J, Hedenäs L, Holioak DT, Hyvönen J, Ignatov MS, Lara F, Mazimpaka V, Muñoz J, Söderström L. 2006.** An annotated checklist of the mosses of Europe and Macaronesia. *Journal of Bryology* **28**: 198–267.
- Hodgetts NG, Matcham HW, Duckett JG. 1999.** Bryophytes collected in Lesotho, the Natal Drakensberg and the Orange Free State, southern Africa. *Journal of Bryology* **21**: 133–155.
- Jiménez JA, Ros RM, Cano MJ, Guerra J. 2005.** A revision of *Didymodon* section *Fallaces* (Musci, Pottiaceae) in Europe, North Africa, Macaronesia, and Southwest and Central Asia. *Annals of the Missouri Botanical Garden* **92**: 225–247.
- Kürschner H. 2000.** Bryophyte flora of the Arabian Peninsula and Socotra. *Bryophytorum Bibliotheca* **55**: 1–131.

- Lawton E.** 1971. *Moss flora of the Pacific Northwest*. Nichinan: The Hattori Botanical Laboratory.
- Li XJ, Crosby MR, He S.** 2001. *Moss Flora of China, English version, vol. 2. Fissidentaceae-Ptychomitriaceae*. Beijing/St. Louis, MO: Science Press and Missouri Botanical Garden Press.
- Magill RE.** 1981. *Flora of southern Africa. Bryophyta. Part 1. Fasc. 1, Sphagnaceae-Grimmiaceae*. Pretoria: Botanical Research Institute.
- Margadant WD, Geissler P.** 1995. Seventeen proposals concerning nomina conservata for genera of Musci. *Taxon* **44**: 613–624.
- Matteri CM.** 2003a. Los musgos (Bryophyta) de Argentina. *Tropical Bryology* **24**: 33–100.
- Matteri CM.** 2003b. New combination and new synonyms in Fuegian mosses. *Lindbergia* **28**: 80–82.
- Matteri CM.** 2004. The mosses (Bryophyta) of Uruguay, their synonyms and distribution. *Cryptogamie: Bryologie* **25**: 147–167.
- Mishler BD.** 1994. *Tortula*. In: Sharp AJ, Crum H, Eckel PM, eds. The Moss Flora of Mexico, vol. 1. *Memoirs of the New York Botanical Garden* **69**: 319–350.
- Mitten W.** 1869. Musci Austro-Americani. *Journal of the Linnean Society, Botany* **12**: 1–659 [reprint: *Monographs in Systematic Botany from the Missouri Botanical Garden* 7].
- Montagne C.** 1845. Cinquième centurie de plantes cellulaires exotiques nouvelles. *Annales des Sciences Naturelles, Botanique* **3** **4**: 86–123.
- Montagne C.** 1850. Plantas Celulares. I. Musgos. In: Gay C, ed. *Historia Fisica y Política de Chile*, 7. Paris: Privately published.
- Müller C.** 1879. Prodrromus Bryologiae Argentinae. I. *Linnaea* **42**: 217–486.
- Müller C.** 1882. Prodrromus Bryologiae Argentinae II, seu Musci Lorentziani Argentini. *Linnaea* **43**: 341–486.
- Müller C.** 1888. Musci cleistocarpici novi. *Flora* **71**: 1–13.
- Müller F.** 2002. New records and new synonyms for the southern South American moss flora. *Nova Hedwigia* **74**: 445–450.
- Nyholm E.** 1989. *Illustrated flora of Nordic mosses. Fasc. 2. Pottiaceae-Splachnaceae-Schistostegaceae*. Copenhagen: Nordic Bryological Society.
- Ochyra R.** 2004. *Tortula hoppeana*, the correct name for *Desmatodon latifolius* in *Tortula* (Bryopsida, Pottiaceae). *The Bryologist* **107**: 497–500.
- O'Shea BJ.** 2003. Checklist of the Mosses of Sub-Saharan Africa (version 4, 12/03). *Tropical Bryology Research Report* **4**: 1–182.
- Ros RM, Cano MJ, Guerra J.** 1999. Bryophyte checklist of Northern Africa. *Journal of Bryology* **21**: 207–244.
- Saito K.** 1975. A monograph of Japanese Pottiaceae (Musci). *Journal of the Hattori Botanical Laboratory* **39**: 373–537.
- Smith AJE.** 2004. *The moss flora of Britain and Ireland*, 2nd edn. Cambridge: Cambridge University Press.
- Sollman Ph.** 1990 [1991]. Some new synonyms in tropical pottiaceous mosses. *Lindbergia* **16**: 22–24.
- Staffeu FA, Cowan RS.** 1976. Taxonomic literature, ed. 2. Volume II: A–G. *Regnum Vegetabile* **94**.
- Staffeu FA, Cowan RS.** 1979. Taxonomic literature, ed. 2. Volume II: H–Le. *Regnum Vegetabile* **98**.
- Steere WC.** 1939. *Tortula*. In: Grout AJ, ed. *Moss flora of North America*, Vol. 1. Newfrane: Privately published, 228–246.
- Steere WC.** 1940. *Tortula* in North America north of Mexico. *The Bryologist* **43**: 12–23.
- Streimann H, Klazenga N.** 2002. *Catalogue of Australian mosses. Flora of Australia supplementary series number 17*. Canberra: Australian Biological Resources Study.
- Tan BC, Iwatsuki Z.** 1991. A new annotated Philippine moss checklist. *Harvard Papers in Botany* **3**: 1–64.
- Thériot I.** 1917. Contribution à la flore bryologique du Chili. *Revista Chilena de Historia Natural* **21**: 6–37.
- Thériot I.** 1923. Contribution à la flore bryologique du Chili (5.e Article). *Revista Chilena de Historia Natural* **27**: 9–15.
- Werner O, Ros RM, Cano MJ, Guerra J.** 2002. *Tortula* and some related genera (Pottiaceae, Musci): phylogenetic relationship based on chloroplast rps4 sequences. *Plant Systematics and Evolution* **235**: 197–207.
- Wijk R van der, Margadant WD, Florschütz PA.** 1959. Index Muscorum I (A–C). *Regnum Vegetabile* **17**.
- Wijk R van der, Margadant WD, Florschütz PA.** 1967. Index Muscorum 4 (P–S). *Regnum Vegetabile* **48**.
- Wijk R van der, Margadant WD, Florschütz PA.** 1969. Index Muscorum 5 (T–Z). *Regnum Vegetabile* **65**.
- Yano O.** 1989. An additional checklist of Brazilian bryophytes. *Journal of the Hattori Botanical Laboratory* **66**: 371–434.
- Yano O.** 1995. A new additional annotated checklist of Brazilian bryophytes. *Journal of the Hattori Botanical Laboratory* **78**: 137–182.
- Yano O.** 1996. A checklist of the Brazilian bryophytes. *Boletim do Instituto de Botânica (São Paulo)* **78**: 137–182.
- Zander RH.** 1989. Seven new genera in Pottiaceae (Musci) and a lectotype for *Syntrichia*. *Phytologia* **65**: 424–436.
- Zander RH.** 1993. Genera of the Pottiaceae: mosses of harsh environments. *Bulletin of the Buffalo Society of Natural Sciences* **32**: 1–378.
- Zander RH.** 1994. *Leptodontium*. In: Sharp AJ, Crum H, Eckel PM, eds. The Moss Flora of Mexico, vol. 1. *Memoirs of the New York Botanical Garden* **69**: 260–267.
- Zander RH, Eckel PM.** 2007. *Tortula*. In: *Bryophyte Flora of North America. North of Mexico. vol. 27, Bryophyta, part 1*. New York: Oxford University Press, 586–603.
- Zander RH, Mahú M.** 1999. A new species of *Hennediella* from Chile. *The Bryologist* **102**: 349–351.

INDEX TO SCIENTIFIC NAMES

Accepted names are in roman type; the entry for the species included in the treatment is in bold type. Synonyms are in italic.

Aloina, 174

Aloinella, 174

- Anacalypta
cucullata Hampe, 206
humillima Ångström, 206
- Barbula, 174, 195, 215, 216
aculeonervis Müll. Hal., 216
alpina Bruch & Schimp., 213
amphidiifolia Müll. Hal., 207
annulus Müll. Hal., 195
berteroana Müll. Hal., 199, 201, 206
brunnea Müll. Hal., 208
characodonta Müll. Hal., 209
contorta Hampe, 209
crenata (Mitt.) A. Jaeger, 215
glacialis Kunze ex Müll. Hal., 211
gracilis Schumach, 215
graminicolor ssp. *subgraminicolor* Thér., 199, 201
minutirosula Müll. Hal., 215
muralis var. *australis* Hampe, *nom. inval.*, 216
muralis var. *rupestris* Schultz, 195
muricola Müll. Hal., 195
perpusilla Müll. Hal., 211
peruviana (Mitt.) A. Jaeger, 204
podocarp Müll. Hal., 216
savatieri Besch., 213
subgraminicolor Thér., *nom. inval.*, 216
vahlia Schultz, 204
- Bryoerythrophyllum, 174, 215
jamesonii (Taylor) H.A. Crum, 216
- Bryum
truncatulum With., 202
- Chenia, 173, 215
lorentzii (Müll. Hal.) R.H. Zander, 207
- Crossidium, 173, 191
dauidai Catches., 183
- Desmatodon, 173
amblyophyllum Mont., 199, 201
argentanicus Broth., 185, 188
cernuus Huebener, 183, 188
convolutus (Brid.) Grout, 183
latifolius (Hedw.) Brid., 191
- Didymodon, 174, 215
acutus (Brid.) K. Saito, 215
schimperi (Mont.) Broth., 183
tophaceus (Brid.) Lisa, 183
- Dolotortula, 173, 174
- Grimmia
atrovirens Turner ex Sm., 181
- Gymnostomum
truncatum Hedw., 202
- Henediella, 173, 174, 191
arenae (Besch.) R.H. Zander, 212
bellii (E.B. Bartram) R.H. Zander, 201
denticulata (Wilson) R.H. Zander, 215
diaguita R.H. Zander & Mahú, 188, 191
heimii (Hedw.) R.H. Zander, 206
- Hilpertia, 173
- Hyophiladelphus, 174
agrarius (Hedw.) R.H. Zander, 215
- Leptodontium, 215
proliferum Herzog, 214, 215
- Microbryum, 206
davallianum (Sm.) R.H. Zander, 206, 207
- Oreoweisia
erosa (Hampe ex Müll. Hal.) Kindb., 206
- Phascum, 174, 175
acaulon With., 175
calodictyon Müll. Hal., 176, 179
cuspidatum Hedw., 173, 174, 175, 178, 179
- Pottia, 173, 174, 175
altipes Broth., 206
asperula Mitt., 207
asperula Müll. Hal. ex Broth., *nom. illeg.*, 207
chubutensis Cardot & Broth., 206
cucullata (Hampe) A. Jaeger, 206
humillima (Ångström) Paris, 206
intermedia (Turner) Fűrnr., 204
ligularifolia Müll. Hal., 207
physcomitrioides Müll. Hal., 202, 204
truncata (Hedw.) Bruch & Schimp., 202
truncatula (With.) Büse, *nom. illeg.*, 202
uleana Paris, 207
- Pseudocrossidium, 174, 202, 211, 212, 214, 215
crinitum (Schultz) R.H. Zander, 202, 212, 214
excavatum (Mitt.) R.S. Williams, 211, 213
leucocalyx (Mont.) Thér., 211
replicatum (Taylor) R.H. Zander, 211
- Pterygoneurum, 173, 174
- Sagenotortula, 173, 174
- Stegonia, 173
- Stonea, 173
- Syntrichia, 173, 174, 195, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216
anderssonii (Ångström) R.H. Zander, 214
andicola (Mont.) Ochyra, 213
bartramii (Steere) R.H. Zander, 208
bogotensis (Hampe) R.H. Zander, 209
brevisetata (Mont.) *comb. nov.*, 207, 208, 213
buchtienii (Herzog) *comb. nov.*, 208
caninervis (Mitt.) Broth., 214
costesii (Thér.) R.H. Zander, 213
flagellaris (Schimp.) R.H. Zander, 209
fragilis (Taylor) Ochyra, 208, 210, 211, 213
glacialis (Kunze ex Müll. Hal.) R.H. Zander, 211, 212
jaffuelii (Thér.) R.H. Zander, 193
lacerifolia (R. S. Williams) R.H. Zander, 213
latifolia (Bruch ex Hartm.) Huebener, 212
limensis (R.S. Williams) R.H. Zander, 198
montana var. *calva* (Durieu & Sagot) J.J. Amann, 208

- napoana (De Not.) *comb. nov.*, 210, 211
 percarcosa (Müll. Hal.) R.H. Zander, 209
 polylepidis (Herzog) *comb. nov.*, 212
 princeps (De Not.) Mitt., 209, 214
 pseudolatifolia (Cardot) *comb. nov.*, 212
 ruralis (Hedw.) F. Weber & D. Mohr, 208, 209, 214
 ruralis var. spiralis (Herzog) R.H. Zander, 208
 sinensis (Müll. Hal.) Ochyra, 213
 xerophila (Herzog) S.P. Churchill, 214
 Tortella, 174
 Tortula, 173, 174, 175, 191, 195, 206, 212, 215
 acaulon (With.) R.H. Zander, 174, **175**, 179
 aculeonervis (Müll. Hal.) Broth., 215
 aestiva (Brid. ex Hedw.) P. Beauv., 195
 agraria (Hedw.) P. Beauv., 215
 amblyophylla (Hook.) Mitt., 199
 amblyophylla (Mont.) Thér., *nom. illeg.*, 199
 amphidiifolia (Müll. Hal.) Broth., 207
 andicola Mont., 213
 annulus (Müll. Hal.) Broth. ex Paris, 195, 198
 appressa Mitt., 215
 arequipensis *sp. nov.*, **179**, 181
 argentinica (Broth.) R.H. Zander, 185
 armata Broth., *nom. inval.*, 216
 atherodes R.H. Zander, *nom. inval.*, 179
 atrata Thér., 207
 atrovirens (Turner ex Sm.) Lindb., 174, **181**, 183
 atrovirens var. brevifolia Thér., 181, 183
 berteroaana (Müll. Hal.) Broth. ex Paris, *nom. illeg.*, 199
 berteroaana Mitt. *nom. illeg.*, 199
 berthoaana Thér., 207, 208
 bogosica (Müll. Hal.) R.H. Zander, 195
 brevipes (Lesq.) Broth., 201
 breviseta Mont., 207, 208
 brunnea (Müll. Hal.) Broth., 208
 buchtienii Herzog, 208
 bullata (Sommerf.) Lindb., 208
 bullata Herzog, *nom. illeg.*, 208
 cernua (Huebener) Lindb., **183**, 188
 characodonta (Müll. Hal.) Broth., 209
 chrysophylla (Müll. Hal.) Paris, 209
 chubutensis Dusén, 209, 214
 contorta (Hampe) Mont., 174, 209
 crenata Mitt., 174, 215
 denticulata (Wilson) Mitt., 215
 diaguita (R.H. Zander & Mahú) *comb. nov.*, **188**
 epilosa Broth. ex Dusén, 210
 felipponei Thér., *nom. inval.*, 216
 ferruginea E.B. Bartram, 209
 flavipes (Bruch & Schimp.) Wilson, 199
 flavipes Broth., 199, 201
 fragillima Herzog, 210
 hoppeana (Schultz) Ochyra, **191**, 193
 jaffuelii Thér., **193**, 195
 laevinervis Broth. ex Dusén, 210
 ligulata Herzog, 210
 litorea Cardot & Broth., 210
 longipila Dusén, *nom. inval.*, 198, 216
 minima Herzog, 181, 183
 minutirosula (Müll. Hal.) Broth., 215
 modica R.H. Zander, 204
 mucronifolia Schwägr., 181
 muralis Hedw., 174, **195**, 198, 199, 201
 muralis var. aestiva Brid. ex Hedw., 195
 muralis var. longipila Dusén, 195, 198
 muricola (Müll. Hal.) Mitt., 174, 195
 napoana De Not., 210, 211
 obscuretis Thér., 211
 obtusissima (Müll. Hal.) Mitt., 214
 occultilimbata Cardot, *nom. inval.*, 216
 perarmata Broth., 211
 perpusilla (Müll. Hal.) Broth., 211
 peruviana Mitt., 174, 204, 205, 206
 planicosta Herzog, 211, 212
 platyphylla Mitt., 174, **199**, 201, 202, 206
 podocarpi (Müll. Hal.) Broth., 216
 polycarpa Dus., 212
 polylepidis Herzog, 212
 pseudolatifolia Cardot, 212
 pulvinatula Dusén, 213
 purpureo-velutina Herzog, 199, 202
 ruralis (Hedw.) P. Gaertn., B. Mey. & Scherb., 209, 214
 santiagensis Broth., 213
 savatieri (Besch.) Broth., 213
 saxicola Cardot, 210
 serrulata Hook. & Grev., 214
 sinuata E.B. Bartram, 213
 sordida Herzog, 213
 squarripila Thér., 213, 214
 stenophylla Cardot & Broth., *nom. illeg.*, 214
 stenophylla Mitt., 214
 subenervis Dusén, *nom. inval.*, 216
 subulata Hedw., 175
 subviridula Broth., 216
 truncata (Hedw.) Mitt., **202**, 204
 umbrosa Dusén, 214, 215
 vahliana (Schultz) Mont., **204**, 205, 206
 xerophila Herzog, 214
 Trematodon
 felipponei Thér., 216
 Trichostomum, 174
 amblyophyllum (Mont.) Müll. Hal., 199
 hoppeanum Schultz, 191
 schimperii Mont., 183
 Weissia
 cucullata (Hampe) Mitt., *nom. illeg.*, 206
 cucullata Müll. Hal., 206
 Zandera
 octoblepharis (A. Jaeger) Goffinet, 207